US Wind
Fueling our future, naturally.

Maryland Offshore Wind Project

DNREC Wetlands and Subaqueous Lands Permit and Lease, Coastal Construction and Water Quality Certification Request

Revised March 2024

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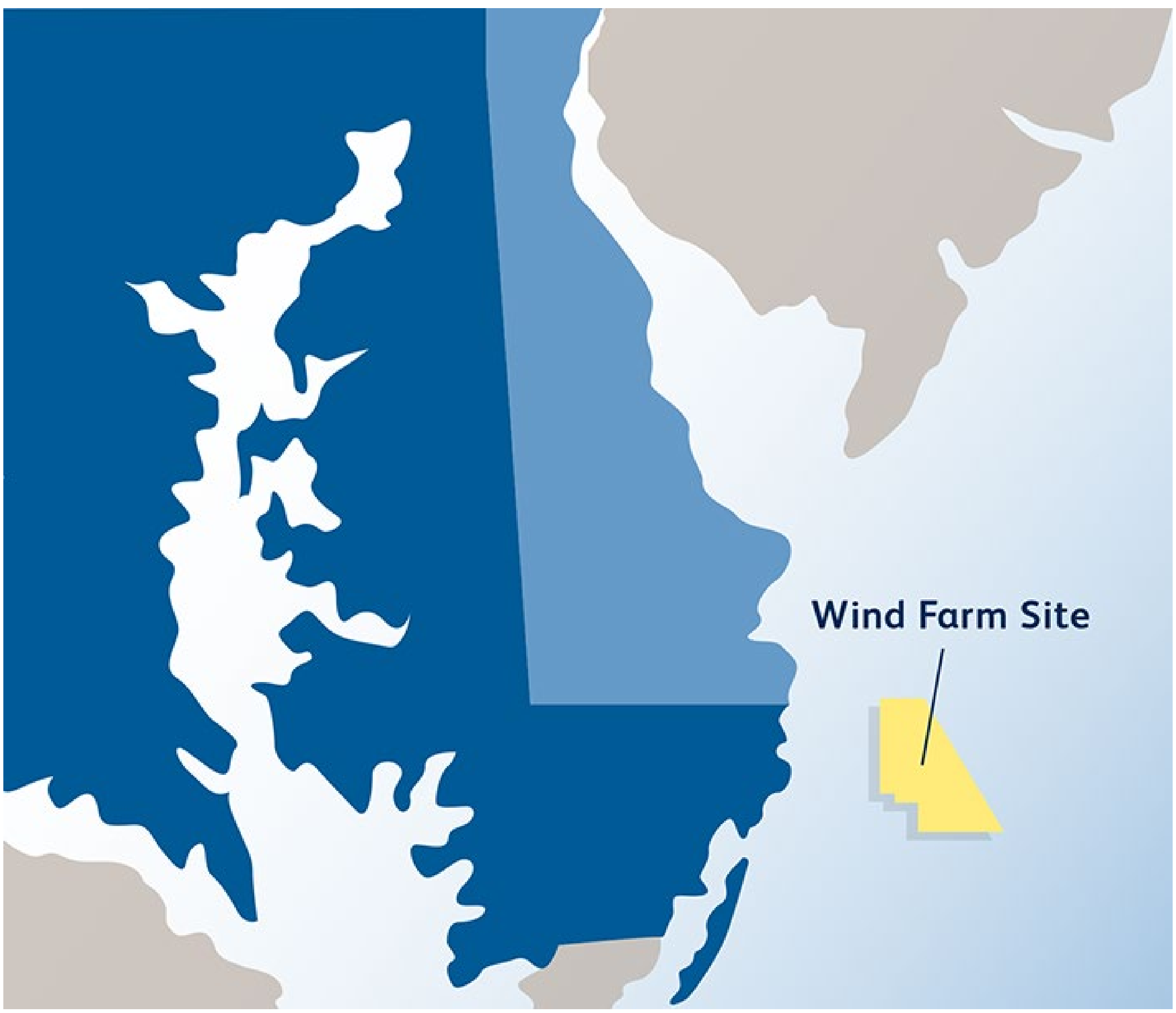

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ACRONYM LIST

°	Degrees
°C	Degrees Celsius
°F	Degrees Fahrenheit
AC	Alternating Current
ACHP	Advisory Council on Historic Preservation
ACPARS	Atlantic Coast Port Access Route Study
ADCP	Acoustic Doppler Current Profiler
ADLS	Aircraft Detection Lighting System
ADIZ	Air Defense Identification Zone
AEPs	Auditory Evoked Potentials
AIS	Air Insulated Substations
ALARP	As Low As Reasonably Practicable
Alpine	Alpine Ocean Seismic Survey, Inc.
Apollo	Apollo Global Management
Barrier Beach Landfall	3R's Beach
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CAA	Clean Air Act
CB&I	Coastal Planning & Engineering, Inc.
CBRAs	Cable Burial Risk Assessment
CBY	Chesapeake Bay Lowlands
C & D Canal	Chesapeake and Delaware Canal
CEJA	Clean Energy Jobs Act
CFR	Code of Federal Regulations
CH_4	Methane
Clearinghouse	Military Aviation and Installation Assurance Siting Clearinghouse
cm	Centimeter
CMECS	Coastal and Marine Ecological Classification System
CMP	Coastal Management Program

CO	Carbon Monoxide
CO_2	Carbon Dioxide
COA	Corresponding Onshore Area
COMAR	Code of Maryland Regulation
COP	Construction and Operations Plan
CPS	Cable Protection Systems
C-PODs	Cetacean PODs
CTD	Conductivity, Temperature, And Depth
CTV	Crew Transfer Vessel
CVA	Certified Verification Agent
CWA	Clean Water Act
CWB	Colonial Nesting Waterbird
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
dB	Decibels
dbh	Diameter at Breast Height
DE	Delaware
DE SHPO	Delaware's State Historic Preservation Office
DelDOT	Delaware Department of Transportation
DIBEP	Delaware Inland Bays Estuary Program Scientific and Technical Advisory Committee
DMAs	Dynamic Management Areas
DNREC	Department of Natural Resources and Environmental Control
DNV	DNV Energy USA, Inc.
DoD	Department of Defense
DOE	Department of Energy
DP	Dynamic Positioning
DP thrusters	Dynamic Positioning Thrusters
DPL	Delmarva Power and Light
DPSs	Distinct Population Segment
DSZ	Dynamic Speed Zones
E2EM1Pd	Estuarine Intertidal High Marsh
E	East

EC	Engineer Circular
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EMF	Electromagnetic Fields
EPA	Environmental Protection Agency
EPC	Engineering, Procurement, and Construction
EPI	EPI Group
EPR	Ethylene Propylene Rubber
ERES	Exceptional Recreational or Ecological Significance
ERL	Effects Range-Low
ESA	Endangered Species Act
ESP	Electric Service Platform
EEZ	Exclusive Economic Zone
FAA	Federal Aviation Administration
FACSFAC	U.S. Navy Fleet Area Control and Surveillance Facility
FFAECC	Fleet Forces Atlantic Exercise Coordination Center
Flotel	Floating Hotel
FMP	Fishery Management Plan
FPM	Flashes Per Minute
ft	Feet
FWCA	Fish and Wildlife Coordination Act
G&G	Geotechnical and Geophysical
GIF	Gulf Island Fabrication, Inc.
GIS	Gas Insulated Substations
GARFO	Greater Atlantic Regional Fisheries Office
GPS	Global Positioning Systems
gm/cm3	Grams Per Cubic Centimeter
GW	Gigawatts
HAPC	Habitat Area of Particular Concern
HD	High Definition
HDD	Horizontal Directional Drilling
HSSE	Health, Safety, Security, and Environmental
Hz	Hertz
HRG	High Resolution Geophysical

HMS	Highly Migratory Species
HVDC	High Voltage Direct Current
ICA	Interconnection Agreement
ICPC	International Cable Protection Committee
IFR	Instrument Flight Rules
IHA	Incidental Harassment Authorization
IMO	International Maritime Organization
in	Inches
IPaC	Information for Planning and Consultation
IMPLAN	Impact Analysis for Planning
IOOS	Integrated Ocean Observation System
ITP	Inspection and Test Plan
IWC	International Whaling Commission
JPA	Joint Permit Application
Keystone	Keystone Engineering, Inc.
kg	Kilograms
kHz	Kilohertz
kJ	Kilojoules
km	Kilometers
km^2	Square Kilometers
KOXB	Ocean City Municipal Airport
kV	Kilovolt
Landmark	Landmark Science & Engineering
LF	Low Frequency
lbs	Pounds
lbs/ft^3	Pounds Per Cubic Feet
LMRCSC	Living Marine Resources Cooperative Science Center
LNTM	Local Notice to Mariners
LOA	Letter of Authorization
Lpk	Peak Sound Pressure
m	Meter
m^2	Square Meters
m^3	Cubic Meters
mm	Millimeters

MABS	Mid-Atlantic Baseline Studies
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MAPC	Maritime Applied Physics Corporation
MARCS	Marine Accident Risk Calculation System
MARUs	Marine Autonomous Recording Units
MBE	Minority Business Enterprise
MBTA	Migratory Bird Treaty Act
MCE	Mission Compatibility Evaluation
MD Project	Maryland Project
MDAT	Marine-Life Data and Analysis Team
MDE	Maryland Department of Environment
MDNR	Maryland Department of Natural Resources
MEA	Maryland Energy Administration
MEC	Munitions of Explosive Concern
Metocean Buoy	Monitoring Buoy
Met Tower	Meteorological Tower
mG	Milligauss
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MGEL	Duke Marine Geospatial Ecology Laboratory
mi	Statute Miles
MLLW	Mean Lower Low Water
MOA	Military Operating Areas
MMPA	Marine Mammal Protection Act
MSF	Module Support Frame
MSL	Mean Sea Level
MTR	Military Training Routes
µm	Micrometers
µPa	MicroPascal
µPa2s	MicroPascal squared-second
µPa RMS	MicroPascal (Root Mean Square)
USBL	Ultra-Short Baseline
MV	Medium Voltage

MW	Megawatt
N	North
NAAQS	National Ambient Air Quality Standards
NARW	North Atlantic Right Whales
NCCA	National Coastal Condition Assessment
NASA	National Aeronautics and Space Administration
NDAA	National Defense Authorization Act
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NLEB	Northern Long-Eared Bat
NAS	Naval Air Station
NGO	Non-Governmental Organizations
NHPA	National Historic Preservation Act
NM	Nautical Miles
NM^2	Square Nautical Miles
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxide
NOAA	National Oceanic and Atmospheric Administration
NOEP	National Ocean Economics Program
NOI	Notice of Intent
NORAD	North American Aerospace Defense Command
NPDES	National Pollutant Discharge Elimination System
NSRA	Navigation Safety Risk Assessment
NTIA	National Telecommunications and Information Administration
NTL	Notices to Lessees
NWI	National Wetland Inventory
O_3	Ozone
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OE/AAA	Obstruction Evaluation/ Airport Airspace Analysis
OEM	Original Equipment Manufacturer
O&M	Operations and Maintenance
OPAREA	Navy Operations Area

OREC	Offshore Wind Renewable Energy Credit
OSRP	Oil Spill Response Plan
OSP	Optimum Sustainable Population
OSS	Offshore Substations
OTM	Offshore Transformer Module
PAHs	Polycyclic Aromatic Hydrocarbons
PARS	Port Access Route Study
PATON	Private Aids to Navigation
Pb	Lead
PDE	Project Design Envelope
PELs	Probable Effect Levels
PEM1E	Freshwater Marsh
PFO4/1Cd	Forested Wetland
PJM	PJM Grid Operator
$PM_{2.5}$	Particulate Matter with a Diameter Less Than or Equal to 2.5 Micrometers
PM_{10}	Particulate Matter with a Diameter Less Than or Equal to 10 Micrometers
POI	Point of Interconnection
PSO	Protected Species Observers
psu	Practical Salinity Units
RCG&A	R. Christopher Goodwin & Associates, Inc.
re 1 μPa	Relative to 1 microPascal
RNA	Rotor-Nacelle Assembly
ROD	Record of Decision
ROV	Remotely Operated Vehicle
ROW	Right-Of-Way
RV	Research Vessel
SADA	Shellfish Aquaculture Development Areas
SAP	Site Assessment Plan
SAV	Submerged Aquatic Vegetation
SCRP	Species Conservation and Research Program
SDM	Species Distribution Modeling
SEFSC	Southeast Fisheries Science Center

SELcum	Cumulative Sound Exposure
SELss	Sound Exposure Levels
SFH	Harvestable Shellfish Waters
SHPO	State Historical Preservation Office
SHT	Spring High Tide
SMAs	Seasonal Management Areas
SMS	Safety Management System
SO_2	Sulfur Dioxide
SO_x	Sulfur Oxides
SPCC	Spill Prevention Control and Countermeasures
SPS	Sparrows Point Steel
sr	Solar Reflectivity
SSZ	Seasonal Speed Zones
SWAs	State Wildlife Areas
SWPPP	Stormwater Pollution Prevention Plan
the Lease	OCS-A 0490
the Project	Maryland Offshore Wind Project
TELs	Threshold Effect Levels
THPO	Tribal Historic Preservation Officers
TOC	Total Organic Carbon
TOY	Time of Year
TMDL	Total Maximum Daily Loads
TNC	The Nature Conservancy
TRBM	Trawl Resistant Bottom Mount
TP	Transition Piece
TSS	Total Suspended Solids
UMCES	University of Maryland Center for Environmental Studies
UME	Unusual Mortality Event
U.S.	United States
USACE	United States Army Corps of Engineers
USCB	United States Census Bureau
USCG	United States Coast Guard
USFF	United States Fleet Forces
USFS	United States Forest Service

USFWS	United States Fish and Wildlife Service
US Wind	US Wind, Inc.
UXO	Unexploded Ordnance
VACAPES	Virginia Capes Operating Area
VAQF	Virginia Aquarium & Marine Science Center Foundation
VHF	Very High Frequency
VOCs	Volatile Organic Compounds
VSA	Visual Study Area
W	West
WEA	Wind Energy Area
WFF	Wallops Flight Facility
WHOI	Woods Hole Oceanographic Institution
WOTUS	Waters of the United States
WTG	Wind Turbine Generators
XLPE	Cross-Linked Polyethylene
y^3	Cubic Yards

TERMINOLOGY

Term	Definition
Barrier Beach Landfalls	Locations on land where the Offshore Export Cables may come ashore, specifically 3R's Beach Parking Lot
Indian River Substation	Delmarva Power and Light (DPL) Substation adjacent to the NRG Indian River Power Plant
Inland Bays	Collection of Inland Bays in Delaware: Indian River Bay, Rehoboth Bay, Little Assawoman Bay
Inter-array Cables	Cables in the Lease area connecting WTGs in strings to OSSs
Interconnection Facilities	US Wind substations and substation expansion at Point of Interconnection
Lease	OCS-A 0490
Lease area	Area described in the Lease
Maryland WEA	The Wind Energy Area off Maryland that became US Wind's Lease area
O&M Facility	Operations and maintenance facility (admin building and quayside) in the Ocean City, Maryland, region
Offshore Export Cable Corridors	Offshore Export Cable Routes labelled
Offshore Export Cables	Up to 4 cables to be located in the selected Offshore Export Cable Corridor(s)
Onshore Export Cable Corridor 1	Area assessed as part of the routing within Indian River Bay, part of the Project Design Envelope
Onshore Export Cable South Corridor	"Onshore" cable corridor through Indian River Bay, proposed route from Barrier Beach Landfall at 3R's Beach to proposed US Wind substations adjacent to Indian River Substation
Onshore Export Cable Corridors	Alternative potential Onshore Cable Routes labelled 1, 1a, 1b, 1c, and 2
Onshore Export Cables	Up to 4 cables to be located in the selected Onshore Export Cable Corridor(s)
Point of Interconnection	Where the Project interconnects to the regional electric grid (PJM)

Term	Definition
The Project	Maryland Offshore Wind Project; encompasses all project activities within the State of Delaware
Submarine Cables	All cables in water, proposed to be buried beneath the seabed or bay bottom (Indian River Bay)
US Wind Substations	The substations that US Wind will build to connect to the Point of Interconnection

1.0 Introduction

US Wind, Inc. (US Wind) is developing the Maryland Offshore Wind Project (the Offshore Wind Project), an offshore wind energy project of up to approximately 2 gigawatts (GW) of nameplate capacity within OCS-A 0490 (the Lease), a Lease area of approximately 80,000 acres located approximately 18.5 kilometers (km) (11.5 miles [mi]) off the coast of Maryland on the Outer Continental Shelf (OCS) (Figure 1.0-1).

The Offshore Wind Project includes:

- MarWin, a wind farm of approximately 300 megawatts (MW) for which the State of Maryland awarded to US Wind Offshore Renewable Energy Credits (ORECs) in 2017;
- Momentum Wind, consisting of approximately 808 MW for which the State of Maryland awarded additional ORECs in 2021; and
- Any subsequent developments authorized within the Lease area.
- All developments would deliver power to the regional electric grid using up to four export cables to new substations connecting to the existing Indian River Substation near Millsboro, Delaware.

The Offshore Wind Project will produce utility-scale power to the regional electric grid, help reduce greenhouse gas emissions, diversify the nation's energy portfolio, and create new economic development opportunities, including employment creation, in the region.

US Wind seeks authorization for the export cables and associated electrical interconnection infrastructure in Delaware from the State of Delaware Department of Natural Resources and Environmental Control (DNREC) Division of Water and Division of Watershed Stewardship via a Wetlands and Waterways Section application for approval of subaqueous lands, wetlands, and water quality certification projects and permit application for Construction Seaward of the DNREC Building Line. The information provided in this application narrative includes the documentation that DNREC would need when evaluating the two applications, in addition to the associated worksheets and appendices specified in each application form (see Appendices A-F). Activities covered by these permit applications are referred to in the document as "the Project", which is the portion of the Maryland Offshore Wind Project that involves Delaware construction activities.

Application Form Components

- Appendix A: Wetlands and Subaqueous Lands Section Permit Application Form
    - Vicinity Map
    - Appendix E. Utility Crossing (with supplemental information)
    - Appendix H. Fill
    - Appendix M. Activities in State Wetlands
    - Appendix S. New Dredging Projects (with supplemental information)
    - Utility Crossing Landowner Agreement

    - Inadvertent Release Contingency Plan
    - Site Photos
    - Jones Crossroads Landfill waste acceptance letter
    - Property Deeds
    - Abutters List of Adjoining Properties
- Appendix B: Supporting Application Materials for Coastal Construction Permit (submitted via e-permitting February 27, 2024)
    - Application Cover Letter
    - DNREC Division of Parks and Recreation Acknowledgement Letter
    - Maryland Offshore Wind Project – 3R's Beach Profile Drawing
    - Maryland Offshore Wind Project – 3R's Beach Topography
- Appendix C: Preliminary Project Design Plans
    - C1: Preliminary Maryland Offshore Wind Project Export Cable Plans – Onshore
        - Scaled Plan View
        - Scaled Cross-Section Plans
    - C2: Preliminary Maryland Offshore Wind Project Substation Plans
        - Scaled Plan View
        - Scaled Cross-Section Plans
    - C3: Preliminary Maryland Offshore Wind Project Export Cable Plans – Offshore
        - Scaled Plan View
        - Scaled Cross-Section Plans
- Appendix D: Water Quality Certification Request
- Appendix E: October 2017 Sediment Sample Results
- Appendix F: Indian River and Indian River Bay Surface Water and Sediment Assessment – January 2024
- Appendix G: Indian River Bay: Hydraulic Dredging Impacts
- Appendix H: Relevant COP Appendices
    - Appendix H1: Waste Discharges and Releases, 2021
    - Appendix H2: CB&I MEA G&G Report, May 2014
    - Appendix H3: Alpine G&G Report 1751, June-Jul 2015
    - Appendix H4: Alpine Export Cable Report 1783, Aug-Nov 2016
    - Appendix H5: Delaware Waters Field Evaluation Report, March 2019
    - Appendix H6: Indian River Bay Sediment Transport Memo, 2020
    - Appendix H7: Offshore Sediment Transport Modeling, 2022
    - Appendix H8: Indian River Bay Sediment Transport Modeling, 2023
    - Appendix H9: Indian River Bay Benthic Report, 2017
    - Appendix H10: Offshore Benthic Report, 2016

- Appendix H11: Lease Area and Offshore Export Cable Corridors Benthic Report 2021
- Appendix H12: Onshore Export Cable Corridors Benthic Report, 2022
- Appendix H13: Information to Support Essential Fish Habitat Assessment, 2023
- Appendix H14: Wetlands Delineations, 2021
- Appendix H15: Underwater Acoustic Assessment Report, 2023
- Appendix H16: Cable Burial Risk Assessment - Export Cable Corridor, 2023

The applicable appendices of the Wetlands and Subaqueous Lands Permit Application Form are included in Appendix A of this submittal. Table 1.0-1 provides an overview of appendix applicability.

Table 1.0-1 Summary of Wetlands and Subaqueous Lands Permit Application Form Appendices Applicability

Permit Form Appendix Name	Applicability Determination	Applicability Explanation
Appendix A: Boat Docking Facilities	Not Applicable	No boat docking facilities are proposed.
Appendix B: Boat Ramps	Not Applicable	No boat ramps are proposed.
Appendix C: Road Crossings	Not Applicable	No road crossings are proposed.
Appendix D: Channel Modifications or Impoundment Structures (Dams)	Not Applicable	No channel modifications or impoundment structures are proposed.
Appendix E: Utility Crossings	**Applicable**	**The utility cables proposed will cross subaqueous lands.**
Appendix F: Intake or Outfall Structures	Not Applicable	No intake or outfall structures are proposed.
Appendix G: Bulkheads	Not Applicable	No bulkheads are proposed.
Appendix H: Fill	**Applicable**	**Where needed, fill may be placed as cable protection in the nearshore Atlantic Ocean.**
Appendix I: Rip-Rap Sills and Revetments	Not Applicable	No rip-rap sills and revetments are proposed.
Appendix J: Vegetative Stabilization	Not Applicable	No vegetative placement is proposed.
Appendix K: Jetties, Groins, or Breakwaters	Not Applicable	No jetties, groins, or breakwaters are proposed.
Appendix M: Activities in State Wetlands	**Applicable**	**The Project will install cables using HDD under state wetlands and temporary pipelines related to dredging and dewatering of dredged material. .**
Appendix N: Preliminary Marina Screening Checklist	Not Applicable	Marinas are not proposed.

Table 1.0-1 Summary of Wetlands and Subaqueous Lands Permit Application Form Appendices Applicability

Permit Form Appendix Name	Applicability Determination	Applicability Explanation
Appendix O: Marinas	Not Applicable	Marinas are not proposed.
Appendix P: Stormwater Management	Not Applicable	No stormwater management for waterways is proposed.
Appendix Q: Ponds and Impoundments	Not Applicable	No impacts to pounds or impoundments are proposed.
Appendix R: Maintenance Dredging or Excavating	Not Applicable	No maintenance dredging or excavating is proposed.
Appendix S: New Dredging Projects	**Applicable**	**The proposed project will conduct new dredging for cable burial during construction.**

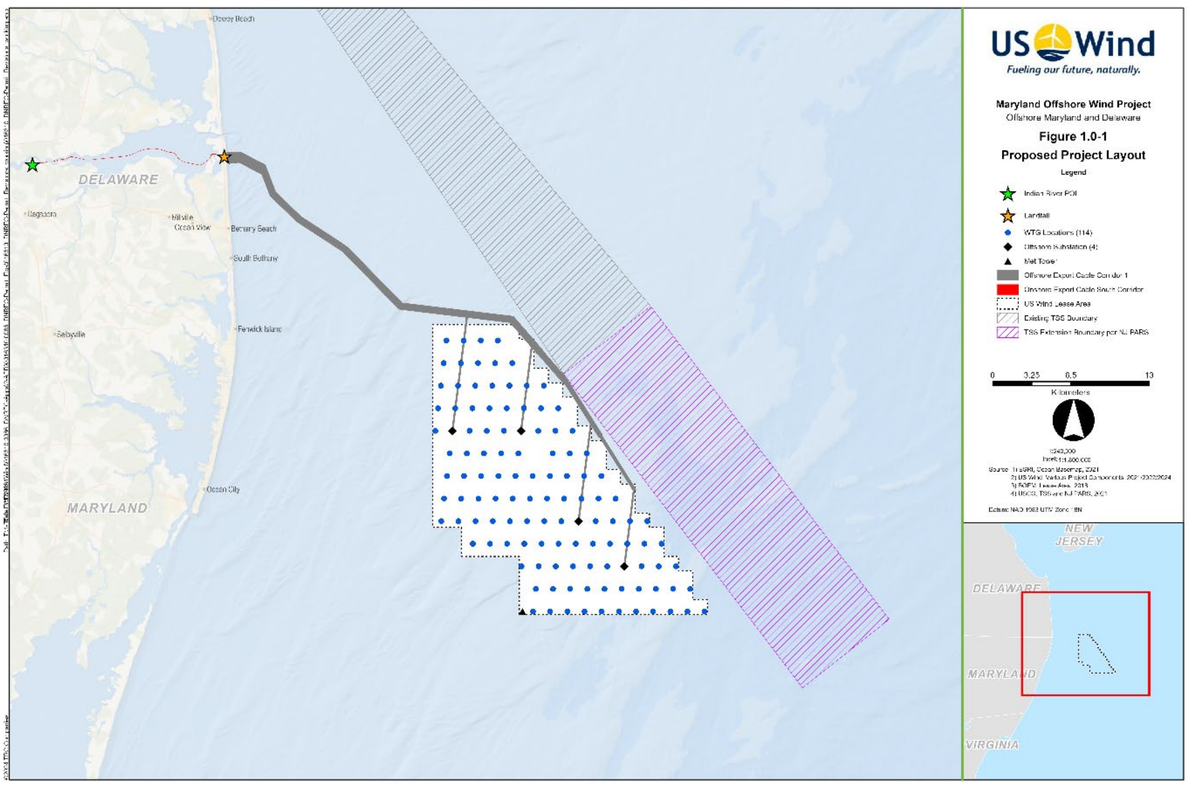

Figure 1.0-1. Proposed Offshore Wind Project Layout

1.1 Project Purpose

The purpose of the Project (Appendix A: Section 2(5) in the Wetlands and Subaqueous Lands Permit Application; Section 4 in Appendix S: New Dredging Projects; Section 1 in Appendix M: Activities in State Wetlands) is to interconnect the Offshore Wind Project to the Delmarva Peninsula in fulfilment of state and federal clean energy standards and targets. Once developed, the Offshore Wind Project will play a critical role in advancing the offshore wind targets set forth by the federal government, reduce greenhouse gas emissions, increase grid reliability, and support economic development growth in the region, including thousands of union jobs. The Offshore Wind Project if fully developed would avoid 139 million short tons of carbon dioxide every year from the electric power sector (US Wind 2023b).

1.2 Overview of the Offshore Wind Project – Project Design Envelope

US Wind's Offshore Wind Project would include up to 121 wind turbine generators located in the Lease area, connected by inter-array cables to up to 4 offshore substations (OSSs) with up to 4 export cables exiting the Lease area toward the landing location onshore. Additionally, a fixed-platform meteorological tower (Met Tower) would be installed in the southern portion of the Lease area for metocean monitoring.

US Wind proposed a Project Design Envelope in a Construction and Operations Plan (COP) submitted to the lead federal permitting agency, the Bureau of Ocean Energy Management (BOEM) in the U.S. Department of the Interior. The Project Design Envelope included multiple export cable routes and two landing locations, as well as a maximum number of wind turbines and cables, to be evaluated (Figure 1.2-1).

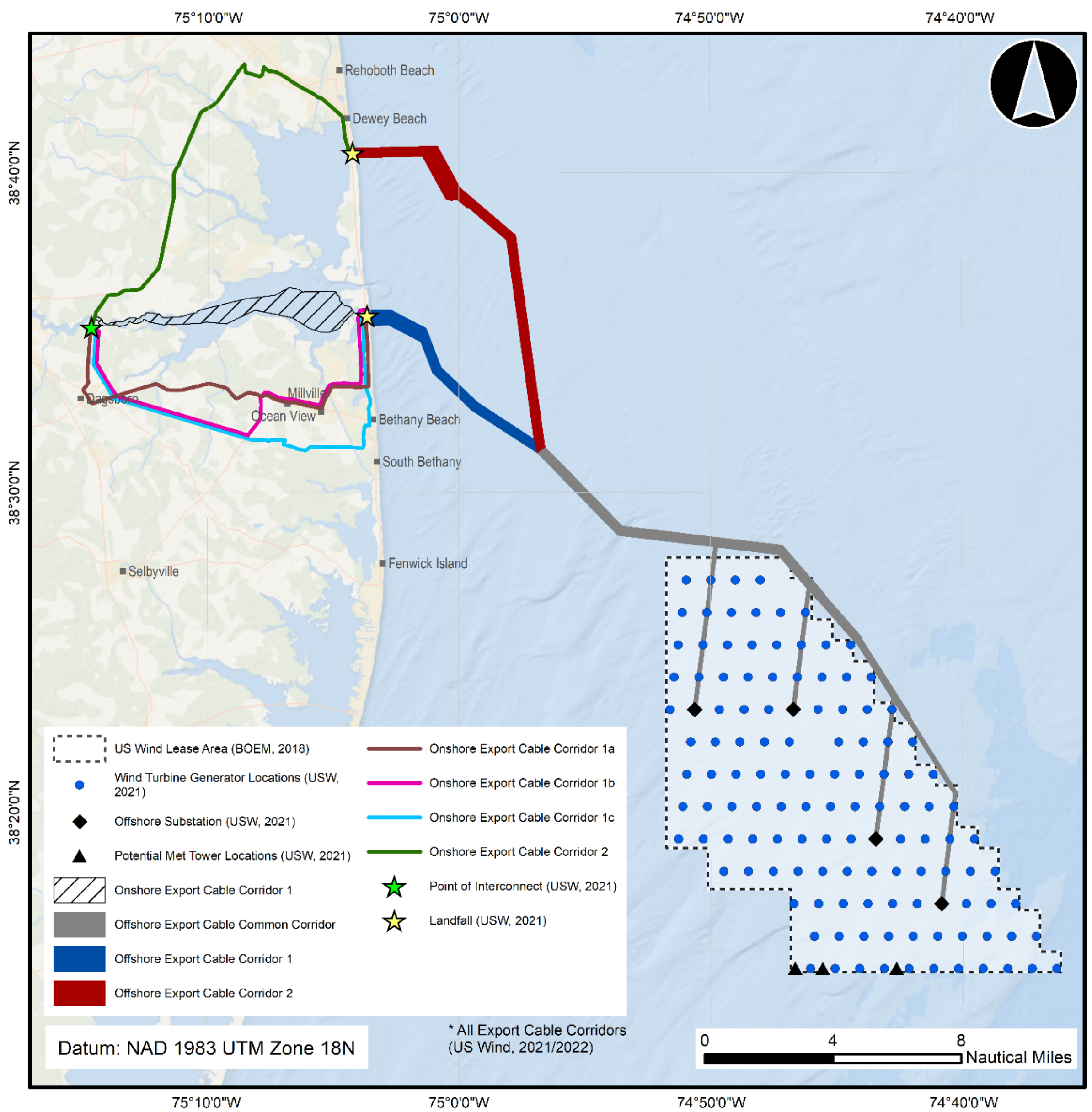

Figure 1.2-1. Project Design Envelope Layout

1.3 Project Elements

The Project for which US Wind seeks DNREC authorization, includes a subset of the Project Design Envelope that US Wind proposes to build. As defined in the COP the Project includes Offshore Export Corridor 1, 3R's Beach Landfall, Onshore Export Cable South Corridor, and US Wind Substations (Figure 1.2-1) as the proposed project layout (Figure 1.0-1).

The Project would interconnect the Offshore Wind Project to the onshore electric grid by up to four new 230-275 kV export cables into new substations in Delaware. Each cable would include 8 km (5 mi) in Delaware state waters in the Atlantic Ocean, and 16 km (10 mi) in Delaware state waters in Indian River Bay, for a total of 24 km (15 mi) in Delaware state waters per cable and 96 km (60 mi), or 334,560 linear feet (55 NM), for all four export cables. Project elements include export cables and onshore infrastructure. The approximate distances of each portion of one cable are as follows:

- Offshore Export Cable Corridor 1 from 3 NM state waters line to approximate HDD punch out location: 8 km (5 mi)
- HDD punch out location in Atlantic Ocean to transition vault at 3R's Beach Parking Lot: 1 km (1 mi)
- 3R's Beach Parking Lot transition vault to HDD punch out location in eastern Indian River Bay: 1 km (1 mi)
- Export cable buried by jet plow/vertical injection in Indian River Bay: 16 km (10 mi)
- HDD punch out location in western Indian River to transition vaults in vicinity of US Wind Substations: 0.7 km (0.5 mi)

Specific lengths of the horizontal directional drill at each location are estimated, pending final design. US Wind would provide as-built drawings following each installation campaign with dimensions and locations of HDDs, cables, and transition vaults.

A summary of the Project parameters encompassed by the potential DNREC approvals is provided in Table 1.2-1.

Table 1.2-1. Summary of Project Parameters Subject to DNREC Approval

Parameter	Description
Offshore Export Cables	4 – 230-275 kV AC submarine through “Offshore Export Cable Corridor 1” in Delaware waters in the Atlantic Ocean
Maximum Length of Offshore Export Cables (4 Total)	32 km (16.9 NM) in Delaware State Waters in the Atlantic Ocean (4.2 NM per cable) (Figure 1.3-1)
Jet plow and vertical injector	Installation method for the offshore and onshore export cables within Delaware State Waters, in the Atlantic Ocean and Indian River Bay
Horizontal Directional Drilling (HDD)	HDD to connect the export cables from water to land, in 3 locations, for up to 12 individual HDDs
Barrier Beach Landfall	Buried cable transition vaults at 3R's Beach parking lot
Onshore Export Cables	Up to 4 – 3-phase 230-275 kV through “Onshore Export Cable South Corridor” in Indian River Bay

Table 1.2-1. Summary of Project Parameters Subject to DNREC Approval

Parameter	Description
Maximum Length of Onshore Export Cables (4 Total)	64 km (40 mi), approximately 10 miles per cable
US Wind Substations	New substations adjacent to the Indian River Substation
Dredging	For cable burial during cable installation in Indian River Bay, 76-m width corridors totaling 2.1 km (1.3 mi) in length anticipated for dredging. Dredging volumes up to 73,676 cubic yards (30,278 cubic yards for Campaign 1; 43,398 cubic yards for Campaign 2) (refer to Appendix C1 and Figure 1.3-2)

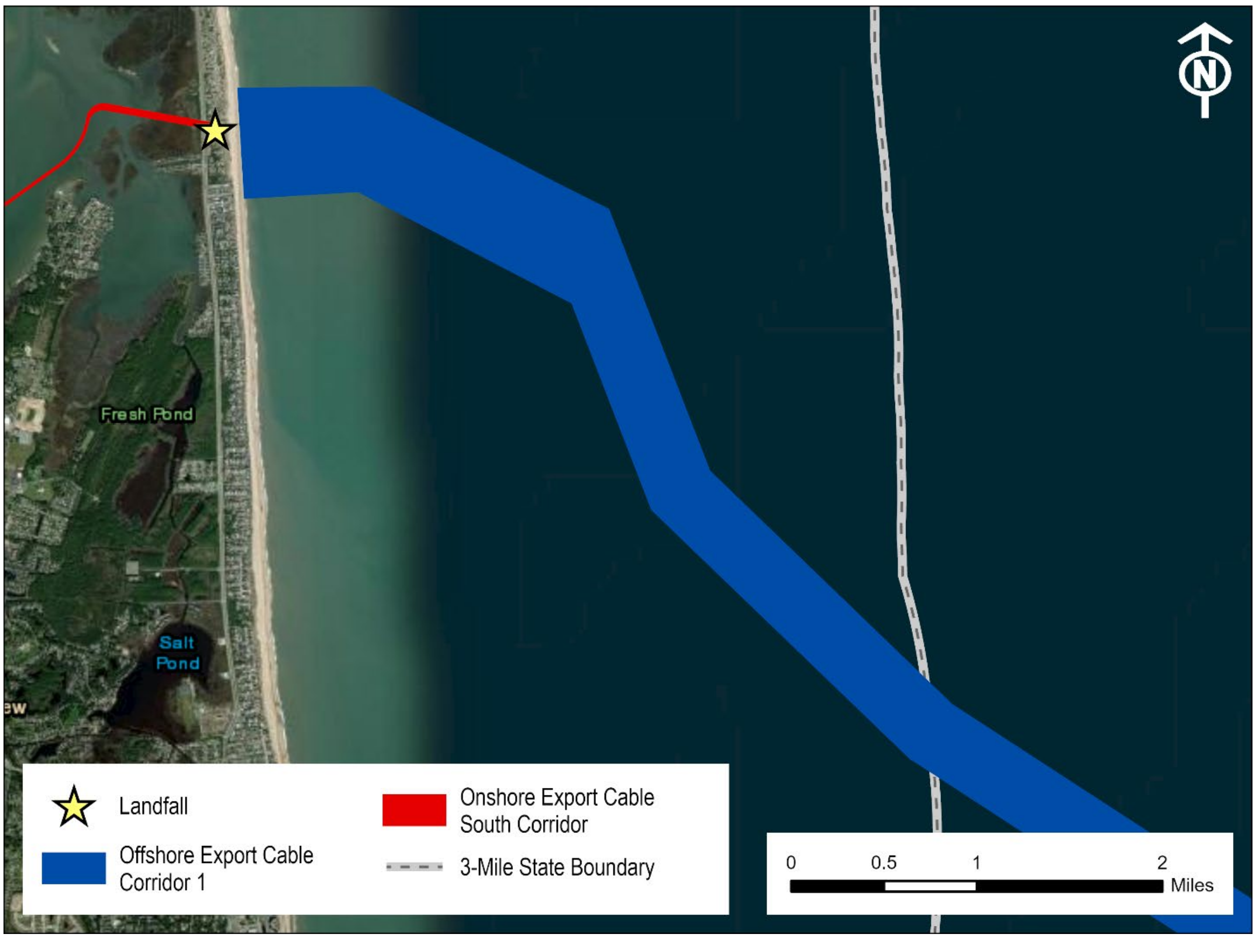

Figure 1.3-1. Offshore Export Cable Corridor 1, within 3 nautical miles

Figure 1.3-2. Onshore Export Cable South Corridor and Temporary Construction Disturbance Area

1.4 Summary of Project Components and Activities in Delaware Land and Water

The proposed activities include the construction, operation and maintenance of an export cable corridor to shore through Delaware waters in the Atlantic within 3 NM, and onshore transmission and substation connections (see Appendix C).

- **Offshore Export Cables**
    - Up to 4 offshore export cables are included in the Project. Export cables consist of an offshore portion, the Offshore Export Cables, from the Lease area to the landing location, through a transition vault to the onshore portion, and the Onshore Export Cables that connect to the Point of Interconnection (POI).
    - Offshore Export Cables are planned as 230-275 kV 3/C submarine cable. Offshore Export Cables would run from one of the up to 4 OSSs to a planned landfall in the vicinity of the Indian River Inlet.

  - One potential landing location is included in the Delaware Seashore State Park parking lot at 3R's Beach.
  - Cable corridors offshore have been sited to avoid conflicts with existing uses, such as active sand borrow areas used for beach nourishment and storm resiliency projects along the Delmarva Peninsula.
- **Onshore Export Cables**
  - Onshore Export Cables are the portion of the export cables from the landfall location to the POI located onshore.
  - Up to 4 Onshore Export Cables traversing Indian River Bay after landfall at 3R's Beach and connecting to onshore substations next to the POI at Indian River Substation. Transition from water to land, and land to water, would be accomplished by horizontal directional drilling (HDD). HDD will minimize impacts to wetlands and sensitive shore areas.
  - Onshore cable infrastructure will be buried.
- **Onshore Substations**
  - Proposed POI to the regional electric grid is the existing Indian River Substation owned by Delmarva Power and Light (DPL) in Dagsboro, Delaware.
  - It is anticipated that the Indian River Substation would be upgraded and expanded as required as the contracted generating capacity of the Project is increased.
- **US Wind Onshore Substations**
  - Proposed construction of onshore substations in the vicinity of the existing Indian River Substation. These substations would provide for a transition for the Onshore Export Cables to connect to the Indian River Substation.

1.5 Water Quality Certification Request

Appendix D contains the Water Quality Certification Request to DNREC.

1.6 Previous Permitting History

The following Table 1.6-1 includes a list of DNREC permits received during development of the Offshore Wind Project (Appendix A, Section 18 the Wetlands and Subaqueous Lands Permit Application).

Table 1.6-1. Previous DNREC Permits and Approvals

Permit Number	Approval Date	Project Area Surveyed
Wetlands and Subaqueous Lands Permit: LA-171/16	7/12/2016 Rev. 9/8/2016	Formerly planned offshore and onshore export cable route.
Wetlands and Subaqueous Lands Permit: LA-232/21	8/9/2021	Nearshore Atlantic offshore cable routes.
Wetlands and Subaqueous Lands Permit: LA-138/22; LA-138/22(A1)	8/10/2022 9/22/2023	Nearshore Atlantic offshore cable routes. Onshore Export Cable Corridor 1. 2023 Physical and Chemical Sediment Sampling.
Special Use Permit	5/9/2022	Onshore geotechnical work in Delaware Seashore State Park.
Scientific Collecting Permit: 2022-FSC-045	8/1/2022	Shellfish survey in Indian River Bay.

1.7 Other Related Permits

Table 1.7-1 includes a list of permits, certifications, or approvals for which US Wind has applied or will apply for from various federal, state, and local entities, as required in Appendix A, Sections 17 and 18, and Appendix M, Section 10f, of the DNREC Wetlands and Subaqueous Lands Section Basic Application Form.

Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
FEDERAL			
Bureau of Ocean Energy Management (BOEM)	Construction and Operation Plan (COP)	Outer Continental Shelf Lands Act (OCSLA) 43 U.S.C. 1337(p) and BOEM Regulations at 30 CFR Part 585	Under these federal regulations, the Lessee must submit a detailed plan for the construction, operation, and conceptual decommissioning of a wind energy project in the commercial lease area, including any easement. BOEM reviews and approves, disapproves, or approves with modifications the Lessee's COP.
	National Environmental Policy (NEPA) – Environmental Impact Statement	NEPA 42 U.S.C. § 4321 *et seq.* and 40 CFR Part 1502	In accordance with NEPA review procedures, BOEM must prepare an Environmental Impact Statement (EIS) to consider the environmental impacts of its actions in decision making, providing full and fair discussion of significant environmental impacts and reasonable alternatives that would avoid or minimize adverse impacts or enhance the quality of the human environment. After completion of the NEPA EIS, BOEM will issue a Record of Decision (RoD) to adopt its final decision on the Lessee's COP. *- Notice of Intent to prepare an EIS posted in the Federal Register on June 8, 2022.* *- Notice of Availability of a Draft EIS posted in the Federal Register on October 6, 2023.*
	Facility Design Report and Fabrication and Installation Report	30 CFR 585, Subpart G	Under these federal regulations, the Lessee must submit a Facility Design Report and a Fabrication and Installation Report to BOEM before installing facilities described in the approved COP.
United States Army Corps of Engineers (USACE)	Individual Permit Section 10 Permit (navigable waters) Section 404 Permit	Rivers and Harbors Act of 1899 33 U.S.C 401 et seq., 33 U.S.C 403 (Section 10) Clean Water Act (CWA) 33 U.S.C. 1251 et seq., 33 U.S.C. 1344 (Section 404)	Section 10 of the Rivers and Harbors Act of 1899 requires that parties seek authorization from USACE for any civils works projects that include the construction of structures in or over any navigable water of the United States.

Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
			Section 404 of the CWA requires that parties seek authorization from the USACE for the discharge of dredged or fill material into any navigable waters of the United States. Under both the Rivers and Harbors Act and the Clean Water Act, the USACE may issue an Individual Permit or Standard Permit. USACE may not issue its permit until it has received a CWA Section 401 Water Quality Certificate from any applicable state (or EPA) unless certification is waived. In addition, EPA or states with delegated authority (Maryland; Delaware) under Section 402 of the CWA may require NPDES permits if there is a regulated discharge of pollutants into waters of the United States (includes oceans out to 200 miles). Although the construction and operation of an offshore wind energy project would not likely create an ongoing source of water pollution, specific activities during construction may be considered a regulated discharge. *- US Wind submitted initial draft application materials in February 2023.* *- US Wind submitted permit application materials on August 30, 2023.* *- US Wind's permit application deemed complete on September 14, 2023.* *- USACE Publication of Public Notice on October 6, 2023.*
	Section 408 Permit Permission – Civil Works Projects	Rivers and Harbors Act of 1899 33 U.S.C 408 (Section 408)	USACE may grant Section 408 permission for another party to alter a Civil Works project upon a determination that the alteration proposed will not be injurious to the public interest and will not impair the usefulness of the Civil Works project. For example, USACE may grant permission to parties for the use or temporary occupation of designated USACE offshore sand borrow

Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
			areas, provided such work is not injurious to the public interest of this project to achieves and mining for beach renourishment and highway projects. *- US Wind submitted initial draft review request materials in February 2023.* *- US Wind submitted the 408 Review Request on August 30, 2023.* *- US Wind's 408 Review Request deemed complete on September 8, 2023.* *- US Wind's 408 Review Request complete application submitted on November 24, 2023.*
National Marine Fisheries Service (NMFS) – NOAA Fisheries	Incidental Harassment Authorization or Letter of Authorization	Marine Mammal Protection Act (MMPA), 16 U.S.C. 1361 et. seq.	The MMPA generally prohibits the "take" of marine mammals (includes harassment) but allows for the issuance of incidental "take" permits for negligible impact within a specified geographic region. The "take" largely arises due to activities incidental to planned marine construction activities and vessel transits, such as underwater sound, and may include avoidance of animal harassment or vessel interaction or strikes. *- US Wind's MMPA Incidental Take Request deemed complete April 3, 2023.* *- Notice of Receipt of Application published in the Federal Register on May 2, 2023.* *- Proposed Rule published in the Federal Register on January 4, 2024.*
National Marine Fisheries Service (NMFS) – NOAA Fisheries	Magnuson-Stevens Fishery Conservation and Management Act Consultation	Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801 - 1891	Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act requires that BOEM conducts consultation with NMFS regarding an action that may adversely affect Essential Fish Habitat. *See also* Fish and Wildlife Coordination Act, 16 U.S.C. 661-667e. *- EFH Consultation Request submitted on June 2, 2023.*

Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
			- EFH Consultation Package deemed completed by NOAA on February 2, 2024.
	Section 7 Endangered Species Act (ESA) Consultation	Endangered Species Act, 16 U.S.C. 1531-1544	Section 7 of the ESA requires that the lead federal agency (BOEM and USACE) consult with NMFS to determine whether or not any proposed action or marine construction activities in the Project's specified coastal or ocean area of effect is not likely to jeopardize the continued existence of any endangered/threatened species within NMFS jurisdiction or result in the destruction or adverse modification of critical habitat. *- ESA Consultation Request Package submitted on June 2, 2023.* *- ESA Consultation Package deemed complete on January 3, 2024.*
United States Fish and Wildlife Service (USFWS)	MBTA and BGEPA conservation plans	Migratory Bird Treaty Act of 1918, 16 U.S.C. 703 – 712 Bald and Golden Eagle Protection Act of 1940, 16 U.S.C. 668 – 668d	Under the Interior Department's current legal position, the MBTA prohibits the incidental take of migratory birds, which could include take from offshore wind structures. While there is no MBTA permitting regime for offshore wind projects, the USFWS weighs heavily the existence of conservation plans in its administration of the statute. The BGEPA prohibits a person from "knowingly, or with wanton disregard" taking bald and golden eagles without permission. Unlike the MBTA, BGEPA has a take permit program.
	Section 7 Endangered Species Act Consultation	ESA 16 U.S.C. 1531-1541	Section 7 of the ESA requires that the lead federal agency (BOEM and USACE) consult with the FWS to determine if the proposed action in terrestrial, coastal, or offshore areas is not likely to jeopardize the continued existence of any endangered/threatened species or result in the destruction or adverse modification of critical habitat.

Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
			FWS may issue an incidental take statement with its Biological Opinion where an action is reasonably certain to result in the incidental take of the species, but it is not likely to jeopardize its continued existence. *- ESA Consultation Request Package submitted on June 2, 2023.* *- ESA Consultation Package deemed complete on January 3, 2024.*
United States Coast Guard (USCG) – District 5	Local Notice to Mariners (LNTM)	14 U.S.C. 81	USCG requires notification of work within United States waters in order to avoid or mitigate potential marine traffic issues or conflicts that may arise from the operation of privately owned vessels in order to notify local mariners. LNTM's are frequently issued by the USCG associated with various phases of construction and operations and maintenance vessel activities.
United States Coast Guard (USCG) – District 5	Private Aids to Navigation (PATON)		USCG will review and issue PATON Permits for WTGs, OSSs, and the Met Tower. They will specify and oversee the placement of structure lighting, lighting patterns and intensities, and flash/color characteristics.
Federal Aviation Administration (FAA)	Obstruction Evaluation/ Airport Airspace Analysis (OE/AAA) "Determination of No Hazard"	14 CFR Part 77	FAA jurisdiction extends 12NM from shore and applies to new construction or alteration of structures more than 200 feet above ground level. The FAA study will only assess WTG and OSS locations within their jurisdiction. It is anticipated BOEM will adopt the same obstruction lighting recommendations in their COP and NEPA reviews for the balance of any structure locations outside FAA jurisdiction, thereby encompassing the entire Project. *- US Wind received a Determination of No Hazard from the FAA on May 22, 2023, effective July 1, 2023.*

Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
Advisory Council on Historic Preservation, Tribes, and the State Historic Preservation Office (ACHP, THPO, SHPO)	National Historic Preservation Act (NHPA) Section 106 Consultation	54 U.S.C. § 306108; 36 CFR Part 800	Section 106 consultation requires federal agencies to consider the effects of projects they carry out, approve, or fund on historic properties or properties eligible for listing. Section 106 applies to federal "undertakings" that may adversely affect historic property within the Area of Potential Effect. Consulting parties may include the state or tribal historic officer, local government, and other members of a community The ACHP must be given an opportunity to participate. The parties may enter into an agreement to avoid, minimize, or mitigate the adverse effects of the Project. *- BOEM initiated consultation June 8, 2022.*
Department of Defense (DoD)	Consultation	Public Law 111-383, National Defense Authorization Act (NDAA) DoD Instruction 4180.02	The DoD is authorized to ensure robust development of renewable energy sources. Per 4180.02, the DoD will review all anticipated renewable energy projects on the OCS to address any stipulations on the lease sale agreement. The Military Aviation and Installation Assurance Siting Clearinghouse (The Clearinghouse) works with industry to overcome risks to national security. The DoD engages in a Mission Compatibility Evaluation (MCE) to study any adverse impacts on military operations and readiness and then proposes mitigation strategies to lessen those impacts. US Wind most recently filed an updated informal review request with the Clearinghouse in January 2022. Based on the FAA Determination of No Hazard, US Wind understands that the DoD will not be requiring a mitigation agreement for radar or aviation impacts at this time.

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Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
STATE OF MARYLAND			
Maryland Department of Environment (MDE) (delegated authority from EPA)	OCS Clean Air Act Permit	COMAR 26.11 Clean Air Act; 42 U.S.C. 7627 40 CFR Part 55	The Clean Air Act (Section 328(a)) requires that OCS sources located within 25 mi (40 km) of States' seaward boundaries (inner sources) submit a Notice of Intent (NOI) and apply for an OCS Air Permit to construct and operate the OCS source in accordance with the requirements of the Corresponding Onshore Area (COA). In addition, Section 328 creates a more comprehensive program for inner sources, stating: "Such requirements shall be the same as would be applicable if the source were located in the corresponding onshore area, and shall include, but not be limited to, State and local requirements for emission controls, emission limitations, offsets, permitting, monitoring, testing, and reporting." *- US Wind filed a Notice of Intent to apply for an OCS Air Permit on August 5, 2022.* *- Air Dispersion Modelling Protocol submitted to MDE September 16, 2022. Revised Air Dispersion Modeling Protocol and Alternative Model Request submitted to MDE March 10, 2023.* *- US Wind submitted an OCS Air Permit Application on August 17, 2023.* *- Alternative Model Requested approved by MDE on September 11, 2023.* *- OCS Air Permit Application deemed administratively complete on January 4, 2024.*
Maryland Department of Natural Resources	Maryland Coastal Zone Management Consistency (per federal Coastal Zone Management Act)	Section 307 of the Coastal Zone Management Act, 16 U.S.C. 1456	The Coastal Zone Management Act authorizes states to manage the development and use of coastal waters and adjacent lands. The Act authorizes the state to conduct a consistency review of federal actions that may affect Maryland's coastal uses and/or resources. Given that the State

Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
			of Maryland has not designated a geographic location description outside its coastal zone area, US Wind will proceed voluntarily to engage in the consistency review with the State, per 15 CFR 930.53 & 930.54. *- MDNR and US Wind executed a stay of review on July 8, 2022, with second extension executed August 9, 2023. MDNR restarted review February 9, 2024.*
Maryland Department of Environment	Tidal Wetlands License	Environment Article Title 16; COMAR 26.24	Any work performed in a tidal wetland or floodplain 5,000 square feet or more of impacts to tidal wetlands requires a Joint Federal/State Application for the Alteration of Any Tidal Wetland in Maryland (JPA). The determination between minor and major projects depends on the impacts to tidal wetlands, not total project area. The type of authorization issued will depend on the amount of impacts and the type of tidal wetland to be impacted (i.e. state or private). US Wind anticipates a Tidal Wetlands License will be necessary for work related to the O&M Facility. *- US Wind met with MDE for a pre-application meeting on June 22, 2023.* *- US Wind submitted a JPA on August 30, 2023.* *- The JPA was deemed complete by MDE, with a public notice published February 9, 2024.* *- A public hearing on the JPA was held on March 25, 2024.*
Maryland Department of Environment	Water Quality Certification	Section 401 of the Clean Water Act, and COMAR Title 26, Part 2, Subtitle 08	Applicable to discharge to navigable waters of the State, in this case potential stormwater from the O&M Facility. *- Water quality certification request included with February 9, 2024, public notice.*

Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
STATE OF DELAWARE			
Delaware Department of Natural Resources and Environmental Control – Division of Water	Wetlands and Subaqueous Lands Permit Section 401 Water Quality Certification	Delaware Title 7 Natural Resources and Environmental Control: 7500 Wetlands and Subaqueous Lands CWA Section 401	Authorization from the Wetlands and Waterways Section is required for construction activities in tidal wetlands or in tidal and non-tidal waters in Delaware. This CWA Section 401 Water Quality Certification will be necessary before USACE can issue its permits. *- Pre-filing meeting held July 20, 2023.* *US Wind submitted application February 15, 2024.*
Delaware Department of Natural Resources and Environmental Control – Division of Water	Subaqueous Lands Lease (renewable on 10-year term)	Delaware Title 7 Natural Resources and Environmental Control: 7500 Wetlands and Subaqueous Lands	A subaqueous lands lease is issued from the Wetlands and Waterways Section in conjunction with a permit and conveys a legal interest in public subaqueous lands for a terminate period for the use of the structure. The wetlands and subaqueous lands permit application serves as the instrument through which to obtain a lease. *- Pre-application submitted to DNREC on June 16, 2023.* *- US Wind submitted application February 15, 2024.*
Delaware Coastal Management Program	DE Coastal Zone Management (CZM) Consistency Certification (per federal Coastal Zone Management Act)	Section 307 of the Coastal Zone Management Act 16 U.S.C. 1456 (15 CFR 930 Subpart E – Consistency for Outer Continental Shelf (OCS) Exploration, Development, and Production Activities)	The Coastal Zone Management Act authorizes states to manage the development and use of coastal waters and adjacent lands. The Act authorizes the state to conduct a consistency review of federal actions that may affect Delaware's coastal uses and/or resources. The Delaware federal CZMP is delegated to DNREC for administration and given that US Wind will engage in a consistency review as set forth under 15 CFR 930.77. The need for Subpart E review is to determine the consistency of the COP.

Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
			- DNREC and US Wind executed a stay of review on July 8, 2022, with second extension executed August 9, 2023.
Delaware Coastal Management Program	DE Coastal Zone Management (CZM) Consistency Certification (per federal Coastal Zone Management Act)	Section 307 of the Coastal Zone Management Act 16 U.S.C. 1456 (15 CFR 930 Subpart D – Consistency for Activities Requiring a Federal License or Permit)	The Coastal Zone Management Act authorizes states to manage the development and use of coastal waters and adjacent lands. The Act authorizes the state to conduct a consistency review of federal actions that may affect Delaware's coastal uses and/or resources. The Delaware federal CZMP is delegated to DNREC for administration and given that US Wind will engage in a consistency review as set forth under 15 CFR 930.53. Subpart D review is to determine the consistency of the USACE application. *- DNREC and US Wind executed a stay of review on November 8, 2023, effective November 11, 2023.*
Delaware Department of Natural Resources and Environmental Control – Division of Fish and Wildlife	Environmental Review for Species of Special Concern	Delaware Title 7 Natural Resources and Environmental Control: 3900 Wildlife Section 17.0 Species of Special Concern	Under Title 7, the Division of Fish and Wildlife may designate certain species of fish and wildlife as threatened or endangered. The Species Conservation and Research Program (SCRP) is responsible for the information on listed species. Parties must submit formal requests to the SCRP for information on these species. It is expected that 'NREC will administer and coordinate its sister Division's respective input into the Project's overall Joint Permit Application review process which is also coordinated with the USACE under their Individual Permit review process. *- US Wind submitted a request for an Environmental Review to DNREC on September 11, 2023.* *- DNREC provided Environmental Review letter on December 21, 2023.*

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Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
Delaware Department of Natural Resources and Environmental Control – Division of Watershed Stewardship	Sediment and Stormwater Management Plan	7 Del. Code, Chapter 40, 7 DE Admin. Code 5101, CWA, 33 §§ 1251 et. Seq.	Under these state regulations, DNREC has the authority to determine if a project may be granted approval for a standardized Sediment and Stormwater Management Plan if located on a site that has previously been managed for stormwater quantity and quality and will disturb less than 1.0 acre of land. For projects under 1.0 acre of land disturbance and minimal impact on stormwater a standard plan can be used. For all other projects, a detailed sediment and stormwater plan is required. The detailed plans consider stormwater impacts on regional drainage, water quantity and quality. Erosion and sediment control during construction is also more complex under detailed plan (see below). Construction review by DNREC may be required. DNREC may approve plans for disturbance on State Lands; otherwise, to delegated agencies (Sussex Conservation District).
Delaware Department of Natural Resources and Environmental Control – Division of Parks and Recreation	Special Use Permit/Land Use Agreement	7 Del.C. Chapter 47 Public Lands, Parks and Memorials – State Parks	This law authorizes DNREC to grant easements for the purposes of transmission lines and other utilities and charge a fee, This Agreement or similar is anticipated for authorization to use and establish underground utility easements and install Project -associated underground utilities through the State Parkland shoreline and barrier beach areas.
Delaware Department of Natural Resources and Environmental Control	Permit or Letter of Approval	Beach Preservation Act – 7 Del. Code Chapter 68; Title 7 Del. Admin. Code Chapter 5000	This law and regulation require permits for construction activities impacting beaches, dunes and vegetation along the Atlantic and Delaware Bay coastline and regulates activities seaward of the state-established building line. *- Pre-application submitted to DNREC on June 16, 2023.*

Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
			- US Wind submitted application February 15, 2024 and re-submitted the application via e-permitting February 27, 2024. *- DNREC in a meeting March 15, 2024, indicated that the Application is complete. Review of the Application is underway.*
Delaware State Fire Marshall's Office	Site Plan Approval	Title 1: 700 Delaware State Fire Prevention Regulations Chapter 4 Submittal of Plans	Site plans and building plans must be submitted for review
Delaware Department of Transportation	Entrance permit	17 Del.C Chapter 1, Section 146I; Title 2 Del. Admin Code § 2309-7.2	An entrance permit is required to construct a new entrance or modify an existing entrance based on estimated traffic impacts resulting from site improvements. Modification of the entrances would be temporary. Approval from DelDOT is a condition of Conditional Use approval by Sussex County.
LOCAL			
Sussex Conservation District	Erosion/Sediment Control and Stormwater Management Plan Approvals	7 Del. Code, Chapter 40, 7 DE Admin. Code 5101; Sussex County Code, Chapter 90	The Sussex Conservation District reviews and approves sediment and stormwater plans as a DNREC delegated agency for DNREC projects located in Sussex County.
Sussex County Planning and Zoning Commission /County Council	Conditional Use and Site Plan	Sussex County, DE Code Chapter 115 9 Del. Code Chapter 68	Sussex County has the authority to regulate the use of land. This jurisdiction relates specifically to the HDD Landfall installations, installation of underground utilities, and construction of the Project Substation interconnecting with the Delmarva Power and Light Indian River substation. US Wind has held Conditional Use Permit (CUP) pre-application meetings with Sussex County Planning and Zoning on December 4, 2023 and February 13, 2024.
Sussex County Building Code Office	Building Permit	Sussex County Code Chapter 52	County conducts plan reviews, building permit issuance and inspections for commercial, residential projects. Requires site plan and other regulatory approvals.

Table 1.7-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
Worcester County Department of Development, Review and Permitting	Building Permit	Worcester County Code, Title 1 Zoning Regulations § ZS 1-115	Under Worcester County Code O, the County Town has the authority to uphold the International Building Code and the Building Code of Worcester County through issuance of Building Permits for the planned O&M Facility to be located on the West Ocean City waterfront.
Worcester County Department of the Environment	Shoreline construction permit	Worcester County Code NR 2 -102	Major construction: any work executed 8-ft channelward of mean high water line, or digging/excavation involving an alteration of the shoreline, in this case construction or upgrades related to the O&M Facility Minor construction: any other construction along the shoreline not considered to be major construction.

1.8 Avoidance and Minimization Summary

US Wind designed the Project to avoid and minimize impacts during construction, operation, and decommissioning to various resources. Below is a summary of measures US Wind employed and will employ, as well as consultations and approvals to identify methods and time of year restrictions for activities.

Geology and Shallow Hazards

Potential Impacts	Avoidance and Minimization Measures
Construction	
Sediment disturbance/displacement	• Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts of sediment disturbance: ○ No in-water work (e.g., cable installation, HDDs, dredging) in Indian River Bay March 1 through September 30. ○ No HDD activities in the Atlantic to the beach landfall from April 1 through September 15 (inclusive of recreational period avoidance from May 15 through September 15).
Surficial geology impacts	• Cable Burial Risk Assessments (CBRAs) have been prepared based on geophysical and geotechnical (G&G) survey data for the export cables (Appendix H16). • Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable. • Minimize sediment disturbance by utilizing the best available technologies to achieve deep burial of submarine cable into a stable sediment layer (i.e. jet plow technology, HDD, gravity cells, etc.).
Munitions of Explosive Concern (MEC)/ Unexploded Ordinance (UXO)	• Prior to construction, analyze survey data at installation locations to identify potential MEC/UXO and plan avoidance or clearance in line with industry best practices. • Prepare an MEC/UXO Emergency Risk Management Plan prior to construction. • Prior to construction activities, provide an MEC/UXO awareness briefing to vessel crews.
Operations	
Sediment disturbance/displacement	• To the greatest extent practicable, select areas with suitable seabed conditions for cable installation during cable route planning.

Water Quality

Potential Impacts	Avoidance and Minimization Measures
Construction	

Turbidity/Total Suspended Solids (TSS)	• Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts to water quality:
	  ○ No in-water work (e.g., cable installation, HDDs, dredging) in Indian River Bay March 1 through September 30.
	  ○ No HDD activities in the Atlantic to the beach landfall from April 1 through September 15 (inclusive of recreational period avoidance from May 15 through September 15).
	• Sediment disturbance associated with submarine cable laying will be minimized by jet plowing, HDD techniques and the use of gravity cells where feasible.
	• Turbidity monitoring will be conducted during construction as required by the permitting authorities. Conduct TSS and water quality monitoring during cable installation activities and post installation as needed.

Frac-out from HDD activities	• A drilling fluid fracture contingency plan will be in place prior to the start of HDD activities. Operations will be shut down immediately in the event a frac-out occurs.
Routine and accidental discharges from vessels	• US Wind will monitor for and report any environmental release or fish kill to the appropriate authorities, e.g., in Delaware state waters, reports will be made via DNREC 24-hour hotline. • Project-specific SPCC Plan and Oil Spill Response Plan will be prepared prior to construction and for operations activities. • US Wind will develop a Stormwater Pollution Prevention Plan (SWPPP) for onshore construction activities, as appropriate. • Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G0“ ("Marine Trash and Debris Awareness and Elimination"), per BOEM guidelines for marine trash and debris prevention. • Vessels will adhere to United States Coast Guard (USCG) guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.

Potential Impacts	Avoidance and Minimization Measures
Operations	
Routine and accidental discharges from vessels	• US Wind will monitor for and report any environmental release or fish kill to the appropriate authorities, e.g., in Delaware state waters, reports will be made via DNREC 24-hour hotline. • Project-specific SPCC Plan and Oil Spill Response Plan will be prepared prior to construction and for operations activities. • US Wind will develop a Stormwater Pollution Prevention Plan (SWPPP) for onshore construction activities, as appropriate. • Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G0“ ("Marine Trash and Debris Awareness and Elimination"), per BOEM guidelines for marine trash and debris prevention. • Vessels will adhere to United States Coast Guard (USCG) guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.

Wetlands and Waterbodies

Potential Impacts	Avoidance and Minimization Measures
Construction and Operations	

	• Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts to wetlands and waterbodies;
	  ○ Installation of cables underneath tidal marshes will not be conducted during nesting season between April 1 through July 31.
	  ○ Restrict nighttime artificial lighting restriction from June 1 through September 1 at Barrier Beach Landfall.
	  ○ Avoid colonial waterbird nesting sites. Avoid construction at the Barrier Beach Landfall and in-water work in Indian River Bay during the nesting season.
	  ○ US Wind would implement best practices such as diver surveys in Indian River for work between November 15 and March 1 to protect hibernating terrapins.
	  ○ US Wind plans to install cables and conduct associated maintenance and monitoring outside of breeding season, April 1 to July 31, which would minimize impacts to marsh nesting birds.
	• US Wind will install cables using HDD to avoid impacts to coastal dunes and interdunal wetlands and to minimize bottom disturbance.
	• US Wind will minimize ground disturbance by confining cable infrastructure, such as transition vaults and HDD operations, to previously disturbed lands as much as practicable.
	• Onshore construction activities will be scheduled to avoid impacting sensitive coastal habitats, where practicable.
	• Between May 1 and August 1, construction activities will not occur within 100 m (328 ft) of hummocks in Indian River Bay in order to avoid impacts to nesting terns.
	• US Wind will minimize impacts on submerged aquatic vegetation where practicable. No submerged aquatic vegetation has been identified in areas proposed for permanent or temporary disturbance.
	• US Wind will establish and maintain buffers around wetlands, implement BMPs to minimize erosion and control sediments and maintain natural surface drainage patterns, as practicable.
	• US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known nesting beaches, where feasible. The use of HDD for cable installation under the Barrier Beach Landfalls will avoid impacts on beaches.
	• Project-specific SPCC Plan will be prepared prior to construction and for operations activities.
	• US Wind will develop a SWPPP for onshore construction activities, as appropriate.
	• Agency consultation and monitoring regarding coastal habitats will be conducted as needed to mitigate disturbances, as practicable.
	• US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, Protected Species Observers (PSO) data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

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Benthic Resources

Potential Impacts	Avoidance and Minimization Measures
Construction	

Seabed and bay bottom disturbance	• Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts of sediment disturbance:
	  ○ No in-water work (e.g., cable installation, HDDs, dredging) in Indian River Bay and beach landfall March 1 through September 30.
	  ○ No HDD activities at the Atlantic beach landfall from April 15 through September 15 (inclusive of recreational period avoidance from May 15 through September 15) to avoid impacts to spawning horseshoe crabs.
	• US Wind plans to employ hydraulic dredging for cable burial in Indian River Bay. Mechanical dredging would only be used if needed.
	• The Project has been sited to avoid sensitive or rare habitats (such as high-density clam beds) where feasible, and habitat disturbance will be minimized to the extent practicable.
	• Shellfish relocation/restoration in Onshore Export Cable South Corridor will be evaluated pre- and post- installation if warranted.
	• Cables will be installed using a jet plow to the greatest extent possible.
	• Horizontal Directional Drilling (HDD) will be used at landfall locations.

Vessel Anchoring	• Potential impacts from anchoring will be minimized by avoiding locations with sensitive habitats and utilizing mid-line anchor buoys.
Operations	
Electromagnetic Fields (EMF)	• Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable. • Conducted a site-specific study of potential EMF impacts on electrosensitive marine organisms.

Finfish and Essential Finfish Habitat

Potential Impacts	Avoidance and Minimization Measures
Construction	

Habitat and migration	• Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts to finfish and EFH;
	  ○ No in-water work in Indian River Bay from March 1 through September 30 to avoid impacts to young of year summer flounder.
	  ○ No in-water work in Indian River from March 1 to May 15 to protect the American eel and allow passage of elvers upstream.
	• US Wind has conducted surveys and reviewed existing data in order to avoid important, sensitive, and unique marine habitats. HAPC for sharks has been avoided with selection of landing location at 3R's Beach.
	• Seafloor disturbance during construction will be minimized as practicable.
	• Impacts to summer flounder HAPC will be minimized by using dynamic positioning where feasible to minimize the need for construction vessels to anchor to the seafloor and using midline buoys to reduce seafloor scarring when construction vessels need to anchor.
	• Minimize construction activities as practicable in areas containing anadromous fish during migration periods.

Monitoring	• US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: • Section 7 ESA consultation for the federally listed Atlantic sturgeon and shortnose sturgeon is underway
Turbidity/TSS impacts	• Sediment disturbance associated with submarine cable laying will be minimized by jet plowing, HDD techniques and the use of gravity cells where feasible.
Lighting	• Work lighting will be limited to the extent practicable to areas of active construction in coordination with USCG and other agencies as appropriate.

Potential Impacts	Avoidance and Minimization Measures
Routine and accidental discharges from vessels	• Project-specific SPCC Plan and Oil Spill Response Plan will be prepared prior to construction and for operations activities. • Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 ("Marine Trash and Debris Awareness and Elimination"), per BOEM guidelines for marine trash and debris prevention. • Vessels will adhere to United States Coast Guard (USCG) guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.
Operations	
Electromagnetic Fields (EMF)	• Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable. • Conducted a site-specific study of potential EMF impacts on electrosensitive marine organisms.

Marine Mammals

Potential Impacts	Avoidance and Minimization Measures
Construction	
Vessel Strike Avoidance	• PSOs or trained observers will be present on crew vessels and other project vessels. • US Wind will ensure that from November 1 through April 30, vessel operators monitor NOAA Fisheries North Atlantic right whale (NARW) reporting systems (e.g., Early Warning System, Sighting Advisory System, and Mandatory Ship Reporting System) for the presence of NARWs. • Vessels 19.8 m (65 ft) or larger will operate at 10 knots or less in NARW Special Management Areas (SMAs). Additionally, all vessels would operate at speeds of 10 knots or less in Right Whale Slow Zones, identical to Dynamic Management Areas (DMAs), to protect visually or acoustically detected NARW. US Wind will incorporate the proposed revision to the NARW vessel speed rule for vessels 10.6-19.8 m (35-65 ft) in length upon implementation. • All vessels will maintain a minimum separation distance of 500 m (1,640 ft) or greater from any sighted NARW. If a NARW is sighted within this exclusion zone while underway, the vessel would steer a course away from the whale at 10 knots (18.5 km/hr) or less until the 500 m (1,640 ft) minimum separation distance has been established. If a NARW is sighted within 100 m (328 ft) of an underway vessel, the vessel operator would immediately reduce speed and promptly shift the engine to neutral. If the vessel is stationary, the operator would not engage engines until the NARW has moved beyond 100 m (328 ft). • All vessels will maintain a minimum separation distance of 100 m (328 ft) or greater from any sighted non-delphinid cetacean other than the NARW. If a non-delphinid cetacean sighted within this exclusion zone while underway, the vessel operator would immediately reduce speed and promptly shift the engine to neutral. The vessel operator would not engage the engines until the no-delphinid cetacean has moved beyond 100 m (328 ft). If the vessel is stationary, the operator would not engage engines until the non-delphinid cetacean has moved beyond 100 m (328 ft). • All vessels will maintain a minimum separation distance of 50 m (164 ft) or greater from any sighted delphinid cetacean or pinniped, except if the mammal approaches the vessel. If a delphinid cetacean or pinniped approaches an underway vessel, the vessel would avoid excessive speed or abrupt changes in direction to avoid injury to these organisms. Additionally, vessels underway may not divert to approach any delphinid cetacean or pinniped.
Routine/Accidental Releases from Vessels	• Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 (“Marine Trash and Debris Awareness and Elimination”), per BOEM guidelines for marine trash and debris prevention. • Vessels will adhere to United States Coast Guard (USCG) guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.

Potential Impacts	Avoidance and Minimization Measures
Monitoring	• US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.
Operations	
EMF	• Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable.
Monitoring	• US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

Sea Turtles

Potential Impacts	Avoidance and Minimization Measures
Construction	
Habitat Alteration	• Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts to sea turtles; ○ Limited offshore site preparation, specifically hopper dredging to avoid impacts to sea turtles, at offshore substation locations June 1 through October 31. • US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known nesting beaches, where feasible. The use of HDD for cable installation under the Barrier Beach Landfalls will avoid impacts on beaches. • Construction is anticipated to occur outside of turtle nesting season. Agency consultation and monitoring will be conducted as needed to mitigate disturbances.
Routine/Accidental Releases	• Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 ("Marine Trash and Debris Awareness and Elimination"), per BOEM guidelines for marine trash and debris prevention. • Vessels will adhere to United States Coast Guard (USCG) guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.
Monitoring	• US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.
Operations	
EMF	• Submarine cables that have electrical shielding will be used and the cables will be buried in the seafloor, where practicable. • Conducted a site-specific study of potential EMF impacts on electrosensitive marine organism

Upland Habitats

Potential Impacts	Avoidance and Minimization Measures
Construction	
Habitat Alteration	• Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts to upland habitats; ○ Tree clearing activities at the US Wind substations required for Project construction are not planned between April 1 through July 31 to avoid or minimize impacts to potentially mature forest and the northern long-eared bat summer maternity period. • For the construction laydown areas and site access, existing disturbed areas will be used where possible. • Lighting-related impacts will be minimized by using best management practices (BMPs) where feasible. Examples of BMPs to minimize the adverse impacts of artificial lighting will include not lighting the facility at night except in the case of an emergency that requires an immediate response, and the use of down-shielded light fixtures to reduce the visibility of light by birds, bats, and insects flying above the facility.
Accidental Releases	• Project-specific SPCC Plan will be prepared prior to construction and for operations activities. • US Wind will develop a Stormwater Pollution Prevention Plan (SWPPP) for onshore construction activities, as appropriate.
Air Emissions	• Methods to reduce engine emissions will be implemented during construction and operation of the proposed Project where practicable, including restricting engine idling.
Operations	
Accidental Releases	• Project-specific SPCC Plan will be prepared prior to construction and for operations activities. • US Wind will develop a Stormwater Pollution Prevention Plan (SWPPP) for onshore construction activities, as appropriate.
Air Emissions	• Methods to reduce engine emissions will be implemented during construction and operation of the proposed Project where practicable, including restricting engine idling.

Avifauna

Potential Impacts	Avoidance and Minimization Measures
Construction and Operations	
Monitoring	• Between May 1 and August 1, construction activities will not occur within 100 m (328 ft) of hummocks in Indian River Bay in order to avoid impacts to nesting terns. • US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known nesting beaches, where feasible. The use of HDD for cable installation under the Barrier Beach Landfalls will avoid impacts on beaches. Agency consultation and monitoring regarding bird species will be conducted as needed to mitigate disturbances, as practicable. • US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.
Habitat Alternation	• Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts to birds; ○ Installation of cables underneath tidal marshes will not be conducted during nesting season between April 1 through July 31. ○ Restrict nighttime artificial lighting restriction from June 1 through September 1 at Barrier Beach Landfall. ○ Avoid colonial waterbird nesting sites. Avoid construction at the Barrier Beach Landfall and in-water work in Indian River Bay during the nesting season. ○ No tree clearing at the substation landfall April 1 through July 31 ○ Complete the Northeast Bald Eagle Project Screening Form. The known bald eagle nest is over 660 ft from the Project area, the maximum USFWS-recommended buffer. US Wind will work with USFWS for additional mitigation measures.

Bats

Potential Impacts	Avoidance and Minimization Measures
Construction	
Habitat Alteration	• Following consultation with DNREC, US Wind would extend the restriction of tree clearing activities at the US Wind Substations location required for Project construction to April 1 through July 31 to avoid or minimize impacts to northern long-eared bat during the summer maternity period. • A habitat assessment and bat survey will be conducted as requested by DNREC.
Monitoring	• US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

Navigation, Air Traffic, and Military Activities

Potential Impacts	Avoidance and Minimization Measures
Construction	
Navigation Safety	• Coordinate with the appropriate regulatory agencies and other stakeholders during construction to provide timely and effective communications regarding planned vessel movements and construction activities. • Work with USCG to establish and maintain safety zones around active construction areas, and mark areas with highly visible marking and lighting. • Bury submarine cables at least 2 m (6 ft) below the Indian River Inlet and Bay Federal Navigation Project. • Cable Burial Risk Assessments (CBRAs) have been prepared based on geophysical and geotechnical (G&G) survey data for the export cables (Appendix H16). • Prior to construction, analyze survey data at installation locations to identify potential MEC/UXO and plan avoidance in line with industry best practices. • Prepare an MEC/UXO Emergency Risk Management Plan prior to construction. • Prior to construction activities, provide an MEC/UXO awareness briefing to vessel crews.

US Wind
Fueling our future, naturally.

Socioeconomics

Potential Impacts	Avoidance and Minimization Measures
Construction	
Local Impacts	• US Wind will work with local officials to develop a traffic management plan to reduce impacts to local traffic during construction. • US Wind has sited and developed Project elements to minimize disturbance to resources, to the extent practicable, enjoyed by residents of and visitors to the region. • Onshore cables and facilities at the Barrier Beach Landfalls will be buried to limit disturbance to coastal resources.
Tourism Impacts	• US Wind will concentrate onshore construction activities outside of the summer recreation season to the greatest extent practicable and will coordinate with DNREC Parks and Recreation to minimize interference with beach activities.
Operations	
Routine/Accidental Vessel Releases	• US Wind will implement practices and operating procedures to reduce the likelihood of vessel accidents and fuel spills. An Oil Spill Response Plan has been prepared and will be implemented for construction and for operations activities.
Construction and Operations	
Economic Benefits	• US Wind will coordinate with local stakeholders to develop opportunities for eco-tourism related to the Project. • US Wind is committed to creating full and equitable business opportunities for minority, women-owned, veteran-owned, and HUBZone businesses in the development of the Project. • US Wind has hired a team of MBE participation and compliance experts to lead the company's outreach efforts to minority businesses and community organizations. • US Wind is coordinating with area organized labor organizations to develop a skilled local workforce for the Project. • US Wind has a strong interest in the welfare of workers employed by the construction managers, contractors and subcontractors on all components of the Project. • US Wind is committed to achieving substantial involvement of Maryland-based small businesses in all phases of the Project. • US Wind is committed to creating opportunities for Delaware-based companies able to deliver supply chain components and/or perform on-site work in Delaware.

Potential Impacts	Avoidance and Minimization Measures
	• US Wind has a particular focus on creating meaningful economic opportunities for environmental justice communities in the Baltimore, Maryland area. • US Wind will support workforce initiatives that are focused on providing support to minority and low-income populations, women, veterans, and underserved communities.

2.0 PROJECT INFRASTRUCTURE AND INSTALLATION

Construction sequence for the placement of the structure was evaluated as required by Appendix A, Section 7 of the DNREC Appendix E Utility Crossings Form, 10d of Appendix M Activities in State Wetlands and Sections 3a, 12, 13, 15, and 18b of Appendix S New Dredging Project Form.

2.1 Project Infrastructure

2.1.1 Cables

The Project includes offshore and onshore export cables. The export cables would be comprised of an offshore component, the offshore export cables, located in the Atlantic Ocean in state waters and an inshore component, up to four onshore export cables, located in Indian River Bay. The proposed export cable corridor in Delaware waters, in the nearshore Atlantic and Indian River Bay, would span 24.5 km (15.2 mi) in Delaware state waters in length. The lengths of export cables by cable segment are provided in Section 1.3.

The proposed export cables both offshore and within Indian River Bay would consist of up to four 230-275 kV, 3/C cable, up to 300 mm (12 in) in diameter (Figure 2.1-1). Table 2.1-1 includes details about the proposed offshore and onshore export cables.

Table 2.1-1. Submarine Cable Construction

Component	Description
Conductor	The conductor is made of round stranded compacted wires filled with a longitudinal water blocking material. The water blocking material is used to prevent penetration of seawater into the conductor in case of damage to the cable. Conductor water blocking is regarded favorably with respect to aging of extruded insulation systems. Due to different thermal conditions at the landfalls HDD, different conductor material for the landfall section and different conductor material for the offshore part have been selected. Offshore export cables will use copper or aluminum conductors and range in size from 200-300 mm overall diameter.
Insulation	The insulation system is made of XLPE, a material with good mechanical, thermal and electrical properties. The insulation system is designed as follows: • Extruded layer of semi-conducting compound; • Extruded insulation of crosslinked polyethylene; • Extruded layer of semi-conducting compound. XLPE is produced by cross-linking of thermoplastic polyethylene. The crosslinking of the molecules in polyethylene is a chemical process caused by

Table 2.1-1. Submarine Cable Construction

Component	Description
	peroxides when subjected to high temperature and pressure. XLPE has thermal properties which permit a continuous maximum conductor temperature of 90 °C (194 ° F) and a maximum short circuit temperature of 250 °C (482 ° F). The insulation material has a high dielectric strength, low dielectric constant, high insulation resistance, and the water absorption is very low.
Lead Alloy Sheath	A lead alloy sheath is applied as radial water barrier. Semi-conductive water swellable tapes are wrapped on the insulated core in the same process. The water swellable tapes will prevent longitudinal water penetration if the cable is damaged.
Core Sheath	An inner sheath of semiconducting extruded polyethylene is applied over the lead sheath. The core sheath acts as a mechanical reinforcement of the lead sheath and act as a corrosion protection.
Assembly	The three sheathed cores together with one fiber optic element are laid up with extruded PE fillers applied in the interstices to give a substantially round shape. The assembled cores are bound together with synthetic tapes.
Armor	The cable armor consists of one layer of round, galvanized steel wires. The armor wires are embedded in bitumen. The armor serves as a mechanical protection and a major tensile element during laying and installation.
Outer Serving	The outer serving is main corrosion protection of the armor. It consists of asphaltic compound with polypropylene reinforcement.

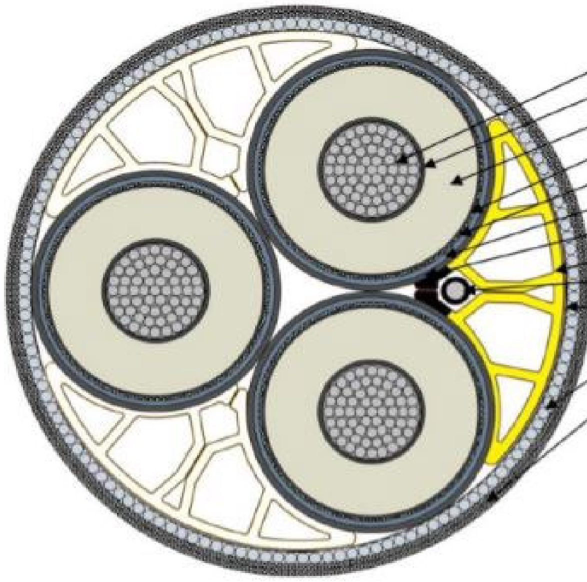

Figure 2.1-1. 230 kV Cable Cross Section (Source: Nexans)

2.1.1.1 Offshore Export Cables

Up to four offshore export cables would be located within an approximately 600-m (1,968-ft) corridor from the OSSs to the planned landfall at 3R's Beach (Barrier Beach Landfall) as shown in Figure 2.1-2.

When the cables reach the landfall at the Barrier Beach Landfall, they would be pulled into a cable duct that routes the cables under the existing beach to subterranean transition vaults.

Spacing between parallel offshore export cables would be approximately three times the water depth, in line with the recommendations from the International Cable Protection Committee (ICPC), to provide ample space for cable repairs as needed. Appendix C3 includes plan and profile views of the proposed installation within Delaware State Waters in the Atlantic Ocean.

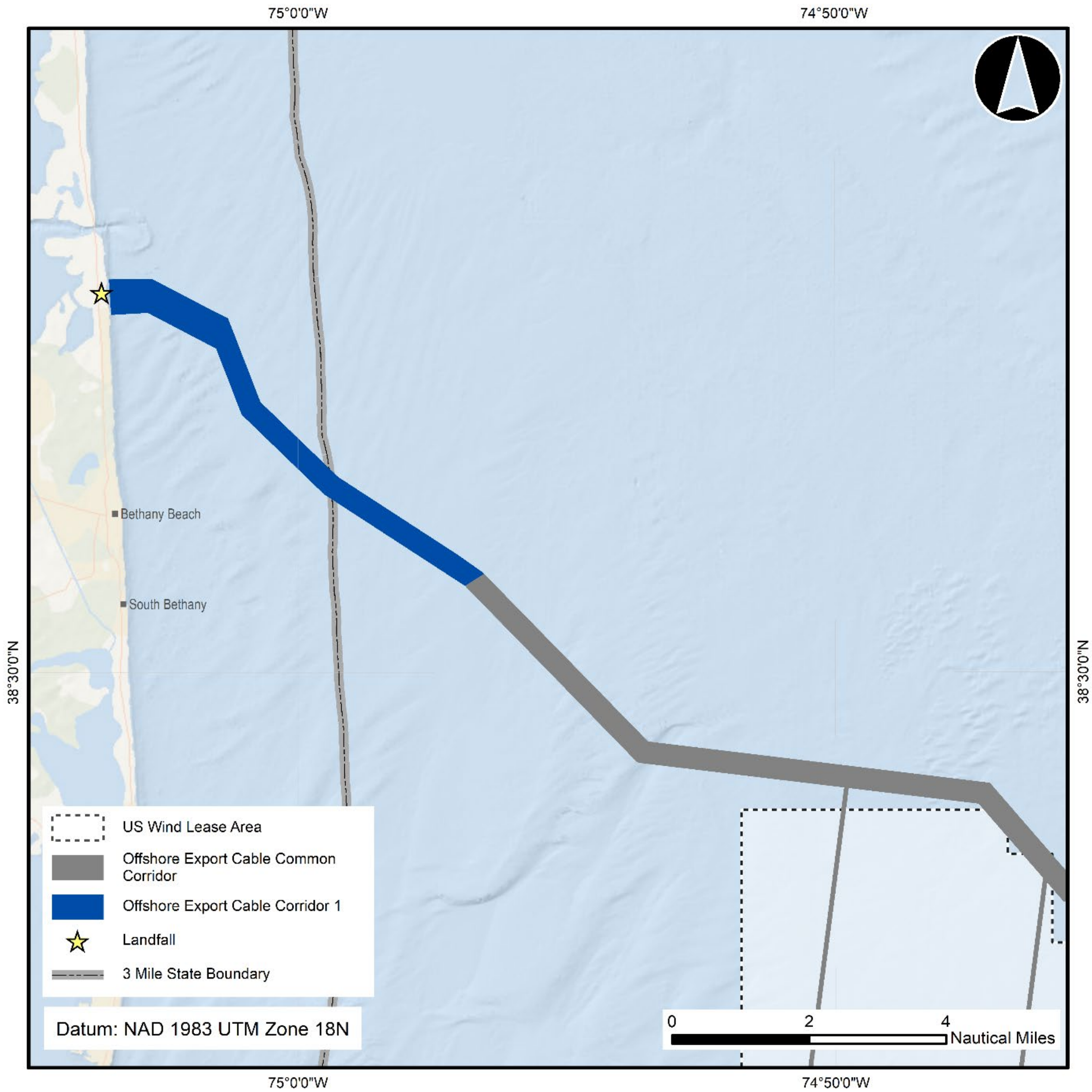

Figure 2.1-2. Offshore Export Cable Corridors

2.1.1.2 Onshore Export Cables

US Wind's proposes a landfall location in vicinity of the 3R's parking lot located approximately 1.6 km (1 mile) south of the Indian River Inlet.

An overview of the Barrier Beach Landfall is provided in Figure 2.1-3.

Figure 2.1-3. Barrier Beach Landfall: 3R's Beach Parking Area

From the Barrier Beach Landfall, up to four onshore export cables of 230-275 kV would run from the transition vaults via a cable corridor to the POI. Transition vaults for the Project would be installed below grade in an existing parking area. An example of the access point for an operational transition vault can be seen in Figure 2.1-4 and Appendix C1, Sheets 34 (Appendix B, DNREC Construction Seaward of the DNREC Building Line Form).

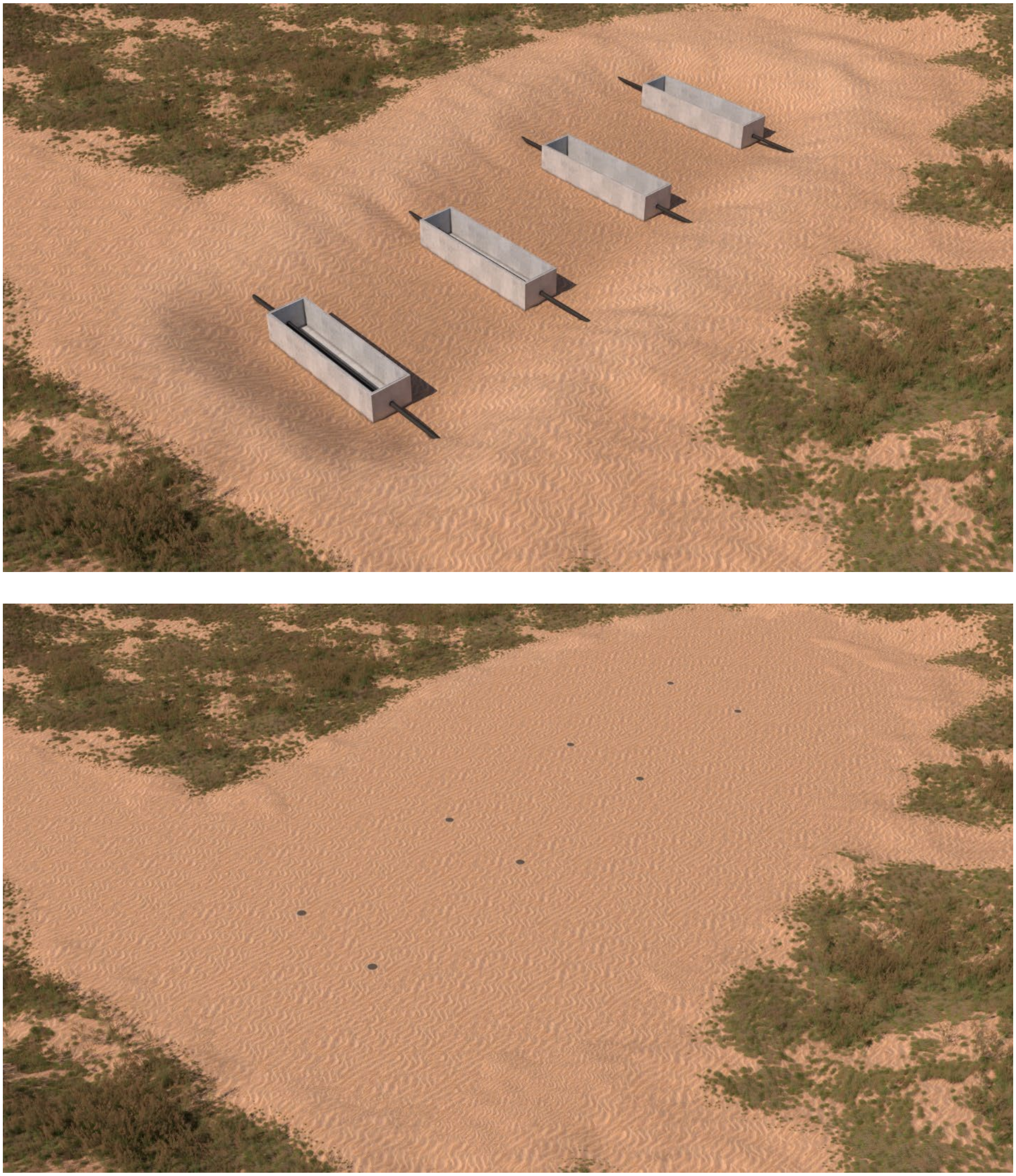

Figure 2.1-4. Typical Vault within Parking Lot, During Construction (top) and Post-Construction (bottom)

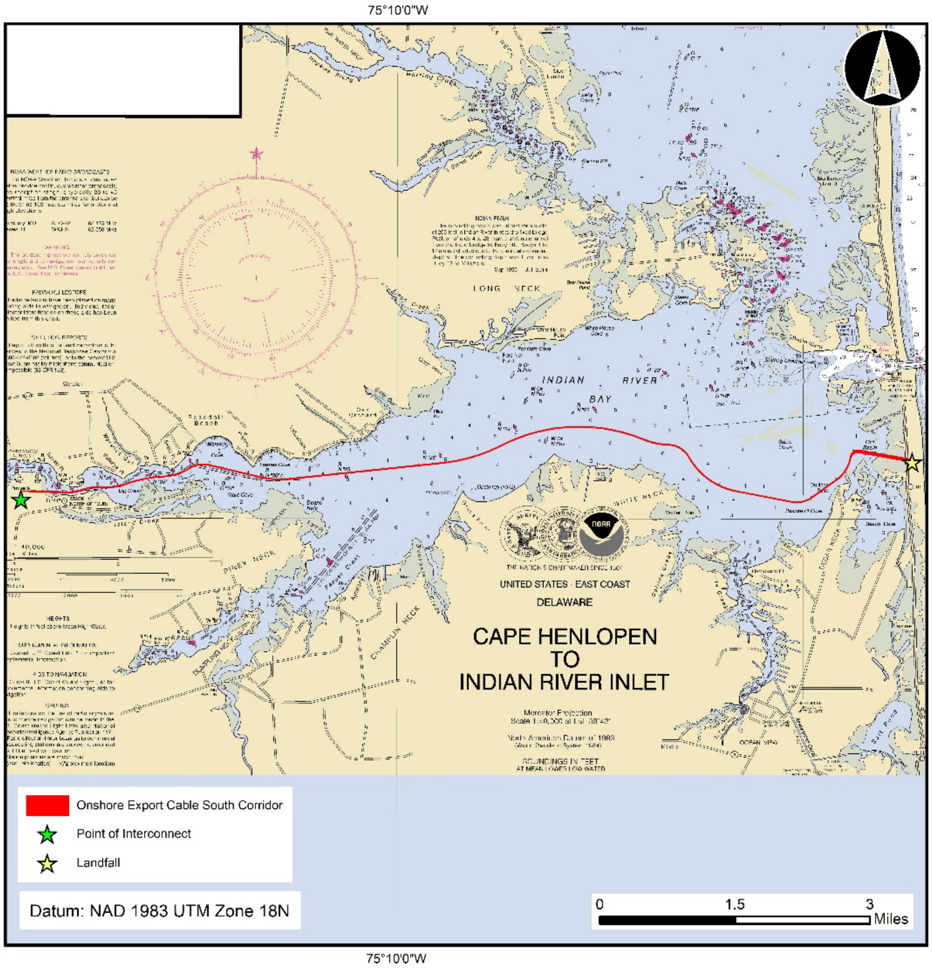

Figure 2.1-5. Onshore Export Cable South Corridor

The proposed alignment, Onshore Export Cable South Corridor, through Indian River Bay is identified in Figure 2.1-5. The minimum width of the 4-cable installation would span a 40 m (131 ft) corridor to allow for cable spacing of approximately 10 m (33 ft) while the maximum width would be dependent on bay bottom conditions, considering the thermal properties of the soil and proper cable spacing. The onshore export cables would be within Delaware State Waters in Indian River Bay for a total of approximately 67.2 km (41.6 miles) for four cables (16.8 km [10.4 miles] per cable). Determination of the final alignments for the cables would be made in consultation with DNREC, BOEM, USACE, and other relevant agencies. Micro-siting of cable alignments may be needed based on conditions found in Indian River Bay, including the presence of rock, cobble, non-jettable formations (i.e., hard clays), or obstructions. Appendix C1 includes plan and profile views of the proposed installation.

2.1.2 Substations

Connection of the Project to the electrical grid is anticipated through a combination of substations built by US Wind and expansion of an existing DPL 230 kV substation at the POI.

2.1.2.1 DPL Substation

DPL's Indian River 230 kV substation (Indian River Substation), located near Millsboro, Delaware, is the proposed POI for the Project. An aerial view of the Indian River Substation can be seen in Figure 2.1-6. The Indian River Substation is located adjacent to the Indian River Power Station. An expansion of the substation by DPL of up to 2 acres is expected to accommodate the new capacity and required transformers, breakers, switch, and control gear.

Figure 2.1-6. Indian River Substation

2.1.2.2 US Wind Substations

US Wind proposes to construct new substations adjacent to an existing DPL substation at the POI.

US Wind's substations immediately adjacent to the proposed Indian River Substation and expansion, including temporary limits of disturbance during construction are shown in Appendix C2. The drawings demonstrate a preliminary general arrangement of the substation; however, the final design may vary within the shown footprint. Onshore export cables would exit the HDD duct from Indian River, into underground transition vaults approximately the same size as transition vaults at the Barrier Beach Landing locations, and traverse underground to be terminated at the respective US Wind substation block (see Figure 2.1-7 and Appendix C2). The transmission line to connect the new US Wind substations and the Indian River Substation POI is expected to be a short overhead transmission line, subject to any applicable DPL discretion. US Wind proposes that the substations will be adjacent to one another such that any overhead transmission line will be less than 152 m (500 ft) long.

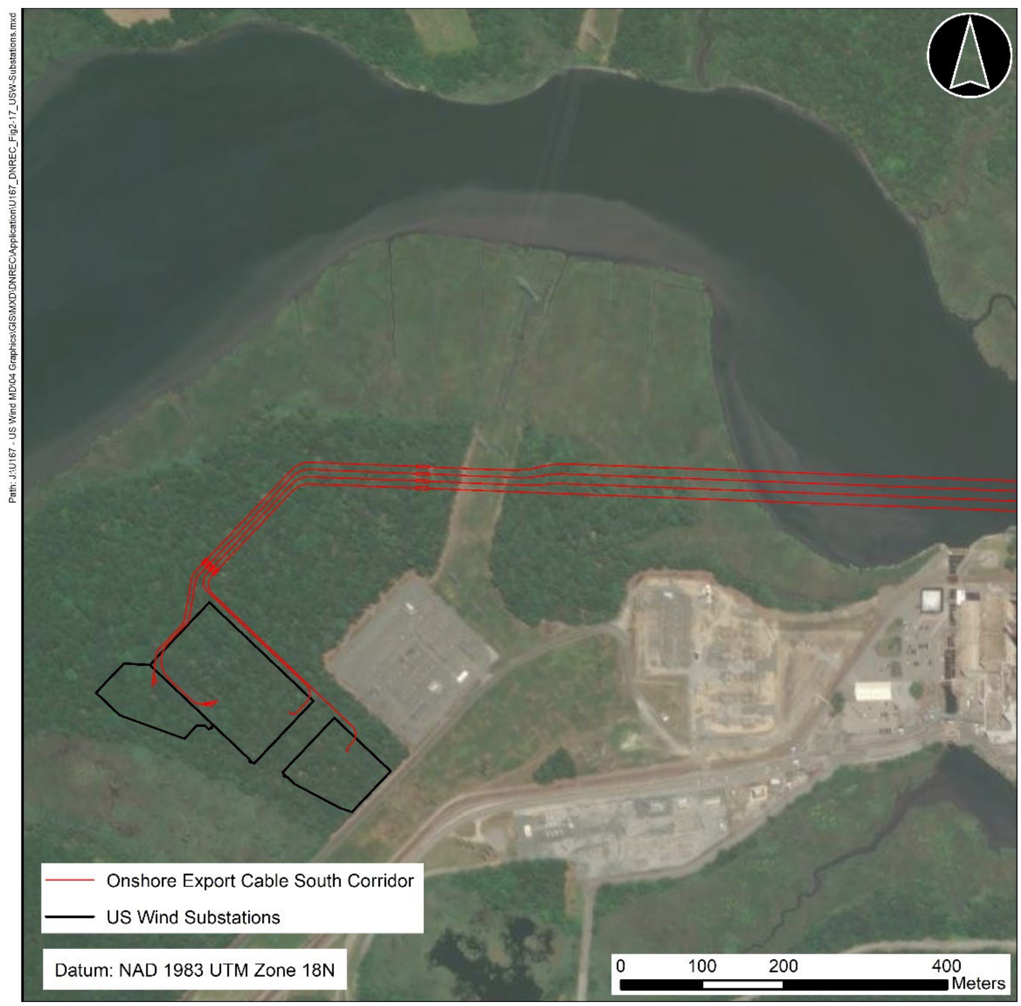

Figure 2.1-7. US Wind Substation Locations

US Wind is evaluating gas-insulated and air-insulated substations for the Project which have different maximum footprints and tallest structures within the substation. Ground disturbance below the substation is estimated to extend 4 m (12 ft) below grade. Preliminary design drawings of substations are included in Appendix C2.

2.1.3 Cable Installation

Cable installation for offshore export cables and onshore export cables would generally proceed using the steps below. Refinement of the installation process, particularly in Onshore Export Cable South Corridor through Indian River Bay, would be discussed with DNREC to incorporate additional impact minimization and avoidance.

- Dredging for barge floatation, barge access, and cable burial installation (only in Indian River Bay)
- Insertion of gravity cells, if required, and installation of HDD ducts at landfall.
- Route clearance including a pre-installation survey and grapnel run.
- Equipment installation trial.
- Installation and jetting of cable.
- Pull-in of the cables through HDD ducts into jointing/transition vaults.
- Post-lay burial, if needed.

Based on the current survey and geotechnical data, installation contractors anticipate cable burial could be accomplished using a jet sled. Jet sled-based installation is used extensively for cables. Over a ten-year period from 2011 to 2021, one cable installation contractor under consideration used jet sleds to install approximately 103 km (64 mi) of cables in seven different states in the U.S. in water depths ranging from 3.7 m to 85.3 m (12 ft to 280 ft).

2.1.3.1 Horizontal Directional Drilling

Horizontal Directional Drilling (HDD) operations will be employed for the Project to install cable ducts that allow for the installation of the export cables at the transition points between water and land (Appendix B, Supporting Application Materials for Coastal Construction Permit). The Project as proposed includes HDD's at up to three locations: between the Atlantic and landfall location at 3R's Beach; from 3R's Beach into Indian River Bay; and, from Indian River to the US Wind onshore substations. The HDD work may be conducted simultaneously or in stages depending on the final design of the Project.

The primary HDD drilling equipment will be located on land and will consist of a drilling rig, mud pumps, drilling fluid cleaning systems, pipe handling equipment, excavators, and support equipment such as generators and trucks. At the landfall location from the Atlantic as well as westward into Indian River Bay, land side operations will be in 3R's Beach Parking Lot to avoid impacts to sensitive coastal habitats. At the western US Wind Substations site, land side HDD operations would be within the Project-defined limit of disturbance to avoid impacts to sensitive habitats and potential cultural resources The approximate footprint, required for HDD land side HDD operations, is 60 by 46 m (200 by 150 ft). An overview of the landside HDD footprint for the offshore to onshore HDD point at 3R's Beach is provided in Appendix C1, Sheet 35. An overview of the landside HDD footprint for western operations in Indian River to onshore is provided in Appendix C1, Sheet 37.

Water side HDD equipment will vary based on the installation location but will generally consist of a work platform (either a barge or small jack-up) and associated support vessels (such as tugs and small work boats). The work platform will be equipped with a crane, excavator, winches, and auxiliary equipment including generators and lights. The limited water depth in Indian River Bay is expected to require in-water operations to be based on a barge equipped with spuds for positioning. An anchor spread may be employed if required (see Appendix C1, Sheets 31 and 32). The offshore (ocean based) HDD works may be supported by either a jack-up or barge depending on the final design and installation requirements (see Appendix C1, Sheet 33).

The HDD process will follow industry practice and will utilize detailed operating procedure including fluids containment plans. Lubrication of the HDD drill bit and sealing of the HDD borehole will be provided through the use of a non-toxic/non-hazardous bentonite water-based drilling mud. During the installation process, temporary excavation pits will be required at the onshore locations and gravity cells may be required at the in-water termination of the HDD bore.

Approximate dimensions of the proposed HDD's are shown in Appendix C1, Sheets 31-33. The approximate distances of the HDD lengths are as follows:

- HDD punch out location in Atlantic Ocean to transition vault at 3R's Beach Parking Lot: 1 km (1 mi)
- 3R's Beach Parking Lot transition vault to HDD punch out location in eastern Indian River Bay: 1 km (1 mi)
- HDD punch out location in western Indian River to transition vaults in vicinity of US Wind Substations: 0.7 km (0.5 mi)

Final HDD lengths will depend on factors such as soil conductivity, cable design, and available installation methods to minimize disturbance in the shallow areas of the bay close to the landfall locations.

Onshore Horizontal Directional Drilling Preparation

Prior to the commencement of drilling operation, a pit will be excavated at the drilling site for each bore entry location for drilling mud containment. It is expected that the excavation will be to a depth of approximately 3 m (9.8 ft). Any material from the excavation will be stockpiled in accordance with a storm water management plan and used for backfill or repurposed as required.

A casing pipe may also be used and installed to help support the overlying soils and prevent the bentonite base drilling mud from flowing to the surface or into the water. Temporary piling may be required to serve as a deadman and anchor the drilling rig which would be driven to design depth using a vibratory hammer.

In Water Horizontal Directional Drilling Preparation

The offshore or in water end of the HDD duct may employ gravity cells, or a casing pipe, in order to facilitate the installation of the cables, retain cuttings and drilling fluids, and to ensure that the HDD duct remains free of debris prior to installation of the export cable. It is expected that the gravity cells for in-water operations would be up to 60 m long and 10 m wide (197 ft long and 33 ft wide). The gravity cells will be designed to minimize the release of drilling cuttings and fluids and would be open on the seaward (outbound) side to facilitate the installation of the export cables.

Gravity cells, if employed in Indian River Bay, would remain in place until the Onshore Export Cable is installed in order to prevent silting in the HDD duct. Any structures installed in Indian River Bay will be marked and lighted as required in accordance with safety of navigation regulations. The gravity cell will be removed upon completion of the HDD duct installation. Any material excavated will be reused on site or disposed of at an appropriate offsite location based on the quality of the material. The excavation will be backfilled with the excavated material and/or the appropriate clean fill upon completion of the work.

<u>Offshore</u>

Materials removed from the gravity cell or casing pipe for the installation of the HDD duct will be reused on site or disposed of at an appropriate offsite location based on the quality of the material. The excavation will be backfilled with the excavated material and/or appropriate clean fill upon completion of the work. The gravity cell or casing pipe will be removed upon completion of the HDD duct installation.

Horizontal Directional Drilling Operations

Horizontal Directional Drilling operations commence with a pilot hole that is progressively enlarged by using progressively larger reaming tools.

The HDD drill rig will be set up on shore and the drill advanced to the offshore exit point. During drilling operations, the drilling mud will be injected to cool the drill bit, provide lubrication and stabilize the borehole. The drilling fluid (mud) is an inert bentonite slurry and will carry the cuttings back to the surface for collection/removal of the cuttings. The HDD operation will include monitoring of the downhole water/bentonite slurry to minimize the potential of drilling fluid breakout. A series of reamers will be added to the drill string as soil conditions allow to progressively increase the size of the borehole until it is large enough to accept the final export cable duct.

When the required borehole diameter is achieved, a pulling head is attached to the drill string at the in-water end of the bore. Prefabricated sections of duct are attached to the pulling head and pulled into the borehole. Figure 2.1-8 below, shows an underwater view of a near-shore cable pull into an HDD duct. The duct sections are expected to be fabricated on shore and floated to the barge or jack-up for installation. A duct of approximately 60 cm (24 in) in diameter is planned and final sizing of the duct will be confirmed based on cable sizing and thermal properties of the soils.

HDD operations would run continuously over 24 hours until completed to reduce the time of installation and for technical feasibility. A variance may be necessary from the Town of Bethany Beach for 24-hour HDD activity at 3R's Beach Parking Lot.

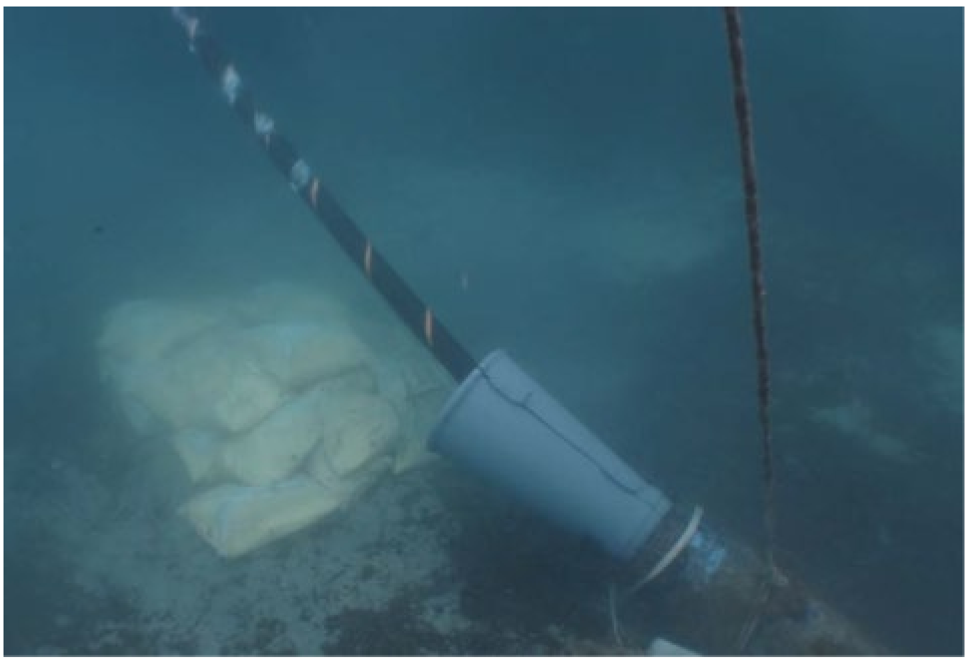

Figure 2.1-8. Underwater View of Near Shore Cable Pull into HDD Duct (Source: Nexans.com)

Transition Vaults

Upon completion of HDD operations, the transition vaults will be installed. Up to four HDD ducts and subterranean transition vaults may be installed at each landfall location, the Barrier Beach Landfall and the substation location. When fully installed the shore end of the HDD ducts will terminate in a transition vault and the water end will be sealed and buried to the installation depth of the offshore export cables. The proposed vaults are each approximately 12 m long, 3 m wide, and 3 m deep (40 ft long, 10 ft wide, and 10 ft deep). The HDD ducts will be connected to the transition vaults and backfilled. The transition vaults when fully installed will be accessed from ground level access points.

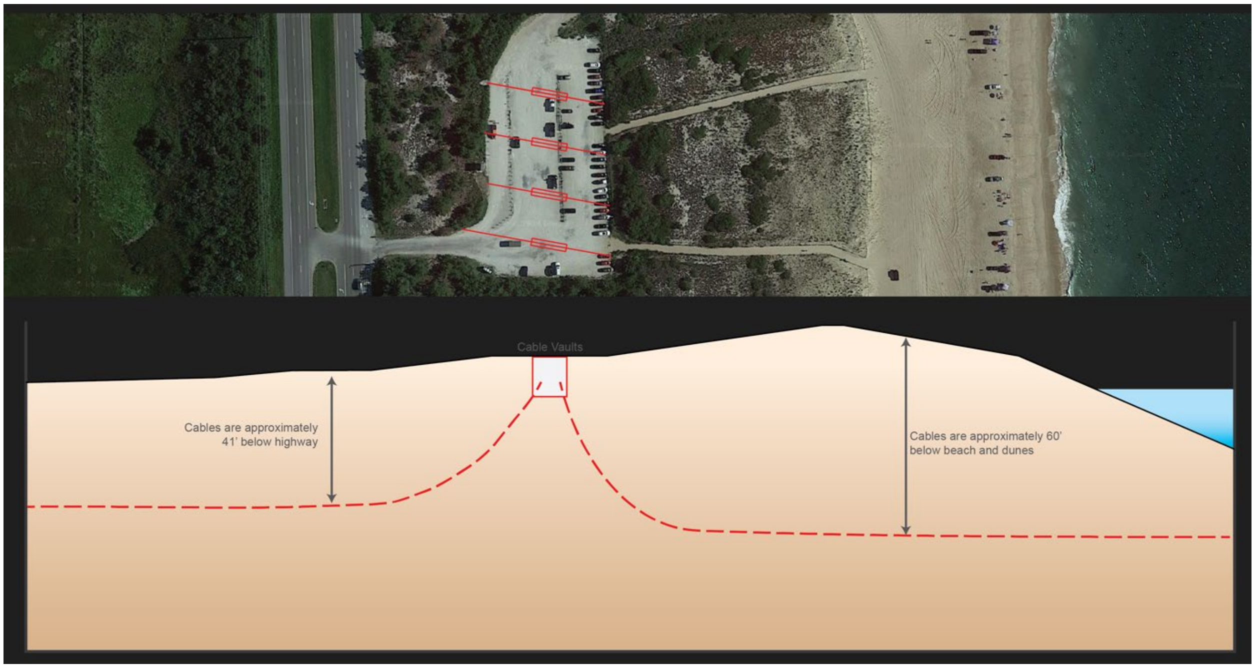

Figure 2.1-9. Transition Vaults and HDDs at 3R's Beach Landfall

2.1.3.2 Offshore Export Cables

US Wind proposes up to four Offshore Export Cables would be installed for the Project. Offshore Export Cables will run from each OSS to the transition vault at the landing location where it would continue as an Onshore Export Cable along on Onshore Export Cable South Corridor to the POI. Cable will be sourced from global suppliers, likely from the United States, Europe, and Asia.

US Wind proposes the Offshore Export Cables will be loaded at the manufacturing facility onto the cable installation vessel. The cable installation vessel will then transit to the installation location. The main elements of the Offshore Export Cable installation are:

- Insertion of gravity cells, if required, and installation of HDD ducts at landfall.
- Route clearance including a pre-installation survey and grapnel run.
- Jet plow installation trial.
- Installation and simultaneous jetting of cable.
- Pull-in of the cables through HDD ducts into jointing/transition vaults.
- Cable pull-in at the OSS.
- Post-lay burial and mattressing, if needed.

Route clearance activities will be conducted prior to Offshore Export Cable installation including a pre-installation survey and grapnel run. The pre-installation survey and grapnel run will be conducted along the Offshore Export Cable Corridor to remove debris such as lost fishing nets or other objects that could impact the cable lay and burial. Collected debris will be recovered and disposed of in appropriate shore side facilities. Pre-installation seabed preparation, such as levelling, pre-trenching or boulder removal, is not currently expected.

A specialized cable lay vessel such as Nexan's Skagerrak as seen Figure 2.1-10 is anticipated to be employed to install the Offshore Export Cable. The cable installation vessel will be supported by smaller vessels as required for activities such as guard duty, pre- and post-lay surveys, access to shallow waters, and support for pulling of the cable into HDD ducts.

Figure 2.1-10. Nexans Skagerrak
(Source: Nexans.com)

The installation process will commence with the offshore cable pull in through the HDD duct (see Section 2.1.3.1 above) into the cable jointing/transition vault at the landfall location. Upon completion of this phase the cable installation vessel will commence the direct laying of cables on the seabed in Delaware state waters along the prescribed route. Based on the sandy seabed observed along the Offshore Export Cable Corridors, it is expected that a jet plow will be employed to bury the cable to target depths of approximately 1 to 3 m (3.3 – 9.8 ft), not more than 4 m (13.1 ft). The jet plow uses a combination of high-pressure water to temporarily fluidize the sediment and the cable subsequently settles into the area opened by the jets through a combination of its own weight and a depressor arm. The displaced sediment settles back over the cable effectively burying the cable. If needed, a trenching tool may be employed in areas with harder bottoms.

The cable installation vessel would employ dynamic positioning, although anchors may be used in shallow waters. If anchors are employed, US Wind will utilize mid-line anchor buoys.

After the cable is installed a post installation survey will be performed as well as videoing the cable route for a real time visual of installed conditions. It is possible target burial depth may not be achieved if, for example, buried debris or boulders are encountered that were not visible or removed during the PLGR. Such instances would be unforeseen conditions and therefore the locations are not known or expected.

In the event burial depth is not achieved it may be necessary to add additional protection over the submarine cables to protect it from damage that could be caused by natural events such as seabed erosion or shifting or to small watercraft strikes. Post lay burial mattressing is a method of protecting the cable by placing a flexible concrete mattress that is designed to protect cables. The mattress is made up of individual concrete blocks that are interconnected with steel wire ropes, allowing it to conform to the seabed contours. A typical concrete mattress used to protect subsea cables is shown in Figure 2.1-11, with dimensions of 2.4 m by 6.1 m by 0.23 (8 ft by 20 ft by 0.75 ft).

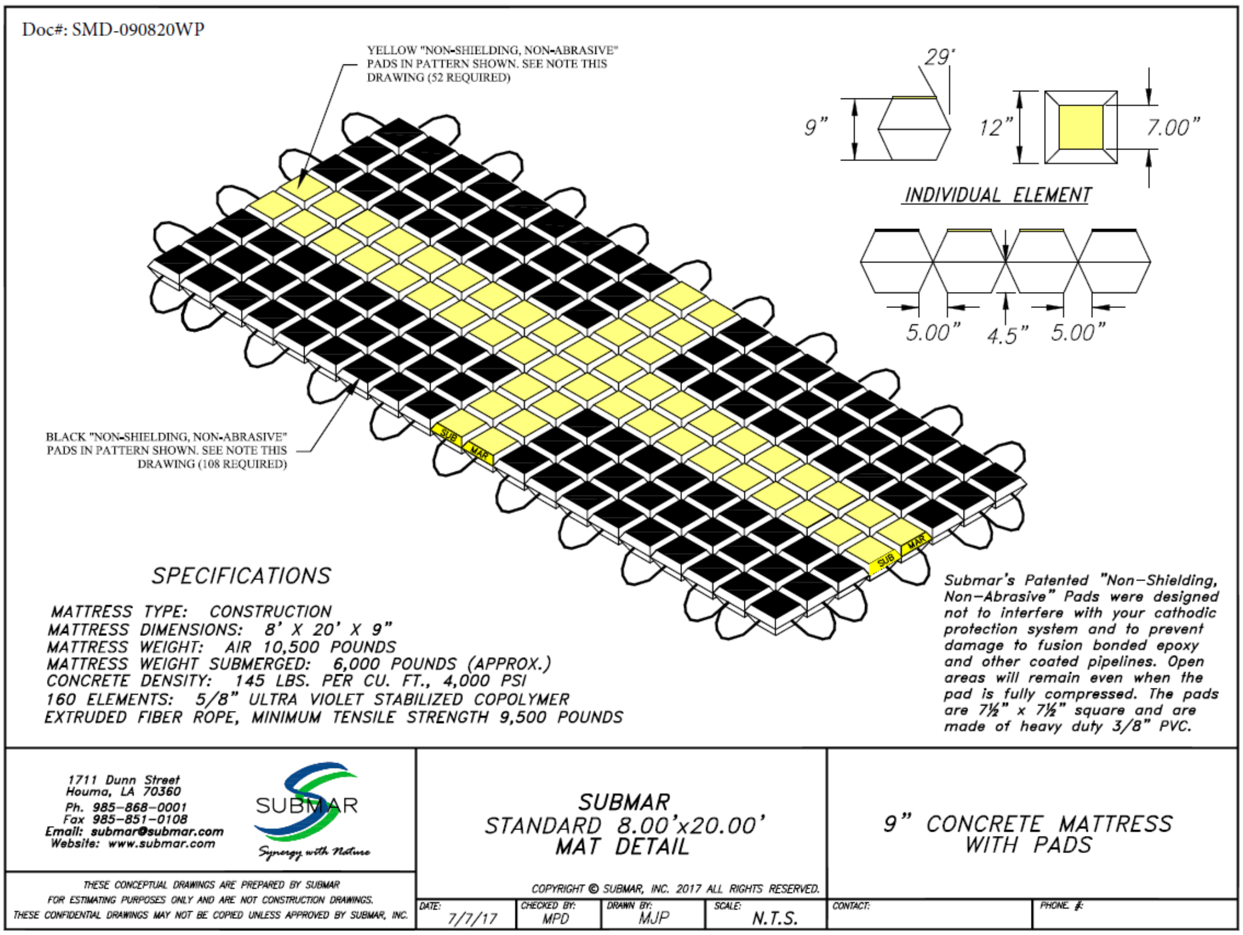

Figure 2.1-11. Typical Cable Protection Mattress

2.1.3.3 Onshore Export Cables

Onshore export cables would enter Indian River Bay via HDD and traverse the Bay to an HDD exit location near the US Wind substations (Appendix B, Supporting Application Materials for Coastal Construction Permit). As noted in Sections 4.2.3, 4.3.3, 4.4.4, 4.5.3, and 4.6.3, time of year (TOY) restrictions are anticipated. Construction activities at the Barrier Beach Landfall are planned in the September-May window. In-water work in Indian River Bay is planned between October 1 and February 28.

Prior to installation in Indian River Bay, route clearance activities would be conducted including pre-installation survey and debris removal and disposal, as needed. Pre-lay grapnel run operations would occur to remove debris and obstructions along the cable route by moving any objects out of the cable corridor to allow for safe cable lay operations and to achieve the specified burial depth. The vessel used would be equipped with a navigation spread, double drum winch, crane, and stern roller, de-trenching grapnel, tool container with appropriate rigging, cutting and welding equipment, and equipment and grapnel spares. A representative grapnel type is shown in Figure 2.1-12.

Figure 2.1-12. Representative Grapnel

Onshore Export Cables would span a minimum 40 m-wide route to allow for appropriate cable spacing, although in multiple areas cable spacing or site conditions may necessitate a route wider than 40 m. Where the cable alignment overlaps portions of the federal navigation channel, particularly within Indian River, USACE directed US Wind to bury cables at least 1.8 m (6 ft) below the lowest channel maintenance depth to avoid interference with future maintenance dredging and to protect the cables in such instances. Additionally, US Wind has added a 76.2-m (250-ft) buffer to the north and south of the last known location of the channel to account for the movement of the channel alignment over time (see Appendix C1, Sheets 4-12). In areas in the vicinity of the channel, export cables would be buried 16 ft below MLLW to abide by USACE guidance. Areas where the HDD punch-out locations may occur are subject to additional review of site conditions and micro-siting.

Dredging in shallow areas of the bay is anticipated for cable burial to achieve burial depth of at least 1.8 m (6 ft) below the maintenance depth of the navigation channel (see Appendix A, DNREC Appendix S New Dredging Projects Form). A cable storage barge would be equipped with a turntable, loading arm, and cable roller highway towards a cable installation barge. In support of the cable lay barge, an auxiliary construction barge would be outfitted with the necessary equipment to perform work in shallow waters. The barges would be suitable for positioning close to the HDD exit points due to the flat bottom and shallow draft. It is expected that the barge will be moved along the cable route using a six-point anchor system, assisted by an anchor handling tug, in combination with spud piles. An example of a barge-based installation can be seen in Figure 2.1-13. Shallow water installation is shown in Figure 2.1-14.

The preferred installation method is to install the submarine cable via jet sled (shown in Figure 2.1-15). A jet sled is a specialized piece of equipment used in the installation of submarine high voltage cables. It is towed along the ocean floor by a vessel and uses high pressure jets to create a trench in the seafloor. The sled is designed to simultaneously lay and bury cables, making the process more efficient. During the cable installation process, the sleds information and videos are monitored continuously. The jet sled is a single pass installation burial tool. It is designed to operate in an optimal position, which has jet nozzles pointing forward into the soil. This is maximized when the blade is at its intended burial depth. The embedment blade can be raised and lowered to accommodate changing burial depths.

Figure 2.1-13. Block Island Cable Installation
Source: www.oceannews.com

Figure 2.1-14. Example of Shallow Water Cable Installation

Figure 2.1-15. Representative Jet Sled

The jet sled would be assembled on site and calibrated following the manufacturers recommendations. The subsea pressure housing of the jet sled electronics would be installed on the sled. This houses all the sensors (pitch and roll, hydraulic ram, water pressure, water depth) used to monitor the sled during the lay. A single armored umbilical is used to transmit the sled sensor data and camera feeds from the electronic pod on the sled to control station on the deck of the cable lay barge. The sled's position would be monitored using positioning systems such as ultra-shore baseline (USBL) and Global Positioning Systems (GPS) antennas.

Once the sled is fully calibrated and ready for installation, the cable installation barge would test the sled during sea trials to ensure proper calibration and operation. Any required modifications would take place at this time.

During the cable installation process, the sleds information and videos are monitored continuously.

The cables would be floated into place near the HDD ducts using small boats and floatation devices where they will subsequently be pulled through the ducts into the jointing/transition bays. The cable barge would lay and bury the cables between the two end points maneuvering along the cable route using its anchoring system and positioned using spuds as required. Based on the sediments observed along Onshore Export Cable South Corridor, US Wind assumes that the jet sled, which fluidizes the soil and simultaneously buries the cable, would be the primary installation tool for the cable. In shallow water and/or where soft sediment conditions exist, the jet sled may be supported by a floating barge frame to keep the tool from sinking into the soft seabed materials under its own weight. In addition, secondary means of cable burial methods could include diver hand jetting, vertical injector, post lay burial tow or self-driving burial tools.

Construction is planned over two construction seasons in Campaign 1 and 2, within a construction window considered to be October 1-Febuary 28 based on feedback from DNREC's Environmental Review received December 21, 2023, and prior dredging projects in Indian River Bay. Cable installation operations would be planned, to the greatest extent practicable, during periods of higher water in the shallow portions of Indian River Bay. Construction operations would be paused during low water conditions. By increasing the size of a cable lay barge to distribute weight of the cable and by accepting downtime during construction, US Wind would avoid the need for dredging for barge access in the shallow, southern portions of Indian River Bay.

No cable or pipeline crossings have been identified based on currently available information. It is anticipated that the cables will be installed in a continuous length, however if operational needs warrant, the cables can be installed in smaller sections and spliced (see Appendix C1, Sheets 4-18).

The cable trench in the bay bottom would be narrow, about one meter, and would collapse immediately after the cable has been depressed into the trench. The required burial depth will be based on the anticipated long-term bay bottom morphology and is expected to be 1-2 m (3-7 ft).

After the cable is installed a post-installation survey would be performed as well as videoing the cable route for a real-time visual of installed conditions. Based on surveys of the bay bottom and sub bottom, target cable burial depth should be achievable and cable protection is not anticipated or proposed.

Dredging within Indian River Bay

US Wind anticipates dredging would be necessary in locations along the cable routes for cable burial. Maximum dredging disturbance is assumed to be within a 76 m (249 ft)-wide corridor along defined portions of the route. The dredging area footprint is within the 183-m (600 ft) area of temporary construction disturbance shown in Figure 2.1-16.

Figure 2.1-16. Cable Burial Dredging Areas within Indian River Bay

Dredging along the routes would be a maximum of 1.8 m (6 ft), varying from 1-6 ft (0.3-1.8 m) depending on location. Much of the route would be 1 m (3 ft) or less. Maximum volume of dredging, assuming all 4 cables installed, would be 73,676 cubic yards over an anticipated two construction seasons or “campaigns” where one cable would be installed in Campaign 1 and three cables installed in Campaign 2.

Dredging would be conducted using hydraulic means, based on sediment information in Indian River Bay and Indian River.

Hydraulic dredging involves a dredge that floats on the water and pumps the material as a slurry through a temporary pipeline to a barge or coastal location. A hydraulic dredge acts as a floating vacuum removing sediment precisely and is best suited for conditions within Indian River Bay with fine silt, sand, and mud. Hydraulic dredging has a lower percentage of suspended sediment than mechanical dredging although the process may take longer depending on the site.

The dredging material volumes are preliminary and worst-case. The draft of the vessel is assumed to be 1.5 m (5 ft).

US Wind will continue to work with contractors to optimize installation methods. The dredge volumes assume all dredging would be conducted by US Wind for cable installation and does not account for maintenance dredging projects that may overlap US Wind's area of construction.

Dredging locations and volumes by location of Onshore Export Cable South Corridor are detailed in Appendix C1. The estimated, worst-case dredging volumes for Campaign 1 and Campaign 2 are provided in Table 2.1-2.

Table 2.1-2. Worst-case Dredging Volumes

Dredging volume	Onshore Export Cable South Corridor (cubic yards)
Campaign 1	30,278
Campaign 2	43,398
Total (2 campaigns)	**73,676**

Per Delaware Regulations Governing the Use of Subaqueous Lands (7 Del.C. §7504-4.11.4), the areas of proposed dredging have been sited to avoid biologically productive areas (i.e., submerged aquatic vegetation, shellfish beds, and nursery areas). Specifically, there would be no dredging along the eastern portion of Onshore Export Cable South Corridor in the vicinity of White Creek, which DNREC has stated in previous communications is an area of high shellfish density. (D.D.o.N.R.a.E.C.D.o.W.S. DNREC 2023d).

Environmental impacts of dredging will be minimized by observing time of year restrictions (see Section 1.8) provided by DNREC Fish & Wildlife, use of turbidity monitoring (see Section 4.3.2.1.1), use of turbidity curtains, use of hydraulic rather than mechanical dredging (see Section 2.1.3.3), and the optimization of the cable installation methods to reduce the areal extent of dredging to as small as practicable (see Section 2.1.3.3).

Placement of Dredged Material

Dredged material would be piped via temporary dredge pipeline to a dewatering staging area at the US Wind Substations, within the planned limits of construction disturbance, before being transported to a landfill. The proposed dewatering area is located on the US Wind Substations property, which is zoned HI-I (Heavy Industrial District) and lies within the Industrial Area Future Land Use Classification established by the most recent Sussex County Comprehensive Plan. There are no wells within 91.4 m (300 ft) of the dewatering sites.

Dewatering would be achieved by a passive method using large geobags (approximately 90-ft circumference by 200-ft long, see Figure 2.1-17). To assist in the dewatering, a flocculant would be added prior to the dredged material being place in the geobags, which accelerates settling rates and improves solid-liquid separation rates. Once the flocculant is added, the geobags would be deployed in a dewatering field. Geobags that are approximately 90 feet circumference are capable of dewatering between 7 to 8 cubic yards of sediment per linear foot. To accommodate the material associated with Campaign 1, approximately twenty-two 200-foot long geobags would be needed and 29 geobags for material associated with Campaign 2. The geobags would be double-stacked in an area approximately 128 m (420 ft) by 83 m (270 ft), which would be configured within the defined dewatering areas. US Wind assumes an area of approximately 6 acres for each dewatering area to accommodate the dewatering field, perimeter controls, staging area, and erosion and sediment controls (Figures 2.1-18).

Figure 2.1-17. Representative Geobags

Figure 2.1-18. Example of a Passive Dewater Operation using Geobags

The proposed areas of dewatering at the US Wind Substation site are shown in Figures 2.1-18 and 2.1-19, each estimated to encompass 6 acres. The limits of disturbance for the dewatering areas would be approximately 310 m (1,020 ft) by 90 m (275 ft) for Campaign 1 (Figure 2.1-19) and 60 m (200 ft) by 475 m (1,560 ft) for Campaign 2 (Figure 2.1-20). The areas would be cleared and graded in preparation for construction of the US Wind Substations and export cable installation. The dewatering fields would include silt fencing to avoid runoff and would be designed to allow for the capture of water for eventual return to Indian River Bay via a temporary pipeline. The water return pipeline would be approximately 820 m (2,700 ft) associated with Campaign 1 and 200 m (650 ft) associated with Campaign 2, with approximately 200 m (600 ft) resting on top of wetlands. Based on the grain size characteristics of the dredged material and the flocculant selected, it is anticipated that dewatering using passive geobags would take 30-60 days.

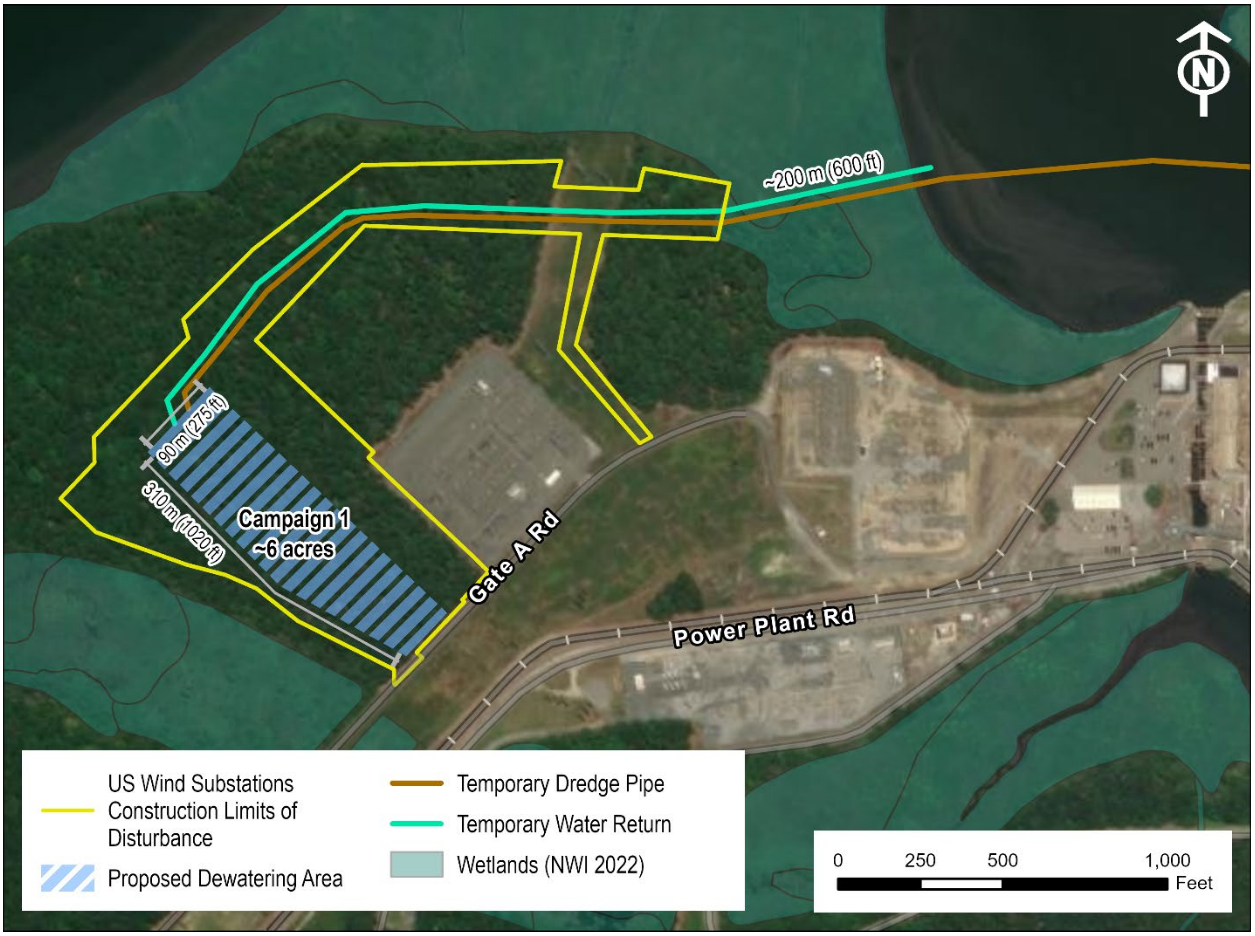

Figure 2.1-19. Proposed Dewatering Sites for Campaign 1

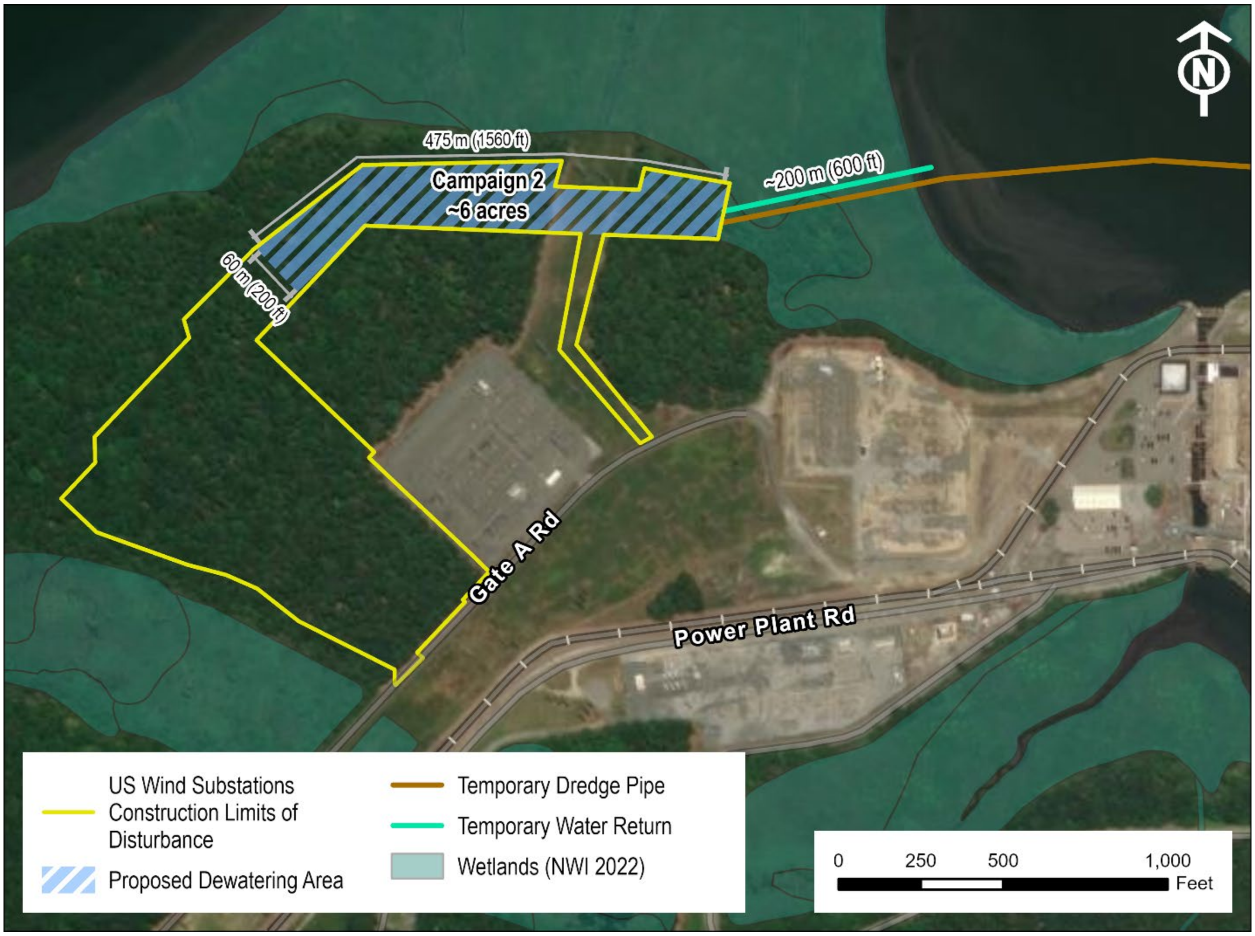

Figure 2.1-20. Proposed Dewatering Sites for Campaign 2

After the completion of dewatering, dredged materials would be placed in trucks for disposal/placement at an upland landfill location within 161 km (100 mi) of the US Wind Substations area. The proposed disposal site is the Jones Crossroads Landfill, approximately 20.9 km (13 mi) from the dewatering site. Jones Crossroads Landfill has capacity for over 74,000 cubic yards of material. An acceptance letter from the Delaware Solid Waste Authority is included in Appendix A as part of the materials for Appendix S New Dredging Projects.

__Turbidity Monitoring__

US Wind would conduct turbidity monitoring along the entirety of Onshore Export Cable South Corridor while performing dredging and cable installation activities within Indian River Bay, in accordance with the requirements contained in USACE and DNREC permits. US Wind anticipates that the permit conditions would specify monitoring for analytes (e.g., TSS, turbidity, metals, PAHs, etc.), exceedance thresholds, monitoring distances, frequency/timing of the required sampling and depth at which samples will be taken.

Turbidity monitoring in Indian River Bay would be constrained by the shallow depths in most locations in the proposed cable corridor. A boat-based and/or buoy-based turbidity monitoring procedure would be employed, depending on the specific permit requirements. For boat-based monitoring, a small vessel with a water quality sonde would be used to collect turbidity data and to collect water quality samples for the analysis of additional analytes, if required. The vessel would navigate to sampling locations along a transect oriented perpendicular to the direction of current flow to locate the sediment plume and area of maximum turbidity for sampling. If laboratory analysis of the samples is required, they would be delivered to a courier each evening for transport to the laboratory.

Alternatively, an array of water quality buoys would be deployed in areas surrounding the dredging or cable installation activities. The buoys would provide continuous near-real time turbidity data and would be relocated as dredging or cable installation activities move along the cable corridor. The number of buoys and the distance between them would be determined based on the specific permit requirements. Buoys would also likely be deployed at up-current stations to measure baseline conditions. Additional coordination with USACE, DNREC, and USCG would be required to assure that buoy placement does not impede dredging or cable installation activities or pose a hazard to navigation. If continuous monitoring is not required and the collection of discrete water samples for additional laboratory analysis is required, the use of a boat-based monitoring approach would be more appropriate to implement.

US Wind would prepare a Turbidity Monitoring Plan for dredging and cable installation operations for submittal to BOEM, DNREC, and USACE, as required, prior to conducting construction activity in Indian River Bay.

2.1.4 Delmarva Power and Light Substation

The DPL Substation expansions at the POI will be governed by the final size of the Project and broader grid requirements. Delmarva Power and Light would construct the expansion of the substation. US Wind conducted preliminary design work to estimate the footprint of the Indian River Substation expansion required to support the Project. The maximum vertical extent above ground would be 18 m (60 ft) and below ground would be 4 m (12 ft). US Wind assumes that the DPL Substation would be expanded to accommodate the addition of up to four circuit breakers and the associated disconnect switches, metering, relay, and control panels.

2.1.5 US Wind Substations

The proposed US Wind substations would be constructed adjacent to the existing Indian River Substation. US Wind anticipates the substations would be constructed in phases aligned with the respective offshore campaigns. Typical onshore construction equipment, including cranes and earth moving equipment, will be employed to install the onshore substations. Tree clearing and ground disturbance associated with construction would occur within the footprint of the substations and temporary limits of disturbance associated with installation of export cables from Indian River to the substations, as well as access to transition vaults in a previously disturbed area under Delmarva Power & Light overhead transmission lines (see Appendix C2). Ground disturbance is estimated to extend 4 m (12 ft) below grade.

2.1.5.1 Routine Operating Procedures for Power Cables

Subsea cables are exposed to tides or sediment flows and, in extreme cases, experience failure due to anchor strike. US Wind will monitor and survey the export cables, repairing as needed. Survey work and remedial work will be subcontracted to a specialist service provider.

The routine procedures will include cable surveys, typically required to check the cable burial depths, especially in those locations with sand waves or a high fishing activity that can have impacts on buried cables. Cable surveys are anticipated in year 1, year 3, and then every 5 years after. The frequency of the surveys may be adjusted based on the results of the first survey. The determination of cable burial depths may be derived indirectly from observed bathymetric changes with respect to the as-built situation. The effects of migrating sand waves will be taken into consideration.

In case of insufficient burial or cable exposure, whether attributable to natural or human caused issues, appropriate remedial measures will be taken including reburial or placement of additional protective measures. If a cable failure occurs, an appropriate cable repair spread will be mobilized.

2.1.6 Summary of Construction and Operations Vessels

A number of vessels will be required to support activities carried out during construction of the Project. An overview of the vessels anticipated to be required and their characteristics is provided in Table 2.1-3. The majority of the vessels are expected to have conventional propeller- or thruster-based propulsion systems. Smaller vessels designed primarily for crew transfer applications are expected to employ water jet-drive based systems.

Table 2.1-3 Cable Installation Vessels Summary

Vessel Class	Vessel Role	Offshore and Onshore Cables	Approx. Length	Approx. Displacement	Approx. Crew Size	Est. # of Fuel Tanks	Estimated Max Fuel Storage Capacity
Multipurpose Offshore Supply	Supply of materials and consumables Pre lay grapnel run boulder clearance Refueling Cable Burial	X	65-90 m (210-295 ft)	500-3,000 t	8-25	10-20	378,000 L (100,000 gal)
Crew Transfer Vessel	Crew Transfer	X	10-30m (30-100ft)	50-1,500 t	2-5	3-8	8,000 (2,110 gal)
Survey	Pre-Installation and Verification Surveys	X	13-112 m (45-350 ft)	400-3,000 t	5-70	5-12	8,000–52,000 L (2,110–13,800 gal)
Cable Laying	Cable Installation	X	80-150 m (262-492 ft)	1,200-1,5000 t	15-45	10-20	120,000 L (31,700 gal)
Mattress Placement	Placement Concrete Mattresses, if needed	X	130-170 m (427-558 ft)	25,000 t	20-60	10-20	260,000-1,800,000 L (68,680-475,510 gal)
Cable barge	In shore cable installation	X	67 m (220 ft)		2-4	1	3,785 L (1,000 gal)
Anchor handling tug	In shore cable installation	X	7.6–15 m (25–50 ft)		1-4	1-2	3,785 L (1,000 gal)

3.0 ALTERNATIVES ANALYSIS

US Wind evaluated use of the Lease area to maximize the production of clean, renewable wind-generated electricity and deliver the power to shore in a manner that avoids and minimizes impacts. Some of the most significant impact-producing factors relate to the selection of viable export cable routes and landfall locations to available points of interconnection for connection to the regional electric grid and the methods used to install the export cables. The alternatives analysis describes US Wind's evaluation and selection process, alternatives discarded and the reasoning why, and the resource impacts of the alternative land-based cable routes.

3.1 Point of Interconnect

The selected point of interconnect needed to be located along the coast and be able to handle the power capacity from the Project. Interconnection of the Project, including the individual construction campaigns, necessitates an existing POI of 230 kV or greater, as lower voltages would require significantly more cables and infrastructure to deliver the total capacity of the Project, resulting in significantly more impact to the community and environment. The Indian River point of interconnection (POI) proposed is the southernmost existing 230 kV interconnection point on the Delmarva Peninsula. South of the Indian River POI the grid only offers 138 kV, and therefore, all three of the feasible POIs are in Delaware, which correspondingly results in the lowest cumulative impact to the environment.

Because the electric grid south of Indian River POI is of insufficient size to accommodate injection of the power from the Project, or any of the three components thereof (MarWin, Momentum Wind and future development), a POI in Maryland would not be technically or economically feasible.

The POIs south of Indian River, Bishop, Worcester and Oak Hall, are 138 kV and geographically constrained, and are therefore insufficient to inject power from the Project without economically infeasible upgrades. Transmission upgrades to the existing 230 kV POIs on the Delmarva Peninsula are estimated to be hundreds of millions of dollars. Upgrade of the 138 kV system would certainly exceed the upgrade costs of 230 kV systems significantly and could be multiples of the 230 kV cost. Interconnection into the lower voltage substation, resulting in significantly greater impacts on the electrical infrastructure around the lower voltage substations, which would require significant expansion of real estate, replacement of entire substations, transmission lines, and equipment.

Indian River is also the site of a 1950's-era coal-fired power plant slated to retire. Using the existing infrastructure adjacent to a retiring fossil fuel power plant is an environmentally attractive alternative to building new, expensive, and disruptive transmission upgrades. It should be noted that PJM has notified Indian River Power Station that the plant cannot retire yet due to the need for power generation in the region to provide regional grid stability - another example of the fragile electric infrastructure and lack of alternative power generation on the Delmarva Peninsula.

230 kV POIs north of Indian River, specifically Milford and Cool Spring, were evaluated and initially proposed in the PDE. However, the PJM queue reform finalized December 2022, pushed projects without existing interconnection queue positions, which US Wind does not have at Milford or Cool Spring, beyond the Project schedule timeframe. Therefore, US Wind dropped the alternative POIs from consideration, along with the terrestrial export cable corridors, Onshore Export Cable Corridor 3 and Onshore Export Cable Corridor 4, from the PDE in January 2023.

US Wind also evaluated the option of developing a new greenfield POI along the existing 230 kV line, apart from existing substations. Initial property screenings evaluated sites along the 230 kV transmission lines in Sussex County, Delaware. While this approach addressed some of the build-out constraints at the existing substations, the associated siting, land acquisition, onshore routing, and interconnection challenges limited its viability. US Wind abandoned the approach and did not include any candidate POIs outside of Indian River.

3.2 Landfall Locations

Landfall locations between the Lease area and POI along the Delmarva Peninsula were evaluated in conjunction with viable routes for the offshore export cables described in Section 3.3. Landfall locations were required to be near the coast and contain a previously disturbed open area for installation of the transition vaults and construction footprint for HDD and cable pulling. Locations away from neighborhoods and developed areas were preferred to avoid construction impacts to residents.

Landing offshore export cables on the Maryland coast were eliminated due to extensive commercial and residential development in Ocean City, Maryland, which extends from the Ocean City Inlet to the border with Delaware (Figure 3.2-1). Similarly, landing cables in Delaware south of Delaware Seashore State Park were eliminated due to similar dense development. Open areas to accommodate construction of the buried transition vaults and export cable pulling activities at shore, and in the limited areas which are potentially open, the route to the POI from potential landfall locations is infeasible due to the length of the onshore cable routes, magnitude of impacts from extreme cable lengths, and cost to install cables on land over the significant distances.

Export cables also must avoid Indian River Inlet, a large connection between the Atlantic Ocean and Indian River Bay that is maintained by USACE.

The proposed landfall location at 3R’s Beach Parking Lot includes sufficient, previously disturbed land (for the parking area) that would allow US Wind to construct the transition vaults underground and includes sufficient space for the temporary footprint of installation equipment to build the transition vaults, equipment to HDD under the protected dunes and beach to the Atlantic Ocean and HDD into Indian River Bay below the dunes, Coastal Highway 1, and wetlands, and equipment to pull the export cables into the transition vaults. US Wind would return the parking area to its current state with 6-8 manhole covers for maintenance access to transition vaults, so that the parking area can continue to be used for parking vehicles for recreational purposes and beach access.

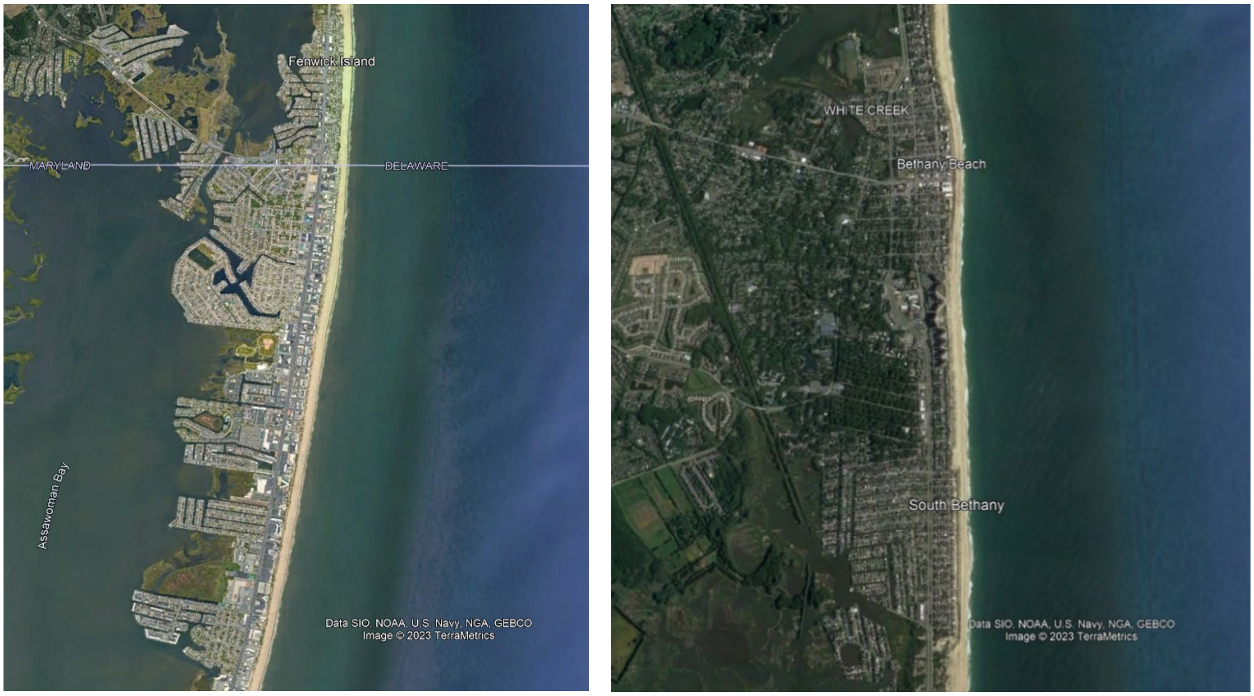

Figure 3.2-1. Examples of coastal development in Ocean City, Maryland and Delaware Border (left) and Delaware Development South of Indian River Bay (right)

Export cables also must avoid Indian River Inlet, a large connection between the Atlantic Ocean and Indian River Bay that is maintained by USACE.

The proposed landfall location at 3R's Beach Parking Lot includes sufficient, previously disturbed land (for the parking area) that would allow US Wind to construct the transition vaults underground and includes sufficient space for the temporary footprint of installation equipment to build the transition vaults, equipment to HDD under the protected dunes and beach to the Atlantic Ocean and HDD into Indian River Bay below the dunes, Coastal Highway 1, and wetlands, and equipment to pull the export cables into the transition vaults. US Wind would return the parking area to its current state with 6-8 manhole covers for maintenance access to transition vaults, so that the parking area can continue to be used for parking vehicles for recreational purposes and beach access.

A similar landing location was identified north of 3R's Beach at Tower Road with similar space which could be returned to current use after a brief period of construction. The onshore cable route from Tower Road is much longer than any route from 3R's Beach which creates greater disturbances, which is the reason Tower Road is not the proposed landing location.

Landfall for offshore export cables exiting Indian River Bay was identified as the closest available locations in relation to US Wind's new substations adjacent to the POI. US Wind evaluated other locations for US Wind's substations which are discussed in Section 3.1. No other viable location to land onshore export cables coming out of Indian River Bay via HDD were identified.

3.3 Offshore Export Cable Corridors

Offshore export cable corridors would ultimately contain up to four offshore export cables that transport power from the Lease area back to shore. US Wind considered offshore export cable corridors in conjunction with the proposed and alternative landfall locations identified above in Section 3.2.

Project considerations associated with offshore export cable routing included evaluations of transmission technology, type of export cables, construction feasibility, and available routing to the landfall locations, each of which is discussed in more detail in the following subsections.

3.3.1 Transmission Technology

US Wind is proposing to configure the Project's power collection and transmission system to employ High Voltage Alternating Current (HVAC). This configuration is the most common for onshore and offshore wind projects in the US and globally. Employing HVAC transmission for the Project facilitates equipment selection and design, interconnection to the US electric grid (and the proposed POI specifically), and project operations and maintenance. The voltage ranges defined in the PDE are aligned with contemporary equipment and component specifications and facilitate interconnection to the grid.

US Wind evaluated high voltage direct current (HVDC) transmission as a potential means to connect from the Lease area to the POI. It is neither technically nor economically feasible to use HVDC for the Project. The reasons for the infeasibility of this option are unrelated to the distance from shore. Implementing an HVDC connection at this stage of the development cycle, including the existing constraints regarding available real estate, would increase costs and cause schedule delays. Based upon current market conditions switching to HVDC would likely result in a delay of at least four years to the delivery of first power. HVDC would have a materially significant impact on onshore and offshore disturbances.

To accommodate HVDC transmission for the Project would require additional infrastructure offshore as well as onshore. Offshore, at least one additional HVDC platform – nominally twice the size of the largest alternating current (AC) OSSs currently included in the COP – would be needed to convert the power collected at the AC OSSs and convert it for transmission via one or two HVDC cables to shore. Onshore, at least one additional structure with a footprint exceeding the size of several football fields (see example in Figure 3.3-1) would be needed to convert the DC power to AC to be fed into the new US Wind onshore substations and then connected to the regional electrical grid. US Wind has not identified any land available near the POI for such a large structure, which would require a permanent disturbance on a coastal location that would create significant impacts to areas on the shore.

Figure 3.3-1. DC to AC power conversion building for 700 MW HVDC Norend cable between Norway and the Netherlands

3.3.2 Export Cables

US Wind is proposing to collect and convey all Project power employing high-voltage cables buried under the seabed, ground, and bay bed. The use of buried high-voltage, 3-conductor submarine cables for the Atlantic portion of the Project is the standard approach for offshore wind projects globally, as well as other U.S. infrastructure projects.

US Wind carefully evaluated cable and construction options for the onshore export cable corridors. US Wind evaluated buried cables and overhead transmission. Overhead transmission, with transmission towers approximately 91 m (300 ft), offered several advantages for portions of the route, including lower costs, shorter schedules, and additional routing flexibility. US Wind ultimately rejected the option of overhead transmission cables for all onshore routes due to the potential for greater adverse environmental, stakeholder and visual impacts, particularly if employed through Indian River Bay.

3.3.3 Construction Feasibility

Avoiding and minimizing disturbance at the landfall locations were key considerations. Multiple cable landing and land-crossing construction approaches were considered, including trench and fill, and HDD. The first method involves excavation of a trench from the surface, laying the cable(s), and back-filling. HDD involves drilling of a bore hole under a land or water feature, installing a conduit along the bore hole, and pulling the cables through the conduit. While HDD requires some temporary surface excavation during construction, trench and fill approach is expected to have higher environmental, cultural, and/or stakeholder impacts at the landings and crossings.

Therefore, using HDD to install the export cables in ducts drilled underground would avoid impacts to beaches used by recreationists, beach and dune habitat used by birds, sea turtles, and other species, and wetlands in Indian River Bay. Trench and fill landing and crossing options were removed from consideration and are not carried through as alternatives. As described in the landfall location section (Section 3.2), temporary HDD equipment to drill and install ducts requires a preferably large area of previously disturbed land close to the coast and away from residential development. From such a location it would be feasible to HDD under the wetlands, beaches, dunes, and roads on the Delaware coast.

HDD from the Beach Landfall Locations into the Atlantic Ocean will require temporary protection around the HDD punchouts. The use of cofferdams at offshore HDD locations, with vibratory hammers to install sheet piles into the seafloor, were considered but not pursued due to the potential for increased underwater sound. US Wind proposes instead to use gravity cells.

Another aspect of construction feasibility is selection of routes and locations that will present the best opportunity to maintain burial of the offshore export cables without extensive cable protection on the seafloor. Based on the generally sandy conditions in the region installation of export cables to target penetration depth of 1-3 m (3.2-9.8 ft) is feasible along much, if not all, of the cable corridors. Earlier in the siting process US Wind included a potential corridor parallel to shore between the two landfall locations. The shore-parallel section was dropped from consideration due to concerns with crossing the immediately outside Indian River Inlet because of the potential for un-burying the cable due to the dynamic conditions and avoidance of future sand resource areas in the immediate vicinity.

3.3.4 Routing from the Lease Area to Landfall Locations

In 2019 US Wind identified a direct cable route from the Lease area to 3R’s Beach (see Figure 3.3-2). The USCG proposed an anchorage area outside Delaware Bay which required relocation of the formerly proposed offshore export cable corridor to avoid the proposed anchorage area, formalized in March 2023, and ensure protection of US Wind’s export cables and minimize interaction with anchoring cargo vessels. Additionally, the former route did not avoid established sand borrow areas. US Wind’s proposed and alternative offshore export cable corridors are now routed to avoid these other maritime uses (see Figure 3.3-3).

When establishing the revised corridors, US Wind set a 600 m (2,968 ft) corridor and surveyed the extents in 2021-2022. The wide corridor allows for micro-siting of the up to four offshore export cables within the corridor in relation to sand borrow areas (see Section 4.16) and potentially sensitive habitat, if any. In some areas of potential overlap or in close proximity to sand borrow areas and a recreational fish haven along Offshore Export Cable Corridor 2, the corridor was enlarged to allow additional opportunities for micro-siting while ensuring sufficient survey coverage for analysis of optimized routing. Similarly, for Offshore Export Cable Corridor 1 as it approaches 3R’s Beach, the corridor was enlarged and shifted south to avoid a potential sand resource area outside Indian River Inlet identified by USACE.

Other routing options for the offshore export cables from the Lease area are not available to US Wind because the length of the cables would economically challenge the Project. Few viable routes to shore are available in the region to feasibly connect to the landfall locations and on to the POI.

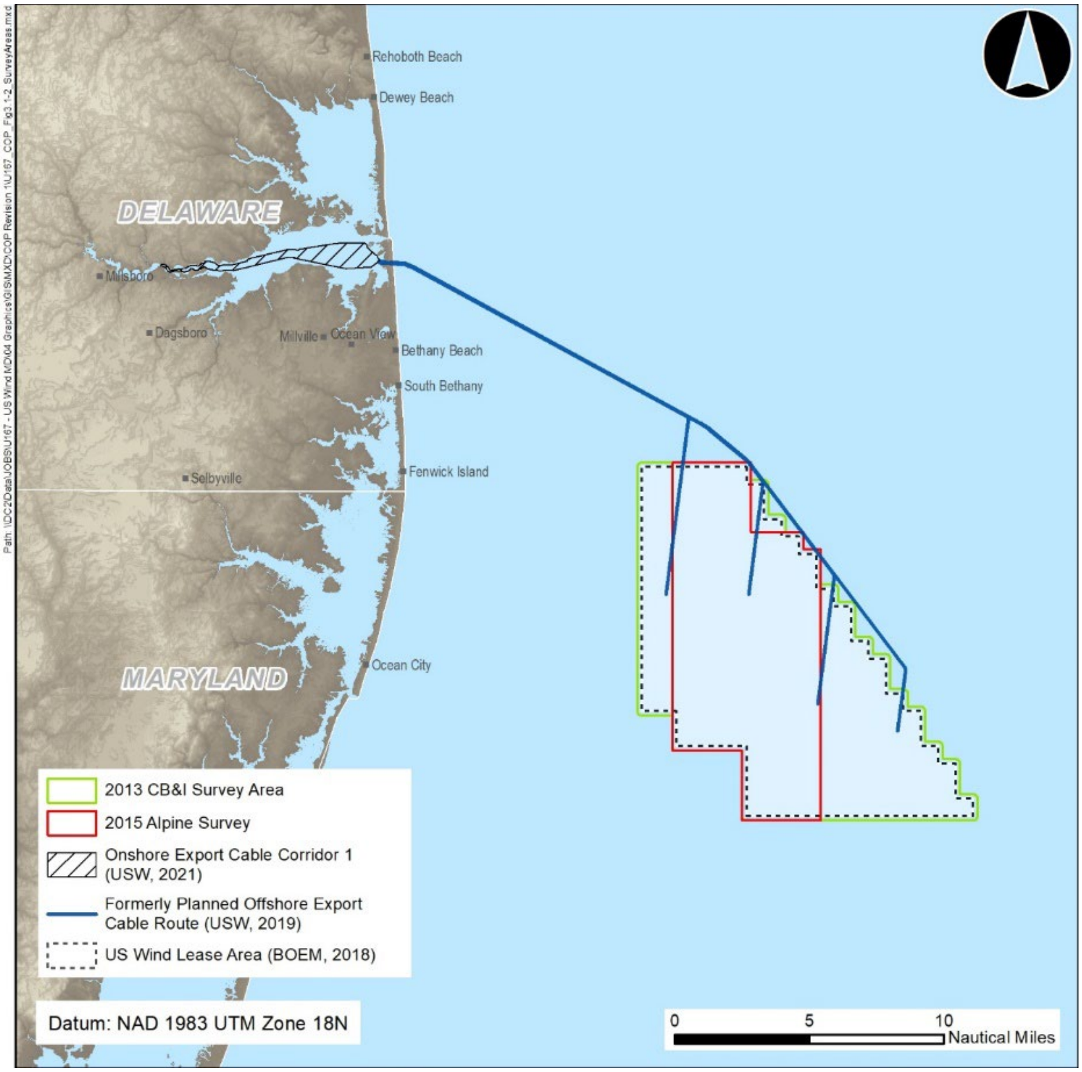

Figure 3.3-2. Formerly Planned Offshore Export Cable Route 2019

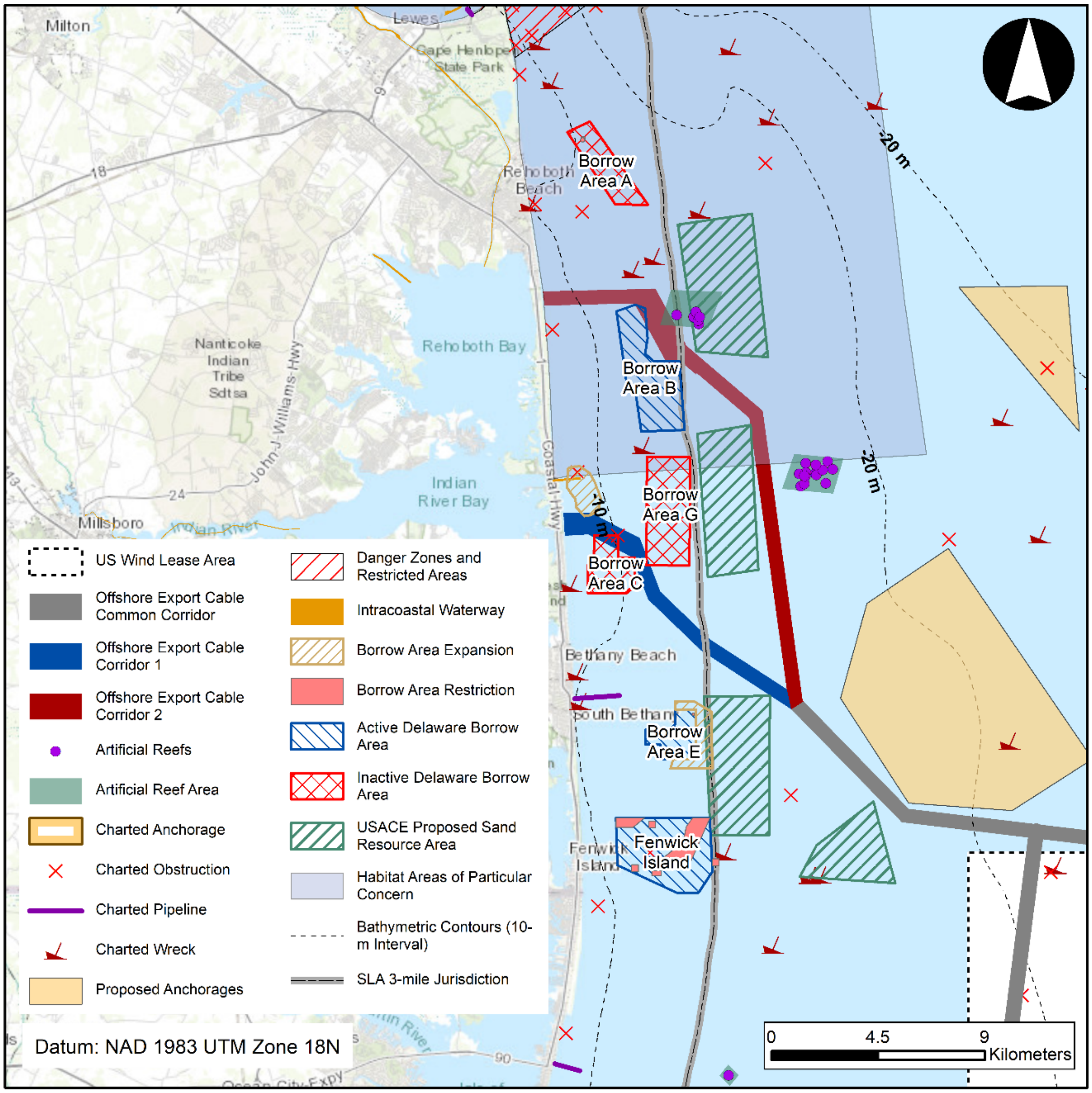

Figure 3.3-3. Revised Offshore Export Cable Corridor Routing Around Offshore Constraints

3.4 Onshore Export Cable Corridors

Onshore Export Cable Corridor 1 is part of the PDE and describes the large area within Indian River Bay within which up to four onshore 230-275 kV export cables would be installed through cable ducts that route the cables under existing coastal wetlands into Indian River Bay (Figure 3.4-2). Onshore Export Cable Corridor 1 extends 17 km (10 mi) from the transition vaults within a corridor within Indian River Bay to Indian River at the landfall location to the US Wind substations. When the cables reach US Wind's substations' cable ducts, they will be pulled into the cable ducts and into the substations' transition bays. The landfall in Indian River for US Wind's proposed substations is adjacent to the existing DPL Indian River substation.

US Wind includes several land-based routes as alternatives. However, burying cables in Indian River Bay to the POI is the shortest distance, installation can be achieved based on feedback from experienced cable installers, the burial depth is achievable and sufficient to protect the cable and minimize disturbances with and from outside parties, and avoidance and minimization measures are available to minimize environmental impacts. Onshore Export Cable South Corridor also minimizes potential disturbance of cultural resources, avoids interference with ongoing and future infrastructure development projects in Delaware's coastal region, and avoids impacts to wetlands. Dredging, which may be necessary for barge access, cable burial, and cable flotation, occurs relatively frequently in portions of Indian River Bay and has been identified by DNREC as a priority area for dredging in the state.

A summary of the parameters of the preferred cable route, Onshore Export Cable South Corridor, and the alternative terrestrial routes analyzed is provided as Table 3.4-1.

Table 3.4-1. Summary of Parameters Considered for the Onshore Export Cable Corridors

Parameter	Onshore Export Cable				
	South Corridor (preferred) through Indian River Bay	Corridor 1a South of Indian River Bay	Corridor 1b South of Indian River Bay	Corridor 1c South of Indian River Bay	Corridor 2 North of Rehoboth Bay
Length	10 miles	16 miles	16 miles	17 miles	17 miles
Practicable installation option	**Yes**	**No** Resistance to new utilities in ROW	**No** Resistance to new utilities in ROW	**No** Resistance to new utilities in ROW	**No** Resistance to new utilities in ROW
Ongoing protection of cables	**Yes** Burial 1-2 m (3-7 ft) maintains protection of cables	**No** At risk due to other utility activity in ROW	**No** At risk due to other utility activity in ROW	**No** At risk due to other utility activity in ROW	**No** At risk due to other utility activity in ROW
Archeological/ cultural sensitivity	**None** – surveyed and evaluated in 2022/2023	"Any undisturbed land [such as temporary construction footprint] were generally classified as locations of **high or moderate archaeological sensitivity**"	"Any undisturbed land [such as temporary construction footprint] were generally classified as locations of **high or moderate archaeological sensitivity**"	"Any undisturbed land [such as temporary construction footprint] were generally classified as locations of **high or moderate archaeological sensitivity**"	"Any undisturbed land [such as temporary construction footprint] were generally classified as locations of **high or moderate archaeological sensitivity**"
Federal/state channels or canals	**Impacts avoided** Avoids Indian River federal navigation channel, areas of overlap cables to be buried 6 ft below maintenance depth	**Impacts avoided** HDD under Assawoman Canal	**Impacts avoided** HDD under Assawoman Canal	**Impacts avoided** HDD under Assawoman Canal	**Impacts avoided?** HDD under Lewes and Rehoboth Canal

Table 3.4-1. Summary of Parameters Considered for the Onshore Export Cable Corridors

Parameter	Onshore Export Cable				
	South Corridor (preferred) through Indian River Bay	Corridor 1a South of Indian River Bay	Corridor 1b South of Indian River Bay	Corridor 1c South of Indian River Bay	Corridor 2 North of Rehoboth Bay
Water crossings	**1** Indian River Bay	**4** Assawoman Canal, Vines Creek, Blackwater Creek, unnamed tributary into Salt Pond	**7** Assawoman Canal, Vines Creek, Blackwater Creek, unnamed tributary into Salt Pond, Herring Branch, Pepper Creek, Island Creek	**32** Assawoman Canal, Blackwater Creek and Vines Creek, Herring Branch, Pepper Creek, Island Creek, unnamed creeks and retention ponds	**8** Love Creek, Burton Pond, Lewes and Rehoboth Canal, Sarah Run, Unity Branch, Guinea Creek, Indian River, unnamed stream
Construction adjacent to wetlands	**Impacts avoided** HDD under wetlands	**Potential for impacts during construction** 3 miles	**Potential for impacts during construction** 4.7 miles	**Potential for impacts during construction** 5.8 miles	**Potential for impacts during construction** 2.4 miles
Socio-economics	**Impacts avoided** Avoid construction during recreation season; temporary impacts to bury cables	**Impacts unavoidable** Avoid construction during recreation season; significant traffic, business, and residential disruptions for road closures; interference with planned infrastructure upgrades	**Impacts unavoidable** Avoid construction during recreation season; significant traffic, business, and residential disruptions for road closures; interference with planned infrastructure upgrades	**Impacts unavoidable** Avoid construction during recreation season; significant traffic, business, and residential disruptions for road closures	**Impacts unavoidable** Avoid construction during recreation season; significant traffic, business, and residential disruptions for road closures; interference with planned infrastructure upgrades

Table 3.4-1. Summary of Parameters Considered for the Onshore Export Cable Corridors

Parameter	Onshore Export Cable				
	South Corridor (preferred) through Indian River Bay	Corridor 1a South of Indian River Bay	Corridor 1b South of Indian River Bay	Corridor 1c South of Indian River Bay	Corridor 2 North of Rehoboth Bay
Birds	**Impacts avoided; habitat benefits** Avoid colonial waterbird nesting sites; avoid construction April 1-July 31; marsh habitat restoration	**May not be feasible** Avoid construction at water crossings April 16-July 31	**May not be feasible** Avoid construction at water crossings April 16-July 31	**May not be feasible** Avoid construction at water crossings April 16-July 31	**May not be feasible** Avoid construction at water crossings April 16-July 31
Fish/ Essential Fish Habitat	**Impacts avoided** Avoid in-water work March 1-September 30	**May not be feasible** Avoid drilling (HDD) March 1-September 30	**May not be feasible** Avoid drilling (HDD) March 1-September 30	**May not be feasible** Avoid drilling (HDD) March 1-September 30	**May not be feasible** Avoid drilling (HDD) March 1-September 30
State Natural Areas	**Impacts avoided and minimized** Indian River Bay Natural Area	**Impacts avoided and minimized** Vines Creek Natural Area	**Impacts avoided and minimized** Vines Creek Natural Area	**Impacts avoided and minimized** Vines Creek Natural Area	**Impacts avoided and minimized** Herring Creek Natural Area

In addition to the summary parameters by route in Table 3.4-1, US Wind summarizes constraints or sensitive locations along each onshore cable route in Table 3.4-2. More detail about the constraints and sensitive locations can be found in the subsection detailing each cable route.

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Table 3.4-2. Quantification of Sensitive Sites along the Onshore Export Cable Corridors

	Onshore Export Cable				
Parameter	**South Corridor (preferred) through Indian River Bay**	**Corridor 1a South of Indian River Bay**	**Corridor 1b South of Indian River Bay**	**Corridor 1c South of Indian River Bay**	**Corridor 2 North of Rehoboth Bay**
Length of Route (statute miles)	10.0	16.0	16.0	17.0	17.0
Conservation Areas					
Number of State Parks/Land/Forest in Close Proximity to Route	1	3	3	4	1
Number of Private Conserved Land	0	2	2	16	4
Number of Conservation Easements	0	2	2	2	1
Number of Nature Preserves	0	0	0	0	1
Environmental Justice					
Number of Census Blocks Classified as 50 Percent or Higher for Minority Groups [a]	0	0	0	0	2
Number of Census Blocks Classified as 50 Percent or Higher for Low Income [a]	0	0	0	0	2
Number of Census Blocks Classified as 50 Percent or Higher for Unemployment [a]	0	0	0	0	0
Farms/Agriculture					
Number of Farms/Agricultural Land [b]	0	42	36	25	27
Municipal					
Number of Municipal Parks	0	2	1	3	0
Number of Libraries	0	0	0	1	0
Number of Schools	0	1	1	0	3

Table 3.4-2. Quantification of Sensitive Sites along the Onshore Export Cable Corridors

Parameter	Onshore Export Cable				
	South Corridor (preferred) through Indian River Bay	Corridor 1a South of Indian River Bay	Corridor 1b South of Indian River Bay	Corridor 1c South of Indian River Bay	Corridor 2 North of Rehoboth Bay
Number of Fire Departments	0	1	1	1	1
Number of Police Departments	0	1	0	1	0
Number of Military Areas	0	0	0	1	0
Number of Hospitals	0	0	1	1	0
Number of Wastewater Treatment Facilities	0	0	1	2	0
Private					
Number of Business Areas	0	3	3	0	6
Number of Nursing Homes	0	0	0	0	1
Number of Railroad Crossings	0	1	1	1	0
Number of Communities that could be Isolated During Construction (not including ongoing construction)	0	7	4	1	9
Religious					
Number of Churches and/or Cemeteries	0	5	0	0	3

[a] Based on EPA Census blocks that overlap or are adjacent to one of the terrestrial onshore export cable corridors.

[b] Agricultural lands based on National Land Cover Database classifications from 2019.

3.4.1 Through Indian River Bay

After identification of the POI, US Wind evaluated routes from potential offshore export cable landing locations to the Indian River POI, which are identified as onshore export cable corridors. US Wind determined that the most efficient and least disruptive route from the proposed landing location at 3R's Beach to the POI is by burying onshore export cables in Indian River Bay, using HDD at both transitions from land to water to avoid impacts to wetlands on the eastern portion of Indian River Bay and on the western side from Indian River. By implementing measures such as time of year restrictions for construction activities on land and in Indian River Bay, turbidity monitoring during cable burial, and installation via HDD, impacts to recreation, sensitive species, water quality, and more would be avoided and minimized as described in Section 4.

In determining available routing for the onshore export cables from landfall locations to the POI, numerous routes have been evaluated. US Wind considered and rejected burying cables in Rehoboth Bay, north of Indian River Bay, due to concerns about sensitive bird and terrapin habitats, active aquaculture leases in Rehoboth Bay, and construction feasibility.

US Wind established a wide area as Onshore Export Cable Corridor 1 through Indian River Bay and surveyed the entire extent. The large area analyzed allowed for consideration of optimal siting of the up to four cables through Indian River Bay and, as was done for the offshore export cable corridors, provides surveyed area within which to micro-site cables. Benthic habitat is the same along routes evaluated within Onshore Export Cable Corridor 1, with no SAV identified in the large corridor. Shellfish are generally more abundant in the polyhaline areas of Indian River Bay (see Section 4.5.1.3 of this document). No potential archeological and cultural resources have been identified in the areas evaluated.

US Wind selected Onshore Export Cable South Corridor after careful analysis of potential routes and impacts to various resources. Onshore Export Cable South Corridor in the eastern portion of Indian River Bay avoids the dynamic nature of the area west of the Indian River Inlet. The shifting shoals in the vicinity of the inlet represent a significant risk to the Project for cable unburial which would be extremely difficult to rectify should it occur. Figure 3.4-1 below from an assessment of satellite imagery and LiDAR by Fugro shows the significant movement of shoals immediately west of the Indian River Inlet (east of the area shown, approximately midway down the figure, as indicated by the channel to the Atlantic Ocean).

The southern route through Indian River Bay also avoids the Indian River Inlet and Bay Federal Navigation Project. The federal navigation channel is not fixed to a particular location and shifts to the deeper sections of the bay along the general route. Avoidance of the vicinity of the inlet deconflicts the eastern portion of the cable routing.

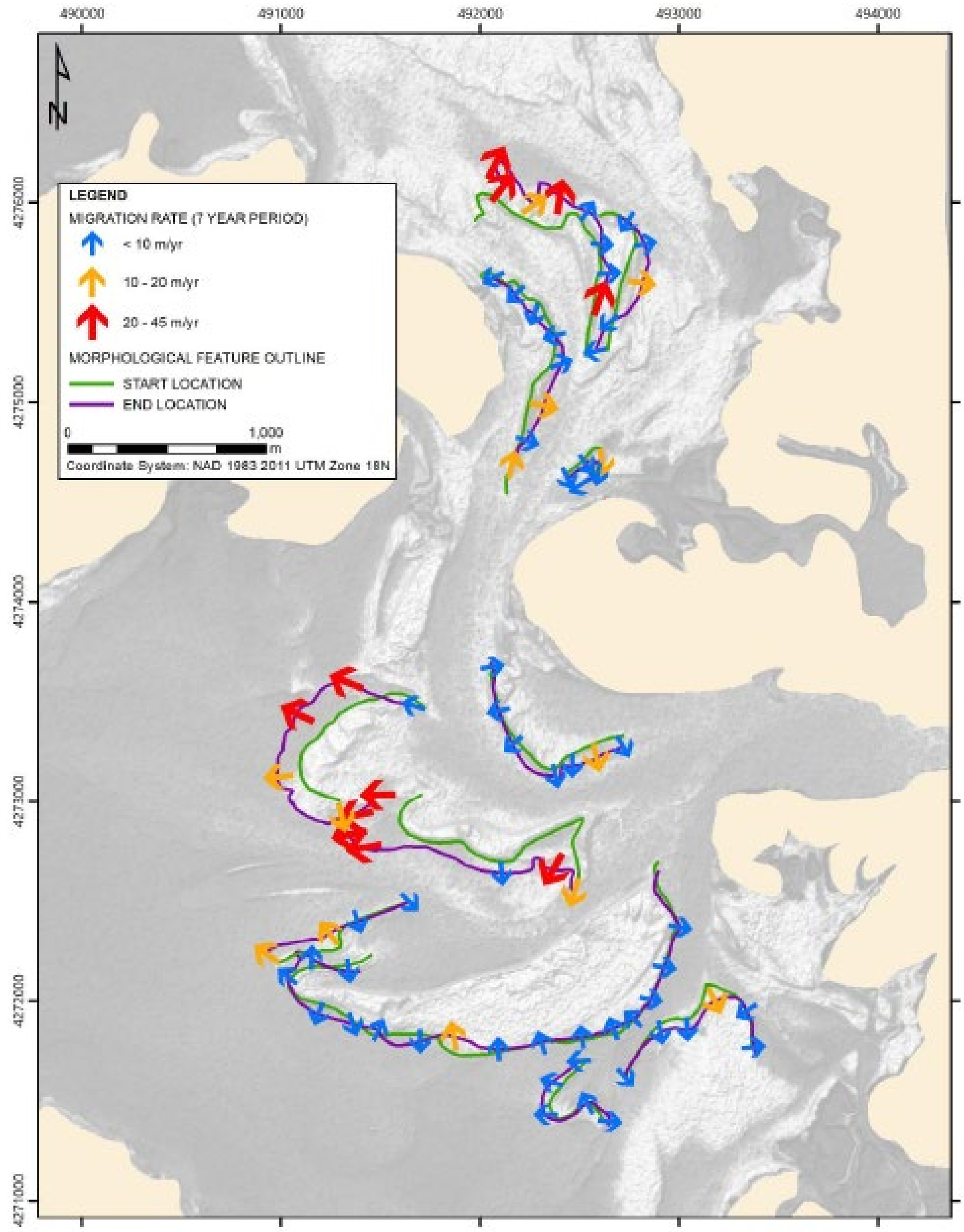

Figure 3.4-1. Shoal Migration Rates in Vicinity of Indian River Inlet

3.4.1.1 Planned Dredging Reductions

US Wind significantly reduced the need for potential dredging through optimization and planning, which would increase costs and construction time, to avoid and minimize potential impacts to sensitive resources. The initial worst-case dredging estimate for the southern corridor, now Onshore Export Cable South Corridor, was 1,368,000 cubic yards, which would have implemented dredging along the entirety of the cable corridor in Indian River Bay. US Wind was able to significantly reduce dredging through the planned use of a cable lay barge with a smaller draft. In February 2024, US Wind identified dredging needed in Onshore Export Cable South Corridor as 309,574 cubic yards over an anticipated two installation campaigns.

US Wind is now able to confirm that dredging volumes can be further reduced to a total of 73,676 cubic yards over two construction campaigns (see Section 2.1.3.3). US Wind worked with its engineers and potential installation contractors to confirm feasible installation processes to realize the dredging reductions. The refined installation process is similar to prior plans, however, downtime during installation would potentially increase during periods of low water, another splice in each cable may be necessary, and a larger barge to optimize weight distribution of the heavy export cables is anticipated, among other optimizations. Installation cost to US Wind and the time of cable installation could increase, however, the dredging reductions made to the Project plan in March 2024 allow US Wind to reduce dredging overall and to avoid dredging entirely along the southern portion of Onshore Export Cable South Corridor, a location DNREC, USACE, and NMFS identified as potentially biologically sensitive. Dredging, if needed, is now planned only in the vicinity of prior dredging projects.

3.4.2 Alternative Terrestrial Routes

Alternative terrestrial routes have been identified within existing rights-of-way (ROW) in Sussex County, to potentially limit ground disturbance. The ROW may be crowded with buried utility lines and there is resistance from legacy users to locating additional cables, particularly power cables, in the ROWs. The concern goes both ways because US Wind also does not wish to install cables in locations that may be opened for future construction projects or utility maintenance. Co-location of export cables in existing ROWs also creates significantly more risk of future disturbances and impacts due to the existence of multiple other users and utility lines within the ROW and the likely need to conduct maintenance and repair. For these reasons as well as additional impacts described below, US Wind has not selected the terrestrial cable routes and while technically and economically feasible, the terrestrial routes are not a practicable alternative to Onshore Export Cable South Corridor through Indian River Bay.

US Wind includes Onshore Export Cable Corridors 1a, 1b, and 1c as alternative export cable routes, and Onshore Export Cable Corridor 2 from alternate landfall at Tower Road. All cables would interconnect via new US Wind substations to the POI and DPL's Indian River Substation. This section briefly describes the location and installation methods for buried terrestrial cables. and potential impacts arising from the alternative onshore export cable corridors is included below.

Cables would be buried along the terrestrial corridors, pending final design for any road or water crossings, along ROW, or ROW under development. Cables for any land-based routes would be (1/C) 230-275 kV single copper or aluminum core cables. Three single conductor (single phase) cables would be installed in parallel, possibly sharing a cement bound sand block in the ROW.

Installation of cables in the land-based corridors (Onshore Export Cable Corridors 1a, 1b, 1c, and/or 2) are planned in previously disturbed ROWs that may include additional infrastructure such as utility lines, telecommunication lines, water and gas lines. A land-based construction crew would install duct banks and transition joint vaults followed by a second construction crew that would pull the cables through the duct banks. Installation of up to four cables in a single construction season is not expected to be feasible. Land-based cable installation for all four cables is anticipated over two construction seasons All work on onshore would likely necessitate staffing from state and local resources on the traffic congestion and management, even during offseason periods. There would also be the necessary restoration work to rebuild and repave the roads that would follow the installation activities as necessary.

The surface disturbance footprint during cable construction in ROWs is assumed to be at least 15 m (50 ft) when installing a cable for the excavator, laydown area alongside installation location, and access road alongside to feed materials. Small 2-lane roads, which are the majority of the roads along the terrestrial cable routes, would likely need to be closed for construction.

The loudest onshore cable installation equipment would be the excavator(s) operating up to 100-110 decibels (dB). Construction would abide by local noise ordinances and construction activity restrictions established in communities throughout the extensive commercial and residential areas along all of the alternative routes, which could increase construction time.

When reviewing the terrestrial cable routes, US Wind attempted to find the shortest, feasible distance along previously disturbed routes to minimize disruption to existing resources. As can be seen in the maps provided below, avoiding wetlands and water bodies is nearly impossible. The region, particularly to the north of Indian River Bay and Rehoboth Bay, is low lying so that water is often within a few feet of roadways in some locations. Installing cables in such locations would require digging up the road, installing the cable ducts and cables, and then repaving the road because there is insufficient room on the shoulder of the road in the existing ROW. These conditions informed the selection of proposed routes with a goal of minimizing impacts to resources, and where avoidance was not feasible, selecting routes that were least harmful. Furthermore, US Wind has not identified any feasible terrestrial routes that would completely avoid water crossings.

US Wind has identified water crossings along each route. At water crossings cables would either be attached to the undersides of existing bridges or installed via HDD under the water body. “Critical water crossing” is used to identify locations where an unavoidable water body crossing, such as a manmade canal or tributary to Indian River Bay or Rehoboth Bay posing an obstacle or impact from the installation of an export cable. Water crossings, or building in close proximity to water bodies, would require co-locating export cables on existing bridges or horizontally directional drilling under the water body to cross it. However, in some cases the road is simply elevated above water and new cables would require building under the road itself, with all of the disturbance associated with such activity. In locations where drilling under water crossings would be necessary DNREC requested that work not occur from March 1 to September 30 to minimize impacts to fisheries resources along any of the routes. This would further reduce the onshore construction season – US Wind planned no construction in ROWs from May 15 through

September 15 – and may not be feasible to accommodate given the complexity of sequencing construction along the lengthy terrestrial routes.

All of the alternative terrestrial routes traverse miles of wetlands, which are identified in more detail by route in the subsections below.

3.4.2.1 Onshore Export Cable Corridor 1a

Onshore Export Cable Corridor 1a is approximately 26 km (16 mi) from the landfall at 3R's Beach along existing DelDOT ROWs to Indian River POI via a southern route around Indian River Bay (see Figure 3.4-3). The cables would exit the transition vaults at 3R's Beach, traverse south along Coastal Highway (Route 1), turning west on Fred Hudson Road, south on Central Avenue then along Route 26/Atlantic Avenue to Dagsboro, continuing north on Route 26/Main Street through Dagsboro, and then generally north along Iron Branch Road/Road 332 to the US Wind substations.

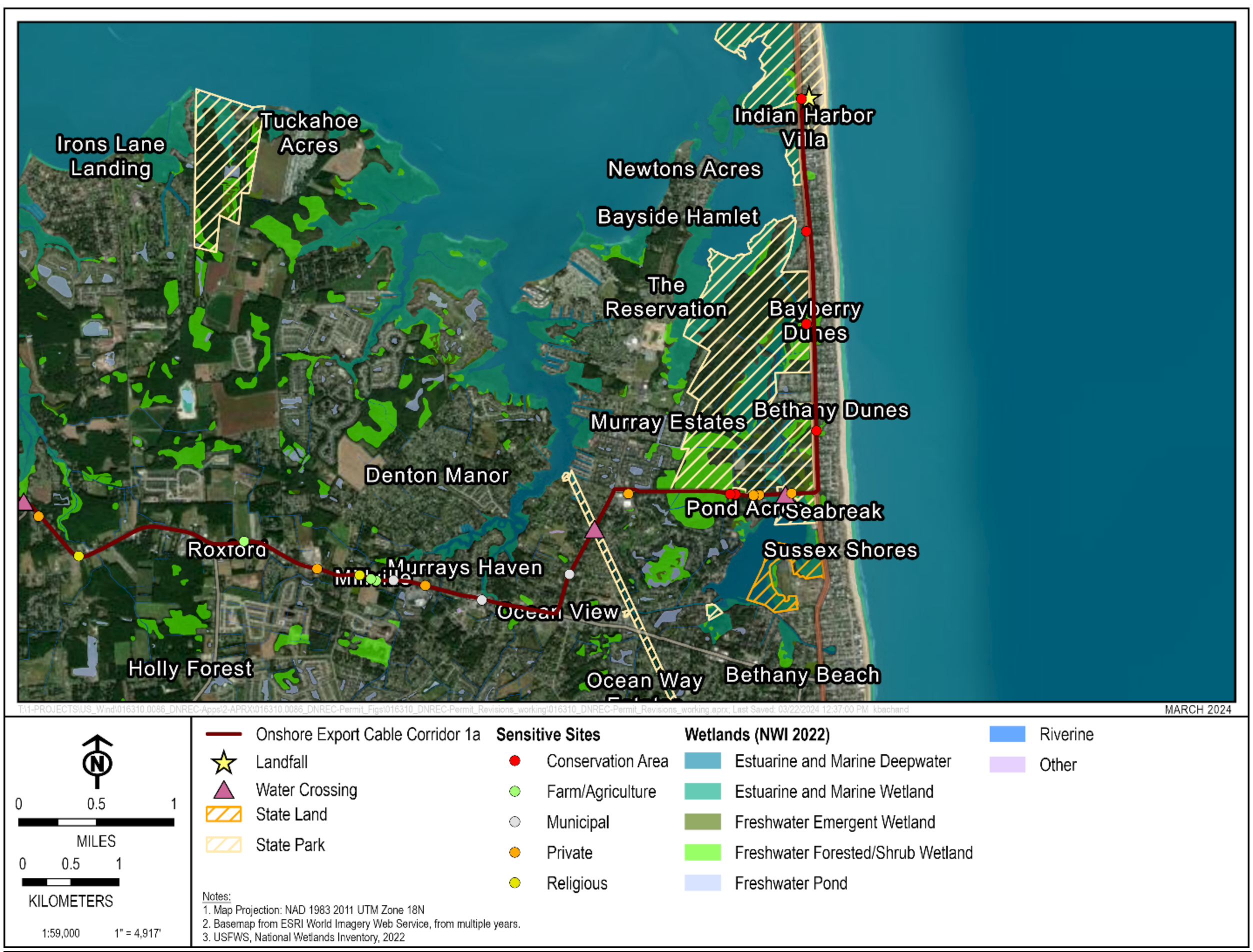

Figure 3.4-3a. Onshore Export Cable Corridor 1a – Eastern Portion

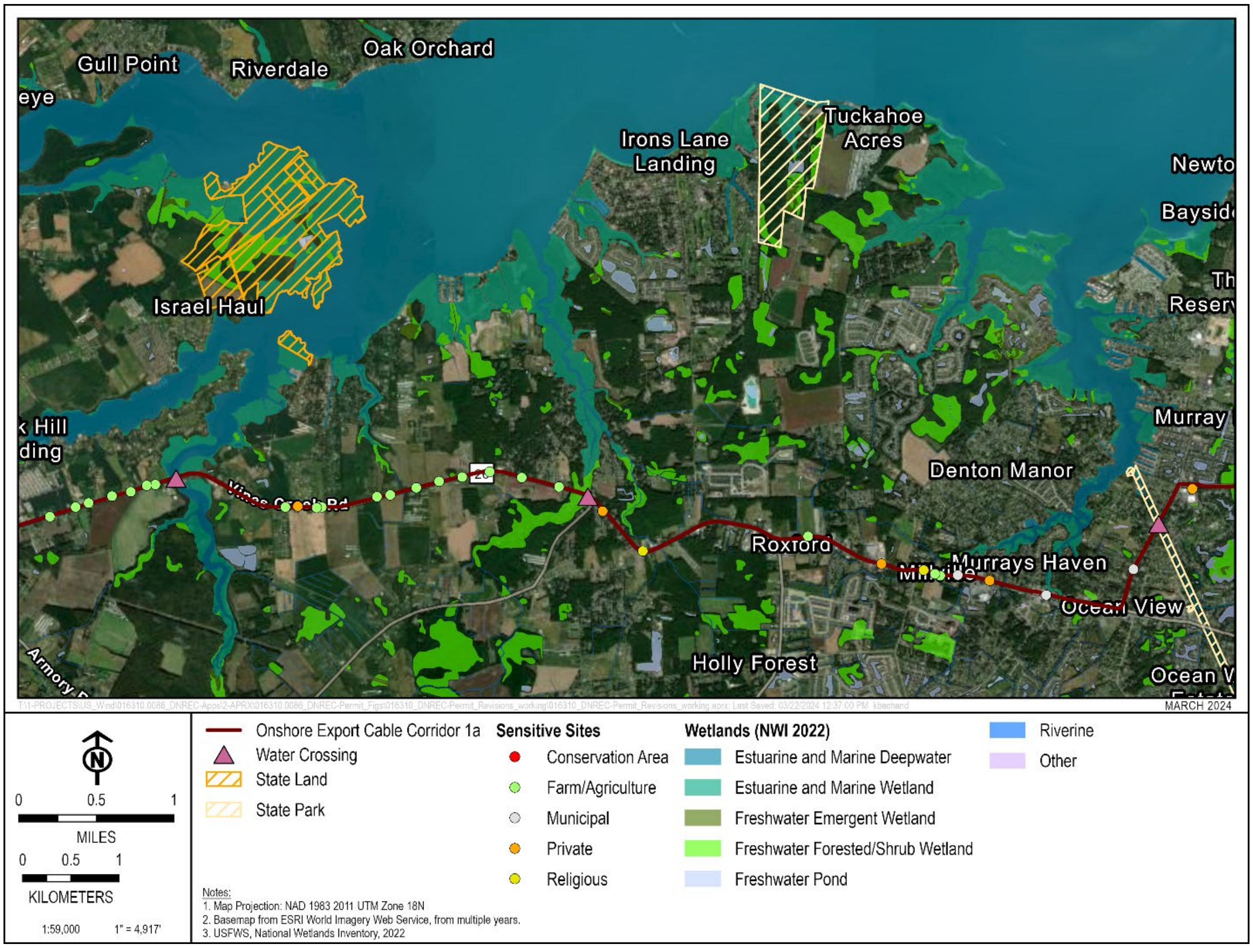

Figure 3.4-3b. Onshore Export Cable Corridor 1a – Central Portion

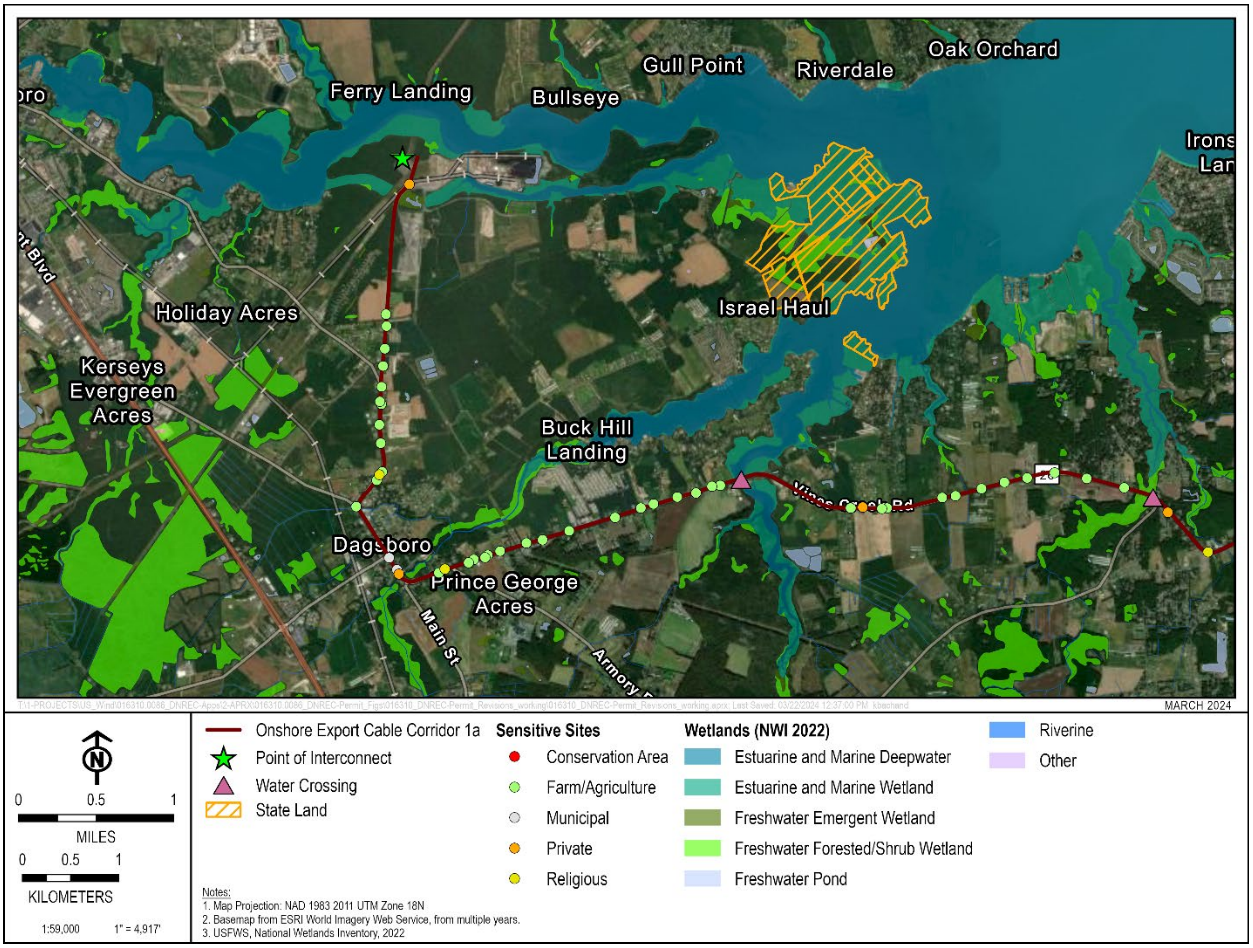

Figure 3.4-3c. Onshore Export Cable Corridor 1a – Western Portion

3.4.2.1.1 Water Crossings

There are a total of four (4) terrestrial water crossings along Onshore Export Cable Corridor 1a. Crossings are found in Figure 3.4-3a, b, and c, and include the Assawoman Canal at Central Avenue, Vines Creek on Route 26, Blackwater Creek and an unnamed tributary into Salt Pond.

3.4.2.1.2 Wetlands

Onshore Export Cable Corridor 1a includes freshwater forested/shrub wetlands and estuarine and marine wetlands, usually associated with streams and rivers in the area (Figure 3.4-3). Freshwater wetlands are also located adjacent to existing developed rights-of-way. Approximately 3 miles of the 16-mile corridor traverse areas of wetlands which are often immediately adjacent to the roadway. Table 3.4-3 details the breakdown of wetland types along Onshore Export Cable Corridor 1a.

Table 3.4-3. Onshore Export Cable Corridor 1a – Wetland Types

Wetland Type	Length of Route in Close Proximity to Wetland (statute miles) *
Estuarine and Marine Deepwater	0.34
Estuarine and Marine Wetland	0.72
Freshwater Emergent Wetland	0.52
Freshwater Forested/Shrub Wetland	2.23
Freshwater Pond	0.22
Lake	0
Riverine	0.97

* Note: The sum for the total length of the route in proximity to wetlands discussed in the preceding paragraph does not account for wetland type. It will therefore be less than the values in this table due to wetlands occurring on both sides of the route. Data used is from USFWS National Wetlands Inventory, 2022.

3.4.2.1.3 Archeological Sensitivity

The alternative cable corridors are largely situated within previously disturbed ROW's reflecting areas of low archaeological sensitivity. However, all of the alternative corridors traverse landscapes that were well occupied historically and traverse environments known to have been used extensively by Indigenous groups both historically and during the precontact periods. As such, portions of the alternative corridors that extend outside of the disturbed ROWs and occupy any undisturbed land were generally classified as locations of high or moderate archaeological sensitivity.

3.4.2.1.4 Designated Areas and Habitat

The potential alternative terrestrial cable corridors may be adjacent to areas of known natural resources, including forests, freshwater habitats, and other conservation lands (Figure 3.4-4). These lands can provide habitat to evergreen bayberry, swamp pink, and Northern long-eared bat, which are protected species that may occur within the Project area.

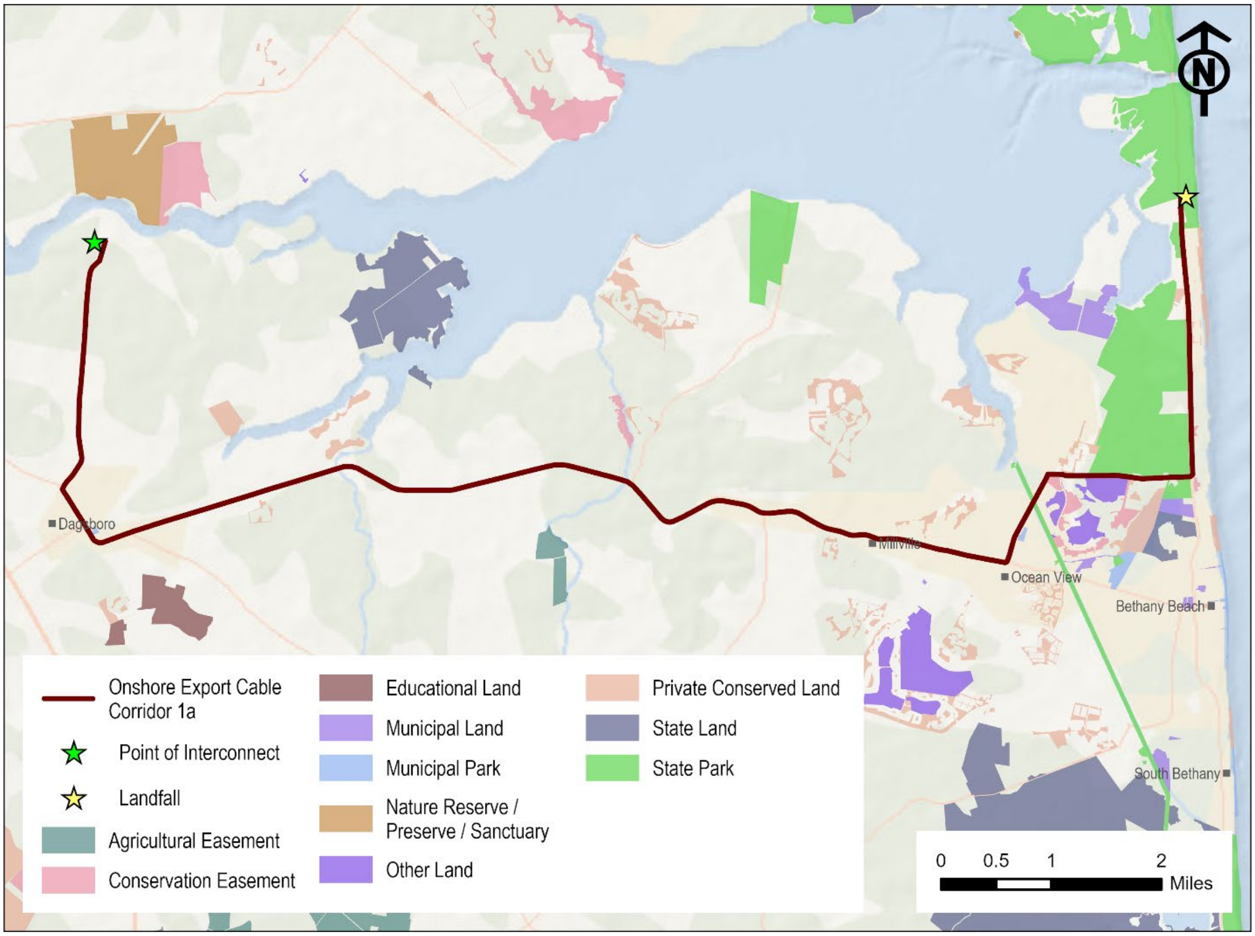

Figure 3.4-4. Natural Resources along Onshore Export Cable Corridor 1a

Birds along the terrestrial cable corridors may be impacted. Cable installation would occur within previously disturbed areas and BMPs would be utilized when near any sensitive habitat. Onshore construction noise may temporarily impact birds by preventing use of trees and other habitat in the immediate vicinity of the Project. DNREC in its Environmental Review identified the potential for bridges along all of the routes which may have nesting migratory birds protected by the Migratory Bird Treaty Act and that additional bird nesting surveys may be needed. DNREC suggested construction occur between August 1 through April 15, which generally coincides with a construction window to avoid tourism season although reduces the available, previously planned construction period by one month, which significantly reduces the practicability of construction in Onshore Export Cable Corridor 1a.

3.4.2.1.5 County and Municipal Projects

Installation of up to four export cables in Onshore Export Cable Corridor 1a would result in significant temporary disruption along roads and statewide bike routes in Sussex County, Delaware, and may affect ongoing infrastructure projects undertaken by the Delaware Department of Transportation (DelDOT) and others.

Sussex County and local municipalities are undertaking projects to accommodate significant growth in the county, up 20.4 percent from 2010 to 2020[1]. New infrastructure and new traffic patterns, resulting from growth in the region, are planned during the potential period of construction, specifically outside of the peak recreation season, which is the same window of construction for US Wind. US Wind's construction activities have the potential to directly overlap with infrastructure construction and require overhaul or repair of recently installed projects. In Onshore Export Cable Corridor 1a announced planned projects include sidewalk construction on Fred Hudson Road, sewer line and pump station installation on Vines Creek Road, and intersection improvement at State Route 26 and Falling Point Road.

3.4.2.1.6 Disruptions During Construction

Road closures would be necessary during construction along Onshore Export Cable Corridor 1a, resulting in rerouting and temporary access impacts to commercial, residential, and municipal properties such as schools, hospitals, recreation centers, and religious centers along all of the routes (see Table 3.4-4). Construction would be planned outside of the recreational season (mid-May through mid-September) and would therefore primarily affect residents and businesspeople in the area, as well as tourists and recreational traffic to a lesser extent.

Table 3.4-4. Onshore Export Cable Corridor 1a – Sensitive Sites

Category	Site Name
Conservation Area	Assawoman Canal Trail
	Delaware Seashore State Park
	Delaware Seashore State Park - Fresh Pond
Municipal	Katie Helm Park
	Dagsboro Police Department
	Millville Volunteer Fire Department
	John West Park
	Lord Baltimore Elementary School
Religious	Millsboro Cemetery
	Millville United Methodist Church
	Prince Georges Chapel
	St. Georges United Methodist Church

3.4.2.2 Onshore Export Cable Corridor 1b

Onshore Export Cable Corridor 1b is approximately 26 km (16 mi) along existing DelDOT ROWs and Sussex County ROWs under development from landfall at 3R's Beach to Indian River POI

[1] https://www.census.gov/quickfacts/fact/table/sussexcountydelaware/PST045222

(see Figure 3.4-5). Cables would exit the transition vaults at 3R's Beach along the same route as Onshore Export Cable Corridor 1a until west of Millville then south on Route 17 until turning west/northwest along a Sussex County water line ROW, currently under development, across Route 26 then north in parallel with Iron Branch Road/Road 332 to the US Wind Substations.

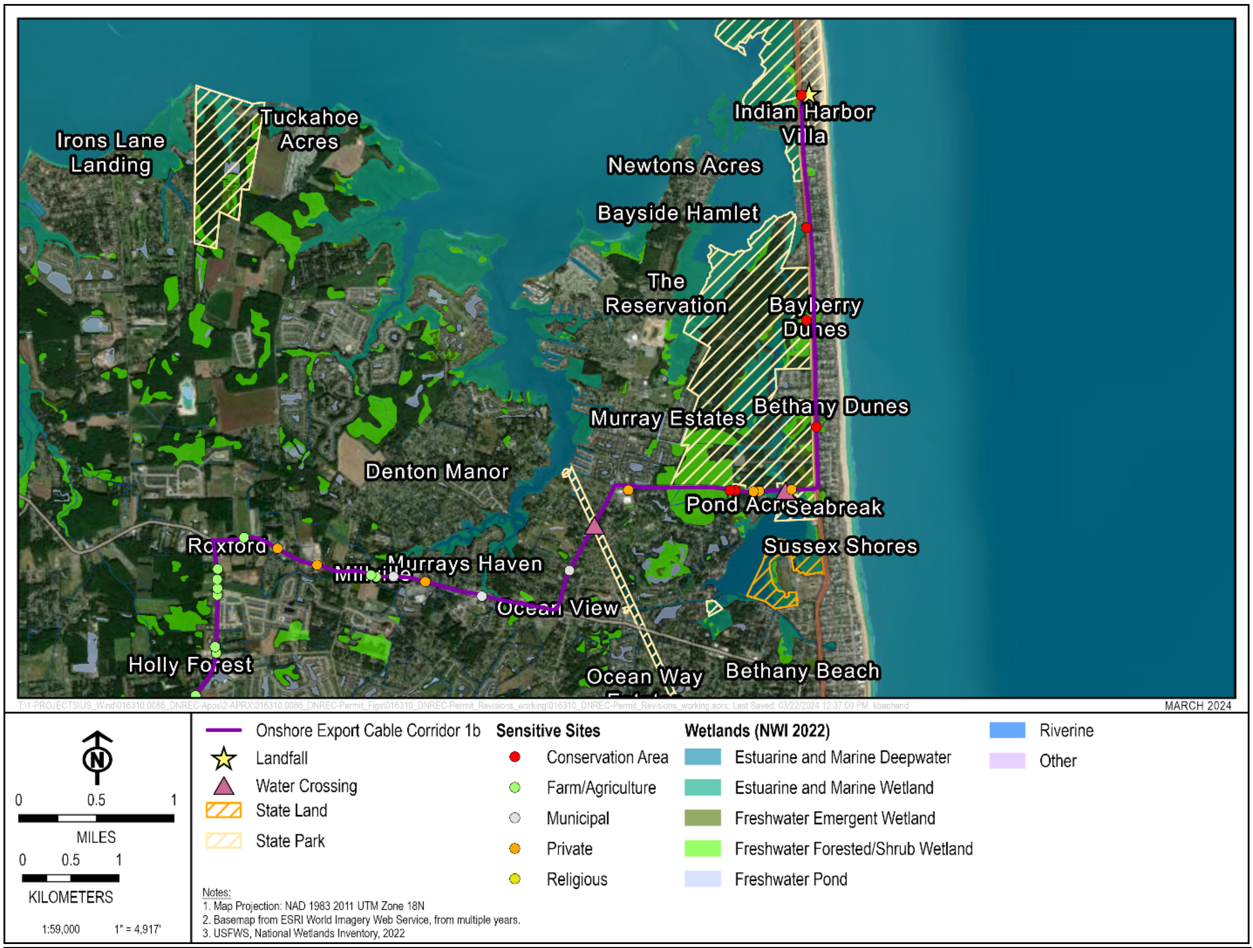

Figure 3.4-5a. Onshore Export Cable Corridor 1b – Eastern Portion

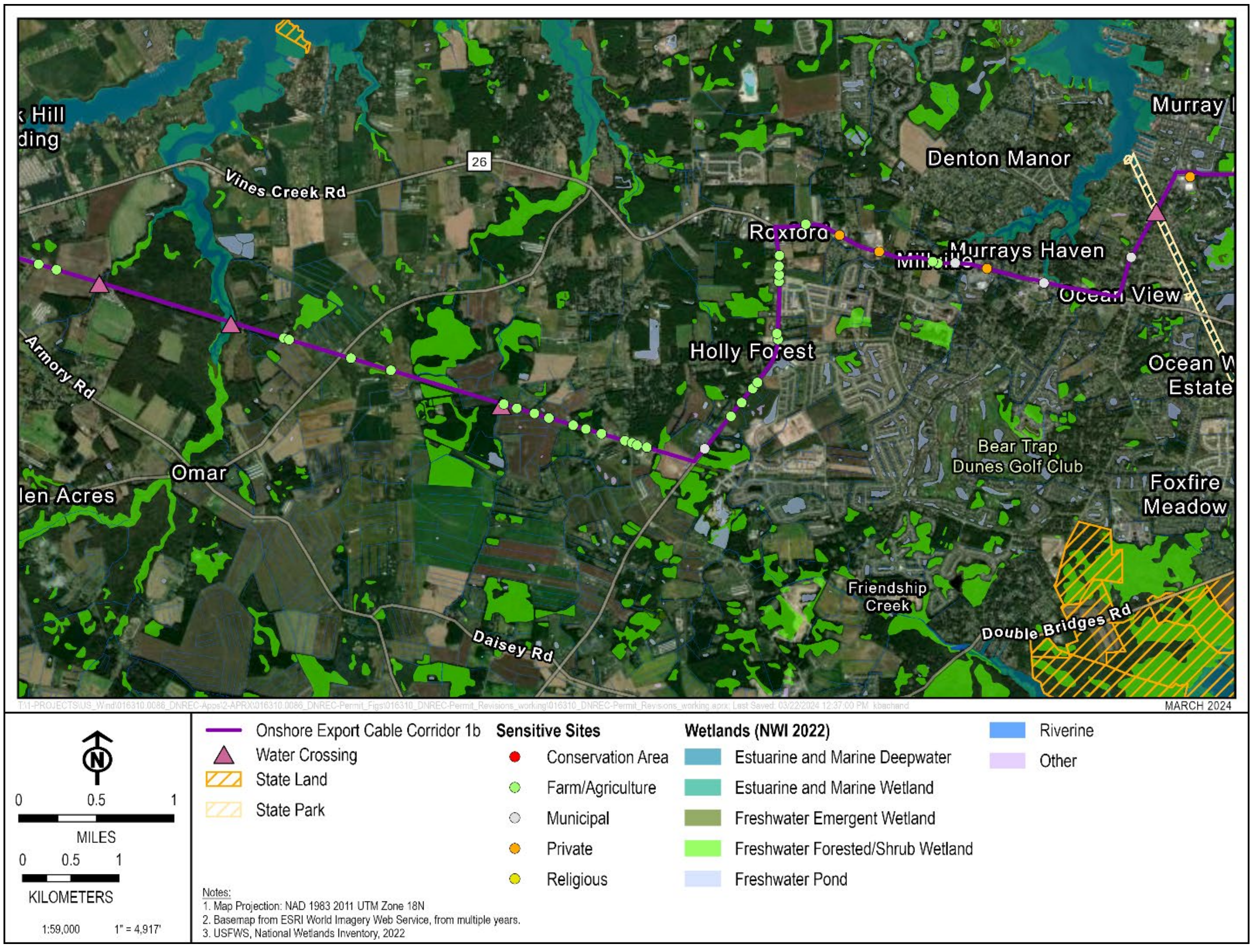

Figure 3.4-5b. Onshore Export Cable Corridor 1b – Central Portion

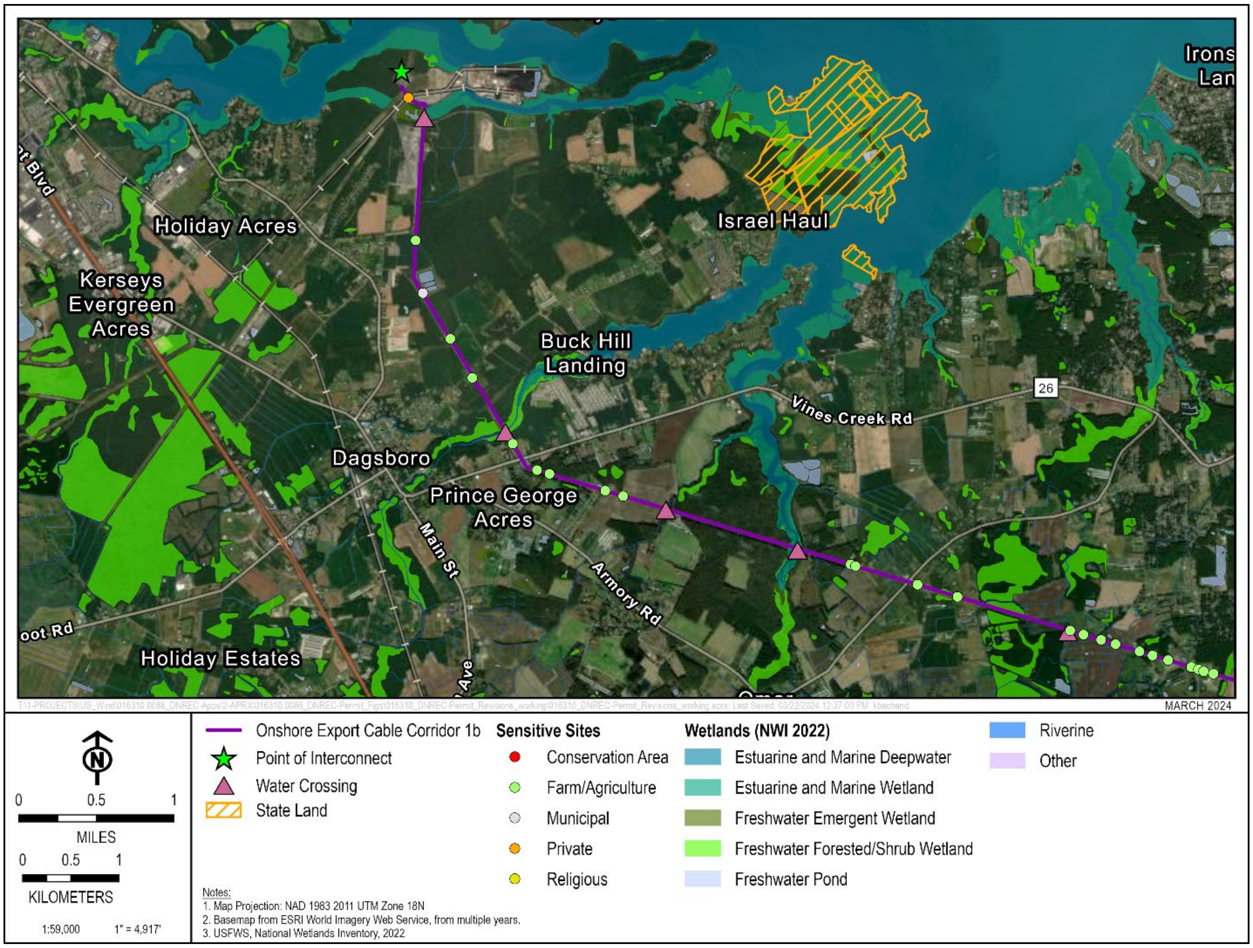

Figure 3.4-5c. Onshore Export Cable Corridor 1b – Western Portion

3.4.2.2.1 Water Crossings

There are a total of seven (7) terrestrial water crossings along Onshore Export Cable Corridor 1b, shown in Figure 3.4-5. The first two of the water crossings are the same as Corridor 1a (Assawoman Canal and an unnamed tributary into Salt Pond). The other five (5) crossings include Blackwater Creek and Vines Creek, Herring Branch, Pepper Creek, and Island Creek.

3.4.2.2.2 Wetlands

Onshore Export Cable Corridor 1b includes freshwater forested/shrub wetlands and estuarine and marine wetlands, usually associated with streams and rivers in the area (Figure 3.4-5). Freshwater wetlands are also located adjacent to existing developed rights-of-way. Approximately 4.7 miles of the 16-mile corridor traverse areas of wetlands which are often immediately adjacent to the roadway. Table 3.4-5 details the breakdown of wetland types along Onshore Export Cable Corridor 1b.

Table 3.4-5 Onshore Export Cable Corridor 1b – Wetland Types

Wetland Type	Length of Route in Close Proximity to Wetland (statute miles) *
Estuarine and Marine Deepwater	0.31
Estuarine and Marine Wetland	0.75
Freshwater Emergent Wetland	0.69
Freshwater Forested/Shrub Wetland	2.8
Freshwater Pond	0.54
Lake	0
Riverine	2.1

* Note: The sum for the total length of the route in proximity to wetlands discussed in the preceding paragraph does not account for wetland type. It will therefore be less than the values in this table due to wetlands occurring on both sides of the route. Data used is from USFWS National Wetlands Inventory, 2022.

3.4.2.2.3 Archeological Sensitivity

The alternative cable corridors are largely situated within previously disturbed ROW's reflecting areas of low archaeological sensitivity. However, all of the alternative corridors traverse landscapes that were well occupied historically and traverse environments known to have been used extensively by Indigenous groups both historically and during the precontact periods. As such, portions of the alternative corridors that extend outside of the disturbed ROWs and occupy any undisturbed land were generally classified as locations of high or moderate archaeological sensitivity.

3.4.2.2.4 Designated Areas and Habitat

The potential alternative terrestrial cable corridors may be adjacent to areas of known natural resources, including forests, freshwater habitats, and other conservation lands (Figure 3.4-6). These lands can provide habitat to evergreen bayberry, swamp pink, and Northern long-eared bat, which are protected species that may occur within the Project area. DNREC in its Environmental Review identified the Vines Creek Natural Area along Onshore Export Cable Corridor 1b, which is a State Natural Area with areas of land and/or water retaining or reestablishing natural character and other sensitive values.

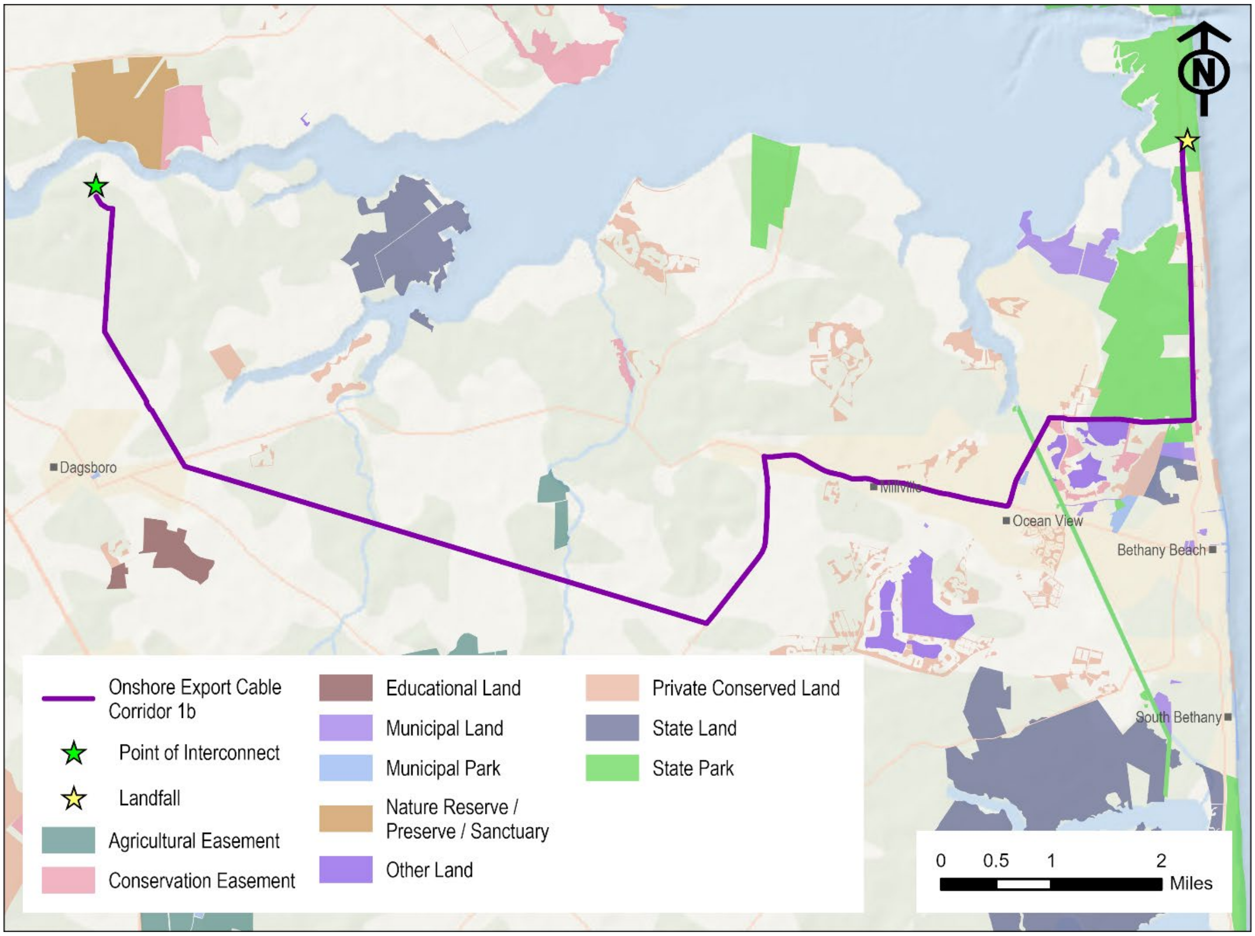

Figure 3.4-6. Natural Resources along Onshore Export Cable Corridor 1b

Birds along the terrestrial cable corridors may be impacted. Cable installation would occur within previously disturbed areas and BMPs would be utilized when near any sensitive habitat. Onshore construction noise may temporarily impact birds by prevent use of trees and other habitat in the immediate vicinity of the Project. DNREC in its Environmental Review identified the potential for bridges along all of the routes which may have nesting migratory birds protected by the Migratory Bird Treaty Act and that additional bird nesting surveys may be needed. DNREC suggested construction occur between August 1 through April 15, which generally coincides with a construction window to avoid tourism season although reduces the available, previously planned construction period by one month, which significantly reduces the practicability of construction in Onshore Export Cable Corridor 1b.

3.4.2.2.5 County and Municipal Projects

Installation of up to four export cables in Onshore Export Cable Corridor 1b would result in significant temporary disruption along roads and statewide bike routes in Sussex County, Delaware, and may affect ongoing infrastructure projects undertaken by the Delaware Department of Transportation (DelDOT) and others.

Sussex County and local municipalities are undertaking projects to accommodate significant growth in the county, up 20.4 percent from 2010 to 2020[2]. New infrastructure and new traffic patterns, resulting from growth in the region, are planned during the potential period of construction, specifically outside of the peak recreation season, which is the same window of construction for US Wind. US Wind's construction activities have the potential to directly overlap with infrastructure construction and require overhaul or repair of recently installed projects. In Onshore Export Cable Corridor 1b announced planned projects include sidewalk construction on Fred Hudson Road, sewer line and pump station installation on Vines Creek Road, and intersection improvement at State Route 26 and Falling Point Road.

3.4.2.2.6 Disruptions During Construction

Road closures would be necessary during construction along Onshore Export Cable Corridor 1b, resulting in rerouting and temporary access impacts to commercial, residential, and municipal properties such as schools, hospitals, recreation centers, and religious centers along all of the routes (see Table 3.4-6). Construction would be planned outside of the recreational season (mid-May through mid-September) and would therefore primarily affect residents and businesspeople in the area, as well as tourists and recreational traffic to a lesser extent.

Table 3.4-6. Onshore Export Cable Corridor 1b – Sensitive Sites

Category	Site Name
Conservation Area	Assawoman Canal Trail
	Delaware Seashore State Park
	Delaware Seashore State Park - Fresh Pond
Municipal	Millville Volunteer Fire Department
	John West Park
	Lord Baltimore Elementary School
	Beebe Healthcare's South Coastal Emergency Department
	Piney Neck Waste Water Treatment Facility

3.4.2.3 Onshore Export Cable Corridor 1c

Approximately 27 km (17 miles) along existing DelDOT and Sussex County ROWs under development from landfall at 3R's Beach to Indian River POI (see Figure 3.4-7). The cables would exit transition vaults at 3R's Beach, traverse south along Route 1 through Bethany Beach turning west on Wellington Avenue, south on Kent Avenue to an Exelon substation then turning generally west along an Exelon ROW, picking up the Sussex County ROW after crossing Route 17 and

[2] https://www.census.gov/quickfacts/fact/table/sussexcountydelaware/PST045222

then traversing the same remaining route to the US Wind substations as Onshore Export Cable Corridor 1b.

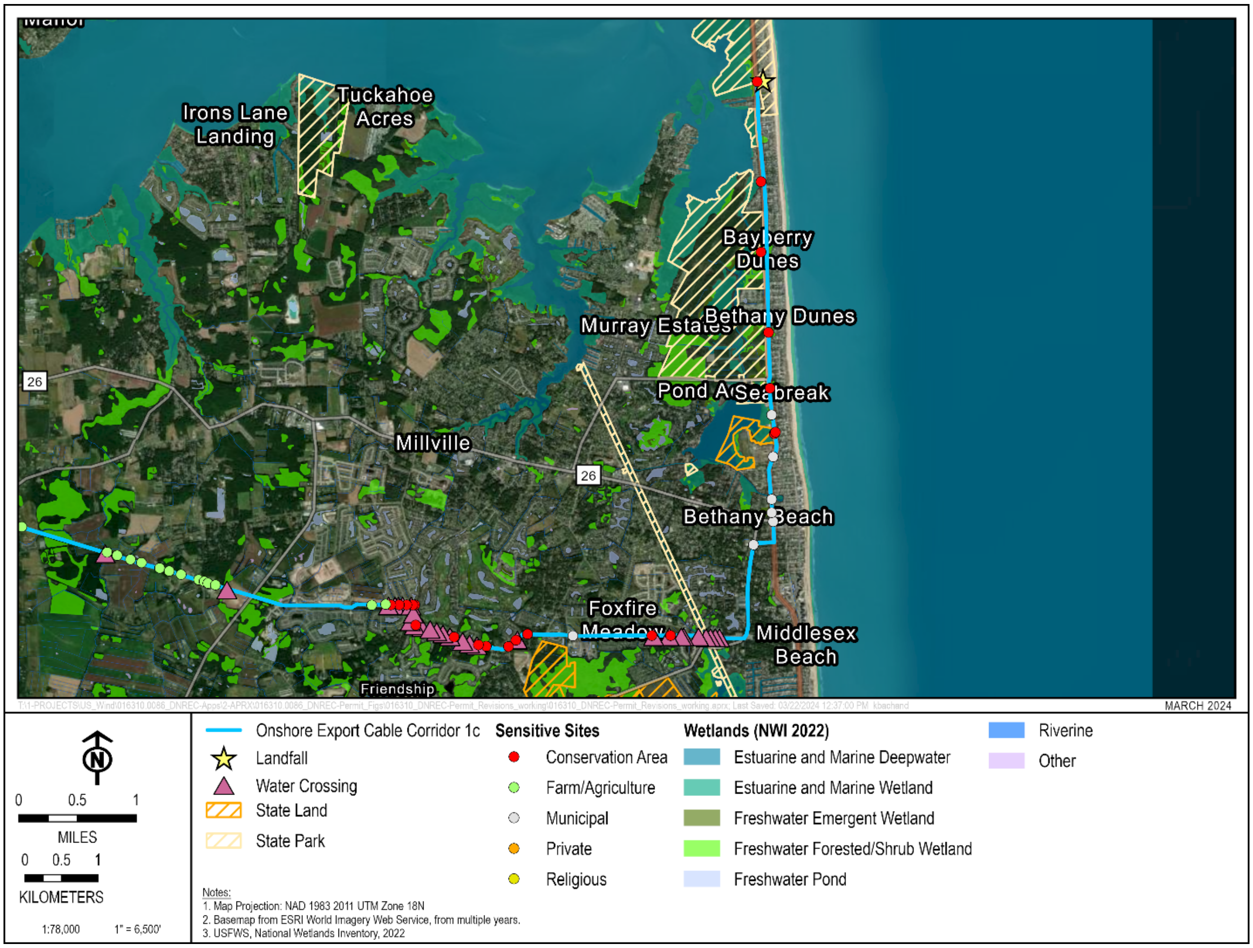

Figure 3.4-7a. Onshore Export Cable Corridor 1c – Eastern Portion

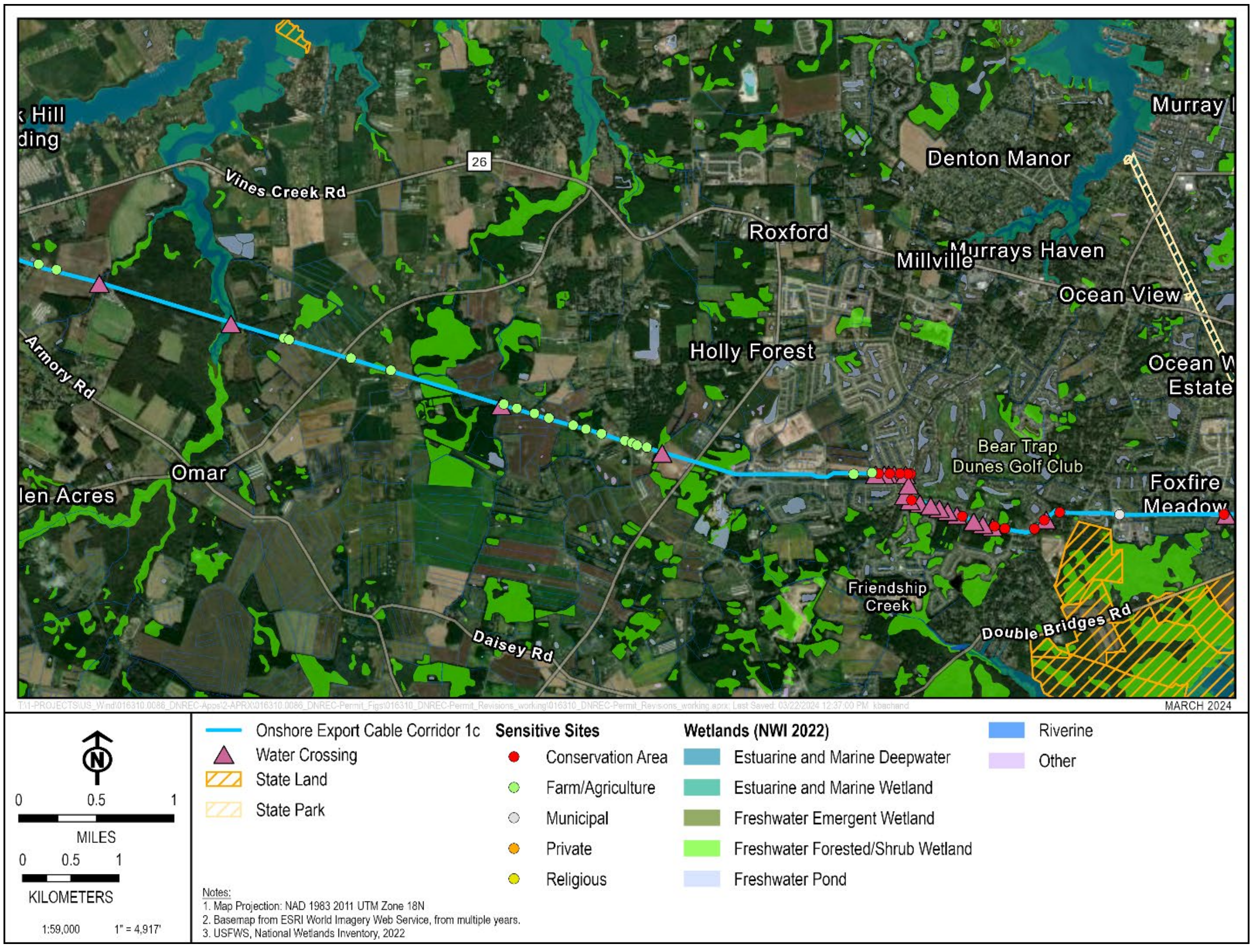

Figure 3.4-7b. Onshore Export Cable Corridor 1c – Central Portion

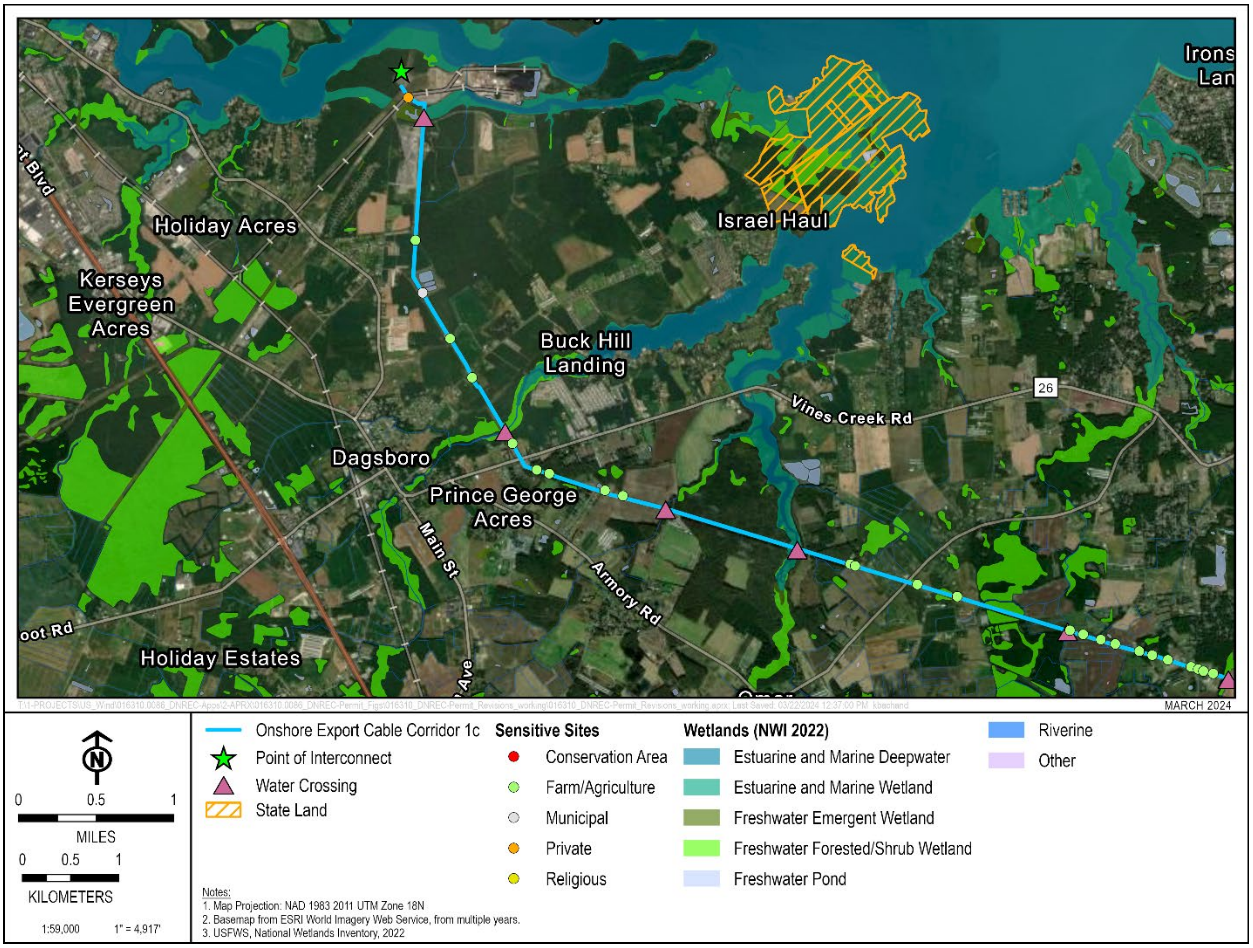

Figure 3.4-7c. Onshore Export Cable Corridor 1c – Western Portion

3.4.2.3.1 Water Crossings

There are a total of 32 water crossings along Onshore Export Cable Corridor 1c, shown in Figure 3.4-7. Water crossings include the Assawoman Canal, Blackwater Creek and Vines Creek, Herring Branch, Pepper Creek, and Island Creek. Additional crossings include unnamed streams or creeks and multiple retention ponds associated with adjacent residential developments. In areas with multiple ponds around residential developments, if Onshore Export Cable Corridor 1c is selected for construction, effort to microsite around these ponds would be made.

3.4.2.3.2 Wetlands

Onshore Export Cable Corridor 1c includes freshwater forested/shrub wetlands and estuarine and marine wetlands, usually associated with streams and rivers in the area (Figure 3.4-7). Freshwater wetlands are also located adjacent to existing developed rights-of-way. Approximately 5.8 miles of the 17-mile corridor traverse areas of wetlands which are often immediately adjacent to the roadway. Table 3.4-7 details the breakdown of wetland types along Onshore Export Cable Corridor 1c.

Table 3.4-7. Onshore Export Cable Corridor 1c – Wetland Types

Wetland Type	Length of Route in Close Proximity to Wetland (statute miles) *
Estuarine and Marine Deepwater	0.21
Estuarine and Marine Wetland	0.65
Freshwater Emergent Wetland	0.67
Freshwater Forested/Shrub Wetland	2.0
Freshwater Pond	1.9
Lake	0
Riverine	2.5

* Note: The sum for the total length of the route in proximity to wetlands discussed in the preceding paragraph does not account for wetland type. It will therefore be less than the values in this table due to wetlands occurring on both sides of the route. Data used is from USFWS National Wetlands Inventory, 2022.

3.4.2.3.3 Archeological Sensitivity

The alternative cable corridors are largely situated within previously disturbed ROW's reflecting areas of low archaeological sensitivity. However, all of the alternative corridors traverse landscapes that were well occupied historically and traverse environments known to have been used extensively by Indigenous groups both historically and during the precontact periods. As such, portions of the alternative corridors that extend outside of the disturbed ROWs and occupy any undisturbed land were generally classified as locations of high or moderate archaeological sensitivity.

3.4.2.3.4 Designated Areas and Habitat

The potential alternative terrestrial cable corridors may be adjacent to areas of known natural resources, including forests, freshwater habitats, and other conservation lands (Figure 3.4-8). These lands can provide habitat to evergreen bayberry, swamp pink, and Northern long-eared bat, which are protected species that may occur within the Project area. DNREC in its Environmental Review identified the Vines Creek Natural Area along Onshore Export Cable Corridor 1c, which is a State Natural Area with areas of land and/or water retaining or reestablishing natural character and other sensitive values.

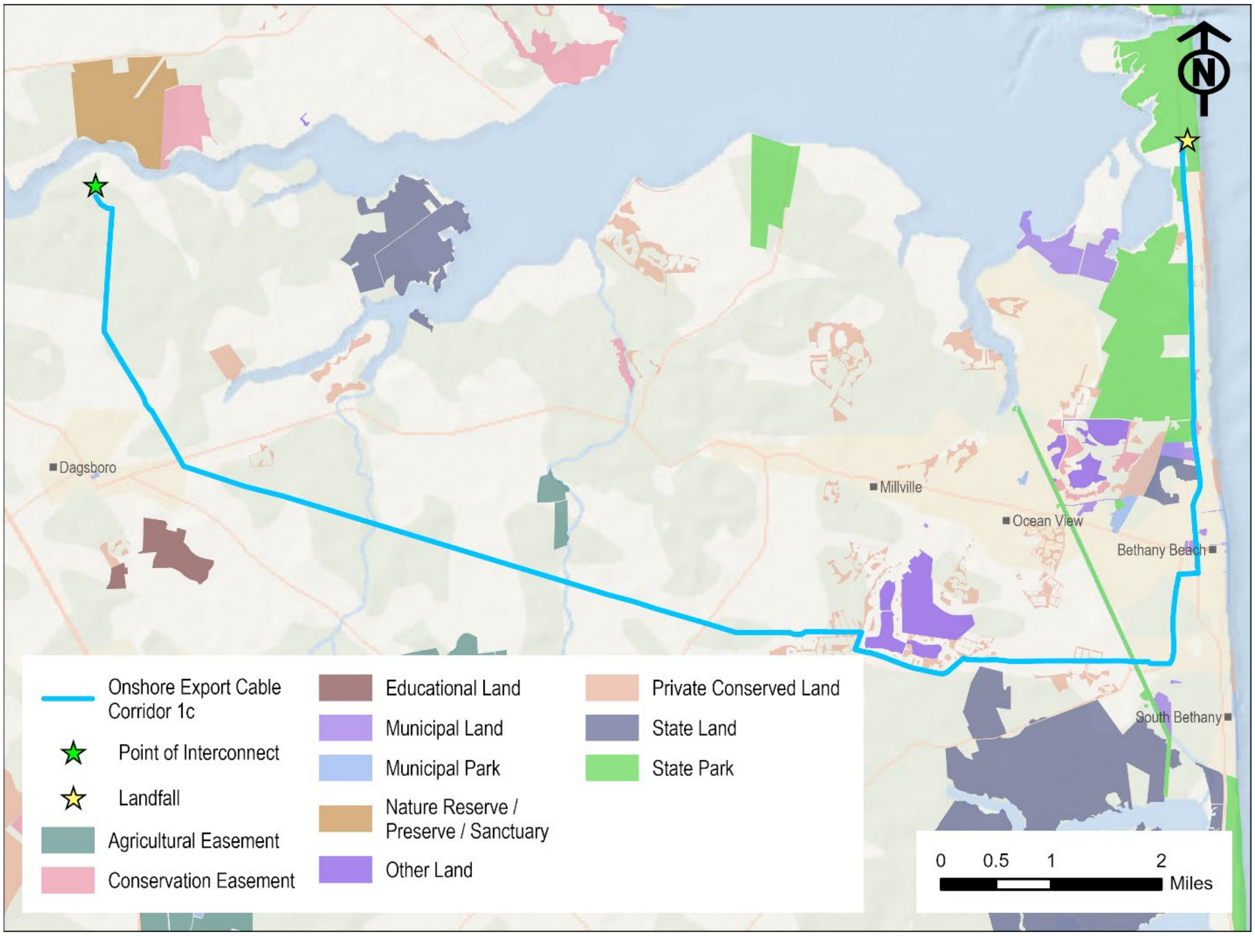

Figure 3.4-8. Natural Resources along Onshore Export Cable Corridor 1c

Birds along the terrestrial cable corridors may be impacted. Cable installation would occur within previously disturbed areas and BMPs would be utilized when near any sensitive habitat. Onshore construction noise may temporarily impact birds by preventing use of trees and other habitat in the immediate vicinity of the Project. DNREC in its Environmental Review identified the potential for bridges along all of the routes which may have nesting migratory birds protected by the Migratory Bird Treaty Act and that additional bird nesting surveys may be needed. DNREC suggested construction occur between August 1 through April 15, which generally coincides with a construction window to avoid tourism season although reduces the available, previously planned construction period by one month, which significantly reduces the practicability of construction in Onshore Export Cable Corridor 1c..

3.4.2.3.5 County and Municipal Projects

Installation of up to four export cables in Onshore Export Cable Corridor 1c would result in significant temporary disruption along roads and statewide bike routes in Sussex County, Delaware, and may affect ongoing infrastructure projects undertaken by the Delaware Department of Transportation (DelDOT) and others.

Sussex County and local municipalities are undertaking projects to accommodate significant growth in the county, up 20.4 percent from 2010 to 2020[3]. New infrastructure and new traffic patterns, resulting from growth in the region, are planned during the potential period of construction, specifically outside of the peak recreation season, which is the same window of construction for US Wind. US Wind's construction activities have the potential to directly overlap with infrastructure construction and require overhaul or repair of recently installed projects.

3.4.2.3.6 Disruptions During Construction

Road closures would be necessary during construction along Onshore Export Cable Corridor 1c, resulting in rerouting and temporary access impacts to commercial, residential, and municipal properties such as schools, hospitals, recreation centers, and religious centers along all of the routes (see Table 3.4-8). Construction would be planned outside of the recreational season (mid-May through mid-September) and would therefore primarily affect residents and businesspeople in the area, as well as tourists and recreational traffic to a lesser extent.

Table 3.4-8. Onshore Export Cable Corridor 1c – Sensitive Sites

Category	Site Name
Conservation Area	Delaware Seashore State Park
	Delaware Seashore State Park - Fresh Pond
	Assawoman Canal
	Salt Pond
Municipal	Delaware Army National Guard RSP
	Bethany Beach Police Department
	Bethany Beach Fire Company
	South Coastal Library
	Bethany Beach Canal
	Bethany Beach Central Park
	South Coastal Regional Wastewater Facility
	Piney Neck Waste Water Treatment Facility

3.4.2.4 Onshore Export Cable Corridor 2

Onshore Export Cable Corridor 2 is approximately 28 km (17 miles) along existing DelDOT ROWs from landfall at Tower Road to Indian River POI via a northern route around Indian River Bay (see Figure 3.4-9). Cables would exit transition vaults at the Tower Road landfall, traverse north along Coastal Highway/Route 1 through Dewey Beach and Rehoboth, turning west along Airport Road, continuing south along Road 274, west along Route 1D, connecting to Route 24 south/John J

[3] https://www.census.gov/quickfacts/fact/table/sussexcountydelaware/PST045222

Williams Highway to an Exelon overhead power line ROW, and then crossing Indian River via horizontal directional drill and continuing underground to the US Wind substations.

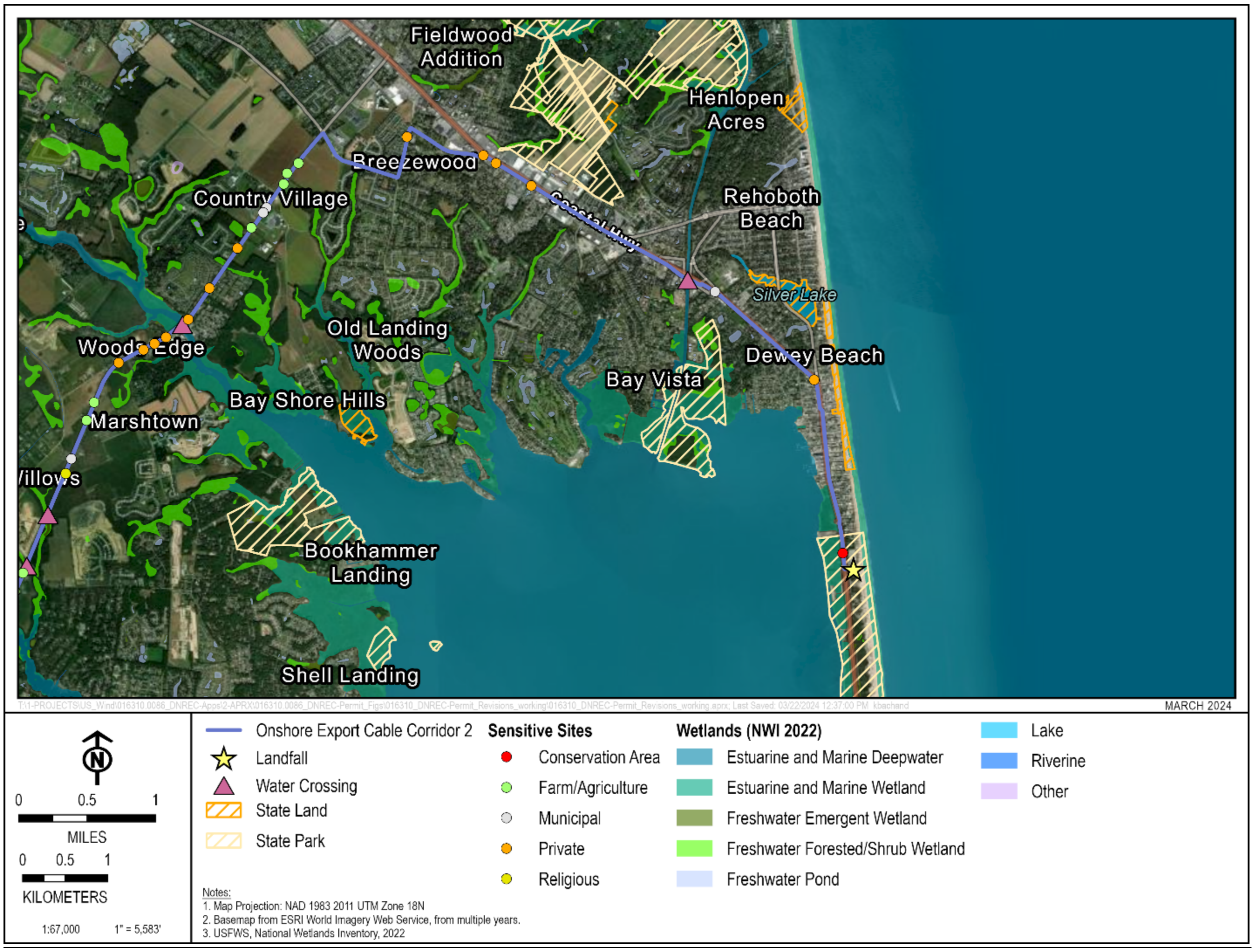

Figure 3.4-9a. Onshore Export Cable Corridor 2– Eastern Portion

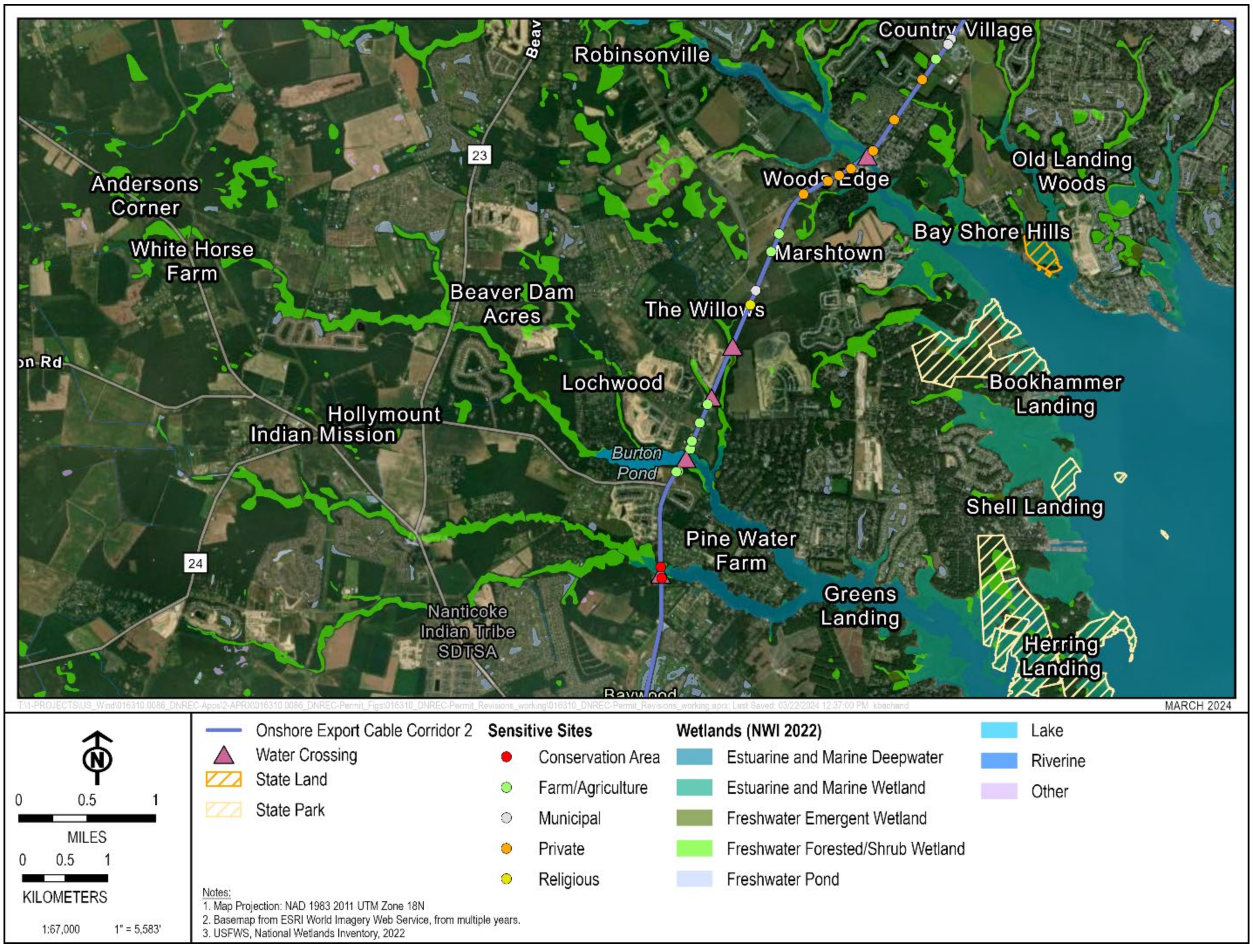

Figure 3.4-9b. Onshore Export Cable Corridor 2 – Central Portion

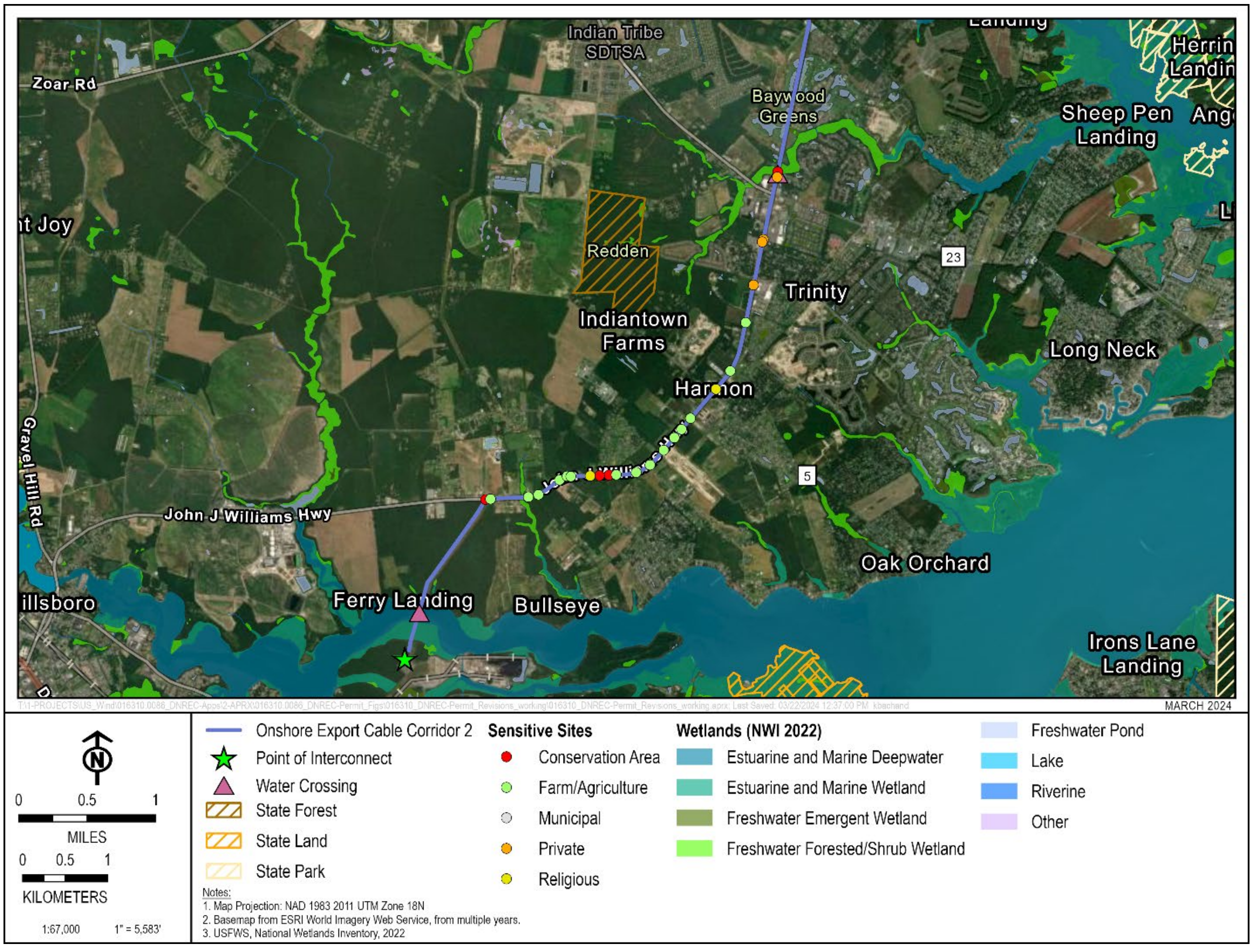

Figure 3.4-9c. Onshore Export Cable Corridor 2 – Western Portion

3.4.2.4.1 Water Crossings

There are a total of eight (8) water crossings along Onshore Export Cable Corridor 2. Crossings are in Figure 3.4-9 and Love Creek and Burton Pond on Route 24, the Lewes and Rehoboth Canal (likely by HDD), Sarah Run, Unity Branch, Guinea Creek, Indian River (by HDD), and an unnamed stream flowing into Sarah Run.

3.4.2.4.2 Wetlands

Onshore Export Cable Corridor 2 includes freshwater forested/shrub wetlands and estuarine and marine wetlands, usually associated with streams and rivers in the area (Figure 3.4-9). Freshwater wetlands are also located adjacent to existing developed rights-of-way. Approximately 2.4 miles of the 17-mile corridor traverse areas of wetlands which are often immediately adjacent to the roadway. Table 3.4-9 details the breakdown of wetland types along Onshore Export Cable Corridor 2.

Table 3.4-9. Onshore Export Cable Corridor 2 – Wetland Types

Wetland Type	Length of Route in Close Proximity to Wetland (statute miles) *
Estuarine and Marine Deepwater	0.39
Estuarine and Marine Wetland	1.3
Freshwater Emergent Wetland	0.044
Freshwater Forested/Shrub Wetland	0.87
Freshwater Pond	0.53
Lake	0.15
Riverine	0.30

* Note: The sum for the total length of the route in proximity to wetlands discussed in the preceding paragraph does not account for wetland type. It will therefore be less than the values in this table due to wetlands occurring on both sides of the route. Data used is from USFWS National Wetlands Inventory, 2022.

3.4.2.4.3 Archeological Sensitivity

The alternative cable corridors are largely situated within previously disturbed ROW's reflectig areas of low archaeological sensitivity. However, all of the alternative corridors traverse landscapes that were well occupied historically and traverse environments known to have been used extensively by Indigenous groups both historically and during the precontact periods. As such, portions of the alternative corridors that extend outside of the disturbed ROWs and occupy any undisturbed land were generally classified as locations of high or moderate archaeological sensitivity.

3.4.2.4.4 Designated Areas and Habitat

The potential alternative terrestrial cable corridors may be adjacent to areas of known natural resources, including forests, freshwater habitats, and other conservation lands (Figure 3.4-10). These lands can provide habitat to evergreen bayberry, swamp pink, and Northern long-eared bat, which are protected species that may occur within the Project area. DNREC in its Environmental Review identified a State Natural Area, Herring Creek Natural Area, along Onshore Export Cable Corridor 2, which is a State Natural Area with areas of land and/or water retaining or reestablishing natural character and other sensitive values.

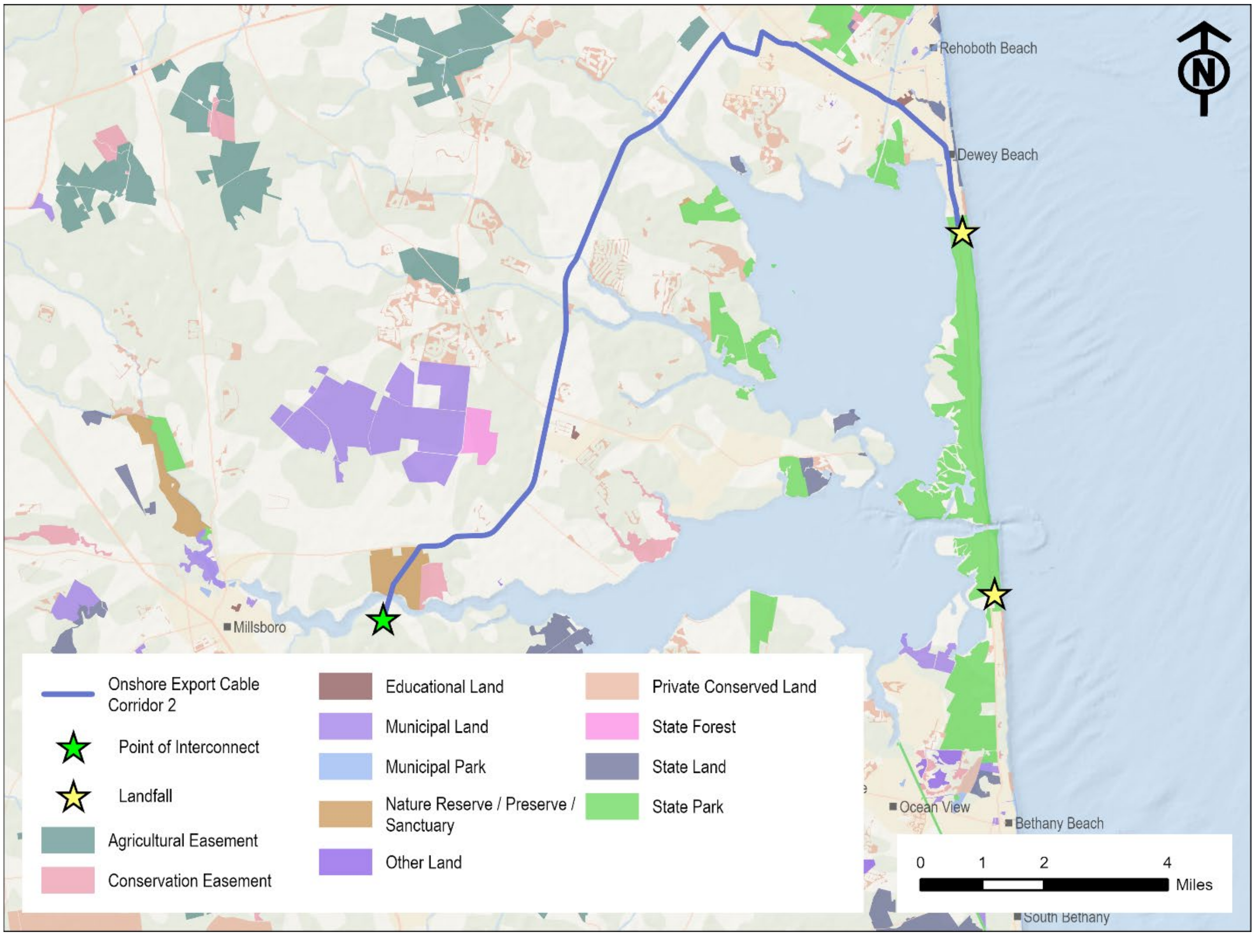

Figure 3.4-10. Natural Resources along Onshore Export Cable Corridor 2

Birds along the terrestrial cable corridors may be impacted. Cable installation would occur within previously disturbed areas and BMPs would be utilized when near any sensitive habitat. Onshore construction noise may temporarily impact birds by preventing use of trees and other habitat in the immediate vicinity of the Project. DNREC in its Environmental Review identified the potential for bridges along all of the routes which may have nesting migratory birds protected by the Migratory Bird Treaty Act and that additional bird nesting surveys may be needed. DNREC suggested construction occur between August 1 through April 15, which generally coincides with a construction window to avoid tourism season although reduces the available, previously planned construction period by one month, which significantly reduces the practicability of construction in Onshore Export Cable Corridor 2.

3.4.2.4.5 County and Municipal Projects

Installation of up to four export cables in Onshore Export Cable Corridor 2 would result in significant temporary disruption along roads and statewide bike routes in Sussex County, Delaware, and may affect ongoing infrastructure projects undertaken by the Delaware Department of Transportation (DelDOT) and others.

Sussex County and local municipalities are undertaking projects to accommodate significant growth in the county, up 20.4 percent from 2010 to 2020[4]. New infrastructure and new traffic patterns, resulting from growth in the region, are planned during the potential period of construction, specifically outside of the peak recreation season, which is the same window of construction for US Wind. US Wind's construction activities have the potential to directly overlap with infrastructure construction and require overhaul or repair of recently installed projects. In Onshore Export Cable Corridor 2 announced planned projects include pedestrian improvement projects in the Dewey Beach area in 2027-2028, intersection upgrades and road extension from Airport Road to State Route 24, and intersection improvements with turn lanes, bike paths, and pedestrian infrastructure at State Route 24 and Warrington Road.

3.4.2.4.6 Disruptions During Construction

Road closures would be necessary during construction along Onshore Export Cable Corridor 2, resulting in rerouting and temporary access impacts to commercial, residential, and municipal properties such as schools, hospitals, recreation centers, and religious centers along all of the routes (see Table 3.4-10). Construction would be planned outside of the recreational season (mid-May through mid-September) and would therefore primarily affect residents and businesspeople in the area, as well as tourists and recreational traffic to a lesser extent.

Table 3.4-10. Onshore Export Cable Corridor 2 – Wetland Types

Category	Site Name
Conservation Area	Holly Lake Campsites
	Delaware Seashore State Park
Municipal	Rehoboth Elementary School
	Lewes-Rehoboth Beach Fire Station #3
	Love Creek Elementary School
	Beacon Middle School
Private	Cadia Healthcare Renaissance
	Rehoboth/Route 1 Outlet Stores and Commercial Area
Religious	Lighthouse Baptist Church
	Mary Mother of Peace Church
	Harmony United Methodist Church
Tribal	Nanticoke Indian Center
	Nanticoke Indian Museum

[4] https://www.census.gov/quickfacts/fact/table/sussexcountydelaware/PST045222

4.0 EXISTING CONDITIONS, POTENTIAL IMPACTS, AVOIDANCE AND MINIMIZATION

4.1 Introduction

This section provides an overview of existing conditions, an assessment of potential impacts and identification of proposed avoidance and minimization measures. The description of existing conditions and potential impacts is presented by resource type and addresses each of the proposed Project components, the Offshore Export Cable Corridor in the Atlantic Ocean and nearshore coastal waters, the barrier beach landfall, the Onshore Export Cable South Corridor in Indian River Bay, and the substations located near the Indian River. The potential impacts and proposed avoidance and minimization apply to the construction, operation, and maintenance phases of the proposed Project.

4.1.1 Impact Assessment Methodology

The potential impacts resulting from the Project will vary in nature, duration, type, extent and overall significance. For the purposes of this assessment, an impact is defined as an environmental consequence that can be reasonably foreseen as a result of the proposed Project. The determination of overall significance of the impacts is based on a combination of the following criteria:

Nature of the impact is expressed as direct or indirect. The nature of the impact is dependent on whether a project activity directly or indirectly influences the resource or condition.

Duration of the impact is expressed as temporary or permanent. Temporary impacts are short-term and recover naturally within approximately three years. Permanent impacts are characterized as those impacts that will be chronic due to ongoing activities, resulting in a permanent or irreversible change to the existing resource condition.

Type of impact is expressed as positive or negative. Positive impacts will enhance the existing condition of the resource. Negative impacts are those impacts that have an adverse effect on the resource.

Extent refers to the impact’s geographic area of influence. Extent is termed local if it is restricted to the immediate Project area.

The overall **significance** of the impact (negligible, minor, moderate, and major) is determined based on the combination of the nature, duration, type, and extent of the impact as follows:

- Negligible - An impact that is discountable or not measurable.
- Minor - The affected resource will recover completely without any remedial action once the impacting agent is eliminated.

- Moderate - Impacts to the affected resource are unavoidable; the viability of the affected resource is not threatened although some impacts may be irreversible, or; the affected resource would recover completely if proper avoidance and minimization is applied during the life of the Project or proper remedial action is taken once the impacting agent is eliminated.
- Major – Impacts to the affected resource are unavoidable; the viability of the affected resource may be threatened, and impacts may be irreversible, or; the affected resource would not recover completely if remedial action was taken.

Descriptions of the existing environmental conditions and potential environmental impacts associated with construction, operation, and maintenance of the Project are provided in the following sections. To the extent practicable, potential environmental impacts have been avoided or minimized. Where impacts have been determined to be unavoidable, additional protective measures have been incorporated into the Project design. These protective measures will be described as applicable.

4.1.2 Summary of Impacts

Table 4.1-1 below summarizes the impacts to the resources that fall within the Project area. Specific details are within the following narrative.

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Table 4.1-1. Summary of Impacts

Section	Resource	Nature	Duration	Type	Extent	Significance
4.2	Geology and Physical Conditions	Direct	Temporary	Negative	Localized to the cable corridor during installation	Negligible
4.3	Water Quality	Direct	Temporary	Negative	Localized to the cable corridor during installation	Negligible to Minor
4.4	Wetlands	Direct	Temporary	Negative	Localized, negligible impacts. HDD will minimize wetland disturbance	Negligible
4.4	Water Bodies	Direct	Temporary	Negative	Localized to the cable corridor during installation	Negligible
4.5	Benthic Resources	Direct	Temporary	Negative	Localized to the cable corridor during installation	Minor
4.6	Finfish and Essential Fish Habitat	Indirect	Temporary	Negative	Localized to the cable corridor during installation	Negligible
4.7	Marine Mammals	Indirect	Temporary	Negative	Localized to the cable corridor during installation	Negligible
4.8	Sea Turtles	Indirect	Temporary	Negative	Localized to the cable corridor during installation	Negligible
4.9	Upland Habitats	Direct	Long-term	Negative	Localized to the substation installation area and cable landfall at 3R's Beach and the substation	Negligible
4.10	Bats	Indirect	Temporary	Negative	Localized to the substation installation area and cable landfall at 3R's Beach and the substation	Negligible
4.11	Terrestrial Species	Indirect	Temporary	Negative	Localized to the substation installation area and cable landfall at 3R's Beach and the substation	Negligible

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Table 4.1-1. Summary of Impacts

Section	Resource	Nature	Duration	Type	Extent	Significance
4.12	Avifauna	Indirect	Temporary	Negative	Localized to the substation installation area and cable landfall at 3R's Beach and the substation	Negligible
4.13	Threatened and Endangered Species	Indirect	Temporary	Negative	Localized to the substation installation area and cable landfall at 3R's Beach and the substation	Negligible
4.14	Navigation and Military Activities	Indirect	Long-term	Negative	Localized to the cable corridor under the federal channel	Minor
4.15.1	Demographics	Indirect	Temporary	Negative	Avoidance of recreational period during construction activities	Negligible
4.15.1	Economy	Indirect	Long-term	Positive	Introduction of jobs within the Project area	Moderate
4.15.1	Employment	Direct	Long-term	Positive	Introduction of jobs within the Project area	Moderate
4.15.2	Commercial and Recreational Fisheries	Indirect	Temporary	Negative	Localized to the cable corridor during installation	Negligible
4.16.1	Marine Minerals	None	NA	NA	Offshore export cable corridors will avoid sand borrow areas	NA
4.16.2	Utilities	None	NA	NA	No existing utilities within the Project area	NA

4.2 Geology and Physical Conditions

Substrate characteristics were evaluated as required by DNREC Appendix S New Dredging Projects Form and Section 10b of Appendix M Activities in State Wetlands (see Appendix A).

4.2.1 Description of Affected Environment

4.2.1.1 Geological Background

The Lease area lies offshore from the Delmarva Peninsula, which is part of the Atlantic Coastal Plain Province of the eastern United States. The Atlantic coast is a passive margin and therefore a tectonically quiet area with dominant processes related to weathering and erosion. This creates a low relief landscape with thick accumulations of sedimentary deposits. The peninsula overlies a seaward thickening wedge of unconsolidated sediments dating back to Cretaceous time (> 65 million years ago), which are over 2,400 m (7,874 ft) thick near Ocean City, Maryland. Tertiary age (Paleocene-Eocene, 34 – 65 million years ago) marine sediments overlie the Cretaceous deposits (Hobbs, Krantz, and Wikel 2008; Andreasen et al. 2016). A disconformity is present between the Eocene sediments and overlying marine Miocene sands, silts and clays. The top of the Miocene (5 million years old) generally lies between 27 – 43 m (89 – 141 ft) below the Maryland coast.

The Tertiary aged sediments of the Delmarva Peninsula and coastal areas are disconformably overlain by younger Quaternary aged sediments consisting of fluvial sands and gravels, littoral and shallow marine clay, silt, and sand. Fluvial deposits comprise the majority of the Pleistocene age sediments (10,000 - 1.8 million years ago), with upper Pleistocene deposits consisting of barrier, back-barrier and fore shelf origin.

Holocene sediments are typically fine to coarse-grained sands ranging in thickness from less than 1 to 10 m (3.2 to 32.8 ft), are generally deposited in coastal and marsh environments, and are similar to the Pleistocene littoral and shallow marine sediments.

Assateague - Fenwick barrier island is the wave dominated barrier island along the Maryland coast of the Delmarva Peninsula (CB&I 2014; Oertel and Kraft 1994). Although once connected, a major hurricane in 1933 formed the Ocean City Inlet and separated the two islands. Once the inlet was formed, the inlet was stabilized and is now maintained by the USACE (CB&I 2014). Coastal features, such as dune systems, back-bay lagoons and salt marshes, and sedimentary features, such as outwash fans, are typically observed (CB&I 2014).

Indian River Bay, Delaware is located along the eastern shore of the Delmarva Peninsula and is part of the Atlantic Coastal Plain Province (Cross et al. 2013). Indian River Bay is comprised of Holocene age flood tidal delta deposits and lagoon deposits. The flood tidal delta deposits are light-gray to gray, clean to silty, and silty sand and range from well-developed cross-bedding to structureless. Lagoon deposits are generally comprised of medium-grey to dark-grey clayey silt, with rare structures consisting of relic borrows, thin laminae of marsh grass fragments, or very fine sand. The Holocene age sediment deposits are up to 30 ft thick, with the thickest tidal delta deposits located in the eastern portion of Indian River Bay and the thickest lagoon deposits located near the center of Indian River Bay (Wunsch 2012).

Previous geotechnical and geophysical studies were conducted in 2013, 2015, 2016, and 2017. The reports for these efforts can be found in Appendix H2 (CB&I MEA G&G Report, May 2014), Appendix H3 (Alpine G&G Report 1751, June-Jul 2015), and Appendix H4 (Alpine Export Cable Report 1783, Aug-Nov 2016). The previous site characterization report for Delaware state waters can be found in Appendix H5 (Delaware Waters Field Evaluation Report, March 2019).

4.2.1.2 Geotechnical and Geophysical Surveys

Recent geotechnical and geophysical surveys were conducted in 2021, 2022, and 2023. The surveys include the entire Lease area, offshore export cable corridors and Onshore Export Cable Corridor 1 through Indian River Bay.

2021 TDI/Fugro Lease Area and Offshore Export Cable Corridors Survey

An updated survey of the Lease area and the offshore export cable corridors was completed during 2021 and 2022 by TDI Brooks International (TDI) and Fugro USA Marine, Inc (Fugro) (Figures 4.2-1 and 4.2-2). TDI vessels surveyed from April 3, 2021, to November 5, 2021. Fugro vessels surveyed from December 8, 2021, to May 23, 2022. The survey consisted of three components: geophysical data, geotechnical data, and benthic data. Collected geophysical data from both surveys included side scan sonar seafloor imaging, marine magnetometer measurements, multibeam bathymetry, and seismic reflection data. TDI collected the geotechnical data, consisting of vibracores and cone penetration tests, to examine sediment characteristics at depth. The benthic data consisted of grab samples for both infauna and grain size analysis, as well as planview imagery of the grab location and transect imagery collected using a remotely operated vehicle.

The complete results of the benthic analysis can be found in Appendix H11 and the results relevant to the DNREC applications are discussed further in Section 4.5.1.

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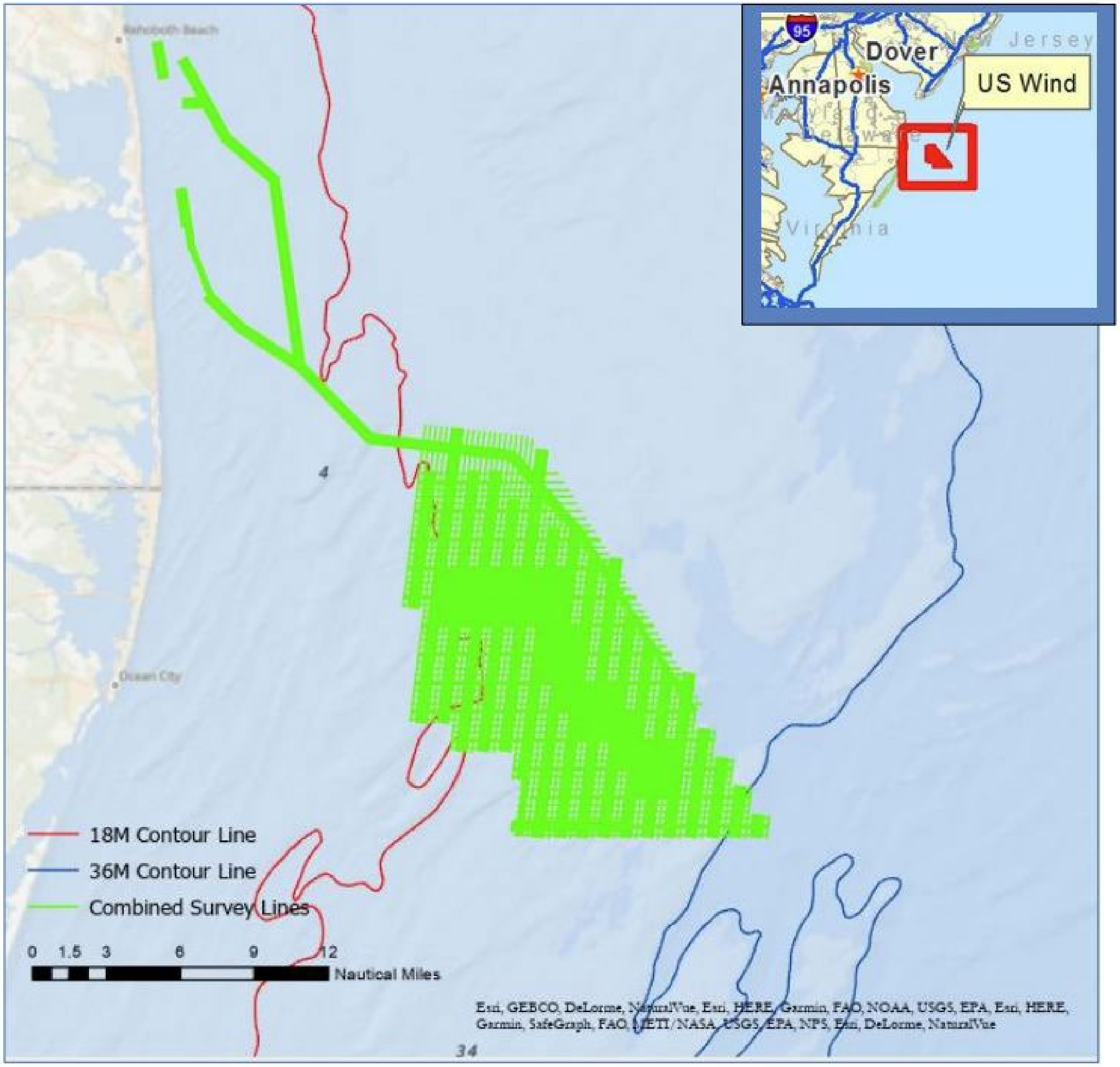

Figure 4.2-1. TDI Offshore Survey Extents

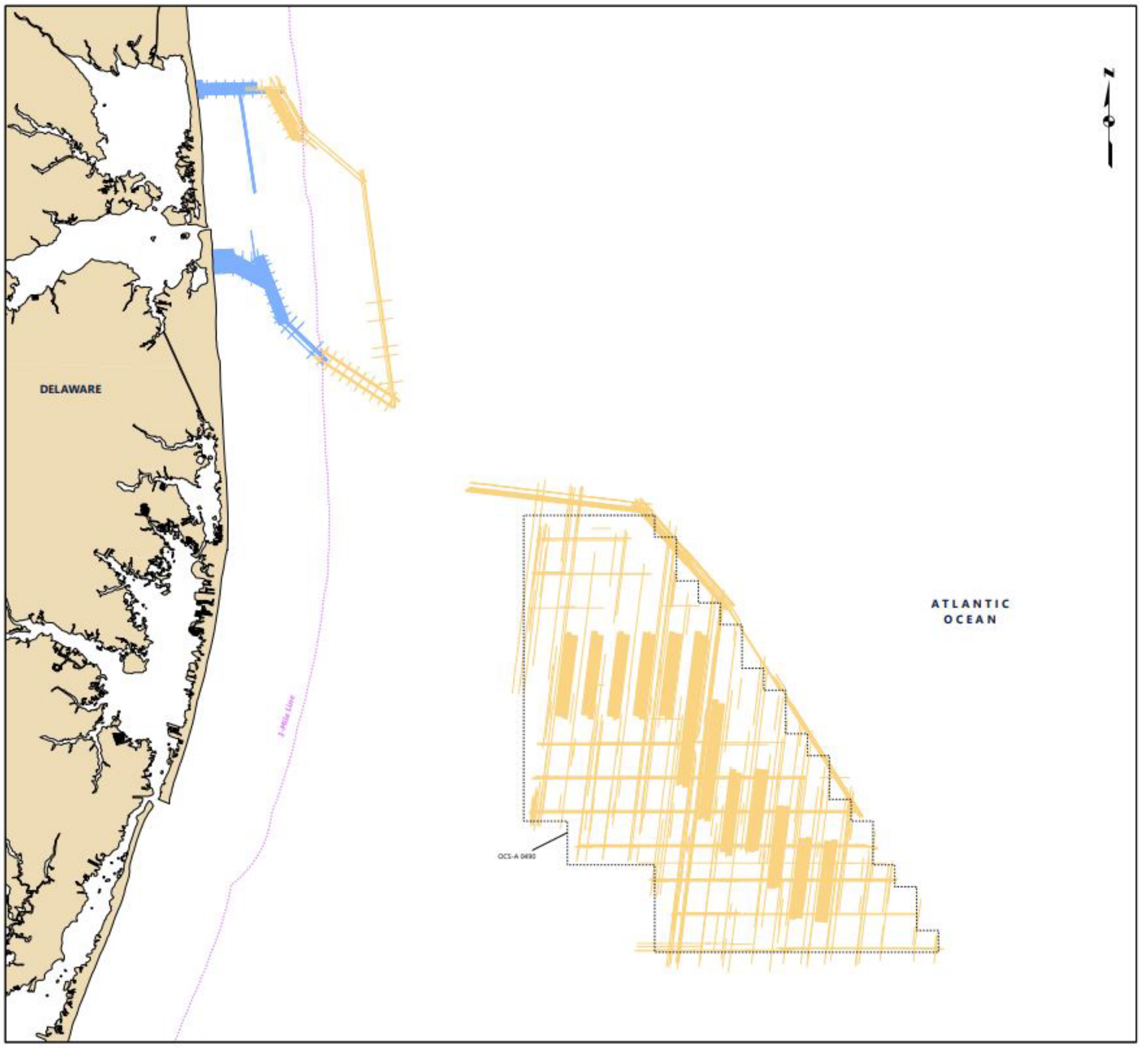

Figure 4.2-2. Fugro Offshore Survey Extents

2022 and 2023 Indian River Bay/Nearshore Atlantic Geotechnical and Geophysical Surveys

Geophysical survey of Indian River Bay was conducted by S.T. Hudson Engineers Inc. (S.T. Hudson) from May to June 2022. Collected geophysical data included side scan sonar seafloor imaging, marine magnetometer measurements, multibeam bathymetry, and seismic reflection data. The area surveyed is shown in Figure 4.2-3 with the intent of surveying a broad area for potential cable placements in Indian River Bay.

Geotechnical surveys in 2022-2023 included Indian River Bay and nearshore Atlantic locations in Delaware state waters, with vibracores, CPTs and deep CPTs collected. Alpine conducted nearshore Atlantic geotechnical surveys from September through December 2022. Ocean Surveys, Inc. and Sealaska Engineering and Applied Sciences (SEAS) conducted geotechnical surveys in Indian River Bay in September 2022 and January through March 2023, respectively.

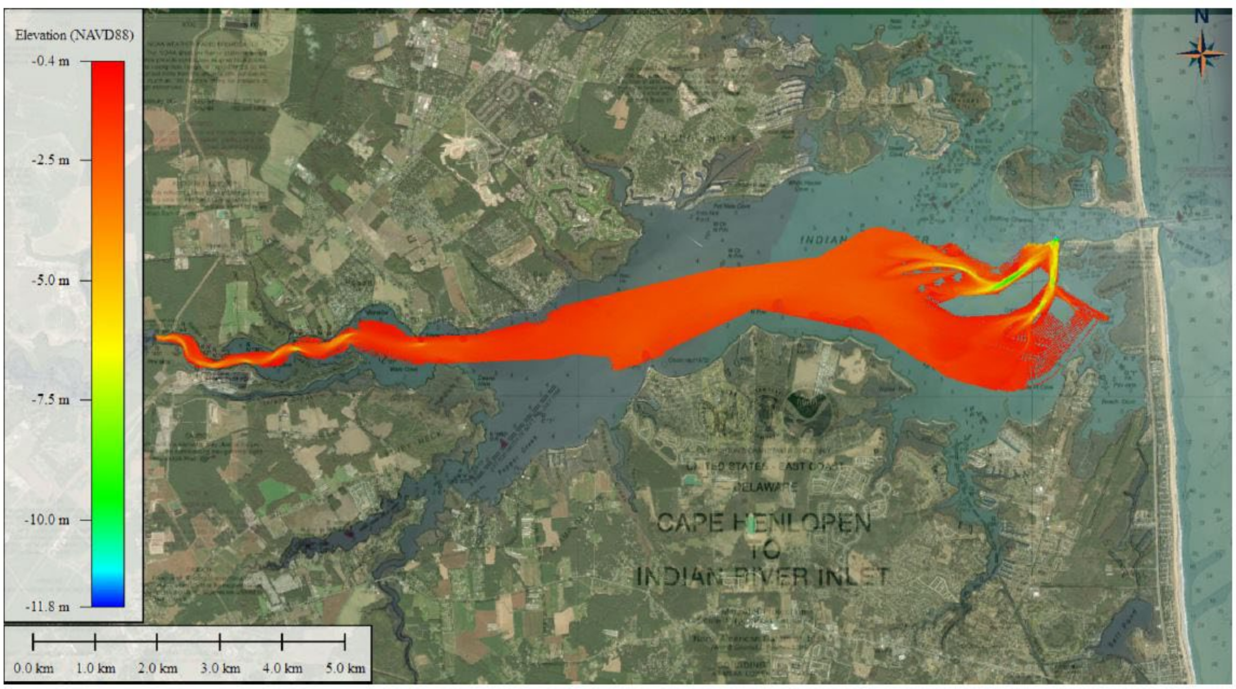

Figure 4.2-3. ST Hudson Geophysical Survey Extents

2022/2023 Updated Integrated Marine Site Characterization Reports

The 2020 *Integrated Site Characterization Report*, authored by McNeilan & Associates, was initially provided as COP Appendix II-A1 (US Wind 2023b).

Following the completion of surveys in 2021, 2022, and 2023, US Wind contracted Wood Thilsted to update the previous Integrated Marine Site Characterization Report. Two separate reports are included in the COP Appendix A, describing the conditions in the Atlantic Ocean for the Lease Area and Offshore Export Cable Corridors federal waters (Appendix II-A1) and for Delaware state waters, including Indian River Bay (Appendix II-A2). The site characterization reports were compiled to fulfil the requirement of 30 CFR 585.626(a)(6) and focused on the following:

- Documentation of all investigations, surveys, in-situ and laboratory testing.
- An analysis of the potential for various hazards and processes.
- Description of sediment layers with geotechnical design parameters.
- Recommendations for mitigating geologic hazards.

4.2.1.3 Geological Features and Hazards

<u>Onshore Export Cable Corridor 1</u>

The bay bottom along Offshore Export Cable Corridor 1 is relatively flat within Indian River Bay but exhibits areas of tidal scour near the cut banks along the Indian River as well as in areas west of Indian River Inlet. The bay bottom is moderately smooth along the survey corridor with some sand ripples and ridges observed. Intermittent areas of biogenic gas from the breakdown of organic matter in the sub-surface were noted. Table 4.2-1 summarizes the potential hazards from the ST Hudson survey of Onshore Export Cable Corridor 1 in 2022, which includes Onshore Export Cable South Corridor.

Table 4.2--1. Onshore Export Cable Corridor 1 Geological Features and Hazards – Wood Thilstead 2023 (Appendix II-A2)

Shallow Hazards	
Shallow Faults	Not Present
Gas Seeps or Shallow Gas	Biogenic gas present in low concentrations. Small depressions present may be related to gas escape.
Mobile Sediments	Features ranging from ephemeral ripples to tidal shoals observed. Seasonal variation is expected. No evidence of slumps, slides, creep, or karst topography. Average slope for Onshore Export Cable Corridor 1 is approximately 0.5°.
Gas Hydrates	Not Present
Surface Line Bottoms, Buried Channels, and Scour Features	No intact or massive rock observed. Buried/infilled channels observed at shallow depths. Scour present within Indian River channel, shoal area tidal channels, and around seafloor debris. Scour patches possible in Indian River Bay. Ice scour is not expected nor observed.

Table 4.2--1. Onshore Export Cable Corridor 1 Geological Features and Hazards – Wood Thilstead 2023 (Appendix II-A2)

Man-made Hazards	
Cables / Pipelines	Not Present
Artificial Reefs	Not Present
Debris	Debris was observed on the bay floor throughout the area. Future deposition of anthropogenic debris is possible due to marine recreational traffic within the area.
Other	Buoys are present, including ones for navigation. A possible infilled dredging channel has been observed.

4.2.2 Impacts

4.2.2.1 Construction

4.2.2.1.1 Onshore Export Cable South Corridor

Onshore Export Cables would then continue along Onshore Export Cable South Corridor beneath Indian River Bay and extend to the substation landfall, which is located at the existing Indian River Power Plant. Low-impact jet plow technology would be used as the preferred method to install the cable in Indian River Bay although other technologies such as a barge-mounted vertical injector may be used in certain areas as needed. The HDD and gravity cells would be used to transition to and from Indian River Bay to land which is expected to minimize impacts to sediment. Turbidity monitoring would be conducted during construction as required by permitting authorities.

Dredging is anticipated for cable burial in the shallow waters of Indian River Bay to reach the required cable burial depth. Areas under consideration for dredged material placement are discussed in the dredging subsection within Indian River Bay section of Section 2.1.3.3. Dredging would temporarily displace sediment and would stabilize after installation of submarine cables, consistent with the impacts analyzed in Appendix H8 and discussed in Section 4.3.2.1.

The installation of the onshore export cables and dredging may impact the surficial geology along Onshore Export Cable South Corridor. Cable installation would cause a temporary disturbance and sediment would be suspended into the water column and then redeposited within, or within the vicinity of Onshore Export Cable South Corridor (see Section 4.3.1 for discussion of sediment transport/suspension with regard to water quality). It is anticipated that the cable will be entirely subsurface.

4.2.2.1.2 Offshore Export Cable Corridor 1

The Offshore Export Cables would begin at an OSS in the Lease area and extend through the Offshore Export Cable Corridor to the proposed landfall located at the 3R's Beach in Delaware where they would cross under the barrier beach and then continue as "Offshore Export Cables" beneath Indian River Bay until landfall near the existing Indian River Substation and Indian River Power Plant.

The Offshore Export Cables would be installed beneath the seafloor using low–impact jet plow technology until they reach the offshore landfall. US Wind would use submarine cables that have electrical shielding and bury the cables in the seafloor when practicable (Sharples 2011). The installation of the Offshore Export Cables and associated cable protection may impact the surficial geology along the Offshore Export Cable Corridors.

The cable installation would cause a temporary disturbance and sediment would be suspended into the water column and then redeposited within, or within the vicinity of, the Offshore Export Cable Corridors (see Section 4.3 and Appendix H7 Offshore Sediment Transport Modeling). It is anticipated that the Offshore Export Cables would be entirely subsurface, but up to 10 percent may require cable protection in the form of concrete mattresses or the equivalent which would be installed where burial depth is not achieved. While placing the concrete mattress over the existing sediment does not modify the sediment, it would increase the seafloor relief in that area.

Horizontal Directional Drilling would be used to install the Offshore Export Cables beneath the barrier beach into the transition vault. This process entails installing a gravity cell and drilling a borehole through sediment layers, which avoids disturbing nearshore subtidal, intertidal, and beach or backshore zones and would not degrade the integrity of the stratigraphic units at the shoreline.

4.2.2.2 Operations

4.2.2.2.1 Onshore Export Cable South Corridor

Maintenance and operations of the submarine cables in the Indian River Bay will follow the same procedures as for the Offshore submarine cables mentioned above.

Overall, aside from repairing unplanned cable damages, operations of the Project are not expected to have temporary or permanent impacts to geology and physical conditions.

4.2.2.2.2 Offshore Export Cable Corridor 1

The submarine cables would be installed beneath the seabed; therefore, the operation of the submarine cables would not impact the surficial geology. Maintenance of the submarine cables and cable protection would include periodic inspections of the Onshore and Offshore Export Cables. Buried submarine cables may be damaged by contact with vessel anchors or fishing trawls dragging over or being dropped upon the cable line (Sharples 2011). Cables can also become exposed due to scour, placing the cable at greater risk of damage (Sharples 2011).

In the event of damage occurring to one of the 4 cables, processes similar to those used during construction and installation would be utilized to expose, repair, and rebury the cable. This activity may cause local sediment displacement and temporarily suspend sediment in the water column. Suspended sediment would settle out of the water column and be redeposited within, or within the vicinity of, the submarine cable corridor.

4.2.3 Avoidance and Minimization

US Wind has, during Project planning, and will, during construction and operation, implement the following avoidance and minimization measures to reduce Project impacts on geological resources. Based on feedback from the USACE, US Wind adjusted the cable corridor routes in order to avoid a USACE-identified sand resource in the area around Indian River Inlet in the Atlantic.

- Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts of sediment disturbance:
    - No in-water work (e.g., cable installation, HDDs, dredging) in Indian River Bay March 1 through September 30.
    - No HDD activities in the Atlantic to the beach landfall from April 1 through September 15 (inclusive of recreational period avoidance from May 15 through September 15).
- Cable Burial Risk Assessments (CBRAs) have been prepared based on geophysical and geotechnical (G&G) survey data for the export cables (Appendix H16).
- Use submarine cables that have electrical shielding and bury the cables in the seafloor, when practicable.
- Minimize sediment disturbance by utilizing the best available technologies to achieve deep burial of submarine cable into a stable sediment layer (i.e., jet plow technology, HDD, gravity cells, etc.).
- Prior to construction, analyze survey data at installation locations to identify potential MEC/UXO and plan avoidance in line with industry best practices.
- Prepare an MEC/UXO Emergency Risk Management Plan prior to construction.
- Prior to construction activities, provide an MEC/UXO awareness briefing to vessel crews.

4.3 Water Quality

Temporary and permanent impacts were evaluated as required by Sections 8b and 9 of the DNREC Appendix S New Dredging Projects Form and Section 10a of Appendix M Activities in State Wetlands. Due to the avoidance and minimization measures in place (discussed in Section 4.3.3.), the dredging project would not cause violations of the water quality criteria.

4.3.1 Description of Affected Environment

The Project area includes both open marine waters and inland waters. Marine waters include the Atlantic Ocean within the Lease area and along the Offshore Export Cable Corridors between the Lease area and the Delaware shoreline. Marine waters also include coastal waters that could be affected by Project activities (e.g., traversed by vessels during Project installation, operation, and/or non-routine events). Inland waters include waters of Indian River and Indian River Bay along Onshore Export Cable South Corridor from the Delaware coast to the proposed landfall at the Indian River Substation. Indian River Bay is part of the coastal watershed locally known as the Inland Bays, which also includes Rehoboth Bay and Little Assawoman Bay. Rehoboth Bay and Little Assawoman Bay are located outside of the Project area.

Water quality is controlled primarily by the anthropogenic inputs of land runoff, land point source discharges, and atmospheric deposition from discharges to the air. With increasing distance from shore, oceanic circulation patterns play an increasingly larger role in dispersing and diluting anthropogenic contaminants and determining water quality.

The condition of mid-Atlantic estuaries and coastal waters is fair to good in most locations, as measured by the National Coastal Condition Assessment (NCCA) water quality index (USEPA 2016). Among the water quality analytes examined, phosphorus and chlorophyll (algal productivity) were more likely to be rated as fair, while nitrogen, dissolved oxygen, and water clarity were predominantly rated as good. Coastal waters in the mid-Atlantic region have improved with regard to overall water quality since 2001 (USEPA 2016). The most consistent gains were observed in dissolved oxygen and water clarity.

4.3.1.1 Offshore Export Cable Corridors

Offshore water quality in the mid-Atlantic region is generally good and recent assessments have found no major indications of poor sediment or water quality. The region generally exhibits low nutrient concentrations and good dissolved oxygen and water clarity measurements (USEPA 2016). The 2006 mid-Atlantic Bight assessment found there were no major indications of poor sediment or water quality and that the dissolved oxygen, sediment contaminants, and sediment Total Organic Carbon (TOC) component indicators were rated good throughout the survey area (USEPA 2012). Additionally, the NOAA rated sediment contaminants and sediment TOC component indicators as good (Balthis et al. 2009).

Within state waters along the Offshore Export Cable Corridors, the Delaware Surface Water Quality Standards (7 DE Admin Code 7401) classify waters of the Atlantic Ocean as suitable for industrial water supply, primary contact recreation, secondary contact recreation, and fish, aquatic life, and wildlife habitat. Along Delaware's Atlantic coast, stormwater is the main source of pollutants, although water quality exceedances at beaches are rare (USEPA 2016).

4.3.1.1.1 Salinity, Temperature and Dissolved Oxygen

Deeper offshore waters of the Offshore Export Cable Corridors appear to demonstrate little variation in salinity and temperature from location to location.

The shallow coastal marine waters near the Offshore Export Cable Corridors are generally well-mixed, as indicated by salinity, temperature, and dissolved oxygen profiles. Scott and Wong collected water quality measurements in Delaware's Atlantic coastal waters as part of a study to characterize potential sand borrow areas (Scott and Wong, (2012). Over the course of this study, little to no stratification was observed at these locations, indicating a well-mixed water column. Salinity ranged from approximately 27 practical salinity units (psu) to almost 31 psu, while dissolved oxygen ranged from approximately 10 milligrams per liter (mg/L) to 12 mg/L (USEPA 2016).

4.3.1.1.2 Turbidity/Suspended Solids

The coastal waters along the Offshore Export Cable Corridors are characterized by sand ridges and troughs that are oriented along a generally southwest to northeast axis (CB&I 2014; Conkwright, Van Ryswick, and Sylvia 2015). The sand ridges have a complex morphology that is superimposed with smaller scale bedforms (sand waves). This is suggestive of active sediment transport with frequent sediment mobilization, resuspension, and deposition occurring due to tides, currents, and storm activity. Along the Offshore Export Cable Corridors, wave action may also affect sediment transport in water depths shallower than approximately 20 m (66 ft). During these periods of naturally induced sediment transport, short-term increases in turbidity affecting water quality may occur.

Detailed studies of suspended sediment concentrations in the marine waters of the mid-Atlantic indicate turbidity can vary by an order of magnitude at a single location over time, from less than 1 mg/L to several hundred mg/L in federal waters. Higher values are typically associated with storm events (Louis Berger Group Inc. 1999).

An offshore sediment transport modelling study has been provided in Appendix H7. This study addresses turbidity and total suspended solids from the construction phase along Offshore Export Cable Corridor 1. Turbidity and total suspended solids from construction along Offshore Export Cable Corridor 2 were assessed in Addendum 1 of Appendix H7. Addendum 2 of Appendix H7 provides sediment transport modeling results for the proposed trailing suction hopper dredging that may be needed to prepare the seafloor for construction at each of the four proposed OSS locations.

4.3.1.1.3 Sediment

Because the State of Delaware has issued guidelines for classifying potential ecological impacts of sediment contamination, a field investigation was conducted within Delaware state waters along the formerly planned Offshore Export Cable route in September 2016 for the purpose of collecting and analyzing environmental sediment core samples, as illustrated in Figure 4.3-1.

Six environmental vibracores were collected and sampled for bulk physical and chemical properties. Samples were predominantly medium-fine-grained sand and silt, contained little organic matter (0.3 - 3.8%), and had bulk densities of 1.3 – 2.0 grams per cubic centimeter (gm/cm^3) (81.4 - 127.8 pounds per cubic feet [lbs/ft^3]).

Of the six cores collected along the formerly planned Offshore Export Cable route, only one sample from one core exceeded a Delaware Ecological Marine Sediment Screening Level (DNREC 2018b). Sample VC-A-04-S1, collected at the sediment surface approximately 1 NM offshore, exceeded the screening levels for arsenic and nickel, as well as the NOAA Effects Range-Low (ERL) level for nickel. Arsenic is ubiquitous in the environment at low concentrations (1 to 40 milligrams per kilogram [mg/kg]), and is transported through natural phenomena such as erosion as well as through human activity, including the use of pesticides and as waste from metal refining processes (Tchounwou et al. 2014). Nickel is also a commonly encountered heavy metal that is widely used in the manufacturing of stainless steel and batteries.

Complete results of the sediment sample analysis described above are provided as Appendix H5.

US Wind is examining sediment data along the Offshore Export Cable Corridor 1, where approximately 50 vibracore locations were sampled during the summer of 2021 (Figure 4.3.-1). The resulting data has been provided in the geophysical survey report of the Export Cable Corridors conducted during 2021 in COP Appendix II-A2 (US Wind 2023b).

4.3.1.2 Onshore Export Cable South Corridor

Onshore Export Cable South Corridor traverses Indian River Bay and estuarine portions of the Indian River. The Delaware Surface Water Quality Standards (7 DE Admin Code 7401) classify both of these waterbodies as suitable for industrial water supply; primary contact recreation; secondary contact recreation; and fish, aquatic life, and wildlife habitat. Parts of Indian River Bay are also classified as Harvestable Shellfish Waters (SFH). Additionally, both Indian River Bay and Indian River have been designated as waters of Exceptional Recreational or Ecological Significance (ERES).

Despite these water quality classifications, Delaware's 2020 *Combined Watershed Assessment Report* (DNREC 2020a) lists both Indian River and Indian River Bay as impaired. Water quality impairments include bacteria, nutrients, temperature, and total suspended solids.

4.3.1.2.1 Salinity, Temperature and Dissolved Oxygen

According to data available from the Delaware Water Quality Portal monitoring station buoy, salinity in Indian River Bay ranges from approximately 18 to 34 psu and is typically greatest from July to October (DNREC 2023b). Indian River Bay exhibits a strong salinity gradient defined by three salinity segments: oligohaline, mesohaline, and polyhaline/euhaline. Onshore Export Cable South Corridor primarily traverses the polyhaline portion of Indian River Bay, where salinity exceeds 18 psu and approaches marine conditions. The polyhaline zone includes the onshore landfall and most of Onshore Export Cable South Corridor to the west. Salinity gradually declines toward the substation landfall, which is located in the mesohaline zone of the Indian River. In this zone, salinity regularly falls below 25 psu, but generally remains above 15 psu (DNREC 2023b; DEMAC et al. 2017).

In Indian River Bay, water temperature ranges from approximately 14 degrees Celsius (°C) (34°F)in the winter to the mid-20s°C (mid-70s°F) in the summer, with occasionally colder or warmer conditions. Shallow tidal creeks along the periphery of Indian River Bay may experience colder temperatures in the winter and warmer temperatures in the summer (DNREC 2023a).

Dissolved oxygen levels in Indian River Bay range from 5.0 - 13 mg/L in the spring and from to 3.5 - 8.9 mg/L in the summer, which is typically when dissolved oxygen drops to its lowest levels (DNREC 2023b; DEMAC et al. 2017). Adequate dissolved oxygen levels are critical to the survival of fish and other marine organisms. Hypoxic (low oxygen) events are rare but may have a significant impact on finfish and commercially harvested shellfish when they occur. In Indian River Bay, dissolved oxygen levels are typically adequate to support aquatic life year-round (DNREC 2023a).

4.3.1.2.2 Turbidity/Suspended Solids

For tidal portions of Indian River Bay, the state water quality criterion for Total Suspended Solids (TSS) is a seasonal average of 20 mg/L from March 1 to October 31. Data collected from Indian River Bay since 2000, indicate a range in TSS from approximately 5 mg/L to more than 184 mg/L over the course of the year (DNREC 2023a). Water clarity is too low to support the growth of submerged aquatic vegetation (SAV) in Indian River and most of Indian River Bay, although it generally improves from west to east (DCIB 2016).

A sediment dispersion analysis in Indian River Bay has been prepared and is provided as Appendix H6. The analysis evaluated both a northern and southern route through Indian River Bay within Onshore Export Cable Corridor 1 while US Wind refined the routing of cables, therefore the analysis includes Onshore Export Cable South Corridor which is part of the Project.

The analysis identified three potentially sensitive receptors:

- Tidal wetlands along the shoreline of Indian River Bay (sensitive to suspended sediment and deposition).

- Shellfish harvesting areas (sensitive to suspended sediment and deposition).
- The cooling water intake at the Indian River Power Plant (sensitive to suspended sediment). The Indian River Power Plant may soon be retired.

Sediment transport modelling for Indian River Bay is provided as Appendix H8 which indicates that the majority of suspended sediments would settle out of the water column following the completion of jet plowing within 24 hours.

The three potentially sensitive receptors are shown in relation to the maximum suspended sediment concentration (Figure 4.3-1) and sediment deposition (Figure 4.3-2) during the 24-hour period prior to the settlement of the majority of the suspended sediments. Impacts to these receptors from suspended sediment is expected to be temporary and localized.

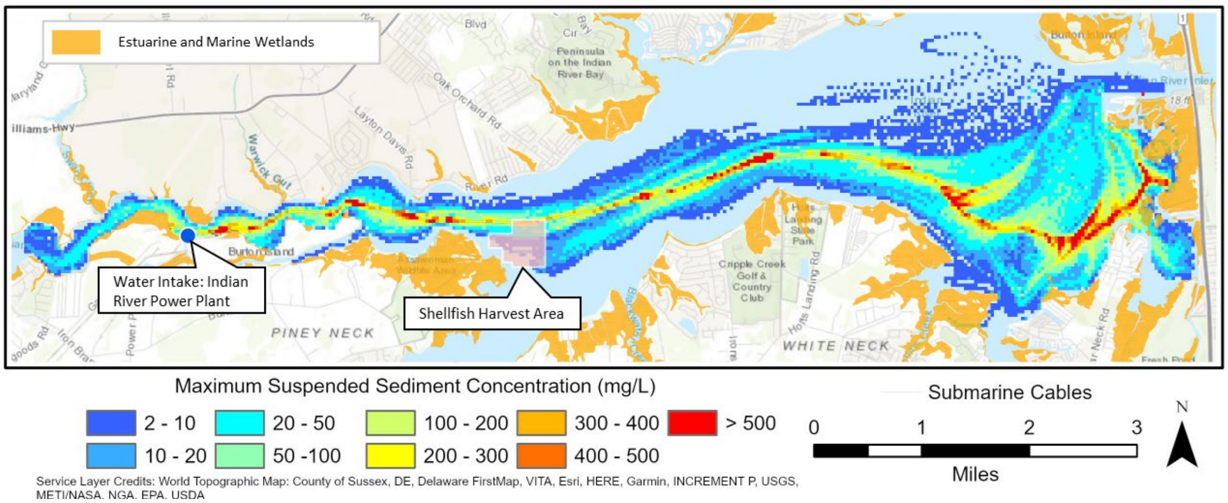

Figure 4.3-1. Sensitive Receptors Relative to the Maximum Suspended Sediment Concentration

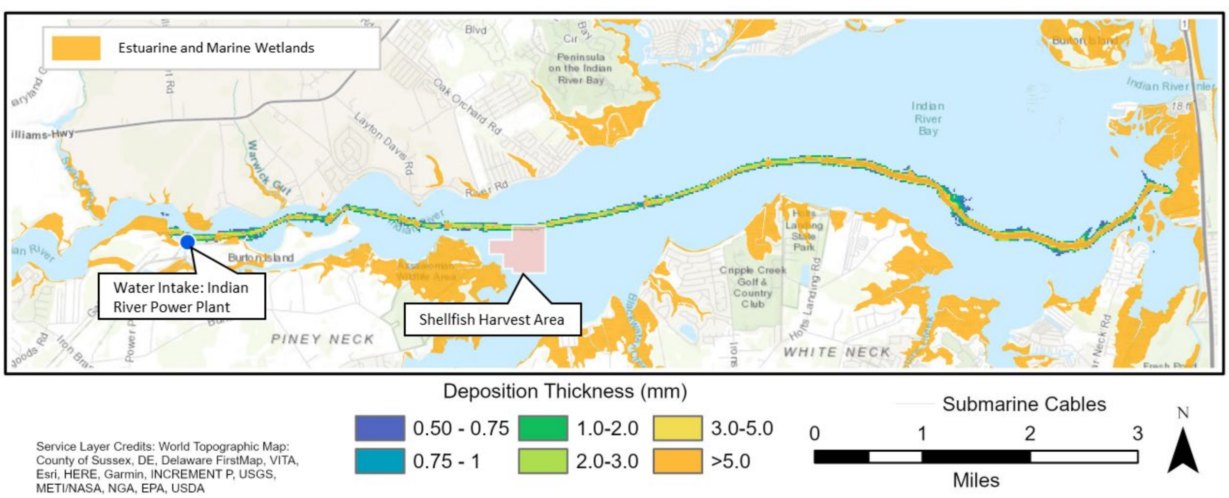

Figure 4.3-2. Sensitive Receptors Relative to Sediment Deposition

The suspended sediment due to dredging is expected to be significantly lower than during cable installation, with a smaller extent and duration. No impacts to sediment transportation along the shoreline are anticipated. Please refer to Appendix G for more information.

4.3.1.2.3 Sediment

US Wind 2017 Sediment Survey

For the purpose of collecting and analyzing environmental sediment core samples, a field investigation was conducted along the Onshore Export Cable Corridor 1 during October 2017. As shown in Figure 4.3-1, environmental vibracores were collected from 17 locations in Indian River Bay. Grain size analysis indicated that sediment samples were predominantly medium-fine-grained sand and silt, contained little organic matter (0.6 – 57 percent), and had bulk densities of 1.0 – 1.7 gm/cm^3 (60.5-107.4 lbs/ft^3). Of the samples analyzed from these cores, 15 exhibited concentrations of select target analytes that exceeded one or more of the Delaware Ecological Marine Sediment Screening Levels (DNREC 2018b).

Two samples (VC-IRB-05-S2 and VC-IRB-08-ALT-S2) exceeded the screening levels and Threshold Effect Levels (TELs) for one or both of the Polycyclic Aromatic Hydrocarbons (PAHs) acenaphthene and naphthalene (Buchanan 2008). However, because the detected PAH concentrations were not significantly elevated (detected concentrations less than twice the screening levels) relative to the screening levels and these two samples exhibited the highest TOC results at 31 percent and 25 percent, it is anticipated that these contaminants are bound to the organic materials and would not become more available to aquatic organisms as a result of the proposed Project. Furthermore, the detected PAH concentrations did not exceed screening values that are more indicative of adverse biological impacts, such as probable effect levels (PELs) (Buchanan 2008).

Thirteen samples exceeded the screening levels for metals (arsenic and/or nickel), although concentrations were at or below 12 mg/kg for arsenic and 23.8 mg/kg for nickel. Exceedances of the Delaware Department of Natural Resources and Environmental Control (DNREC) screening levels were detected in eleven of the samples for arsenic and thirteen of the samples for nickel. However, the following observations were also made regarding the presence of arsenic and nickel in sediments of Indian River Bay:

- These heavy metals are widespread within the shallow sediments in Indian River Bay. Arsenic and nickel are also the only two heavy metals that exceeded ERL levels in sediment samples that were previously collected during an assessment of the mid-Atlantic Bight in 2006 (Balthis et al. 2009).
- The mean concentration from all of the sediment cores for both of these heavy metals (5.92 mg/kg - arsenic; 12.70 mg/kg – nickel) is below the applicable DNREC screening levels and TELs.

- Detected heavy metal concentrations did not exceed screening values that are more indicative of adverse ecological impacts, such as PELs (Buchanan 2008).

Complete results of the sediment sample analysis are provided as Appendix H5.

Indian River Dredging Project: Analysis of Chemical Contaminants in Sediments (2020b)

In September 2019, DNREC collected ten sediment cores within Indian River to evaluate the potential environmental risk associated with a proposed maintenance dredging project in the federal channel (D.D.o.N.R.a.E.C. DNREC 2020b). Of the 40,000 cubic yards of proposed dredged material, about 23,000 cubic yards was proposed to be placed in a previously constructed upland confined disposal facility (CDF) near the project site. The remaining 17,000 cubic yards was proposed for beneficial reuse to restore/create wetlands owned by the Town of Millsboro.

The ten sediment cores collected by DNREC were composited into two samples, a surface sample and a subsurface sample. Polychlorinated biphenyls (PCBs) were detected in both surface and subsurface composite samples. Total PCB levels were not significantly different between the two samples (D.D.o.N.R.a.E.C. DNREC 2020b). Despite the presence of PCBs in the sediment samples, toxicity to aquatic life due to PCBs was not expected. Furthermore, neither the surface nor subsurface sample PCB results exceeded DNREC Soil Screening Values for protection of human health.

Several semi-volatile organic compounds (SVOCs) were detected in the sediment samples (D.D.o.N.R.a.E.C. DNREC 2020b). However, none of the SVOCs detected exceeded their compound specific Equilibrium Partitioning Sediment Benchmarks (ESBs) so potential toxicity to aquatic life from SVOCs was not expected. Furthermore, neither the surface nor subsurface sample SVOC results exceeded the applicable DNREC Soil Screening Levels for protection of human health.

Metals were also present in the sediment samples. However, toxicity to aquatic life from dredging activities due to metals was not expected and the potential toxic impact to humans was considered low based on a comparison of the analytical results with the applicable Delaware Screening Values. Estimated arsenic concentration exceeded the Delaware chronic toxicity standards for surface water but were within the range of sediment values detected regionally within the Delaware Inland Bays (D.D.o.N.R.a.E.C. DNREC 2020b).

Organochlorine pesticides were not detected in either of the sediment composite samples at concentrations exceeding analytical detection limits.

Overall, the results of the DNREC (2020b) study on sediment contamination within Indian River Bay were consistent with the results of the 2017 survey work completed by US Wind (see Appendix H5).

US Wind 2023 Sediment and Surface Water Survey

US Wind performed additional sediment and surface water sampling surveys to assess impacts to ecological and/or human health associated with the proposed dredging in Indian River Bay. US Wind conducted physical and chemical analysis in advance of submitting this application as authorized by DNREC in Wetlands and Subaqueous Lands Permit: LA-138/22; LA-138/22(A1). A sampling and analysis plan was provided with the application materials on September 7, 2023, and approved by DNREC on September 22, 2023. The results of field work and laboratory analysis are provided as Appendix F: Indian River and Indian River Bay Surface Water and Sediment Assessment..

Mercury was the only DNREC HSCA Screening Level exceeded for the surface water samples. However, the measured mercury concentrations were below the Delaware chronic and acute water quality criteria (WQC); therefore, no adverse impacts are expected. The human health evaluation indicated that thallium was the only constituent in the sediment samples with a concentration higher than its soil screening level. Further evaluation concluded that even when using the most conservative, default exposure assumptions, the measured thallium concentrations were below both the DNREC and USEPA thresholds for potential adverse human health effects.

The measured metals, mercury, and polychlorinated biphenyls (PCBs) concentrations did not exceed the DNREC screening levels. Arsenic was the only inorganic above the screening levels for marine surface water but is unlikely to result in adverse effects. Two semi-volatile organic compounds (SVOCs) exceeded the screening levels, however, further analysis determined that potential toxicity to aquatic life is unlikely. There is negligible potential for adverse effects from dioxins in the sediments on aquatic life. Per- and polyfluoroalkyl substances (PFAS) were infrequently detected and impacts are not considered to be significant or have adverse effects on aquatic life.

Composite Area 1, as defined in Appendix F, contains the areas proposed for dredging. The composition of the sediment consisted of 50% clay, 40.6% silt, and 9.4% sand. The results exceeded the HSCA Soil Screening Level for thallium; the HSCA Ecological Marine Sediment Screening Level for 2- Methylnaphthalene, naphthalene; and the HSCA Ecological Surface Soil Screening Level for mercury, selenium, zinc, and total 2,3,7,8-TCDD Equivalent for mammals (ND = 1/2 MDL). However, as mentioned above, no adverse human health effects or adverse effects on aquatic life are expected.

If the dredged material is placed in an upland disposal site, there is negligible potential for adverse effects based on the results of this analysis.

The report discussing the results of this work is provided as Appendix F and is consistent with the results of the 2017 survey work completed by US Wind (see Appendix H5).

4.3.1.2.4 Nutrients

Both nitrogen and phosphorus pollution are considered to be problematic in the Inland Bays watershed. DNREC conducted a Total Maximum Daily Loads (TMDL) analysis for nitrogen and phosphorus in Indian River and Indian River Bay in 1998 (DNREC 1998) and introduced a pollution control strategy (DCIB 2016). The majority of the pollutant reductions proposed in the plan targeted agriculture, because it is the dominant land use in the Inland Bays watershed (DCIB 2016). However, conversion of agricultural lands into developed areas has been occurring at a rapid pace since the plan was developed (DCIB 2016), making stormwater runoff an increasingly important driver of nutrient concentrations in the watershed.

A number of point sources have historically discharged nutrient pollution into Delaware's Inland Bays, but all of the significant sources of nutrient pollution have since been eliminated. The Town of Millsboro removed its wastewater discharge from the Indian River in 2015, and the City of Rehoboth Beach rerouted its wastewater discharge from an outfall on Rehoboth Bay to an ocean outfall in 2018 (Peikes 2018). Of the thirteen nutrient pollution sources originally identified, only one small point source in Millsboro continues to discharge to the Indian River as of 2018 (DCIB 2018). In August 2023, the Millsboro sanitary sewer system failed and discharged raw sewage into a tributary of Indian River Bay, resulting in the emergency closure of recreational clamming and mussel harvest for 21 days to protect public health (D.D.o.N.R.a.E.C. DNREC 2023c).

Water quality in the Indian River and Indian River Bay has been degraded by these sources of nutrient pollution. The water quality standard for dissolved inorganic phosphorus in both waterbodies is 0.010 mg/L (DNREC 1998). Average concentrations of dissolved inorganic phosphorus between 2011 and 2015 exceeded the standard at three of the four monitoring stations on the River and at three of the four monitoring stations in Indian River Bay (DCIB 2016). The four monitoring stations on the Indian River had average nitrogen concentrations more than double the standard of 0.14 mg/L, but three of the four stations in Indian River Bay met the standard (DCIB 2016). Algae concentrations in Indian River Bay have improved since 2010, but excess nutrients continue to fuel algal growth on the Indian River. From 2011 to 2015, concentrations of chlorophyll *a* at all four monitoring stations on the Indian River exceeded the 15 mg/L standard, but stations in Indian River Bay met the standard (DCIB 2016).

4.3.2 Impacts

4.3.2.1 Construction

4.3.2.1.1 Onshore Export Cable South Corridor

<u>Suspended Sediment/Deposition</u>

Suspended sediment/deposition associated with construction is anticipated to have a negligible to minor impact on water quality. The use of jack-up and feeder vessels, jet plow operations during cable laying and embedment, and vessel anchoring would disturb sediment on the seafloor. The

HDD operations at the landfall locations are also expected to result in some sediment disturbance in and around the gravity cells.

Sediment transport modeling within Indian River Bay, along Onshore Export Cable Corridor 1, has been provided as Appendix H8. These studies address turbidity and total suspended solids from the construction phase along Onshore Export Cable South Corridor through Indian River Bay.

Submarine Cables

The use of HDD at the landfalls would minimize water quality impacts in the nearshore environment, and gravity cells would help to contain sediment that becomes suspended in the water column. Some sediment may be displaced during the installation and removal of the gravity cells; however, this would be a relatively small volume of material that would settle out relatively quickly. Consequently, water quality impacts associated with HDD are anticipated to be negligible.

Although jet plow embedment is the least impactful method for installing submarine cables (Eversource Energy 2018), jet plow operations during cable laying and embedment would result in the disturbance of sediments along the Offshore Export Cable Corridors and Onshore Export Cable South Corridor. Alternative cable installation methods may be necessary in Indian River Bay (e.g., vibro-injector or trenching) where jet plow operation is not feasible. This would result in suspended sediment concentrations that may vary from what would be produced by jet plow installation methods. However, increases in suspended sediment would still be expected to be temporary. Therefore, water quality impacts associated with alternative cable installation methods, if used, are anticipated to be minor.

Based on sediment transport assessment results that evaluated Onshore Export Cable Corridor 1 (Appendix H8), the vast majority of sediments disturbed by the jet plow in Indian River Bay would quickly return to the cable installation trench. A portion of the disturbed sediments would leave the immediate trench area, resulting in measurable, but temporary increases in suspended sediment that are anticipated to occur within 1,400 m (4,600 ft) of jet plow operations. Areas of sediment deposition greater than 5 mm (0.2 in) are also anticipated to occur within 30 m (95 ft) of jet plow operations.

Sediment suspension and deposition are expected to be locally higher in the immediate vicinity of jet plow operations. However, suspended sediment concentrations are expected to return to background levels no more than 24 hours after jet plow passage. Although concentrations of TSS associated with jet plow operations depend on the type of sediment present and the strength of local water currents, a study conducted by Elliott et al. 2017, of particle settlement during cable laying for the Block Island Wind Farm found that measured TSS concentrations during and after plowing were as much as two orders of magnitude smaller than modeled concentrations. Measured TSS concentrations two weeks post plowing were rarely distinguishable from background levels (Elliott et al. 2017).

Sediment transport modeling for the Offshore Export Cable Corridors has been provided as Appendix H7. Sediment transport modeling within Indian River Bay, along Onshore Export Cable Corridor 1, has been provided as Appendix H8. These studies address turbidity and total suspended solids from the construction phase along Offshore Export Cable Corridor 1, including portions of the cable route in Delaware state waters, and Onshore Export Cable South Corridor through Indian River Bay.

Additionally, as discussed in Sections 4.3.1.1.3 and 4.3.1.2.3, some of the material suspended by the plow may contain elevated levels of arsenic and nickel that are common nearshore and inshore in the Project area. Therefore, water quality impacts associated with jet plow operations are expected to be minor.

Appropriate avoidance and minimization measures for potential impacts associated with the low concentrations of heavy metals and PAHs that were detected in some of the sediment samples collected along Onshore Export Cable Corridor 1 will be addressed in the water quality certificate obtained for this Project under Section 401 of the Clean Water Act (CWA). For example, turbidity monitoring will be conducted during Project construction, if required by the permitting authorities.

Stormwater

Land-based construction activities related to the Project include the installation of the US Wind substations, associated laydown area and access roads. Potential stormwater impacts related to the construction of the Project include the discharge of sediment, or other pollutants, from the construction site(s) that may impact the quality of waters of the state. The total volume of stormwater discharge from the construction site is dependent on factors such as the size of the site and overall weather conditions.

The DNREC regulates construction activities that result in land disturbance equal to or greater than one acre that discharge stormwater to Waters of the State through the National Pollutant Discharge Elimination System (NPDES) Construction General Permit, effective March 11, 2021. Construction of the Project may result in the disturbance of approximately 0.08 square kilometers (km^2) (20 acres) of land during the construction activities noted above. US Wind anticipates that a Construction General Permit will be required and will develop an associated Stormwater Pollution Prevention Plan (SWPPP) for construction activities as appropriate. The use of HDD at the landfalls will minimize water quality impacts in the nearshore environment, and gravity cells will help to contain sediment that becomes suspended in the water column. Some sediment may be displaced during the installation and removal of the gravity cells; however, this would be a relatively small volume of material that would settle out relatively quickly. Consequently, water quality impacts associated with HDD are anticipated to be negligible.

Cable Installation and Dredging

Alternative cable installation methods may be necessary in Indian River Bay (e.g., vibro-injector or trenching) where jet plow operation is not feasible. This would result in suspended sediment concentrations that may vary from what would be produced by jet plow installation methods. However, increases in suspended sediment would still be expected to be temporary. Therefore, water quality impacts associated with alternative cable installation methods, if used, are anticipated to be minor.

Impacts from dredging would also result in increased suspended sediment concentrations. However, these impacts are expected to be less than those resulting from jet plow installation and are anticipated to be negligible (see Appendix G).

The use of HDD at the landfalls would minimize water quality impacts in the nearshore environment, and gravity cells would help to contain sediment that becomes suspended in the water column. Some sediment may be displaced during the installation and removal of the gravity cells; however, this would be a relatively small volume of material that would settle out relatively quickly. Consequently, water quality impacts associated with HDD are anticipated to be negligible.

Potential impacts associated with the low concentrations of heavy metals and PAHs that were detected in some of the sediment samples collected along Onshore Export Cable South Corridor would be negligible due to the avoidance and minimization measures in place and not violate the Delaware water quality criteria (per Appendix S Section 9a). For example, turbidity, total suspended solids, and water quality monitoring is anticipated during Project construction based on consultations with the permitting authorities.

Routine/Accidental Releases

During the course of construction, pollutants may be discharged into the environment as part of routine activities, such as the operation of construction vessels and vehicles, or due to accidental spills. Pollutants may be discharged directly into a waterbody or discharged into the air and deposited on the surface of a waterbody. It is anticipated that these releases will have a negligible impact on water quality.

Installation of the export cables would require the operation of vessels. Any discharge of greywater, uncontaminated bilge and ballast water, and treated deck drainage from construction vessels would comport with USCG and United States Environmental Protection Agency (EPA) requirements. Refer to COP Volume I, Section 5.1 for a discussion of waste generation and disposal (US Wind 2023b). In addition, Appendix H1 describes potential wastes generated by the Project and the means of storage or discharge. Volumes would be typical of those used in maritime construction activities.

While oil and grease, sanitary waste, and solid waste would be stored securely until they can be disposed on land in accordance with the Code of Federal Regulations (CFR) (33 CFR 151.10, CFR 140 and 149, and 33 CFR 151.51-77), it is possible that small amounts of litter could be unintentionally released to surface waters. Any de minimis amounts of litter inadvertently released during construction of the Project would be insignificant in comparison to the high existing levels of marine debris along the coastline within the Project area.

Procedures for preventing and controlling spills would be documented in the Project's Construction Spill Prevention Control and Countermeasures (SPCC) Plan and Oil Spill Response Plans (OSRP). The OSRP can be found in COP Appendix I-A. A Project-specific SPCC Plan would be prepared prior to construction and for operations activities. As described in COP Volume II, Section 5.0, vessel engines would emit particulates into the air as they combust fuel (US Wind 2023b). Vessels would comport with air permitting and emissions limitations and violations are not anticipated. In addition, the emissions of construction vessels would be insignificant in comparison with other existing sources of atmospheric deposition that impact the Atlantic Ocean. The OSRP located in COP Appendix I-A would mitigate any impacts (US Wind 2023b). As such, water quality impacts due to routine and accidental releases are anticipated to be negligible.

The HDD operation would include a drilling fluid fracture or overburden breakout monitoring program during borehole drilling operations to minimize environmental impacts, which at worst will be temporary and localized. The use of gravity cells would help contain any HDD drilling fluids that may be released. In the case of potential inadvertent release of HDD drilling fluids, nearshore waters of the Atlantic Ocean, Indian River Bay, and the Indian River could be affected by localized release of HDD drilling fluids from deeper subsurface borehole drilling, if drilling fluids are released and not properly contained by the gravity cells. However, HDD drilling fluids (bentonite, clay and water) are biologically inert and would not cause appreciable poor water quality conditions. The bentonite contained in the drilling fluid would gel or coagulate upon contact with saline or brackish water. In the event of a fluid release, the bentonite fluid density and composition would cause it to remain as a cohesive mass on the seabed, which can be quickly cleaned up and removed by diver-operated vacuum equipment. Given the small area covered and the short-term duration of HDD operations, impacts to water quality are expected to be negligible.

Construction vehicles would also emit particulates into the air as they combust fuel. While these particles could settle on the surface of the Indian River, Indian River Bay, or the Atlantic Ocean, much of the pollution associated with vehicle emissions would settle over land. The operation of construction vehicles in the Project area would be short-term and temporary, and insignificant when compared to existing sources of atmospheric pollutants that impact the Inland Bays and the Atlantic Ocean. Therefore, water quality impacts due to routine and accidental releases are anticipated to be negligible in nearshore waters. Project activities would comply with all reporting and monitoring conditions established under applicable permits.

4.3.2.1.2 Offshore Export Cable Corridor 1

Sediment transport modeling for the Offshore Export Cable Corridors has been provided as Appendix H7. These studies address turbidity and total suspended solids from the construction phase along Offshore Export Cable Corridor 1, including portions of the cable route in Delaware state waters.

Impacts for the Offshore Export Cable Corridors would be the same as those described above in Section 4.3.2.1.1.

4.3.2.2 Operations

4.3.2.2.1 Onshore Export Cable South Corridor

Suspended Sediment/Deposition

Temporary increases in suspended sediment and resulting deposition would be possible during emergency cable repairs, if these become necessary over the course of Project operation, due to cable replacement and/or repair vessel anchoring. However, increases in suspended sediment concentrations would not be a routine occurrence during operations and would have localized impacts similar to or less than the impacts of construction; therefore, their impact on water quality is expected to be negligible.

Routine/Accidental Releases

It is anticipated that routine and accidental releases associated with the Project would have negligible impacts on water quality during operations. Over the lifetime of the installation, regular maintenance will be necessary, as well as potential non-routine repairs. Maintenance personnel and equipment will access the submarine cables by boat. Boats traveling to the Project area may discharge sanitary waste, litter, and engine emissions into the Atlantic, as described above. However, the discharged volume of these materials would be small and unlikely to have a measurable impact on water quality. Materials such as paint, solvent, or lubricant could also be spilled during maintenance work, but these would also be used in relatively small quantities. Boats may also experience accidental oil spills. These scenarios are unlikely to occur, and spill prevention plans would mitigate any impacts. Because marine discharges are not a part of routine operations for the Project, it is anticipated that they would have a negligible impact on water quality.

4.3.2.2.1 Offshore Export Cable Corridor 1

Impacts for the Offshore Export Cable Corridors would be the same as those described above in Section 4.3.2.2.1.

4.3.3 Avoidance and Minimization

US Wind has, during Project planning, and will, during construction and operation, implement the following avoidance and minimization measures to reduce Project impacts on water quality.

- Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts to water quality:
    - No in-water work (e.g., cable installation, HDDs, dredging) in Indian River Bay March 1 through September 30.

- No HDD activities in the Atlantic to the beach landfall from April 1 through September 15 (inclusive of recreational period avoidance from May 15 through September 15).

- Sediment disturbance associated with submarine cable laying will be minimized by jet plowing, HDD techniques and the use of gravity cells where feasible.
- Turbidity monitoring will be conducted during construction as required by the permitting authorities. Conduct TSS and water quality monitoring during cable installation activities and post installation as needed.
- A drilling fluid fracture contingency plan will be in place prior to the start of HDD activities. Operations will be shut down immediately in the event a frac-out occurs.
- US Wind will monitor for and report any environmental release or fish kill to the appropriate authorities, e.g., in Delaware State waters, reports will be made via DNREC 24-hour hotline.
- Project-specific SPCC Plan and Oil Spill Response Plan will be prepared prior to construction and for operations activities.
- US Wind will develop a SWPPP for onshore construction activities, as appropriate.
- Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in Bureau of Safety and Environmental Enforcement (BSEE) Notices to Lessees (NTL) No. 2015-G03 *Marine Trash and Debris Awareness and Elimination*, per BOEM guidelines for marine trash and debris prevention.
- Vessels will adhere to USCG guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.

4.4 Wetlands and Waterbodies

Shoreline composition was evaluated as required by Section 11c of the DNREC Appendix S New Dredging Projects Form and Sections 6, 8, 9, and 10b of Appendix M Activities in State Wetlands.

4.4.1 Description of the Affected Environment

The Project area includes coastal habitat between marine subtidal unconsolidated bottom on the Atlantic coast of the barrier beach to the east and intertidal salt marsh located at the substation landfall to the west. The following components of the Project are located within coastal habitat; the Barrier Beach Landfall, Onshore Export Cable South Corridor, and the proposed HDD locations within Indian River Bay. The habitat affected by each of these components is described below.

4.4.1.1 Barrier Beach Landfall

Coastal habitats in the vicinity of the Barrier Beach Landfall, defined as the Offshore Export Cable landfall location at 3R's Beach including the area where Onshore Export Cables would enter Indian River Bay via HDD to the west, includes areas that fall under the following National Wetland Inventory (NWI) classifications: estuarine and marine deepwater (marine and estuarine subtidal unconsolidated bottom), estuarine and marine wetland (marine and estuarine intertidal unconsolidated shore, Atlantic coastal beach and dune, and tidal salt marsh), freshwater emergent wetland (non-tidal freshwater marsh), and freshwater forested/scrub-shrub (non-tidal freshwater scrub-shrub wetland). These habitat types are discussed in the following sections and shown in Figure 4.4-1. Location of gravity cells and export cable routes are approximate. All cables and HDDs would be under the habitat types identified.

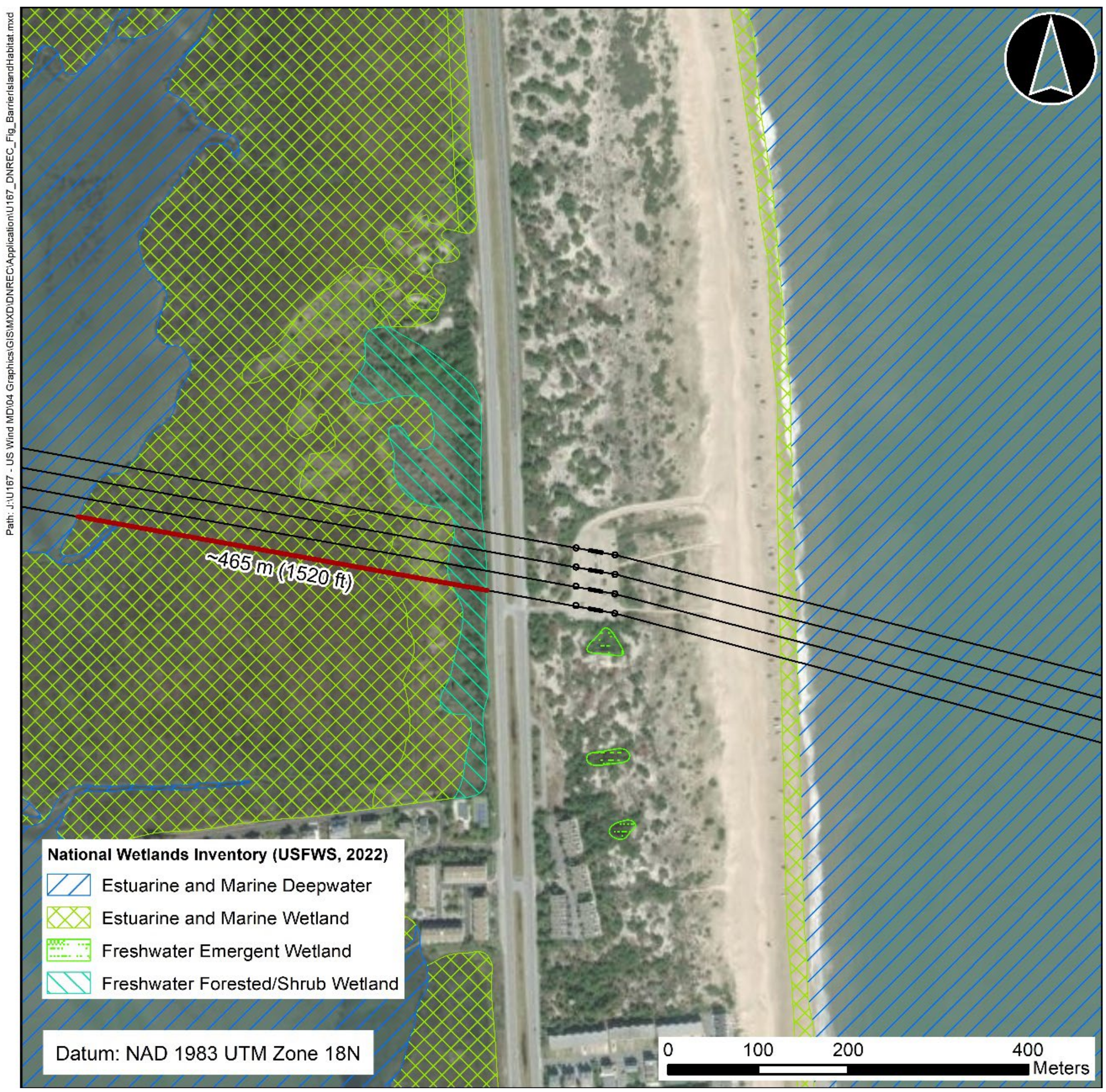

Figure 4.4-1. Barrier Beach Landfall Coastal Habitat – 3R's Beach

Unconsolidated Bottom and Shore

Largely unvegetated, regularly flooded, marine intertidal unconsolidated shore of the sand subclass (M2US2N) (USDOI and USFWS 2018b)) occupies the intertidal zone on the eastern side of the 3R's Beach landfall. Marine subtidal unconsolidated bottom (M1UBL) (USDOI and USFWS 2018b)) is located east of the intertidal shore. There is estuarine subtidal unconsolidated bottom (E1UBL) (USDOI and USFWS 2018b)) in Indian River Bay, west of 3R's Beach. As described in Section 5.2.1.2, sediment cores collected in Indian River Bay during 2016-2017 surveys indicate that the substrate is a mixture of predominantly sand (approximately 65%) and silt (approximately 35%).

Atlantic Coastal Beach and Dune

Above the high-tide line, sandy beaches extend landward to grassy dunes and overwash areas, to a complex of shrub-dominated back dunes. Coastal dunes near the 3R's Beach Landfall support a variety of grasses, however the dominant species is American beach grass (*Ammophila breviligulata*). These grassed areas develop on the crests and faces of primary foredunes as well as within the backdune area. Seabeach amaranth (*Amaranthus pumilus*), a federally threatened species, may occur in dune habitats near the Project area and is discussed in Section 4.13.1.4. Construction activity at 3R's Beach Landfall is proposed entirely within the already disturbed parking lot area and would not encroach on coastal beach or dune habitat. According to the Dune Encroachment Reduction Worksheet, attached to Appendix B Seaward Beach Construction Permit Application, construction within the vicinity of 3R's Beach is anticipated to have negligible impacts towards the surrounding dune ecosystem.

Tidal Salt Marsh

The eastern side of Indian River Bay in Delaware Seashore State Park includes 0.65 km^2 (160 acre) of estuarine intertidal salt marsh. Salt marsh consists of two distinct habitats: high marsh (E2EM1Pd) (USDOI and USFWS 2018b)) and low marsh (E2EM1Nd) (USDOI and USFWS 2018b)). The former occurs at a higher elevation, where it is subject to shorter tidal inundation, while the latter is flooded for extended periods during daily tidal cycles. High marsh experiences a salinity ranging from 18 to 30 parts per thousand and is dominated by saltgrass (*Distichlis spicata*) and saltmeadow cordgrass (*Spartina patens*) (Mitsch and Gosselink 2007). High marsh also provides microhabitats such as tidal creeks, salt pannes and pools. The more seaward low marsh is a stressful environment for most plant species due to high salinity and frequent flooding and is predominately vegetated by smooth cordgrass (*Spartina alterniflora*).

Non-tidal Freshwater Scrub-Shrub Wetland

A 0.03 km^2 (6.70 acre) non-tidal freshwater scrub-shrub wetland (PSS3A) (USDOI and USFWS 2018b) is located on the western or inland side of the landfall location at 3R's Beach, adjacent to Route 1, approximately 1.6 km (1 mile) south of the Indian River Bay Inlet. This wetland type only experiences temporary flooding and is able to support shrubs and low saplings. Loblolly pines

(*Pinus taeda*), black gum (*Nyssa sylvatica*), red maple (*Acer rubrum*), red cedar (*Juniperus virginiana*), and American holly (*Ilex opaca*) are saplings that may be found in scrub-shrub wetlands around Indian River Bay (DCIB 2017). These trees may provide nesting habitat for piscivorous birds that forage in salt marshes, such as bald eagles (*Haliaeetus leucocephalus*), egrets, herons, and osprey (*Pandion haliaetus*) (DCIB 2017).

Non-tidal Freshwater Marsh

The HDD operations area would be staged out of the proposed landfall location at the existing 3R's Beach parking lot. There is an 809 square meter (m^2) (0.2 acre) freshwater marsh (PEM1E) (USDOI and USFWS 2018b)) immediately south of the parking lot. The dune and swale landforms in this area create wetland habitat in the depressions between sand dunes. The Bethany Beach Firefly (*Photuris bethaniensis*), named for its type locale south of the Barrier Beach Landfalls, inhabits shrub thickets in these interdunal swales (Heckscher and Bartlett 2004). For additional information on threatened and endangered species information refer to Section 4.12 of this document.

4.4.1.2 Onshore Export Cable South Corridor

From the Barrier Beach Landfall at 3R's Beach, Onshore Export Cable South Corridor continues westward across Indian River Bay. The benthos of Indian River Bay are discussed in Section 4.5 of this document. The shoreline composition is addressed in Section 4.9 of this document. The area of Indian River Bay surveyed by US Wind in 2022 did not indicate the presence of any SAV, and some data suggests that Indian River Bay does not currently host SAV (DCIB 2017). Hummocks, areas of higher elevation that provide coastal habitat for wildlife, are dispersed throughout Indian River Bay. The locations of these hummocks shift over time due to sediment transport and deposition in Indian River Bay.

4.4.1.3 Substation Landfall

After crossing Indian River Bay, Onshore Export Cable South Corridor would travel up the Indian River and under a tidal salt marsh and uplands before connecting to the proposed Interconnection Facilities. A 0.18 km^2 (45 acre) estuarine intertidal high marsh (E2EM1Pd) (USDOI and USFWS 2018b) has established in the low-energy environment on the inside of a meander bend about 2.7 km (1.7 mi) from the confluence of Indian River and Pepper Creek at Indian River Bay. The marsh is partially ditched or drained, indicating that it has a history of human impact.

A relatively small freshwater mixed (needle-leaved evergreen and broad-leaved deciduous) forested wetland (PFO4/1Cd) has been mapped just inland from the salt marsh and northeast of the Indian River Substation (see Appendix C2) (USDOI and USFWS 2018b). This wetland type is considered a habitat of conservation concern because it is rare in the state and has the potential to harbor a high diversity of uncommon species.

In May 2021, Landmark Science & Engineering (Landmark) performed a wetland field delineation in the area around the proposed US Wind substations and substation landfall, shown in Appendix C2. Investigation of the study area concluded that vegetated tidal wetlands and non-tidal wetland fringe were present in relation to Indian River and Indian Creek. In addition to tidally influenced areas, the upland portion of the study area contains scrub-shrub vegetation and saplings. Based on this field delineation, the upland area is mostly mixed forest vegetation, mainly deciduous and coniferous species. There is a large emergent tidal wetland with a non-tidal wetland fringe along the border with the Indian River. North of the existing substation there is an emergent forested non-tidal wetland, which may be of conservation concern, as noted above. On the westernmost side of the study area, there is an emergent scrub/shrub tidal wetland with a non-tidal wetland fringe. The detailed results can be found in Appendix H14.

4.4.2 Potential Impacts of the Project on Wetlands and Waterbodies

Temporary and permanent changes which would be caused by the proposed Project and the impact of these changes was evaluated as required in Section 6 of the DNREC Appendix M Activities in State Wetlands Form (see Appendix A).

4.4.2.1 Construction

Habitat Alteration

The 3R's Beach Landfall is planned in the existing parking lot that has already been disturbed and are expected to have negligible habitat alteration impacts. The transition vault box would be installed, and HDD operations would occur in the proposed landfall location at the existing 3R's Beach parking lot, which is already disturbed. Any material from land-based excavations would be stockpiled in accordance with a storm water management plan and used for backfill or repurposed as required. Limiting ground disturbance to the parking lot also avoids impacting the hydrology of the site since the parking lot is already a compacted surface.

The Offshore Export and Onshore Export Cables would be installed using HDD. The HDD operations would only disturb the ground at the bore entry and exit for each cable. By minimizing ground disturbance, the Project minimizes the area in which complex vegetation re-establishment may be needed. A draft frac out plan is provided as an attachment to Appendix M in Appendix A, Wetlands and Subaqueous Lands Section Permit Application Form, for DNREC review and consideration.

DNREC has suggested a 100-ft setback from wetlands at the US Wind Substations site. However, this is not possible due to various site constraints. US Wind proposes the use of a 50-ft buffer to avoid and minimize impacts to wetlands where feasible.

Because ground disturbance will be minimized using the proposed construction approach, it is anticipated that habitat alteration of wetlands and waterbodies in the Project area will be negligible. According to the Dune Encroachment Reduction Worksheet, attached to Appendix B

Seaward Beach Construction Permit Application, construction within the vicinity of 3R's Beach is anticipated to have negligible impacts towards the surrounding dune ecosystem.

Routine and Accidental Releases

Vessel traffic associated with construction activities is expected to produce routine and accidental releases of pollutants that would have negligible impacts on wetlands and waterbodies. Construction-related impacts from routine and accidental releases, including drilling fluid that could be released in the event of a frac-out during HDD, are discussed in detail as COP Volume II, Section 4.2.1 (US Wind 2023b). Spills of oil and hazardous chemicals can inhibit the growth of aquatic plants and harm or kill aquatic animals. Litter and other marine debris can also injure or suffocate aquatic animals. However, since the routine releases associated with this Project are anticipated to be small quantities of clean discharge and accidental releases associated with this Project are unlikely, the impacts of routine and accidental releases associated with the Project are anticipated to be negligible.

4.4.2.2 Operations

Routine and Accidental Releases

Potential impacts to wetlands and waterbodies due to routine and accidental releases associated with Project operations and maintenance are anticipated to be less than impacts associated with construction. Potential impacts of routine and accidental releases during operations and maintenance are discussed in detail in Section 4.3.2.1. Vessels may be used to transport maintenance materials and personnel to the Project in the event that the submarine cables are in need of repair. Vessels may release sanitary waste and engine emissions as part of their routine operations and may inadvertently release trash, oil, or other chemicals that could impact wetlands and waterbodies; however, the impact of these releases is anticipated to be negligible due to the anticipated low frequency of maintenance and the low likelihood of accidental discharge.

4.4.3 Avoidance and Minimization

The Project has been sited and designed to avoid and minimize potential impacts to wetlands and waterbodies by using previously disturbed areas, such as existing ROW or ROW under development, as practicable, and the use of HDD technology to install the Onshore Export Cables under wetland areas. Where avoidance is not possible, the Project proposes to minimize wetland impacts during construction by maintaining buffers around wetlands, implementing best management practices (BMPs) for erosion and sediment control, and maintaining natural surface draining patterns, as practicable.

Avoidance and minimization have been evaluated as required by Appendix B, Supporting Application Materials for Coastal Construction Permit and Appendix M in Appendix A, Wetlands and Subaqueous Lands Section Permit Application Form. US Wind will implement the following measures to reduce Project impacts on wetlands and waterbodies.

- US Wind will install cables using HDD to avoid impacts to coastal dunes and interdunal wetlands and to minimize bottom disturbance. An approved frac out plan will be implemented during construction.
- US Wind will minimize ground disturbance by confining cable infrastructure, such as transition vaults and HDD operations, to previously disturbed lands as much as practicable.
- Onshore construction activities will be scheduled to avoid impacting sensitive coastal habitats, where practicable.
- Between May 1 and August 1, construction activities will not occur within 100 m (328 ft) of hummocks in Indian River Bay in order to avoid impacts to nesting terns.
- Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts to wetlands and waterbodies;
    - Installation of cables underneath tidal marshes will not be conducted during nesting season between April 1 through July 31.
    - Restrict nighttime artificial lighting restriction from June 1 through September 1 at Barrier Beach Landfall.
    - Avoid colonial waterbird nesting sites. Avoid construction at the Barrier Beach Landfall and in-water work in Indian River Bay during the nesting season.
    - US Wind would implement best practices such as diver surveys in Indian River for work between November 15 and March 1 to protect hibernating terrapins.
    - US Wind plans to install cables and conduct associated maintenance and monitoring outside of breeding season, April 1 to July 31, which would minimize impacts to marsh nesting birds.
- US Wind will minimize impacts on submerged aquatic vegetation where practicable. No submerged aquatic vegetation (SAV) has been identified in areas proposed for permanent or temporary disturbance.
- US Wind will establish and maintain buffers around wetlands, implement BMPs to minimize erosion and control sediments and maintain natural surface drainage patterns, as practicable.
- US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known nesting beaches, where feasible. The use of HDD for cable installation under the Barrier Beach Landfalls will avoid impacts on beaches.
- Construction is anticipated to occur outside of turtle nesting season. Agency consultation and monitoring will be conducted as needed to mitigate disturbances.
- Project-specific SPCC Plan will be prepared prior to construction and for operations activities.
- US Wind will develop a SWPPP for onshore construction activities, as appropriate.

- Agency consultation and monitoring regarding coastal habitats will be conducted as needed to mitigate disturbances, as practicable.
- US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, Protected Species Observers (PSO) data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

4.5 Benthic Resources

Temporary and permanent impacts were evaluated as required by Section 8a and 8c of the DNREC Appendix S New Dredging Projects Form and Section 10b of Appendix M Activities in State Wetlands(see Appendix A). A Benthic invertebrate survey was evaluated as required by Section 20.2e of the DNREC Appendix S New Dredging Projects Form (see Appendix A).

4.5.1 Description of Affected Environment

The Project Area includes benthic habitats in the DE state waters portion of Offshore Export Cable Corridor 1, and the Onshore Export Cable South Corridor located in Indian River Bay. US Wind conducted benthic habitat survey programs in 2021 (including sampling of Offshore Export Cable Corridor 1) and 2022 (Onshore Export Cable Corridor 1 in Indian River Bay). Results of these studies are summarized below and detailed in Appendix H11 and Appendix H12.

US Wind previously conducted studies of benthic habitats along a formerly planned Offshore Export Cable Route in 2016, and a formerly planned Onshore Export Cable Route in the Indian River Bay in 2017. The results of these superseded studies are available in Appendix H9 and Appendix H10 and are consistent with the surveys completed in 2021 and 2022.

Benthic field surveys completed within the Project area are summarized in Table 4.5-1. The most recent work, completed by US Wind in 2021, is summarized below. Additional information can be found in the COP (US Wind 2023b).

Table 4.5-1. Lease Area Geological Features and Hazards Summary

Surveyor	Year(2014)(2014)	Location(2015)(2015)	Type of Work
Northeast Fisheries Science Center Living Marine Resources Cooperative Science Center (Guida et al. 2017)	2013	- Vicinity of the Lease Area	- Sediment sampling - Benthic grab sampling - Survey trawls - Video surveys
ESS Group, Inc.	2015	- Portion of the Lease area (former location of the Met Tower)	- Benthic imagery

Table 4.5-1. Lease Area Geological Features and Hazards Summary

Surveyor	Year(2014)(2014)	Location(2015)(2015)	Type of Work
			- Benthic grab sampling
ESS Group, Inc.	2016	- Offshore Export Cable Corridors	- Benthic imagery - Benthic grab sampling
ESS Group, Inc.	2017	- Portion of Onshore Export Cable Corridor 1	- Benthic grab sampling

4.5.1.1 Lease Area

2021 Benthic Field Survey

The results of the 2021 Benthic Survey are provided as Appendix H11. The 2021 Benthic Survey Report delineates complex seafloor features using NOAA Fisheries modified CMECS classifications.

In July and August of 2021, US Wind contracted TRC Companies, Inc (TRC) (formerly ESS Group, Inc.) to carry out a Project-specific field survey of benthic resources in the Lease area. This survey involved the collection of benthic grabs at 120 locations across the Lease area, as well as collection of video transects via ROV at 70 locations.

Of the 120 benthic grab sample locations selected in the Lease area, 60 were fixed locations co-located with proposed WTG or OSS locations. These locations were selected to ensure broad geographic characterization of portions of the Lease area that may be directly impacted by Project construction. The other 60 locations were selected to characterize potential complex habitat, as identified by preliminary interpretation of the 2021 HRG acoustic data and supplemented by other existing sources of data (CB&I 2014; Alpine 2015; Guida et al. 2017). Areas targeted as potential complex habitat were mapped by one or more of these sources as more likely to contain unconsolidated hard bottom, such as gravel, gravel mixes, and gravelly substrates.

Of the 70 benthic imagery transects completed in the Lease area, ten were fixed locations co-located with proposed WTG or OSS locations. The remaining 60 imagery transects were selected to characterize the areas of potential complex habitat. The axes of these transects were aligned to capture features of interest (e.g., high-relief objects, areas of higher reflectivity or rugosity) based on preliminary interpretation of the 2021 HRG acoustic data.

4.5.1.2 Offshore Export Cable Corridors

The deeper waters of the Offshore Export Cable corridor 1 are euhaline, with vertical thermal and salinity gradients during the summer months. Shallower coastal waters near the offshore landfall are typically well-mixed throughout the year and subject to more variable temperatures, as described in Section 5.3.1.1.1.

Benthic habitats in nearshore shelf and offshore areas of Delaware are primarily composed of reworked Holocene deposits with sand as the dominant grain size in most areas (Reid et al. 2005; Coastal Planning & Engineering 2014). The area is generally shaped by sedimentary processes from high wave energy in the Atlantic Ocean. The intense wave action has generated sandy ridges interspersed with depressions, the spacing of which vary substantially with distance from shore. These features tend to become larger and more widely spaced toward the southeast, where they may be spaced 2 to 4 km (1.2 to 2.4 mi) apart and extend tens of kilometers (tens of miles) from end to end. The ridges and adjacent depressions are generally oriented along a southwest to northeast axis with a maximum relief of 5 to 10 m (16 to 32 ft) from trough to crest . The Offshore Export Cable Corridor 1 traverses the northern periphery of these ridges where the relief is generally less pronounced and takes the form of broad flats in some areas.

Benthic habitats in Delaware coastal waters are variable, but are often dominated by sandy substrates with varying levels of gravel and or silt, and shell hash (Cutter et al. 2000). A prior study of the benthic community in Delaware coastal waters suggests dominance of fine-grained benthic habitats by polychaete worms, followed by mollusks and crustaceans (Cutter et al. 2000). Among polychaetes, the ampharetid worm *Asabellides oculata*, the mud worm *Spio setosa*, and the bee worm *Spiophanes bombyx* were common. The majority of mollusks observed were bivalves, though gastropods were also present at lower densities. The crustacean assemblage was dominated by amphipods, although crabs, cumaceans, and other taxa were also present. On coarser substrates, mollusks and crustaceans comprised a larger portion of the benthic community, with Astarte clams (*Astarte* spp.), the crenella bean mussel (*Crenella glandula*), blue mussel (*Mytilus edulis*), and the amphipod *Byblis serrata* most common. Infaunal organism abundance varied greatly, ranging from 90/m^2 to 70,600/m^2. Likewise, taxa richness varied from three to 40 taxa per sample.

2021 Benthic Field Survey

The results of the 2021 Benthic Survey are provided as Appendix H11. The 2021 Benthic Survey Report delineates complex seafloor features using NOAA Fisheries modified CMEC classifications.

In July and August of 2021, US Wind contracted TRC to conduct a field survey of benthic resources along the Common Export Cable Corridor, Offshore Export Cable Corridors, and Lease Area (Figure 4.5-1). A portion of Offshore Export Cable Corridor 1 is located within DE State waters; results of this survey are presented below.

In developing earlier versions of its benthic habitat assessment and mapping approach, US Wind relied on guidance from the BOEM June 2019, *Guidelines for Providing Benthic Habitat Survey*

Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585. However, following issuance of the Greater Atlantic Regional Fisheries Office's (GARFO) May 27, 2020 *Updated Recommendations of Mapping Fish Habitat* (NOAA Fisheries 2021b), subsequent consultations with BOEM and GARFO on June 15, 2020, and GARFO's March 29, 2021 *Updated Recommendations for Mapping Fish Habitat*, US Wind revised its habitat mapping approach for surveys that were undertaken in 2021.

In the Offshore Export Cable Corridors, preliminary acoustic survey results were not available prior to initiating selection of the benthic sample locations. Therefore, benthic sample locations were selected at discrete intervals of approximately 1 km (0.62 mi) to provide geographic coverage for characterization of benthic habitats.

The 2021 benthic habitat survey program was conducted in July and August of 2021. It included collection of 0.04 m^2 (0.43 ft^2) benthic grabs, still imagery, and video transects. Separate benthic grab samples were collected and processed for bulk physical and macrofaunal analysis at each sampling location. Still plan view imagery was collected at each benthic grab location using a grab-mounted camera. Video transects were approximately 180 m in (590 ft) length and included collection of both oblique and plan view imagery.

The results of the fully processed acoustic mapping and targeted seafloor sampling have been integrated to produce final data products that include both characterization and delineation of benthic habitat according to the NOAA Fisheries-modified CMECS taxonomic framework identified in GARFO's March 29, 2021 *Updated Recommendations for Mapping Fish Habitat*.

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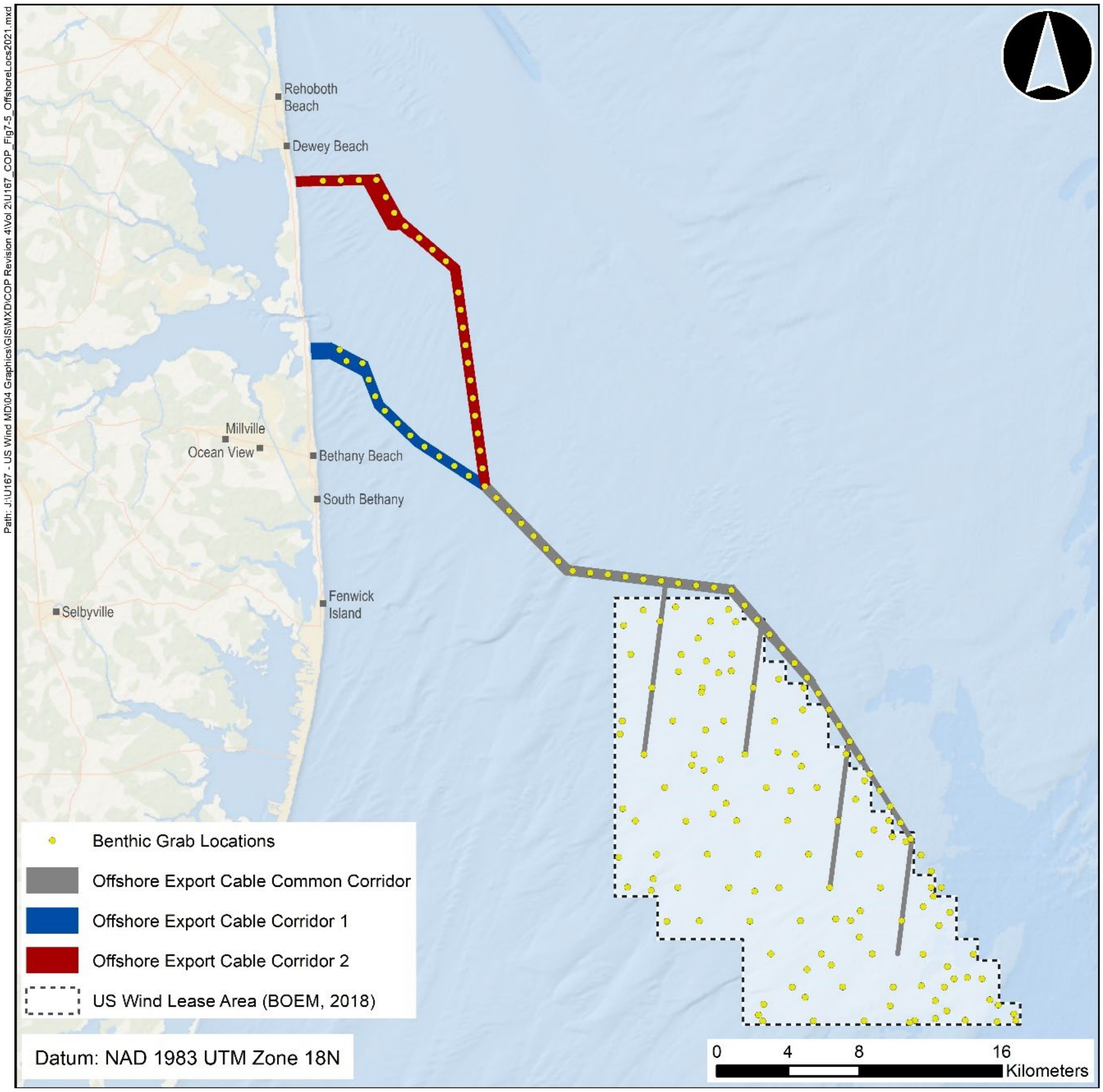

Figure 4.5-1. 2021 Benthic Field Survey Sample Locations

4.5.1.3 Onshore Export Cable South Corridor

Onshore Export Cable South Corridor extends through Indian River Bay from 3R's Beach landfall location to the vicinity of the Indian River Substation. Salinity and sediment composition are the major factors controlling benthic species distribution in Indian River Bay (DIBEP 1993) . Indian River Bay exhibits a strong salinity gradient with salinity generally increasing from west to east, as described in Section 4.3.1.2.1.

Onshore Export Cable South Corridor primarily traverses the polyhaline portion of Indian River Bay, where salinities approach marine conditions and generally remain above 18 psu (DIBEP 1993; DEMAC et al. 2017). However, the westernmost portions of Onshore Export Cable South Corridor, including the substation landfall, are located in the mesohaline zone, where salinity tends to be lower but also highly variable, depending on the magnitude of freshwater inputs from Indian River and other watershed tributaries. Benthic habitat in Indian River Bay is diverse and consists of areas of mud, sand, and mixed substrate (Chaillou et al. 1996). Muddy substrates are more prevalent than sand, especially in the upper portion of Indian River Bay. The overall silt-clay content in the Indian River Bay system is estimated to be 60 percent (Chaillou et al. 1996).

A review of historical data (for the period 1974-1976) characterized the benthic community structure of each salinity region within Indian River Bay (DIBEP 1993). Samples from the mesohaline region, which includes the area near the substation landfall, contained an average of 19 species and had an average density of 6,776 individuals/m^2. Polychaetes accounted for 49 percent of all taxa in this salinity segment, with the disturbance-tolerant spionid worm *Streblospio benedicti* comprising the majority of individuals. Crustaceans accounted for 34 percent of all taxa, with the aorid amphipod *Leptocheirus plumulosis* and the ampeliscid amphipod, *Ampelisca abdita,* comprising the majority of individuals. Bivalves accounted for four percent of all taxa in this salinity segment, with the amethyst gem clam (*Gemma gemma*) and dwarf surf clam (*Mulinia lateralis*) comprising the majority of individuals.

Samples from the polyhaline region of Indian River Bay were similar to those collected from mesohaline areas in both taxonomic diversity and organism density, but differed in community composition (DIBEP 1993). Polyhaline samples contained an average of 18 species, and organism density averaged 6,484 individuals/m^2. Polychaetes accounted for 31 percent of all taxa in polyhaline areas of Indian River Bay. The capitellid worm *Heteromastus filiformis* was the most abundant species, followed by the spionid worm *S. benedicti.* Crustaceans also accounted for 31 percent of all taxa, with the amplescid amphipod *A. abdita* and the aorid amphipod *L. plumulosus* comprising the majority of individuals. Mollusks, including commercially important shellfish, were more abundant in polyhaline areas of Indian River Bay than in all other regions. Mollusks accounted for 27 percent of all taxa in the region, and blue mussel and the clam *Macoma tenta* were the most abundant species (DIBEP 1993). A more recent assessment of benthic communities in Indian River Bay, conducted in 1993, identified a total of 141 species from 15 different taxonomic groups with an average of 17 taxa per sample (Chaillou et al. 1996). Chaillou et al (1996) also reported an average density of 34,889 organisms/m^2 in Indian River Bay samples, which is much higher than reported from and earlier survey conducted by the Delaware

Inland Bays Estuary Program Scientific and Technical Advisory Committee (DIBEP) (DIBEP (1993).

Community composition also differed between the two studies; the most abundant taxonomic group observed by Chaillou et al. (1996) was crustaceans (75 percent of total abundance), with polychaetes accounting for only 17 percent of the total abundance. However, polychaetes were the most taxonomically rich group with 60 species, followed by crustaceans (29 species), bivalves (15 species), and gastropods (12 species). The most abundant crustacean species were the amphipods *A. abdita* and *Corophium acherusicum*. *S. benedicti* and *Mediomastus ambiseta* were the most abundant polychaetes. Of the bivalves and gastropods, the northern dwarf tellin (*Tellina agilis*), amethyst gem clam, and the pitted baby-bubble (*Rictaxis punctostriatus)* were the most abundant species. Chaillou et al. (1996) concluded that approximately 77 percent of Indian River Bay is characterized by degraded benthic habitat.

2022 Benthic Field Survey

The results of the 2022 Benthic Survey are summarized below and provided as Appendix H12. This benthic report delineates complex seafloor features using NOAA Fisheries modified CMEC classifications.

A field survey of benthic resources within Indian River Bay in the area of the Onshore Export Cable Corridors was conducted in August of 2022 (Figure 4.5-2) as part of US Wind's analysis of cable routing options through Indian River Bay. The survey involved collection of benthic grabs at 35 locations, including the selected route through Indian River Bay – Onshore Export Cable South Corridor which includes what was referred to in the 2022 survey as the Onshore Export Cable Common Corridor.

The taxa observed across the Onshore Export Cable Corridors are typical of soft-sediment habitats, with no significant difference between survey locations. As part of the 2022 Indian River Bay sampling program, a shellfish density survey was conducted at the Bott and Wong (2012) sites that were accessible via wading (less than 1.2 m [4 ft] deep) (Bott and Wong 2012). Six hard clams were collected, ranging in size from 3.7-11.0 cm (1.5-4.3 in).

Shellfish

Mollusks were observed in Onshore Export Cable South Corridor benthic samples, consisting of tellin clams, chestnut clams, and a taxon of minute immature bivalve. Hard clams (*Mercenaria mercenaria*), a shellfish species of potential commercial importance, were encountered at sites IRB-BG-TRC-02, IRB-BG-TRC-05, IRB-BG-TRC-17, and IRB-BG-TRC-23 (see Appendix H12, Attachment C for additional information on shellfish in Indian River Bay). No taxa indicative of sensitive habitats (hard bottom areas, cold water coral reefs, seagrass beds, etc.) were observed in samples collected in the vicinity of the Onshore Export Cable Common Corridor, and no SAV was observed during sample collection.

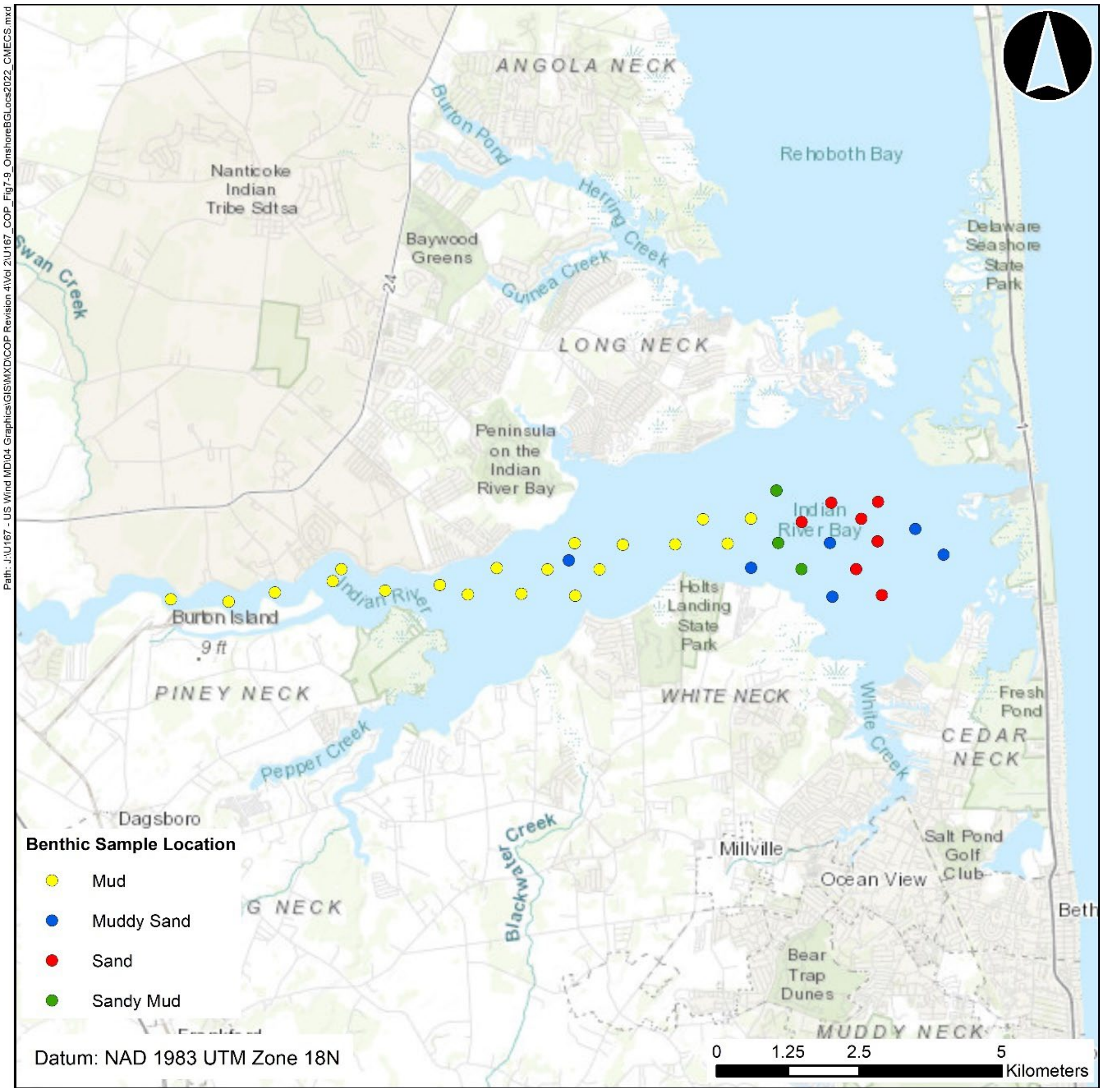

Figure 4.5-2. 2022 Onshore Export Cable Corridors Benthic Samples NMFS-modified CMECS Substrate Group Classification

As part of the 2022 Indian River Bay sampling program, a shellfish density survey was conducted, because the most recent publicly available study was conducted in 2011 (by Bott and Wong). Bott and Wong (2012) sites were selected based on water depth and used for sampling in 2022, as they needed to be accessible via wading (less than 1.2 m [4 ft] deep). A total of 48 locations were sampled (11 prior Bott and Wong (2012) locations, two additional sites added during the field survey based on local information, and the inclusion of shellfish collected as part of the benthic community assessment [35 locations]). Six hard clams were collected using a clam rake modified with a mesh wire sieve, ranging in size from 3.7-11.0 cm (1.5-4.3 in) (Figure 4.5-3). This report is provided as Attachment C to Appendix H12 and was previously submitted to DNREC.

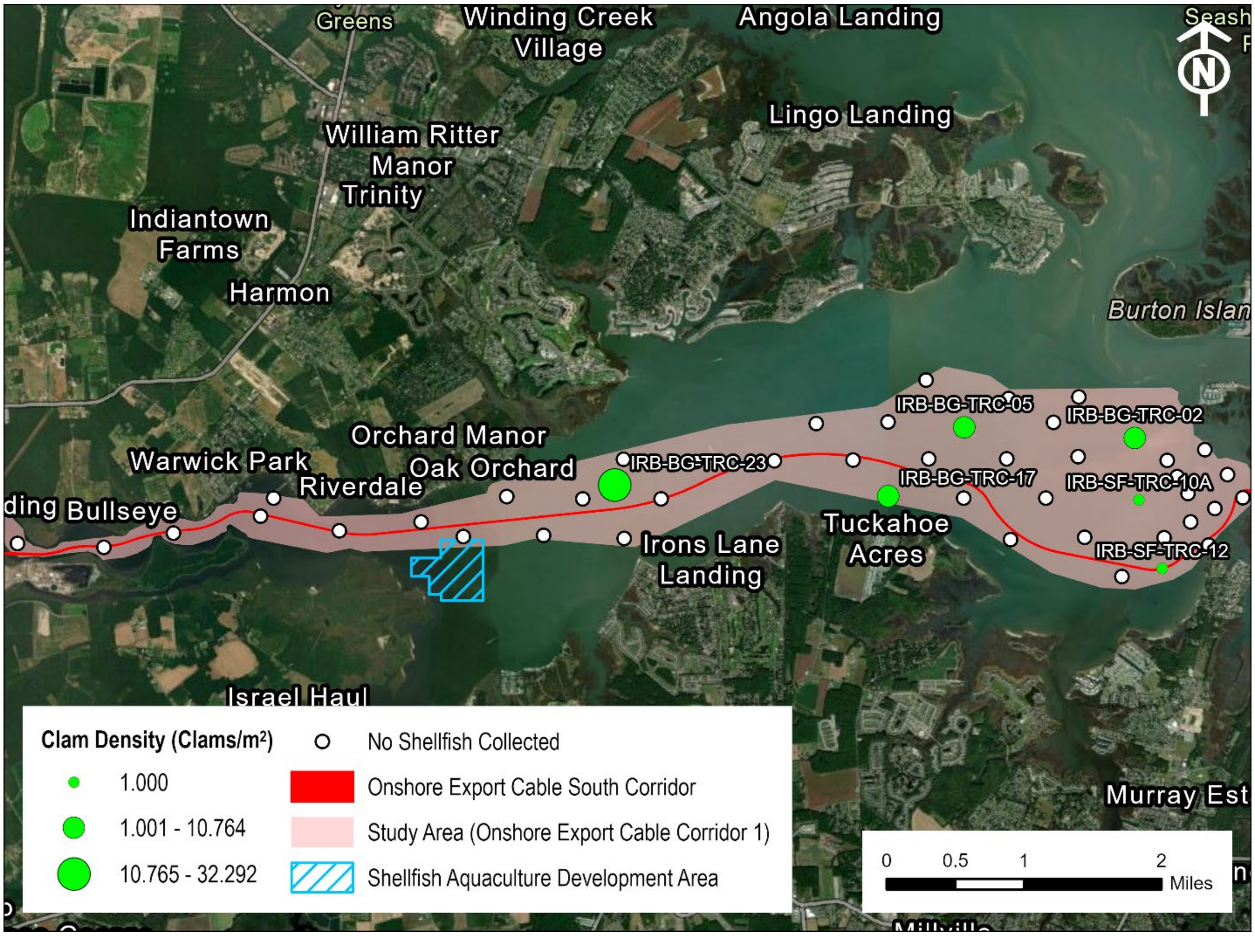

Figure 4.5-3. Shellfish Density Survey Results

Hard clam is the primary shellfish species of recreational and commercial concern in Indian River Bay. Hard clams are mapped as either absent or present at low densities over most of Onshore Export Cable Corridor 1, according to maps obtained from DNREC and surveys conducted in 2011 (Bott and Wong 2012). The formerly planned onshore export cable route does cross a narrow band mapped as moderate density hard clam beds. However, the intersection of the formerly planned onshore export cable route with these moderate density beds is unavoidable, as the beds extend from the mouth of White Creek northward across Indian River Bay to Steels Cove. Onshore Export Cable Corridor 1 will avoid areas mapped as high-density hard clam beds where feasible, and only one of the benthic samples collected during the field survey of the Corridor contained hard clams.

Although natural oyster reefs are no longer present in Indian River Bay (Ewart 2013), the state of Delaware has designated portions of Indian River Bay as shellfish aquaculture development areas (SADA) for oyster production (Figure 4.5-3). No leases in the Indian River Bay SADA have been issued for use. Two lease blocks have been removed due to the presence of hard clam beds and the remaining lease blocks are flagged as likely to be prohibited harvest areas in the next two years. Onshore Export Cable South Corridor avoids the SADA lease blocks.

4.5.2 Impacts

4.5.2.1 Construction

4.5.2.1.1 Onshore Export Cable South Corridor

Permanent Disturbance

There will be no permanent impacts to Indian River Bay resulting from the installation of the Onshore Export Cables. All impacts are expected to be temporary and negligible.

Temporary Disturbance

Habitat Alteration

The primary impacts to benthic organisms from construction activities would result from the installation of the submarine cables, anchoring, and seafloor disturbance due to dredging for cable burial in Indian River Bay and the use of gravity cells at the landfalls. Slow-moving or sessile organisms inhabiting benthic sediments in areas directly within the footprint of these activities would suffer mortality from crushing or burial. Although motile organisms, including crabs, lobsters, sea scallops, and horseshoe crabs, may be able to vacate installation areas and avoid direct mortality, these organisms could be temporarily displaced by construction activities.

Cables will be installed using a jet plow, which will minimize the area of temporary bottom disturbance compared to other installation methods (e.g., dredging). This installation method would result in maximum mortality-inducing disturbance of a corridor of seafloor along the length of the Onshore Export Cable Corridors. Sediment vibrations caused by movement of the cable installation equipment might elicit avoidance behaviors from certain mobile species (e.g., crabs, lobsters, amphipods), but sessile or slow-moving organisms that remain within the directly impacted portion of the cable laying area during installation would suffer mortality (USDOE and MMS 2009).

To minimize temporary impacts from potential anchoring, vessels would avoid anchoring in locations with sensitive habitats when possible and would utilize mid-line anchor buoys to decrease anchor line sweep impacts.

As described in Section 2.1.3.1 of this document, HDD would be used at the landfall locations to minimize impacts to nearshore habitats. For Onshore Export South Cable Corridor, this operation would require the installation of eight gravity cells, up to four on the Atlantic Ocean side of the barrier beach and up to four in Indian River Bay, and up to four gravity cells at the Indian River Substation landfall, which would require the excavation of sediment from an approximately 0.01 km^2 (1.8 acres) area. Organisms in the excavated area would suffer mortality but the gravity cells would be removed following HDD operations.

Although benthic communities would experience localized mortality and habitat disturbance during construction, these impacts are expected to be temporary and spatially limited. Organisms inhabiting soft sediment communities along Offshore Export Cable Corridor 1 are regularly exposed to natural disturbance due to the motile nature of sandy sediments in the region (Guida et al. 2017). These recurrent disturbance events contribute to spatial heterogeneity and resource patchiness in the region (S.F. Thrush and Dayton 2002), and organisms inhabiting this region are adapted to these conditions. Similarly, the benthic community represented in samples collected from the Onshore Export Cable South Corridor included many pollution-tolerant and opportunistic species, characterized by rapid dispersal capabilities and high reproductive rates suited to colonization of disturbed areas (e.g., *S. benedicti*, (Levin 1986); *M. ambiseta*, (Hughes 1996)).

As the areas disturbed by construction activities would constitute only a small percentage of benthic habitats in the region, and these habitats are already exposed to natural disturbance, organisms are expected to rapidly recolonize these locations from surrounding undisturbed habitats. Physical seafloor recovery has been observed to be more rapid in areas of fine-grained sand than in areas of medium to coarse grained sand (HDR 2018). Benthic communities in mobile sand habitats have also been observed to recover from natural sediment movement in less than a year (Lindholm, Auster, and Valentine 2004), though the rate of recovery can vary due to local species diversity and organism density. Studies examining dredging impacts have suggested benthic recovery times ranging from 3 months to 2.5 years (Brooks et al. 2006), 1.5 to 2.5 years (D. H. Wilber and Clarke 2007) , or up to 3.0 years (D. H. Wilber and Clarke 2007). Recovery times are impacted by the size of the disturbed areas and the composition of the benthic community in surrounding habitats (D. H. Wilber and Clarke 2007) , although community composition may not return to baseline conditions until three or more years after the disturbance event (BOEM 2016).

Bottom-disturbing activities, including cable laying and dredging for cable burial, would only disturb benthic habitats in a small portion of Delaware state waters. Large areas of undisturbed benthic habitat would be preserved, which will allow for rapid recolonization of impacted areas. As the Project has been sited to avoid sensitive or rare habitats, including hard bottom areas, artificial reefs, clam beds, and SAV beds, impacts to the benthic community due to installation-related habitat alterations are expected to be minor and temporary.

Suspended Sediment/Deposition

Seafloor-disturbing activities will cause localized and temporary increases in suspended sediment levels and sediment deposition rates, primarily near the areas dredged for burial of the submarine cables, but also near gravity cell locations.

Based on sediment transport results for Project activities, the vast majority of sediments disturbed during jet plow operation would quickly return to the cable installation trench. A portion of disturbed sediment would leave the immediate trench area, resulting in measurable, but temporary, increases in suspended sediment levels within 24 hours after the completion of jet plow activities. In Onshore Export Cable Corridors, temporary increases in suspended sediment are anticipated to occur within 1,400 m (4,600 ft) of jet plow operations. Sections 4.3 provide details of the expected suspended sediment and deposition due to construction activities.

Elevated suspended sediment concentrations can clog the filtering organs of filter feeding benthic invertebrates, leading to decreased feeding efficiency (S. Thrush et al. 2004). However, many bivalve species, including blue mussel, surf clam, and sea scallop, are able to cope with temporarily increased suspended sediment concentrations by selectively rejecting filtered inorganic material as pseudofeces prior to ingestion (Bayne et al. 1993; Robinson, Wehling, and Morse 1984; MacDonald and Ward 1994). Sessile filter feeding organisms, including tunicates, corals, and sponges are most sensitive to elevated suspended sediment concentrations (S. Thrush et al. 2004). However, the Project has been sited to avoid hard bottom habitats where these taxa are found. Impacts to benthic communities from increased suspended sediment levels are expected to be negligible.

Resuspension of contaminated sediments due to human activities can have negative impacts on benthic communities. However, impacts of this nature are not anticipated to result from Project activities, as sediments within the Project area are not known to be highly contaminated, as described in Sections 4.3.1.1.3 and 4.3.1.2.3. Therefore, exposure of benthic organisms to harmful levels of resuspended contaminants is not expected.

In areas where deposition is highest, benthic organisms may become buried. Surface-dwelling motile organisms and actively burrowing organisms are at low risk of harm from burial, as these species will be able to vacate the affected area during disturbance or unbury themselves. However, sessile or less motile buried organisms located in the disturbed area may experience mortality or metabolic impacts due to smothering. However, these conditions are expected to be localized and result in negligible to minor impacts to benthic communities.

4.5.2.1.2 Offshore Export Cable Corridor 1

Permanent Disturbance

Habitat Alteration

Permanent seafloor impacts could occur where burial depth of Offshore Export Cables may be insufficient, requiring the installation of cable protection in the form of rock or concrete mattresses. The location(s) of any cable protection cannot be determined until after installation. Should post-lay protection be necessary, US Wind would coordinate with DNREC and USACE to notify the extent and location of any mattresses needed. Installation of cable mattresses would crush or bury benthic organisms in the footprint. However, because cable laying operations will be located in areas with primarily sandy substrates, and the Project has been sited to avoid known hard bottom habitats to the extent possible, cable protection requirements are expected to be minimal.

Temporary Disturbance

Impacts due to habitat alteration suspended sediment deposition are discussed in Section 4.5.2.1.1. Additional temporary bottom disturbance will result from the use of jack-up vessels. Any depressions in the seafloor caused by the jack-up vessel legs are expected to backfill naturally.

4.5.2.2 Operations

4.5.2.2.1 Indian River Bay

Habitat Alteration

Direct mortality may also be caused by contact with equipment associated with maintenance or repair. However, the area of these disturbances is expected to be limited, and community-scale impacts are not anticipated due to rapid recolonization of impacted areas from nearby habitats.

Overall, O&M impacts to benthic resources from habitat alteration are anticipated to be minor.

Suspended Sediment/ Deposition

Certain activities associated with O&M such as cable repair will result in localized disruption of seafloor sediments and associated temporary increases in suspended sediment concentration. However, these impacts are anticipated to be limited in scope and extent. Therefore, O&M impacts to benthic resources from suspended sediment and deposition are anticipated to be negligible.

Electromagnetic Fields

The potential impacts of electromagnetic fields (EMF) on benthic invertebrates are understudied, and there is little to no information available about the impacts of EMF on most organisms, especially non-commercially-important taxa (BOEM 2021). One recent study documented subtle but statistically significant changes in the behavior of American lobster (*Homarus americanus*) when exposed to a 330 MW high voltage direct current (HVDC) submarine cable (Hutchison et al. 2018). However, all non-DC types of submarine cables generate limited magnetic fields (Sharples 2011), and no biologically significant impacts on benthic resources have been reported from EMF from AC cables (CSA Ocean Sciences Inc. and Exponent 2019; Thomsen et al. 2015).

A review of recent studies indicates that benthic communities located along cable routes are generally similar to nearby natural habitats (A. Gill and Desender 2020). Love et al. (2016) reported no differences in the invertebrate community between unburied energized and non-energized cables offshore of California. Additionally, no long-term impacts of EMF on clam habitat have been observed as a result of existing power cables connecting mainland Massachusetts and Nantucket (BOEM 2021).

The effects of EMF on most invertebrate taxa (embryonic and juvenile crustaceans and mollusks, horseshoe crabs, etc.) remain largely understudied (A. Gill and Desender 2020). Although a small number of species have demonstrated responses to EMF in recent studies, these responses have been associated with EMF intensities exceeding those produced by renewable energy projects (A. Gill and Desender 2020).

EMF intensity decreases rapidly with distance from transmission cables, with potentially meaningful EMFs most likely extending less than 15.4 m (50 ft) from each transmission cable (BOEM 2021).

A site-specific study of potential impacts of EMF found electric and magnetic fields produced by the operation of project cables to be below the reported detection thresholds for electrosensitive marine organisms (Exponent 2023). The maximum magnetic and electric fields at peak loading of the Project cables rapidly decrease with horizontal distance from the cables and is shown in Table 4.5-2 (Exponent 2023). Therefore, EMF associated with the submarine cable system is unlikely to impact benthic organisms, as all electrical transmission cables will be buried at a minimum depth of 1 m (3.2 ft) beneath the substrate or covered in cable protection. Therefore, impacts to benthic resources from EMF are expected to be negligible.

Table 4.5-2. Summary of Calculated Magnetic- and Induced Electric-Field Levels[1]

Cable Configuration	Evaluation Height for Magnetic- or Electric-Field	Magnetic Field (mG)			Electric Field (mV/m) [2]		
		Max	Horizontal Distance from Cable		Max	Horizontal Distance from Cable	
			1.5 m (5 ft)	3 m (10 ft)		1.5 m (5 ft)	3 m (10 ft)
Inter-array Cable	At the seabed	49	4.0	0.1	0.7	0.1	< 0.1
	1 m (3.3 ft) above the seabed	2.1	0.5	< 0.1	< 0.1	< 0.1	< 0.1
Offshore Export Cable	At the seabed	148	21	0.9	2.5	0.4	< 0.1
	1 m (3.3 ft) above the seabed	12	3.7	0.3	0.2	0.1	< 0.1
Export Cables in Indian River Bay [3,4]	At the seabed	148	21	0.9	2.5	0.4	< 0.1
	1 m (3.3 ft) above the seabed	12	3.8	0.3	0.2	0.1	< 0.1

Adapted from Exponent 2023
[1] The horizontal distance is measured from the centerline of the individual inter-array or offshore export cable.
[2] Induced electric fields in representative marine species of interest are lower than those presented here for induced electric fields in seawater.
[3] For HDD, cables will be installed approximately 6.6 ft (2 m) or greater. As a result, the maximum calculated field levels will be lower than those presented here.
[4] For Indian River Bay Export Cables, the results at horizonal distances > 0 were provided relative to the cable with the higher current (1,200 A and 480 A for peak and average loading, respectively). Calculated fields near cables carrying lower currents will be lower.

4.5.2.2.2 Offshore Export Cable Corridor 1

Impacts for the Offshore Export Cable Corridors would be the same as those described above in Section 4.5.2.2.1.

4.5.3 Avoidance and Minimization

US Wind will implement the following avoidance and minimization measures to reduce Project impacts on benthic resources.

- Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts of sediment disturbance:
    - No in-water work (e.g., cable installation, HDDs, dredging) in Indian River Bay March 1 through September 30.
    - No HDD activities at the Atlantic beach landfall from April 15 through September 15 (inclusive of recreational period avoidance from May 15 through September 15) to avoid impacts to spawning horseshoe crabs.
- US Wind plans to employ hydraulic dredging for cable burial in Indian River Bay. Mechanical dredging would only be used if needed.
- The Project has been sited to avoid sensitive or rare habitats (such as high-density clam beds) where feasible, and habitat disturbance will be minimized to the extent practicable.
- Shellfish relocation/restoration in Onshore Export Cable South Corridor will be evaluated pre- and post- installation if warranted.
- Cables will be installed using a jet plow to the greatest extent possible.
- HDD will be used at landfall locations.
- Potential impacts from anchoring will be minimized by avoiding locations with sensitive habitats and utilizing mid-line anchor buoys.
- Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable.
- US Wind conducted a site-specific study of potential EMF impacts on electrosensitive marine organisms.

4.6 Finfish and Essential Fish Habitat

Temporary and permanent impacts were evaluated as required by Section 8a of the DNREC Appendix S New Dredging Projects Form and Section 10b of Appendix M Activities in State Wetlands (see Appendix A).

4.6.1 Description of Affected Environment

The waters along the Atlantic Coast are home to a wide variety of fish species, and the number and types of species present depend on differences in habitat conditions. The Project area includes finfish and Essential Fish Habitat (EFH) in Indian River Bay and the western Atlantic Ocean. Invertebrates, such as shellfish and horseshoe crabs are discussed in Section 4.5, of this document. The benthic habitat in the Project area is dominantly sandy sediment type and is almost homogenous in that the variations in sediment type observed only occur in small spatial scale. Benthic habitat is important for fish habitat and influences site fidelity in fish species.

Fish assemblages include pelagic, demersal, highly migratory and estuarine fishes. Pelagic fishes are those that generally occur throughout the water column being neither close to the bottom or near the shore, and in contrast demersal fishes (groundfish) are those that occur on or near the ocean bottom. Highly migratory species are those that travel great distances for resources or reproduction, often from the South Atlantic to as far north as the Gulf of Maine. Estuarine fishes are those that occur in brackish water between marine and river environments, such as in Indian River Bay.

Fish species that are protected under a federal Fishery Management Plan (FMP) are discussed in further detail in Section 4.6.1.7, of this document as well as Appendix H13.

Finfish species listed as threatened and/or endangered are discussed in Section 4.12, of this document.

Fish species of commercial and recreational importance are discussed in Section 4.13.2 of this document, as well as COP Volume II, Section 17.0 (US Wind 2023b).

Table 4.6-1 lists fish species that may be present in the Project area. Atlantic Ocean includes State and Federal Waters.

Table 4.6-1. Fish Species Potentially Occurring in the Project Area

Species	Scientific Name	Habitat Association	EFH in Project Area	Commercial / Recreational Importance	Atlantic Ocean	Indian River Bay
Albacore tuna	*(Thunnus alalunga)*	Pelagic	●	●	●	
Alewife	(*Alosa pseudoharengus*)	Pelagic		●	●	●

Table 4.6-1. Fish Species Potentially Occurring in the Project Area

Species	Scientific Name	Habitat Association	EFH in Project Area	Commercial / Recreational Importance	Atlantic Ocean	Indian River Bay
American conger	(*Conger oceanicus*)	Benthic				●
American eel	(*Anguilla rostrata*)	Demersal			●	●
American sand lance	(*Ammodytes americanus*)	Demersal				●
American shad	(*Alosa sapidissima*)	Pelagic		●	●	●
Atlantic angel shark	*(Squantina dumeril)*	Demersal	●		●	
Atlantic butterfish	*(Peprilus triacanthus)*	Demersal / Pelagic (spring to fall)	●	●	●	●
Atlantic cod	*(Gadus morhua)*	Demersal	●	●	●	●
Atlantic croaker	*(Micropogonias undulates)*	Demersal		●	●	●
Atlantic herring	*(Clupea harengus)*	Pelagic	●	●	●	●
Atlantic mackerel	*(Scomber scombrus)*	Pelagic	●	●	●	
Atlantic menhaden	(*Brevoortia tyrannus*)	Pelagic		●		●
Atlantic needlefish	(*Stongylura marina*)	Demersal				●
Atlantic sea scallop	(*Placopecten magellanicus*)	Benthic	●	●		●
Atlantic sharpnose shark	(*Rhizoprionodon terraenovae*)	Pelagic	●		●	●
Atlantic silverside	(*Menidia menidia*)	Pelagic		●		●
Atlantic sturgeon	(*Acipenser oxyrinchus oxyrinchus*)	Demersal			●	
Atlantic surf clam	(*Spisula solidissima*)	Benthic	●		●	
Bay anchovy	(*Anchoa mitchilli*)	Pelagic		●	●	●
Bergall	(*Tautogolabrus adspersus*)	Demersal		●		●
Black drum	(*Pogonias cromis*)	Demersal		●		●
Black sea bass	*(Centropristis striata)*	Demersal	●	●	●	●
Blueback herring	(*Alosa aestivalis*)	Pelagic			●	●
Bluefin tuna	*(Thunnus thynnus)*	Pelagic	●	●	●	●
Bluefish	*(Pomatomus saltatrix)*	Pelagic	●	●	●	●

Table 4.6-1. Fish Species Potentially Occurring in the Project Area

Species	Scientific Name	Habitat Association	EFH in Project Area	Commercial / Recreational Importance	Atlantic Ocean	Indian River Bay
Blue shark	(*Prionace glauca*)	Pelagic	●		●	
Broad striped anchovy	(*Anchoa hepsetus*)	Pelagic			●	●
Clearnose skate	*(Raja eglanteria)*	Demersal	●		●	●
Common thresher shark	(*Alopias vulpinus*)	Pelagic	●		●	
Crevalle jack	(*Caranx hippos*)	Pelagic		●	●	●
Dusky shark	*(Carcharhinus obscurus)*	Pelagic	●	●	●	
Feather blenny	(*Hypsoblennius hentz*)	Demersal				●
Flathead grey mullet	(*Mugil cephalus*)	Demersal		●		●
Fourspine stickleback	(*Apeltes quadracus*)	Demersal			●	●
Giant manta ray	*(Mobula birostris)*	Pelagic			●	
Gray snapper	(*Lutjanus griseus*)	Demersal / Pelagic		●	●	●
Hogchoker	(*Trinectes maculatus*)	Demersal				●
Inland silverside	(*Menidia beryllina*)	Pelagic				●
Inshore lizardfish	(*Synodus foetens*)	Pelagic				●
Little skate	*(Leucoraja erinacea)*	Demersal	●		●	
Little sculpin	(*Myoxocephalus aenaeus*)	Demersal				●
Longfin inshore squid	(*Doryteuthis pealeii*)	Pelagic		●	●	●
Monkfish	(*Lophius americanus*)	Demersal	●	●	●	
Mummichog	(*Fundulus heteroclitus*)	Demersal			●	●
Naked goby	(*Gobiosoma bosc*)	Demersal				●
Northern kingfish	(*Menticirrhus saxatilis*)	Demersal			●	●
Northern pipefish	(*Syngathus fuscus*)	Demersal			●	●
Northern puffer	(*Sphoeroides maculatus*)	Demersal			●	●

Table 4.6-1. Fish Species Potentially Occurring in the Project Area

Species	Scientific Name	Habitat Association	EFH in Project Area	Commercial / Recreational Importance	Atlantic Ocean	Indian River Bay
Northern seahorse	(*Hippocampus erectus*)	Demersal			●	●
Northern sea robin	*(Prionotus carolinus)*	Demersal			●	●
Northern sennet	(*Sphyraena borealis*)	Demersal				●
Northern shortfin squid	(*Illex illecebrosus*)	Demersal	●		●	●
Northern stargazer	(*Astroscopus guttatus*)	Demersal			●	●
Ocean quahog	(*Artica islandica*)	Benthic	●		●	
Oyster toadfish	(*Opsanus tau*)	Demersal				●
Pinfish	*(Lagodon rhomboides)*	Demersal		●		●
Pollock	*(Pollachius virens)*	Demersal	●	●		●
Rainwater killifish	(*Lucania parva*)	Pelagic				●
Red drum	(*Sciaenops ocellatus)*	Demersal		●		●
Red hake	*(Urophycis chuss)*	Demersal	●	●	●	●
Rough silverside	(*Membras martinica*)	Pelagic				●
Sand tiger shark	*(Carcharias taurus)*	Pelagic	●	●	●	●
Sandbar shark	*(Carcharhinus plumbeus)*	Pelagic	●	●	●	
Scup	*(Stenotomus chrysops)*	Demersal (fall) / Pelagic	●	●	●	●
Seaboard goby	(*Gobiosoma ginsburgi)*	Demersal				●
Sheepshead minnow	(*Cyprinodon variegatus variegatus*)	Demersal				●
Shortfin mako	*(Isurus oxyrinchus)*	Pelagic	●	●	●	
Shortnose sturgeon	Shortnose sturgeon (*Acipenser brevirostrum*)	Demersal				
Silver hake	(*Merluccius bilinearis*)	Demersal (night) / Pelagic (day)	●	●	●	
Silver perch	(*Bairdiella chrysoura*)	Demersal				●
Skipjack tuna	*(Katsuwonus pelamis)*	Pelagic	●	●	●	

Table 4.6-1. Fish Species Potentially Occurring in the Project Area

Species	Scientific Name	Habitat Association	EFH in Project Area	Commercial / Recreational Importance	Atlantic Ocean	Indian River Bay
Smallmouth flounder	(*Etropus microstomus*)	Demersal			●	●
Smoothhound shark	(*Mustelus canis)*	Demersal	●		●	●
Spiny dogfish	*(Squalus acanthias)*	Demersal	●	●	●	
Spot	*(Leiostomus xanthurus)*	Demersal		●	●	●
Spotfin butterflyfish	(*Chaetodon ocellatus*)	Demersal				●
Spotfin killifish	(*Fundulus luciae*)	Demersal				●
Spotted hake	*(Urophycis regia)*	Demersal			●	●
Spotted seatrout	(*Cynoscion nebulosus*)	Demersal		●		●
Striped bass	*(Morone saxatilis*)	Demersal		●		●
Striped cusk-eel	(*Ophidion marginatum*)	Demersal				●
Striped sea robin	(*Prionotus evolans*)	Demersal		●	●	●
Summer flounder	*(Paralichthys dentatus)*	Demersal	●	●	●	●
Striped killifish	(*Fundulus majalis*)	Demersal				●
Tautog	*(Tautoga onitis*)	Demersal			●	
Three-spined stickleback	*(Gasterosteus aculeatus)*	Benthopelagic				●
Tiger shark	(*Galeocerdo cuvier)*	Pelagic	●		●	
Weakfish	*(Cynoscion regalis)*	Demersal			●	●
White mullet	(*Mugil curema*)	Demersal				●
White perch	(*Morone americana*)	Demersal		●		●
Windowpane flounder	*(Scopthalmus aquosus)*	Demersal	●		●	●
Winter flounder	(*Pseudopleuronectes americanus*)	Demersal	●	●	●	
Winter skate	*(Leucoraja ocellata)*	Demersal	●		●	●
Witch flounder	(*Glytocephalus cynoglossus*)	Demersal	●		●	●
Yellowfin tuna	*(Thunnus albacares)*	Pelagic	●	●	●	●
Yellowtail flounder	*(limanda ferruginea)*	Demersal	●	●	●	
(Sources: (Able and Fahay 2010); NOAA Fisheries *EFH Mapper*; (USDOI and BOEM 2012); (Nelson and Monaco 2000) ;("FishBase" 2018)						

4.6.1.1 Pelagic Fishes

Pelagic fish fill important roles in coastal food webs, both feeding on zooplankton and providing a source of food for birds, mammals, and larger fish (Able and Fahay 2010) (Able and Fahay 2010). Atlantic silverside (*Menidia menidia*) and bay anchovy (*Anchoa mitchilli*) dominate the pelagic community in the Delaware Inland Bays, which is further discussed under Estuarine Fishes in Section 4.6.1.4, of this document (Nelson and Monaco 2000). Pelagic community composition can shift when some species migrate inland to estuarine habitats to spawn, primarily from spring to summer. Atlantic menhaden (*Brevoortia tyrannus*) is the only migratory pelagic species that is common in the mid-Atlantic Bight and Delaware Inland Bays (Able and Fahay 2010). Some mid-Atlantic pelagic species, including silver hake (*Merluccius bilinearis*) and bluefish (*Pomatomus saltatrix*), are considered predatory fish.

4.6.1.2 Demersal Fishes

Demersal fish are often found in mixed species aggregations that differ depending upon the specific area and time of year. Some demersal fish species have pelagic eggs or larvae that are sometimes carried long distances by oceanic surface currents. Many demersal species are sought by commercial and recreational anglers and are managed by multispecies groundfish FMPs and single-species management plans.

Summer flounder (*Paralichthys dentatus*) is particularly abundant in the Delaware Inland Bays and has designated EFH and Habitat Area of Particular Concern (HAPC) (Nelson and Monaco 2000) (Nelson and Monaco 2000). All native aquatic vegetation, including macroalgae, macrophytes, and seagrasses, within summer flounder EFH is designated as HAPC (MAFMC 1998). Vegetated areas provide important feeding grounds for summer flounder (MAFMC 1998). Within Indian River Bay, SAV has been observed to be sparse (DCIB 2016). Based on the 2022 Indian River Bay surveys, no SAV was observed within Onshore Export Cable Corridor 1, either at sample locations or during transit.

Larvae are present at a concentration of approximately 0.568 per every 100 cubic meters (m^3) (130 cubic yards [y^3]) in the Delaware Inland Bays, and summer flounder frequently return to the same estuaries to feed during the summer months (Able and Fahay 2010). Because they can live in both marine and estuarine environments, summer flounder often react to adverse environmental conditions, such as the onset of severe weather or anoxia, by migrating away from the stressor, either inshore or offshore (Able and Fahay 2010).

4.6.1.3 Highly Migratory Fishes

Fish that migrate in waters across multiple state boundaries and even different national boundaries require specialized management in order to ensure that policies implemented by different governing bodies do not conflict. The 2006 Atlantic Highly Migratory Species (HMS) FMP combines and supersedes two FMPs for highly migratory fish in the Atlantic Ocean: one for Atlantic tunas, swordfishes, and sharks, and one for Atlantic billfishes (NOAA Fisheries 2006).

Swordfish and highly migratory billfish are warm-water species that are not known to exist in the Project area, so only sharks and tunas are discussed.

Highly migratory fish include game fish species and shark species that are sought by commercial and recreational anglers. Exploitation of albacore (*Thunnus alalunga*), skipjack (*Katsuwonus pelamis*), and yellowfin tuna (*Thunnus albacares*) took off in the 1950's, when commercial purse seining and recreational vessels turned their attention toward these species. Because tuna spawn in tropical and subtropical waters in winter or spring, juveniles and adults are most likely to be found in the Project area in summer and fall. By contrast, sharks of all life stages may be found in the Project area depending on the species. Pelagic species such as blue shark (*Prionace glauca*), common thresher shark (*Alopias vulpinus*), and shortfin mako *(Isurus oxyrinchus)* make use of estuaries and shallow coastal waters to birth pups. Coastal species, such as Atlantic sharpnose (*Rhizoprionodon terraenovae*), sandbar *(Carcharhinus plumbeus)*, and tiger sharks (*Galeocerdo cuvier)*, remain in coastal areas through maturity. The HMS FMP establishes quotas, bycatch release requirements, and other measures designed to promote recovery from finning and other unsustainable fisheries practices that have strained shark populations since the 1970's (NOAA Fisheries 2006).

4.6.1.4 Estuarine Fishes

The Delaware Inland Bays, including Indian River Bay, support more than 100 species of fish. In a 2015 open water trawl survey, the most abundant species were found to be bay anchovy, Atlantic silverside, silver perch (*Bairdiella chrysoura*), and weakfish. Bay anchovy and weakfish abundance have been declining, while silver perch abundance has been increasing. Both weakfish and silver perch spawn in the Delaware Inland Bays. Shore-zone surveys from 2011 to 2015 found mummichog (*Fundulus heteroclitus*), Atlantic silverside, striped killifish (*Fundulus majalis*), and spot to be the most abundant species. The abundance of mummichog and striped killifish, which are tolerant of low oxygen levels, indicates poor water quality. However, numbers of spot, Atlantic menhaden (*Brevoortia tyrannus*), and bay anchovy are increasing, and may indicate improving conditions. The Delaware Inland Bays also support a number of fisheries, including striped bass (*Morone saxatilis*), weakfish, and summer flounder (DCIB 2016). Historically, the Delaware Inland Bays supported large spawning runs of anadromous fish. However, freshwater habitat decreased significantly with the deepening and widening of the Indian River Inlet, as well as with the dredging and deepening of navigational channels. Today, few anadromous fish are found in the Delaware Inland Bays (DCIB 1995) .

4.6.1.5 Ichthyoplankton

Ichthyoplankton refers to fish eggs and larvae that occur throughout the water column after spawning aggregations or events. Oceanographic processes and fish species specific life history strategies dictate larval distribution patterns. Ichthyoplankton found in the mid-Atlantic Bight come from warm temperate to cold temperate waters and are generally distributed in an onshore/offshore pattern (Doyle, Morse, and Kendall 1993; Hare, Fahay, and Cowen 2001).

Seasonal occurrence and geographic distribution of ichthyoplankton varies for each fish species. In general, the most abundant fish eggs and larvae found during winter months are those of cold temperate fish species originating in more northerly waters. During spring, summer, and fall months, ichthyoplankton is dominated by warm temperate species originating from more southerly waters. Depending on where spawning takes place on the continental shelf margin, the ichthyoplankton is transported either southwestward or northeastward by currents or frontal zones (Hare et al. 2002).

Ichthyoplankton data is often used to indicate spawning stock biomass and spawning locations for ecologically important fish species in the area. Review of scientific literature, including larval fish recruitment and coastal nursery habitats, suggest that only the outer limits of the Project area contain ichthyoplankton assemblages. No significant data was found on the abundance and duration of ichthyoplankton assemblages within the Project area. Hydrodynamic modeling shows that local fish populations in the Project area are likely to be recruited from southern ichthyoplankton assemblages (Hare et al. 2002). Since the marine connectivity of ichthyoplankton is on a broad scale on the northeast coast of the United States, the implications on impacts to larval fish species that contribute to the adult population would be hard to identify.

4.6.1.6 Fish Species Richness and Biomass

Fish species richness and biomass data were developed by the Marine-Life Data and Analysis Team (MDAT) (Curtice et al. 2018; Fogarty and Perretti 2016) (Curtice et al. 2018; Fogarty and Perretti 2016), using data from the NOAA Northeast Fisheries Science Center (NEFSC) fall trawl. Therefore, these data do not reflect absolute fish biomass or species richness hotspots, but rather serve as fishery descriptors.

4.6.1.7 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires fishery management councils to: (1) describe and identify EFH in their respective regions; (2) specify actions to conserve and enhance that EFH; and (3) minimize the adverse impacts of fishing on EFH. The Magnuson-Stevens Act requires federal agencies to consult on activities that may adversely affect EFH designated in FMP. Additionally, fishery management councils identify HAPCs within FMPs. Consultation with NMFS is currently underway as part of the NEPA process for the COP and USACE permit applications.

HAPCs are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation. A HAPC has been identified for the sand tiger shark in a portion of the nearshore area off the Delaware coast and into Delaware Bay, north of the Project area (Figure 4.6-1). All vegetated areas of summer flounder EFH are considered HAPCs.

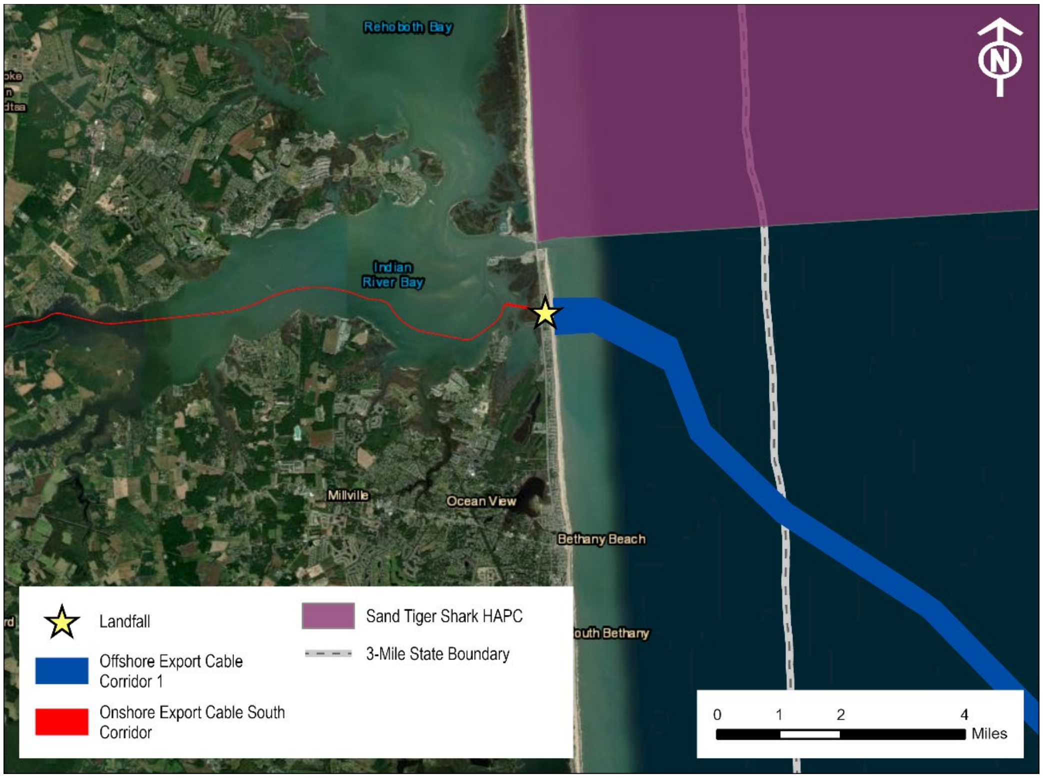

Figure 4.6-1. Sand Tiger HAPC for Delaware Bay Area

Table 4.6-2. Fish Species by Life Cycle Potentially Occurring in the Project Area

	Eggs		Larvae/Neonates		Juveniles/ Subadults		Adults	
	Onshore Export Cable South Corridor	Offshore Export Cable Corridors	Onshore Export Cable South Corridor	Offshore Export Cable Corridors	Onshore Export Cable South Corridor	Offshore Export Cable Corridors	Onshore Export Cable South Corridor	Offshore Export Cable Corridors
Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan (MAFMC)								
Atlantic mackerel (*Scomber scombrus*)						●		●
Long finned squid (*Loligo pealeii*)	●	●				●		●
Northern shortfin squid (*Illex illecebrosus*)						●		
Atlantic butterfish (*Peprilus triacanthus*)		●		●	●	●	●	●
Atlantic Surfclam and Ocean Quahog Fishery Management Plan (MAFMC)								
Atlantic surf clam (*Spisula solidissima*)						●		
Ocean quahog (*Artica islandica*)								●
Bluefish Fishery Management Plan (MAFMC)								
Bluefish (*Pomatomus saltatrix*)		●		●	●	●	●	●
Spiny Dogfish Fishery Management Plan (MAFMC)								
Spiny dogfish (*Squalus acanthias*)					●	●	●	●
Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan (MAFMC)								
Summer flounder (*Paralichthys dentatus*)			●	●	●	●	●	●
Scup (porgy) (*Stenotomus chrysops*)					●	●	●	●
Black sea bass (*Centropristis striata*)				●	●	●		●
Atlantic Highly Migratory Species (NOAA HMS)								
Sharks								
Atlantic angel shark (*Squatina dumerili*)				●		●		●

Table 4.6-2. Fish Species by Life Cycle Potentially Occurring in the Project Area

	Eggs		Larvae/Neonates		Juveniles/ Subadults		Adults	
	Onshore Export Cable South Corridor	Offshore Export Cable Corridors	Onshore Export Cable South Corridor	Offshore Export Cable Corridors	Onshore Export Cable South Corridor	Offshore Export Cable Corridors	Onshore Export Cable South Corridor	Offshore Export Cable Corridors
Atlantic sharpnose shark (*Rhizopriondon terraenovae*)							•	•
Blue shark (*Prionace glauca*)						•		•
Common thresher shark (*Alopias vulpinus*)*			•	•	•	•	•	•
Dusky shark (*Carcharhinus obscurus*)				•		•		•
Sand tiger shark (*Carcharias taurus*)			•	•	•	•	•	•
Sandbar shark (*Carcharhinus plumbeus*)			•	•	•	•	•	•
Shortfin mako shark (*Isurus oxyrinchus*)				•		•		•
Smoothhound shark (*Mustelus canis*)*			•	•	•	•	•	•
Tiger shark (*Galeocerdo cuvier*)						•		•
Tunas								
Albacore tuna (*Thunnus alalunga*)						•		
Bluefin tuna (*Thunnus thynnus*)						•		
Skipjack tuna (*Katsuwonus pelamis*)							•	•
Yellowfin tuna (*Thunnus albacares*)						•		
Northeast Multispecies Fishery Management Plan (NEFMC)								
Atlantic cod (*Gadus morhua*)				•				•
Pollock (*Gadus Pollachius*)				•				
Red hake (*Urophycis chuss*)	•	•	•	•	•	•	•	•
Silver Hake (*Merluccius bilinearis*)		•		•				

Table 4.6-2. Fish Species by Life Cycle Potentially Occurring in the Project Area

	Eggs		Larvae/Neonates		Juveniles/ Subadults		Adults	
	Onshore Export Cable South Corridor	Offshore Export Cable Corridors	Onshore Export Cable South Corridor	Offshore Export Cable Corridors	Onshore Export Cable South Corridor	Offshore Export Cable Corridors	Onshore Export Cable South Corridor	Offshore Export Cable Corridors
Windowpane flounder (*Scophthalmus aquosus*)	●	●	●	●	●	●	●	●
Witch Flounder (*Glytocephalus cynoglossus*)		●		●				●
Yellowtail flounder (*Limanda ferruginea*)		●		●				●
Atlantic Herring Fishery Management Plan (NEFMC)								
Atlantic herring (*Clupea harengus*)					●	●		●
Atlantic Sea Scallop Fishery Management Plan (NEFMC)								
Atlantic sea scallop (*Placopecten magellanicus*)		●		●		●		●
Monkfish Fishery Management Plan (NEFMC)								
Monkfish (Goosefish) (*Lophius americanus*)		●		●				
Skate Fishery Management Plan (NEFMC)								
Clearnose Skate (*Raja eglanteria*)					●	●	●	●
Little Skate (*Leucoraja erinacea)*					●	●	●	
Winter Skate (*Leucoraja ocellata*)					●	●	●	●
Coastal Migratory Pelagics Fishery Management Plan (SAFMC)								
Cobia (*Rachycentron canadum*)*								
King mackerel (*Scomberomorus cavalla*)*								
Spanish mackerel (*Scomberomorus maculatus*)*								

Table 4.6-3 provides the respective Regional Fishery Management Council responsible for species management of EFH designated species with potential to occur in the Project area.

A discussion of potential Project-related impacts to these species is presented as Appendix H13.

Table 4.6-3. EFH Species with Regional Fishery Management Plan and Council Locations

New England FMP Species	Mid-Atlantic FMP Species	Atlantic HMS FMP Species
Atlantic herring	Atlantic mackerel	Albacore tuna
Atlantic sea scallop	Atlantic surf clam	Atlantic angel shark
Atlantic cod	Black sea bass	Atlantic bluefin tuna
Clearnose skate	Bluefish	Atlantic sharpnose
Little skate	Long-finned squid	Blue shark
Monkfish	Ocean quahog	Common thresher shark
Pollock	Scup	Dusky shark
Red hake	Spiny dogfish	Sand tiger shark
Silver hake	Summer flounder	Sandbar shark
Yellowtail flounder		Shortfin mako
Windowpane flounder		Skipjack tuna
Winter skate		Smooth dogfish
Witch flounder		Tiger shark
		Yellowfin tuna

4.6.2 Impacts

4.6.2.1 Construction

4.6.2.1.1 Onshore Export Cable Corridor South

<u>Habitat Alteration</u>
As discussed in Section 2.0 of this document the installation of submarine cables, dredging for cable burial in Indian River Bay, and the operation of anchored vessels during construction would alter benthic habitat in Indian River Bay. Immobile and slow-moving benthos may be lost during these installations, temporarily reducing the potential food supply for demersal fish until these species recover to pre-construction population levels.

It is anticipated that habitat alteration would have a negligible to minor impact on finfish. The reduction in benthic food supply would be temporary and localized, and the loss of soft-bottom habitat associated with the Project would be small relative to the overall extent of benthic habitat available within and around the Project area. Impacts to summer flounder HAPC would be minimized by using DP to minimize the need for construction vessels to anchor to the seafloor and by using midline buoys to reduce seafloor scarring when construction vessels need to anchor for offshore construction activities. The cable routes through Onshore Export Cable South Corridor would be planned to avoid SAV to the extent feasible. No seagrass beds have been documented in the Project area.

Turbidity/Suspended Sediment

Increases in turbidity and TSS are expected to occur during foundation construction, submarine cable laying, and dredging for proper cable burial depth in Indian River Bay, but would be minimized by using installation techniques such as jet plow and hydraulic dredging, when possible. It is anticipated that suspended sediment and sedimentation would have a negligible to minor impact on finfish and EFH. As discussed in Section 4.3.1 of this document, turbidity levels could be significantly elevated for a period of less than 24 hours during cable installation activities. Dredging for cable burial in Indian River Bay would also result in temporarily increased suspended sediment levels in the vicinity of Project activities. While some fish may struggle to navigate during this time due to reduced visibility and alterations in water chemistry, others may benefit from the increased turbidity because it would help conceal them from predators (D.H. Wilber and Clarke 2001).

Gilledfish may also experience increased respiration during periods of increased turbidity in order to maintain sufficient oxygen intake (Newcombe and Jensen 1996). As suspended sediment settles out of the water column, fish eggs could be buried, and demersal fish that feed on benthic organisms may experience difficulty finding food (USDOI and MMS 2007). However, it is expected that most fish would seek food and shelter outside of the Project area when vessel traffic and other construction noises begin. Installation of onshore and nearshore export cables would be planned to occur outside the spring spawning season, and all construction activities within Indian River Bay would occur between October and March in observance of the general time of year restrictions for summer flounder and other species. Additionally, gravity cells would be placed around the HDD boreholes to contain sediment at the landfalls. As suspended sediment concentrations are expected to return to background levels quickly after construction ceases, it is anticipated that the impact of increased turbidity and suspended sediment on finfish would be negligible to minor depending on the species.

Noise

Project activities including dredging for cable burial in Indian River Bay and vessel traffic would produce noise during. The impacts of construction noises on fish are not as well understood as the impacts of noises on marine mammals. Like marine mammals, fish responses to sounds are species-specific, but all fish are expected to exhibit behavioral responses to sounds at larger distances than those at which they would exhibit physiological responses. Historically, 150 decibels (dB) has been used as the threshold above which fish may modify their behavior, although recent work suggests that this number may be conservative (California Department of Transportation (Caltrans) 2009). The most likely behavior change in fish is avoiding the source of noise, but some species may be attracted to noises (Normandeau Associates 2012). In either case, the most severe impact would be that fish may be deterred from annual migration routes, which could interfere with their feeding and reproductive success.

Potential physiological impacts to fish exposed to construction noise include stress, injury, and death. While fish may experience minor loss of hearing as a result of exposure to intense sounds, the loss would not be permanent as fish have the ability to repair or replace damaged sensory hairs (Lombarte et al. 1993). Continuous noise exposure over multiple hours can reduce fishes' sensitivity to sound, which may make them less likely to notice predators and prey, physical hazards, and communication from other fish (Normandeau Associates 2012). Additionally, exposure to continuous boat noise over a period of half an hour can increase cortisol levels in fish (Wysocki, Dittami, and Ladich 2006). Most of the scientific literature discusses noise impacts to mature fish, but a study of sole (*Soleidae* spp.) found no response in larvae to sounds as loud as 206 dB (Bolle et al. 2012).

It is anticipated that construction noise would have a negligible to minor impact on finfish. The most sensitive of fish species do not experience physiological impacts at cumulative sound exposures less than 203 dB relative to 1 microPascal squared per second (re 1 μPa^2s) of pressure, and species that do not have swim bladders (i.e., flatfish, sharks and rays) experience no physiological impacts at sound exposures as high as 216 dB re 1 μPa (Normandeau Associates 2012). However, since fish can restore their own hearing loss, and fish such as Chinook salmon (*Oncorhynchus tshawytscha*) exposed to sounds as loud as 213 dB re 1 μPa have recovered from physical injury in a matter of days (Casper et al. 2012), it is expected that most species of fish will experience temporary impacts from which both the individual and its population will be able to recover.

Vessel Traffic

There is a risk that construction vessels may hit aquatic organisms, potentially causing injury or death. It is anticipated that vessel traffic will have a negligible impact on finfish. Fish may differ their spatial distribution patterns in the presence of construction vessels. For example, skipjack tunas have shown attraction responses to floating objects (NOAA Fisheries 2006) which may draw them toward construction vessels. However, avoidance or attraction responses to construction vessels are not expected to have a net impact on fish, either positive or negative. In the event of collision with a construction vessel, fish are unlikely to be harmed due to their small size relative to the vessel, which allows the vessel to absorb the fish's momentum with no real impact to the fish or the vessel.

Lighting

If Project construction activities extend before sunrise or after sunset, artificial lighting may be used. It is anticipated that such construction lighting would have a negligible impact on finfish and EFH. While it is possible that fish may alter their movement toward or away from the light (Orr, Herz, and Oakley 2013), this reaction is not well-studied, and it is not expected that this behavior would have a net impact on fish, either positive or negative. Lighting will be limited to areas of active construction, which will leave most of the Project area unaffected at any given time.

Hydraulic Entrainment

Operation of the jet plow (for cable installation) and the hydraulic dredge (during dredging for cable burial in Indian River Bay) would result in bycatch of fish eggs, larvae, and other plankton, due to hydraulic entrainment. The jet plow intakes water via a surface-oriented intake. Therefore, naturally occurring surface plankton could be entrained in the system. The hydraulic dredge would uptake water, along with sediments, from the bottom of Indian River Bay, entraining plankton present in this area. Fish eggs and larvae entrained during jet plowing and hydraulic dredging would likely experience mortality (reviewed in Wenger et al. (2017)). In addition to direct uptake of plankton, water movement caused by jet plowing and hydraulic dredging may indirectly impact fish eggs and larvae due to mixing of the water column.

However, water volumes entrained by the hydraulic dredge and jet plow would be low in relation to the volume of water present in surrounding Indian River Bay habitats. Therefore, as the duration and extent of hydraulic entrainment impacts would be limited and short-term, planktonic assemblages will recover from the disturbance (BOEM 2021).

Routine/Accidental Releases

As discussed in Section 4.3.2.1, of this document, wastes from Project construction vessels may be released into Indian River Bay either as part of their allowed operations or during an accidental spill. Because permissible releases are relatively clean and accidental releases would be infrequent and dilute quickly in these large bodies of water, it is anticipated that routine and accidental releases would have a negligible impact on finfish.

4.6.2.1.2 Offshore Export Cable Corridor 1

Impacts for the Offshore Export Cable Corridors would be the same as those described above in Section 4.6.2.1.1.

4.6.2.2 Operations

4.6.2.2.1 Onshore Export Cable South Corridor

Habitat Alteration

No new habitat alterations are anticipated as a part of routine maintenance of the Project. Benthic habitat may be altered during operation of the Project if any of the submarine cables are damaged and require repair or replacement. The impacts of repairing or replacing submarine structures would be similar to, but less than the impacts from construction.

Turbidity/Suspended Sediment

Increases in turbidity and TSS are expected to occur during submarine cable laying. Routine operations of the Project would not affect turbidity levels in Indian River Bay. However, should the submarine cables require repair during the lifetime of the Project, sediment disturbance may occur. The impacts of increases in turbidity associated with Project maintenance would be similar to but less than the impacts of turbidity increases incurred during Project construction.

Noise

During Project operation, noise would be produced by vessels. Aquatic organisms that reside in the Project area are likely habituated to the sound of vessel traffic and unlikely to respond to it.

Electromagnetic Fields

Once the Project is operational, electric current would be continuously transmitted through the export cables. This current can produce an EMF. The EMF created by the submarine cables could interfere with naturally occurring EMF.

At least some marine fishes are able to detect EMFs, including sharks, skates, rays, salmonids, sturgeons and mackerels (Normandeau Associates Inc. 2011). Many of the fish that are able to detect EMFs occupy different habitats during different times of year or life stages, and it has been suggested that these fish may use electromagnetic signatures to navigate (Kenneth J. Lohmann, Putman, and Lohmann 2008). Fish that feed on benthic organisms may also use EMFs to locate prey that may be difficult to see due to camouflage or low light levels (Collin and Whitehead 2004). Juveniles of some species, such as clearnose skate *(Raja eglanteria)*, are able to detect electrical signals produced by adults of other marine species that could be potential predators (Sisneros et al. 1998).

The mechanisms by which fish detect EMFs and use the information that they obtain are poorly understood, so studies of fishes' behavioral responses to EMFs provide the best indication of how they may be impacted by potential changes in EMFs caused by the Project. For example, little skate have been observed to increase their movement and the amount of time they spend near the seafloor in the presence of an EMF that exceeds background levels (Hutchison et al. 2018). Variability in individual speeds and distances traveled were also greater in the presence of a high EMF. While the skates modified their behavior in the presence of EMF alteration, the altered EMF did not prevent them from accessing any part of the study area (Hutchison et al. 2018).

Although some species may use EMFs for important functions such as locating mating and spawning grounds, the high frequency of EMFs produced by submarine power cables relative to fishes' sensitivity levels (Normandeau Associates Inc. 2011) and the high variability observed in individual responses to EMF alterations suggest that population-level impacts are unlikely to occur. It is uncertain whether migratory species would be misled by an electromagnetic anomaly, use the anomaly as a navigational landmark, or disregard the anomaly as noise, as some species disregard their own EMF signals (Bodznick, Montgomery, and Tricas 2003).

Demersal species are most likely to experience negligible, short-term impacts to their feeding and navigation patterns because the EMF generated by the cables would be strongest near the ocean floor and would only be detectable within a few meters of the cable route (Normandeau Associates Inc. 2011). Burying the cables would minimize the impact of the EMFs they produce, and the proposed submarine cables include protective shielding to further reduce the impact of EMFs produced by transmission cables in the Project area.

A site-specific study of potential impacts of EMF found electric fields produced by the operation of project cables to be below the reported detection thresholds for electrosensitive marine organisms (Table 4.6-4, see Exponent (2023)). The maximum magnetic-field levels decreased from 148 mG (milligauss) at the seabed to 12 mG at 3.3 ft (1 m) above the seafloor, which was approximately 3.4 and 42 times lower, respectively, that levels demonstrated to have no impact on other fish species (i.e., Atlantic salmon or American eel) (Exponent 2023).

Table 4.6-4. Summary of Calculated Magnetic- and Induced Electric-Field Levels[1]

Cable Configuration	Evaluation Height for Magnetic- or Electric-Field	Magnetic Field (mG)			Electric Field (mV/m) [2]		
		Max	Horizontal Distance from Cable		Max	Horizontal Distance from Cable	
			1.5 m (5 ft)	3 m (10 ft)		1.5 m (5 ft)	3 m (10 ft)
Inter-array Cable	At the seabed	49	4.0	0.1	0.7	0.1	< 0.1
	1 m (3.3 ft) above the seabed	2.1	0.5	< 0.1	< 0.1	< 0.1	< 0.1
Offshore Export Cable	At the seabed	148	21	0.9	2.5	0.4	< 0.1
	1 m (3.3 ft) above the seabed	12	3.7	0.3	0.2	0.1	< 0.1
Export Cables in Indian River Bay [3,4]	At the seabed	148	21	0.9	2.5	0.4	< 0.1
	1 m (3.3 ft) above the seabed	12	3.8	0.3	0.2	0.1	< 0.1

Adapted from Exponent 2023

[1] The horizontal distance is measured from the centerline of the individual inter-array or offshore export cable.

[2] Induced electric fields in representative marine species of interest are lower than those presented here for induced electric fields in seawater.

Table 4.6-4. Summary of Calculated Magnetic- and Induced Electric-Field Levels[1]

Cable Configuration	Evaluation Height for Magnetic- or Electric-Field	Magnetic Field (mG)			Electric Field (mV/m) [2]		
		Max	Horizontal Distance from Cable		Max	Horizontal Distance from Cable	
			1.5 m (5 ft)	3 m (10 ft)		1.5 m (5 ft)	3 m (10 ft)

[3] For HDD, cables will be installed approximately 6.6 ft (2 m) or greater. As a result, the maximum calculated field levels will be lower than those presented here.
[4] For Indian River Bay Export Cables, the results at horizonal distances > 0 were provided relative to the cable with the higher current (1,200 A and 480 A for peak and average loading, respectively). Calculated fields near cables carrying lower currents will be lower.

Vessel Traffic

Over the lifetime of the installation, regular maintenance would be necessary, as well as potential non-routine repairs. Maintenance personnel and equipment would access the cables by boat. The impact of maintenance vessel traffic on finfish would be similar to but less than the impacts of vessel traffic during Project construction.

Lighting

Should any of the Project infrastructure be compromised during the lifetime of the Project, it is possible that maintenance vessels may need to use artificial lighting while repairing or replacing the infrastructure during nighttime hours. The impacts of this lighting on finfish would be similar to but less than the impacts of artificial lighting used during Project construction.

Routine/Accidental Releases

Emissions of liquids and gases into the environment are not part of the Project's routine operations. However, fuel discharges may occur if the Project infrastructure necessitates maintenance vessel trips. The impact of these releases on finfish would be similar to but less than the impacts of routine and accidental releases that occur during Project construction.

4.6.2.2.2 Offshore Export Cable Corridor 1

Impacts for the Offshore Export Cable Corridors would be the same as those described above in Section 4.6.2.2.1.

4.6.3 Avoidance and Minimization

US Wind has and will implement the following avoidance and minimization measures to reduce Project impacts on finfish and EFH.

- Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts to finfish and EFH;
  - No in-water work in Indian River Bay from March 1 through September 30 to avoid impacts to young of year summer flounder.
  - No in-water work in Indian River from March 1 to May 15 to protect the American eel and allow passage of elvers upstream.
  - Landing Offshore Export Cables at 3R's Beach landfall location to avoid habitat sandbar and sand tiger sharks.
- US Wind has conducted surveys and reviewed existing data in order to avoid important, sensitive, and unique marine habitats. HAPC for sharks has been avoided with selection of landing location at 3R's Beach.
- Section 7 ESA consultation for the federally listed Atlantic sturgeon and shortnose sturgeon is underway (see Table 1.7-1).
- Minimize construction activities as practicable in areas containing anadromous fish during migration periods.
- Seafloor disturbance during construction will be minimized as practicable.
- Impacts to summer flounder HAPC will be minimized by using DP where feasible to minimize the need for construction vessels to anchor to the seafloor and using midline buoys to reduce seafloor scarring when construction vessels need to anchor.
- Sediment disturbance associated with submarine cable laying will be minimized by jet plowing, HDD techniques and the use of gravity cells where feasible.
- Work lighting will be limited to the extent practicable to areas of active construction in coordination with USCG and other agencies as appropriate.
- Project-specific SPCC Plan and Oil Spill Response Plan will be prepared prior to construction and for operations activities.
- Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 *Marine Trash and Debris Awareness and Elimination*, per BOEM guidelines for marine trash and debris prevention.
- Vessels will adhere to USCG guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.
- Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable.

- US Wind conducted a site-specific study of potential EMF impacts on electrosensitive marine organisms.
- US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

4.7 Marine Mammals

Temporary and permanent impacts were evaluated as required by Section 10b of Appendix M Activities in State Wetlands (see Appendix A).

4.7.1 Description of the Affected Environment

The following description of the affected environment for marine mammals draws upon numerous recent studies and data sources. In addition to the studies described below, other resources referenced include New Jersey's Ocean/Wind Power Ecological Baseline Studies Final Report: January 2008 – December 2009 (Geo-Marine 2010).

These studies and sources of information are briefly summarized below.

- The NMFS and the United States Fish and Wildlife Service (USFWS) are required to generate stock assessment reports for all marine mammal stocks within the United States Exclusive Economic Zone (EEZ). This requirement was established under the 1994 amendments to the MMPA. Stock Assessment Reports are prepared by staff of the NEFSC and Southeast Fisheries Science Center (SEFSC) and are updated annually for strategic stocks and at least every three years for nonstrategic stocks. These reports include estimates of stock sizes and annual human-caused serious injury/mortality (Hayes et al. 2019; S.A. Hayes et al. 2020; S.A. Hayes et al. 2021; S.H. Hayes et al. 2022b; Waring et al. 2015).
- The Atlantic Marine Assessment Program for Protected Species (AMAPPS) is a multi-agency research program that provides information about the abundance, distribution, ecology, and behavior of marine mammals from Maine to the Florida Keys. Marine mammal observation data from 2021 field activities, including aerial and shipboard surveys, are incorporated into species profiles below (NEFSC and SEFSC 2021).
- The Mid-Atlantic Baseline Studies Project (MABS, Williams et al. 2015a) documented marine mammal, bird, and sea turtle distributions, densities, and movements using aerial and boat-based surveys on the mid-Atlantic outer continental shelf from 2012 through 2014. Additional funding provided by the Maryland Department of Natural Resources allowed for expanded MABS data collection efforts in Maryland state waters in 2013 and 2014 (Williams et al. 2015c).

4.7.1.1 Overview

The Atlantic Coast's marine mammals are represented by members of the taxonomic orders Cetacea, Carnivora, and Sirenia. The order Cetacea includes the mysticetes (baleen whales) and the odontocetes (toothed whales). Occurrence of cetacean species is generally widespread in Western North Atlantic waters with many of the large whales and populations of smaller toothed whales undergoing seasonal migrations along the length of the United States Atlantic coast. The order Carnivora, suborder Pinnipedia, family Phocidae, includes two species of seal that may occur in the mid-Atlantic, though these animals are mainly found in the North Atlantic. The order Sirenia is represented by the West Indian manatee, which occurs mainly in the South Atlantic.

4.7.1.2 Cetaceans

Numerous cetacean species may occur in DE state waters, although many are unlikely to be impacted by project activities. Cetaceans which may be impacted by Project activities in Delaware state waters are listed below. A total of nine cetacean species, including four baleen whales and five toothed whales have been identified. Two of these species (the North Atlantic right whale (NARW) [*Eubaelena glacialis*] and the fin whale [*Balaenoptera physalus*]) are listed as federally endangered under the ESA and are described in detail in Section 4.12.3. Detailed information about non-ESA listed cetacean species is presented in COP Volume II, Section 9.

- Fin whale (*Balaenoptera physalus*)
- Humpback whale (*Megaptera novaeangliae*)
- Minke whale (*Balaenoptera acutorostrata*)
- North Atlantic Right Whale (*Eubalaena glacialis*)
- Atlantic spotted dolphin (*Stenella frontalis*)
- Bottlenose dolphin (*Tursiops truncates*)
- Harbor porpoise (*Phocoena phocoena*)
- Pantropical spotted dolphin (*Stenella attenuata*)
- Short-beaked common dolphin (*Delphinus delphis*)

4.7.1.3 Pinnipeds

Two species of pinniped, both federally protected by the MMPA, have the potential to be impacted by project activities due to their presence in DE state waters. Though both gray seals (*Halichoerus grypus*) and harbor seals (*Phoca vitulina*) are rare in the mid-Atlantic region, one unidentified seal was observed during the 2017 HRG survey of Onshore Export Cable Corridor 1 in Indian River Bay (Alpine 2017). Therefore, these species have the potential to be present during project activities in Delaware state waters.

4.7.2 Impacts

Marine mammals in the Project area have the potential to be impacted by a variety of factors associated with Project activities. Given the presence of marine mammals in the Project area, US Wind has designed the Project to minimize and mitigate the potential for mortality, injury, and disturbance. The potential Project noise and vessel traffic impacts on marine mammals are discussed in more detail in Sections 4.7.2.1, 4.7.2.2, and 4.7.2.3 of this document. Consultation with NMFS is currently underway as part of the MMPA process for the Letter of Authorization.

4.7.2.1 Construction

4.7.2.1.1 Onshore Export Cable South Corridor

Vessel Noise

Marine mammals are heavily reliant upon sound for navigation, communication, reproduction, prey location, and predator avoidance. Marine mammal responses to anthropogenic sound exposure can range from apparent indifference to behavioral changes or physical injury, depending upon the sound source and species. Project construction activities in Delaware state waters that would generate noise with the potential to impact marine mammals includes vessel traffic and vessels using Dynamic Positioning thrusters (DP thrusters).

Increased vessel traffic associated with installation activities could impact marine mammals due to the noise produced by work boats. Vessel noise is primarily composed of low-frequency components caused by propeller cavitation, though rotational and reciprocal machinery movement and hydrodynamic water movement over the boat hull also contribute to sound generation (Hildebrand 2009). As the intensity of vessel noise is largely related to ship size and speed (Hildebrand 2009), exposure of marine mammals to noise from construction and installation vessels would be variable.

Vessel noise can elicit behavioral responses in marine mammals. Recent research has indicated that porpoises can exhibit behavioral response to low levels of high frequency sound present in vessel noise (Dyndo et al. 2015) and NARW are vulnerable to communication masking due to low frequency vessel traffic (Hatch et al. 2012). Marine mammals have also been known to alter their foraging methods due to vessel noise (Blair et al. 2016). Blair et al. (2016) documented slower decent rates and fewer side-roll feeding events per dive in foraging humpback whales exposed to increased levels of vessel noise. Vessel noise can also result in a reduction of the communication space available to marine mammals (Putland et al. 2017). Using AIS data, Putland et al. (2017) concluded that routine vessel traffic reduced communication space for Bryde’s whale (*Balaenoptera edeni*) by up to 87.4%. For a large commercial vessel passing less than 10 km (6.2 miles) from the listening station, communication space for this species was reduced up to 99% as compared to ambient conditions (Putland et al. 2017).

Marine mammals may also experience increased stress as the result of vessel noise. Rolland et al. (2012) examined the effect of reduced noise on NARW due to reduced shipping traffic in the Bay of Fundy, Canada, following the events of September 11, 2001. Measurements indicated a 6 dB decrease in background noise, with noise below 150 Hz greatly reduced (Rolland et al. 2012). The decreased level of underwater noise caused a significant decrease in NARW stress-related fecal hormone metabolites (glucocorticoids), demonstrating that shipping traffic and the noise it generates causes stress to marine mammals like NARW (Rolland et al. 2012; Southall et al. 2007).

The Project area and adjacent waters are well-traveled by commercial shipping traffic (in the nearby shipping lanes) and recreational and commercial fishing vessels. Therefore, marine mammals in the region are likely habituated to vessel noise. The underwater acoustic assessment (Appendix H15) provides a brief summary of documented ambient noise levels in and around the Lease area based on the passive acoustic study conducted by H. Bailey et al. (2018a).

Construction vessel noise related to the Project would be limited, as boats will travel to and from the Project area at reduced speeds and will remain stationary at work sites for extended periods of time. DP thrusters may be used during Project installation activities. Noise resulting from the use of DP thrusters is similar to that produced by vessels in transit and is typically only used for short intervals. Additionally, previous analyses have shown that the use of DP thrusters has not resulted in an observable reaction in marine mammals to this noise source (83 FR 14417). Any impacts to marine mammals due to vessel noise during Project installation would be temporary, with behavior rapidly returning to normal following passage of a vessel, and it is unlikely that such short-term effects would result in long-term population-level impacts.

Vessel Traffic

Vessel collisions with marine mammals can cause serious injury or death and are a leading cause of mortality for certain species. Baleen whales are most at risk from ship strikes, and species including NARW, fin whale, and humpback whale are particularly vulnerable (Laist et al. 2001). Most ship strikes resulting in severe injury or death occur from ships traveling at 14 knots or faster and strikes from larger vessels (>80 m [262 ft]) are more likely to result in mortality (Laist et al. 2001). High levels of vessel traffic (e.g., from whale watching operations) have also been noted to cause behavior changes in many cetacean species (reviewed in Parsons 2012).

The highly endangered NARW experiences the most numerous per capita vessel strikes (Vanderlaan and Taggart 2007) and is especially vulnerable because it primarily utilizes busy coastal areas, swims slowly, and congregates at or just below the water surface (NOAA Fisheries 2018). This species also shows no avoidance response when exposed to approaching vessels (Nowacek, Johnson, and Tyack 2003), perhaps indicating habituation to ubiquitous vessel noise in its habitat. However, vessel speed restrictions are effective in decreasing NARW ship strikes; vessel speed limits of 10 knots have been shown to reduce ship strike mortality risk by 80-90 percent (Conn and Silber 2013).

In order to protect this species, Seasonal Management Areas (SMAs) for reducing ship strikes of NARWs have been designated in the U.S. and Canada. Vessels greater than 19.8 m (65 ft) in overall length must operate at speeds of 10 knots or less within these areas during specified time periods (NOAA Fisheries 2022). The closest SMA is located approximately 13 km (7 NM) from the northwestern portion of the Lease area and is active between November 1 and April 30 each year (NOAA Fisheries 2022). Dynamic Management Areas (DMAs) or Right Whale Slow Zones may also be established by NOAA Fisheries in response to sightings of NARW, and vessels are encouraged to reduce speeds to 10 knots or avoid these areas (NOAA Fisheries 2022).

Construction vessels would follow NOAA Fisheries collision avoidance guidance, including vessel speed restrictions to minimize the risks to NARW and other marine mammals. In addition, US Wind would continue to evaluate technologies that may increase the ability to detect marine mammals from vessels, such as thermal detection technologies. US Wind will implement vessel strike avoidance measures as detailed in Appendix B (Vessel Strike Avoidance Policy) of the Application for Letter of Authorization (LOA, (US Wind 2023a)). Impacts to marine mammals from vessel strikes are expected to be negligible.

Entanglement and Marine Debris

Entanglement would not pose a risk to marine mammals during Project construction. US Wind does not anticipate the use of anchored vessels during construction. If used, mooring lines during submarine cable installation would be of relatively large diameter and would generally be kept under tension, eliminating entanglement risk. US Wind would follow BOEM guidelines for marine trash and debris prevention (Section 4.3.2 of this document). Therefore, construction impacts to marine mammals due to entanglement and marine debris are anticipated to be negligible.

Routine/Accidental Releases

During the course of Project construction, pollutants may be discharged into the environment as part of routine activities, such as the operation of construction vessels and vehicles, or due to accidental spills. See Section 4.3.2 for a discussion of the impacts of routine and accidental releases during Project activities. Water quality impacts due to routine and accidental releases are anticipated to be negligible and are therefore not anticipated to impact marine mammals or their prey species.

Suspended Sediment/Deposition

The use of jack-up and feeder vessels, jet plow operations during cable laying and embedment, vessel anchoring, and the installation and removal of gravity cells would disturb sediment on the seafloor. See Section 4.3.2 for a discussion of the impacts of these activities on suspended sediment levels and sediment deposition. Water quality impacts associated with jet plow operations, HDD, and other bottom-disturbing activities are expected to be minor and temporally limited and are not anticipated to directly impact marine mammals.

Impacts to marine mammal prey species due to bottom disturbing activities are also expected to be minor. Though direct bottom disturbance and sediment deposition would result in localized mortality of benthic organisms, impacts to communities of benthic crustacean and shellfish species which may serve as prey for marine mammals are expected to be negligible (Section 4.5.2.1). Therefore, impacts to marine mammals are not anticipated to result from bottom disturbing activities related to Project construction.

4.7.2.1.2 Offshore Export Cable Corridor 1

Impacts for the Offshore Export Cable Corridors would be the same as those described above in Section 4.7.2.1.1.

4.7.2.2 Operations

4.7.2.2.1 Onshore Export Cable South Corridor

Noise

Vessel Noise

Project O&M activities may require vessel travel within the Project area. Vessel noise has the potential to impact marine mammals (Section 4.7.2.1). However, as the region is heavily traveled by commercial shipping and fishing vessels, low levels of vessel noise associated with Project activities are not anticipated to alter existing acoustic conditions in the region.

Vessel Traffic

Vessel traffic associated with O&M activities could endanger marine mammals (Section 4.7.2.1). US Wind will implement vessel strike avoidance procedures in consultation with NOAA Fisheries. Trained observers or PSOs would be present on vessels, therefore the risk of harm to marine mammals from vessel strikes is considered negligible. In addition, US Wind would continue to evaluate technologies that may increase the ability to detect marine mammals from vessels, such as thermal detection technologies.

EMF

Certain marine mammals have the ability to detect magnetic intensity gradients and use this sensitivity for navigation during migration (Czech-Damal et al. 2012; Kirschvink, Dizon, and Westphal 1986; Normandeau Associates Inc. 2011). The presence of anthropogenic magnetic fields could illicit behavioral responses in marine mammals, ranging from changes in swim direction to alteration of migration routes (A.B. Gill et al. 2005). The EMF associated with the submarine cables such as offshore export cables could be detectable by marine mammals, however impacts are unlikely due to the low intensity and localized nature of these fields.

A site specific study found that the maximum magnetic-field levels decreased from 148 mG (milligauss) at the seabed to 12 mG at 3.3 ft (1 m) above the seafloor (Table 4.7-1 (Exponent 2023)). Multiple additional reviews of current research have documented a lack of evidence of cable EMF impacts on marine mammal behavior (A. Gill and Desender 2020; Normandeau Associates Inc. 2011), though this topic remains understudied. Because the export cables will be shielded and buried or covered by cable protection, the intensity of the electromagnetic fields generated by operation of the cables will be minimized (BOEM 2021). Additionally, as marine mammals are pelagic and must regularly return to the water surface to breath, they will rarely, if ever, be in close proximity to project cables (Exponent 2023). Therefore, impacts to marine mammals due to EMF are anticipated to be negligible.

Table 4.7-1. Summary of Calculated Magnetic- and Induced Electric-Field Levels[1]

Cable Configuration	Evaluation Height for Magnetic- or Electric-Field	Magnetic Field (mG)			Electric Field (mV/m) [2]		
		Max	Horizontal Distance from Cable		Max	Horizontal Distance from Cable	
			1.5 m (5 ft)	3 m (10 ft)		1.5 m (5 ft)	3 m (10 ft)
Inter-array Cable	At the seabed	49	4.0	0.1	0.7	0.1	< 0.1
	1 m (3.3 ft) above the seabed	2.1	0.5	< 0.1	< 0.1	< 0.1	< 0.1
Offshore Export Cable	At the seabed	148	21	0.9	2.5	0.4	< 0.1
	1 m (3.3 ft) above the seabed	12	3.7	0.3	0.2	0.1	< 0.1
Export Cables in Indian River Bay [3,4]	At the seabed	148	21	0.9	2.5	0.4	< 0.1
	1 m (3.3 ft) above the seabed	12	3.8	0.3	0.2	0.1	< 0.1

Adapted from Exponent 2023

[1] The horizontal distance is measured from the centerline of the individual inter-array or offshore export cable.
[2] Induced electric fields in representative marine species of interest are lower than those presented here for induced electric fields in seawater.
[3] For HDD, cables will be installed approximately 6.6 ft (2 m) or greater. As a result, the maximum calculated field levels will be lower than those presented here.
[4] For Indian River Bay Export Cables, the results at horizonal distances > 0 were provided relative to the cable with the higher current (1,200 A and 480 A for peak and average loading, respectively). Calculated fields near cables carrying lower currents will be lower.

4.7.2.2.2 Offshore Export Cable Corridor 1

Impacts due to vessel noise, EMF, and vessel traffic are discussed in Section 4.7.2.2.1.

Habitat Alteration

Habitat alteration due to the presence of the submarine cables and cable protection for the Offshore Export Cables is not expected to impact marine mammal populations. The addition of man-made structures to the marine habitat within the Project area would not physically restrict marine mammal movement or alter marine mammal prey densities.

Entanglement and Marine Debris

Entanglement will not pose a risk to marine mammals during Project operations. Submarine cables will be buried approximately 1 to 4 m (3 to 13 ft) beneath the seafloor or covered with protective material (e.g., concrete mattresses) when target burial depths for the Offshore Export Cables are not achievable. US Wind would follow BOEM guidelines for marine trash and debris prevention (Section 4.3.2). Therefore, operations impact to marine mammals due to entanglement and marine debris are anticipated to be negligible.

Avoidance and Minimization

US Wind has and will implement the following avoidance and minimization measures to reduce Project impacts on marine mammals. US Wind will comply with the measures defined in the final proposed rule for the MMPA upon its publication.

Vessel Strike Avoidance

US Wind will implement the following vessel strike avoidance and minimization measures:

- Trained observers or PSOs will be present on crew vessels and other project vessels.
- US Wind will ensure that from November 1 through April 30, vessel operators monitor NOAA Fisheries NARW reporting systems (e.g., Early Warning System, Sighting Advisory System, and Mandatory Ship Reporting System) for the presence of NARWs.
- Vessels 19.8 meters (65 feet) in length or greater would operate at speeds of 10 knots or less in NARW Special Management Areas (SMAs). Additionally, all vessels would operate at speed of 10 knots or less in Right Whale Slow Zones, identical to Dynamic Management Areas (DMAs), to protect visually or acoustically detected NARW. US Wind will incorporate the proposed revision to the NARW vessel speed rule[5] for vessels 10.6-19.8 meters (35-65 feet) in length upon implementation.

[5] On August 1, 2022, NMFS published proposed amendments to the North Atlantic right whale vessel strike reduction rule (87 FR 46921). As of this writing the proposed amendments have not been finalized.

- All vessels would maintain a minimum separation distance of 500 meters (1,640 feet) or greater from any sighted NARW. If a NARW is sighted within this separation distance while underway, the vessel would steer a course away from the whale at 10 knots (18.5 kilometers/hour) or less until the 500 meters (1,640 feet) minimum separation distance has been established. If a NARW is sighted within 100 meters (328 feet) of an underway vessel, the vessel operator would immediately reduce speed and promptly shift the engine to neutral. If the vessel is stationary, the operator would not engage engines until the North Atlantic right whale has moved beyond 100 meters (328 feet).
- All vessels would maintain a separation distance of 100 meters (328 feet) or greater from any sighted non-delphinid cetacean other than the NARW. If a non-delphinid cetacean is sighted within 100 meters (328 feet) of an underway vessel, the vessel operator would immediately reduce speed and promptly shift the engine to neutral. The vessel operator would not engage the engines until the non-delphinid cetacean has moved beyond 100 meters (328 feet). If a vessel is stationary, the operator would not engage engines until the non-delphinid cetacean has moved beyond 100 meters (328 feet).
- All vessels would maintain a separation distance of 50 meters (164 feet) or greater from any sighted delphinid cetacean or pinniped, except if the mammal approaches the vessel. If a delphinid cetacean or pinniped approaches an underway vessel, the vessel would avoid excessive speed or abrupt changes in direction to avoid injury to these organisms. Additionally, vessels underway may not divert to approach any delphinid cetacean or pinniped.
- All vessels would reduce speed to less than or equal to 10 knots when mother/calf pairs, pods, or large assemblages of ESA-listed marine mammals are observed.
- Vessels would monitor for marine mammal species during Project activities. Details are presented in the US Wind Marine Mammal Monitoring Plan (Appendix B, of the US Wind Application for Letter of Authorization under the Marine Mammal Protection Act (US Wind 2023a)).

<u>Other Avoidance and Minimization</u>

US Wind will implement the following other avoidance and minimization measures:

- Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable.
- Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 *Marine Trash and Debris Awareness and Elimination*, per BOEM guidelines for marine trash and debris prevention.
- Vessels will adhere to USCG guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.

- US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

4.8 Sea Turtles

Temporary and permanent impacts were evaluated as required by Section 10b of Appendix M Activities in State Wetlands (see Appendix A).

4.8.1 Description of Affected Environment

The Atlantic coast's sea turtles are represented by members of the taxonomic families Cheloniidae (the hardshell sea turtles) and family Dermochelyidae (leatherback sea turtles). Table 4.8-1 lists the sea turtle species that are known to occur at least occasionally in the mid-Atlantic OCS region. One of these species is known to occur only rarely in the mid-Atlantic OCS region and is not likely to be affected by project activities.

Table 4.8-1 Sea Turtles with Potential Occurrence in the Project Area

Common Name	Scientific Name	ESA Status	Relative Occurrence in Project Area
Family Cheloniidae (hardshell sea turtles)			
Loggerhead turtle	*Caretta*	Threatened	Common
Green turtle	*Chelonia mydas*	Threatened	Uncommon
Kemp's Ridley turtle	*Lepidochelys kempii*	Endangered	Uncommon
Hawksbill turtle	*Eretmochelys imbricata*	Endangered	Rare
Family Dermochelyidae (leatherback sea turtles)			
Leatherback turtle	*Dermochelys coriacea*	Endangered	Common

Though the range of the endangered hawksbill turtle includes the Project area, this species prefers tropical and sub-tropical waters and is only rarely found in the mid-Atlantic (USDOI and USFWS 2018a). Therefore, four species of sea turtle, listed below, are likely to be affected due to their potential presence in Delaware state waters during project activities.

- Loggerhead turtle (*Caretta caretta*)
- Leatherback turtle (*Dermochelys coriacea*)

- Green turtle (*Chelonia mydas*)
- Kemp's ridley turtle (*Lepidochelys kempii*)

Loggerhead turtles are common in the vicinity of the Lease area, while green, leatherback, and Kemp's ridley turtles are less frequently observed.(USDOI and BOEM 2012). All four of these species are listed as endangered or threatened under the ESA and are described in detail in Section 4.12.4.

4.8.2 Impacts

Sea turtles in the Project area have the potential to be impacted by a variety of factors associated with Project activities. The impacts of noise and vessel traffic on these organisms are discussed in more detail in Sections 4.8.2.1, 4,8.2.2, and 4.8.2.3. US Wind does not propose dredging offshore; therefore, this impact to sea turtles would be avoided.

4.8.2.1 Construction

4.8.2.1.1 Onshore Export Cable South Corridor

Vessel Noise

Sea turtles may use auditory signals to locate prey, avoid predators, and aid in navigation (W. Dow Piniak, Mann, et al. 2012; W.E. Dow Piniak, D.A. Mann, et al. 2012). Relatively little is known about sea turtle hearing capabilities, but these organisms are generally sensitive to low-frequency sounds. Vessel noise is primarily composed of low-frequency components (Hildebrand 2009), and is therefore within the hearing ranges of the sea turtle species likely to occur in the Project area.

Exposure of sea turtles to noise from construction and operations vessels would be variable, as the intensity of vessel noise is largely related to ship size and speed (Hildebrand 2009). Because the Project area and adjacent waters are already well-traveled and host active fishing (commercial and recreational) and shipping industries, sea turtles in the region are likely habituated to vessel noise. Construction vessel noise would be limited, as boats will travel to and from the Project area at low speeds and will remain stationary at work sites for extended periods of time. During Project installation activities, DP thrusters may be used. Noise resulting from the use of DP thrusters is similar to that produced by vessels in transit. Any impacts to sea turtles due to vessel noise are expected to be temporary, with behavior rapidly returning to normal following passage of a Project vessel. It is unlikely that such short-term effects would result in long-term population-level impacts to sea turtles.

Vessel Traffic

Though sea turtles spend a majority of the time submerged (Southwood et al. 1999; Houghton et al. 2002; Eckert 2006), these organisms are vulnerable to vessel collisions when feeding or basking in surface waters or breathing at the water surface (NOAA Fisheries 2017e). These interactions can result in serious injury or death (Barco et al. 2016; Hazel et al. 2007). Hazel et al. (2007) observed that green turtles likely habituate to vessel noise and found that the proportion of turtles that fled from approaching vessels decreased with increasing vessel speed. This study concluded that turtles in surface waters may not be able to effectively avoid being struck by vessels traveling in excess of four knots (Hazel et al. 2007). The risk of vessel strike during Project activities is limited as vessels will maintain a separation distance of 50 m (164 ft) from any sighted sea turtle, except if the animal approaches the vessel.

Entanglement and Marine Debris

Entanglement will not pose a risk to sea turtles during Project construction. US Wind does not anticipate the use of anchored vessels during construction. If used, mooring lines will be of relatively large diameter and will generally be kept under tension, eliminating entanglement risk.

All CWA and other federal regulations regarding marine debris will be followed during construction activities. Items that have the potential to become marine debris will be disposed of on shore. Construction activities are not anticipated to generate marine debris and will therefore not pose a risk to sea turtles.

Land Disturbance

US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known sea turtle nesting beaches. The use of HDD for cable installation under the Barrier Beach Landfall will avoid impacts on beaches. Construction is anticipated to occur outside of turtle nesting season. Agency consultation and monitoring will be conducted as needed to mitigate disturbances.

Routine/Accidental Releases

During the course of construction, pollutants may be discharged into the environment as part of routine activities, such as the operation of construction vessels and vehicles, or due to accidental spills. See Section 4.3.2 for a discussion of the impacts of routine and accidental releases during Project activities. Water quality impacts due to routine and accidental releases are anticipated to be negligible and are therefore not expected to impact sea turtles or their prey species.

Suspended Sediment/Deposition

The use of jack-up and feeder vessels, jet plow operations during cable laying and embedment, vessel anchoring, and the installation and removal of gravity cells would disturb sediment on the seafloor. The use of mechanical trenching or conventional cable plowing would also result in sediment disturbance, though this activity will be limited only to areas where site conditions do not allow for the use of jet plowing. See Section 4.3.2 for a discussion of the impacts of these activities on suspended sediment levels and sediment deposition. Water quality impacts associated with jet plow operations, HDD, and other bottom-disturbing activities are expected to be minor and temporally limited and are not anticipated to directly impact sea turtles.

Impacts to sea turtle prey species due to bottom disturbing activities are expected to be minor. Though direct bottom disturbance and sediment deposition would result in localized mortality of benthic organisms, impacts to communities of benthic crustacean and shellfish species which may serve as prey for sea turtles are expected to be negligible (Section 4.5.2.1). Similarly, local increases in suspended sediment concentrations are expected to have negligible to minor, and spatially limited, impacts on other sea turtle prey species including jellyfish, ctenophores, salps, and fish (Section 4.6.2.1). Therefore, impacts to sea turtles are not anticipated to result from bottom-disturbing activities related to project construction.

4.8.2.1.2 Offshore Export Cable Corridor 1

Impacts for the Offshore Export Cable Corridors would be the same as those described above in Section 4.8.2.1.1.

4.8.2.2 Operations

4.8.2.2.1 Onshore Export Cable South Corridor

Vessel Noise

Project O&M activities would require vessel travel within the Project area. Vessel noise has the potential to impact sea turtles (Section 4.8.2.1). However, as the region is heavily traveled by commercial shipping and fishing vessels, low levels of vessel noise associated with Project activities are not anticipated to alter acoustic conditions.

EMF

Several species of sea turtle are able to detect and utilize the earth’s natural magnetic field. Sea turtles are able to detect both magnetic field intensity (Kenneth J. Lohmann and Lohmann 1996) and magnetic inclination angle (Kenneth J. Lohmann and Lohmann 1994) and possess a heritable “magnetic map” that they use for navigation (K. J. Lohmann et al. 2007). The highest intensity EMF, located directly above the cable, may be experienced by sea turtles foraging in the vicinity of the Project area. Loggerheads, the most common turtle in the Project area, primarily forage for finfish and other prey in the top 10 m (33 ft) of the water column, though this species does intermittently venture to the seafloor in search of benthic invertebrate prey and may come in contact with cable-generated EMF (Smolowitz et al. 2015; Seney and Musick 2007).

Green sea turtles may forage near buried submarine cables. This species exhibits ontogenetic shifts in diet; adult turtles are almost entirely herbivorous, and are found in benthic coastal regions, whereas juveniles consume an omnivorous diet and forage within the water column (Arthur, Boyle, and Limpus 2008). Therefore, adult green turtles are most likely to spend time in proximity to buried cables. In contrast, leatherback turtles are obligate feeders on gelatinous zooplankton and are unlikely to spend time in the vicinity of the submarine cable.

The intensity of EMF generated by the Offshore Export Cables would be limited by burial of the cable beneath the sea floor (approximately 1 to 4 m [3.2 to 13.1 ft]). A site specific study found that the maximum magnetic-field levels decreased from 148 mG (milligauss) at the seabed to 12 mG at 3.3 ft (1 m) above the seafloor (Table 4.8-2 (Exponent 2023)). US Wind would use submarine cables that have electrical shielding and bury the cables in the seafloor, when practicable. Due to the limited spatial extent of the EMF produced by cable operation, and the low level of risk of exposure of sea turtle species to EMF, population-level impacts to sea turtle behavior are not anticipated (Exponent 2023).

Table 4.8-2. Summary of Calculated Magnetic- and Induced Electric-Field Levels[1]

Cable Configuration	Evaluation Height for Magnetic- or Electric-Field	Magnetic Field (mG)			Electric Field (mV/m) [2]		
		Max	Horizontal Distance from Cable		Max	Horizontal Distance from Cable	
			1.5 m (5 ft)	3 m (10 ft)		1.5 m (5 ft)	3 m (10 ft)
Inter-array Cable	At the seabed	49	4.0	0.1	0.7	0.1	< 0.1
	1 m (3.3 ft) above the seabed	2.1	0.5	< 0.1	< 0.1	< 0.1	< 0.1
Offshore Export Cable	At the seabed	148	21	0.9	2.5	0.4	< 0.1
	1 m (3.3 ft) above the seabed	12	3.7	0.3	0.2	0.1	< 0.1
Export Cables in Indian River Bay [3,4]	At the seabed	148	21	0.9	2.5	0.4	< 0.1
	1 m (3.3 ft) above the seabed	12	3.8	0.3	0.2	0.1	< 0.1

Adapted from Exponent 2023

[1] The horizontal distance is measured from the centerline of the individual inter-array or offshore export cable.
[2] Induced electric fields in representative marine species of interest are lower than those presented here for induced electric fields in seawater.
[3] For HDD, cables will be installed approximately 6.6 ft (2 m) or greater. As a result, the maximum calculated field levels will be lower than those presented here.

Table 4.8-2. Summary of Calculated Magnetic- and Induced Electric-Field Levels[1]

Cable Configuration	Evaluation Height for Magnetic- or Electric-Field	Magnetic Field (mG)			Electric Field (mV/m) [2]		
		Max	Horizontal Distance from Cable		Max	Horizontal Distance from Cable	
			1.5 m (5 ft)	3 m (10 ft)		1.5 m (5 ft)	3 m (10 ft)
[4] For Indian River Bay Export Cables, the results at horizonal distances > 0 were provided relative to the cable with the higher current (1,200 A and 480 A for peak and average loading, respectively). Calculated fields near cables carrying lower currents will be lower.							

Vessel Traffic

Vessel traffic associated with Project O&M activities could endanger sea turtles (Section 4.8.2.1). Project vessels will follow NOAA Fisheries collision avoidance guidance and maintain a separation distance of at least 50 m (164 ft) from any sighted sea turtle, unless the animal approaches the vessel. Therefore, the risk of harm to sea turtles from vessel strike is negligible.

4.8.2.2.2 Offshore Export Cable Corridor 1

Impacts due to vessel noise, EMF, and vessel traffic are discussed in Section 4.8.2.2.1.

Habitat Alteration

Habitat alteration due to the installation of the submarine cable and placement of cable protection for the Offshore Export Cables is not expected to negatively impact sea turtle populations.

Entanglement and Marine Debris

Entanglement will not pose a risk to sea turtles during Project operation. Submarine cables will be buried approximately 1 to 4 m (3 to 13 ft) beneath the sea floor or covered with protective material (e.g., concrete mattresses) when target burial depths for the Offshore Export Cables are not achievable.

Additionally, the CWA and other federal regulations regarding marine debris will be followed during operations activities. Items that have the potential to become marine debris will be disposed of on shore. Operations activities are not anticipated to generate marine debris and will therefore not pose a risk to sea turtles.

Avoidance and Minimization

US Wind will implement the following avoidance and minimization measures to reduce Project impacts on sea turtles.

Vessel Strike Avoidance

- Vessels will observe NOAA Fisheries collision avoidance guidance, such as establishing a minimum separation distance of 50 m (164 ft) from sea turtles.
- Trained observers will be present on crew vessels and other project vessels without PSOs.

4.8.3 Other Avoidance and Minimization

US Wind will implement the following other avoidance and minimization measures:

- Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts to sea turtles;
    - Limited offshore site preparation, specifically hopper dredging to avoid impacts to sea turtles, at offshore substation locations June 1 through October 31.
- US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.
- Submarine cables that have electrical shielding will be used and the cables will be buried in the seafloor, where practicable.
- Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 *Marine Trash and Debris Awareness and Elimination*, per BOEM guidelines for marine trash and debris prevention.
- Vessels will adhere to USCG guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.
- US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known nesting beaches, where feasible. The use of HDD for cable installation under the Barrier Beach Landfalls will avoid impacts on beaches.
- Construction is anticipated to occur outside of turtle nesting season. Agency consultation and monitoring will be conducted as needed to mitigate disturbances.

- US Wind conducted a site-specific study of potential EMF impacts on electrosensitive marine organisms.

4.9 Upland Habitats

Shoreline composition and habitat was evaluated as required by Sections 11b and 11c of the DNREC Appendix S New Dredging Projects Form and Section 10e of Appendix M Activities in State Wetlands (see Appendix A).

4.9.1 Description of Affected Environment

The terrestrial portion of the Project area is in the Delmarva region and includes the proposed Interconnection Facility. The Barrier Beach Landfall is considered in Section 4.4.1.1 of this document, as a coastal resource.

Interconnection Facilities

Several federal agencies and non-governmental organizations (NGO) have developed systems to classify and describe distinct regions and sub-regions of North America with respect to geography, geology, hydrology, vegetation, and wildlife which are used in the section to describe terrestrial portions of the Project. The Interconnection Facility is located in the Virginian Barrier Island and Coastal Marshes (63d) Level IV Ecoregion (Indian River Bay). The EPA defines Ecoregions as "areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. Because they include large-scale geophysical patterns in the landscape that are linked to the faunal and floral assemblages and processes at the ecosystem scale, ecoregions provide a useful means for simplifying and reporting on more complex patterns of biodiversity" (USEPA 1999).

The Nature Conservancy (TNC) also classifies North America into Ecoregions based on shared biotic and abiotic characteristics (Groves et al. 2002). The TNC system places the Interconnection Facilities in the Chesapeake Bay Lowlands (CBY) Ecoregion. The United States Forest Service (USFS) classification system places most of Delaware, including the Interconnection Facility, in the Outer Coastal Plain Mixed Forest Province (Bailey 1995). These forests are dominated by evergreen oaks and members of the laurel and magnolia families.

The DNREC designates State Wildlife Areas (SWAs) through its general authority to manage and conserve all forms of regulated state wildlife. SWAs or refuges are any land or water body of the state, whether in public or private ownership, designated by DNREC in the interest of conservation of wildlife. According to DNREC and the USFWS, the Interconnection Facilities are not located in the vicinity of any state or federally owned conservation land (USFWS 2021a). Per consultation with DNREC in the Environmental Review, the Project is within the Indian River Bay Natural Area and near the Vines Creek and Herring Creek Natural Areas. Impacts to the Indian River Bay Natural Area due to Project activities will be temporary, as discussed in this document. The Vines

Creek and Herring Creek Natural Areas are outside the proposed Project and would not be impacted.

The proposed Interconnection Facilities are adjacent to the existing Indian River Substation in Sussex County, Delaware. The area in the vicinity of the proposed Interconnection Facilities includes areas of forest, the existing Indian River Substation and the nearby Indian River Power Plant. Associated infrastructure includes overhead powerlines, rail lines, and paved access roads.

As it is expected that the proposed Interconnection Facility will be installed within previously disturbed areas to the extent feasible, Project impacts to terrestrial species and upland habitats will be minimal.

Onshore Export Cable South Corridor

Onshore Export Cable South Corridor is entirely within Indian River Bay. There are upland habitats along the shoreline in the form of natural areas. These include the following conservation areas:

- Bullseye Ferry Landing Preserve: located on the Indian River, opposite the Indian River Power Plant (owned by the Nature Conservancy)
- Indian River – Bullseye Farm: located on the Indian River, opposite the Indian River Power Plant (owned by the Nature Conservancy)
- Delaware Seashore State Park: located at the eastern HDD location and 3R's Beach landfall location (owned by Delaware DNREC Division of Parks and Recreation)

Cable Burial Dredging Areas

The existing land uses along the northern bank in the vicinity of the dredging areas include mixed residential; single and multi-family dwellings; recreational; and farms, pastures, and cropland. The southern bank is mostly undeveloped (part of the Piney Neck Conservation Area), consisting of emergent wetlands, evergreen forest, and mixed forest. The shoreline composition in the vicinity of the dredging areas is extremely variable. The northern shoreline is developed and consists predominantly of bulkheads, with beaches, wetlands, and vegetated banks also present. The southern shoreline is predominantly undeveloped, consisting of beaches, wetlands, and vegetated banks.

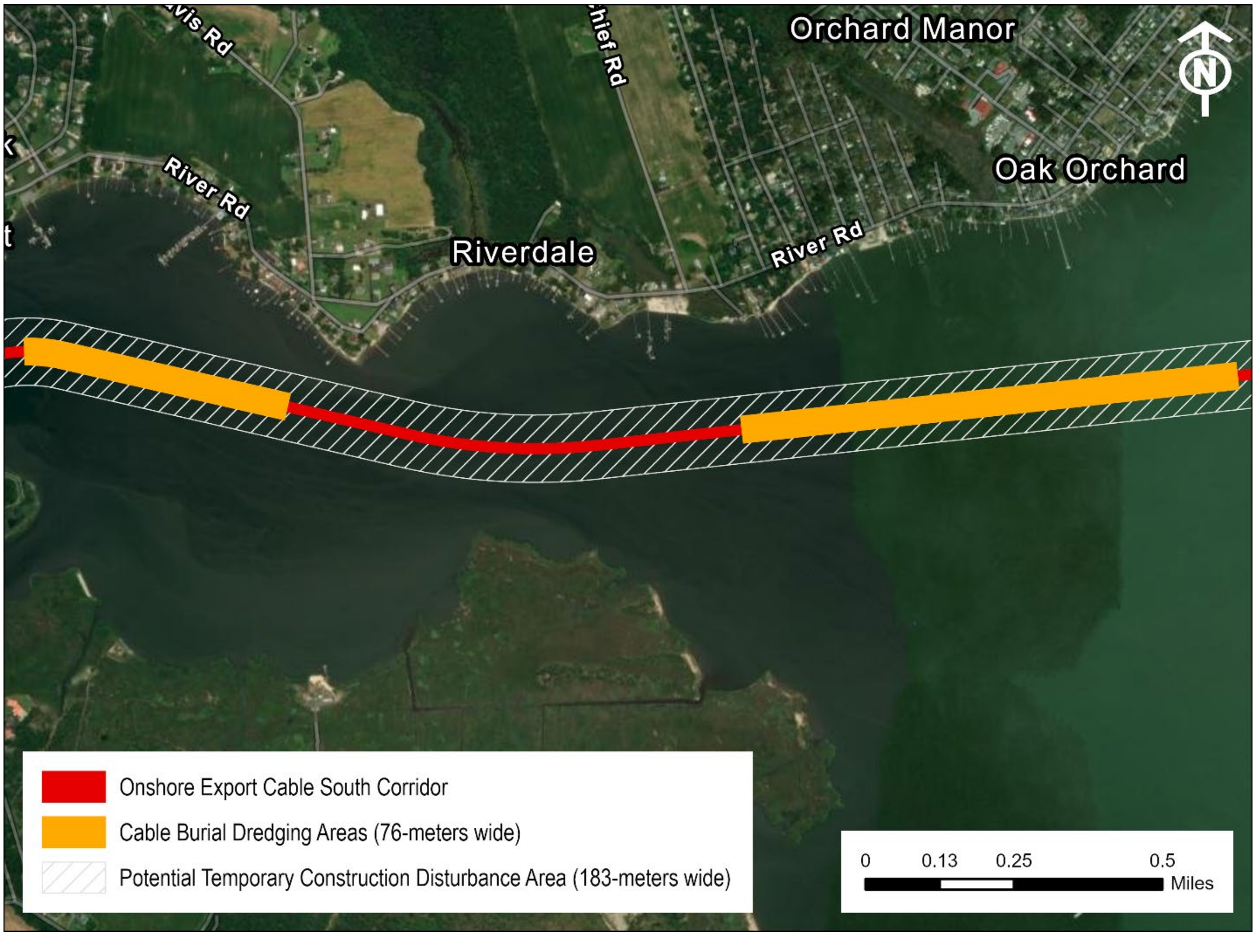

Figure 4.9-1. Shoreline in the Vicinity of the Dredging Areas

4.9.2 Impacts

Impacts to upland habitats during the construction and operation would be negligible to minor and be limited to the areas surrounding the Project areas. Measures to reduce potential environmental impacts were evaluated as required by Section 18f of the DNREC Appendix S New Dredging Projects Form and Section 10e of Appendix M Activities in State Wetlands (see Appendix A).

4.9.2.1 Construction

Impacts to upland habitats during construction would be negligible to minor. Project impacts to upland habitats will be minimal. Disturbance to habitat alteration is considered to have already occurred from the development of the pre-existing facilities. The Interconnection Facility will consist of US Wind substations that may result in varying degrees of forested habitat loss and require vegetation clearing.

4.9.2.2 Operations

There would be minor impacts to upland habitats during the operations of this Project.

4.9.3 Avoidance and Minimization

Measures to reduce potential environmental impacts were evaluated as required by Section 18f of the DNREC Appendix S New Dredging Projects Form (see Appendix A). US Wind will implement various avoidance and minimization measures to reduce Project impacts on upland habitats.

- For the construction laydown areas and site access, existing disturbed areas will be used where possible.
- Tree clearing activities at the US Wind substations required for Project construction are not planned between April 1 through July 31 to avoid or minimize impacts to potentially mature forest and the northern long-eared bat summer maternity period.
- Methods to reduce engine emissions (i.e., restricting engine idling) will be implemented during construction and operation where possible.
- Project-specific SPCC Plan will be prepared prior to construction and for operations activities.
- US Wind will develop a SWPPP for onshore construction activities, as appropriate.
- Lighting-related impacts will be minimized by using best management practices (BMPs) where feasible. Examples of BMPs to minimize the adverse impacts of artificial lighting will include not lighting the facility at night except in the case of an emergency that requires an immediate response, and the use of down-shielded light fixtures to reduce the visibility of light by birds, bats, and insects flying above the facility.

4.10 Bats

Temporary and permanent impacts were evaluated as required by Section 10b of Appendix M Activities in State Wetlands (see Appendix A).

4.10.1 Description of Affected Environment

Up to ten species of bats are present in Delaware during at least a portion of the year (Table 4.10-1) (DNREC 2012a; MDNR 2015a). All ten species breed in Delaware and are present from the spring through the late summer or fall. Following the completion of their annual reproductive cycle, the four species in the genera *Nycticeius*, *Lasiurus*, and *Lasionycteris* (the “tree bats”) migrate out of the area to more southerly wintering grounds (Cryan 2003). By contrast, the six species in the genera *Eptesicus*, *Myotis*, and *Perimyotis* (the “cave bats”) remain in the mid-Atlantic region and begin moving into local winter hibernacula (primarily caves and mines). Among the cave bats are the federally endangered northern long-eared bat (NELB) (*Myotis septentrionalis*) (DNREC 2012) (80 FR 17973).

Table 4.10-1. Bats of Delaware and Eastern Maryland

Common Name	Scientific Name	Federal Status
Cave Bats		
Big brown bat	*Eptesicus fuscus*	
Eastern small-footed bat	*Myotis leibii*	
Little brown bat	*Myotis lucifugus*	
Northern long-eared bat	*Myotis septentrionalis*	Endangered*
Eastern pipistrelle (Tri-colored bat)	*Perimyotis subflavous*	
Tree Bats		
Evening bat	*Nycticeius humeralis*	
Hoary bat	*Lasiurus cinereus*	
Eastern red bat	*Lasiurus borealis*	
Silver haired bat	*Lasionycteris noctivagans*	
Source: DNREC 2012a, MDNR 2015b, 50 CFR Part 17 *Life history information about this endangered species can be found in Section 4.13.6, of this document.		

While the specific migration patterns of bats are not well-documented, many species are known to travel along linear landscape features such as rivers and topographic ridges during daily movements and migration, suggesting a preference for overland migration routes. Bats are also known to migrate along the coast. In the mid-Atlantic, eastern red bats (*Lasiurus borealis*), hoary bats (*Lasiurus cinereus*), and silver-haired bats (*Lasionycteris noctivagans*) migrate through Assateague Island National Seashore, a barrier island off the coast of Maryland (Johnson, Gates, and Zegre 2011)

4.10.2 Onshore Occurrence

Bats use a variety of natural and anthropomorphic terrestrial habitats during their active period between spring and fall. All bat species that occur in the mid-Atlantic region feed primarily on insects captured in flight and are typically attracted to areas where large numbers of flying insects may be found. These include areas of open water (streams and ponds), clearings, forest canopies, agricultural areas, and around streetlights and other artificial light sources. Depending on the species, summertime diurnal roosting sites may include buildings and other man-made structures or trees beneath loose or peeling bark, in cavities, or among foliage on branches. In the fall, tree bats begin their relatively long-distance migrations to more southerly portions of their range, where they may remain active throughout the year. Cave bats, by contrast, complete relatively short-distance migrations from summer habitats to local hibernacula, where they overwinter until the following spring (DNREC 2012)

Analysis by Johnson et al. (2011) examined seasonal bat activity along the Atlantic Coast at Assateague Island. By using three Anabat II detectors spread throughout the island, it was determined that bats were using Assateague Island during migration activity, but the study did not specify the extent of the use of Assateague Island by bats (Johnson, Gates, and Zegre 2011) Silver-haired bats (*Lasionycteris noctivagans*) used the barrier island as a stopover during migration, while hoary bats (*Lasiurus cinereus*) and eastern red bats were either migrants or residents year-round. The analysis concluded that bats may be attracted to offshore structures as a resting or mating area, but since the results represented an index of bat activity, not a count, it would be difficult to assess or predict the number of bats affected by offshore wind farms.

DNREC has installed acoustic bat detectors in six locations in Indian River Bay area and collected data during the 2019 to 2021 summer breeding season (DNREC 2021). Based on an analysis of the recorded bat calls, DNREC estimates that there is a 90 to 100 percent likelihood that *Myotis* were present in 2020 in the vicinity of the detector and that Northern long-eared bats are potentially present in the area.

4.10.3 Impacts

4.10.3.1 Construction

<u>Habitat Alteration</u>

The area in the vicinity of the Interconnection Facilities is comprised primarily of forested habitats, and due to the relatively general nature of many bat species' habitat preferences, may provide suitable habitat for one or more bat species. Construction impacts in the vicinity of the Interconnection Facility are discussed in Section 4.9.1 above and includes vegetation clearing and grubbing. These activities may have the potential to degrade the suitability of the area as habitat for bats. However, given the relatively small size of the footprint of the Interconnection Facilities and the large area of roosting and foraging habitat that would remain available for use by bat species in the immediate vicinity, the effect of this potential impact is considered negligible.

Onshore export cables traversing Onshore Export Cable South Corridor would exit Indian River Bay via HDD to the US Wind substations. The HDD activities would take place within the footprint of the Interconnection Facilities and would not require any additional clearing. As discussed in US Wind (2022) Volume II, Section 13.0, the NELB has not been identified as being present in the vicinity of the Interconnection Facilities, however it may occur in Delaware. Bats tend to use coastal systems, such as barrier islands (specifically Assateague Island), as stopovers during seasonal migrations, which is further discussed in Section 4.10.2 above.

The USFWS has established a recommended seasonal time of year (TOY) restriction for tree clearing activities in areas where the federally listed NELB may occur. This tree clearing TOY restriction recommended for NELB is expected to be protective of other bat species which may occur in the area. To avoid or minimize impacts to northern long-eared bat during the summer maternity period, the USFWS recommends tree clearing activities occur between August 1 and May 30. The Project will adopt this tree clearing TOY restriction.

Construction of the Interconnection Facilities would generate noise that has the potential to result in disturbance or displacement of bats during the construction period. However, noise generating construction activities would generally take place during daylight hours when bats are inactive in their diurnal roosts. Construction activities are not expected to occur at night when bats are actively foraging, and thus are unlikely to interfere with the ability of bats to echolocate or result in significant disturbance or displacement of bats from the vicinity of the Interconnection Facilities. In addition, the area is currently impacted by noise generated by the existing Indian River Power Plant and Indian River Substation. Therefore, the effect of this potential impact is considered negligible.

Lighting

Construction of the Interconnection Facilities may generate artificial lighting that has the potential to result in disturbance or displacement of bats during the construction period. However, construction activities will generally take place during daylight hours when bats are inactive in their diurnal roosts. Construction activities are not expected to occur at night, when bats are actively foraging, and thus are unlikely to interfere with bat behavior or cause disturbance or displacement effects. In addition, the area in the vicinity of the proposed Interconnection Facilities is currently exposed to artificial lighting generated by the existing Indian River Power Plant and Indian River Substation. Therefore, the effect of this potential impact is considered negligible.

4.10.3.2 Operations

Artificial lighting generated by the Interconnection Facilities may attract insects, which in turn may attract foraging bats, thus increasing the risk of collision with electrical infrastructure and other aboveground structures. However, artificial lighting generated by the existing Indian River Power Plant and Indian River Substation already exists in the area, and the additional lighting generated by the Interconnection Facilities is not expected to significantly increase the degree of this existing effect.

4.10.4 Avoidance and Minimization

US Wind will implement the following avoidance and minimization measures to reduce Project impacts on bats.

- Following consultation with DNREC, US Wind would extend the restriction of tree clearing activities at the US Wind substations location required for Project construction to April 1through July 31 to avoid or minimize impacts to northern long-eared bat during the summer maternity period.
- A habitat assessment and bat survey will be conducted as requested by DNREC.

- US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

4.11 Terrestrial Species

Temporary and permanent impacts were evaluated as required by Section 10b of Appendix M Activities in State Wetlands (see Appendix A).

4.11.1 Vegetation

Terrestrial plant habitat value has been evaluated as required by Sections 8d and 20.2f of the DNREC Appendix S New Dredging Projects Form (see Appendix A).

The primary natural vegetative community types present in the vicinity of the Interconnection Facility are: Southern Atlantic coastal plain mesic hardwood forest and North Atlantic coastal plain hardwood forest (DEDFW 2015). In general, highly fragmented and dominated by a mix of hickories, oaks, and tulip poplar, Southern Atlantic coastal plain mesic hardwood forests often develop on moist, acidic, nutrient-poor soils in the coastal plain on a variety of landforms, including flatwoods, undulating uplands, ravines, and lower slopes. This is one of the common forested habitats in Delaware and it is not listed as a habitat of conservation concern. Per DNREC consultation, there is the potential for mature forest around the substation site.

North Atlantic coastal plain hardwood forests are found on acidic, sandy soils and are largely dominated by oaks, with pines occasionally as a codominant. An herbaceous layer is typically not well developed and is patchy to sparse throughout the forest floor. According to the Delaware Wildlife Action Plan, this habitat community is considered a habitat of conservation concern (DEDFW 2015).

4.11.2 Wildlife Communities

The wildlife community in the vicinity of the Interconnection Facilities is expected to be typical of that associated with the two habitat community types described above. Both the Southern Atlantic coastal plain mesic hardwood forest habitat and the North Atlantic coastal plain hardwood forest habitat have relatively similar vegetation and physical characteristics and therefore would be expected to host a similar wildlife community. Examples of typical mammal species that may be found in these habitats include: white-tailed deer (*Odocoileus virginianus*), eastern gray squirrel (*Sciurus carolinensis*), and red fox (*Vulpes vulpes*). Typical bird species that could occur in both forest types include: red-tailed hawk (*Buteo jamaicensis*), broad-winged hawk (*Buteo platypterus*), barred owl (*Strix varia*), downy woodpecker (*Dryobates pubescens*), Carolina chickadee (*Poecile carolinensis*), blue-winged warbler (*Vermivora cyanoptera*), Tennessee warbler (*Leiothlypis peregrine*), and blue jay (*Cyanocitta cristata).* Some examples of reptile and amphibian species that may be found in both forest types include: American toad (*Anaxyrus americanus*), Cope's gray tree frog (*Hyla chrysoscelis*), wood frog (*Lithobates sylvaticus*), eastern garter snake (*Thamnophis sirtalis*), and eastern box turtle (*Terrapene carolina*). These lists are intended to provide examples of representative wildlife species that could be expected to occur in these habitat types and are not exhaustive.

4.11.3 Impacts

4.11.3.1 Construction

Construction of the Interconnection Facilities entails an expansion of a DPL Substation, along with a temporary construction laydown area, and related infrastructure.

The following section describes potential impacts to terrestrial habitats and wildlife species that may occur during construction of the Interconnection Facilities.

Habitat Alteration

The construction of the Interconnection Facilities would result in habitat alteration and impacts are anticipated to be minor. Habitat alteration would generally entail the conversion of currently vegetated, pervious areas to non-vegetated, impervious areas. The vegetative cover over the cable right-of-way from the transition vault location to the substation would be limited to grasses and small shrubs to allow future access for maintenance if needed. This habitat alteration would in turn result in an incremental loss of habitat available for use by wildlife species commensurate with the degree of alteration. US Wind substations with a combined footprint of approximately 8.3 acres may result in varying degrees of forested habitat loss and require tree and vegetation clearing. Refer to Appendix C2 for the preliminary engineering plans of the US Wind substation.

Noise

Construction of the Interconnection Facilities would generate noise that may temporarily displace wildlife. Noise impacts are considered negligible to minor. Any increase in noise levels during construction would be temporary and limited.

Vehicle Traffic

The use of construction-related vehicles and equipment at the Interconnection Facilities may result in impacts to wildlife in the vicinity due to increased noise, emissions, and the potential for vehicle strikes. Vehicle strikes may result in mortality of individual wildlife; however most mobile species would be expected to temporarily relocate from areas of active construction. Given the infrequent nature of vehicle strikes, this potential impact is expected to be negligible.

Air Emissions and Routine and Accidental Releases

Routine releases are chemical releases that would be expected to occur during construction and primarily include engine emissions from construction-related vehicles and equipment. Engine emissions are an unavoidable result of the use of construction vehicles and equipment for any construction project and are not specific to the proposed Project. However, methods to reduce engine emissions will be implemented during construction of the proposed Project, including restricting engine idling. Air quality impacts associated with the generation of vehicle emissions at the Interconnection Facilities will be negligible and temporary in nature.

Accidental releases could occur during construction from the HDD operations (in the case of an accidental frac-out of bentonite) and the use of construction vehicles and equipment. A construction SPCC Plan would be developed and implemented in accordance with applicable local, state, and federal requirements. The SPCC Plan would identify control measures proposed to prevent spills of fuel, oil, lubricants, and other chemicals as well as best management practices to be implemented to prevent and contain chemical releases into the environment. Given the nature of construction-related equipment and methods proposed at the Interconnection Facilities, if an accidental release did occur the impacts associated with such a release would be negligible and temporary.

4.11.3.2 Operations

The following section will discuss potential impacts to terrestrial habitats and wildlife species that may occur during operation of the proposed Project.

Noise

Noise generation at the Interconnection Facilities is expected to be negligible during operations. Operations are not expected to result in an increase in background noise levels in the vicinity of the proposed Interconnection Facilities. At Interconnection Facilities locations, operations are not expected to significantly increase background noise levels. Periodic maintenance and inspection activities may result in an increase in noise; however, the incremental increase in noise levels resulting from these activities would be negligible and temporary in nature. US Wind plans to conduct an acoustic assessment of operational noise related to the US Wind substations to support local permitting.

Vehicle Traffic

The Interconnection Facilities would not be staffed on a regular basis; therefore, vehicle traffic during operations is expected to be limited to periodic maintenance and inspection activities. There is a potential for vehicle strikes of wildlife during these activities; however, given the expected intermittent use of vehicles at the site and the relatively infrequent nature of vehicle strikes, this impact would be negligible.

Lighting

Artificial lighting during the night has the potential to alter the behavior of some wildlife species; however, lighting-related impacts can be minimized by using BMPs. Examples of BMPs to minimize the adverse impacts of artificial lighting include not lighting the facility at night except in the case of an emergency that requires an immediate response, and the use of down-shielded light fixtures to reduce the visibility of light by birds, bats, and insects flying above the facility. Lighting during operation of the Interconnection Facilities is not expected to result in a significant increase in the existing ambient light conditions in the area. The existing Indian River Power Plant and Indian River Substation already contribute to artificial lighting in the vicinity of the proposed Interconnection Facilities; the incremental increase in artificial lighting during the operation of the proposed Interconnection Facilities will therefore be negligible. At Interconnection Facilities under consideration, operations are not expected to result in a significant increase in the existing ambient light conditions in the area.

Air Emissions and Routine and Accidental Releases

Routine releases are chemical releases that would be expected to occur during inspections and maintenance of the Project and primarily include engine emissions from vehicles and equipment. Engine emissions are an unavoidable result of the use of vehicles and equipment and are not specific to the proposed Project. However, methods to reduce engine emissions will be implemented during the operations and maintenance, including restricting engine idling. Vehicle use at the facility would occur infrequently for routine inspection and maintenance purposes. Air quality impacts associated with the generation of vehicle emissions at the Interconnection Facilities during operations would be negligible and temporary in nature.

Accidental releases of chemicals could occur during operations. Such releases would most likely entail the release of oil-filled equipment within the US Wind substations or interconnection substation or a release of fuel, oil, or other chemicals during routine maintenance of the facility. The facility would be designed to include built-in containment to prevent the accidental release of chemicals into the environment. An SPCC Plan would be developed for the facility and would be implemented in the event of an accidental release.

4.11.4 Avoidance and Minimization

US Wind will implement the following avoidance and minimization measures to reduce Project impacts on terrestrial species and upland habitats.

- Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts to bats;
    - Tree clearing activities at the US Wind substations required for Project construction are not planned between April 1 through July 31 to avoid or minimize impacts to potentially mature forest and the northern long-eared bat summer maternity period.

    - Restriction on night lighting at the 3R's Beach landfall location from June 1 to September 1 to protect the Bethany Beach firefly.

- A habitat assessment and bat survey will be conducted as requested by DNREC.
- Previously disturbed areas will be used for the construction laydown area and access roads where feasible.
- Methods to reduce engine emissions will be implemented during construction and operation of the proposed Project where practicable, including restricting engine idling.
- Project-specific SPCC Plan will be prepared prior to construction and for operations activities.
- US Wind will develop a SWPPP for onshore construction activities, as appropriate.
- Lighting-related impacts will be minimized by using BMPs where feasible. Examples of BMPs to minimize the adverse impacts of artificial lighting will include not lighting the facility at night except in the case of an emergency that requires an immediate response, and the use of down-shielded light fixtures to reduce the visibility of light by birds, bats, and insects flying above the facility.

4.12 Avifauna

Temporary and permanent impacts were evaluated as required by Section 10b of Appendix M Activities in State Wetlands (see Appendix A).

Table 4.11-1 below, details the migratory bird species that could occur within the onshore portions of the Project area, based on USFWS Information for Planning and Consultation (IPaC) results. Consultations with USFWS as part of the NEPA process would include bald eagles and migratory birds, under the Bald Eagle Protection Act and the Migratory Bird Treaty Act.

Table 4.11-1. Migratory Birds That May Occur in the Project Area

Common Name	Scientific name	Level of Concern
Bald Eagle	*Haliaeetus leucocephalus*	Non-BCC Vulnerable *
Bonaparte's Gull	*Chroicocephalus philadelphia*	Non-BCC Vulnerable
Canada Warbler	*Cardellina canadensis*	BCC Rangewide (CON **)
Clapper Rail	*Rallus crepitans*	BCC-BCR ***
Common Loon	*Gavia immer*	Non-BCC Vulnerable
Common Tern	*Sterna hirundo*	Non-BCC Vulnerable
Double-crested Cormorant	*Phalacrocorax auritus*	Non-BCC Vulnerable
Dunlin	*Calidris alpina arcticola*	BCC-BCR

Table 4.11-1. Migratory Birds That May Occur in the Project Area

Common Name	Scientific name	Level of Concern
Eastern Black Rail	*Laterallus jamaicensis jamaicensis*	ESA-Endangered
Evening Grosbeak	*Coccothraustes vespertinus*	BCC Rangewide (CON)
Great Black-backed Gull	*Larus marinus*	Non-BCC Vulnerable
Herring Gull	*Larus argentatus*	Non-BCC Vulnerable
Lesser Yellowlegs	*Tringa flavipes*	BCC Rangewide (CON)
Piping Plover	*Charadrius melodus*	ESA-Threatened
Prairie Warbler	*Dendroica discolor*	BCC Rangewide (CON)
Prothonotary Warbler	*Protonotaria citrea*	BCC Rangewide (CON)
Red-breasted Merganser	*Mergus serrator*	Non-BCC Vulnerable
Red-headed Woodpecker	*Melanerpes erythrocephalus*	BCC Rangewide (CON)
Red-throated Loon	*Gavia stellata*	BCC Rangewide (CON)
Ring-billed Gull	*Larus delawarensis*	Non-BCC Vulnerable
Roseate Tern	*Sterna dougallii*	ESA-Threatened/Endangered
Royal Tern	*Thalasseus maximus*	Non-BCC Vulnerable
Ruddy Turnstone	*Arenaria interpres morinella*	BCC-BCR
Rufa Red Knot	*Calidris canutus rufa*	ESA-Threatened
Rusty Blackbird	*Euphagus carolinus*	BCC Rangewide (CON)
Semipalmated Sandpiper	*Calidris pusilla*	BCC Rangewide (CON)
Short-billed Dowitcher	*Limnodromus griseus*	BCC Rangewide (CON)
Surf Scoter	*Melanitta perspicillata*	Non-BCC Vulnerable
Willet	*Tringa semipalmata*	BCC Rangewide (CON)
Wood Thrush	*Hylocichla mustelina*	BCC Rangewide (CON)

Source: (USFWS 2021a, 2021b)
* BCC: Bird of Conservation Concern
** CON: Continental US and Alaska
*** BCR: Bird Conservation Regions (BCC in these areas only)

4.12.1 Coastal Birds

Birds that may be present in the coastal habitat found in the Project area have been documented by the MABS Project and an expansion of the MABS study funded by the MDNR and the MEA

(Williams et al. 2015d; Williams et al. 2015e) This section also considers other species that could occur in mid-Atlantic coastal habitats during at least a portion of the year based on data from field guides and mapping resources (Ridgely et al. 2003; Sibley 2014; Cornell University 2016; NAS 1996). These species can be grouped by shared habitats and life history characteristics as shown in Table 4.11-2. Groups that are most likely to be impacted by the Project are discussed below. At least some species in each of the first nine groups of birds listed in Table 4.11-2 may be present in the Project area year-round and nest there as well. Migratory birds are only likely to be in the Project area while stopping along their migration routes.

Table 4.11-2. Coastal Bird Families Occurring in the Project Area

Order	Family	Distribution and Ecology
Suliformes	Phalacrocoracidae (Cormorants)	Sit and swim on water. Roost colonially on perches. Nest colonially in the mid-Atlantic; found there year-round.
Pelecaniformes	Pelecanidae (Brown Pelican)	Typically seen sitting on water or in flight. Nests colonially on islands in the mid-Atlantic; found there year-round.
Charadriiformes (Shorebirds)	Recurvirostridae (Avocets and Stilts) Haematopodidae (Oystercatchers) Charadriidae (Plovers) Scolopacidae (Sandpipers, Yellowlegs, Godwits, Dowitchers, Snipe, and Phalaropes)	Diverse group that uses a variety of habitats including beaches, dunes, mudflats, saltmarshes, and rocky coasts. Found in the mid-Atlantic year-round, though few species nest there.
Pelecaniformes (Wading Birds)	Ardeidae (Bitterns, Egrets, Herons, and Night-herons) Threskiornithidae (Ibises)	Nest in coastal areas of the mid-Atlantic; found there year-round.
Gruiformes	Rallidae (Rails, Coots, and Gallinules)	Rails inhabit coastal marshes. Several species breed in the mid-Atlantic and occur there year-round. Coots and gallinules inhabit ponds and marshes, often near the coast. Coots winter in the mid-Atlantic.
Anseriformes (Waterfowl)	Anatidae (Geese, Swans, and Ducks)	Diverse group that uses a variety of habitats including coastal ponds, bays, saltmarshes, and rivers. Most do not breed in the Project area and are present primarily during winter; however, a handful of species do breed in the Project area including Canada goose (*Branta canadensis*), Mallard, Wood Duck, and Hooded Merganser.

Table 4.11-2. Coastal Bird Families Occurring in the Project Area

Order	Family	Distribution and Ecology
Coraciiformes	Alcedinidae (Belted Kingfisher)	Uses sheltered waters, including coastal bays and marshes. Nests in mid-Atlantic and occurs there year-round.
Passeriformes (Saltmarsh Perching Birds)	Emberizidae (Saltmarsh Sparrow and Seaside Sparrow) Icteridae (Red-winged Blackbird) Troglodytidae (Marsh Wren and Sedge Wren)	Nest in marshes along the mid-Atlantic coast and winter in the Project area. Wrens and Sparrows found in the mid-Atlantic primarily during breeding season. Red-winged Blackbird in the mid-Atlantic year-round.
Various (Birds of Prey)	Pandionidae (Osprey) Accipitridae (Eagles, Hawks, and Harriers) Falconidae (Falcons) Strigidae (Owls) Cathartidae (Vultures)	Found in mid-Atlantic coastal habitats year-round. Osprey and bald eagle nest prominently and feed in coastal areas. Northern Harrier (*Circus hudsonius*), Merlin (*Falco columbarius*), Peregrine Falcon (*F. peregrinus*), and Short-eared Owl (*Asio flammeus*) nest in terrestrial habitats but hunt in open coastal habitats.
Passeriformes	Various Species	Typically, not associated with marine and coastal habitats in the Project area except during migration. Any species using the Atlantic Flyway could potentially occur in the Project area during migration.

4.12.1.1 DNREC Colonial Bird Study

The DNREC began colonial nesting waterbird (CWB) surveys in Rehoboth Bay in 2019. Survey teams counted birds, including laughing gulls (*Leucophaeus atricilla*), herring gulls (*Larus argentatus*), great black-backed gulls (*Larus marinus*), great egrets (*Ardea alba*) and Forster's tern (*Sterna forsteri*), from the water using spotting scopes or binoculars during the April – September time period (DNREC 2021). Locations for the surveys, shown in Figure 4.12-1, were selected based on historic breeding records for Species of Greatest Conservation Need (DEDFW 2015). Although hundreds of nesting birds of various species have been documented at these locations, exact nest locations, reproductive success and colony boundaries are currently undetermined. US Wind would review data for applicability to the Project when it becomes available as DNREC plans to continue this study.

4.12.1.2 Mid-Atlantic Baseline Study

According to the MABS survey, cormorants and waterfowl are among the most frequently encountered birds on the mid-Atlantic coast. Most waterfowl are likely to be present in the Project area during their migration between northern breeding grounds and southern wintering areas. Green-winged teal (*Anas crecca*), brant (*Branta bernicla*), and mallard (*A. Platyrhyncos*) are common in the Project area in the fall (Williams et al. 2015e). Waterfowl that may breed in the Project area include mallard, wood duck (*Aix sponsa*), and hooded merganser (*Lophodytes cucullatus*). Most waterfowl feed on aquatic vegetation and invertebrates. Shorebirds and pelicans are also likely to be present. Both double-crested cormorant (*Phalacrocorax auritus*) and brown pelican (*Pelecanus occidentalis*) are common in the mid-Atlantic region year-round, where they nest and feed on small schooling fish, such as menhaden and anchovies. Similar to waterfowl, while nearly three dozen shorebird species may be found in the Project area throughout the year, relatively few species would nest there. American oystercatcher (*Haematopus palliatus*), piping plover (*Charadrius melodus*), spotted sandpiper (*Actitis macularius*), and willet (*Tringa semipalmata*) are among the few shorebirds that may nest locally.

Overwintering shorebird species include black-bellied plover (*Pluvialis squatarola*), ruddy turnstone (*Arenaria interpres*), dunlin (*Calidris alpina*), and sanderling (*C. Alba*). Most shorebirds that may nest in the Project area build nests on the ground in beach face and back-dune habitats or in grassy marshes above the high tide line. Resident and migratory species often feed on invertebrates found in the intertidal zone.

Wading birds, saltmarsh perching birds, and birds of prey that may overwinter in the Project area may potentially be impacted by Project activities that are scheduled to occur in winter months. Wading birds that may overwinter in the Project area include American bittern (*Botaurus lentiginosus*), great blue heron (*Ardea herodias*), black-crowned night heron (*Nycticorax nycticorax*), and white ibis (*Eudocimus albus*). Wading birds feed primarily on fish, amphibians, crayfish, and aquatic insects. Saltmarsh perching birds that may nest and overwinter in the Project area include saltmarsh sparrow (*Ammodramus caudacutus*), seaside sparrow (*A. Maritimus*),

marsh wren (*Cistothorus palustris*), sedge wren (*C. Platensis*), and red-winged blackbird (*Agelaius phoeniceus*). The two wren species and red-winged blackbird nest in vegetation, while the two sparrow species nest directly on the ground, usually just above the high tide line. As top-level consumers in coastal food webs, birds of prey do not typically achieve large populations, which can make them more sensitive to disturbances than more abundant species. Osprey were the only raptors that were detected repeatedly during the MABS boat surveys (Williams et al. 2015d; Williams et al. 2015e). Osprey typically nest in bare trees or on nesting platforms overlooking saltmarshes and are adapted to an exclusive diet of fish.

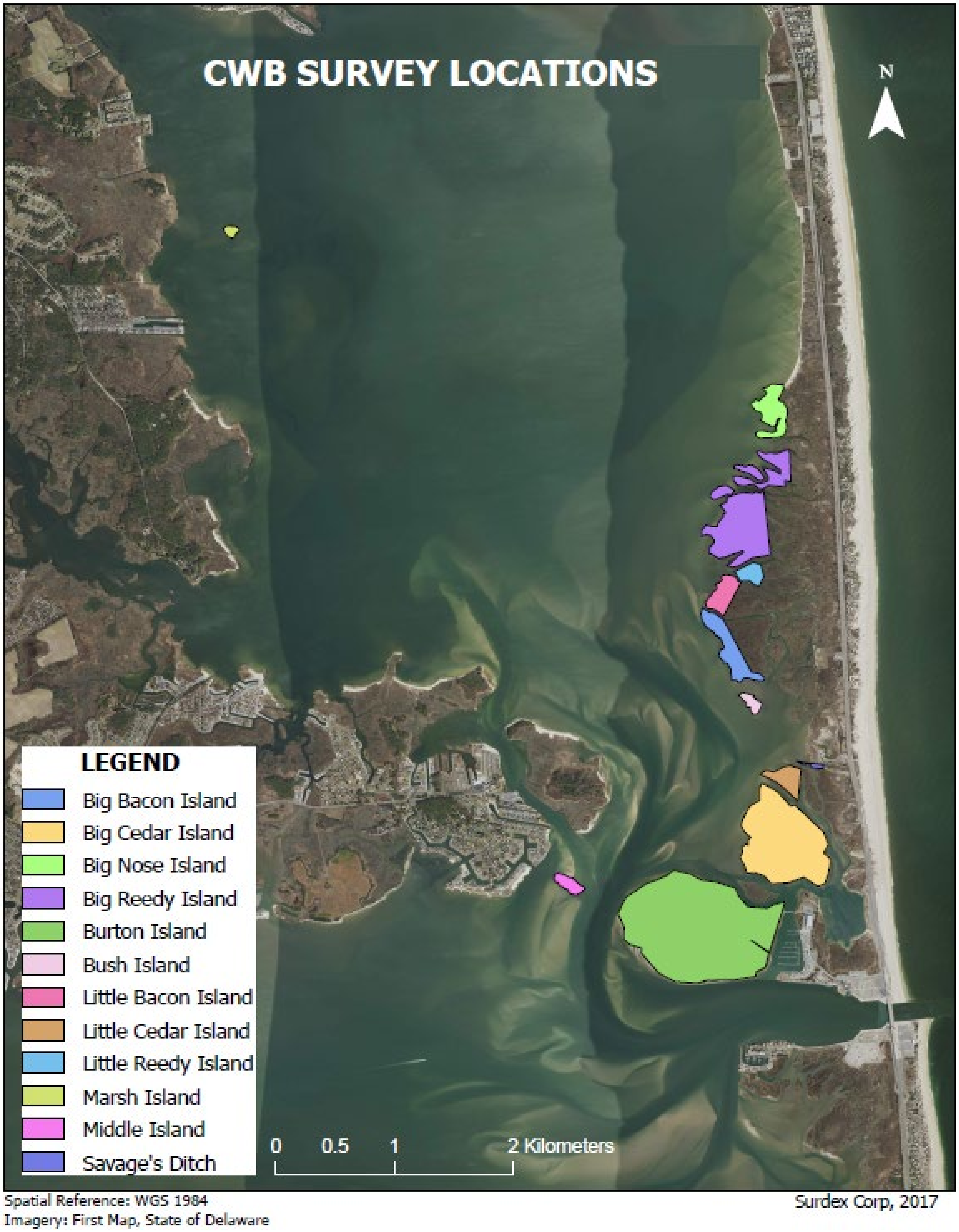

Figure 4.12-1 Rehoboth Bay Colonial Waterbird Nesting Survey Locations

4.12.2 Terrestrial Birds

Typical bird species that could occur in the upland communities of the Project area include: red-tailed hawk (*Buteo jamaicensis*), broad-winged hawk (*Buteo platypterus*), barred owl (*Strix varia*), downy woodpecker (*Dryobates pubescens*), Carolina chickadee (*Poecile carolinensis*), blue-winged warbler (*Vermivora cyanoptera*), Tennessee warbler (*Leiothlypis peregrine*), and blue jay (*Cyanocitta cristata).*

4.12.3 Impacts

Birds could potentially be impacted by factors that occur along the Delaware State Waters portion of the Offshore Export Cable Corridors and Onshore Export Cable Corridors. The overall risk to marine birds from the construction and operation of the Project is considered to be minor. Project-related activities in the coastal and terrestrial environments are not likely to adversely affect coastal or terrestrial birds but are also addressed in this section.

4.12.3.1 Construction

4.12.3.1.1 Onshore Export Cable South Corridor

Impacts to birds during construction may result from activities related to installation of the Export Cables. In general, the primary potential impacts to birds that could result from these activities is disturbance or displacement due to the generation of noise, the movement of vessels through the area, the generation of artificial lighting, and habitat alteration. The nature of this potential impact is expected to be indirect, as the effects of noise, vessel traffic, and artificial lighting may alter the behavior of individual birds such that they are potentially displaced from or attracted to the Project area. Activities associated with construction would be temporary in duration, and any potential impacts associated with these activities would likewise be temporary. If disturbance or displacement of birds did occur, this impact would be considered negative, as it would entail an alteration of the natural behavior of individuals and cause them to expend energy that they otherwise would not have in the absence of the Project. The extent of potential disturbance/displacement impacts associated with construction activities is expected to be localized to the immediate vicinity of the Project area.

Noise

Noise would be generated in the offshore environment during construction by cable installation and other vessels) and other construction related activities. Noise generated during construction has the potential to result in disturbance and/or displacement of individual birds in the vicinity of noise-generating activities. Therefore, the impacts of noise generated during construction on marine birds are expected to be negligible to minor.

Vessel Traffic

A variety of marine vessels would be used during construction in the offshore environment. Vessels would be used during construction to transport personnel and equipment to install the Export Cables and for other purposes. Vessels would use established vessel courses and not disturb colonial waterbird nesting sites in Indian River Bay or other areas (i.e., the Chesapeake and Atlantic Coastal Bays Critical Area). The use of vessels in the offshore environment has the potential to result in micro-scale disturbance of individual birds and has the potential to attract marine birds. Micro-scale disturbance may occur if an individual bird is sitting on the water in the direct path of a vessel and is forced to relocate to avoid the vessel. In this scenario, the individual would likely swim or fly a short distance to avoid the path of the vessel and then continue with its previous behavior (i.e., feeding and resting); individuals would not be expected to be displaced from the wider area by the use of vessels.

The use of vessels in the marine environment may also result in attraction of some marine birds. Gulls in particular are frequently attracted to and follow commercial fishing vessels in search of food; this behavior often extends to non-fishing vessels as well. The potential attraction of seabirds, especially gulls, to vessels used during construction may be considered an adverse impact as it results in an alteration to the behavior of the individual birds that may affect foraging and cause an expenditure of energy that would otherwise not occur. However, this impact is expected to be temporary and restricted to the immediate vicinity of the activity, and therefore is considered a negligible impact.

Lighting

Artificial lighting may be generated by activities conducted in the offshore environment during construction, including the use of vessels and lighting of temporary structures. Artificial lighting has the potential to indirectly impact seabirds by attracting individuals to lighted structures or vessels and thus may increase the risk of collision (Boehlert and Gill 2010). The potentially attracting effects of artificial lighting may be more pronounced at night or during inclement weather, when visibility is generally poorer and the ability of birds to avoid structures may be reduced. This effect is more likely to be of concern during operation and the potential impacts of artificial lighting during construction are expected to be negligible.

Habitat Alteration

The offshore export cables and Onshore Export Cable 1 would be installed using HDD. The HDD operations would only disturb the ground at the bore entry and exit for each cable. By minimizing ground disturbance, the Project minimizes the area in which complex vegetation re-establishment may be needed. Minimizing ground and vegetation disturbance also avoids impacts to coastal birds. The potential impacts to birds from habitat alteration due to HDD are negligible.

The Project has been designed to avoid impacts to coastal dunes and interdunal wetlands because they provide critical habitat for rare, threatened, and endangered coastal bird species for much of the year (discussed in Section 4.13).

The construction of the Interconnection Facilities would result in habitat alteration and impacts to birds are anticipated to be minor. Habitat alteration would generally entail the conversion of currently vegetated, pervious areas to non-vegetated, impervious areas. The vegetative cover over the cable right-of-way from the transition vault location to the substation would be limited to grasses and small shrubs to allow future access for maintenance if needed. This habitat alteration would in turn result in an incremental loss of habitat available for use by bird species commensurate with the degree of alteration. The Indian Bay Substation expansion may result in varying degrees of forested habitat loss and require tree and vegetation clearing.

4.12.3.1.2 Offshore Export Cable Corridor 1

Impacts for the Offshore Export Cable Corridors would be the same as those described above in Section 4.12.3.1.1.

4.12.3.2 Operations

4.12.3.2.1 Onshore Export Cable South Corridor

Impacts to birds during operations may result from several factors. Potential impacts include disturbance and/or displacement due to noise or vessel traffic, and the potential attracting effects of artificial lighting.

Noise

Noise would be generated in the offshore environment during operations by the operation of vessels used for routine inspections of the facility and by activities related to maintenance or repair of Project infrastructure. Noise generated during operations is unlikely to result in disturbance and/or displacement of birds. Noise associated with the operation of vessels in the marine environment is not expected to result in disturbance or displacement of marine birds. Similarly, noise associated with activities related to maintenance or repair of Project infrastructure are expected to have a low potential for disturbance or displacement impacts due to the infrequent nature of these activities and the likely low intensity of noise associated with them. Therefore, the impacts of noise generated during operations on marine birds are expected to be negligible.

Vessel Traffic

The use of vessels during operations is likely to be functionally the same as during construction in the context of potential impacts to marine birds. This activity would be expected to occur less frequently than during construction, but over a longer period of time. The use of vessels in the offshore environment during operations is expected to result in negligible impacts to marine birds. Vessels would use established vessel courses and not disturb colonial waterbird nesting sites in sites in Indian River Bay or other areas (i.e., the Chesapeake and Atlantic Coastal Bays Critical Area).

Lighting

The potential attracting impacts of artificial lighting may be reduced by minimizing the number, intensity, and duration of lighting; using red or green lighting instead of white lighting; using flashing or strobing lights instead of steady-burning lights; using flashing lights with the lowest flash rate practicable; minimizing direct lighting of the water's surface; and employing the use of down-shielding devices to limit the visibility of lights from above (Hötker, Thomsen, and Jeromin 2006; BOEM 2013).

4.12.3.2.1 Offshore Export Cable Corridor 1

Impacts for the Offshore Export Cable Corridors would be the same as those described above in Section 4.12.3.2.1.

4.12.4 Avoidance and Minimization

US Wind will implement the following avoidance and minimization measures to reduce Project impacts on birds.

- Based on feedback from DNREC, US Wind will implement the following time of year restrictions to minimize impacts to birds;
    - Installation of cables underneath tidal marshes will not be conducted during nesting season between April 1 through July 31.
    - Restrict nighttime artificial lighting restriction from June 1 through September 1 at Barrier Beach Landfall.
    - Avoid colonial waterbird nesting sites. Avoid construction at the Barrier Beach Landfall and in-water work in Indian River Bay during the nesting season.
    - No tree clearing at the substation landfall April 1 through July 31.
    - Complete the Northeast Bald Eagle Project Screening Form. The known bald eagle nest is over 660 ft from the Project area, the maximum USFWS-recommended buffer. US Wind will work with USFWS for additional mitigation measures.

- Between May 1 and August 1, construction activities will not occur within 100 m (328 ft) of hummocks in Indian River Bay in order to avoid impacts to nesting terns.
- US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known nesting beaches, where feasible. The use of HDD for cable installation under the Barrier Beach Landfalls will avoid impacts on beaches. Agency consultation and monitoring regarding bird species will be conducted as needed to mitigate disturbances, as practicable.
- US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

4.13 Threatened and Endangered Species

Temporary or permanent impact of fragile communities were evaluated as required by Section 17f of the DNREC Appendix S New Dredging Projects Form and Section 10b of Appendix M Activities in State Wetlands (see Appendix A). Section 7 ESA Consultation with NMFS and USFWS is currently underway as part of the NEPA evaluation for the COP, MMPA, and USACE permit actions.

4.13.1 Life Histories of Federally Listed Threatened and Endangered Species

The following species are listed under the USFWS, DNREC, or MDNR as threatened, endangered or candidate species and shown in Table 4.12-1, below.

4.13.1.1 Finfish

Two sturgeon species listed as endangered under the ESA may occur in the Project area are the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*). Both are anadromous species, spawning in rivers and spending their adult lives in the open ocean. The giant manta ray *(Mobula birostris)*, listed as threatened under the ESA, may also occur in the Project area. The American eel (anguilla rostrata), listed as endangered by the IUCN, is likely to occur in the Indian River Bay and Indian River project areas.

Avoidance and minimization measures as relate to finfish are presented in Section 4.6.3.

Table 4.12-1 Federal and State Threatened and Endangered Species with Potential Occurrence in the Project Area

	Common Name	Scientific Name	Federal Status[1]	DE State Status[2]	Location
Finfish	Atlantic Sturgeon	*Acipenser oxyrinchus*	E	E	Marine
	Shortnose Sturgeon	*Acipenser brevirostrum*	E	E	Marine
	Giant Manta Ray	*Mobula birostris*	T	-	Marine
Marine Mammals	North Atlantic Right Whale	*Eubaelena glacialis*	E	E	Marine
	Fin Whale	*Balaenoptera physalus*	E	E	Marine
Sea Turtles	Loggerhead Turtle	*Caretta caretta*	T	E	Marine
	Leatherback Turtle	*Demochelys coriacea*	E	E	Marine
	Green Turtle	*Chelonia mydas*	T	E	Marine
	Hawksbill Turtle	*Eretmochelys imbricata*	E	-	Marine
Terrestrial Vegetation	Seabeach Amaranth	*Amaranthus pumilus*	T	S1	Coastal
	Evergreen Bayberry	*Morella caroliniensis*	-	S2	Coastal
	Swamp Pink	*Helonias bullata*	T	S2	Wetland
Terrestrial Wildlife	Bethany Beach Firefly	*Photuris bethaniensis*	-	E	Coastal
	Monarch Butterfly	*Danaus plexippus*	C	-	Upland
	Northern Long-eared Bat	*Myotis septentrionalis*	E	E	Upland

Table 4.12-1 Federal and State Threatened and Endangered Species with Potential Occurrence in the Project Area

	Common Name	Scientific Name	Federal Status[1]	DE State Status[2]	Location
Avifauna	Roseate Tern	*Sterna dougallii*	E	-	Coastal and Marine
	Piping Plover	*Charadrius melodus*	T	E	Coastal
	Rufa Red Knot	*Calidris canutus rufa*	T	-	Coastal
	Eastern Black Rail	*Laterallus jamaicensis jamaicensis*	T	E	Coastal

[1]T: Threatened, E: Endangered, C: candidate species for listing.

[2]T: Threatened, E: Endangered, S1: Rare and of conservation concern, may be especially vulnerable to extirpation, S2: Rare and of conservation concern, may be susceptible to becoming extirpated.

Atlantic Sturgeon (*Acipenser oxyrinchus*)

The Atlantic sturgeon is an estuarine-dependent, anadromous species that is found along the eastern coast of North America from Canada to Florida. They spend the majority of their lives in the marine environment, but spawn in freshwater. They are present in 36 coastal rivers in the United States, and spawning takes place in at least 20 of these rivers. Larvae and juveniles remain in riverine or estuarine areas where they were spawned and move to higher salinity waters as subadults. Subadults and adults migrate seasonally throughout marine waters. In the summer, they are found in shallow waters of about 10 to 20 m (32.8 to 65.6 ft), and in the winter they move to deeper waters of about 20 to 50 m (65.6 to 164.0 ft) (Secor et al. 2020). Current threats to Atlantic sturgeon include ship strikes, bycatch, habitat degradation/loss, climate change and habitat impediments such as dams (BOEM 2013; NOAA Fisheries 2017a). Critical habitat for the New York Bight DPS of Atlantic sturgeon includes approximately 547 km) (340 mi) of aquatic habitat in the Hudson, Connecticut, Housatonic, and Delaware Rivers (82 FR 39160), and does not coincide with the Project area.

In 2011, telemetered Atlantic sturgeon were detected in nearshore waters off the coast of Maryland, along the southern end of the Delmarva Peninsula. Atlantic sturgeon were observed in shallow, well-mixed, relatively warm freshwater near the 25 m (82 ft) isobath and appeared to be associated with a water mass tied to Delaware Bay (Oliver et al. 2013). Additionally, matching telemetry records with derived seascapes indicate that Atlantic sturgeon prefer a seascape that is associated with the coastline of Delaware Bay and the Atlantic Ocean, with a mean temperature of 19.8 °C (68 °F) and a mean reflectance of 0.0073 solar reflectivity $(sr)^{-1}$ at 443 millimeters (mm) (1.45 ft). Based on these studies, Atlantic sturgeon would be more likely to occur near the coast rather than further offshore in the Lease area. The Delaware Division of Fish and Wildlife has not reported occurrences of Atlantic sturgeon within the Inland Bays (USACE 2015). Marine-phase Atlantic Sturgeon migrate through Delaware’s coastal waters in mid-late March through mid-May and early September through mid-December (DNREC 2017b).

Giant Manta Ray (*Mobula birostris)*

Giant manta ray are large bodied, pelagic planktivores that are broadly spread in tropical and temperate waters of the Pacific, Atlantic and Indian Oceans. This species is not regularly encountered in large numbers and overall encountered with far less frequency than any other manta species despite having a larger distribution across the globe (IUCN 2011). While manta rays feed typically in shallow waters, they can dive as deep as 1,000 m (3,300 ft)) (Miller and Klimovich 2016) Giant manta rays are observed to migrate by following prey abundance (Farmer et al. 2021). It is understood that the population of this species is in decline and it is ESA threatened throughout its range, which includes New England/mid-Atlantic, the Pacific Islands, and the Southeast. Giant mantas are slow growing and long-lived with low fecundity and reproductive output with a gestation period up to one year. These biological traits make them prone to overexploitation, with their most direct threats being by-catch and intentional hunting for gill rakers by the Asian market (White, Giles, and Dharmadi 2006).

Recorded occurrences of giant manta rays within the Project are considered rare and only two recorded observations in 2016 and 2021 confirm giant manta ray range is off the coast of Delaware. Farmer et al. (2021) integrated decades of sightings and survey effort data from numerous sources in a comprehensive species distribution modeling (SDM) framework for the eastern United States and revealed that giant manta rays were most commonly detected at productive nearshore and shelf-edge upwelling zones at surface thermal frontal boundaries within a temperature range of approximately 20-30°C (68-86°F). The SDMs predicted high nearshore concentrations off northeast Florida during April, with the distribution extending northward along the shelf-edge as temperatures warm, leading to higher occurrences north of Cape Hatteras, North Carolina from June to October, and then south of Savannah, Georgia from November to March as temperatures cool (IUCN 2011; Miller and Klimovich 2016; Marshall et al. 2011; Farmer et al. 2021; White, Giles, and Dharmadi 2006).

American Eel (*Anguilla rostrata*)

American eels are long, slender, snake like fish that can grow up to 4 feet in length and can weigh up to 17 pounds (U.S.F.a.W.S. USFWS 2024). They are the only freshwater eel species in North America and are catadramonous, meaning they live in freshwater but venture into salt water to spawn (U.S.F.a.W.S. USFWS 2024). American eel are common throughout the eastern US and are a species of economic importance, often being used by fisherman as bait for Striped Bass (U.S.F.a.W.S. USFWS 2024). The American eel is a migratory species traveling from rivers along the east coast, across the Atlantic Ocean to the Sargasso Sea where they spawn (U.S.F.a.W.S. USFWS 2024) . While most eels live in freshwater habitats such as rivers and lakes, some do spend more time in estuarine environments including bays, lagoons and salt marshes (U.S.F.a.W.S. USFWS 2024). The Delaware River Basin supports an abundant American eel population due to the lack of dams on the Delaware River, allowing for migration to and from the sea (Delaware River Basin Commission 2024). Dammed rivers are one of the major sources of stress for American eels as it blocks their ability to migrate upstream to feed and mature (Delaware River Basin Commission 2024). While much is unknown about their population, American eel landings from fisherman have significantly decreased over the past 40 years, making management increasingly important (U.S.F.a.W.S. USFWS 2024). Recorded occurrence of American eel within the Project area is common within Indian River Bay and Indian River (D.o.N.R.a.E.C.D.o.F.a.W. DNREC 2023e).

4.13.1.2 Marine Mammals

Eleven marine mammal species, including nine cetaceans and two pinnipeds, have the potential to be impacted by project activities in DE state waters. Two of these species, the NARW (*Eubaelena glacialis*) and the fin whale (*Balaenoptera physalus*), are listed as federally endangered under the ESA and are described below.

Potential impacts to marine mammals are discussed in Section 4.7.2. Avoidance and minimization measures to reduce impacts are presented in Section 4.7.3.

North Atlantic Right Whale (*Eubaelena glacialis*)

North Atlantic right whales (NARW) are among the rarest of all marine mammal species. The NARWs occurring in U.S. waters belong to the western Atlantic stock. The size of this stock is considered to be extremely low relative to its Optimum Sustainable Population (OSP) in the U.S. Atlantic Exclusive Economic Zone (EEZ). The most recent official estimate of minimum NARW population size was 338 individuals, which was presented in the 2022 NOAA draft stock assessment report and reflects estimated abundance as of November 2020 (88 FR 4162) (Hayes et al. 2022a). This agrees with other recent estimates, which indicate that the NARW population has fallen to 340 individuals (Pettis, Pace, and Hamilton 2022). Historically, the NARW population suffered severely from commercial overharvesting. Based on carrying capacity in the North Pacific, the estimate of the pre-whaling population of the western Atlantic stock is between 9,075 and 21,328 individuals (Monserrat et al. 2015). Whaling activities killed an estimated 5,500 right whales in the western North Atlantic between 1634 and 1950, although records are incomplete (Reeves, Smith, and Josephson 2007). Back calculations indicate that the western Atlantic NARW stock was as low as 100 individuals by 1935, before international protection for right whales was established (Hain 1975; Reeves, Breiwick, and Mitchell 1992; Kenney, Winn, and Macaulay 1995).

NARW are currently experiencing an unusual mortality event (UME); elevated numbers of dead or seriously injured NARW have been recorded in Canada and the United States since 2017 (NOAA Fisheries 2023). Throughout this time period, 35 NARW deaths have been reported, as well as 22 serious injuries, and 37 sublethal injuries and illnesses (NOAA Fisheries 2023). Human interaction, through vessel strikes and entanglements, is the leading cause of this UME (NOAA Fisheries 2023). Due to the small NARW population size, it is estimated that human sources of mortality have a disproportionately large effect on population growth (88 FR 4162). A stochastic model of North Atlantic right whale population growth from 1980 to 1996 showed a declining population growth rate attributed to a decrease in survival probability and an increase in the calving interval (Caswell et al. 1999). Additionally, changes to right whale habitat have caused migration into new territory, which has exposed right whales to new anthropogenic threats (Baumgartner et al. 2017). The NARW is a strategic stock and is listed as endangered under the ESA (88 FR 4162).

Surveys have demonstrated the existence of seven areas where Western North Atlantic right whales congregate seasonally: the coastal waters of the southeastern United States; the Great South Channel; Jordan Basin; Georges Basin along the northeastern edge of Georges Bank; Cape Cod and Massachusetts Bays; the Bay of Fundy; and the Roseway Basin on the Scotian Shelf (Hayes et al. 2019). The Project area does not include any of the areas listed above where NARW are known to congregate, however the Project area is within a migratory corridor for NARW as they travel between calving grounds off the coast of Jacksonville, Florida and feeding grounds near Cape Cod Bay, Massachusetts (Firestone et al. 2008).

The NARW is a strongly migratory species that undertakes well-defined seasonal movements. However, this species exhibits condition-dependent partial migration; though all NARW have the potential to migrate each winter to the southeastern United States, only a portion of the NARW population migrates in any given year (Gowan et al. 2019). Migration behavior and habitat use varies between years and across different demographic groups (Gowan et al. 2019). Gowan et al. (2019) found that juvenile NARW were more likely to migrate than adults, and males were more likely to migrate to the southeastern U.S. than non-calving females. Generally, NARW occupy feeding grounds in New England waters, the Canadian Bay of Fundy and Scotian Shelf, and the Gulf of St. Lawrence in spring, summer, and fall, and travel to their sole known calving and wintering grounds in the waters of the southeastern U.S. (Kenney and Vigness-Raposa 2009). Mid-Atlantic waters are a primary migration corridor during these seasonal movements (Knowlton, Ring, and Russel 2002; Firestone et al. 2008). An acoustic detection study conducted over an 11-month period in 2012 and 2013 in nearshore waters of North Carolina and Georgia did not detect a bi-modal pattern of NARW occurrence during predicted migratory periods (Hodge et al. 2015). Mapped migration routes along the Atlantic coast are close to both major ports and shipping lanes (Hayes et al. 2022a). Recently, North Atlantic right whales have been observed increasingly in the mid-Atlantic region (Davis et al. 2017)

Fin Whale (*Balaenoptera physalus*)

Fin whales in the Project area are expected to be part of the Western North Atlantic stock, which is comprised of fin whales off the eastern coast of the United States, Nova Scotia, and the southeastern coast of Newfoundland. The best abundance estimate available for the Western North Atlantic fin whale stock is 6,802 individuals and the average annual human-caused mortality and serious injury for fin whales between 2015 and 2019 was 1.85 (Hayes et al. 2022a). The status of the Western North Atlantic stock relative to Optimum Sustainable Population (OSP) in the U.S. Atlantic Exclusive Economic Zone (EEZ) is unknown, and a population trend analysis has not been performed (Hayes et al. 2022a). The Western North Atlantic population is listed as a strategic stock under the MMPA because it is listed as an endangered species under the ESA. Like most other whale species present along the U.S. east coast, ship strikes and fisheries entanglements are perennial causes of serious injury and mortality to fin whales, though contaminants and climate-related changes may impact this population as well (Hayes et al. 2022a).

The range of the Western North Atlantic stock of fin whales extends from the Gulf of Mexico and Caribbean Sea, to the southeastern coast of Newfoundland in the north (Hayes et al. 2022a). Fin whales generally migrate from Arctic and Antarctic coastal feeding areas in the summer to deeper tropical breeding and calving areas in the winter (Hayes et al. 2022a). During migration, fin whales travel in open seas away from coastal areas (Mizroch, Rice, and Breiwick 1984; Hayes et al. 2022a). However, calving, mating, and wintering locations are unknown for most of the fin whale population and data from the north Pacific indicates that fin whales may not undergo large-scale annual migratory movements (Hayes et al. 2022a). Biologically important areas (BAIs) for fin whale feeding have been identified in the Gulf of Maine and east of Montauk Point (LaBrecque et al. 2015). However, no critical habitat areas have been designated for fin whales in the western Atlantic.

4.13.1.3 Sea Turtles

Five species of sea turtle, all of which are listed as endangered or threatened under the ESA, have the potential to be impacted by project activities in DE state waters. These species are described below.

Potential impacts to sea turtles are discussed in Section 4.8.2. Avoidance and minimization measures to reduce impacts are presented in Section 4.8.3.

Loggerhead Turtle (*Caretta caretta*)

Loggerhead sea turtles in the northwest Atlantic Ocean DPS are listed as threatened under the ESA. The most recent regional abundance data for the loggerhead turtle was collected In 2010. The preliminary regional abundance was approximately 588,000 individuals based on only positive identifications of loggerhead sightings, and approximately 801,000 individuals based on positive identifications and a portion of unidentified turtles from the survey (National Marine Fisheries Service Northeast Fisheries Science Center 2011).

In the Atlantic, loggerhead turtles range from Newfoundland to as far south as Argentina (NOAA Fisheries 2017d). Adult loggerheads migrate seasonally from nesting beaches to foraging grounds, primarily driven by changes in sea surface temperatures (TEWG 2000). Nesting sites for loggerhead turtles in the northwest Atlantic DPS are primarily located along the Atlantic and the Gulf of Mexico coastlines of Florida, South Carolina, Georgia, North Carolina, and Alabama (NOAA Fisheries 2017d). Though it is rare for this species to nest north of Virginia, a limited number of loggerhead nests have been observed in Maryland and Delaware (NPS 2017; DNREC 2018a). The first record of successful loggerhead nesting in Maryland was reported in 2017 at Assateague Island National Seashore, and three nests hatched from this location in 2020 (NPS 2017; WJLA 2020). In Delaware, a single loggerhead nest was laid in Fenwick, Delaware in 2018, below the high tide line (DNREC 2018a). This nest was relocated to Fenwick Island State Park and later successfully hatched, marking the first recorded loggerhead hatching in the state since 1973 (DNREC 2018a).

Loggerhead turtles occur year-round in ocean waters off North Carolina, South Carolina, Georgia, and Florida. As coastal water temperatures warm in the spring, loggerheads begin to migrate to inshore waters of the southeast United States and move up the United States Atlantic coast (Epperly, Braun, and Chester 1995; Epperly et al. 1995; Braun-McNeill and Epperly 2004) . During spring and summer months, loggerhead turtles are abundant in coastal waters off New York and the mid-Atlantic states and are found as far north as New England (Morreale and Standora 1989). In late September through mid-October, loggerhead turtles begin to migrate southward to coastal areas off the south Atlantic states, particularly from Cape Hatteras, North Carolina, to Florida (Morreale and Standora 1989; Musick, Barnard, and Keinath 1994). During the winter, loggerhead turtles tend to aggregate in warmer waters along the western boundary of the Gulf Stream off Florida (N. B. Thompson 1988) or hibernate in bottom waters and soft sediments in channels and inlets along the Florida coast (Ogren and McVea Jr. 1981; Butler, Nelson, and Henwood 1987).

In the winter and spring, loggerheads congregate off southern Florida before migrating northward to their summer feeding ranges (CeTAP 1982). No critical habitat areas for loggerhead turtles are located in DE state waters.

Leatherback Turtle (*Demochelys coriacea*)

Leatherback turtles are currently listed as endangered under the ESA. On December 17, 2017, NOAA Fisheries and USFWS initiated a review of the leatherback turtle, to gather data on the species, apply the DPS policy, and evaluate this species' risk of extinction. This review was published in 2020 and identified seven leatherback turtle DPSs (USFWS and NOAA Fisheries 2020). Leatherback turtles found along the eastern United States Atlantic coast belong to the northwest (NW) Atlantic DPS. Like all other DPSs, the NW Atlantic leatherback DPS is at high risk of extinction (USFWS and NOAA Fisheries 2020). Confidence in this conclusion for the NW Atlantic DPS is moderate, due to the spatial distribution, diversity, and abundance of this population segment (USFWS and NOAA Fisheries 2020). The best available estimate of nesting female leatherback abundance in the NW Atlantic DPS is 20,659 females, 1,694 of which nest in the United States (USFWS and NOAA Fisheries 2020). This estimate includes all nesting areas utilized by the DPS, largely concentrated from Florida throughout the wider Caribbean region (Dow et al. 2007). In the United States, leatherback nesting occurs primarily on the eastern coast of Florida, Puerto Rico, and St. Croix, though occasional nesting has been observed in North and South Carolina (USFWS and NOAA Fisheries 2020). Though temporal trends vary between nest sites, the NW Atlantic leatherback turtle DPS, including the Florida nesting population, has exhibited a decreasing nest trend in recent years (USFWS and NOAA Fisheries 2020).

Leatherback turtles are highly migratory, exploiting convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters (S. Morreale et al. 1994; S. A. Eckert 1999). Adult leatherbacks migrate extensively throughout the Atlantic basin in search of food and may swim 6,000 to 12,000 km (3,240 to 6,480 NM) in a year (James et al. 2006) . In the north Atlantic Ocean, leatherback turtles regularly occur in deep waters (>100 m (328 ft)) but are also sighted in coastal areas of the United States continental shelf (USFWS and NOAA Fisheries 1992). Leatherback turtle seasonal movement patterns are dictated by sea surface temperatures (Davenport and Balazs 1991; Luschi et al. 2006). Following breeding and nesting in Florida and the tropical Caribbean and aided by the northward flow of the Gulf Stream, leatherback turtles in the Northwestern Atlantic DPS move northward and westward beyond the shelf break in the spring. During the summer months, leatherbacks move into fairly shallow coastal waters, apparently following their preferred jellyfish prey. Leatherbacks become more numerous off the mid-Atlantic and southern New England coasts in late spring and early summer, and by late summer and early fall, leatherbacks may be found in the waters off eastern Canada (CeTAP 1982; Shoop and Kenney 1992; N.B. Thompson et al. 2001; James et al. 2006). In response to cooling sea surface temperatures in the fall, leatherback turtles move offshore and begin a southward migration to their winter breeding grounds (Payne, Selzer, and Knowlton 1984). There are no critical habitat areas designated for the leatherback sea turtle along the United States Atlantic coast.

Green Turtle (*Chelonia mydas*)

Green turtles in waters along the eastern United States Atlantic coast belong to the north Atlantic DPS, which is listed as threatened under the ESA. Estimates of the population size of the north Atlantic DPS of green turtles are unavailable. Green turtles in the north Atlantic DPS nest to the south of the Project area; in small numbers in the United States Virgin Islands, Puerto Rico, Georgia, South Carolina, and North Carolina, and in larger numbers in Florida (NOAA Fisheries 2017b).

In the western North Atlantic, green turtles are found in inshore and nearshore waters from Texas to Massachusetts (NOAA Fisheries 2017b). Like other sea turtles, green turtles display highly migratory behavior, making seasonal coastal and annual transoceanic migrations (Godley et al. 2003; Godley et al. 2008; Godley et al. 2010). However, green turtles appear to occupy smaller home ranges than other sea turtle species (Seminoff, Resendiz, and Nichols 2002; Makowski, Seminog, and Salmon 2006; Broderick et al. 2007). This species generally feeds in shallow lagoons, inlets, reefs, shoals, and bays that have abundant algae or sea grass (USDOC 2007) . Females nest between June and September on mainland or island sandy beaches along the southeastern United States coast and are not known to nest as far north as the mid-Atlantic states (NOAA Fisheries 2017b). Though green turtles are reported to use the coastal waters of North Carolina and Virginia as summer foraging habitat (Mansfield et al. 2009) , this species is generally classified as uncommon in the mid-Atlantic and is usually a transient species present during the summer and fall. The only designated critical habitat area for green sea turtles surrounds an island off the coast of Costa Rica and is far to the south of the Project area (NOAA Fisheries 2017b).

Kemp's Ridley Turtle (*Lepidochelys kempii*)

The Kemp's ridley turtle is listed as endangered under the ESA. The most recent estimate of the Kemp's ridley turtle population is 7,000 to 8,000 nesting females (USFWS and NOAA Fisheries 2007). As this species is female biased, there are likely several thousand additional males (USFWS and NOAA Fisheries 2007). Kemp's ridley sea turtles exhibit unique nesting behavior observed in only one other sea turtle species; during events called "arribada" female turtles arrive onshore in large, synchronous aggregations to nest (NOAA Fisheries 2017c). This species nests almost exclusively in the western Gulf of Mexico, primarily in the states of Tamaulipas and Veracruz, Mexico (BOEM 2014). Though extremely large arribadas occurred in the 1940s (as many as 42,000 Kemp's ridley turtles were observed in one day in 1947), populations plummeted between the 1940s and the 1980s, reaching a low of fewer than 250 nesting females in 1985 (NOAA Fisheries 2017c). Conservation efforts led to annual increases of approximately 15 percent in Kemp's ridley breeding populations through 2009. However, recent data indicate a decrease in the number of Kemp's ridley nests since 2010 (NOAA Fisheries 2017c).

The Kemp's ridley sea turtle is found most commonly along the eastern coast of North America, from the Gulf of Mexico to Nova Scotia (NOAA Fisheries 2017c; BOEM 2014). After nesting and breeding in Mexico, this species travels to foraging grounds in shallow coastal waters, embayments, and estuarine systems along the Atlantic seaboard, where they remain for the duration of the spring and summer (BOEM 2014). The Kemp's ridley is present in areas including Chesapeake Bay, Pamlico Sound, Charleston Harbor, and Delaware Bay during the summer (USFWS and NOAA Fisheries 2007) and is the second most common turtle reported off the coast of Virginia (VIMS 2014). Kemp's ridley turtles begin leaving northern areas in mid-September, and most have departed for warmer southern waters by the beginning of November (Burke, Standora, and Morreale 1989; Morreale and Standora 1989). Wintering habitats for Kemp's ridley turtles include shelf habitats off of Florida and waters south of Cape Hatteras, North Carolina (Gitschlag 1996). There are no critical habitat areas designated for the Kemp's ridley sea turtle.

4.13.1.4 Herptiles

Diamondback Terrapin (*Malaclemys terrapin*)

The Diamondback terrapin (Malaclemys terrapin) is the only estuarine turtle species found in North America, spending its life in bays, salt marshes, creeks, and coves (DCIB 2021). Although the terrapin is considered aquatic, female terrapins lay their eggs on sandy beaches and juveniles use adjacent fringe or salt marshes to feed and grow (DCIB 2021). Many of the Delaware Inland Bays, including Indian River Bay, have natural shorelines with alternating beach and marsh habitat, making them excellent terrapin habitat (DCIB 2021). Habitat loss is a significant threat to terrapin in Delaware, arising from shoreline development, shoreline stabilization, and beach disturbance (DCIB 2021).

DNREC conducted a terrapin nesting study in Delaware Seashore State Park in 2005 – 2006. The seven locations for the study, shown in Figure 6-4 below, were selected based on the presence of open-canopied, sparsely vegetated areas, which are considered ideal terrapin nesting habitat. Two of the sites (Creation and Haven Bay) are Delaware Department of Transportation habitat mitigation sites specifically designed to provide terrapin nesting habitat. Terrapin nests were noted at all seven sites, although the exact nest locations were not recorded. The sites were revisited in 2020 to assess vegetative changes and quality of nesting habitat. The sites still contain suitable nesting habitat and site management was determined not to be necessary (DNREC 2021).

Figure 4.12-1. Indian River Bay and Rehoboth Bay Diamondback Terrapin Nesting Area

4.13.1.5 Terrestrial Vegetation

Three plant species that may occur in the Project area are listed as federally threatened or endangered (Table .12-1) including the evergreen bayberry (*Morella caroliniensis*), seabeach amaranth (*Amaranthus pumilus*) and the swamp pink (*Helonias bullata)* (U.S.F.a.W.S. USFWS 2022a).

Potential impacts on plant species can be found in Section 4.10.1.

<u>Evergreen Bayberry</u> (*<u>Morella caroliniensis</u>*)

The evergreen bayberry, also referred to as southern bayberry or small bayberry, is a perennial shrub species that is classified as S2, rare and of conservation concern, by the state of Delaware. It is typically found in man-made or disturbed habitats, dunes, forest edges, meadows and fields, ridges, and ledges (Native Plant Trust 2021).

The plant consists of woody stems that grow from the base with waxy, aromatic leaves. Over winter, the leaves will either drop off the plant or will wither and persist, and new leaves will sprout in spring. Bark along the woody stems ranges from white to grey and is generally smooth (Native Plant Trust 2021).

Seabeach Amaranth (*Amaranthus pumilus*)

The federally threatened seabeach amaranth is an annual plant species typically found in the lower foredunes of sandy beaches on the Atlantic coast (USDOI and USFWS 2018d). Seeds germinate as early as May, and plants flower as early as June and occasionally as late as December (USDOI and USFWS 2018d). Seabeach amaranth was historically found on barrier islands throughout the Atlantic coast from South Carolina to Massachusetts (USDOI and USFWS 1993). When all known populations were lost outside of New York, North and South Carolina, the species was proposed and accepted for ESA listing in 1993 (USDOI and USFWS 1993).

This species is classified as S1 (rare and of conservation concern) in Delaware; though populations have been identified in Sussex County, these appear to be declining. Hundreds of seedlings have been planted north of the Project area at Delaware Seashore State Park to help restore a self-sustaining population (USDOI and USFWS 2018d). The area around the Barrier Beach Landfalls also provides suitable habitat for this species. Recent numbers in Delaware have fluctuated between a few dozen and a few hundred plants per year since 2000 (USDOI and USFWS 2018d).

The species is highly sensitive to habitat alteration and fragmentation, but because all known populations occurred on private lands at the time of listing, critical habitat has not been designated for this species (USDOI and USFWS 1993). Beach maintenance activities, including grooming and shoreline stabilization, threaten the continued existence of seabeach amaranth. Erosion, flooding, herbivory, competition, and all-terrain vehicle use during the plant's flowering and fruiting also stress seabeach amaranth populations.

Swamp Pink *(Helonias bullata)*

Swamp pink is a federally threatened plant species and is classified as S2 (rare and of conservation concern) in the state of Delaware (U.S.F.a.W.S. USFWS 2022b). It has smooth, oblong, dark green leaves that form an evergreen rosette with a flowering stalk that can grow over 3 feet tall (U.S.F.a.W.S. USFWS 2022b). The stalk is topped by a 1- to 3-in cluster of pink flowers dotted with blue anthers (U.S.F.a.W.S. USFWS 2022b).

Swamp pink is found in perennially saturated, spring-fed, nutrient-poor, shrub swamps and forested wetlands (Virginia DCR 2022). It requires stable water levels and can tolerate only brief or infrequent flooding (Virginia DCR 2022). Swamp pink is found in New Jersey, Delaware, Maryland, Virginia, the Carolinas, and Georgia and occurs primarily in coastal plain and mountain habitats (Virginia DCR 2022).

Swamp pink reproduces primarily by vegetative means. Relatively few plants reach the flowering stage and reproduce via seeds, and very few seeds and seedlings survive (Virginia DCR 2022), Seed dispersal is limited, although high fat content allows the seeds to float which may contribute to higher dispersal (Virginia DCR 2022).

Swamp pink is wetland-dependent and activities which have impacts on water quality and quantity may impact swamp pink survival (Virginia DCR 2022). Activities that increase sedimentation, pollutant runoff, or flooding may negatively impact the species (Virginia DCR 2022).

4.13.1.6 Terrestrial Mammals and Insects

One species mammal species is listed as federally threatened as the potential to occur in the Project area; NELB and one insect, the monarch butterfly (*Danaus plexippus*), which is currently listed as candidate species (Table 4.12-1). A candidate species is recognized as those species for which sufficient information is available to support a proposal for listing as federally endangered or threatened, but for which preparation and publication of a proposal is precluded by higher priority listing actions by USFWS (50 CFR 424.15).

Avoidance and minimization measures as relate to these mammal and insect species are presented in Section 4.10.5.

Bethany Beach Firefly (*Photuris bethaniensis*)

The Bethany beach firefly is a small, tan firefly with dark brown or black markings that is endemic to the Delaware coast. It is easily identified by its distinct flash pattern of two green flashes. The insect is listed as endangered by the State of Delaware and is under review for listing under the Endangered Species Act by USFWS (University of Minnesota Department of Entomology N.d.).

The fireflies have very specific habitat needs and require freshwater interdunal swale wetland habitats within 500 m of the coast. Their habitat is at risk of saltwater intrusion from storm surges, rising sea levels, and land development (University of Minnesota Department of Entomology N.d.).

Northern Long-eared Bat (*Myotis septentrionalis*)

One federally listed bat species, the NLEB, may occur in Delaware and eastern Maryland. The endangered NLEB was subject to a 4(d) rule under ESA 8 FR 1900 (Table 4.12-1). However, on November 30, 2022, the USFWS published a final rule to the FR (87 FR 73488) to uplist the status of the NLEB from threatened to endangered. The final rule listing this species as endangered was set to go into effect 60 days from publishing in the FR on January 30, 2023 (50 CFR Part 17). On March 31, 2023, the NLEB was officially listed as endangered under the ESA.

The NLEB is a medium-sized bat that has been listed as endangered at the federal level due to summer habitat loss or degradation, impacts to hibernacula, and white-nose syndrome. White-nose syndrome poses the most severe and immediate threat to NLEB and is the primary reason for the species listing (USDOI and USFWS 2018c)

Northern long-eared bats are widely distributed in the eastern United States and Canada, with the exception of the far southeastern United States. During summer months reproductive females roost singly or in colonies in wooded areas, while nonreproductive females and males roost in cooler places such as caves and mines (DNREC 2012; USDOI and USFWS 2018c). Typically, NLEB migrate to their hibernacula sites (caves and abandoned mines) in August and September, and then enter hibernation around October and November. In April, the bats emerge from hibernation and migrate back to their summer habitat where they feed on insects. Suitable summer habitat for NLEB includes a wide variety of forested habitats, adjacent and interspersed non-forested habitats (i.e., emergent wetlands, adjacent edges of agricultural fields, old field, and pastures), forests and woodlots containing potential roosts (live trees and/or snags ≥3 in diameter at breast height (dbh) with exfoliating bark, cracks, crevices, and/or cavities), and other wooded areas with variable amounts of canopy closure (DNREC 2012; USDOI and USFWS 2018c).

Based on a review of the iPaC online database, NLEB is not expected to occur in the vicinity of the onshore substations or the offshore export landfall. However, suitable habitat is present elsewhere in the Project area, and it is possible that NLEB could occur in the area.

Monarch Butterfly (*Danaus plexippus*)

As of December 2020, the monarch butterfly (*Danaus plexippus*) (87 FR 26152 26178) became a candidate for listing, due to decreasing population size as a result of habitat loss and fragmentation (USFWS 2021c).

The monarch butterfly population is known or is believed to occur in almost all of the United States, including Pennsylvania, Delaware and Maryland. Typically, monarchs breed year-round and if in temperate climates, can undergo long-distance migration and live for an extended period of time. In the fall in eastern North America, monarchs begin migrating to their respective overwintering sites. Monarchs can migrate distances over three thousand kilometers. While the monarch butterfly population is very dispersed, the species lead region is in the Midwest (USFWS 2022b).

4.13.1.7 Avifauna

Four coastal species that are classified as threatened or endangered under the federal ESA may be found in the Project area and are discussed in Section 4.11. These include these avian species include roseate terns (*Sterna dougallii*), piping plover (*Charadrius melodus*), rufa red knot (*Caldiris canutus rufa*), and eastern black rail (*Laterallus jamaicensis jamaicensis*).

Based on correspondence and consultation with the USFWS and DNREC Division of Fish and Wildlife, no federally listed species have been identified in the vicinity of the proposed Interconnection Facilities (DNREC 2017b). DNREC has noted the existence of a nearby bald eagle nest, which is discussed in more detail as COP Volume II, Section 6.1.1 (US Wind 2023b).

Avoidance and minimization measures as related to avifauna are presented in Section 4.11.6.

<u>Roseate Tern (*Sterna dougallii*)</u>

Roseate terns (52 FR 42064) are medium-sized waterbirds that are strongly associated with coastal and marine habitats, including seacoasts, bays, estuaries, and offshore waters. Roseate terns forage mainly by plunge-diving and contact-dipping (in which the bird's bill briefly contacts the water) or surface-dipping over shallow sandbars, reefs, or schools of fish. They are adapted for fast flight and relatively deep diving and often submerge completely when diving for fish (USDOI and USFWS 2015b). Along the Atlantic coast, roseate terns nest primarily on islands in sandy beach, open bare ground, and grassy habitats, typically near areas with cover or shelter (NatureServ 2015).

Roseate tern is a widespread but localized species in coastal habitats throughout the world. The Atlantic subspecies (*S. d. dougallii*) breeds in two discrete areas in the western hemisphere: northeastern North America from the Canadian Maritime Provinces to Long Island, New York, and the northern Caribbean, including the Bahamas and the Florida Keys (USDOI and USFWS 1998). The northeastern population is listed as endangered by the governments of the United States and Canada, as well as by several northeastern states. Historically, the northeastern breeding population extended as far south as Virginia; however, several factors have caused the breeding range of the population to contract (USDOI and USFWS 2015b).

Northeastern roseate terns are thought to migrate through the eastern Caribbean and along the northern coast of South America to wintering grounds along the eastern coast of Brazil (USDOI and USFWS 2010). The most current abundance estimate for the northeastern population is approximately 3,200 nesting pairs (Nisbet, Gochfeld, and Burger 2014). The Caribbean breeding population is listed as threatened at the federal level. Individuals from this population are occasionally found nesting along the southeastern coast of the United States as far north as North and South Carolina (USDOI and USFWS 2015b).

The need for extending ESA protections to the roseate tern was identified based primarily on the concentration of the population into a small number of breeding sites, and to a lesser extent, observed declines in the population (USDOI and USFWS 1998). The most important factor in breeding colony loss was predation by herring gulls (*Larus smithsonianus*) and/or great black-backed gulls (*Larus marinus*). To date, critical habitat for roseate tern has not been designated by the USFWS. Roseate tern breeding colonies once existed on Assateague Island in Maryland (Stewart and Robbins 1958); however, there are currently no roseate tern breeding colonies in Maryland or Delaware. During boat and aerial surveys conducted between 1978 and 2009 this species was observed in Maryland and Delaware waters during spring months (O'Connell et al. 2009). Roseate tern was not detected in the WEA during the MABS surveys (Williams et al. 2015a, 2015b).

<u>Piping Plover (*Charadrius melodus*)</u>

The piping plover (50 FR 50726) is a small, migratory shorebird that breeds on beaches from Newfoundland to North Carolina (Elliot-Smith and Haig 2004; USDOI and USFWS 1996) .

According to USFWS (USDOI and USFWS 2009b), piping plovers that breed on the Atlantic Coast belong to the subspecies *C. m. melodus*. The Atlantic Coast population is classified as threatened (USDOI and USFWS 2015a) by both Delaware and Maryland as endangered (DNREC 2013; MDNR 2016). The most recent abundance estimates by USFWS estimate approximately 1,762 nesting pairs in 2011 (USDOI and USFWS 2012) .

Piping plovers inhabit coastal sandy beaches and mudflats. They use open, sandy beaches close to the primary dune of barrier islands for breeding, preferring sparsely vegetated open sand, gravel, or cobble for nesting sites. They feed on marine worms, fly larvae, beetles, insects, crustaceans, mollusks, and other small invertebrates. They forage along the wrack zone, or line, where dead or dying seaweed, marsh grass, and other debris is left on the upper beach by high tides (USDOI and USFWS 2015a).

A key threat to the Atlantic Coast population is habitat loss resulting from shoreline development (USDOI and USFWS 1996). Piping plovers are sensitive to human activities, and disturbances from anthropogenic activities can cause breeding birds to abandon their nests. Since the listing of this species under the ESA in 1986, the Atlantic Coast piping plover population has increased 234 percent (USDOI and USFWS 2009b). Although increased abundance has reduced near-term vulnerability to extinction, piping plovers remain sparsely distributed across their Atlantic Coast breeding range, and populations are highly vulnerable to even small declines in survival rates of adults and fledged juveniles (USDOI and USFWS 2009b).

The USFWS has designated critical habitat for the wintering population of piping plovers in coastal areas south of the Project area from North Carolina to Texas (USDOI and USFWS 2001, 2008, 2009a).Some piping plovers migrate to the Bahamas and West Indies from mid-September to March. Although precise routes of migration are not firmly established, it is possible that Piping Plovers could be present in the Project area during migration.

Rufa Red Knot *(Calidris canutus rufa)*

The rufa red knot (79 FR 73705) is a medium-sized shorebird that was added to the list of threatened species under the ESA in December of 2014 (USDOI and USFWS 2014). Its listing became effective on January 15, 2015. Large flocks of red knot migrate long distances between breeding grounds in the mid- and high-arctic and wintering grounds in southern South America (USDOI and USFWS 2013). Their northward migration through the contiguous United States occurs April-June, and their southward migration occurs July-October.

Delaware Bay is the most important spring migration stopover in the eastern United States., because it is the final place at which the birds can refuel in preparation for their nonstop journey to the Arctic (Baker et al. 2013). Red knots arriving at Delaware Bay depend on readily available and easily digestible foods such as juvenile clams and mussels and horseshoe crab eggs to restore their depleted energy reserves (USDOI and USFWS 2013).

Up to 90 percent of the entire red knot population can be present in Delaware Bay in a single day (Cornell University 2017). Although their precise migration route has not been firmly established (Niles et al. 2010), it is possible that these birds could be present in the Project area during spring and fall migrations. Due to challenges with the species' migratory habits and differing survey methods across the red knots' range, a range-wide population estimate does not exist; however, survey counts in the mid-Atlantic estimate 48,955 knots stopping in Delaware Bay (2013) and 5,547 to 8,482 knots annually stopping in Virginia (2011 to 2014) (USDOI and USFWS 2014).

Along the mid-Atlantic coast, red knots forage along sandy beaches, tidal mudflats, salt marshes, and peat banks (USDOI and USFWS 2014) . In Delaware Bay, they feed primarily on horseshoe crab eggs, and the timing of their arrival at Indian River Bay typically coincides with the annual peak of the horseshoe crab spawning period in May and June (USDOI and USFWS 2014; The Nature Conservancy 2021). Red knots are also known to occur in Maryland (USDOI and USFWS 2014), although they were not observed in the MABS surveys (Williams et al. 2015a, 2015b).

Surveys of wintering red knots along the coasts of southern Chile and Argentina and during spring migration along the United States coast indicate that a serious population decline occurred in the 2000s (USDOI and USFWS 2013). This population decline has been attributed to a reduction in horseshoe crabs (Cornell University 2017; USDOI and USFWS 2013), which are harvested primarily for use as bait and secondarily to support the biomedical industry (USDOI and USFWS 2003), but serve as an essential food source for red knot. Other threats to red knot include habitat destruction resulting from beach erosion and shoreline protection and stabilization projects, the inadequacy of existing regulatory mechanisms, human disturbance, and competition with other species for limited food resources.

Eastern Black Rail (*Laterallus jamaicensis jamaicensis*)

The threatened eastern black rail (85 FR 63764), a subspecies of the black rail, is a small marsh bird that occurs in salt, brackish, and freshwater wetlands in the eastern United States (USFWS 2019). It was listed as threatened on October 8, 2020, with the rule becoming effective on November 9, 2020 (USDOI and USFWS 2020). Both Maryland and Delaware list this species as a black rail in their records and classify the species as endangered (DEDFW 2015; MDNR 2016).

Eastern black rail wetland habitat requires dense overhead cover, moist to saturated soils, and nearby shallow water for foraging (USFWS 2019) . The species lives across the elevation gradient between the lower wetland area and the higher upland area of estuarine and palustrine marshes. The upland area serves as a refuge from predation and as a means to escape flooding. Due to their nests being built in moist soil or shallow water, flooding is a frequent cause of nest failure for eastern black rails (USDOI and USFWS 2020). This species rarely flies and runs to escape predators through the vegetation present in the wetland. eastern black rails feed on a variety of small aquatic and terrestrial invertebrates and seeds (USFWS 2019).

The eastern black rail has declined in numbers throughout the entirety of its range. Historically, Chesapeake Bay was considered an important breeding area, but the distribution and counts of the species has declined in recent studies, with study areas in Maryland experiencing a 13.8 percent annual rate of decline (Watts 2016). Past stressors include habitat degradation and fragmentation, mainly due to past conversion of marshes and wetlands into agricultural and urban areas and ditching due to mosquito control (USDOI and USFWS 2020). Current stressors include continued development in marsh and wetland areas, sea level rise due to climate change, and incompatible land management (i.e., poorly timed fires, grazing, or mechanical treatment) (USDOI and USFWS 2020).

Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles (*Haliaeetus leucocephalus*) nest in the mid-Atlantic and are present there year-round. After severe population declines throughout much of the United States during the early- to mid-20th century, the Federal government formally listed the bald eagle as endangered throughout most of its range in 1978. The bald eagle was federally de-listed in 2007 due to increasing numbers; however, the species continues to be protected by the Bald and Golden Eagle Protection Act of 1940, as well as other laws (USDOI and USFWS 2016). The state of Maryland has updated its listing for the bald eagle to secure (M.W.a.H.S. MDNR 2016b), but the bald eagle remains classified as endangered in Delaware (Delaware Division of Fish and Wildlife 2006), where it is described as inhabiting coastal plain upland forests.

Bald eagles are commonly found close to bays, rivers, lakes, or other bodies of water that reflect the general availability of their primary food sources – fish and waterfowl. They tend to avoid areas with nearby human activity (boat traffic, pedestrians) and development (buildings). Perch sites are typically in deciduous and coniferous trees. Communal roost sites used by two or more eagles are common; some may be used by 100 or more eagles during periods of high use. Large stick nests are usually built in tall trees near water. Nest trees include pines, spruce, firs, cottonwoods, oaks, poplars, and beeches. Females typically lay two eggs each year, sometime between January and April, and chicks fledge in approximately 3 months (USDOI and USFWS 2019). As of 2020, more than 220 pairs were successfully nesting in Delaware (Delaware River Basin Commission 2021). The Delaware River provides essential wintering habitat for bald eagles (Delaware River Basin Commission 2021). Bald eagles are less common on the coastline; only two were detected during the MABS-MD aerial surveys (Williams et al. 2015b). DNREC identified a bald eagle nest on Burton Island, where the Indian River Power Plant is located in response to a request from US Wind (DNREC 2017b). Project activities will not intersect the nest location, but if any work is done east of the Power Plant, DNREC requests that US Wind contact United States Fish and Wildlife Services (USFWS) about the nest location. (DNREC 2017b)

4.13.2 Impacts

Impacts of project construction and operations on finfish, marine mammals, and sea turtles, are described in Sections 4.6.2, 4.7.2, and 4.8.2, respectively. Impacts of project construction and operations on bats, terrestrial vegetation and insects, and avifauna are described in Sections 4.10.3 and 4.11.3, respectively.

4.13.3 Avoidance and Minimization

US Wind will implement avoidance and minimization measures to reduce project impacts. Avoidance and minimization measures relating to finfish, marine mammals, and sea turtles, are described in Sections 4.6.3, 4.7.3, and 4.8.3, respectively. Avoidance and minimization measures relating to bats, terrestrial vegetation and insects, and avifauna, are described in Sections 4.10.4, 4.11.4, and 4.12.4, respectively.

4.14 Navigation and Military Activities

The Indian River Inlet and Bay Federal Navigation Project is located within Indian River Bay and Indian River, terminating at Millsboro, Delaware (Figure 4.14-1). The ongoing project is considered general operation and maintenance of the existing navigation channel. The project provides a safe navigation channel for commercial, recreational and USCG use. Indian River Inlet is the only water access point into the Delaware Inland Bay area that includes Indian River Bay and Rehoboth Bay (U.S.A.C.o.E. USACE 2022). USACE does not maintain the Federal Navigation Channel west of Indian River Inlet. However, DNREC has dredged the portions of the channel through Indian River and proposes dredging the portions passing through Indian River Bay. DNREC maintains portions of the Channel by dredging and has designated the Channel a high priority for maintenance based on function and public stakeholder survey results.

The Indian River Inlet and Bay Federal Navigation Channel begins 0.6 km (0.4 miles) offshore of the Indian River Inlet and proceeds through Indian River Bay and the Indian River until the highway bridge in Millsboro (U.S.A.C.o.E. USACE 2022). The channel varies from 61-18 m (200-60 ft wide) and 4.6-1.2 m (15-4 ft) deep as it proceeds inland (Figure 16-3).

In response to a draft Section 408 Review Request submitted to USACE on February 1, 2023, USACE directed US Wind to install export cables no less than 1.8 meters (6 feet) below the maintenance depth of the Channel. The Channel does not have a fixed location through Indian River Bay. A channel is marked each year by the U.S. Coast Guard by marker buoys indicating the deeper portions of the route for navigation. DNREC communicated to US Wind in recent meetings that US Wind’s buried export cables should not impede the ability of future dredging projects for maintenance of the Channel. Based on feedback from USACE and DNREC, US Wind is planning to bury the export cables 4.9 m (16 ft) below MLLW through much of Indian River Bay to properly protect the export cables and avoid conflict with maintenance activities if future dredging occurs. US Wind included a 76 m (250 ft) area on either side of the last known extent of the Channel and would bury the cables anywhere within that area at least 1.8 m (6 ft) below the maintenance depth of the Channel to accommodate potential shifting of the Channel in the future.

To achieve the target burial depth US Wind and its contractors have determined dredging would be necessary in locations along the cable routes for cable burial. Dredging activities are discussed in Section 2.1.3.3 under Dredging within Indian River Bay.

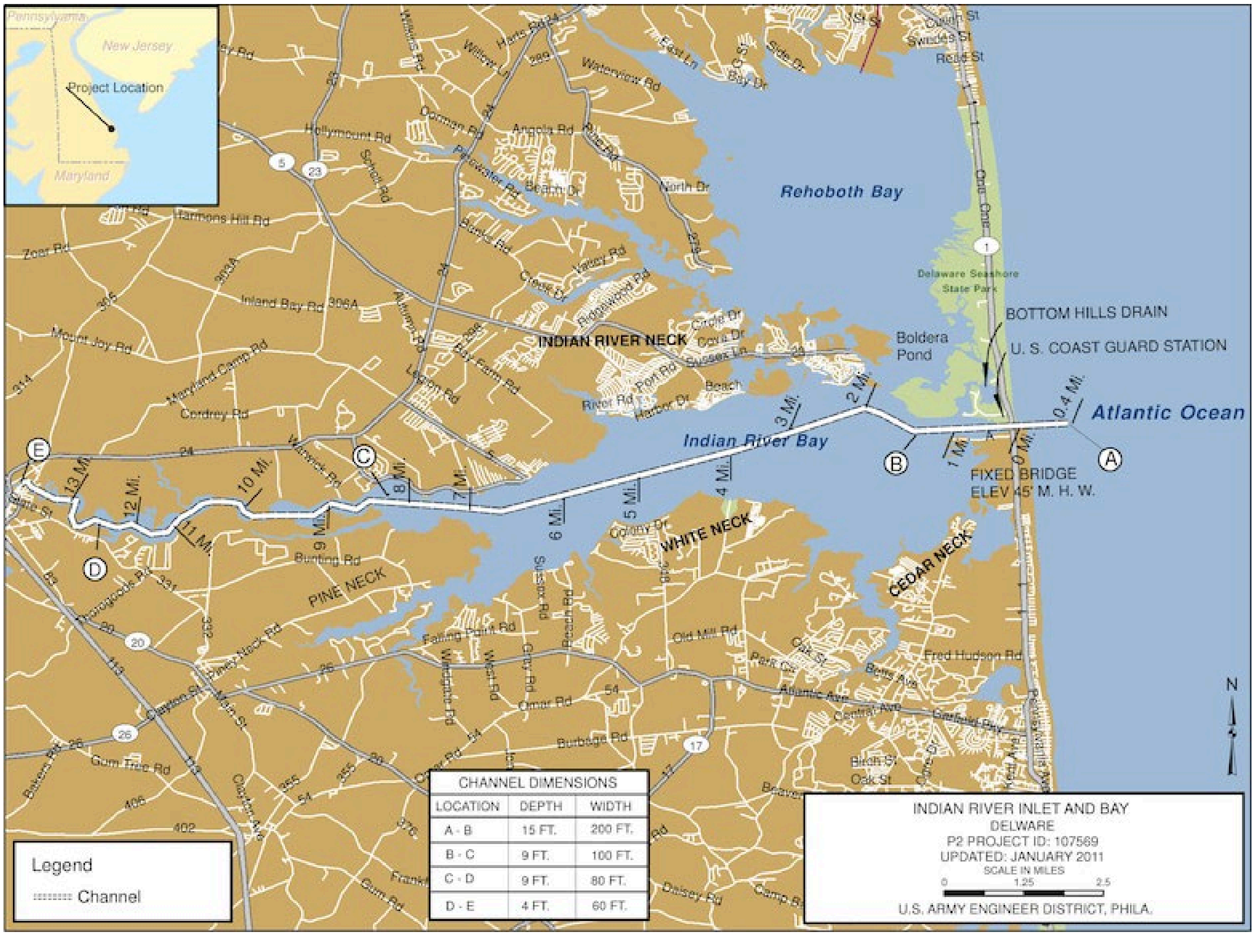

Figure 4.14-1. Indian River Inlet and Bay Federal Navigation Project (USACE 2022)

The Offshore Export Cables would be buried below the seabed. Buried cables present potential snagging risks for vessel anchors. Sufficient cable burial depth and cable protection, including concrete matting where necessary, and routing the offshore export cables to avoid anchoring sites would help protect the cables and OCS users from any potential contact with vessel anchors. US Wind routed the Offshore Export Cable Corridors to the south of anchorage grounds proposed by USCG in the November 29, 2019, Notice of Inquiry, request for comments, 84 CFR 65727 (Figure 4.16-2), which was formally proposed in a Notice of Proposed Rulemaking, 87 FR 16126, on March 22, 2022.

A Cable Burial Risk Assessment based on the 2021-2022 geophysical and shallow geotechnical surveys along the Offshore Export Cable Corridors has been provided in COP Volume II, Appendix II-K7 (US Wind 2023b).

4.14.1 MEC/UXO

In 2021, US Wind contracted EPI Group (EPI) to conduct a desk-based threat and risk assessment and management strategy for munitions of explosive concern (MEC) and unexploded ordnance (UXO) for the Lease area and Offshore Export Cable Corridors (EPI Group 2021). The report indicates that the most likely potential for MEC/UXO is within the nearshore Offshore Export Cable Corridors and from vessels sunk by mine action within the Lease area. Although there is the potential for MEC/UXO across the Lease area, this concern was assessed to not be a significant threat.

The probability of encountering MEC for this Project is considered to be moderate to low. MEC is reasonably expected to be identified during HRG survey activities that include side-scan sonar and a magnetometer array. Smaller items of MEC that may be missed during such surveys are considered of lower risk and the risk may be considered to be ALARP.

The EPI prepared *Combined MEC/UXO Detailed Threat and Risk Assessment and Risk Mitigation Strategy for the OCS-A 0490 Offshore Lease Report*, is provided as COP Volume II, Appendix II-A3 (US Wind 2023b).

4.14.2 Impacts

DNV prepared a Navigation Safety Risk Assessment (NSRA) for the Project to evaluate the potential for risks to navigation from the construction and operation of the Project. A copy of the NSRA is provided in COP Volume II Appendix II-K1. United States Coast Guard (USCG) guidance "Navigation and Vessel Inspection Circular No. 01-19 (NVIC 01-19)" was used in the preparation of the NSRA (USCG 2019). The NSRA serves as the outline and basis for evaluating the potential impact of the Project on the marine transportation system, including navigation safety, traditional uses of waterways and USCG missions. The NSRA also identifies reasonable methods of controlling or mitigating potential Project impacts.

4.14.3 Avoidance and Minimization

US Wind will implement the following avoidance and minimization measures to reduce Project impacts on navigation and military activities.

- Coordinate with the appropriate regulatory agencies and other stakeholders during construction to provide timely and effective communications regarding planned vessel movements and construction activities.
- Work with USCG to establish and maintain safety zones around active construction areas, and mark areas with highly visible marking and lighting.
- Bury submarine cables at least 2 m (6 ft) below the Indian River Inlet and Bay Federal Navigation Project.
- Cable Burial Risk Assessments (CBRAs) have been prepared based on geophysical and geotechnical (G&G) survey data for the export cables (Appendix H16).
- Prior to construction, analyze survey data at installation locations to identify potential MEC/UXO and plan avoidance in line with industry best practices.
- Prepare an MEC/UXO Emergency Risk Management Plan prior to construction.

- Prior to construction activities, provide an MEC/UXO awareness briefing to vessel crews.

4.15 Socioeconomics

Socioeconomic resources discussed in this section are varied, from employment and transportation infrastructure to tourism and commercial fishing. The majority of socioeconomic resources are evaluated at the county level. The Barrier Beach Landfalls and Interconnection Facilities are located in Sussex County, Delaware. Offshore the presence of associated submarine cables may affect activities in nearby counties. Figure 4.15-1 illustrates the locations of the potentially affected counties.

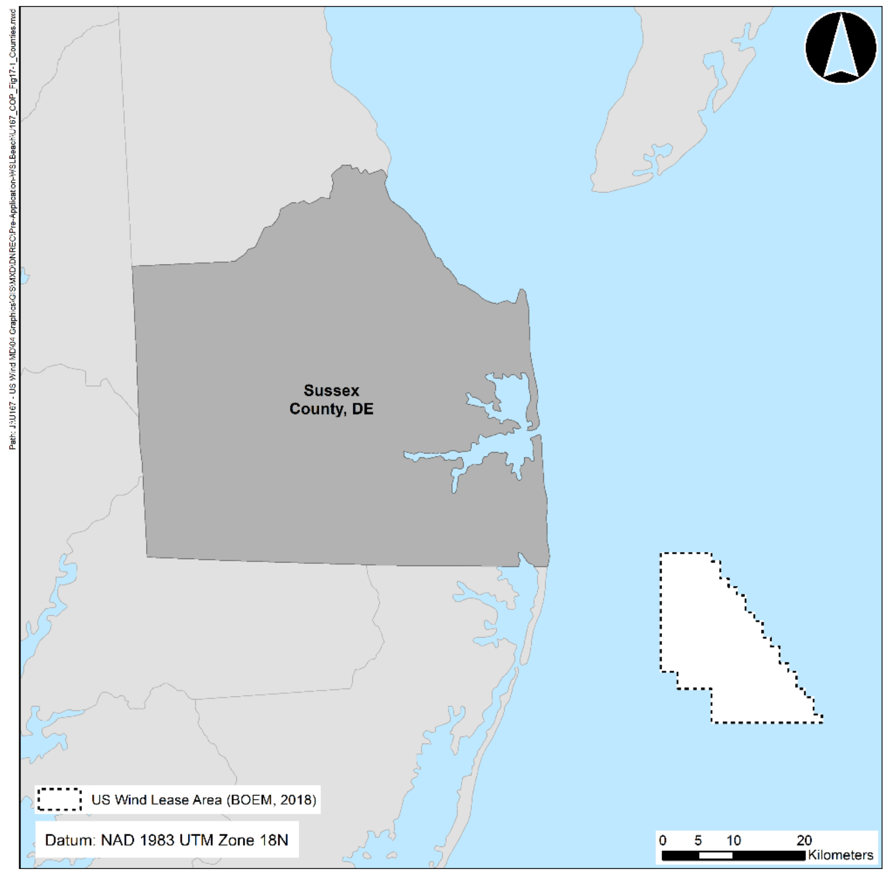

Figure 4.15-1. Counties Potentially Affected by the Project

4.15.1 Demographics, Economy, and Employment

4.15.1.1 Description of Affected Environment

This section describes the populations and economic status of the counties within the Project area. Population data are primarily derived from the United States Census Bureau (USCB). Industry data are primarily derived from the National Ocean Economics Program (NOEP), which reports financial data in 2012 dollars. The NOEP provides statistics for the “ocean economy” (or “ocean-based industries”), comprised of industries that use ocean resources, such as marine fisheries, transportation, and offshore mining, and for all industries that conduct business in coastal counties (the "coastal economy"). Many of the statistics referenced in this section are also listed in Table 4.15-1.

Table 4.15-1. Demographic, Economic and Employment Statistics for Counties in the Project Area

Location	Estimated Population (2019)	Median Income 2015-2019	Per capita Income 2015-2019	Employment (2019)	Unemployment (2019)
Sussex County, DE	234,225	$63,162	$35,491	74,351	4,501
State of Delaware	973,764	$68,287	$35,450	413,410	26,481
United States	328 million	$62,843	$34,103	132,989,428	8,713,400
Sources: (USCB 2019a, 2019b)					

4.15.1.2 Impacts

The discussion of impacts on the demographics, economy, and employment in the Project area below uses the economic impact assessment, found in COP Volume II Appendix II-L1 (US Wind 2023b).

The assessment used Impact Analysis for Planning (IMPLAN), a predictive model that uses matrices to relate the performance of economic variables for 546 industries (as of completion of the modeling exercise for this Project) for national, state, and county geographies. The Project was modeled under two scenarios over a 7-year fabrication, construction and commissioning timeframe, Scenario 1 is based on using 114 WTGs of the 220 m rotor diameter platform (14.7 MW), and Scenario 2 is based on a PDE maximum with 121 WTGs of the 250 m rotor diameter platform (18 MW). In both scenarios the WTGs are on monopile foundations. The scenarios were modeled with a constant 2021 value, based on a "bill-of-goods" approach to expenditures and labor involved in procurement, installation, and administration during construction. The results of this modeling were in the form of direct, indirect, and induced economic impacts of the Project in the form of, respectively, jobs created due to local operations and spending, jobs created by suppliers, and jobs created due to increased local income and spending as part of construction of the Project.

According to the IMPLAN modeling results, the direct economic impacts of the Project would be driven by expenditures on labor, materials, and equipment used for construction.

The Project presents an opportunity for the region to benefit from the economic activity related to the creation of a new industry. US Wind is focused on building out a local supply chain to benefit the Project and the broader U.S. offshore wind industry. US Wind believes that a diverse, well-compensated, and well-trained workforce delivers ahigh-quality product and service, which is why US Wind is committed to creating full and equitable business opportunities for minority, women-owned, veteran-owned, and HUBZone businesses in the development of the Project. In November 2021, US Wind was awarded the “Best Practices Award” by the Maryland Minority Contractors Association for the company’s work to maximize minority business enterprise (MBE) participation in the Project. Additionally, US Wind signed agreements with organized labor such as United Steelworkers, Baltimore-DC Building and Construction Trades, and the International Brotherhood of Electrical Workers, to support union engagement with offshore wind in the region.

4.15.1.3 Construction

It is not anticipated that construction would negatively impact the population of the Project area. The onshore components, the Barrier Beach Landfalls and Interconnection Facilities, are not proposed in residential areas and interference with the operations of existing business enterprises would be temporary. The Project is expected to bring new economic and employment opportunities to the Project area.

A joint study by the Delaware Sea Grant College Program and the Delaware Center for the Inland Bays determined that improvements in water quality within the Inland Bays (including Indian River Bay) have the potential to increase economic contributions (Hauser and Bason 2022). These include increased property values for waterfront homes and homes close to the water, increase in associated real estate economic contributions (including jobs), and an increase in outdoor recreation (Hauser and Bason 2022). US Wind will avoid impacts to water quality and therefore its potential economic contributions through the time of year restrictions outlined in Section 4.3.3.

4.15.1.4 Operations

It is anticipated that the operations and maintenance of the Project would positively impact the population of the Project area. Analysis of potential jobs and spending during operations of the Project is included in COP Volume II Appendix II-L1 and shows this impact to the region once the Project is operational.

4.15.1.5 Avoidance and Minimization

US Wind will implement the following avoidance and minimization measures to reduce Project impacts on socioeconomic resources.

- US Wind will work with local officials to develop a traffic management plan to reduce impacts to local traffic during construction.
- US Wind will concentrate onshore construction activities outside of the summer recreation season to the greatest extent practicable and will coordinate with DNREC Parks and Recreation to minimize interference with beach activities.
- US Wind will coordinate with local stakeholders to develop opportunities for eco-tourism related to the Project.

- US Wind has sited and developed Project elements to minimize disturbance to resources, to the extent practicable, enjoyed by residents of and visitors to the region.
- Onshore cables and facilities at the Barrier Beach Landfalls will be buried to limit disturbance to coastal resources.
- US Wind will implement practices and operating procedures to reduce the likelihood of vessel accidents and fuel spills. An Oil Spill Response Plan has been prepared and will be implemented for construction and for operations activities.
- US Wind is committed to creating full and equitable business opportunities for minority, women-owned, veteran-owned, and HUBZone businesses in the development of the Project.
- US Wind has hired a team of MBE participation and compliance experts to lead the company's outreach efforts to minority businesses and community organizations.
- US Wind is coordinating with area organized labor organizations to develop a skilled local workforce for the Project.
- US Wind has a strong interest in the welfare of workers employed by the construction managers, contractors and subcontractors on all components of the Project.
- US Wind is committed to achieving substantial involvement of Maryland-based small businesses in all phases of the Project.
- US Wind is committed to creating opportunities for Delaware-based companies able to deliver supply chain components and/or perform on-site work in Delaware.
- US Wind has a particular focus on creating meaningful economic opportunities for environmental justice communities in the Baltimore, Maryland area.
- US Wind will support workforce initiatives that are focused on providing support to minority and low-income populations, women, veterans, and underserved communities.

4.15.2 Commercial and Recreational Fisheries

Commercial and Recreational activities were evaluated as required by Section 17h of the DNREC Appendix S New Dredging Projects Form (see Appendix A).

4.15.2.1 Description of Affected Environment

Commercial and recreational fishing occurs in nearshore Delaware waters and in the Indian River Bay.

<u>Commercial Fishing Resources</u>

Significant species to the commercial fishing industry in Delaware include the following: Black Sea Bass, Striped Bass, Spanish Mackerel, Spotted Seatrout, White Perch and Shellfish (Delaware Administrative Code Title 3000). Please refer to Section 4.15.2.3 for information regarding the avoidance and minimization measures US Wind will implement to protect impacts on recreational and commercial fisheries within Delaware state boundaries.

As shown in Figure 4.15-2, commercial fishing revenue is relatively low in Delaware state waters compared to areas further offshore. There are 8 commercial clam harvest license holders in Indian River Bay. US Wind reached out to all 8 and none responded.

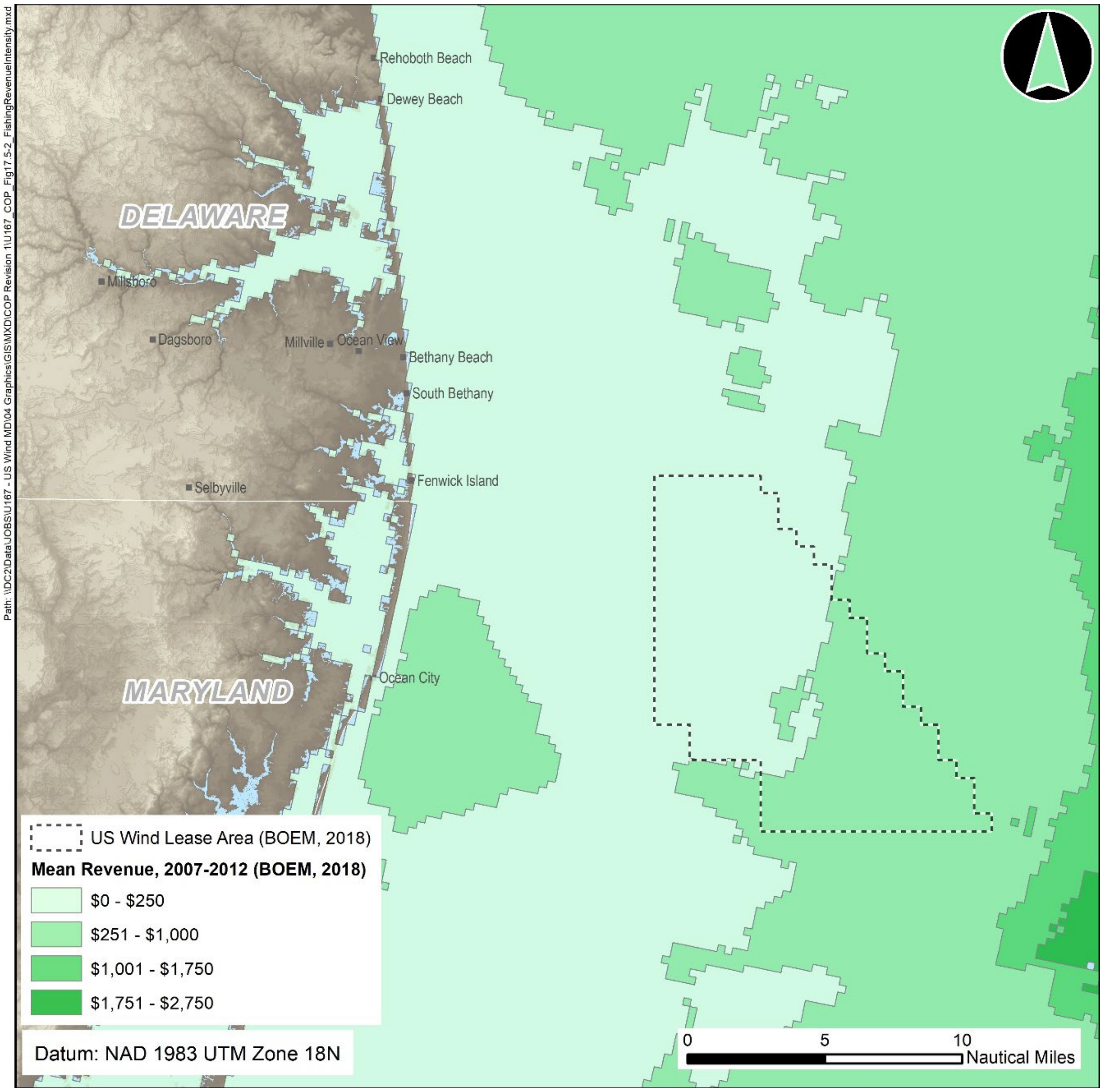

Figure 4.15-2. Lease Area and Revenue-Intensity Raster from Commercial Fishing Activity

Fish packing facilities have not been active in Delaware since the 1980's, so vessels that depart from Delaware typically land their catch in Ocean City to take advantage of one of the three packing facilities there (NOAA Fisheries n.d.).

Recreational Fishing Resources

The majority of recreational fishing in Delaware occurs in inland waters. Between 2018 to 2021 the top species by catch in Delaware waters included summer flounder, bluefish, black sea bass, and white perch. For each of the top twelve species by catch, over 60 percent of the catch occurred in inland waters for all species except black sea bass, striped mullet, and smooth dogfish (NOAA Fisheries 2021a).

Artificial reefs have been established offshore to provide substrate that encourages growth of marine invertebrates and provides protection for crustaceans and fish. No artificial reefs are located within the area of Project activities in Delaware state waters.

In the Delaware Inland Bays, over 200,000 recreational fishing trips are made per year (DCIB 2016). In Indian River Bay, fishing access areas include Rosedale’s Beach, Massey Landing, Holts Landing, Indian River Marina, and Indian River Inlet. Rosedale’s Beach is located at the base of Indian River; Massey Landing and Holts Landing are located near the center of the Bay, on the north and south shores, respectively; and Indian River Marina is located to the east of Indian River Inlet (DNREC 2017a). Per consultation with DNREC, over 99% of Delaware’s hard clams, both commercial and recreational, are harvested from the Inland Bays, which includes Indian River Bay.

The DNREC Shellfish Program is responsible for the management of areas that are harvested for shellfish to protect human health. The majority of Indian River and parts of Indian River Bay are classified as prohibited to shellfish harvesting (Figure 4.15-3). Some areas along the northern shore near Long Neck and Masseys Landing are seasonally approved.

Please refer to Section 4.15.2.3 for information regarding the avoidance and minimization measures US Wind will implement to protect impacts on recreational and commercial fisheries within Delaware state boundaries.

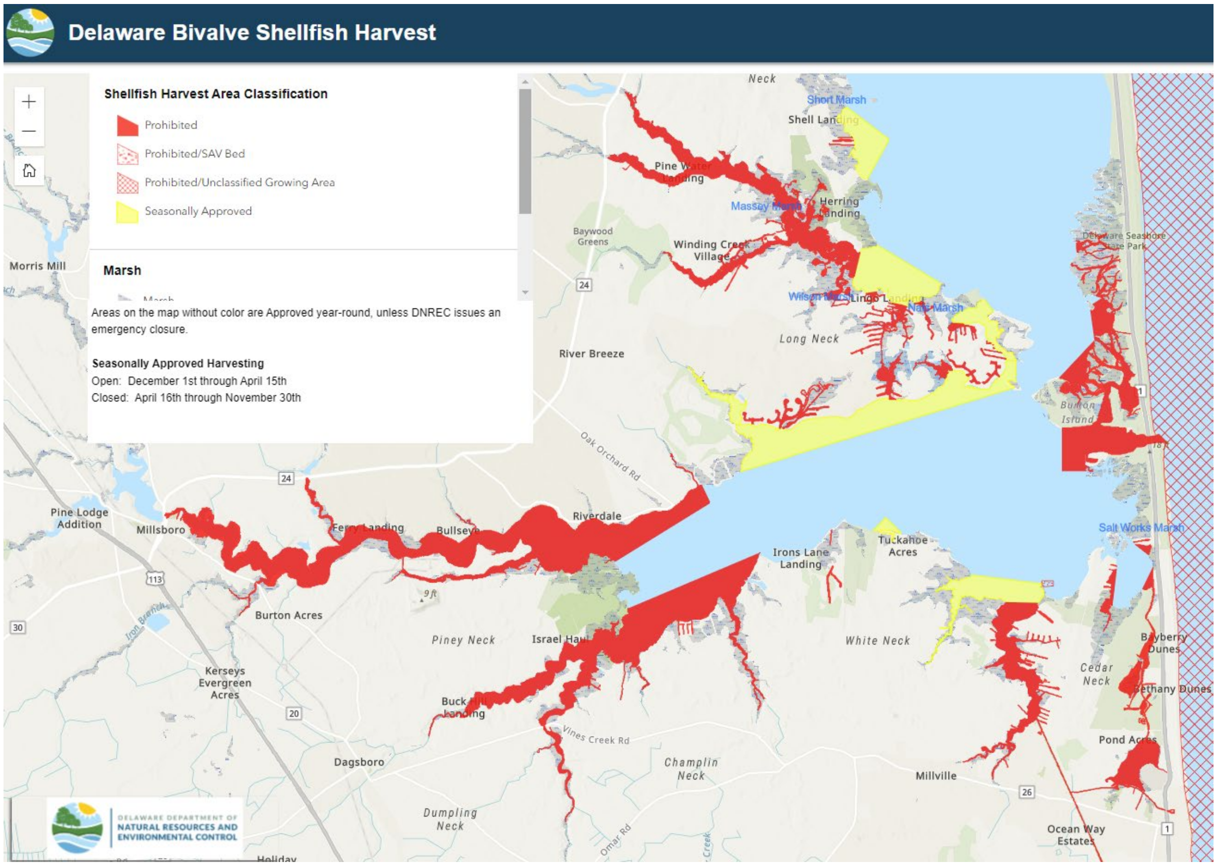

Figure 4.15-3. Shellfish Harvest Areas within Indian River Bay

4.15.2.2 Impacts

Commercial and Recreational activities were evaluated as required by Section 17h of the DNREC Appendix S New Dredging Projects Form.

4.15.2.2.1 Construction

Activities associated with Project construction have the potential to impact commercial and recreational fisheries, though these impacts are expected to be minor and temporary.

Habitat Alteration

Construction activities, including cable burial, gravity cell installation, and contact of anchors and jack-up vessels with the seafloor, would temporarily alter habitat in the area. Benthic organisms located in the path of the jet plow, beneath jack-up vessel legs, in areas of anchor chain sweep, and within gravity cell footprints, would likely experience mortality. However, these impacts will be temporary and localized, as seafloor habitats are expected to undergo rapid physical and biological recovery following disturbance (see Section 4.5.2).

The installation of cable protection for the Offshore Export Cables (in areas where cable burial depth is insufficient) will result in direct mortality to organisms located in the footprint of these structures, as well as long-term impacts to the benthic community resulting from conversion of soft sediment habitat to hard substrate (see Section 4.5.2). The area impacted by these activities would be limited and commercial and recreational fisheries are not expected to be impacted.

Noise and Suspended Sediment/Deposition

Exposure to elevated sound levels associated with construction activities, including vessel noise, is expected to have negligible to minor impacts on fish, and therefore commercial and recreational fisheries, within the Project area. Fish are likely to respond to this activity by temporarily avoiding the area of the sound source (see Section 4.6.2). Similarly, Project activities, including the installation of onshore export cables in Indian River Bay, have the potential to result in temporary and localized increases in suspended sediment concentrations. These water quality changes could impact finfish, and individuals are likely to vacate the area immediately surrounding Project activities (see Section 4.6.2). As avoidance behavior in response to noise and water quality changes will be temporally limited, impacts on commercial and recreational fishing will be negligible.

Space-Use Conflicts

US Wind does not propose any long-term vessel exclusions during construction of the Project. Temporary exclusion areas, including fishing restrictions, will occur in the area of offshore construction activities for safety reasons. Restrictions would be temporary and are anticipated to have negligible impact on commercial and recreational fisheries.

Modest increases in vessel traffic will occur in and around ports used for Project mobilization. However, these temporary changes are unlikely to impact either commercial or recreational fisheries activity. Where feasible, space-use conflicts will be mitigated through the implementation of BMPs as described in BOEM’s 2014 report on this topic (Ecology and Environment Inc. 2014).

One of the BMPs for commercial wind energy development identified by BOEM is that a lessee designate a Fisheries Liaison and develop a fisheries communication plan (BOEM 2015). The plan, which is implemented with the assistance of the liaison, allows Lessees to acquire information from representatives of the fishing community and to fully consider the impacts of construction and operation of proposed facilities throughout the life of the Project. US Wind contracted Sea Risk Solutions as the Fishing Liaison Officer. Sea Risk Solutions developed a Fisheries Communication Plan for US Wind (COP Volume II Appendix II-F1 (US Wind 2023b)). The Fisheries Communication Plan identifies the Fisheries Liaison who serves as US Wind’s outreach representative to the fishing industry and two Fisheries Representatives who represent the local fishing community.

4.15.2.2.2 Operations

Habitat Alteration

Cable protection along the offshore export cables within Delaware State waters would be minimal if present. No other impacts to fisheries habitat would be created by the buried infrastructure during operations.

EMF

While in operation, export cables would produce EMFs. Some marine fish are able to detect EMFs. However, exposure to EMF would be limited by cable shielding and burial, and any impacts to commercial and recreational fisheries from EMFs are expected to be minor and short-term (see Section 4.6.2) (BOEM 2021). A site-specific study of potential impacts of EMF found electric fields produced by the operation of project cables to be below the reported detection thresholds for electrosensitive marine organisms (Exponent 2023).

Space-Use Conflicts and Noise

The use of mobile gear along the offshore export cables is unlikely to be restricted during Project operations, as cables would be buried 1 to 4 m (3 to 13 ft) below the seafloor. In areas where sufficient burial depth for the Offshore Export Cables is not attainable, cable protection in the form of concrete mattresses or rock would be installed. These materials may present a risk for gear entanglement. However, burial is the preferred cable protection approach, and cable protection would be minimized to the greatest extent practicable.

4.15.2.3 Avoidance and Minimization

US Wind will implement the following avoidance and minimization measures to reduce Project impacts on commercial and recreational fisheries.

- US Wind developed a Fisheries Communication Plan, in conjunction with the designated Fisheries Liaison Officer and will work with fisheries stakeholders to update it as appropriate.
- US Wind established a process for gear loss compensation for commercial fishermen.
- US Wind conducted a site-specific study of potential EMF impacts on electrosensitive marine organisms.
- US Wind will work cooperatively with commercial/recreational fishing entities and interests to review planned activities and ensure that the construction and operation activities will minimize potential conflicts.
- US Wind will evaluate potential pre- and post-construction monitoring for regionally important species, such as a partnership with the University of Maryland Center for Environmental Science to study black sea bass, to identify commercial and recreational fishing impact.

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4.16 Other Uses

4.16.1 Marine Minerals

Following the 1994 amendments to the OCSLA, BOEM may offer and enter into a noncompetitive, negotiated lease to mine sand, shell, or gravel located in marine environments for certain types of projects that receive funding or authorization from the Federal Government. The primary function of BOEM's marine minerals program as such is identifying and mining sand on the OCS to be used for beach nourishment and coastal restoration projects (USDOI and BOEM 2012). Most of the area between the Lease area and the Submerged Lands Act boundary is considered to contain sand resources. The Isle of Wight Shoal; Fenwick Shoal; Weaver Shoal; and Shoals A, B, C, D are located in this area, and the Delaware Sand Resource Area is located further north, offshore from the location of the Barrier Beach Landfalls (USDOI and BOEM 2014).

Sediment in these areas ranges from poorly to very well sorted sands, and the mean grain size of sediment in these areas is medium sand or greater. Weaver Shoal and Isle of Wight Shoal are suitable sources for replenishing sand on beaches in Ocean City and Assateague Island. It is estimated that there are more than 253 million cubic m (8,934 million cubic ft) of sand with high resource potential and more than 100 million cubic m (3,521 million cubic ft) of sand with moderate resource potential in the Maryland sand borrow areas and 35 million cubic m (1,236 million cubic ft) of usable sand resources in the Delaware Sand Resource Area (Louis Berger Group Inc. 1999). A small portion of Offshore Export Cable Corridor 1 overlaps with the northeast corner of Borrow Area C, as well as the southwest corner of Borrow Area G before making landfall (See 4.15-2). These sand borrow areas are currently inactive.

During the drafting of the offshore export cable corridors, great care was taken to avoid sand borrow areas and sand resource areas. However, due to the proximity of these areas to each other and the location of the USCG anchorage area (to the north of the Lease area), avoiding sand borrow and resource areas entirely is not feasible. After consultation with USACE, US Wind would micro-site offshore export cables in Offshore Export Cable Corridor 1 to maintain a 400 m (0.25 mi) buffer from active areas and the proposed future borrow area in the vicinity of Indian River Inlet. Communication with BOEM's marine minerals program and the USACE indicated that encroachment on the inactive sand borrow areas would be acceptable given that no active areas are impacted.

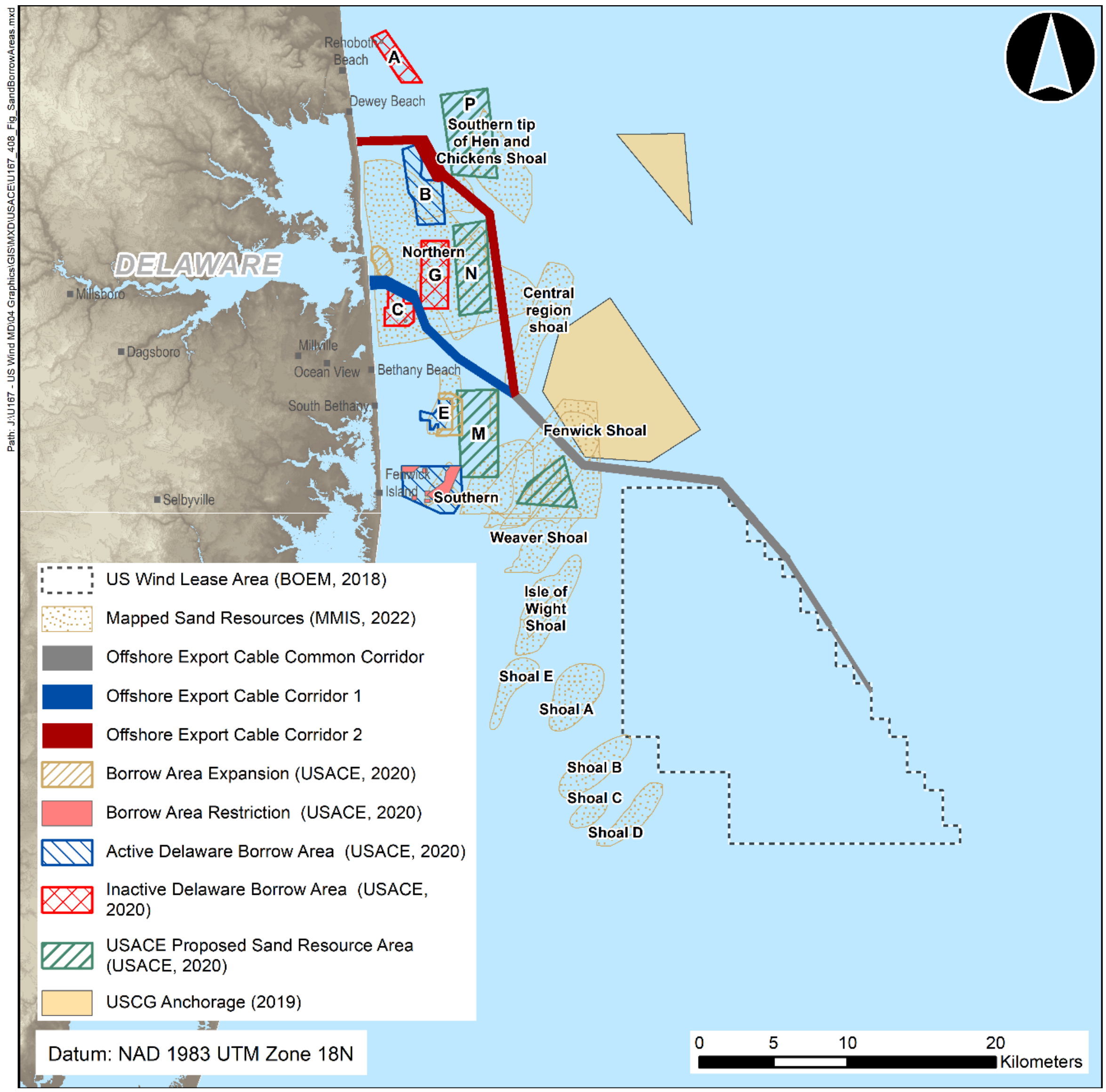

Figure 4.16-1. Sand Borrow Areas

4.16.2 Utilities

There are no known or documented submerged cables, pipelines or military seabed assets in the vicinity of the Project area. Two offshore wind energy lease areas are located to the north of US Wind's Lease area: OCS-A 0519, under Skipjack Offshore Energy, LLC, and OCS-A 0482 under GSOE I, LLC.

4.16.3 Impacts

4.16.3.1 Construction

Marine Minerals

It is not anticipated that construction will interfere with marine minerals operations. Construction barges would be part of routine traffic passing by the borrow areas offshore Ocean City. Offshore Export Cable Corridor 1 overlaps a small portion of two inactive sand borrow areas (Borrow Areas C and G). US Wind will coordinate with the United States Army Corps of Engineers (USACE) and others to address as necessary. USACE Proposed sand resource areas have been identified to the west of the Lease area.

Utilities

It is not anticipated that construction will interfere with offshore utilities. No submerged cables or pipelines have been identified in the Project area. The proposed Offshore Export Cable Corridors and vessel routes avoid crossing any neighboring wind energy lease areas. US Wind is willing to coordinate with appropriate parties about future submarine cable crossings as needed.

4.16.3.2 Operations

The Offshore Export Cable Corridors have been designed to avoid active and inactive sand borrow areas to the extent practicable. Due to other constraints in locating the Offshore Export Cable Corridors (See Volume I, Figure 2-1), there are several sections that would be in close proximity to and potentially overlap with existing active and inactive sand borrow areas. US Wind will coordinate with the United States Army Corps of Engineers (USACE) and others to address as necessary.

4.16.4 Avoidance and Minimization

US Wind has and will implement the following avoidance and minimization measures to reduce Project impacts on marine mineral resources and utilities.

- Submarine cables will be buried and regularly inspected to maintain cable burial.
- Route Offshore Export Cable Corridors to avoid marine mineral resources areas to the extent practicable.

4.17 Mitigation Measures

US Wind is committed to working with DNREC to determine mitigation measures that would be the most beneficial to the species and habitats that may be impacted by the Project. Some possible measures include the following:

- US Wind would conduct an evaluation of opportunities and locations where eelgrass establishment or hard clam seeding could be appropriate in Indian River Bay.
- US Wind would evaluate replacing trees in locations of temporary impact after construction at the onshore substation location in consultation with DNREC.
- US Wind may evaluate the wetlands around the US Wind Substations location for potential beneficial reuse for future use related to DNREC or USACE dredging projects.

5.0 CONCLUSIONS

The proposed Project has been designed to be in compliance with applicable regulations and guidelines. There would not be any permanent or lasting impact on the physical, chemical, or biological characteristics of the aquatic ecosystem. Any discharges of dredged or fill material would be conducted in a manner that will minimize potential adverse impacts to Delaware State waters and special aquatic sites. Furthermore, the construction methodologies selected by US Wind would not cause or contribute to significant degradation of Delaware State waters, or on the aquatic ecosystem. In addition, there would be no significant impacts to threatened and endangered species or to cultural and archaeological resources. The Project has been designed to avoid creating impacts where possible, and to minimize and/or mitigate impacts where avoidance is not practicable. All applicable federal, state, and local licenses, permits, and certifications will be obtained.

6.0 REFERENCES

Able, K.W., and M.P. Fahay. 2010. *Ecology of Estuarine Fishes: Temperate Waters of the Western North Atlantic*. John Hopkins University Press.

Alpine. 2015. *Marine G&G Survey Report - U.S. Wind.* Alpine Ocean Surveys (Norwood).

---. 2017. High Resolution Geophysical, Geotechnical, and Environmental Survey Report - US Wind. Norwood.

Andreasen, David C., Mark R. Nardi, Andrew W. Stanley, Grufron Achmad, and John W. Grace. 2016. *The Maryland Coastal Plain Aquifer Information System: A GIS based tool for assessing groundwater resources.* The Geological Society of America (Maryland).

Arthur, Karen E., Michelle C. Boyle, and Colin J. Limpus. 2008. Ontogenetic changes in diet and habitat use in green sea turtle (*Chelonia mydas*) life history. 362: 303-311. https://doi.org/10.3354/meps07440.

Bailey, R.G. 1995. Description of the ecoregions of the United States. United States Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

Balthis, W.L., J.L. Hyland, M.H. Fulton, E.F. Wirth, J.A. Kiddon, and J. Macauley. 2009. Ecological Condition of Coastal Ocean Waters Along the U.S. Mid-Atlantic Bight: 2006. NOAA National Ocean Service, Charleston, SC.

Barco, Susan, B Stacy, M Law, Bridgette Drummond, H Koopman, C Trapani, Shannon Reinheimer, S Rose, Mark Swingle, and A Williard. 2016. "Loggerhead turtles killed by vessel and fishery interaction in Virginia, USA are healthy prior to death." *Mar Ecol Prog Ser* 555. https://doi.org/10.3354/meps11823.

Baumgartner, M.F., F.W. Wenzel, N.S.J. Lysiak, and M.R. Patrician. 2017. "North Atlantic right whale foraging ecology and its role in human-caused mortality." *Marine Ecology Progress Series* 581: 165-181.

Bayne, B.L., J.I.P. Iglesias, A.J.S. Hawkins, E. Navarro, M. Heral, and J.M. Deslous-Paoli. 1993. "Feeding Behaviour of the Mussel, *Mytilus Edulis*: Responses to Variations in Quantity and Organic Content of the Seston." *J. mar. bio. Ass. U.K.* 73: 813-829. https://archimer.ifremer.fr/doc/1993/publication-3069.pdf.

Blair, Hannah B., Nathan D. Merchant, Ari S. Friedlaender, David N. Wiley, and Susan E. Parks. 2016. "Evidence for ship noise impacts on humpback whale foraging behavior." *Biology Letters* 12 (8). https://doi.org/http://dx.doi.org/10.1098/rsbl.2016.0005.

Bodznick, D., J. Montgomery, and T. Tricas. 2003. *Electroreception: Extracting Behaviorally Important Signals from Noise.* (Springer-Verlag: NY).

BOEM. 2013. Evaluation of lighting schemes for offshore wind facilities and impacts to local environments. edited by Bureau of Ocean Energy Management U.S. Department of the Interior, Office of Renewable Energy Programs. Herndon, VA.

US Wind
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---. 2014. "Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Area Final Programmatic Environmental Impact Statement." Bureau of Ocean Energy Management. http://www.boem.gov/BOEM-2014-001-v1/.

---. 2016. *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York.* US Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. https://www.boem.gov/NY-Public-EA-June-2016/.

---. 2021. Vineyard Wind 1 Offshore Wind Energy Project
Final Environmental Impact Statement
Volume I. Bureau of Ocean Energy Management.

Bolle, L.J., C.A.F. de Jong, S.M. Bierman, P.J.G. van Beek, O.A. van Keeken, P.W. Wessels, C.J.G. van Damme, H.V. Winter, D. de Haan, and R.P.A. Dekeling. 2012. "Common Sole Larvae Survive High Levels of Pile-Driving Sound in Controlled Exposure Experiments." *PLoS One* 7 (3). https://doi.org/10.1371/journal.pone.0033052.

Bott, M., and R. Wong. 2012. *Hard Clam (Mercenaria mercenaria) Population Density and Distribution in Rehoboth Bay and Indian river Bay, Delaware.* Delaware Department of Natural Resources and Environmental Control.

Braun-McNeill, J., and S.P. Epperly. 2004. "Spatial and temporal distribution of sea turtles in the western North Atlantic and the U.S. Gulf of Mexico from Marine Recreational Fishery Statistics Survey (MRFSS)." *Marine Fisheries Review* 64 (4): 50-56.

Broderick, A.C., M.S. Coyne, W.J. Fullere, F. Glen, and B.J. Godley. 2007. "Fidelity and over-wintering of sea turtles." *Proceedings of the Royal Soceity B:Biological Sciences* 274 (1): 533-1, 538.

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*: 804-818.

Buchanan, M.F. 2008. "NOAA Screening Quick Reference Tables." *NOAA OR&R Report 08-1*: 34.

Burke, V. J., E. A. Standora, and S. J. Morreale. 1989. *Environmental Factors and Seasonal Occurrence of Sea Turtles in Long Island, New York.* (National Marine Fisheries Service).

Butler, R. W., W. A. Nelson, and T. A. Henwood. 1987. "A Trawl Survey Method for Estimating Loggerhead Turtle, *Caretta caretta,* Abundance in Five Eastern Florida channels and Inlets." *Fish Bulletin* 85: 447-453.

California Department of Transportation (Caltrans). 2009. *Technical guidance for assessment and mitigation of the hydroacoustic effects of pile driving on fish.* http://www.dot.ca.gov/hq/env/bio/files/Guidance_Manual_2_09.pdf.

Casper, B.M., A.N. Popper, F. Matthews, T.J. Carlson, and M.B. Halvorsen. 2012. "Recovery of Barotrauma Injuries in Chinook Salmon, Oncorhynchus tshawytscha from Exposure to Pile Driving Sound." *PLoS One* 7 (6).

CB&I. 2014. *Maryland Energy Administration High Resolution Geophysical Resource Survey (Project Number DEXR240005).* Coastal Planning & Engineering, Inc. (Boca Raton, FL).

CeTAP, Cetacean and Turtle Assessment Program. 1982. *A characterization of marine mammals and turtles in the mid- and north Atlantic areas of the U.S. outer continental shelf.* Cetacean and Turtle Assessment Program (Washington, DC).

Chaillou, J. C., S. B. Weisberg, F. W. Kuts, T. E. DeMoss, L. Mangiaracia, R. Magnien, R. Eskin, J. Maxted, K. Price, and J. K. Summers. 1996. *Assessment of the Ecological Condition of the Delaware and Maryland Coastal Bays.*

Coastal Planning & Engineering, Inc., a CB&I Company CB&I. 2014. *Maryland Energy Administration High Resolution Geophysical Resource Survey (Project Number DEXR240005).* (Boca Raton, FL).

Collin, S., and D. Whitehead. 2004. "The functional roles of passive electroreception in non-electric fishes." *Animal Biology* 54 (1): 1-25. https://doi.org/10.1163/157075604323010024.

Conkwright, S. Van Ryswick, and E. R. Sylvia. 2015. Seafloor Classification of Area Adjacent to Maryland Wind Energy Area. Maryland Geological Survey; Department of Natural Resources: Baltimore, MD.

Conn, PB, and GK Silber. 2013. "Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales." *Ecosphere* 4 (4(43)). https://esajournals.onlinelibrary.wiley.com/doi/pdf/10.1890/ES13-00004.1.

Cornell University. 2016. "All About Birds." https://www.allaboutbirds.org/.

---. 2017. Red Knot. Cornell Lab of Ornithology.

Cross, V.A, J.F. Bratton, H.A. Michael, K.D. Kroeger, Adrian Green, and Emile Bergeron. 2013. Continuous resistivity profiling and seismic-reflection data collected in April 2010 from Indian River Bay, Delaware: U.S. Geological Survey Open-File Report 2011–1039.

Cryan, P.M. 2003. "Seasonal distribution of migratory tree bats (*Lasiurus* and *Lasionycteris*) in North America." *Journal of Mammology* 84 (2): 579-593.

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.

Curtice, C., J. Cleary, E. Shumchenia, and Halpin P.N. 2018. *Marine-life Data and Analysis Team (MDAT) technical report on the methods and development of marine-life data to support regional ocean planning and management.* (Prepared on behalf of the Marine-life Data and Analysis Team (MDAT)). http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report.pdf.

Cutter, G. R. Jr., R. J. Diaz, J. A. Musick, J. Sr. Olney, D. M. Bilkovic, J. P.-Y. Maa, S.-C. Kim, C. S. Jr. Hardaway, D. A. Milligan, R. Brindley, and C. H. III Hobbs. 2000. *Environmental Survey of Potential Sand resource Sites Offshore Delaware and Maryland.* Virginia Institute of Marine Science
College of William and Mary.

Czech-Damal, N., G. Dehnhardt, P. Manger, and W. Hanke. 2012. "Passive electroreception in aquatic mammals." *Journal of Comparative Physiology*. https://doi.org/10.1007/s00359-012-0780-8.

Davenport, J., and G.H. Balazs. 1991. "Fiery bodies' - Are pyrosomas an important component of the diet of leatherback turtles?" *British Herpetological Society Bulletin* 37: 33-38.

Davis, G.E., M.F. Baumgartner, J.M. Bonnell, J. Bell, C. Berchok, J. Bort Thornton, S. Brault, G. Buchanan, R.A. Charif, D. C holewiak, C.W. Clark, P. Corkeron, J. Delarue, K. Dudzinski, L. Hatch, J. Hildebrand, L. Hodge, H. Klinck, S. Kraus, B. Martin, D.K. Mellinger, H. Moors-Murphy, S. Nieukirk, D.P. Nowacek, S. Parks, A.J. Read, A.N. Rice, D. Risch, A. Sirovic, M. Soldevilla, K. Stafford, J.E. Stanistreet, E. Summers, S. Todd, A. Warde, and S.M. Van Parijs. 2017. "Long-term passive acoustic recordings track the changing distribution of North Atlantic right whales (E*ubalaena glacialis)* from 2004–2014." *Scientific*
Reports 7 (1): 1-12.

DCIB. 1995. *A Comprehensive Conservation and Management Plan for Delaware's Inland Bays.* Delaware Center for the Inland Bays. https://www.inlandbays.org/wp-content/documents/comp_conservation_plan_for_the_inland_bays.pdf.

---. 2016. State of the Delaware Inland Bays. Delaware Center for Inland Bays.

---. 2017. "Habitats in the Watershed." Delaware Center for the Inland Bays. Accessed 3 January, 2019. http://www.inlandbays.org/about-the-bays/habitats/.

---. 2018. "New Rehoboth Outfall Means Healthier Inland Bays!". Delaware Center for the Inland Bays. https://www.inlandbays.org/new-rehoboth-outfall-means-healthier-inland-bays.

---. 2021. "Diamondback Terrapins." Delaware Center for the Inland Bays. https://www.inlandbays.org/about-the-bays/diamondback-terrapin/.

DEDFW. 2015. *The Delaware Wildlife Action Plan 2015-2025.* Delaware Division of Fish and Wildlife.

Delaware River Basin Commission. 2024. "Living Resources: American Eel." Accessed February 15, 2024. https://www.nj.gov/drbc/basin/living/american-eel.html.

DEMAC, Delaware Environmental Monitoring and Analysis Center, Delaware Environmental Observing System, Delaware Department of Natural Resources, and Watershed Assessment Section. 2017. Delaware Water Quality Portal.

DIBEP, Delaware Inland Bays Estuary Program Scientific and Technical Advisory Committee. 1993. *Delaware Inland Bays Estuary Program Characterization Summary.* https://www.inlandbays.org/wp-content/uploads/2011/01/IB-CHAR-RPT-PT-2.pdf.

https://www.inlandbays.org/wp-content/uploads/2011/01/IB-CHAR-RPT-PT-3.pdf.
https://www.inlandbays.org/wp-content/uploads/2011/01/IB-CHAR-RPT-PT-4.pdf.

DNREC. 1998. Total Maximum Daily Load (TMDL) Analysis for Indian River. Indian River Bay, and Rehoboth Bay, Delaware: Delaware Department of Natural Resources and Environmental Control.

---. 2012. "Delaware Bat Species." Delaware Department of Natural Resources and Environmental Control. Accessed December 2017. http://www.dnrec.delaware.gov/fw/bats/Documents/DEbat%20Species-Apr2012.pdf.

---. 2013. "Delaware's Endangered Species." Delaware Department of Natural Resources and Environmental Control. Accessed February 2016. www.dnrec.delaware.gov/fw/NHESP/information/Pages/Endangered.aspx.

---. 2017a. *2017 Delaware Fishing Guide.* Delaware Department of Natural Resources and Environmental Control. http://www.eregulations.com/wp-content/uploads/2017/01/17DEFW_LR2.pdf.

---. 2017b. "ESS 2017 Maryland Offshore Wind Energy Project."

---. 2018a. DNREC's Division of Fish & Wildlife announces rare event involving loggerhead sea turtles hatching at Fenwick Island State Park. 48. Accessed 2018-10-24.

---. 2018b. "Screening Level Table." Delaware Department of Natural Resources and Environmental Control Division of Waste and Hazardous Substances Site Investigation and Restoration Section. Accessed 10 January, 2019. http://www.dnrec.delaware.gov/dwhs/SIRB/Documents/Screening%20Level%20Table.pdf.

---. 2020a. *State of Delaware 2020 Combined Watershed Assessment Report (305(b)) and Determination for the Clean Water Act Section 303(d) List of Waters Needing TMDLs (The Integrated Report).* https://documents.dnrec.delaware.gov/swc/wa/Documents/2020-Delaware-Final-IR-with-appendices.pdf.

---. 2021. "Response to Request for Biological Data for the Inland Bays."

---. 2023a. "Delaware Water Quality Portal." https://cema.udel.edu/applications/waterquality/.

---. 2023b. "Delaware Water Quality Portal." Accessed June 15, 2023. https://cema.udel.edu/applications/waterquality/.

DNREC, Delaware Department of Natural Resources and Environmental Control. 2020b. *Indian River Dredging Project Analysis of Chemical Contaminants in Sediments.*

---. 2023c. "Millsboro Wastewater Spill Closes Indian River Bay to Recreational Bivalve Shellfish Harvest Through Aug. 24." Accessed February 2024. https://news.delaware.gov/2023/08/02/millsboro-wastewater-spill-closes-indian-river-bay-to-recreational-bivalve-shellfish-harvest-through-aug-24/.

DNREC, Delaware Department of Natural Resources and Environmental Control Division of Water Stewardship. 2023d. "DNREC to Dredge Assawoman Canal and Complete White Creek Project to Improve Navigability on Sussex County Waterways." Accessed January 2024. https://news.delaware.gov/2023/12/11/dnrec-to-dredge-assawoman-canal-and-complete-white-creek-project-to-improve-navigability-on-sussex-county-waterways/.

DNREC, Department of Natural Resources and Environmental Control Division of Fish and Wildlife. 2023e. US Wind 2023 Maryland Offshore Wind (Environmental Review on Rare, Threatened, and Endangered Species).

Dow Piniak, W.E., D.A. D.A. Mann, S.A. Eckert, and C.A. Harms. 2012. Amphibious Hearing in Sea Turtles. In: Popper, A.N. and A. Hawkins, eds. The Effects of Noise on Aquatic Life. *Advances in Experimental Medicine and Biology* 730: 83- 87.

Dow Piniak, WE, DA Mann, SA Eckert, and CA Harms. 2012. Amphibious Hearing in Sea Turtles. In: Popper,
A.N. and A. Hawkins, eds. The Effects of Noise on Aquatic Life. *Advances in Experimental Medicine and Biology* 730: 83- 87.

Dow, W., K. Eckert, M. Palmer, and Kramer. P. 2007. An atlas of sea turtle nesting habitat for the wider Caribbean region. Beaufort, North Carolina: The Wider Caribbean Sea Turtle Conservation Network and The Nature Conservancy.

Doyle, M.J., W.W. Morse, and Jr. Kendall, A.W. 1993. "A comparison of larval fish assemblages in the temperate zone of the northeast Pacific and northwest Atlantic oceans." *Bulletin of Marine Science* (53(2)): 588-644.

Dyndo, Monika, Danuta Maria Wiśniewska, Laia Rojano-Doñate, and Peter Teglberg Madsen. 2015. "Harbour porpoises react to low levels of high frequency vessel noise." *Scientific Reports* 5: 11083. https://doi.org/DOI: 10.1038/srep11083. https://www.nature.com/articles/srep11083.pdf.

Eckert, Scott A. 2006. "High-use oceanic areas for Atlantic leatherback sea turtles (Dermochelys coriacea) as identified using satellite telemetered location and dive information." *Marine Biology* 149: 1257-1267. https://doi.org/10.1007/s00227-006-0262-z. file:///C:/Users/HFisher/Downloads/Eckert2006AtlanticLeatherbackHighUseAreasFinalwithAppendix.pdf.

Ecology and Environment Inc. 2014. Development of Mitigation Measures to Address Potential Use Conflicts between Commercial
Wind Energy Lessees/Grantees and Commercial Fishermen on the Atlantic Outer Continental Shelf Report on Best Management Practices and Mitigation Measures. In *A final report for the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewal Energy Programs, Herndon, VA*.

Elliot-Smith, E., and S.M. Haig. 2004. Piping plover (*Charadrius melodus*). In *The Birds of North America Online*. Ithaca, NY: Cornell Lab of Ornithology.

Elliott, J., K. Smith, D.R. Gallien, and A. Khan. 2017. *Observing Cable Laying and Particle Settlement*

During the Construction of the Block Island Wind Farm. Final Report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs.

Epperly, S.P., J. Braun, and A.J. Chester. 1995. "Aerial surveys for sea turtles in North Carolina inshore waters." *Fishery Bulletin* (93): 254-261.

Epperly, S.P., J. Braun, A.J. Chester, F.A. Cross, J.V. Merriner, and P.A. Tester. 1995. "Winter distribution of sea turtles in the vicinty of Cape Hatteras and their interactions with the summer flounder trawl fishery." *Bulletin of Marine Science* (56(2)): 547-568.

Eversource Energy. 2018. Horizontal Directional Drilling and Jet Plow: A Comparison of Cable Burial Installation Options for a 115-kV Electric Transmission Line in Little Bay.

Ewart, J. W. 2013. Shellfish Aquaculture in Delaware's Inland Bays: Status, Opportunities, and Constraints. Lewes, DE: Delaware Sea Grant Program, College of earth, Ocean and Environment (CEOE), University of Delaware.

Exponent. 2023. *US Wind Offshore Wind Project: Offshore Electric- and Magnetic-Field Assessment.*

Farmer, Nicholas A., L.P. Garrison, C. Horn, M. Miller, T. Gowan, R.D. Kenney, M. Vukovich, J. Robinson Willmot, J. Pate, H. Webb, T.J. Mullican, J.D. Stewart, K. Bassos-Hull, C. Jones, D. Adams, S. Kajiura, and J. Waldron. 2021. The Distribution of Giant Manta Rays In The Western North Atlantic Ocean Off The Eastern United States. Research Square.

Firestone, J., S.B. Lyons, C. Wang, and J.J. Corbett. 2008. "Statistical modeling of North Atlantic right whale migration along the mid-Atlantic region of the eastern seaboard of the United States." *Biological Consevation* 141 (1): 221-232.

"FishBase." 2018. https://www.fishbase.org.

Fogarty, M., and C. Perretti. 2016. "Distribution and biomass data for fish species along the U.S. east coast from about Cape Hatteras north to Canadian waters, created by the Northeast Fisheries Science Center for the Northeast Regional Ocean Council." http://www.northeastoceandata.org/data-explorer/?fish.

Geo-Marine, Inc. 2010. *Ocean Wind Power Ecological Baseline Studies Final Report - Volume 3: Marine Mammal and Sea Turtle Studies.* Geo-Marine, Inc. and New Jersey Department of Environmental Protection Office of Science.

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. COWRIE 1.5 Electromagnetic Fields.* https://tethys.pnnl.gov/sites/default/files/publications/The_Potential_Effects_of_Electromagnetic_Fields_Generated_by_Sub_Sea_Power_Cables.pdf.

Gill, Andrew, and Marieke Desender. 2020. *Risk to Animals from Electromagnetic Fields emitted by Electric Cables and Marine Renewable Energy Devices.*

Gitschlag, G.R. 1996. "Migration and diving behavior of Kemp's ridley sea turtles along the U.S. southeastern Atlantic coast." *Journal of Experimental Marine Biology and Ecology* 205: 115-135.

Godley, B.J., C. Barbosa, M. Bruford, A.C. Broderick, P. Catry, M.S. Coyne, A. Formia, G.C. Hays, and J.C. Witt. 2010. "Unraveling migratory connectivity in marine turtles using multiple methods." *Journal of Applied Ecology* 47: 769-778. http://www.seaturtle.org/PDF/GodleyBJ_2010_JApplEcol.pdf.

Godley, B.J., J.M. Blumenthal, A.C. Broderick, M.S. Coyne, M.H. Godfrey, L.A. Hawkes, and M.J. Witt. 2008. "Satellite tracking of sea turtles: Where have we been and where do we go next?" *Endangered Species Research* 4: 3-22. http://www.int-res.com/articles/esr2007/3/n003pp16.pdf.

Godley, B.J., A.C. Broderick, F. Glen, and G.C. Hays. 2003. "Post-nesting movements and submergence patterns of loggerhead marine turtles in the Mediterranean assessed by satellite tracking." *Journal of Experimental Marine Biology and Ecology* 287: 119-134. http://www.seaturtle.org/mtrg/pubs/godley_JEMBE_03.pdf.

Gowan, T.A., J.G. Ortega-Ortiz, J.A. Hostetler, P.K. Hamilton, A.R. Knowlton, K.A. Jackson, R.C. George, C.R. Taylor, and P.J. Naessig. 2019. "Temporal and demographic variation in partial migration of the North Atlantic right whale." *Scientific reports* 9 (1): 1-11.

Groves, Craig R., Deborah B. Jensen, Laura L. Valutis, Kent H. Redford, Mark L. Shaffer, J. Michael Scott, Jeffrey V. Baumgartner, Jonathan V. Higgins, Michael W. Beck, and Mark G. Anderson. 2002. "Planning for Biodiversity Conservation: Putting Conservation Science into PracticeA seven-step framework for developing regional plans to conserve biological diversity, based upon principles of conservation biology and ecology, is being used extensively by the nature conservancy to identify priority areas for conservation." *BioScience* 52 (6): 499-512. https://doi.org/10.1641/0006-3568(2002)052[0499:PFBCPC]2.0.CO;2. https://academic.oup.com/bioscience/article-pdf/52/6/499/26892669/52-6-499.pdf.

Guida, Amy Drohan, Heather Welch, Jennifer McHenry, Donna Johnson, Victoria Kentner, Jonathan Brink, DeMond Timmons, Jeffrey Pessutti, Steven Fromm, and Eric Estela-Gomez. 2017. Habitat Mapping and Assessment of Northeast Wind Energy Areas. In *OCS Study BOEM 2017-088*. Sterling, VA: US Department of the Interior, Bureau of Ocean Energy Management.

Hain, J.H.W. 1975. "The international regulation of whaling." *Marine Affairs Journal* 3: 28–48.

Hare, James H. Churchill, Robert K. Cowen, Thomas J. Berger, Peter C. Cornillon, Paul Dragos, Scott M. Glenn, John J. Govoni, and Thomas N. Lee. 2002. "Routes and rates of larval fish transport from the southeast to the northeast United States continental shelf." *Limnology and Oceanography* 6. https://doi.org/10.4319/lo.2002.47.6.1774.

Hare, M.P. Fahay, and R.K. Cowen. 2001. "Springtime ichthyoplankton of the slope region off the northeastern United States of America:larval assemblages, relation to hydrography and implications for larval transport." *Fisheries Oceanography* 10 (12): 164-192.

Hatch, Leila T, Christopher W Clark, Sofie M Van Parijs, Adam S Frankel, and Dimitri W Ponirakis. 2012. "Quantifying loss of acoustic communication space for right whales in and around a US National Marine Sanctuary." *Conservation Biology* 26 (6): 983-994.

Hauser, Christian A., and Christopher W. Bason. 2022. *The Economic Value of the Delaware Inland Bays.* Delaware Sea Grant College Program and Delaware Center for the Inland Bays. https://www.inlandbays.org/wp-content/uploads/Economic-Valuation-of-the-Inland-Bays-FINAL-HIGH-REZ-080222.pdf.

Hayes, E. Josephson, K. Maze-Foley, and P.E. Rosel. 2019. "US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2018." *NOAA Tech Memo NMFS-NE* 258: 291.

Hayes, Elizabeth Josephson, Katherine Maze-Foley, Patricia E. Rosel, and Jennifer Wallace. 2022a. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments 2021. Northeast Fisheries Science Center (U.S.).

Hayes, Sean A., E. Josephson, K. Maze-Foley, PE Rosel, B. Byrd, S. Chavez-Rosales, TVN Col, LP Garrison, J. Hatch, A. Henry, SC Horstman, J. Litz, MC Lyssikatos, KD Mullin, C. Orphanides, RM Pace, DL Palka, J. Powell, and FW. Wenzel. 2020. "US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2019." NOAA Tech Memo NMFS NE-264.

Hayes, Sean A., Elizabeth Josephson, Katherine Maze-Foley, Patricia E. Rosel, Jennifer Turek, Barbie Byrd, Samuel Chavez-Rosales, Timothy VN Cole, Lance P. Garrison, Hatch Joshua, Allison Henry, Stacey C. Horstman, Jenny Litz, Marjorie C. Lyssikatos, Keith D. Mullin, Christopher Orphanides, Joel Ortega-Ortiz, Richard M. Pace, Debra L. Palka, Jessica Powell, Gina Rappucci, and Frederick W. Wenzel. 2021. *US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2020.* NOAA NMFS, Northeast Fisheries Science Center (Woods Hole, Massachusetts). https://media.fisheries.noaa.gov/2021-07/Atlantic%202020%20SARs%20Final.pdf?null%09.

Hayes, Sean H., Elizabeth Josephson, Katherine Maze-Foley, Patricia E. Rosel, and Jennifer Wallace. 2022b. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments 2021. Northeast Fisheries Science Center (U.S.).

Hazel, Julia, Ivan R. Lawler, Helene Marsh, and Simon Robson. 2007. "Vessel speed increases collision risk for the green turtle *Chelonia mydas*." *Endangered Species Research* 3: 105-113. https://www.int-res.com/articles/esr2007/3/n003p105.pdf.

HDR. 2018. *Field Observations during Wind Turbine Foundation Installation at the Block Island Wind Farm, Rhode Island.* (U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Program).

Heckscher, C. M., and C. R. Bartlett. 2004. "Rediscovery and habitat associations of P*hoturis bethaniensis* McDermott (Coleoptera: Lampyridae)." *The*

Coleopterists Bulletin 58 (3). https://doi.org/https://doi.org/10.1649/622.

Hildebrand, J.A. 2009. "Anthropogenic and natural sources of ambient noise in the ocean." *Marine Ecology Progress Series* 395: 5-20. https://www.int-res.com/articles/theme/m395p005.pdf.

Hobbs, Carl H., David E. Krantz, and Geoffrey Wikel. 2008. *Coastal Processes of Offshore Geology.* Virginia Institute of Marine Science (Gloucester Point).

Hodge, K.B., C.A. Muirhead, J.L. Morano, C.W. Clark, and A.N. Rice. 2015. "North Atlantic right whale occurrence near wind energy areas along the mid-Atlantic US coast: implications for management." *Endangered Species Research* 28: 225-234. https://doi.org/10.3354/esr00683.

Houghton, Jonathan D.R., Annette C. Broderick, Brendan J. Godley, Julian D. Metcalfe, and Graeme C. Hays. 2002. "Diving behavior during the internesting interval for loggerhead turtles *Caretta caretta* nesting in Cyprus." *Mar Ecol Prog Ser* 227: 63-70. https://www.int-res.com/articles/meps2002/227/m227p063.pdf.

Hughes, J. E. 1996. "Size-dependent, small-scale dispersion of the capitellid polychaete, Mediomastus ambiseta." *Journal of marine research* 54 (5): 915-937.

Hutchison, Zoe, Peter Sigray, Haibo He, Andrew Gill, John King, and Carol Gibson. 2018. Electromagnetic Field (EMF) Impacts on Elasmobranch (shark, rays, and skates) and American Lobster Movement and Migration from Direct Current Cables. U.S. Department of the Interior, Bureau of Ocean Energy Management.

Hötker, H., K. Thomsen, and H. Jeromin. 2006. Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats. Michael-Otto-Institution NABU, Bergenhusen.

IUCN. 2011. "IUCN Red List of Threatened Species." Accessed 11 November 2021. http://www.iucnredlist.org/.

James, M.C., S.A. Sherrill-Mix, K. Martin, and R.A. Myers. 2006. "Canadian waters provide critical foraging habitat for leatherback sea turtles." *Biological Conservation* 133: 347-357.

Johnson, J.B., J.E. Gates, and N.P. Zegre. 2011. "Monitoring seasonal bat activity on a coastal barrier island in Maryland, USA." *Environmental Monitoring Assessment* 17: 685-699.

Kenney, R.D., and K.J. Vigness-Raposa. May 31, 2009 2009. *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.*

Kenney, R.D., H.E. Winn, and M.C. Macaulay. 1995. "Cetaceans in the Great South Channel, 1979-1989: right whale (*Eubalaena glacialis*)." *Continental Shelf Research* 15: 385-414.

Kirschvink, J.L., A.E. Dizon, and J. Westphal. 1986. "Evidence from Strandings for Geomagnetic Sensitivity in Cetaceans." *Journal of Experimental Biology* 120: 1-24. https://pdfs.semanticscholar.org/a830/2949034e0e8521957febb2290072dd7e821b.pdf.

Knowlton, A., J. Ring, and B. Russel. 2002. *Right Whale Sightings and Survey Effort in the Mid-Atlantic Region: Migratory Corridor, Time Frame, and Proximity to Port Entrances. A report submitted to the NMFS Ship Strike Working Group.* www.nero.noaa.gov/shipstrike/ssr/midatanticreportrFINAL.pdf.

LaBrecque, E., C. Curtice, J. Harrison, S.M. Van Parijs, and P.N. Halpin. 2015. "Biologically Important Areas for Cetaceans within US Waters: East Coast Region." *Aquatic Mammals* 41 (1): 17-29.

Laist, David W, Amy R Knowlton, James G Mead, Anne S Collet, and Michela Podesta. 2001. "Collisions between ships and whales." *Marine Mammal Science* 17 (1): 35-75. http://cpps.dyndns.info/cpps-docs-web/planaccion/docs2013/ago/transfront/Laist-et-al-2001.pdf.

Levin, LA. 1986. "Effects
of enrichment on reproduction in the opportunistic polychaete Streblospio
benedicti (Webster): a mesocosm study." *Biological
Bulletin* 171: 143-160.

Lindholm, J, P Auster, and P C Valentine. 2004. "Role of a large marine protected area for conserving landscape attributes of sand habitats on Georges bank (NW Atlantic)." *Marine Ecology Progress Series* 260: 61-68.

Lohmann, K. J., C. M. Lohmann, N. Putman, and F. 2007. "Magnetic maps in animals: nature's GPS." *Journal of Experimental Biology* 210 (21): 3697-3705.

Lohmann, Kenneth J., and Catherine M.F. Lohmann. 1994. Detection of Magnetic Inclination Angle by Sea Turtles: A Possible Mechanism For Determining Latitude. 194: 23-32.

---. 1996. Detection of Magnetic Field Intensity by Sea Turtles. 380. https://doi.org/10.1038/380059a0.

Lohmann, Kenneth J., Nathan F. Putman, and Catherine M.F. Lohmann. 2008. "Geomagnetic imprinting: A unifying hypothesis of long-distance natal homing in salmon and sea turtles." *PNAS* 105 (49).

Lombarte, A., H.Y. Yan, A.N. Popper, J.S. Chang, and C. Platt. 1993. "Damage and regeneration of hair cell ciliary bundles in a fish ear following treatment with gentamicin." *Hearing Research* (64): 166-174.

Louis Berger Group Inc. 1999. Environmental Report: Use of Federal Offshore Sand Resources for Beach and Coastal Restoration in New Jersey, Maryland, Delaware, and Virginia. Prepared for the U.S. Department of the Interior
– Minerals Management Service – Office of International Activities and Marine
Minerals (INTERMAR) under Contract No. 1435-01-98-RC-30820.

Love, M. S., M. M. Nishimoto, S. Clark, and A. S. Bull. 2016. Renewable Energy in situ Power Cable Observation. U.S. Department of the Interior, Bureau of Ocean Energy Management, Pacific OCS Region, Camarillo, CA.

Luschi, P., J.R.E. Lutjeharms, P. Lambardi, R. Mencacci, G.R. Hughes, and G.C. Hays. 2006. "A review of migratory behaviour of sea turtles off southeastern Africa." *South African Journal of Science* 102: 51-58.

MacDonald, Bruce A., and J. Evan Ward. 1994. "Variation in food quality and particle selectivity in the sea scallop *Placopecten magellanicus* (Mollusca: Bivalvia)." *Mar. Ecol. Prog. Ser.* 108: 251-264. https://www.int-res.com/articles/meps/108/m108p251.pdf.

MAFMC, Mid-Atlantic Fishery Management Council. 1998. Amendment 12 to the Summer Flounder, Scup, and Black
Sea Bass Fishery Management Plan. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Region.

Makowski, C., J.A. Seminog, and M. Salmon. 2006. "Home range and habitat use of juvenile Atlantic green turtles (*Chelonia mydas, L.*) on shallow reef habitats in Palm Beach, Florida, USA." *Marine Biology* 148: 1167-1179.

Mansfield, K.L., V.S. Saba, J.A. Keinath, and J.A. Musick. 2009. "Satellite tracking reveals a dichotomy in migration strategies among juvenile loggerhead turtles in the Northwest Atlantic." *Marine Biology* 156 (12): 2555-2570.

Marshall, A., M.B. Bennett, G. Kodja, S. Hinojosa-Alvarez, F. Galvan-Magana, M. Harding, G. Stevens, and T. Kashiwagi. 2011. Manta birostris.

MDNR. 2016. List of Rare, Threatened, and Endangered Animals of Maryland. Annapolis, MD: Maryland Department of Natural Resources.

Miller, M. H., and C. Klimovich. 2016. Endangered Species Act Status Review Report: Giant Manta Ray (Manta birostris) and Reef Manta Ray (Manta alfredi).

Mitsch, W.J., and J.G. Gosselink. 2007. Wetlands. Hoboken: John Wiley & Sons, Inc.

Mizroch, S.A., D.W. Rice, and J.M. Breiwick. 1984. "The fin whale, Balaenoptera physalus." *Marine Fisheries Review* 46 (4): 20-24.

Monserrat, S., M.G. Pennino, T.D. Smith, R.R. Reeves, C.N. Meynard, D.M. Kaplan, and A.S.L. Rodrigues. 2015. "A spatially explicit estimate of the prewhaling abundance of the endangered North Atlantic right whale." *Conservation Biology* 30: 783-791.

Morreale, S. J., and E. A. Standora. 1989. *Occurrance, Movement, and Behavior of the Kemp's Ridley and Other Sea turtles in New York Waters.* (April 1988 to April 1989 Okeanos Ocean Research Foundation Annual Report).

Musick, J. A., D. E. Barnard, and J. A. Keinath. 1994. *Aerial Estimates of Seasonal Distribution and Abundance of Sea Turtles Near the Cape Hatteras Faunal Barrier.* (National Oceanographic and Atmospheric Administration U.S. Department of Commerce).

NAS, National Audubon Society. 1996. "Guide to North American Birds" National Audubon Society. https://www.audubon.org/bird-guide.

National Marine Fisheries Service Northeast Fisheries Science Center, NMFS NEFSC. 2011. *Preliminary Summer 2010 Regional Abundance estimate of Loggerhead Turtles (Caretta caretta) in Northwestern Atlantic Ocean Continental Shelf Waters.* (Northeast Fisheries Science Center U.S. Department of Commerce).

Native Plant Trust. 2021. "Morella caroliniensis (small bayberry)." https://gobotany.nativeplanttrust.org/species/morella/caroliniensis/.

NatureServ. 2015. *Sterna dougallii, Roseate Tern*. In *NatureServ Explorer: An Online Encyclopedia of Life*. Arlington, VA.

NEFSC, and SEFSC. 2021. Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US waters of the Western North Atlantic Ocean – AMAPPS III.

Nelson, D. M., and M.E. Monaco. 2000. *National Overview and Evolution of NOAA's Estuarine Living Marine Resources (ELMR) Program.* NOAA, NOS, Center for Coastal Monitoring and Assessment (Silver Spring, MD).

Newcombe, C.P., and J.O.T. Jensen. 1996. "Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact." *North American Journal of Fisheries Management* 16 (4): 693-727.

Niles, L.J., J. Burger, R.R. Porter, A.D. Dey, C.D.T. Minton, P.M. Gonzalez, A.J. Baker, J.W. Fox, and C. Gordon. 2010. "First results using light level geolocators to track Red Knots in the Western Hemisphere show rapid and long intercontinental flights and new details of migration pathways." *Wader Study Group Bulletin* 117 (2): 123-130.

Nisbet, I.C., M. Gochfeld, and J. Burger. 2014. Roseate Tern (*Sterna dougallii*). In *The Birds of North America Online*. Ithaca, NY: Cornell Lab of Ornithology.

NOAA Fisheries. 2006. *Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan.* (Silver Spring, MD: National Marine Fisheries Service National Oceanic and Atmospheric Administration, Office of Sustainable Fisheries, Highly Migratory Species Management Division).

---. 2017a. "Atlantic Sturgeon (*Acipenser Oxyrinchus Oxyrinchus*)." National Oceanic and Atmospheric Administration. Accessed January 2018. http://www.nmfs.noaa.gov/pr/species/fish/atlantic-sturgeon.html.

---. 2017b. "Green Turtle (*Chelonia mydas*) Species Profile." National Oceanic and Atmospheric Administration Fisheries. Accessed December 10. http://www.nmfs.noaa.gov/pr/species/turtles/green.html.

---. 2017c. "Kemp's Ridley Turtle (*Lepidochelys kempii*) Species Profile." National Oceanographic and Atmospheric Administration Fisheries. Accessed December 20. http://www.nmfs.noaa.gov/pr/species/turtles/kempsridley.html.

---. 2017d. "Loggerhead Turtle (*Caretta caretta*) Species Description." Accessed December 10. http://www.nmfs.noaa.gov/pr/species/turtles/loggerhead.html.

---. 2017e. "Understanding Vessel Strikes." National Oceanic and Atmospheric Administration. https://www.fisheries.noaa.gov/insight/understanding-vessel-strikes.

---. 2018. "North Atlantic Right Whale Conservation: Get the Facts from Our Ship Strike Experts." National Oceanic and Atmospheric Administration. https://www.fisheries.noaa.gov/feature-story/north-atlantic-right-whale-conservation-get-facts-our-ship-strike-experts.

---. 2021a. "Marine Recreational Information Program Query Index." Accessed 11 November 2021. https://www.st.nmfs.noaa.gov/SASStoredProcess/do?

---. 2021b. Updated Recommendations for Mapping Fish Habitat. edited by Greater Atlantic Regional Fisheries Office. Gloucester, MA.

---. 2022. "Reducing Vessel Strikes to North Atlantic Right Whales." National Oceanic and Atmospheric Administration. Accessed October 2022. https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-vessel-strikes-north-atlantic-right-whales.

---. 2023. "2017-2023 North Atlantic Right Whale Unusual Mortality Event." https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2023-north-atlantic-right-whale-unusual-mortality-event.

---. n.d. Mid-Atlantic Fishing Community Profiles.

Normandeau Associates, Inc. 2012. *Effects of Noise on Fish, Fisheries, and Invertebrates in the U.S. Atlantic and Arctic from Energy Industry Sound-Generating Activities.* U.S. Department of the Interior, Bureau of Ocean Energy Management.

Normandeau Associates Inc. 2011. *Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species.* U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region (Camarillo, CA).

Nowacek, Douglas P, Mark P Johnson, and Peter L Tyack. 2003. "North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alerting stimuli." *Proceedings of the Royal Society of London B: Biological Sciences* 271 (1536): 227-231. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1691586/pdf/15058431.pdf.

NPS. 2017. "First Confirmed Sea Turtle Nest Hatch on Assateague Island National Seashore - Assateague Island National Seashore." National Park Service. https://www.nps.gov/asis/learn/news/first-confirmed-sea-turtle-nest-hatch.htm.

Ocean, Bureau of, and Energy Management BOEM. 2015. *Guidelines for Providing Information on Fisheries Social and Economic Conditions for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585.* https://www.boem.gov/Social-and-Economic-Conditions-Fishery-Communication-Guidelines/.

Oertel, G.F., and J.C. Kraft. 1994. "New Jersey and Delmarva Barrier Islands " In *Geology of Holocene Barrier Island Systems*, 207-232. Dusseldorf, Germany

Ogren, L., and C. McVea Jr. 1981. "Apparent Hibernation by Sea Turtles in North Atlantic Waters." In *Biology and Conservation of Sea Turtles*, edited by K. A. Bjorndal. Washington, D.C.: Smithsonian Institution Press.

Oliver, M.J., M.W. Breece, D.A. Fox, D.E. Haulese, J.T. Kohut, J. Manderson, and T. Savoy. 2013. "Shrinking the haystack: Using an AUV in an integrated ocean observatory to map Atlantic sturgeon in the coastal ocean." *Fisheries* 38 (5): 210-216. https://doi.org/10.1080/03632415.2013.782861.

Orr, T., S. Herz, and D. Oakley. 2013. Evaluation of lighting schemes for offshore wind facilities and impacts to local environments. edited by Bureau of Ocean Energy Management U.S. Department of the Interior, Office of Renewable Energy Programs. Herndon, VA.

O'Connell, A. F., B. Gardner, A. T. Gilbert, and K. Laurent. 2009. *Compendium of Avian Occurrence Information for the Continental Shelf Waters along the Atlantic Coast of the United States, Final Report (Database Section - Seabirds).* U.S. Department of the Interior, Geological Survey, and Bureau of Ocean Energy Management Headquarters (Beltsville Prepared by the USGS Patuxent Wildlife Research Center, MD).

Parsons, E.C.M. 2012. "The Negative Impacts of Whale-Watching." *Journal of Marine Biology* 2012.

Payne, P.M., L.A. Selzer, and A.R. Knowlton. 1984. Distribution and density if cetaceans, marine turtles, and seabirds in the shelf waters of the northeastern United States, June 1980-December 1983, based on shipboard observations.

Peikes, K. 2018. Rehoboth Ocean Outfall: Past, Present and Future. Delaware Public Media: Dover, DE.

Pettis, H.M., R.M. III Pace, and P.K. Hamilton. 2022. North Atlantic Right Whale Consortium 2021 Annual Report Card.

Putland, Rosalyn L., Nathan D. Merchant, Adrian Farcas, and Craig A. Radford. 2017. "Vessel noise cuts down on communication space for vocalizing fish and marine mammals." *Global Change Biology*: 1-14. https://doi.org/10.1111/gcb.13996.

Reeves, R.R., J.M. Breiwick, and E. Mitchell. 1992. Pre-exploitation abundance of right whales off the eastern United States. The right whale in the western North Atlantic: A science and management workshop, 14–15 April 1992, Silver Spring, Maryland: Northeast Fisheries Science Center.

Reeves, R.R., T. Smith, and E. Josephson. 2007. *Near-annihilation of a species: Right whaling in the North Atlantic.The urban whale: North Atlantic right whales at the crossroads*, edited by S.D. Kraus and R. M. Rolland. Cambridge, MA: Harvard University Press.

Reid, J. M., J. A. Reid, C. J. Jenkins, M. E. Hastings, S. J. Williams, and L. J. Poppe. 2005. Atlantic Coast Offshore Surficial Sediment Data Release. edited by U.S. Geological Survey.

Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, T.W. Mehlman, B.E. Young, and J.R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere. Digital Distribution Maps of the Birds of the Western Hemisphere. NatureServe, Arlington, VA.

Robinson, William E., William E. Wehling, and Patricia M. Morse. 1984. "The effect of suspended clay on feeding and digestive efficiency of the surf clam, Spisula solidissima (Dillwyn)." *Journal of Experimental Marine Biology and Ecology* 74 (1): 1-12. https://doi.org/10.1016/0022-0981(84)90034-0.

Rolland, Rosaline M., Susan E. Parks, Kathleen E. Hunt, Manuel Castellote, Peter J. Corkeron, Douglas P. Nowacek, Samuel K. Wasser, and Scott D. Kraus. 2012. "Evidence that ship noise increases stress in right whales." *Proceedings of the Royal Society B: Biological Sciences* 279: 2362-2368. https://doi.org/10.1098/rspb.2011.2429.

Scott, L.C., and D. Wong. 2012. An evaluation of the benthic community within a potential sand source (Area B) for the Delaware Atlantic Coast Storm Damage Reduction Project.: Prepared by Versar, Inc. for the U.S. Army Corps of Engineers under Contract No W912BU-06-D-003 Delivery Order No. 74.

Secor, D., M. O'Brien, E. Rothermel, C. Wiernicki, and H. Bailey. 2020. *Movement and habitat selection by migratory fishes within the Maryland Wind Energy Area and adjacent reference sites* (Sterling, VA: Bureau of Ocean Energy Management U.S. Department of the Interior, Office of Renewable Energy Programs).

Seminoff, J.A., A. Resendiz, and W.J. Nichols. 2002. "Home range size of green turtles *Chelonia mydas* at a coastal foraging area in the Gulf of California, Mexico." *Marine Ecology Progress Series* 242: 253-265.

Seney, Erin E., and John A. Musick. 2007. Historical Diet Analysis of Loggerhead Sea Turtles (Caretta Caretta) in Virginia. 2007 (2): 478-489. https://doi.org/10.1643/0045-8511(2007)7[478:HDAOLS]2.0.CO;2.

Sharples, Malcolm. 2011. "Offshore Electrical Burial for Wind Farms: State of the Art, Standards and Guidance & Acceptable Burial Depths, Separation Distances and Sand Wave Effect." https://www.bsee.gov/sites/bsee.gov/files/tap-technical-assessment-program//final-report-offshore-electrical-cable-burial-for-wind-farms.pdf.

Shoop, C.R., and R.D. Kenney. 1992. "Distributions and abundances of loggerhead and leatherback sea turtles in northeastern United States waters." *Herpetological Monographs* 6: 43-67.

Sibley, D. A. 2014. *The Sibley Guide to Birds, 2nd Edition*. Knopf Doubleday Publishing Group.

Sisneros, J., Tricas, T., and C. Luer. 1998. "Response properties and biological function of the skate electrosensory system during ontogeny." *Journal of Comparative Physiology* 183: 87-99.

Smolowitz, Ronald J., Samir H. Patel, Heather L. Haas, and Shea A. Miller. 2015. Using a remotely operated vehicle (ROV) to observe loggerhead sea turtle (*Caretta caretta*) behavior on foraging grounds off the mid-Atlantic United States. Journal of Experimental Marine Biology and Ecology.

Southall, B.L., A.E. Bowles, W.T. Ellison, J.L. Finneran, R.L. Gentry, C.R. Greene Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack. 2007. "Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations." *Aquatic Mammals* 33 (4): 411-509. http://sea-inc.net/assets/pdf/mmnoise_aquaticmammals.pdf.

Southwood, A. L., R. D. Andrews, M. Lutcavage, E., F. V. Paladino, N. H. West, R. H. George, and D. R. Jones. 1999. "Heart rates and diving behavior of leatherback sea turtles in the eastern Pacific Ocean." *Journal of Experimental Biology* 202 (9): 1115-1125.

Stewart, R. E., and C.S. Robbins. 1958. "Birds of Maryland and the District of Columbia." *North American Fauna* 62: 1-401.

Tchounwou, P. B., C. G. Yedjou, Patlolla, A. K., and D. J. Sutton. 2014. Heavy Metals Toxicity and the Environment. E*xperientia Supplementum*.

TEWG, Turtle Expert Working Group. 2000. Assessment Update for the Kemp's Ridley and Loggerhead Sea Turtle Populations in the Western North Atlantic.

The Nature Conservancy. 2021. "Delaware Horseshoe Crab Count." Accessed 16 November 2021. https://www.nature.org/en-us/about-us/where-we-work/united-states/delaware/stories-in-delaware/delaware-horseshoe-crab-count/.

Thompson, N. B. 1988. "The Status of Loggerhead, *Caretta caretta*; Kemp's Ridley, *Lepidochelys kempii*; and Green, *Chelonia mydas*, Sea Turtles in U. S. Waters." *Marine Fisheries Review* 50 (3): 16-23.

Thompson, N.B., J.R. Schmid, S.P. Epperly, M.L. Snover, J. Braun-McNeill, W.N. Witzell, W.G. Teas, L.A. Csuzdi, and R.A. Myers. 2001. "Stock assessment of leatherback sea turtles of the western North Atlantic." In *Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the western North Atlantic*, edited by National Marine Fisheries Service - Southeast Fisheries Science Center NMFS-SEFSC, 67-104.

Thomsen, F., A. Gill, M. Kosecka, M. Andersson, M. Andre, St. Degraer, T. Folegot, J. Gabriel, A. Judd, T. Neumann, A. Norro, D. Risch, P. Sigray, D. Wood, and B. Wilson. 2015. *MaRVEN – Environmental Impacts of Noise, Vibrations and Electromagnetic Emissions from Marine Renewable Energy Final study report.* (Prepared and Directorate General for Research and Innovation. for European Commission).

Thrush, SF, JE Hewitt, VJ Cummings, JI Ellis, C Hatton, A Lohrer, and A Norkko. 2004. "Muddy waters: elevating sediment input to coastal and estuarine habitats." *Front Ecol Environ* 2 (6): 299-306. http://www.helsinki.fi/tvarminne/benthicecology/resources/Publications/2004_Thrush_Front_Sed.pdf.

Thrush, Simon F., and Paul K. Dayton. 2002. "Disturbance to Marine Benthic Habitats by Trawling and Dredging: Implications for Marine Biodiversity." *Annual Review of Ecology and Systematics* 33: 449-473.

https://doi.org/10.1146/annurev.ecolsys.33.010802.150515. http://www.jstor.org/stable/3069270?origin=JSTOR-pdf.

University of Minnesota Department of Entomology. N.d. "Small Wonders – Bethany Beach Firefly." Accessed May 2023. https://entomology.umn.edu/bethany-beach-firefly#:~:text=The%20Bethany%20Beach%20firefly%20(Photuris,dark%20brown%20or%20black%20markings.

US Wind, Inc. 2023a. Application for Letter of Authorization under the Marine Mammal Protection Act for the Maryland Offshore Wind Farm. https://www.fisheries.noaa.gov/action/incidental-take-authorization-us-wind-inc-construction-and-operation-maryland-offshore-wind.

---. 2023b. Construction and Operations Plan: Maryland Offshore Wind Project: Volume I, Project Information and Volume II, Site Characterization & Impact Assessment. Prepared by TRC Environmental Corporation. Prepared for US Wind, Inc. July 2023.

USACE. 2015. *Public Notice: Inland Bays Aquaculture (CENAP-OP-R-Delaware).* US Army Corps of Engineers Philadelphia District.

USACE, United States Army Corps of Engineers. 2022. "Indian River Inlet and Bay." Accessed November 2022. https://www.nap.usace.army.mil/Missions/Factsheets/Fact-Sheet-Article-View/Article/490811/indian-river-inlet-bay/.

USCG. 2019. Navigation and Vessel Inspection Circular No. 01-19. Washington DC, United States Department of Homeland Security.

USDOC. 2007. Green sea turtle (*Chelonia mydas*) 5-year review: Summary and evaluation. Silver Spring, MD.

USDOE, and MMS. 2009. Final Environmental Impact Statement for the Proposed Cape Wind Energy Project, Nantucket
Sound, Massachusetts (Adopted), DOE/EIS-0470.

USDOI, U.S. Department of the Interior, and Bureau of Ocean Energy Management BOEM. 2012. Commercial wind lease issuance and site characterization activities on the Atlantic outer continental shelf offshore New Jersey, Delaware, Maryland and Virginia: Final environmental assessment. edited by Office of Renewable Energy Programs.

---. 2013. Biological opinion for programmatic environmental impact statement for Atlantic OCS proposed geological and geophysical activities in the Mid-Atlantic and South Atlantic planning areas.

---. 2014. Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas - Final Programmatic Environmental Impact Statement. edited by Office of Renewable Energy Programs.

USDOI, U.S. Department of the Interior, and Minerals Management Service MMS. 2007. Programmatic environmental impact statement for alternative energy development and production and alternate use of facilities on the outer continental shelf final environmental impact statement.

USDOI, U.S. Department of the Interior, and U.S. Fish and Wildlife Service USFWS. 1993. "Endangered and Threatened Wildlife and Plants;
Amaranthus pumilus (Seabeach amaranth) Determined to be Threatened." *Federal Register* 58 (65).

---. 1996. Piping plover (*Charadrius melodus*) Atlantic Coast population. Revised recovery plan. Hadley, MA.

---. 1998. Roseate tern (*Sterna dougallii*) northeastern population recovery plan, first update. Hadley, MA.

---. 2001. Endangered and threatened wildlife and plants; Final determination of critical habitat for wintering piping plovers. 66 FR 132. edited by United States Department of the Interior and United States Fish and Wildlife Service.

---. 2003. Delaware Bay shorebird- horseshoe crab
assessment report and peer review. Arlington, VA.

---. 2008. Endangered and threatened wildlife and plants; revised designation of critical habitat for the wintering population of the piping plover (*Charadrius melodus*) in North Carolina. 73 FR 204. edited by United States Department of the Interior and United States Department of Fish and Wildlife Service.

---. 2009a. Endangered and threatened wildlife and plants; revised designation of crital habitat for the wintering population of the piping plover (*Charadrius melodus*) in Texas. 74 FR 95. edited by United States Department of the Interior and United States Department of Fish and Wildlife Service.

---. 2009b. Piping plover (*Charadrius melodus*) 5-year review: Summary and evaluation. edited by MA) Northeast Region (Hadley, Midwest Region (East Lansing, MI).

---. 2010. Caribbean roseate tern and north Atlantic roseate tern (*Sterna dougallii dougallii*) 5-year review: Summary and Evaluation. edited by Caribbean Ecological Services Field Office (Boqueron Southeast Region, PR), Northeast Region, New England Field Office (Concord, NH).

---. 2012. 2011 Atlantic coast piping plover abundance and productivity estimates.

---. 2013. Rufa red knot (Calidris canutus rufa). Factsheet, Hadley, MA: Northeast Region.

---. 2014. Rufa Red Knot Background Information and Threats
Assessment. Pleasantville, NJ: Northeast Region.

---. 2015a. Species profile: Piping plover (*Charadrius melodus*).

---. 2015b. Species profile: Roseate tern (*Sterna dougallii dougallii*).

---. 2018a. "Hawksbill sea turtle Fact Sheet | U S Fish & Wildlife Service's North Florida ESO Jacksonville." https://www.fws.gov/northflorida/seaturtles/turtle%20factsheets/hawksbill-sea-turtle.htm.

---. 2018b. "National Wetlands Inventory Online Data Mapper." Accessed 3 January, 2019. https://www.fws.gov/wetlands/data/Mapper.html.

---. 2018c. "Northern Long-eared Bat (M*yotis septentrionalis)* species profile." Accessed February 2019. https://www.fws.gov/midwest/endangered/mammals/nleb/.

---. 2018d. "Seabeach Amaranth (A*maranthus pumilus)*." Accessed 10 January 2019. https://www.fws.gov/northeast/njfieldoffice/Endangered/amaranth.html.

---. 2020. Endangered and Threatened Wildlife and Plants, Threatened Species Status for Eastern Black Rail with a Section 4(d) Rule.

USEPA, U.S. Environmental Protection Agency. 1999. Level III and IV Ecoregions of Delaware, Maryland, Pennsylvania, Virginia and West Virginia.

---. 2012. National Coastal Condition Report IV. edited by Office of Water Office of Research and Development. Washington, D.C.

---. 2016. National Coastal Condition Assessment 2010. edited by Office of Water and Office of Research and Development. Washington, DC.

USFWS. 2019. Species Status Assessment Report for the Eastern Black Rail *(Laterallus jamaicensis jamaicensis)*. Southeast Region, Atlanta, GA: U.S. Fish and Wildlife Service.

---. 2021a. IPaC Resource List - Migratory Birds - Indian River Power Plant, Sussex County, Delaware. U.S. Fish and Wildlife Service.

---. 2021b. IPaC Resource List - Migratory Birds - Potential Landfall Locations. U.S. Fish and Wildlife Service.

---. 2021c. "Monarch Butterfly: Status and Conservation." United States Fish and Wildlife Service. Accessed September 2, 2021. https://www.fws.gov/savethemonarch/.

USFWS, and NOAA Fisheries. 1992. *Recovery Plan for Leatherback Turtles (Dermochelys coriacea) in the U.S. Caribbean, Atlantic, and Gulf of Mexico.* National marine Fisheries Service (Silver Spring, MD).

---. 2007. Kemp's ridley sea turtle (*Lepidochelys kempii*) 5-year review: Summary and evaluation. edited by MD NMFS Silver Spring and FL USFWS Jacksonville.

---. 2020. *Endangered Species Act status review of the leatherback turtle (Dermochelys coriacea).* National Marine Fisheries Service and U.S. Fish and Wildlife Service.

USFWS, United States Fish and Wildlife Service. 2022a. IPaC: Information for Planning and Consulting. https://ipac.ecosphere.fws.gov/.

---. 2022b. "Swamp Pink." Accessed September 7, 2022. https:// www.fws.gov/species/swamp-pink-helonias-bullata.

---. 2024. "American Eel." Accessed February 13, 2024. https://www.fws.gov/species/american-eel-anguilla-rostrata.

Vanderlaan, Angelia SM, and Christopher T Taggart. 2007. "Vessel collisions with whales: the probability of lethal injury based on vessel speed." *Marine Mammal Science* 23 (1): 144-156. https://www.phys.ocean.dal.ca/~taggart/Publications/Vanderlaan_Taggart_MarMamSci-23_2007.pdf.

VIMS, Virginia Institute of Marine Science. 2014. "Virginia's Sea Turtles." http://www.vims.edu/research/units/programs/sea_turtle/va_sea_turtles/index.php.

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel. 2015. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2014.

Watts, B.D. 2016. *Status and distribution of the eastern black rail along the Atlantic and Gulf Coasts of North America.* (College of William and Mary & Virginia Commonwealth University, Williamsburg, VA). https://scholarworks.wm.edu/ccb_reports/315.

Wenger, Amelia S., Euan Harvey, Shaun Wilson, Chris Rawson, Stephen J. Newman, Douglas Clarke, and Benjamin J. Saunders. 2017. "A critical analysis of the direct effects of dredging on fish." *Fish and Fisheries* 18, no. 5: 967-985.

White, W.T., J. Giles, and Potter IC. Dharmadi. 2006. "Data on the bycatch fishery and reproductive biology of mobulid rays (Myliobatiformes) in Indonesia." *Fish Res. 2006* 82 (1-3): 65–73.

Wilber, D. H., and D. G Clarke. 2007. "Defining and assessing benthic recovery following dredging and dredged material disposal." *Proceedings XXVII World Dredging Congress* 2007: 603-618.

Wilber, D.H., and D.G. Clarke. 2001. "Biological Effects of Suspended Sediments: A Review of Suspended Sediment Impacts on Fish and Shellfish with Relation to Dredging Activities in Estuaries." *North American Journal of Fisheries Management* (21): 855-875.

Williams, K.A., E.E. Connelly, S.M. Johnson, and I.J. Stenhouse. 2015a. Wildlife densities and habitat use across temporal and spatial scales on the Mid-Atlantic Outer Continental Shelf: Final Report to the Department of Energy EERE Wind & Water Power Technologies Office. Portland, Maine, USA: Biodiversity Research Institute.

Williams, K.A., E.E. Connelly, S.M. Johnson, and I.J. Stenhouse, eds. 2015b. *Baseline Wildlife Studies in Atlantic Waters Offshore of Maryland.* Biodiversity Research Institute (Portland, ME).

---. 2015c. *Baseline Wildlife Studies in Atlantic Waters Offshore of Maryland: Final Report to the Maryland Department of Natural Resources and the Maryland Energy Administration.* Biodiversity Research Institute (Portland, ME).

---. 2015d. *Baseline Wildlife Studies in Atlantic Waters Offshore of Maryland: Final Report to the Maryland Departmentof Natural Resources and the Maryland Energy Administration.* Biodiversity Research Institute (Portland, ME).

Williams, K.A., E.E. Connelly, S.M. Johnson, and I.J. eds. Stenhouse. 2015e. *Wildlife Densities and Habitat Use Across Temporal and Spatial Scale on the Mid-Atlantic Outer Continental Shelf.* Biodiversity Research Institute (Portland, ME).

WJLA, 2020, "3 loggerhead clutches hatch on Assateague in rare instances of north-of-Virginia nesting," https://wjla.com/news/local/third-final-sea-turtle-clutch-hatches-assateague-island.

Wunsch, D.R. 2012. Delaware Geological Survey Geologic Map of the Bethany Beach and Assawoman Bay Quadranges, Delaware.

Wysocki, L.E., J.P. Dittami, and F. Ladich. 2006. "Ship noise and cortisol secretion in European freshwater fishes." *Biological Conservation* 128 (4): 501-508.