E1. Information to Support Essential Fish Habitat Assessment (July 2023)

Information to Support Essential Fish Habitat Assessment

Maryland Offshore Wind Project

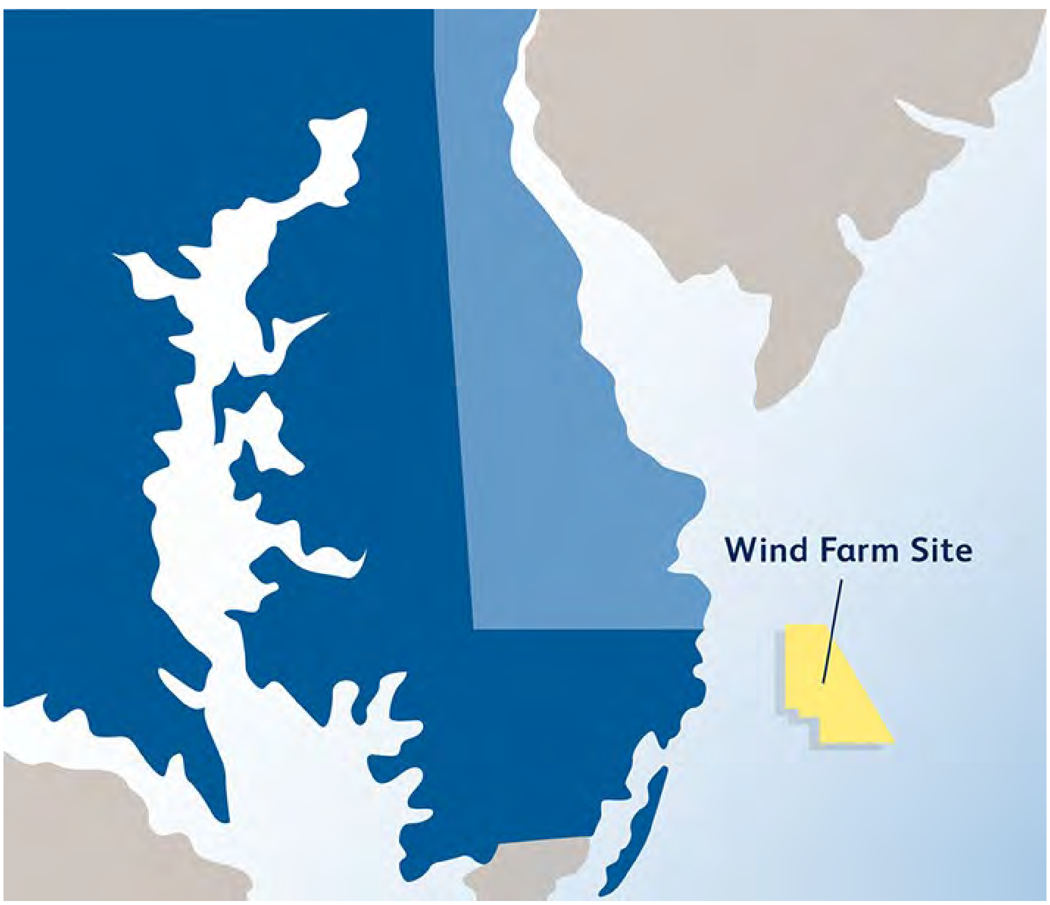
November 2021
Revised September 2022
Revised November 2022
Revised July 2023

Prepared For:

US Wind, Inc.
401 East Pratt Street
Baltimore, MD 21202

Prepared By:

TRC
10 Hemingway Drive, 2nd Floor
East Providence, Rhode Island 02915



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Executive Summary

US Wind, Inc. (US Wind) is developing the Maryland Offshore Wind Project[1] (the Project), an offshore wind project of up to 2 gigawatts within OCS-A 0490 (the Lease), an area off the coast of Maryland on the Outer Continental Shelf. US Wind obtained the Lease in 2014 when the company won an auction for two leases from the Bureau of Ocean Energy Management (BOEM) which in 2018 were combined into the Lease. The Project would include as many as 121 wind turbine generators (WTG) up to four (4) offshore substations (OSS), and one (1) met tower in the roughly 80,000-acre Lease area. The Project will be interconnected to the onshore electric grid by up to four (4) new 230-275 kV export cables into new substations in Delaware.

The Magnuson-Stevens Fishery Conservation and Management Act and the 1996 Sustainable Fisheries Act (Magnuson Stevens Act) mandate that the National Oceanic and Atmospheric Administration (NOAA) identify and protect important marine and anadromous fish habitat, known as Essential Fish Habitat (EFH). EFH is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity” (16 U.S.C.1802 § 3). The Magnuson Stevens Act requires consultation with NOAA National Marine Fisheries Service (NOAA Fisheries) for proposed activities that may “adversely affect” EFH. An “adverse effect” is defined as any impact which reduces quality and/or quantity of EFH, including direct, indirect, individual, cumulative or synergistic impacts.

EFH Designations in the Project Area

Four NOAA resources were consulted to determine the EFH in the Project area:

- NOAA *EFH Mapper*. An interactive, web-based guide that provides lists of species with designated EFH based on 10’ by 10’ squares of latitude and longitude. At the time the EFH Mapper was accessed for the Project, the NOAA website recommended comparing any species lists generated via the EFH Mapper against the EFH Guide to ensure a complete and accurate list (NOAA 2021).
- NOAA *Guide to EFH Designations in the Northeastern US* (EFH Guide). This interactive, web-based guide provides lists of species with EFH present in the northeastern U.S. The species lists are geographically referenced using 10’ by 10’ squares of latitude and longitude, or by waterbody for sites located in an estuary, bay, river, or outside of the 10-minute square grids (NOAA 2008).
- NOAA *Guide to EFH Species Descriptions* which provides ecological information for each species and life stage with designated EFH (NOAA Fisheries 2013).

[1] The Project includes MarWin, a wind farm of approximately 270 MW for which US Wind was awarded Offshore Renewable Energy Credits (ORECs) in 2017 by the state of Maryland; Momentum Wind, consisting of approximately 808 MW for which the State of Maryland awarded additional ORECs in 2021; and any subsequent development within the Lease area.

- New England Fishery Management Council (NEFMC) *Final Omnibus Essential Fish Habitat Amendment 2*. This report provides updated EFH for skates and other fish governed under NEFMC (NEFMC 2017).

NOAA's designation of EFH is based on literature review and original analysis of fishery-independent data on specific habitat characteristics and distribution. For estuarine waters (including estuaries, bays and rivers), NOAA designates EFH based on the NOAA Fisheries Estuarine Living Marine Resources program (ELMR) (Jury et al. 1994; Stone et al. 1994; Nelson et al. 2017).

The Project area, including the Lease area, Offshore Export Cable Corridors, and Onshore Export Cable Corridor 1, encompasses all or part of nine NOAA EFH squares. These squares in part encompass inland bays in Delaware, coastal waters off Delaware, and offshore waters of both Delaware and Maryland. Within the nine squares, NOAA has designated EFH for at least one life stage of 36 fish and 5 invertebrate species.

NOAA Trust Resources in the Project Area

In addition to EFH species, NOAA trust resources were also identified to provide information to support the EFH and Fish and Wildlife Coordination Act consultation process. Trust resources include marine and estuarine fish and shellfish, endangered and threatened marine species (including diadromous fish species) and their habitats, marine mammals, turtles, coastal habitats (i.e., marshes, mangroves, coral reefs, seagrass beds), and aquatic habitats resources associated with national marine sanctuaries and marine monuments and the Great Lakes. More than 30 designated trust resource species and habitats may occur within the Project area.

Habitat Mapping: Approach

To support the EFH assessment, benthic habitats were characterized and mapped in both the offshore (Lease area and Offshore Export Cable Corridors) and onshore (Onshore Export Cable Corridor 1) portions of the Project area.

Habitat mapping for the Project area was primarily based on the results from acoustic survey and benthic sampling programs conducted in 2021 and 2022. The results of the fully processed acoustic mapping and targeted seafloor sampling were used to produce final data products that include both characterization and delineation of benthic habitat according to the NOAA Fisheries-modified Coastal and Marine Ecological Classification System (NMFS-modified CMECS) taxonomic framework identified in GARFO's March 29, 2021 "Updated Recommendations for Mapping Fish Habitat."

Acoustic data sources used include mosaics of multibeam echosounder (MBES) bathymetry and sidescan sonar collected in 2021 and 2022 (COP Appendix II-A1 and Appendix II-A2).

Additionally, where available, derived data products were used to support habitat mapping; these include bathymetric contours, reflectivity, interpreted seafloor features, and sidescan sonar targets.

Mapping was completed in accordance with minimum mapping units and map scales provided in GARFO's March 29, 2021 "Updated Recommendations for Mapping Fish Habitat." Consequently, the minimum mapping unit for complex habitat was 2,000 m^2. Additionally, landscape scale overview maps of mapped habitat features were developed at 1:25,000 scale while complex habitats were mapped at a larger scale (1:5,000) to provide a greater level of detail. Attachment A shows the NMFS-modified CMECS habitat classifications, as defined in GARFO's March 29, 2021 guidance. Attachment B contains interpreted habitat classification maps showing the offshore habitat type inferred from biology observed during the review of collected infaunal grab samples, planview imagery, and video transects. Attachment C delineates the areas where the NMFS-modified CMECS habitat classifications habitat classification has been changed based on additional data review and interpretation.

Habitat Mapping: Results

Lease Area and Offshore Export Cable Corridors

Benthic habitat in the Lease area and Offshore Export Cable Corridors was dominated by soft bottom habitat. Soft bottom habitat consisted of sand; no muddy sands, sandy muds, or muds were observed.

Contiguous areas of complex habitat were the second most prevalent habitat characterization mapped in the Lease area and Offshore Export Cable Corridors. Complex habitats primarily consisted of gravel with the pebble/granule substrate subgroup dominant. Some complex habitats also contained a high enough fraction of shell to be classified as shell hash.

Heterogeneous complex habitat areas were less common in the Lease area and Offshore Export Cable Corridors overall, although they were most extensive in Offshore Export Cable Corridor 2. These habitats primarily consisted of areas with isolated to scattered boulders or cobbles embedded within soft bottom habitats.

Large grained complex habitat was exceptionally rare in most of the Lease area and Offshore Export Cable Corridors; four areas greater than the minimum mapping unit of 2,000 m^2 were observed. The most prominent area was mapped in Offshore Export Cable Corridor 2.

Indian River Bay - Onshore Export Cable Corridors

Benthic habitat in the Onshore Export Cable Corridors was dominated by soft bottom habitat, which covered the entirety of the area mapped. Soft bottom habitat consisted of sand, muddy sand, sandy mud, and mud. Hard bottom, biogenic, and submerged aquatic vegetation habitats were not observed in the Onshore Export Cable Corridors. Therefore, no areas of complex habitat, heterogeneous complex habitat, or large grained habitat were mapped in the Onshore Export Cable Corridors.

Assessment of Potential Impacts: Construction

Construction impacts to EFH and EFH species in this Project area are expected to be temporary and localized. In addition, applicable fisheries Time of Year restrictions (ToY) imposed by permitting agencies will be followed to avoid or minimize potential Project impacts on EFH and water quality. The use of offshore monopile foundation systems, low impact jet plow embedment technology, and HDD shoreline transition methods will all serve to minimize direct seabed and associated EFH impacts.

Although it is highly unlikely, accidental spills of oil or hazardous material may also occur during construction. An incidental spill of a hazardous material in the water or on the seabed would be immediately contained and mitigated in accordance with US Wind's Oil Spill Response Plan and vessel operation health and safety requirements.

Because low impact horizontal directional drill (HDD) cable conduit installation procedures will be used to facilitate shoreline landfall transition of the submarine cable system, a release of bentonite drilling fluid could potentially occur. Although significant release of drilling fluids is unlikely, an HDD Monitoring Plan will be prepared prior to construction to minimize potential impacts and identify measures for containment of any releases.

Finally, pile driving and foundation/scour protection work activities for WTG and OSS monopile foundations in the offshore Lease area will likely produce sound impacts that could temporarily impact EFH species. Some species may be more impacted by construction sound due to lower mobility or greater sensitivity. However, it is expected that many EFH species will not be physically impacted by construction sounds because they will avoid the active construction within the Project area.

Assessment of Potential Impacts: Operation

Permanent impacts to EFH resources will only occur in the offshore Lease area. Direct loss or recovery of soft-bottom monotypic seabed habitat associated with the installation of the WTGs, OSSs, Met Tower, and foundation scour protection would either result in permanent loss, temporary loss, or replacement of that habitat. These losses represent a relatively small area of ocean bottom in comparison to the undisturbed soft-bottom habitat areas within the Project area. Additionally, the creation of hard-bottom complex habitat via stone riprap scour armor around the foundation base for each WTG is expected to positively impact local EFH source and species biodiversity. This addition of new complex habitat will also help mitigate impacts to existing complex habitat that may occur.

Once constructed, routine operation and maintenance activities are expected to be minimal and infrequent. Bottom disturbing activities are only anticipated if submarine cables or scour protection require repairs.

Sound impacts are also expected to be minimal and infrequent and largely related to crew and service vessel transfers of equipment or person-power needed to maintain the electrical facilities. Sound emitted by operating WTGs from blade interaction with wind is expected to result in minimal to no impacts associated with EFH seabed resources.

Electromagnetic fields (EMF) may be generated during operation of the AC submarine cables, which will be buried 1-3 m below the present sea bottom. However, no biologically significant impacts on benthic resources have been reported from EMF generated by operation of AC cables (CSA Ocean Sciences Inc. and Exponent 2019; Thomsen et al. 2015). 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). 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, than levels demonstrated to have no impact on other fish species (i.e., Atlantic salmon or American eel) (Exponent 2023). Thus, no adverse impacts to EFH are expected from EMF.

Assessment of Potential Impacts: Decommissioning

US Wind plans to seek approval from BOEM to leave some components of the Project in place, such as buried cables and scour protection, to minimize the potential impacts to the seabed and EFH during decommissioning. If BOEM requires that the buried cables and scour protection be removed during Project decommissioning, the EFH impacts associated with their removal will be similar to those described during their installation.

1.0 Description of Proposed Action

US Wind is developing the Maryland Offshore Wind Project[2] (the Project), an offshore wind project of up to 2 gigawatts of generating capacity within OCS-A 0490 (the Lease), an area off the coast of Maryland on the Outer Continental Shelf. US Wind obtained the Lease in 2014 when the company won an auction for two leases from the Bureau of Ocean Energy Management (BOEM) which in 2018 were combined into the Lease. The Project will include as many as 121 wind turbine generators (WTG), up to four (4) offshore substations (OSS), and one (1) met tower in the approximately 80,000-acre Lease area. The Project will be interconnected to the onshore electric grid by up to four new 230 kV export subsea electric transmission cables that will ultimately connect with the existing Indian River Power Station substation near Millsboro, Delaware. The Project area in this report refers to the Lease area, Offshore Export Cable Corridors,[3] and Onshore Export Cable Corridor 1[4] and is referenced as such going forward. The Project area as defined for this report is provided in Figure 1.

2.0 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act and the 1996 Sustainable Fisheries Act (Magnuson Stevens Act) mandate that the National Oceanic and Atmospheric Administration (NOAA) identify and protect important marine and anadromous fish habitat, known as Essential Fish Habitat (EFH). EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 U.S.C.1802 § 3). The Magnuson Stevens Act requires consultation with NOAA National Marine Fisheries Service (NOAA Fisheries) for proposed activities that may "adversely affect" EFH. An "adverse effect" is defined as any impact which reduces quality and/or quantity of EFH, including direct, indirect, individual, cumulative or synergistic impacts.

Habitat Areas of Particular Concern (HAPC) are defined as subsets of EFH. They exhibit one or more of the following characteristics: "rare, stressed by development, provide important ecological functions for federally managed species, or are especially vulnerable to anthropogenic (or human impact) degradation" (NOAA Fisheries 2022a). They can consist of a specific location or include habitat that can be found at many locations.

[2] The Project includes MarWin, a wind farm of approximately 300 MW for which US Wind was awarded Offshore Renewable Energy Credits (ORECs) in 2017 by the state of Maryland; and Momentum Wind, consisting of approximately 808 MW for which the State of Maryland awarded additional ORECs in 2021; and any subsequent wind energy development within the remaining Lease area.

[3] Offshore Export Cable Corridors refers to the offshore export cable corridors (Common Export Cable Corridor, Offshore Export Cable Corridor 1, and Offshore Export Cable Corridor 2) included within US Wind's Project Design Envelope described in Volume I of the Construction and Operations Plan. They were combined for this report due to the overlap of Essential Fish Habitat offshore.

[4] Onshore Export Cable Corridor 1 is also referred to as the Onshore Export Cable Corridors (which include Onshore Export Cable Common Corridor, Onshore Export Cable North Corridor, and Onshore Export Cable South Corridor) in this report.

Four NOAA resources were consulted to determine the EFH in the Project area:

- NOAA *EFH Mapper*. An interactive, web-based guide that provides lists of species with designated EFH based on 10’ by 10’ squares of latitude and longitude. At the time the EFH Mapper was accessed for the Project, the NOAA website recommended comparing any species lists generated via the EFH Mapper against the EFH Guide to ensure a complete and accurate list (NOAA Fisheries 2019).
- NOAA *Guide to EFH Designations in the Northeastern US* (EFH Guide). This interactive, web-based guide provides lists of species with EFH present in the northeastern U.S. The species lists are geographically referenced using 10’ by 10’ squares of latitude and longitude, or by waterbody for sites located in an estuary, bay, river, or outside of the 10-minute square grids (NOAA 2008).
- NOAA *Guide to EFH Species Descriptions* which provides ecological information for each species and life stage with designated EFH (NOAA Fisheries 2013).
- New England Fishery Management Council (NEFMC) *Final Omnibus Essential Fish Habitat Amendment 2*. This report provides updated EFH for skates and other fish governed under NEFMC (NEFMC 2017).

NOAA’s designation of EFH is based on literature review and original analysis of fishery-independent data on specific habitat characteristics and distribution. For estuarine waters (including estuaries, bays and rivers), NOAA designates EFH based on the NOAA Fisheries Estuarine Living Marine Resources program (ELMR) (Jury et al. 1994; Stone et al. 1994; Nelson et al. 2017).

US Wind collected EFH and benthic/seabed characteristic data within the Lease area and Offshore Export Cable Corridors from the Lease area to shore in 2021-2022 and within Onshore Export Cable Corridor 1 in 2022-2023. This Information to Support EFH assessment also includes relevant discussion about benthic/seabed survey work in 2016 for a formerly planned offshore export cable route that has since been abandoned by US Wind due to a U.S. Coast Guard anchorage area over a significant portion of that route.

2.1 EFH Designations in the Project Area

As shown in Figure 1 and Table 1, the Project area, including the Lease area, Offshore Export Cable Corridors, and Onshore Export Cable Corridor 1, encompasses all or part of nine NOAA EFH squares. These squares in part encompass inland bays in Delaware, coastal waters off Delaware, and offshore waters of both Delaware and Maryland. NOAA EFH squares are typically identified by their southern latitude and eastern longitude (e.g., 38°30’ - 75°10’) as shown in Figure 1 and Table 1.

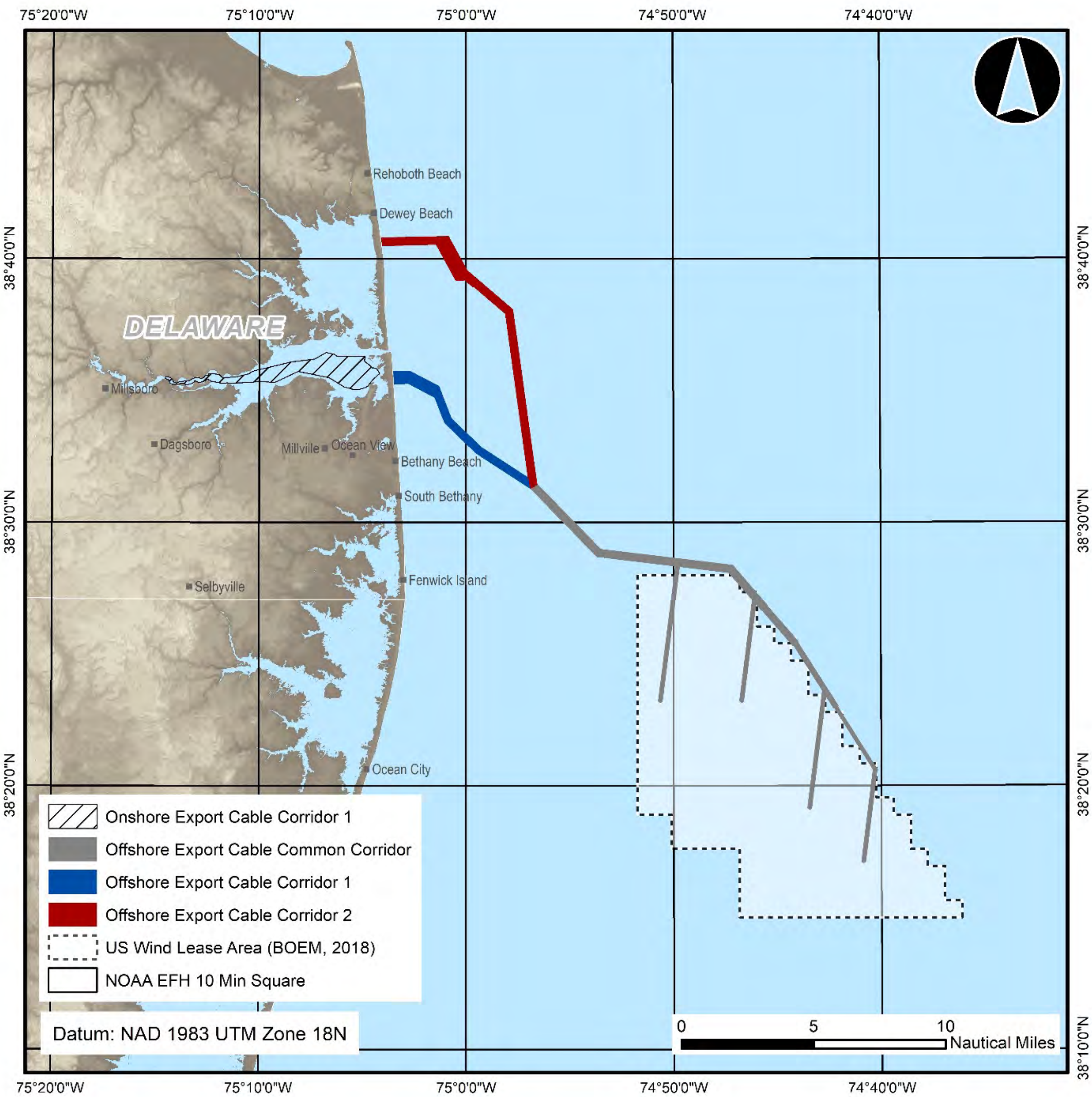

Figure 1 . Project Area

Table 1. NOAA 10' x 10' EFH Squares in Project Area

Lat/Long Identification	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area
3810/7430			X
3810/7440		X	X
3810/7450			X

Table 1. NOAA 10' x 10' EFH Squares in Project Area

Lat/Long Identification	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area
3820/7440		X	X
3820/7450		X	X
3830/7450		X	
3830/7500	X	X	
3830/7510	X		
3840/7500		X	
Activities	**Cable lay Dredging Sheet Pile**	**Subsea Cable Installation**	**Cable lay Pile-driving**
Potential Adverse Effects	Noise Turbidity Habitat Alteration	Turbidity Habitat Alteration	Noise Turbidity Habitat Alteration

Within the nine squares, NOAA has designated EFH for at least one life stage of 36 fish and 5 invertebrate species. These species, which include all species and life stages identified by NOAA in both the EFH Guide and the EFH Mapper, as well as in the waterbody-specific list for the Delaware Inland Bays (Indian River Bay, Rehoboth Bay, and Little Assawoman Bay), are presented in Table 2.

Table 2. Summary of EFH Designations for Species in the Project Area

	Eggs			Larvae/Neonates			Juveniles/Subadults			Adults		
	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area
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*)					•	•		•	•		•	•
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*)								•	•		•	•

Table 2. Summary of EFH Designations for Species in the Project Area

	Eggs			Larvae/Neonates			Juveniles/Subadults			Adults		
	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area
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*)		•			•							
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*)*												
* no life stage breakdown provided												
MAFMC = Mid-Atlantic Fisheries Management Council												

Table 2. Summary of EFH Designations for Species in the Project Area

	Eggs			Larvae/Neonates			Juveniles/Subadults			Adults		
	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area
NEFMC = New England Fisheries Management Council												
NOAA HMS = National Oceanic and Atmospheric Administration's Highly Migratory Species Division												
SAFMC = South Atlantic Fishery Management Council												
References: NOAA Fisheries 2013, NOAA Fisheries 2017a, NOAA Fisheries 2021												

2.2 Habitat Characteristics of the Project Area

The offshore and nearshore portion of the Project area includes the Atlantic Ocean and the estuarine waters of Indian River Bay, Delaware.

2.2.1 Marine Sediment Quality

Marine sediments in the Project area can be characterized geographically based on their bulk physical and chemical properties. In general, seabed surface textures are predominantly coarser grained sand sized sediment in its offshore and coastal barrier beach nearshore areas, including the hydrodynamic coastal inlet entrance where Indian River Bay meets the ocean and adjacent barrier beach shorelines. As may be expected in a typical coastal plain estuary, surface sediment tends to be finer grained sized material transitioning from lower Indian River Bay sand to sands and silts up to the head of the estuary, then finer silts and clays in the upper estuary and Indian River reaches.

In addition to these sediment type characteristics, local variations in surface sediments occur regularly, especially near the Indian River Bay Inlet which routinely shoals in with sand from updrift shoreline transport. Seabed surface sediment texture and profiles in the nearshore and inlet areas of Indian River Bay can change dramatically due to its shallow water and tidal flat conditions. The inlet is characterized as a flood dominated inlet exhibiting highly mobile bed conditions and texture changes, particularly due to large coastal storm events or periods of high river discharge to the lower estuary. The leading determinants of local sediment variation are the coastal and estuarine hydrodynamics and sediment transport originating from the Indian River Bay Inlet and the freshwater discharge from the Indian River.

2.2.1.1 Alpine 2016 Sampling Program

A seabed surface sediment coring and benthic sampling program was conducted by Alpine in 2016 within the offshore Lease area and the formerly planned offshore export cable route (see Figure 2) to characterize the seabed sediment quality and type likely to be disturbed by construction or installation activities. The benthic sampling program included seabed benthic grabs designed to assist in the EFH assessment and constructability assessments. The resulting analysis included detailed descriptions of the field sampling programs, field observations, documentation of benthic habitat conditions, and surface sediment quality and type. These results and characterizations are presented in the Alpine Export Cable Report 1783 Aug-Nov 2016 provided as Appendix II-A6. Results are also summarized in brief below.

Marine seabed sediments in both the Atlantic Ocean along the former offshore export cable route and much of what is now a portion of Onshore Export Cable Corridor 1 through Indian River Bay were found to consist of predominantly medium to fine-grained sands in the offshore and coastal nearshore environments, reworked sands and sandy silts near the Indian River Bay Inlet, sandy silts, and silts and clay in the upper reaches of the estuary near Millsboro, DE.

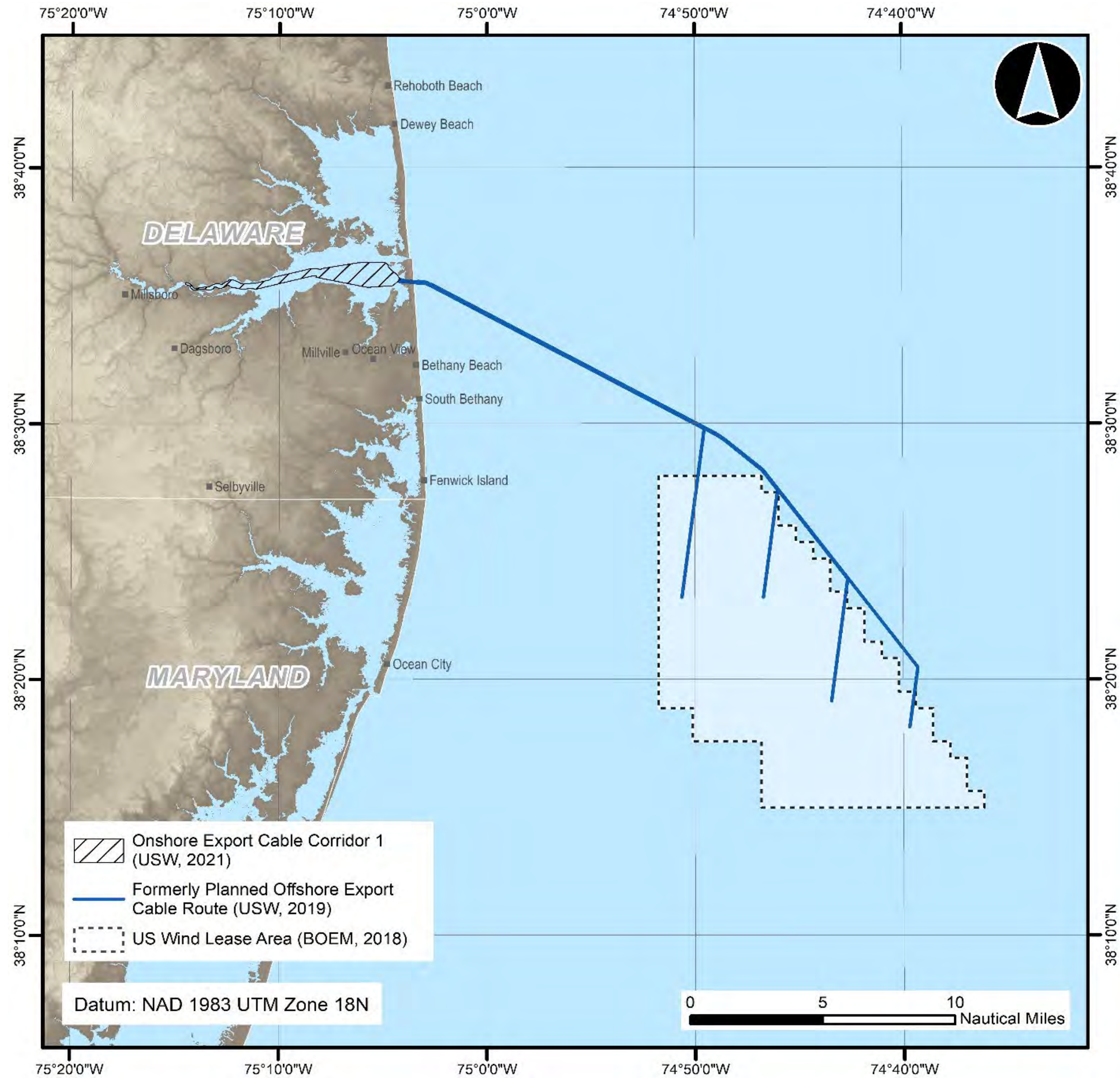

Figure 2. Formerly Planned Offshore Export Cable Route

Marine seabed sediment samples collected from the Atlantic Ocean along the former offshore export cable route consisted of predominantly medium-fine-grained sand and silt and contained little organic matter (0.3-3.8%). Sediment samples collected from the more landward reaches of Indian River Bay generally contained more fine-grained sediments with higher organic matter (0.6 - 57% vs. 0.3 - 3.8%). Elevated concentrations of arsenic and nickel were found in most of the samples collected from upper Indian River Bay (COP Appendix II-A6). This may be indicative of land-based metals loading from surrounding land use and agricultural runoff in the middle to upper bay and estuary.

Of the six cores collected along the former offshore export cable route, only one sample from one core was found to exceed current Delaware Department of Natural Resources and Environmental Control's (DNREC's) Division of Waste and Hazardous Substances - Site Investigation and Restoration Section's Ecological Marine Sediment (EMS) Screening Levels (DNREC 2018) for the polycyclic aromatic hydrocarbons (PAHs) naphthalene and acenaphthene (COP Appendix II-A7). This was considered as an outlier sample for the EFH assessment.

2.2.1.2 TDI 2021 Sampling Program

The 2016 work was expanded and updated in 2021 by TDI-Brooks International, Inc. within the offshore Lease area and the Offshore Export Cable Corridors. Final reports indicate that sediment within the Lease area and the Offshore Export Cable Corridors were predominantly a mix of medium and coarse-grained sand, with some fine sand, shell fragments and gravel also present. Nearshore areas also consisted of silts and clays towards the mouth of the Indian River Inlet. These results are consistent with the Alpine 2016 sampling program and are presented in field reports included as part of COP Appendix II-A1.

2.2.1.3 TRC Benthic Grab and Imagery Analysis

2.2.1.3.1 Lease Area and Offshore Export Cables (2021)

A total of 189 benthic grabs were collected within the Lease area (120 locations) and the Offshore Export Cable Corridors (69 locations). Based on the NMFS-modified CMECS substrate group classification, the Lease area samples contained predominantly gravelly substrate (40%) and sand (39%), with the rest of the Lease area composed of gravel mixes (21%). The Offshore Export Cable Corridors consisted predominantly of gravelly substrate (46%) and sand (33%), with gravel mixes and gravel (17% and 3%, respectively). Finer substrates (muddy sands, sandy muds, and muds) were not observed in any samples.

Ninety-eight benthic imagery transects (68 in the Lease area, 30 from the Offshore Export Cables) were successfully classified by dominant substrate. The majority of transects (81%) were dominated by sand substrate, although patches of secondary substrate types, such as granules/pebbles or shell hash, were also sometimes observed on these transects. Similarly, transects dominated by gravelly substrates, which constituted approximately 18% of all benthic imagery transects, were frequently observed to contain patches of bare sand interspersed along the seafloor surface. Lone standing or scattered boulder- and cobble-sized clasts were also occasionally observed on transects dominated by sand, gravelly substrates, or gravel mixes. Boulders were observed on seven of the benthic imagery transects and cobbles were observed on an additional two transects.

2.2.1.3.2 Onshore Export Cable Corridor 1 (2022)

A total of 35 benthic grabs were collected within Onshore Export Cable Corridor 1. Based on the NMFS-modified CMECS classification, mud was the dominant substrate (54%). Additional substrates included sand (20%), muddy sand (17%), and sandy mud (9%).

No imagery was collected along Onshore Export Cable Corridor 1 due to poor visibility.

2.2.1.4 BOEM Mapping and Habitat Assessment

Upon the designation of wind energy areas in the Atlantic, the NOAA Northeast Fisheries Science Center (NEFSC), Woods Hole Oceanographic Institute, and the University of Massachusetts-Dartmouth School for Marine Science and Technology collaborated to perform benthic assessments of these areas. The assessment utilized pre-existing data (prior to 2013) and additional surveys conducted in 2013 (Guida et al. 2017). The study concluded benthic habitat in the Lease area is generally characterized by mobile sandy substrates on gentle slopes, with shell hash frequently accompanying mineral substrates (Guida et al. 2017). Although sand is the dominant sediment type in the area, gravel is common as a minor component, particularly in northern portions of the Lease area (Guida et al. 2017). Muddy sands were also observed in areas protected from strong currents, including portions of the central Lease area. Variations in sediment were observed to occur over small spatial scales within the Lease area, and though few hard bottom patches were believed to be present, scattered cobble areas were observed (Guida et al. 2017).

2.2.1.5 2022/2023 Indian River Bay Sampling Program

Additional work within the Indian River Bay and in the nearshore Atlantic was completed in 2022 to assess the environmental conditions within Onshore Export Cable Corridor 1. Based on grain size analysis of grab samples collected by TRC and ST Hudson Engineers, Inc., surficial sediments consist primarily of very fine sand in the vicinity of Indian River Inlet with sediment type shifting to mud in the western part of Indian River Bay and the Indian River. These results are consistent with the Alpine 2016-2017 sampling program and are presented in field reports included as part of COP Appendix II-A8.

2.2.1.6 Northeast Fishing Effects Model

The Northeast Regional Ocean Council (NROC) provides sediment data from multiple sources on the Northeast Ocean Data Portal (NROC n.d.). Sediment type is reported as the proportion of the grid cell classified as a specific sediment type and includes mud, sand, granule or pebble, cobble, and boulder grain sizes (Bachman 2020). Maps of these layers in and near the Project area are shown in Figure 3.

The highest percentages of cobble occur along the eastern side of the Lease area but are not mapped in other locations within the Lease area or in the Onshore/Offshore Export Cable Corridors. Granule and pebbles areas occur in a large portion of the Lease area, areas north of Bethany Beach offshore, and within Indian River Bay, but not at high percentages. Areas of mud occur mostly within Indian River Bay and immediately offshore of the Indian River Inlet. Very little mud is shown within the Lease area. Sand is found at high percentages throughout the Project area, with sand being the most common offshore in the Lease area. No boulders are mapped within the Project area. This is consistent with previous surveys completed by Alpine in 2016 and 2017 and TDI in 2021 (see COP Appendix II-A1 and Appendix II-A8).

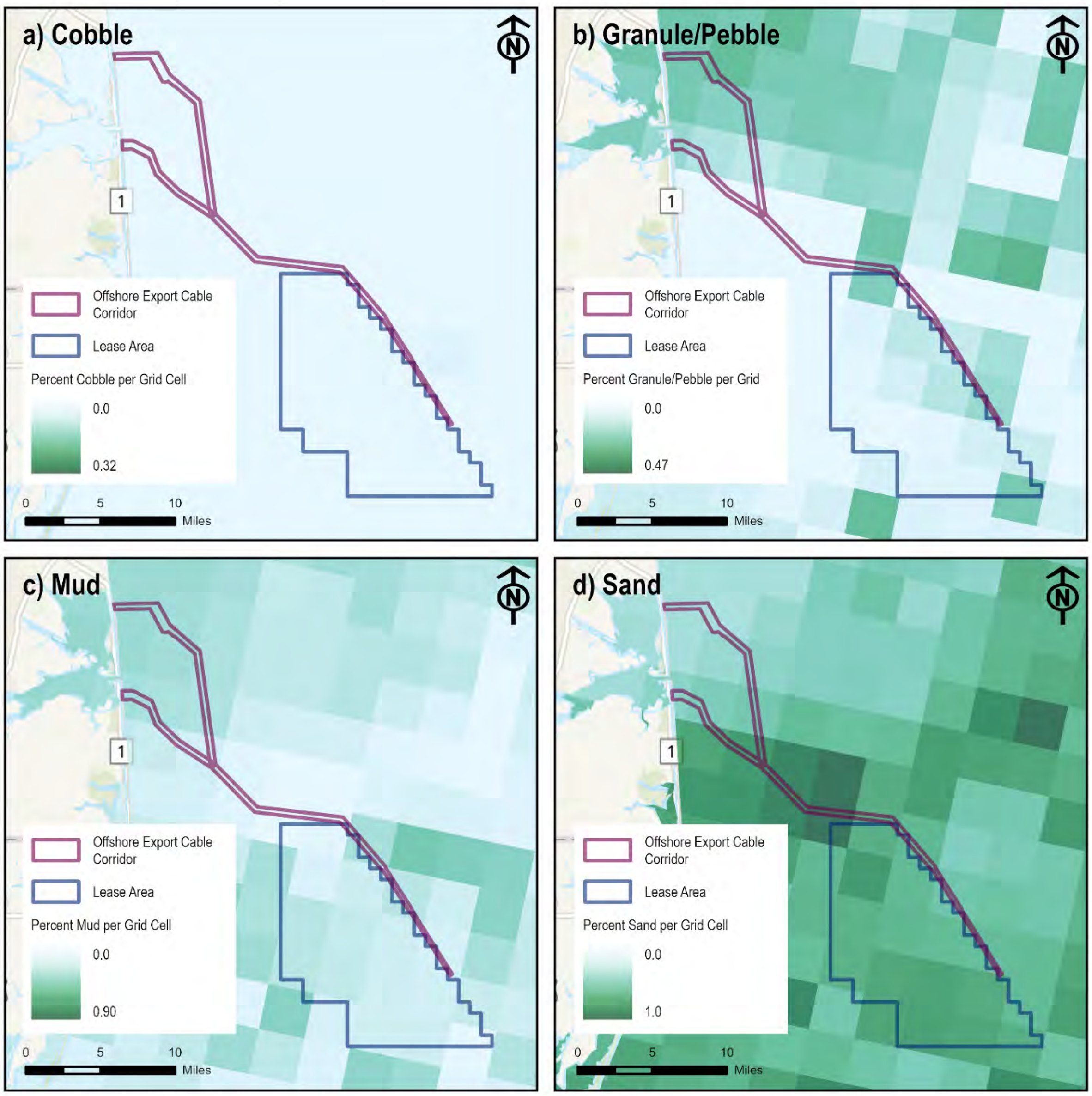

Figure *3.* Fishing Effects Model – Percent Sediment Type

2.2.2 *Surface Water Quality*

Delaware Water Quality Standards promulgated under Title 7 14 DE Reg. 1392 set the required water quality criteria that must be met to support the best use indicated in their regulations and policies. Onshore Export Cable Corridor 1 traverses DNREC's water body Class SA waters. This classification is considered a high-quality water body or waterway suitable for primary and secondary contact recreation, industrial uses, fish and aquatic life and wildlife, as well as harvestable shellfishing in discrete locations (7 DE Admin Code 7401: Surface Water Quality Standards).

Waterbodies that do not meet the SA surface water quality standards associated with their use classification are considered to be impaired waters. Delaware's 2022 *Combined Watershed Assessment Report* (DNREC 2022b) lists both the Indian River and Indian River Bay as "Impaired Waters". Cited water quality impairments in these waters include bacteria, nutrients, temperature, suspended solids, and copper. Copper is the only one of the identified constituents of concern found in some of the sediment samples for which a total maximum daily load (TMDL) has not yet been approved by Delaware or NOAA to address the impairment classification. As previously discussed, water quality impairment in the upper and lower reaches of Indian River Bay is reportedly attributed to increasing nearby land use and agricultural nutrient, coliform and metals runoff in the upper watersheds feeding into to the Bay rivers' main stems and tributaries. For example, many of the shellfish growing areas in the upper estuary of Indian River Bay (i.e., the Indian River) close to commercial and recreational shell fishing due to poor water quality conditions, particularly in the summer season (April 16th through November 30th) (DNREC 2022a).

2.2.3 *Dissolved Oxygen*

Adequate ambient dissolved oxygen (DO) concentrations in marine and estuarine waters are seasonally variable and critical to the growth and survival of fish and other marine organisms using these waterways for favorable habitat or life cycle attributes or conditions. The level or variability of DO concentrations throughout the water column and at the water/seabed interface can be determined by several factors, including water depth, the degree of tide and current mixing, seasonal rates of water column turbidity and algae photosynthesis, temperature, microbial populations, decomposition of organic matter, and required organism respiration levels to support population density and life cycle habitat whether it be coastal ocean, barrier beach, or coastal estuary.

Active photosynthesis of marine algae, a high degree of river flow, tide, and current mixing, and relatively low seawater temperatures generally result in a sufficient or increase in DO concentrations in the water column. In contrast, higher aquatic organism respiration rates, microbial decomposition of seabed organic material, chemical oxidation, combined with high air and water temperatures generally suppresses or can dramatically reduce available oxygen sometimes creating anoxic conditions resulting in the mortality of a variety of marine organisms due to lack of dissolved oxygen throughout the water column.

Marine and estuarine water quality in offshore and nearshore areas and within Indian River Bay can be generally characterized as good and adequately supports a variety of marine and estuarine fish and benthic species. DO levels range from 5.0 – 13 milligrams per liter (mg/L) in the spring (March through May), and range from to 3.5 - 8.9 mg/L in the summer (June through August) (DNREC 2023). This indicates that Indian River Bay DO levels are usually adequate to support a wide variety of marine life seasonally and year-round. Hypoxic water quality (low oxygen) events are reportedly rare in the Bay and nearshore areas, but these events can have a significant adverse impact on finfish and commercially harvested shellfish when they occur (DCIB 2016).

2.2.4 Salinity

Atlantic Ocean Salinity

Atlantic Ocean salinity levels within the Project area (nearshore and offshore) are reported to be typically marine-like, ranging from 27 – 32 ppt depending on location and depth. Unlike the Indian River Bay estuary where salinity stratification is more horizontal (i.e., salt wedge), the primary driver of salinity concentrations in the Atlantic offshore is more influenced by vertical stratification due primarily to marine tides and currents. Vertical variation in marine salinity gradients occurs mostly due to seasonal variations and changes to local tides and currents. This vertical stratification in offshore areas is also supported by conductivity, temperature, and depth (CTD) cast data collected from numerous NOAA research cruises that included the Lease area (NOAA NEFSC 2014). These data show that vertical stratification typically reaches a maximum in the summer when surface waters are warmer and somewhat less saline than mid depth and near bottom waters. This stratification scheme is then followed by a water mass turnover in September that results in a well-mixed and more uniform vertical salinity and temperature profile that lasts into the following spring. Salinities at any given point in the water column are consistent year-round in offshore waters, but vary between 27 and 31 parts per thousand near shore (USACE 2016).

Indian River Bay

Marine and estuarine salinity profiles and concentrations in the Indian River Bay estuary is reported to range from approximately 18 to 34 ppt depending on distance from the Indian River Bay Inlet (DNREC 2023). Indian River Bay can be characterized as a typical mid-Atlantic Coastal Plain Estuary with high salinities nearer its ocean inlet and decreasing salinity levels moving up bay and river where freshwater discharge from the upper watersheds dilutes the higher salinities. Conversely, during spring freshet events, high freshwater discharges to the lower Indian River Bay can dilute the more saline estuarine and seawater concentrations. Indian River Bay estuary exhibits strong salinity gradients depending on the seasonal upper river flow conditions and can be characterized by three estuarine salinity conditions: oligohaline, mesohaline, and polyhaline/euhaline. Indian River Bay can exhibit each type of salinity condition due to seasonal variations in freshwater discharge to the bay.

Salinity levels in Indian River Bay are reported to typically exceed 18 ppt in the polyhaline zone, which includes the areas closest to the Onshore Landfall location and most of Onshore Export Cable Corridor 1 to the west. Salinity levels gradually decline moving westward upriver toward the mesohaline zone of the middle Indian River. In the upper estuary and river sections of Indian River Bay are reported to exhibit salinity levels that regularly falls below 25 ppt (brackish to riverine salinities), but generally remains above 15 ppt (DNREC 2023).

2.2.5 Seawater Temperature

Seawater temperatures throughout the Project area ranges seasonally due to its geographic location. In Indian River Bay, water temperature ranges from approximately 14 degrees Celsius (°C) (34° Fahrenheit [F]) in the winter to the mid-20s°C (mid-70s°F) in the summer, with occasionally colder or warmer conditions (DNREC 2023). Maximum water temperatures were found to be much higher in the western portions of the bay, most likely due to reduced tidal flushing, shallower water depths and estuarine circulation. Conductivity, temperature, and depth (CTD) measurements taken during a variety of survey and research cruises within the Lease area indicated a minimum water temperature of approximately 3.4°C (38°F) in winter and a maximum water temperature of approximately 24°C (75°F) in summer (NOAA NEFSC 2014). These seawater temperatures may vary with water depth, seasonal tides, and currents as well as mixing by tropical depressions. This natural range of variability in water temperatures and seasonal changes is reflective of the diverse types of species and their respective life cycle habitats observed in the Project area from offshore to nearshore to Indian River Bay.

2.3 EFH Species Descriptions

NOAA Fisheries defines EFH as those areas of coastal and offshore waters that are mapped by NOAA that includes all types of aquatic habitat where fish spawn, breed, feed, or grow to maturity and includes among other things wetlands, seagrasses, rivers, estuaries, bays, and coastal and offshore oceans. EFH habitat conditions and descriptions used in the analysis are detailed in the

NOAA *Guide to EFH Descriptions*. To assess EFH for the Project, the applicable NOAA EFH habitat descriptions were reviewed for each species with EFH mapped within or around the Project area (Table 2). The findings of this review and habitat impact assessment are presented below.

2.3.1 Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan (MAFMC)

2.3.1.1 Atlantic Mackerel (*Scomber scombrus*)

EGGS. EFH for Atlantic mackerel eggs includes pelagic waters in estuaries and embayments from New Hampshire to New York and on the continental shelf from Georges Bank to Cape Hatteras. Atlantic mackerel egg EFH is typically found in depths less than 100 m (328 ft) and in water temperatures between 6.5 to 12.5°C (43 to 54ºF) in the upper water column (MAFMC 2011). EFH for Atlantic mackerel eggs includes offshore waters in the Project area (NOAA Fisheries 2019).

JUVENILES. EFH for Atlantic mackerel juveniles includes estuaries and embayments in the Gulf of Maine, and on the continental shelf from Georges Bank to Cape Hatteras. Juvenile Atlantic mackerel EFH is typically found in depths between 10 and 110 m (32 and 361 ft) and in water temperatures between 5 and 20°C (41 and 68ºF) (MAFMC 2011). EFH for juvenile Atlantic mackerel includes coastal and offshore waters in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, juveniles are not present in Delaware Inland Bays (Nelson et al. 2017).

ADULTS. EFH for adult Atlantic mackerel includes estuaries and embayments in the Gulf of Maine, and on the continental shelf from Georges Bank to Cape Hatteras. Adult Atlantic mackerel EFH is typically found in depths less than 170 m (558 ft) and in water temperatures between 5 and 20°C (41 and 68ºF) (MAFMC 2011). EFH for adult Atlantic mackerel includes coastal and offshore waters in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, adults are common in Delaware Inland Bays from March through May (Nelson et al. 2017).

2.3.1.2 Longfin Squid *(Loligo pealeii)*

EGGS. EFH for longfin squid eggs includes inshore and benthic habitats from Georges Bank to Cape Hatteras, NC. Eggs are typically found in water temperatures between 10 and 23°C (50 and 73ºF), salinities between 30 and 32 ppt, and depths less than 50 m (164 ft). Egg masses are anchored to hard bottom substrates, submerged aquatic vegetation, mud, or sand (MAFMC 2011). EFH for longfin squid eggs includes Indian River Bay and adjacent coastal waters in the Project area (NOAA Fisheries 2019).

JUVENILES (PRE-RECRUITS). EFH for pre-recruit (juvenile) longfin squid includes the pelagic waters inshore and over the continental shelf from the Gulf of Maine to South Carolina, including some embayments. They inhabit in water temperatures from 8.5 to 24.5ºC (47 to 76ºF), salinities between 28.5 and 36.5 ppt, and depths from 6 to 160 m (20 to 525 ft). Pre-recruits make daily vertical migrations and overwinter in deeper water along the continental shelf (MAFMC 2011). EFH for juvenile longfin squid includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

ADULTS (RECRUITS). EFH for adult (recruit) longfin squid includes the pelagic waters inshore and over the continental shelf from the Gulf of Maine to South Carolina, including some embayments. They inhabit in water temperatures from 8.5 to 14ºC (47 to 57ºF) salinities between 24 and 36.5 ppt, and depths up to 400 m (1,312 ft). Recruits make daily vertical migrations and overwinter in deeper water along the continental shelf (MAFMC 2011). EFH for adult longfin squid includes offshore waters in the Project area (NOAA Fisheries 2019).

2.3.1.3 Northern Shortfin Squid (*Illex illecebrosus*)

JUVENILES (PRE-RECRUITS). EFH for pre-recruit (juvenile) northern shortfin squid includes pelagic habitat along the outer continental shelf and slope from the Gulf of Maine to South Carolina, and on the inner continental shelf from southern Maine to New Jersey. They inhabit in water temperatures from 9.5 to 16.5ºC (49 to 62ºF), salinities between 34.5 and 36.5 ppt, and depths from 41 to 400 m (134 to 1,312 ft). They can also be found in pelagic areas of the Gulf Stream in temperatures greater than 16ºC (61ºF); juveniles move onto the shelf as they age. Pre-recruits make daily vertical migrations into the upper water column at night and the lower water column in the day (MAFMC 2011). EFH for juvenile northern shortfin squid includes offshore waters in the Project area (NOAA Fisheries 2019).

2.3.1.4 Atlantic Butterfish (*Peprilus triacanthus*)

EGGS. EFH for butterfish eggs includes pelagic waters in estuaries and embayments from Massachusetts Bay to Chesapeake Bay, and on the continental shelf and slope from Georges Bank south to Cape Hatteras. They are found from shore to 1,500 m (4,921 ft) depth and in upper water column temperatures between 6.5 and 21.5˚C (44 and 71ºF) (MAFMC 2011). EFH for butterfish eggs includes coastal and offshore waters in the Project area (NOAA Fisheries 2019). According to NOAA’s ELMR database, eggs are not present in Delaware Inland Bays (Nelson et al. 2017).

LARVAE. EFH for butterfish larvae includes the pelagic waters in estuaries and embayments from Massachusetts Bay to Chesapeake Bay, and on the continental shelf from the western Georges Bank south to Cape Hatteras. Butterfish larvae EFH are mostly found at depths between 41 and 350 m (134 and 1,148 ft), and upper column water temperature between 8.5 and 21.5˚C (47 and 71ºF) (MAFMC 2011). EFH for butterfish larvae includes offshore waters in the Project area (NOAA Fisheries 2019).

JUVENILES. EFH for butterfish juveniles includes the pelagic waters in estuaries and embayments from Massachusetts Bay to Pamlico Sound, North Carolina; inshore waters of the Gulf of Maine and South Atlantic Bight; and on the continental shelf from southern New England to South

Carolina. Juvenile butterfish EFH is primarily found at depths between 10 and 280 m (33 and 919 ft) and bottom water temperatures between 6.5 and 27°C (44 and 81ºF). Salinity is typically greater than 5 ppt (MAFMC 2011). EFH for juvenile butterfish includes Indian River Bay and the adjacent coastal and offshore water in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, juveniles are common in Delaware Inland Bays from May through August and rare from September through November (Nelson et al. 2017).

ADULTS. EFH for butterfish adults includes the pelagic waters in estuaries and embayments from Massachusetts Bay to Pamlico Sound, North Carolina; inshore waters of the Gulf of Maine and South Atlantic Bight; and on the continental shelf from southern New England to South Carolina. Adults are typically found in depths of 10 to 150 m (33 to 492 ft) and bottom temperatures between 4.5 and 27.5°C (40 and 82ºF). Salinity is typically greater than 5 ppt (MAFMC 2011). EFH for adult butterfish includes Indian River Bay and adjacent coastal and offshore water in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, adults are common in Delaware Inland Bays from May through August and rare from September through November (Nelson et al. 2017).

2.3.2 Atlantic Surfclam and Ocean Quahog Fishery Management Plan

2.3.2.1 Atlantic Surf Clam (*Spisula solidissima*)

JUVENILES & ADULTS. EFH for juvenile and adult surf clam is comprised of sandy substrates to a depth of 0.9 m (3 ft) below the water-sand interface within federal waters from the eastern edge of Georges Bank and the Gulf of Maine throughout the Atlantic Exclusive Economic Zone (EEZ). They typically occur from the beach zone to depths of 38 m (125 ft), becoming rarer to 60 m (197 ft) (NOAA Fisheries 2013). Temperatures in areas supporting surf clams typically remain above 1ºC (34ºF) and below 25ºC (77ºF). They are usually found in salinities of 28 ppt or above, and susceptible to die-offs when DO drops below about 3 ppm (Cargnelli et al. 1999). EFH for surf clam juveniles and adults includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

2.3.2.2 Ocean Quahog (*Artica islandica*)

JUVENILES & ADULTS. EFH for juvenile and adult quahogs includes sandy substrate, to a depth of 3 ft below the water/sediment interface, within federal waters from the eastern edge of Georges Bank and the Gulf of Maine throughout the Atlantic EEZ. Distribution in the western Atlantic ranges from 9 to 243 m (30 to 797 ft). Ocean quahogs are rarely found where bottom water temperatures exceed 16°C (61ºF) (NOAA Fisheries 2013). EFH for juvenile and adult ocean quahog includes offshore waters in the Project area (NOAA Fisheries 2019).

2.3.3 *Bluefish Fishery Management Plan*

2.3.3.1 Bluefish (*Pomatomus saltatrix*)

EGGS. EFH for bluefish eggs north of Cape Hatteras includes pelagic waters over the continental shelf at mid-depths as far north as Montauk Point, NY. Eggs are generally found between April and August, with a peak in July, in water temperatures above 18°C (64°F), and at salinities above 31 ppt (NOAA Fisheries 2013). EFH for bluefish eggs includes offshore waters in the Project area (NOAA Fisheries 2019).

LARVAE. EFH for larval bluefish includes pelagic waters north of Cape Hatteras over the continental shelf as far north as Montauk Point, NY. They are most often found in the water column at depths of 15 m (49 ft) or shallower. They generally occur from April through September, in water temperatures warmer than 18°C (64°F) and at salinities greater than 30 ppt (NOAA Fisheries 2013). EFH for bluefish larvae includes coastal and offshore waters in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, larvae are not present in Delaware Inland Bays (Nelson et al. 2017).

JUVENILES. EFH for juvenile bluefish north of Cape Hatteras includes the pelagic waters over the continental shelf as far north as Nantucket Island, MA, and in all major estuaries along the coast north to Penobscot Bay, ME. Specific habitat preferences and distribution of juveniles based on salinity, water temperatures, or depth have not been well described. Bluefish juveniles may also be present in the Mid-Atlantic estuaries from May to October (NOAA Fisheries 2013). EFH for this life stage includes Indian River Bay and adjacent coastal waters in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, juveniles are common in Delaware Inland Bays from July through October and rare in the months of June and November (Nelson et al. 2017).

ADULTS. EFH for adult bluefish north of Cape Hatteras includes the pelagic waters over the continental shelf as far north as Cape Cod Bay, MA and in all major estuaries along the coast north to Penobscot Bay, ME. Adult bluefish are migratory and vary seasonally in distribution. Adult bluefish typically inhabit Mid-Atlantic estuaries from April through October (NOAA Fisheries 2013). Adult bluefish generally prefer salinities greater than 25 ppt. (NOAA Fisheries 2013). EFH for this life stage includes Indian River Bay and adjacent coastal waters in the Project area (NOAA Fisheries 2013). According to NOAA's ELMR database, adults are common in Delaware Inland Bays from July through September and rare in the months of June and October (Nelson et al. 2017).

2.3.4 Spiny Dogfish Fisheries Management Plan

2.3.4.1 Spiny Dogfish (*Squalus acanthias*)

JUVENILES. EFH for juvenile spiny dogfish includes the Gulf of Maine through Cape Hatteras, NC across the outer continental shelf and slope. Juvenile spiny dogfish can be found in offshore wintering grounds from November to January (MAFMC 2014). EFH for juvenile spiny dogfish includes coastal waters and offshore waters in the Project area (NOAA Fisheries 2019).

*ADULTS***.** EFH for adult spiny dogfish includes the Gulf of Maine through Cape Hatteras, NC across the continental shelf. Adult spiny dogfish are found in temperatures between 7 and 15°C (45 and 59ºF) and in salinities between 32 and 35 ppt. Adult spiny dogfish typically leave the mid-Atlantic in the summer and fall once temperatures increase above 15°C (59ºF) (MAFMC 2014). EFH for adult spiny dogfish adult includes Indian River Bay and adjacent coastal and offshore waters in the Project area (NOAA Fisheries 2019).

2.3.5 Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan

2.3.5.1 Summer Flounder *(Paralichthys dentatus*)

EGGS. EFH for summer flounder eggs includes the pelagic waters over the continental shelf from the Gulf of Maine to Florida. The largest concentrations of summer flounder eggs are within 15 km (9 mi) offshore of New Jersey and New York between October and May. They are found up to depths of 110 m (361 ft) (NOAA Fisheries 2013). EFH for this life stage includes coastal and offshore waters in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, eggs are not present in Delaware Inland Bays (Nelson et al. 2017).

LARVAE. EFH for summer flounder larvae is located north of Cape Hatteras, NC and includes pelagic waters over the continental shelf north to the Gulf of Maine as well as coastal estuaries. Summer flounder larvae are most frequently found in the northern Mid-Atlantic Bight from September to February and in the southern Mid-Atlantic Bight from November to May. Summer flounder larvae are most abundant nearshore (19 - 83 km (12 - 52 mi) from shore) at depths between 10 and 70 m (33 and 230 ft) and in water temperatures between 9 and 18°C (48 and 64ºF) (NOAA Fisheries 2013). EFH for this life stage includes Indian River Bay and coastal and offshore waters in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, larvae are common to abundant in saline waters of the Delaware Inland Bays from October through March and rare in April. In estuarine waters, the species is present during the same months, but in lesser numbers (Nelson et al. 2017).

JUVENILES. EFH for summer flounder juveniles includes bottom habitat over the continental shelf from the Gulf of Maine to Florida. It also includes many estuaries along the coast where juveniles use salt marsh creeks, seagrass beds, mudflats, and open bay areas as nursery habitat. Juvenile summer flounder occur in water temperatures greater than 2.8°C (37ºF) and a salinity range of

10 - 30 ppt (NOAA Fisheries 2013). EFH for juvenile summer flounder includes Indian River Bay and adjacent coastal waters and offshore waters in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, juveniles are rare in Delaware Inland Bays from November through March, common in the month of April, abundant to highly abundant from May through September and common in the month of October (Nelson et al. 2017).

ADULTS. EFH for adult summer flounder includes bottom habitat over the continental shelf from the Gulf of Maine to Florida, including estuaries along the coast. Generally, adult summer flounder inhabit shallow coastal and estuarine waters during spring and summer, then move offshore during late-summer and fall to depths of 150 m (492 ft) on the outer continental shelf (NOAA Fisheries 2013). Summer flounder occur in temperatures from 2 to 27°C (36 to 81ºF) and salinities greater than 15 ppt (Packer et al. 1999). EFH for adult summer flounder includes Indian River Bay and adjacent coastal and offshore waters in the Project area (NOAA Fisheries 2019). The entirety of Indian River Bay is considered to be a Habitat of Particular Concern (HAPC) for summer flounder, which are relatively abundant in the area, based on the presence of macroalgae, seagrasses, and other native species of submerged aquatic vegetation (NOAA Fisheries 2019). According to NOAA's ELMR database, adults are rare in saline portions of Delaware Inland Bays in the month of April, abundant to highly abundant from May through September, and rare in October. In estuarine waters, the species is present during the same months, but in lesser numbers (Nelson et al. 2017).

2.3.5.2 Scup (Porgy, *Stenotomus chrysops*)

Juveniles. EFH for scup juveniles includes demersal waters over the continental shelf from the Gulf of Maine to Cape Hatteras, NC. They are most common in estuaries from Massachusetts Bay to Virginia during the spring and summer. This life stage is typically found in water temperatures greater than 7.2°C (45ºF) and at salinities greater than 15 ppt. Juvenile scup prefer eelgrass, mud, mussel, and sand substrates (NOAA Fisheries 2013). EFH for juvenile scup includes Indian River Bay and adjacent coastal and offshore waters in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, juveniles are common in Delaware Inland Bays from May through September and rare from October through December (Nelson et al. 2017).

Adults. EFH for scup adults includes demersal waters over the continental shelf from the Gulf of Maine to Cape Hatteras, NC. Scup adults typically winter offshore from New York to North Carolina in waters above 7.2°C (45ºF) (NOAA Fisheries 2013). EFH for adult scup includes Indian River Bay and adjacent coastal and offshore waters in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, adults are common in Delaware Inland Bays from May through September and rare from October through December (Nelson et al. 2017).

2.3.5.3 Black Sea Bass (*Centropristus striata*)

LARVAE. The pelagic waters on the continental shelf in the Gulf of Maine south to Cape Hatteras are EFH for black sea bass larvae (NOAA Fisheries 2013). EFH for this life stage includes coastal and offshore waters in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, larvae are not present in Delaware Inland Bays (Nelson et al. 2017).

JUVENILES. EFH for juvenile black sea bass includes demersal waters over the continental shelf from the Gulf of Maine to Cape Hatteras, and coastal estuaries between Massachusetts and Virginia in the summer and south of New Jersey in the winter. After settling in coastal areas, most juveniles seek out estuarine nursery habitat, typically with high structural complexity (NOAA Fisheries 2013). EFH for juvenile black sea bass includes Indian River Bay and coastal and offshore waters in the Project area (NOAA Fisheries 2019). According to NOAA's ELMR database, juveniles are common in Delaware Inland Bays from May through November (Nelson et al. 2017).

ADULTS. EFH for adult black sea bass includes demersal waters over the continental shelf from the Gulf of Maine to Cape Hatteras. Black sea bass are found in estuaries from spring to fall. Adults typically winter offshore, south of New York to North Carolina. Adult black sea bass are typically found in temperatures above 6.1°C (43ºF). Black sea bass are strongly associated with structurally complex habitats, including sand and shell bottoms. EFH for adult black sea bass includes Indian River Bay and adjacent coastal and offshore waters in the Project area (NOAA Fisheries 2013). According to NOAA's ELMR database, adults are present, but rare in Delaware Inland Bays from May through November (Nelson et al. 2017).

2.3.6 Atlantic Highly Migratory Species

2.3.6.1 Sharks

Atlantic Angel Shark (*Squatina dumerilli*)

LARVAE (NEONATES), JUVENILES, ADULTS. EFH for Atlantic angel sharks includes the benthic habitats along the continental shelf from New Jersey to North Carolina (NOAA Fisheries 2018a). Neonates are born in the spring or early summer at depths between 18 and 27 m (59 and 89 ft) (NOAA Fisheries 2019). Angel sharks are common from southern New England to the coast of Maryland (NOAA Fisheries 2019). EFH for all life stages includes coastal and offshore waters adjacent to Indian River Bay (NOAA Fisheries 2019).

Atlantic Sharpnose Shark (*Rhizopriondon terraenovae*)

ADULTS. EFH for Atlantic sharpnose shark adults includes waters from Delaware Bay to Florida. Adults are most likely to be found in the northern part of their range during the summer. This life stage is typically found in less than 180 m (591 ft) of water (NOAA Fisheries 2019). EFH for adult Atlantic sharpnose shark includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

Blue Shark (*Prionace glauca*)

JUVENILES. EFH for juvenile blue sharks extends from Georges Bank to offshore Cape Hatteras, NC between the 25-meter isobath and the EEZ. EFH for juvenile blue sharks includes offshore waters in the Project area (NOAA Fisheries 2019).

ADULTS. EFH for adult blue sharks includes localized areas from the Georges Bank to North Carolina, and offshore areas of South Carolina, Georgia, and Florida. Blue sharks are pelagic and prefer cool waters that are 10 to 20ºC (50 to 68ºF) and more than 180 m (591 ft) deep, although habitat preferences can vary by sex (NMFS 2006). EFH for adult blue shark includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

Common Thresher Shark (*Alopias vulpinus*)

LARVAE (NEONATES), JUVENILES, ADULTS. EFH for common thresher shark neonates (larvae) includes the Georges Bank, at the offshore boundary of the U.S. EEZ, to Cape Lookout, NC. EFH also extends from Maine to offshore of Cape Ann, Massachusetts. Common thresher sharks are likely to be found in depths from the surface to 305 m (1,001 ft). Juveniles are typically found further inshore than adults (NOAA Fisheries 2018b). EFH for all life stages includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

Dusky Shark (*Carcharhinus obscurus*)

LARVAE (NEONATES). EFH for dusky shark neonates (larvae) includes offshore areas from New England to North Carolina. EFH includes areas with temperatures from 18.1 to 22.2°C (65 to 72ºF), salinities from 25 to 35 ppt, and depths from 4.3 to 15.5 m (14 to 50 ft) (NOAA Fisheries 2019). EFH for dusky shark neonates includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

JUVENILES. EFH for juvenile dusky sharks includes coastal and pelagic waters inshore of the continental shelf break from Cape Cod to Georgia. Juveniles prefer depths greater than 20 m (66 ft), and are typically found in shallower waters than adults (NOAA Fisheries 2019). EFH for juvenile dusky shark includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

ADULTS. EFH for adult dusky sharks includes coastal and pelagic waters inshore of the continental shelf break from Cape Cod to Georgia. Adults can be found in depths up to 2,000 m (6,562 ft) (NOAA Fisheries 2019). EFH for adult dusky shark includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

Sand Tiger Shark (*Carcharias taurus*)

LARVAE (NEONATES). EFH for sand tiger shark neonates (larvae) ranges from Massachusetts to Florida, including several bays and coastal sounds. Neonates are thought to be associated with mud or sand substrate, with temperatures from 19 to 25°C (66 to 77ºF), salinities from 23 to 30 ppt, and depths from 2.8 to 7 m (9 to 23 ft) in areas near Delaware Bay (NOAA Fisheries 2019). EFH for sand tiger shark neonates includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

JUVENILES. EFH for juvenile sand tiger sharks ranges from Massachusetts to New York, and from mid-New Jersey to Florida, including several bays. Juveniles are thought to be associated mud or sand substrate, with temperatures from 19 to 25°C (66 to 77ºF), salinities from 23 to 30 ppt, and depths from 2.8 to 7 m (9 to 23 ft) to in areas near Delaware Bay (NOAA Fisheries 2019). EFH for juvenile sand tiger sharks includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

ADULTS. EFH for adult sand tiger shark ranges from Delaware Bay to Florida. Adults spend 95% of their time in temperatures from 17 to 23°C (63 to 73ºF) around Delaware Bay and adjacent coastal habitat (NOAA Fisheries 2019). EFH for adult sand tiger sharks includes Indian River Bay and adjacent coastal and offshore waters in the Project area (NOAA Fisheries 2019).

Sandbar Shark (*Carcharhinus plumbeus*)

LARVAE (NEONATES). EFH for neonate (larvae) sandbar sharks includes coastal areas from New York to Florida. Neonates are associated with water temperatures from 15 to 30°C (59 to 86ºF), salinities from 15 to 35 ppt, and depths from 0.8 to 23 m (3 to 75 ft). Benthic habitat includes rocky, sand, mud, and shell sediments (NOAA Fisheries 2019). EFH for sandbar shark neonates includes Indian River Bay and adjacent coastal and offshore waters in the Project area (NOAA Fisheries 2019).

JUVENILES. EFH for juvenile sandbar sharks includes coastal areas from southern New England to Georgia. Juveniles are associated with water temperatures from 15 to 30°C (59 to 86ºF), salinities from 15 to 35 ppt, and depths from 0.8 to 23 m (3 to 75 ft). Benthic habitat includes rocky, sand, mud, and shell sediments (NOAA Fisheries 2019). EFH for sandbar shark juveniles includes Indian River Bay and adjacent coastal and offshore waters in the Project area (NOAA Fisheries 2019).

ADULTS. EFH for adult sandbar sharks includes coastal areas from southern New England to the Florida Keys, ranging from inland waters to the continental shelf break (NOAA Fisheries 2019). The sandbar shark is a bottom-dwelling, coastal-pelagic species found in inshore shallow coastal waters (2 to 55 m (7 to 180 ft)) and deep offshore waters (183 to 247 m (600 to 810 ft)) (NOAA Fisheries 2018c). EFH for adult sandbar sharks includes coastal and offshore habitats in the Project area (NOAA Fisheries 2019). The Project avoids the HAPC for sandbar shark in the nearshore area off of the Delaware coast and into Delaware Bay, which is north of the Project area.

Shortfin Mako Shark (*Isurus oxyrinchus*)

LARVAE (NEONATES), JUVENILES, ADULTS. EFH for all life stages includes pelagic habitats from the continental shelf break to the EEZ boundary from Georges Bank to Cape Cod; coastal and offshore waters between Cape Cod and North Carolina; and localized habitats adjacent to South Carolina and Georgia (NOAA Fisheries 2019). Shortfin mako is a pelagic species with circumglobal distribution throughout all warm and warm-temperate seas (NOAA Fisheries 2019). EFH for all life stages includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

Smoothhound Shark (*Mustelus canis)*

LARVAE (NEONATES), JUVENILES, ADULTS. EFH for all life stages ranges from Massachusetts to South Carolina, including estuaries and bays. Smooth dogfish can also be found on the continental shelf between southern New Jersey and Cape Hatteras, NC (NOAA Fisheries 2019). EFH for all life stages includes Indian River Bay and adjacent coastal and offshore waters in the Project area (NOAA Fisheries 2019).

Tiger Shark (Galeocerdo cuvier)

JUVENILES, ADULTS. EFH for juvenile and adult tiger shark in the Atlantic Ocean includes offshore pelagic waters from the continental shelf break to the boundary, to the Florida Keys (NOAA Fisheries 2019). EFH for this life stage includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

2.3.6.2 Tunas

Albacore Tuna (*Thunnus alalunga*)

JUVENILES. EFH for juvenile albacore tuna includes offshore pelagic areas of the Atlantic Ocean from the edge of US EEZ from Georges Bank to Cape Hatteras, NC (NOAA Fisheries 2019). EFH for this life stage includes coastal and offshore waters in the Project area (NOAA Fisheries 2019).

Bluefin Tuna (*Thunnus thynnus*)

JUVENILES. EFH for juvenile Atlantic bluefin tuna in the mid-Atlantic includes coastal and pelagic habitats of the mid-Atlantic Bight, from southern Maine to Cape Lookout, NC. Atlantic bluefin tuna juveniles are typically found in temperatures from 4 to 26°C (39 to 79°F) and depths less than 20 m (66 ft) (NOAA Fisheries 2019). EFH for this life stage includes the coastal and offshore areas adjacent to Indian River Bay (NOAA Fisheries 2019).

Skipjack Tuna (*Katsuwonus pelamis*)

JUVENILES. EFH for juvenile skipjack tuna includes coastal and offshore waters from Massachusetts to South Carolina and from Georgia to Florida, with localized abundance between South Carolina and Georgia (NOAA Fisheries 2019). All waters greater than 20 m (66 ft) deep in which juvenile skipjack tuna are found are designated as EFH. The juvenile life stage is relatively short as skipjack tuna reach maturity in their first or second year (NOAA Fisheries 2019). EFH for juvenile skipjack tuna includes offshore waters in the Project area (NOAA Fisheries 2019).

ADULTS. EFH for adult skipjack tuna includes coastal and offshore waters from Massachusetts to North Carolina, and localized areas south of North Carolina to Florida (NOAA Fisheries 2019). They inhabit waters that are 20 to 31°C (68 to 88ºF), but prefer temperatures around 27°C (81ºF) (NOAA Fisheries 2019). EFH for adult skipjack tuna includes Indian River Bay and adjacent coastal and offshore waters in the Project area (NOAA Fisheries 2019).

Yellowfin Tuna (*Thunnus albacares*)

JUVENILES. EFH for juvenile yellowfin tuna includes coastal and offshore pelagic areas of the Atlantic ocean between Georges Bank and Cape Lookout, NC (NOAA Fisheries 2019). EFH for this life stage includes offshore waters in the Project Area (NOAA Fisheries 2019).

2.3.7 Northeast Multispecies Fishery Management Plan

2.3.7.1 Atlantic Cod (*Gadus morhua*)

EGGS, LARVAE. EFH for Atlantic cod eggs and larvae includes the pelagic zone from the Gulf of Maine to the mid-Atlantic. They can also be found in the high salinity zones of some bays and estuaries, but this does not include Indian River Bay. EFH for this life stage includes coastal and offshore habitat in the Project area (NEFMC 2017).

ADULTS. EFH for adult Atlantic cod is comprised of bottom habitats with rock, pebble, or gravel substrate throughout the Gulf of Maine and Georges Bank, including the high salinity zones of some bays and estuaries. This life stage is typically found in depths from 30 to 160 m (98 to 525 ft). Adults can also be found on deeper slopes and sandy bottoms along the shore. Spawning occurs in depths less than 70 m (230 ft). EFH for this life stage includes coastal and offshore habitat in the Project area (NEFMC 2017). According to NOAA’s ELMR database, adults are not present in Delaware Inland Bays (Nelson et al. 2017).

2.3.7.2 Pollock (*Pollachius virens*)

LARVAE. EFH for pollock larvae includes the pelagic zone of estuarine and marine waters from the Gulf of Maine to Chesapeake Bay (NEFMC 2017). The Mid-Atlantic is the southern end of the species' range, and its presence is discontinous in this area. EFH for this life stage includes offshore habitat in the Project area (NEFMC 2017). According to NOAA's ELMR database, larvae are not present in Delaware Inland Bays (Nelson et al. 2017).

2.3.7.3 Red Hake (*Urophycis chuss*)

Eggs. EFH for red hake eggs includes pelagic habitat in the Gulf of Maine and Georges Bank along the inner continental shelf south to Cape Hatteras, NC, including some bays and estuaries (NEFMC 2017). Eggs are most often observed between May and November, with peaks in June and July. Water conditions generally include sea surface temperatures below 10°C (50oF) and salinity below 25 ppt (NOAA Fisheries 2013). EFH for red hake eggs includes waters within Indian River Bay and adjacent coastal and offshore waters (NEFMC 2017). According to NOAA's ELMR database, eggs are not present in Delaware Inland Bays (Nelson et al. 2017).

Larvae. EFH for red hake larvae includes pelagic habitat in the Gulf of Maine and Georges Bank along the inner continental shelf south to Cape Hatteras, NC, including some bays and estuaries (NEFMC 2017). Red hake larvae typically occur in surface temperatures below 19°C (66ºF), water depths less than 200 m (656 ft), and salinity greater than 0.5 ppt. Red hake larvae are most often observed from May through December, with peaks in September and October (NOAA Fisheries 2013). EFH for red hake larvae includes waters within Indian River Bay and adjacent coastal and offshore waters in the Project area (NEFMC 2017). According to NOAA's ELMR database, larvae are not present in Delaware Inland Bays (Nelson et al. 2017).

Juveniles. EFH for red hake juveniles includes intertidal and sub-tidal benthic habitats in the Gulf of Maine and Georges Bank along the inner continental shelf south to Cape Hatteras, NC, to a maximum depth of 80 m (262 ft), including some bays and estuaries. Juvenile red hake prefer bottom habitats providing shelter (e.g., artificial reef), like habitats with biogenic complexity or mud with biogenic depressions (NEFMC 2017). Juvenile red hake typically occur in temperatures below 16°C (61ºF), depths less than 100 m (328 ft), and salinity between 31 and 33 ppt (NOAA Fisheries 2013). EFH for red hake juveniles includes waters within Indian River Bay and adjacent coastal and offshore waters in the Project area (NEFMC 2017). According to NOAA's ELMR database, juveniles are present, but rare, in Delaware Inland Bays November through June (Nelson et al. 2017).

Adults. EFH for red hake adults includes benthic habitats in the Gulf of Maine and the outer continental shelf and slope in depths between 50 and 750 m (164 and 2,461 ft) and as shallow as 20 m (66 ft) in a number of inshore estuaries and embayments as far south as Chesapeake Bay. They are typically found in soft sediments, shell beds, or artificial reefs. In softer sediments, they are typically found in depressions. Adults are common in temperate reefs around Maryland. EFH for adult red hake includes offshore waters in the Project area (NEFMC 2017). According to NOAA's ELMR database, adults are present, but rare in the Delaware Inland Bays November through June (Nelson et al. 2017).

2.3.7.4 Silver Hake (*Merluccius bilinearis*)

EGGS. EFH for silver hake eggs includes pelagic habitat from the Gulf of Maine south to Cape May, NJ (NEFMC 2017). Eggs are observed all year, with peak occurrence from June through October. They generally occur where sea surface temperatures are below 20°C (68ºF) in water depths between 50 and 150 m (164 and 492 ft) (NOAA Fisheries 2013). EFH for silver hake eggs includes designated offshore waters in the Project area (NEFMC 2017).

LARVAE. EFH for silver hake larvae includes pelagic habitat from the Gulf of Maine south to Cape May, NJ (NEFMC 2017). Larvae are observed year-round, with peaks from July through September, and tend to occur in areas with sea surface temperatures below 20°C (68ºF) with water depth between 50 and 130 m (164 and 426 ft) (NOAA Fisheries 2013). EFH for silver hake larvae includes offshore waters in the Project area (NEFMC 2017).

2.3.7.5 Windowpane Flounder (*Scophthalmus aquosus*)

EGGS. EFH for windowpane flounder eggs includes pelagic habitats on the continental shelf from Georges Bank to Cape Hatteras, including high salinity bays and estuaries (NEFMC 2017). They are generally found where sea surface temperatures are less than 20°C (68ºF) and water depths are less than 70 m (230 ft). Windowpane flounder eggs are most often observed from February to November with peaks in May and October in the mid-Atlantic (NOAA Fisheries 2013). EFH for windowpane flounder eggs includes Indian River Bay and coastal and offshore waters in the Project area (NEFMC 2017). According to NOAA's ELMR database, eggs are common in Delaware Inland Bays in April through October and rare in November (Nelson et al. 2017).

LARVAE. EFH for windowpane flounder larvae includes pelagic habitats on the continental shelf from Georges Bank to Cape Hatteras, including high salinity bays and estuaries (NEFMC 2017). They are most often observed from February to November with peaks in May and October in the mid-Atlantic, where water conditions include sea surface temperatures less than 20°C (68ºF) and depths less than 70 m (230 ft) (NOAA Fisheries 2013). EFH for windowpane flounder larvae includes Indian River Bay and coastal and offshore waters in the Project area (NEFMC 2017). According to NOAA's ELMR database, larvae are common in the Delaware Inland Bays in April through October and rare in November (Nelson et al. 2017).

JUVENILES. EFH for juvenile windowpane flounder includes intertidal and sub-tidal benthic habitats in estuarine, coastal, or continental shelf waters from the Gulf of Maine to Florida. They are most often found in mud and sand benthic habitats to depths of 60 m (197 ft) (NEFMC 2017). They prefer temperatures below 25°C (77ºF) and salinities from 5.5 to 36 ppt (NOAA Fisheries 2013). EFH for juvenile windowpane flounder includes Indian River Bay and adjacent coastal and offshore waters in the Project area (NEFMC 2017). According to NOAA's ELMR database, juveniles are common in the Delaware Inland Bays year-round (Nelson et al. 2017).

Adults. EFH for adult windowpane flounder includes intertidal and sub-tidal benthic habitats in estuarine, coastal, or continental shelf waters from the Gulf of Maine to Cape Hatteras, NC. They are most often found on mud and sand benthic habitats to depths of 70 m (230 ft) (NEFMC 2017). They tend to occur in water temperatures below 26.8°C (80ºF) and salinities from 5.5 to 36 ppt (NOAA Fisheries 2013). EFH for adult windowpane flounder includes Indian River Bay and adjacent coastal and offshore habitat (NEFMC 2017). According to NOAA's ELMR database, adults are common in the Delaware Inland Bays year-round (Nelson et al. 2017).

Spawning Adults. EFH for adult windowpane flounder include intertidal and sub-tidal benthic habitats in estuarine, coastal, or continental shelf waters from the Gulf of Maine to Cape Hatteras, NC (NEFMC 2017). They tend to occur in water temperatures below 21°C (70ºF), depths from 1 to 75 m (3 to 246 ft), and salinity between 5.5 and 36 ppt. They are most often observed from February to December, peaking in may in the mid-Atlantic (NOAA Fisheries 2013). EFH for spawning adult windowpane flounder includes Indian River Bay and adjacent coastal and offshore habitat (NOAA Fisheries 2019). According to NOAA's ELMR database, spawning adults are common in the Delaware Inland Bays in April through October and rare in November (Nelson et al. 2017).

2.3.7.6 Witch Flounder (*Glyptocephalus cynoglossus*)

Eggs. EFH for witch flounder eggs includes pelagic habitats from the Gulf of Maine to Cape Hatteras, NC (NEFMC 2017). Eggs are found in waters with temperatures less than 13°C (55ºF) and high salinity. Witch flounder eggs are typically seen between March and October (NOAA Fisheries 2013). EFH for witch flounder eggs includes coastal and offshore waters in the Project area (NEFMC 2017).

Larvae. EFH for witch flounder larvae includes pelagic habitats from the Gulf of Maine south to Cape Hatteras, NC (NEFMC 2017). They are generally found in waters with surface temperatures below 13°C (55ºF), in deep water with high salinity. Witch flounder larvae are typically observed between March and November, with peaks between May and July (NOAA Fisheries 2013). EFH for witch flounder larvae includes coastal and offshore waters in the Project area (NEFMC 2017).

Adults. EFH for adult witch flounder includes muddy benthic habitats between 50 and 1500 m (164 and 4,921 ft). EFH for adult witch flounder includes coastal and offshore waters in the Project area (NEFMC 2017).

2.3.7.7 Yellowtail Flounder (*Limanda ferruginea*)

Eggs. EFH for yellowtail flounder eggs comprises coastal and continental shelf pelagic habitats from the Georges Bank to Delaware, including some bays and estuaries (NEFMC 2017). They are typically found in surface temperatures below 15°C (59ºF), depths from 30 to 90 m (98 to 295 ft), and salinity between 32.4 and 33.5 ppt. Yellowtail flounder eggs are most often found in the spring to summer (NOAA Fisheries 2013). EFH for yellowtail flounder eggs includes coastal and offshore waters in the Project area (NEFMC 2017).

LARVAE. EFH for yellowtail flounder larvae includes the coastal and continental shelf pelagic habitats from Georges Bank to Cape Hatteras, NC, including some bays and estuaries (NEFMC 2017). They are typically found in surface temperatures below 17°C (63°F), in depths from 10 to 90 m (33 to 295 ft), and salinities from 32.4 to 33.5 ppt. They are most often observed in spring and summer (NOAA Fisheries 2013). EFH for yellowtail flounder larvae includes coastal and offshore waters in the Project area (NEFMC 2017).

JUVENILES. EFH for juvenile yellowtail flounder includes sub-tidal benthic habitats from the Georges Bank to south of Delaware Bay. EFH for this life stage occurs on sand or muddy sand substrates from 20 to 80 m (66 to 262 ft). Young-of-the-year juveniles typically settle on the bottom of the continental shelf at depths of 40 - 70 m (131 - 230 ft) in the mid-Atlantic (NEFMC 2017). Juvenile yellowtail flounder are typically found in temperatures below 15°C (59°F) and salinity from 32.4 to 33.5 ppt (NOAA Fisheries 2013). EFH for juvenile yellowtail flounder includes offshore waters in the Project area (NEFMC 2017).

ADULTS. EFH for adult yellowtail flounder includes sub-tidal benthic habitat from the Georges Bank to south of Delaware Bay. EFH occurs in benthic substrates of sand, muddy sand, rocks, gravel or hash at depths from 25 to 90 m (82 to 295 ft) (NEFMC 2017). They are typically found in temperatures below 15°C (59°F) and salinity from 32.4 to 33.5 ppt (NOAA Fisheries 2013). EFH for adult yellowtail flounder includes offshore waters in the Project area (NEFMC 2017).

2.3.8 Atlantic Herring Fishery Management Plan

2.3.8.1 Atlantic Sea Herring (*Clupea harengus*)

JUVENILES. The intertidal and sub-tidal pelagic waters to 300 m (984 ft) in the Gulf of Maine and Georges Bank south to Cape Hatteras are EFH for juvenile Atlantic herring. They are typically found in temperatures as high as 22°C (72°F) in the mid-Atlantic. Young-of-the-year fish can tolerate brackish water, but older juveniles cannot. EFH for this life stage includes coastal and offshore waters in the Project area (NEFMC 2017; NOAA Fisheries 2017). According to NOAA's ELMR database, juveniles are present, but rare in the Delaware Inland Bays between March and August (Nelson et al. 2017).

ADULTS. EFH for adult Atlantic herring includes sub-tidal pelagic waters in the Gulf of Maine and Georges Bank south to Cape Hatteras, including some bays and estuaries. Adults overwinter in southern New England and the mid-Atlantic region. Adults are found typically in temperatures below 10°C (50°F) and depths less than 100 m (328 ft). Adults avoid low salinities. Spawning occurs in benthic habitat at depths of 5 to 90 m (16 to 295 ft). EFH for adult herring includes coastal and offshore waters in the Project area (NEFMC 2017). According to NOAA's ELMR database, adults are present, but rare, in the Delaware Inland Bays from November through May (Nelson et al. 2017).

2.3.9 Atlantic Sea Scallop Fishery Management Plan

2.3.9.1 Atlantic Sea Scallop (*Placopecten magellanicus*)

EGGS, LARVAE, JUVENILES, ADULTS. EFH for Atlantic sea scallop eggs includes the benthic zone inshore and on the continental shelf from the Gulf of Maine to Cape Hatteras, NC. EFH for Atlantic sea scallop larvae consists of both living and non-living elements of marine habitat to which spat may attach, including algae, polyps, seashells, and small rocks, inshore and on the continental shelf from the Gulf of Maine to Cape Hatteras, NC. EFH for juvenile Atlantic sea scallop includes the benthic zone of offshore waters 18 - 100 m (59 – 328 ft) deep where salinities remain above 25 ppt. As part of their maturation, juveniles attach to hard surfaces, preferably gravel. Juveniles that are no longer attached will swim around in search of food and to avoid predators, but currents exceeding 10 cm/sec (4 in/sec) inhibit their movement. Optimal survival has been observed to occur from 1.2 to 15ºC (34 to 59ºF). EFH for adult Atlantic sea scallop in the mid-Atlantic consists of the benthic zone of saline waters 45 - 75 m (148 - 246 ft) deep. They are found in shallower and deeper waters in other parts of their range from Cape Hatteras, NC to the Gulf of Maine. Survival is most successful in slow-moving (<25 cm/second) waters that are 10 to 15ºC (50 to 59ºF) where sand and gravel bottom is present (NOAA Fisheries 2019). EFH for Atlantic sea scallop includes offshore waters in the Project area (NEFMC 2017).

2.3.10 Monkfish Fishery Management Plan

2.3.10.1 Monkfish (Goosefish, *Lophius americanus*)

EGGS. Monkfish lay their eggs in a single-layered sheet known as a veil. EFH for these buoyant veils comprises pelagic habitats in inshore areas from the Gulf of Maine and Georges Bank south to Cape Hatteras (NEFMC 2017). They are generally found in waters with temperatures below 18°C (64ºF) and depths from 15 - 1,000 m (49 – 3,280 ft). They are most often observed during the months between March and September (NOAA Fisheries 2013). EFH for monkfish eggs includes coastal and offshore waters in the Project area (NEFMC 2017).

LARVAE. EFH for monkfish larvae includes the pelagic habitats in inshore areas from the Gulf of Maine and Georges Bank south to Cape Hatteras. They are generally found at depths from the surf zone to 1,500 m (4,921 ft). They are most often observed in the mid-Atlantic and between the months of March and September (NOAA Fisheries 2013; NEFMC 2017). EFH for monkfish larvae includes coastal and offshore waters in the Project area (NEFMC 2017).

2.3.11 Skate Fishery Management Plan

2.3.11.1 Clearnose Skate (*Raja eglanteria*)

JUVENILES. EFH for juvenile clearnose skate includes sub-tidal benthic habitats in coastal and inner continental shelf waters from New Jersey to Florida, including high salinity zones of some bays and estuaries. Juvenile clearnose skates are often found on mud, sand, or rocky substrates from the shoreline to 30 m (98 ft) depth. EFH for juvenile clearnose skate includes coastal and offshore waters in the Project area. EFH has also been designated in the brackish and saline zones of the Delaware Inland Bays (NEFMC 2017).

ADULTS. EFH for adult clearnose skate includes sub-tidal benthic habitats in coastal and inner continental shelf waters from New Jersey to Cape Hatteras, NC, including high salinity zones of some bays and estuaries. EFH for this life stage occurs in depths from the shoreline to 40 m (131 ft). Adult clearnose skates are often found on mud, sand, or rocky substrates. EFH for adult clearnose skate includes coastal and offshore waters in the Project area. EFH has also been designated in the brackish and saline zones of the Delaware Inland Bays (NEFMC 2017).

2.3.11.2 Little Skate (*Leucoraja erinacea*)

Juveniles. Adults. EFH for juvenile and adult little skate includes intertidal and sub-tidal benthic habitats from the Gulf of Maine to Delaware Bay, and on Georges Bank to a depth of 80 m (262 ft). EFH also includes some bays and estuaries with high salinities. They are typically found on sand, gravel, or mud substrate. EFH for juvenile and adult little skate includes coastal and offshore waters in the Project area (NEFMC 2017).

2.3.11.3 Winter Skate (*Leucoraja ocellata*)

JUVENILES, ADULTS. EFH for juvenile and adult winter skate includes sub-tidal benthic habitats from Maine to Delaware; the continental shelf in southern New England and the Mid-Atlantic; and on Georges Bank to a depth of 80 - 90 m (262 – 295 ft). The high salinity zones of some bays and estuaries are also included. They are most often found on mud, sand, or gravel benthic habitat. EFH for these life stages includes Indian River Bay and coastal waters in the Project area (NEFMC 2017).

2.3.12 Coastal Migratory Pelagics Fishery Management Plan

EFH has been designated for coastal migratory pelagic species (cobia, king mackerel, and Spanish mackerel) as the sandy shoals of capes and offshore bars, high-profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, from the Gulf Stream shoreward within the Mid-Atlantic and South Atlantic Bights. The Gulf Stream itself is designated as EFH because it provides a mechanism to disperse coastal migratory pelagic larvae. All coastal inlets and state-designated nursery habitats, including Indian River Bay, are also designated EFH for these species. For cobia, EFH also includes high salinity bays, estuaries, and seagrass beds (NOAA Fisheries 2013).

Coastal migratory species are currently managed within the jurisdiction of the South Atlantic Fisheries Management Council and are presumed rare in the Project area. Based on a review of their habitat preferences and physical and chemical characteristics of the Project area, EFH is unlikely to exist in the Project area. Brief descriptions of their life histories and ranges are presented below.

2.3.12.1 Cobia (*Rachycentron canadum*)

EGGS, LARVAE, JUVENILES, ADULTS. Cobia are commonly found in offshore waters adjacent to the mouth of the Chesapeake Bay and south to Virginia from late June through mid-August (Shaffer and Nakamura 1989). Larvae may inhabit S*argassum* beds. Juvenile cobia move inshore and inhabit coastal areas near beaches, river mouths, barrier islands, lower reaches of bays and inlets, or bays of relatively high salinities (Shaffer and Nakamura 1989). Cobia adults on the Atlantic coast occur from Virginia to Florida and in the Gulf of Mexico (SAFMC 2013b). They often congregate along reefs and around buoys, pilings, wrecks, and other stationary or floating objects. Cobia typically spawn in late summer along the southeastern U.S. (SAFMC 2013b). It is unlikely that cobia will be in the Project area as it is north of their typical range.

2.3.12.2 King mackerel (*Scomberomorus cavalla*)

EGGS, LARVAE, JUVENILES, ADULTS. King mackerel larvae have been observed in surface waters along the south Atlantic coast from May through October in surface water temperatures of 22 to 28°C (72 to 82ºF) and in a salinity range of 30 - 37 ppt (Godcharles and Murphy 1986; SAFMC 2013a). Juveniles are concentrated off the coast of the Carolinas in the spring, summer and fall and off the coast of southern Florida and Louisiana in winter (Godcharles and Murphy 1986; SAFMC 2013a). King mackerel adults range from the Gulf of Maine to Brazil; however, they are most commonly found from North Carolina southward along the West Indies and southern Florida (Bigelow and Schroeder 1953). Migratory patterns are driven heavily by water temperature, with preference for waters warmer than 20°C (68ºF) (Godcharles and Murphy 1986). They spawn in the coastal waters of the northern Gulf of Mexico and off the south Atlantic coast between April and November (Godcharles and Murphy 1986; SAFMC 2013a). Spawning typically occurs south of the Carolinas. There is no documentation of king mackerel occurring in the Project area, which is located north of the typical distribution reported for this species.

2.3.12.3 Spanish mackerel (*Scomberomorus maculatus*)

EGGS, LARVAE, JUVENILES, ADULTS. All life stages of Spanish mackerel are primarily seen in waters above 18°C (64ºF) and within a salinity range of 32 - 36 ppt (Godcharles and Murphy 1986). Spawning typically occurs from late spring to late summer along the North Carolina and Virginia coasts (SAFMC 2013b). Larvae are believed to develop in estuaries and have been observed from May through mid-September along the south Atlantic coast (Godcharles and Murphy 1986). Some juvenile Spanish mackerel use estuaries as nursery grounds, but most stay nearshore in open beach waters (Godcharles and Murphy 1986). Spanish mackerel adults may occur from the Gulf of Maine to the Yucatan Peninsula, but are considered uncommon north of Virginia (Godcharles and Murphy 1986). Spanish mackerel are not expected to occur in the Project area, which is located north of the typical distribution reported for this species.

2.4 NOAA Trust Resources

NOAA-trust resources are also included as part of the EFH and Fish and Wildlife Coordination Act consultation process (NOAA Fisheries 2022b). Trust resources include marine and estuarine fish and shellfish, endangered and threatened marine species (including diadromous fish species) and their habitats, marine mammals, turtles, coastal habitats (i.e., marshes, mangroves, coral reefs, seagrass beds), and aquatic habitats resources associated with national marine sanctuaries and marine monuments and the Great Lakes (NOAA 2022). Table 3 lists the species and habitats that may occur within the Project area.

Table 3. NOAA-Trust Resources Potentially Occurring within the Project Area

Species	Habitat Association	Atlantic Ocean	Indian River Bay
Finfish			
Alewife (*Alosa pseudoharengus*)	Pelagic	•	
American eel (*Anguilla rostrata*)	Demersal	•	•
American shad (*Alosa sapidissima*)	Pelagic	•	•
Atlantic menhaden (*Brevoortia tyrannus*)	Pelagic		•
Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)	Demersal	•	
Blueback herring (*Alosa aestivalis*)	Pelagic	•	•
Shortnose sturgeon (*Acipenser brevirostrum*)	Demersal		
Striped bass (*Morone saxatilis*)	Demersal		•
Shellfish			
Blue crab (*Callinectes sapidus*)	Demersal	•	•
Blue mussel (*Mytilus edulis*)	Benthic	•	•
Eastern oyster (*Crassostrea virginica*)	Benthic	•	•
Horseshoe crab (*Limulus polyphemus*)	Benthic	•	•
Quahog (*Mercenaria mercenaria*)	Benthic	•	•
Soft-shell clam (*Mya arenaria*)	Benthic	•	•
Cetaceans			
North Atlantic right whale (*Eubaelena glacialis*)	Pelagic	•	

Table 3. NOAA-Trust Resources Potentially Occurring within the Project Area

Species	Habitat Association	Atlantic Ocean	Indian River Bay
Fin whale (*Balaenoptera physalus*)	Pelagic	•	
Humpback whale (*Megaptera novaeangilae*)	Pelagic	•	
Minke whale (*Balaenoptera acutorostrata*)	Pelagic	•	
Sei whale (*Balaenoptera borealis*)	Pelagic	•	
Blue whale (*Balaenoptera musculus*)	Pelagic	•	
Atlantic spotted dolphin (*Stenella frontalis*)	Pelagic	•	
Pantropical spotted dolphin (*S. attenuata*)	Pelagic	•	
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Pelagic	•	
Bottlenose dolphin (*Tursiops truncatus*)	Pelagic	•	
Harbor porpoise (*Phocoena phocoena*)	Pelagic	•	
Pilot whales (*Globicephala* sp.)	Pelagic	•	
Risso's dolphin (*Grampus griseus*)	Pelagic	•	
Short-beaked common dolphin (*Delphinus delphis*)	Pelagic	•	
Sperm whale (*Physeter macrocephalus*)	Pelagic	•	
Pinnipeds			
Harbor seal (*Phoca vitulina*)	Pelagic	•	
Gray seal (*Halichoerus grypus*)	Pelagic		
Sea Turtles			
Loggerhead Turtle (*Caretta caretta*)	Pelagic	•	
Leatherback Turtle (*Demochelys coriacea*)	Pelagic	•	
Green Turtle (*Chelonia mydas*)	Pelagic	•	
Kemp's Ridley Turtle (*Lepidochelys kempii*)	Pelagic	•	
Hawksbill Turtle (*Eretmochelys imbricata*)	Pelagic	•	
Habitats			
Seagrass beds (*Ruppia maritima*, *Zostera marina*)	N/A		•
References: NOAA 2022a, NOAA Fisheries 2022b.			

2.5 Habitat Mapping Approach

2.5.1 Lease Area and Offshore Export Cable Corridors

Habitat mapping for the Offshore Project area was primarily based on the results from acoustic survey and benthic sampling programs conducted in 2021 (and extending into 2022 for the acoustic survey). The results of the fully processed acoustic mapping and targeted seafloor sampling were used to produce final data products that include both characterization and delineation of benthic habitat according to the NOAA Fisheries-modified Coastal and Marine Ecological Classification System (NMFS-modified CMECS) taxonomic framework identified in GARFO's March 29, 2021 "Updated Recommendations for Mapping Fish Habitat."

Acoustic data sources used include mosaics of multibeam echosounder (MBES) bathymetry and sidescan sonar collected in 2021, 2022, and 2023 (COP Appendix II-A1, Appendix II-A2, and Appendix II-A8). Additionally, derived data products used to support habitat mapping include bathymetric contours, reflectivity, interpreted seafloor features, and sidescan sonar targets. The acoustic mosaics and derived data were of similar extent, providing coverage for all available surveyed portions of the Offshore Project area.

Acoustic backscatter mapping was also processed from the MBES data for the Lease area (Figure 4), as well as the Offshore Export Cable Corridors (i.e., a 350-m corridor). The acoustic backscatter data were used to complement sidescan sonar in the interpretation of benthic habitat features (Figure 5).

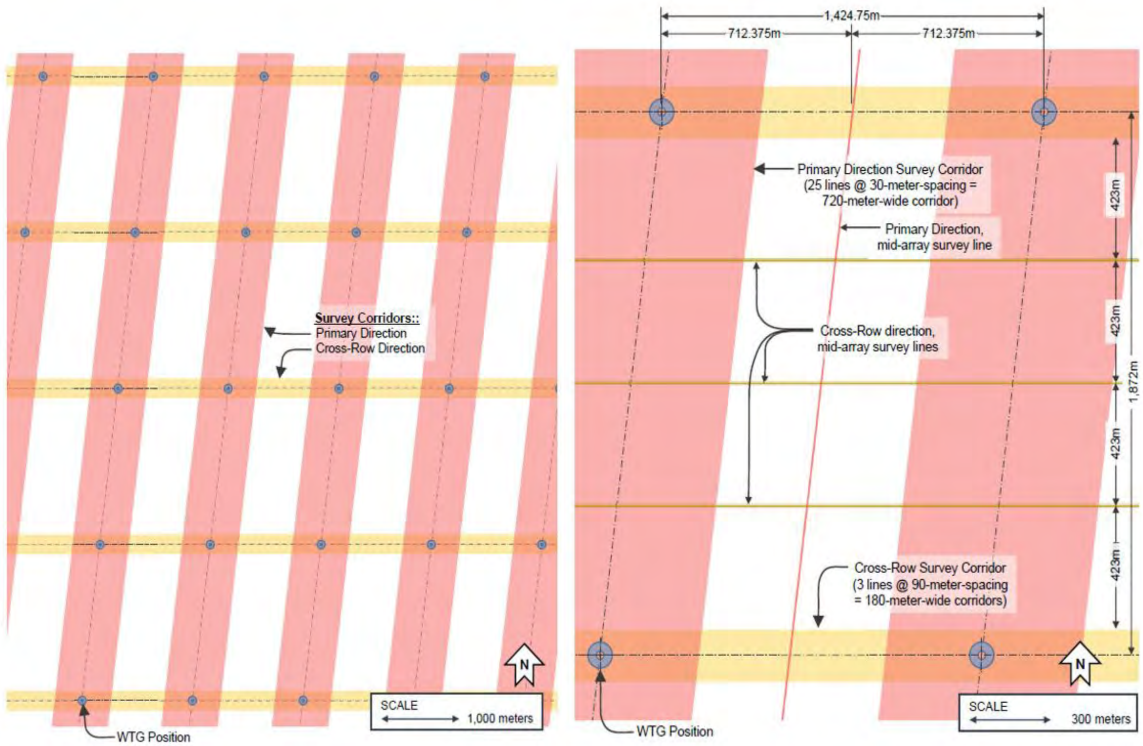

Figure 4. Tartan-Pattern Survey Corridors

Depiction of the tartan-pattern survey corridors. The left panel shows the primary direction and the cross-row direction for the survey. The right panel shows the survey corridors and tie-lines with spacing.

Characterizations of the collected grab samples and seafloor imagery are provided in the Lease Area and Offshore Export Cable Corridors Benthic Report, 2021 (see Section 2.2.1.3.1; COP Appendix II-D4) and the Indian River Bay Benthic Report 2022 (see Section 2.2.1.3.2; COP Appendix II-D5). This includes both biological data and NMFS-modified CMECS classifications for each benthic grab and imagery transect. Additionally, Appendix II-D4 also includes a description of the selection process used to identify sampling locations for the benthic grab sample and imagery collection.

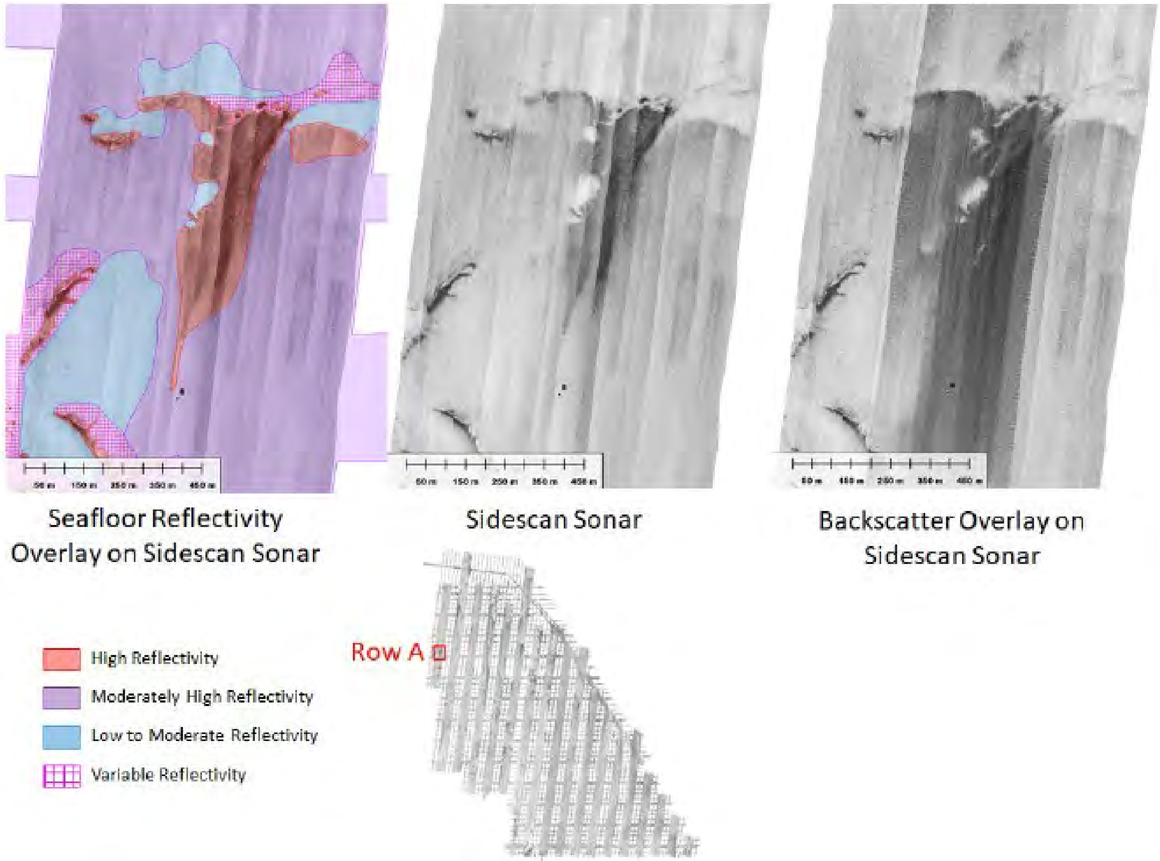

Figure 55. Sidescan Sonar and Acoustic Backscatter Mapping Comparison

Acoustic backscatter overlay (right panel) demonstrates similarity with the benthic features identified in the low frequency sidescan sonar mosaic (center panel). Reflectivity overlay provided for context (left panel).

2.5.1.1 Classification of Benthic Habitat

The first step in delineating habitat polygons was to compare NMFS-modified CMECS substrate group classifications from benthic sampling with relative reflectivity polygons mapped at a 1:5,000 scale. Where changes in reflectivity coincided with observed differences in the benthic sample or imagery classifications, habitat polygons were assigned to the respective NMFS-modified CMECS substrate group and generally aligned with reflectivity boundaries (Figure 6). Seafloor reflectivities were classified into six categories based on relative acoustic reflectivity, including low, moderate, moderately high 1, moderately high 2, high, and variable (see COP Appendix II-A1 and Appendix II-A2 for details). In general, coarse unconsolidated substrates (e.g., gravel, shell hash) were associated with high reflectivities while fine unconsolidated substrates (e.g., sand) were associated with other reflectivity categories. However, in cases where changes in reflectivity did not appear to coincide with observed benthic sample or imagery transects results, habitat polygon boundaries were allowed to vary from reflectivity polygon boundaries.

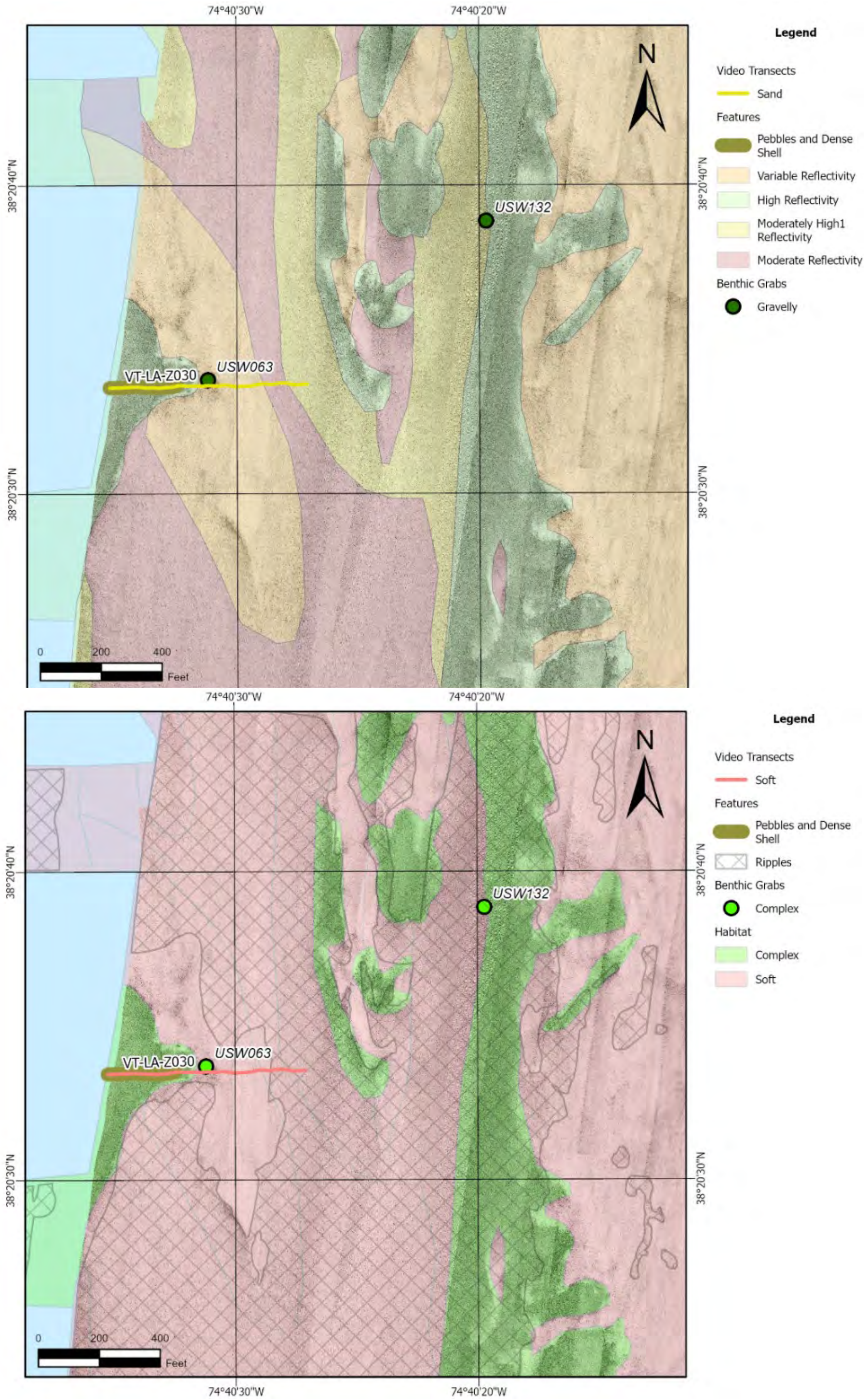

Figure 6. Integration of Acoustic, Benthic Grab, Benthic Imagery, and Derived Data to Create Habitat Maps

High reflectivity returns correspond with pebble/granule and dense shell (shell hash) observed in the benthic grabs and along the benthic imagery transect (top panel). Remaining reflectivity categories align with sand observed along the benthic imagery transect.

Once this process was complete, these initial substrate group classifications were then further refined and expanded beyond the extent of the original 1:5,000 scale maps using the MBES bathymetry and sidescan sonar mosaics, descriptions of high relief targets from the sidescan sonar mosaics, and the derived geophysical seafloor mapping products, such as areas of large clasts (cobble and boulder). These classifications were then checked against the acoustic backscatter data to confirm.

Finally, benthic features interpreted and delineated from the geophysical seafloor mapping, including sand ripples, megaripples, and sand waves (inclusive of sand ridges and certain irregular seafloor areas) were imported directly into the habitat maps as overlays.

Mapping was completed in accordance with minimum mapping units and map scales provided in GARFO's March 29, 2021 "Updated Recommendations for Mapping Fish Habitat." Consequently, the minimum mapping unit for complex habitat was 2,000 m^2. Additionally, landscape scale overview maps of mapped habitat features were developed at 1:25,000 scale while complex habitats were mapped at a larger scale (1:5,000) to provide a greater level of detail. Maps showing this habitat classification can be found in Attachment A.

Some areas originally mapped as complex habitats (shown in Attachment A), including those identified as gravelly or gravel mix substrate groups, were later reclassified and remapped as soft bottom habitats (Attachment B and Attachment C). The reason for this reclassification was the apparent lack of differentiation between the macrofaunal communities observed in gravel mixes/gravelly substrates compared to sand substrates, as originally classified using the strict definitions in the NMFS-modified CMECS taxonomic framework.

Benthic infaunal and video transect data collected during the 2021 benthic survey of the Lease area and Offshore Export Cable Corridors suggest that benthic habitat in these areas is likely to support a similar biological assemblage whether the substrate is sand, gravelly, or gravel mix, particularly if the following are true:

- Gravel is not dominant. By definition, this includes all gravelly substrates, which contain less than 30% gravel. However, this also applies to some gravel mixes.
- The maximum grain size is granule or smaller (i.e., <4 mm [0.16 in]).

Macrofaunal assemblages found in the majority of fine and coarse unconsolidated substrate samples were highly similar, as supported by multivariate analysis of the benthic infaunal data. The non-metric multidimensional scaling (nMDS) ordination presented in Figure 7 demonstrates the large degree of overlap between the infaunal community composition of sand and coarser substrates.

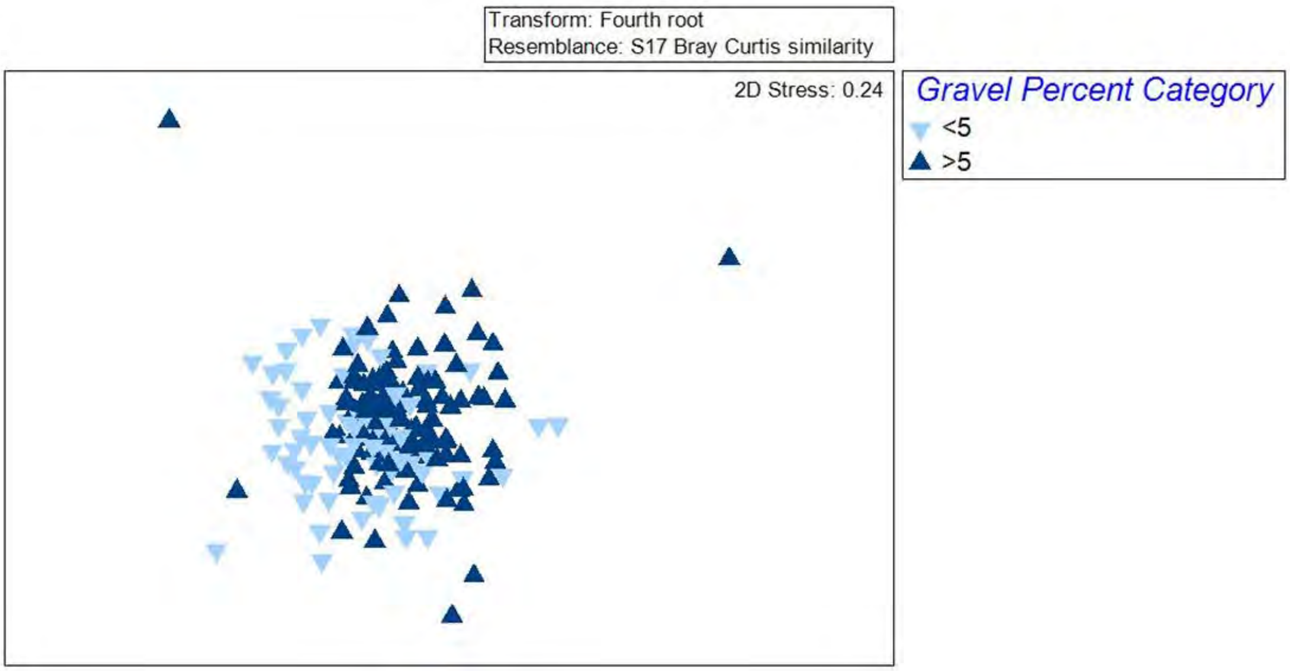

Figure 7. nMDS Ordination of Benthic Community Composition by Gravel Percentage

Note high degree of overlap in the ordination between infaunal composition of fine (<5% gravel) and coarse (≥ 5% gravel) unconsolidated substrates in the central cluster.

Video transect observations also support the conclusion that macrofaunal assemblages were similar in fine and coarse unconsolidated substrate habitats. Sessile or encrusting epifauna were absent from most of the transect lengths located in gravelly substrates or where granules were the predominant gravel type. Additionally, northern sea robin (*Prionotus carolinus*), which prefers soft bottom habitats, was one of the most frequently observed fish in these areas, while black sea bass (*Centropristis striata*) and other species that prefer structured habitats were primarily observed outside of these areas.

Maps showing the revised classification can be found in Attachment B.

2.5.1.2 Results

Overall, benthic habitat in the Offshore Project area was dominated by soft bottom habitat (Table 4, Attachment B). Soft bottom habitat consisted of sand; no muddy sands, sandy muds, or muds were observed. As indicated previously in the description of the habitat mapping approach, soft bottom habitat also included some areas of gravelly and gravel mix substrate groups.

Contiguous areas of complex habitat were the second most prevalent habitat characterization mapped in the Offshore Project area (Table 4 and Attachment B). Complex habitats primarily consisted of gravel with the pebble/granule substrate subgroup dominant. Some complex habitats also contained a high enough fraction of shell to be classified as shell hash.

Heterogeneous complex habitat areas were less common in the Offshore Project area overall (Table 4 and Attachment B), although they were most extensive in Offshore Export Cable Corridor 2. These habitats primarily consisted of areas with isolated to scattered boulders or cobbles embedded within soft bottom habitats.

Large grained complex habitat was exceptionally rare in most of the Offshore Project area; four areas greater than the minimum mapping unit of 2,000 m^2 were observed. The most prominent area was mapped in Offshore Export Cable Corridor 2 and consists of a broken linear feature that runs along an approximately west-northwest to east-southeast axis just outside of Delaware state waters (Maps 11 to 13 of Attachment B). This area of large grained and heterogeneous complex habitat is also the only portion of the Project area that was observed to include a megaclast (i.e., boulder greater than 4 m in diameter). Additionally, landscape scale overview maps of mapped habitat features were developed at 1:25,000 scale while complex habitats were mapped at a larger scale (1:5,000) to provide a greater level of detail.

Table 4. Summary of Habitats Mapped in the Offshore Project Area

Characterization*	Entire Offshore Project Area		Lease Area		Common Offshore Export Cable Corridor		Offshore Export Cable Corridor 1		Offshore Export Cable Corridor 2	
	Area (km^2)	Area (%)	Area (km^2)	Area (%)	Area (km^2)	Area (%)	Area (km^2)	Area (%)	Area (km^2)	Area (%)
Soft	250.98	80.6	226.99	84.4	13.06	71.9	5.29	60.1	5.63	36.5
Complex	1.28	0.41	0.80	0.30	0.25	1.36	0.23	2.63	0.00	0.00
Heterogeneous Complex	58.90	18.92	41.00	15.3	4.86	26.7	3.28	37.2	9.77	63.3
Large Grained Complex	0.07	0.02	0.03	0.0	0.00	0.00	0.00	0.03	0.03	0.20
Total	**311.22**	**100**	**268.82**	**100**	**18.17**	**100**	**8.80**	**100**	**15.43**	**100**

*As defined in GARFO's March 29, 2021 "Updated Recommendations for Mapping Fish Habitat."

Benthic Bedform Features					
Characterization*	Entire Offshore Project Area	Lease Area	Common Offshore Export Cable Corridor	Offshore Export Cable Corridor 1	Offshore Export Cable Corridor 2
	Area (km2)	Area (km2)	Area (km2)	Area (km2)	Area (km2)
Sand Ripples	256.82	231.25	12.47	5.79	7.32
Sand Waves Dune Field	7.93	5.48	1.22	0.526	0.705
Dunes	0.114	0.022	0.031	0.002	0.058
Amalgamated Sand Ridges	57.04	56.06	0.981	0	0
Minor Sand Ridges	12.42	6.22	1.22	2.17	2.81
Major Sand Ridges	51.63	49.51	2.11	0	0
Irregular Seafloor	22.49	21.97	0.524	0	0
Megaripples	0.123	0.116	0	0.007	0

Benthic features (sand bedforms) were observed over a large portion of the Offshore Project area and in each of the Project component areas (Table 4 and Attachment B). Of these, the most widespread benthic feature was sand ripples. Although most prevalent in the Lease area, sand ripples were commonly observed within each of the Project component areas. Sand waves were also present but confined to the western portion of the Lease area, the central and western Common Offshore Export Cable Corridor, and portions of Offshore Export Cable Corridor 1 and Offshore Export Cable Corridor 2 located near or within Delaware state waters. Sand ridges (sand waves with wavelength greater than 250 m [820 ft], height greater than 2 m [6.6 ft]) were also present in the Offshore Project area. Minor sand ridges were present along the western side of the Lease area and portions of the Offshore Export Cable Corridors. Major sand ridges were present in the southern portion of the Lease area and a small portion of the Common Offshore Export Corridor. Amalgamated sand ridges were present along the western side of the Lease area and extended into the Common Offshore Export Cable Corridor. Irregular seafloor areas with prevalent erosional processes and/or sediment transport were present near and along the southern margins of the Lease area. These irregular seafloor areas can also contain mobile seafloor features (including sand waves or sand dunes). Megaripples were the least widespread benthic feature in the Offshore Project area, confined to the far southeastern corner of the Lease area.

Based on the assessment of the biology observed in the benthic habitats located in the Offshore Project area, approximately 49.3 km^2 were reclassified from the NMFS-modified CMECS classification of heterogenous complex to soft bottom habitat (Figure 7). Additionally, nearshore areas surveyed in 2022 have been added to the habitat maps. Attachment C includes habitat maps showing these areas at 1:25,000 scale.

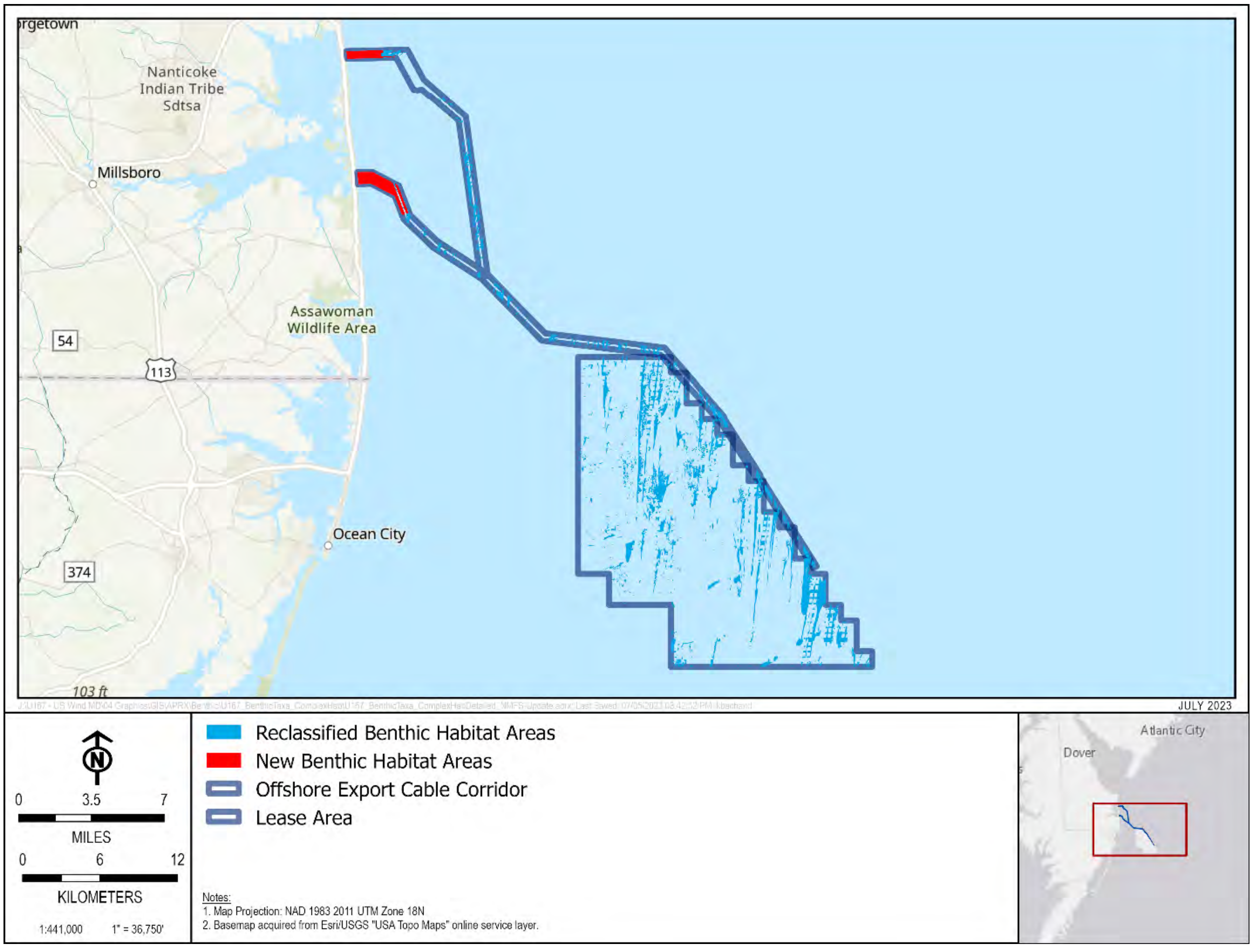

Figure 8. Benthic Habitat Areas with Revised Classifications

2.5.2 Indian River Bay – Onshore Export Cable Corridors

Habitat mapping for Indian River Bay was based on the results of the acoustic survey completed by ST Hudson Engineers, Inc. and the benthic sampling program completed by TRC and ST Hudson Engineers, Inc. in 2022 (COP Appendix II-D5). Onshore Export Cable Corridor 1 encompasses a large portion of Indian River Bay for the proposed cable corridor from the proposed landing location at 3R'S Beach in Delaware Seashore State Park through the Bay to the point of interconnection (POI) at Indian River Substation in Delaware. Potential routes for the 4 cables have been identified within Onshore Export Cable Corridor 1. These potential cable alignments are shown in Figure 8 as Onshore Export Cable North Corridor, Onshore Export Cable South Corridor, and Onshore Export Cable Common Corridor.

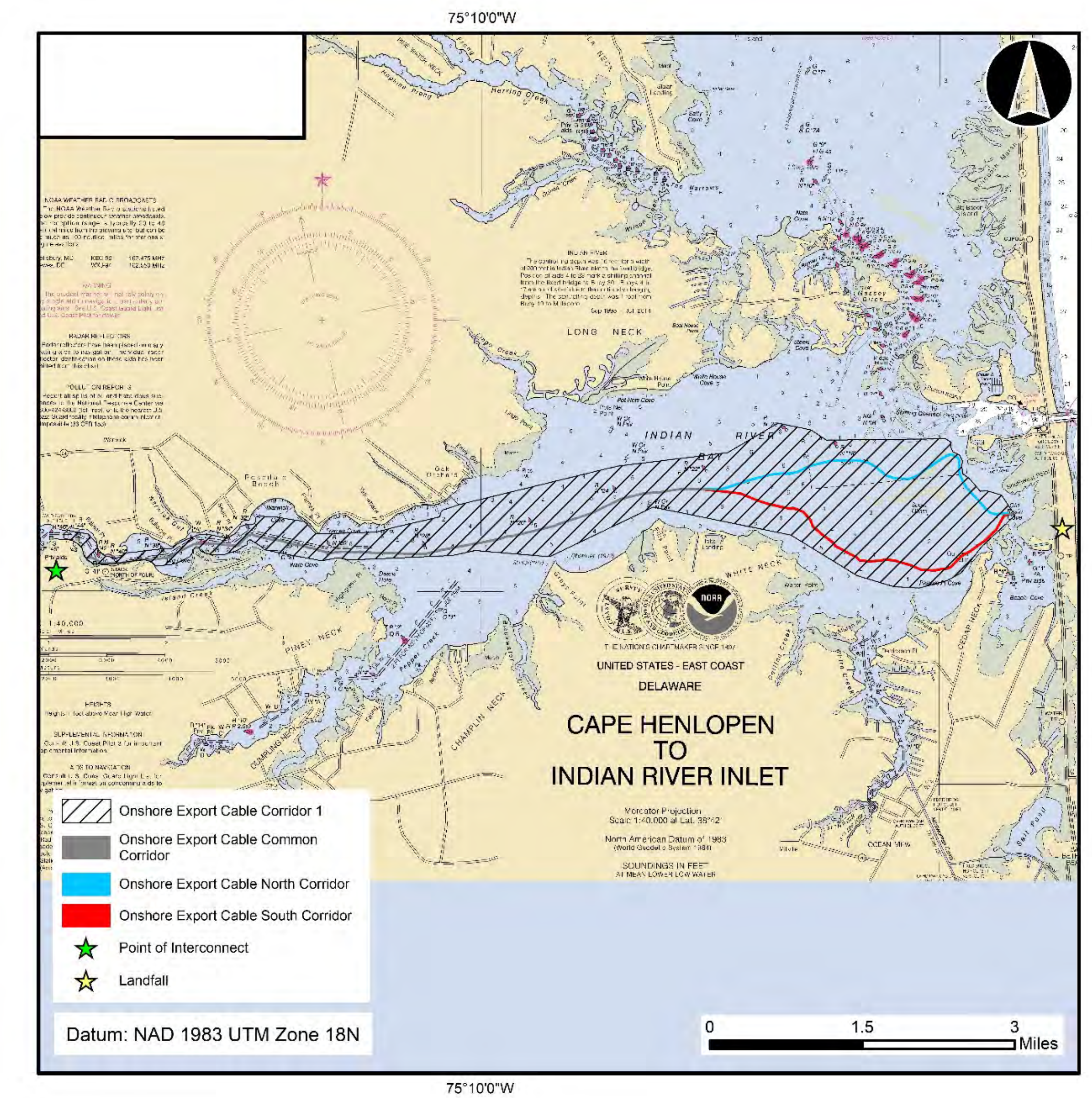

Figure 9. Onshore Export Cable Corridor 1

The results of the fully processed acoustic mapping and benthic sampling were used to produce final data products that include both characterization and delineation of benthic habitat according to the NOAA Fisheries-modified Coastal and Marine Ecological Classification System (NMFS-modified CMECS) taxonomic framework identified in GARFO's March 29, 2021 "Updated Recommendations for Mapping Fish Habitat."

Acoustic data sources used in the habitat mapping process include mosaics of multibeam echosounder (MBES) bathymetry, backscatter, and sidescan sonar collected. Additionally, derived data products used to support habitat mapping include bathymetric contours.

Characterizations of the collected grab samples and seafloor imagery are provided in the Onshore Export Cable Corridors Benthic Report, 2022 (COP Appendix II-D5). This includes both biological data and NMFS-modified CMECS classifications for each benthic grab. Additionally, the Onshore Export Cable Corridors Benthic Report, 2022 also includes a description of the selection process used to identify sampling locations for the benthic grab sample collection. Due to poor visibility in Indian River Bay, no benthic imagery was collected as part of the benthic survey effort.

Given the reduced survey area and more homogeneous benthic habitats in Indian River Bay, as compared to offshore portions of the Project, NMFS-modified CMECS substrate group classifications from benthic sampling were used directly with the MBES bathymetry, backscatter, and sidescan sonar mosaics to map habitats and benthic feature overlays (including sand ripples and waves).

Mapping was completed in accordance with minimum mapping units and map scales provided in GARFO's March 29, 2021 "Updated Recommendations for Mapping Fish Habitat." Consequently, the minimum mapping unit for complex habitat was 2,000 m^2.

Table 5. Summary of Habitats Mapped in the Onshore Project Area

Characterization*	Entire Onshore Project Area		Onshore Export Cable Common Corridor		Onshore Export Cable North Corridor		Onshore Export Cable South Corridor	
	Area (km^2)	%	Area (km^2)	%	Area (km^2)	%	Area (km^2)	%
Soft	12.83	100	6.02	100	3.00	100	3.81	100
Complex	0	0	0	0	0	0	0	0
Heterogeneous Complex	0	0	0	0	0	0	0	0
Large Grained Complex	0	0	0	0	0	0	0	0
Total	**12.83**	**100**	**6.02**	**100**	**3.00**	**100**	**3.81**	**100**

<u>**Results**</u>

Overall, benthic habitat in the Onshore Export Cable Corridors was dominated by soft bottom habitat, which covered the entirety of the approximately 13 km^2 mapped (Table 5 and Attachment A). Soft bottom habitat consisted of sand, muddy sand, sandy mud, and mud. Hard bottom, biogenic, and submerged aquatic vegetation habitats were not observed in the Onshore Export Cable Corridors. Therefore, no areas of complex habitat, heterogeneous complex habitat, or large grained habitat were mapped.

3.0 Assessment of Potential Impacts

3.1 Potential Construction Impacts

3.1.1 Coastal and Offshore Ocean EFH

Because the Project includes the installation of 121 monopile-supported offshore Wind Turbine Generators (WTGs), pile-supported Offshore Substations (OSSs) and a pile supported meteorological tower in the Lease Area in this designated area of the Outer Continental Shelf (OCS), along with buried submarine export cables in the Atlantic Ocean and Indian River Bay, impacts to EFH and EFH species in this Project area are expected to be temporary and localized. In addition, applicable fisheries Time of Year restrictions (ToY) imposed by permitting agencies will be followed to avoid or minimize potential Project impacts on EFH and water quality. The use of offshore monopile foundation systems, low impact jet plow embedment technology, and HDD shoreline transition methods will all serve to minimize direct seabed and associated EFH impacts.

Although the majority of the offshore monopile structures and offshore export cables would be located in the coastal and offshore ocean environments where EFH is shown to be more monotypical, impacts to the nearshore and estuarine EFH may be more sensitive to these acute total suspended sediments (TSS) exposure events than in offshore deeper ocean environments. This may be due to the increased species diversity and abundance of fishery resources for coastal and estuarine species associated with their respective in-shore seasonal life stage habitats. However, consultation regarding potential ToY restrictions, the use of low impact installation methodologies, and the relatively localized areas of impacts, combined with anticipated rapid recovery of the benthic profile of areas of temporary seabed disturbance, minimal short- and long-term adverse impacts to EFH conditions within the Project area is expected. In addition, due to relatively high ambient concentrations of TSS in the Indian River Bay/Estuary, likely due to natural river discharge, the ocean inlet dynamics present at the Indian River Bay inlet, consistent with the dynamics of any ocean inlet, further promote rapid benthic bed and habitat/food source recovery for any species of concern – shellfish or finfish.

For Project effects related to riprap rock or other seabed scour protection measures used at the water/seafloor interface to protect the monopile foundation, the loss of monotypical sandy seafloor

EFH conditions will improve EFH at these locations by presenting a more diverse benthic habitat condition than what previously existed. The seabed habitat would provide deep water seabed habitat as well as rocky interstitial habitat created by the scour aprons. This diversification of the seabed habitat is beneficial to maintaining species abundance and diversity within the wind farm areas (Langhamer 2012).

3.1.2 Impacts to Estuarine EFH

Historical records of finfish and shellfish population densities in Indian River Bay supports its value as limited for commercial fisheries due largely to mobile bed and inlet sediment transport dynamics as well as water quality conditions due to estuarine circulation patterns found in the Bay. However, as a typical Atlantic coastal plain estuary, Indian River Bay EFH supports a variety of seasonal, migratory, and indigenous fish species. These species utilize the estuary and barrier beach nearshore areas to serve as life cycle habitat due to the sheltered, low-salinity environment of this coastal area and estuary at some stage of their life cycle, often including egg, larval, and spawning life stages. Diverse or seasonal changes in the estuarine benthic substrate in Indian River Bay can facilitate the movement of aquatic organisms between nursery and foraging grounds and other import life-cycle microhabitats. Shallow, sunlit banks allow aquatic vegetation to grow along the estuary's shoreline, while deeper tidal pools and creeks provide refuge from warm water temperatures and predators.

The Project's potential impacts to estuarine EFH are also expected to be temporary and localized within the narrow footprint of the jet plow embedment device. Fish that otherwise do not avoid the Project area may be temporarily exposed to higher levels of TSS associated with the suspended sediment generated by the jet plow as it moves along the seabed or bay bottom. It is not anticipated that this temporary duration (days) of TSS exposure would have long-term or population-level impacts given construction methodologies and the likelihood this work would take place outside of sensitive fish spawning and migration seasons.

Loss of epibenthos in Indian River Bay is expected during jet plow embedment operations for the export cable installation. However, rapid recolonization of the seabed habitat is expected given existing rates of natural sedimentation nearshore and offshore and relative mobility of the seabed. Many species (finfish/shellfish) that utilize the Indian River Bay estuary are already accommodated to mobile bed conditions and high TSS exposure during spring freshets. The temporary TSS generated by the jet plow in Indian River Bay would be expected to be within the range of natural variability that the estuary and EFH species already experience on a year to year or seasonal basis.

Foraging finfish and crustaceans may experience a temporary reduction in benthic resource food supply that would rapidly recover over a time scale estimate of days or weeks depending on the time of year of installation. Onshore Export Cable Corridor 1 in Indian River Bay crosses some previously mapped low to the medium-density hard clam (*Mercenaria mercenaria*) beds located in the lower estuary near the Indian River Bay Inlet (Bott and Wong 2012). The Indian River Bay

Shellfish Density Survey Report (COP Appendix II-D5, Attachment C) completed in 2022 documented hard clams at similar densities. However, hard clam occurrence was limited to 13% of the sampled locations, which suggests that these shellfish beds in Indian River Bay may be patchy in distribution. Suspended sediments caused by the jet plow are expected to redeposit on the bay bottom within a few days or weeks. Hard clams and other benthic species utilizing this EFH have the ability to recolonize the disturbed area relatively quickly. The use of low-impact jet plow embedment technology to install the submarine cables beneath the present bottom will minimize the area and volume of temporary seabed sediment disturbance compared to other available technologies like dredging or plowing.

Seabed sediment disturbance by Project construction activities can also release seabed contaminants into the adjacent water column. This relates to bulk sediment quality samples and vibracore testing samples along the proposed cable area corridor in the offshore, coastal nearshore and Indian River Bay estuary environments. Sediment cores taken to the depth of planned jet plow embedment (1.5-2m) were collected along the length of Onshore Export Cable Corridor 1 in the fall of 2016 and 2017.

Of the samples analyzed from the sixteen (16) vibracores collected in Indian River Bay in 2016 and 2017 along Onshore Export Cable Corridor 1, fourteen (14) of these samples exceeded a few of DNREC's EMS Screening Levels (DNREC 2018). Thirteen (13) samples collected in Indian River Bay, representing all but two (2) of the sampling locations, exceeded the sediment quality screening levels for the metals arsenic and nickel. One sediment sample, located 1 nautical mile offshore, exceeded the screening levels for the polycyclic aromatic hydrocarbons (PAHs) naphthalene and acenaphthene (COP Appendix II-A7).

Because the same two heavy metals (arsenic and nickel) are present in relatively low concentrations in surface sediments throughout the Indian River Bay estuary, much of the EFH and EFH species that regularly utilize the Bay for life cycle habitat are likely to have already acclimated to these concentrations and surrounding seabed sediment quality conditions. Alternative cable installation methods may be required in some locations due to the dynamic water channel and variable water depths in Indian River Bay. However, with the use of jet plow embedment, the overall volume of sediment disturbed and injected into the water column is minimal in either dissolved or solid form, and is expected to quickly resettle back into the jetted trench within several tidal cycles or within a sediment transport season. Sediment dispersion models completed for the jetting operations to predict elevated near bottom TSS concentrations shows that 7,270 mg/l of suspended sediments are predicted to settle out and be re-deposited back in the trench or the adjacent seabed in less than 24 hours. Refer to Appendix II-B1, Indian River Bay Sediment Transport Memorandum for further detail. The Indian River Bay sediment transport information will be updated following the completion of the 2022 surveys.

Relatively low concentrations of contaminants of concern were found within the jet plow embedment sediment profile along Onshore Export Cable Corridor 1. Modeling predicts that only about 30% of fluidized trench sediments could exit the vertical limits of the trench, and considering the vigorous exchange of seawater and river flow that presently exists in Indian River Bay, any acute and limited TSS exposure event caused by the jet plow would result only in temporary and localized impacts to directly impacted EFH with anticipated rapid recolonization and seabed profile recovery post-jetting in a very short period of time (a season or two).

3.1.3 Impacts to Marine EFH

3.1.3.1 Sedimentation and TSS

Installing and burying the offshore export cables and inter-array cables will also create an acute TSS exposure event that is predicted to be localized and temporary. Due to the predominant sand-sized nature of seabed sediments in the offshore environment, water column TSS exposure is expected to be minimum and rapidly settle back inside the jetted trench or deposited on the narrow flanks of the trench cut. Similar experience has shown that pelagic or demersal fish tend to avoid the noise generated by the hydraulically operated jet plow as it moves slowly along the seabed while it embeds the cable systems 1.5-3m below the present bottom. It is anticipated that avoidance responses to noise and other aspects of construction activities would lead most of these fish species away from the jetting device and localized turbidity plume. For eggs, larvae, and any juvenile fish that may not be able to move away from the construction areas, it is expected this temporary and low level TSS exposure would not result in any long-term habitat or population-level adverse impacts. It should also be recognized the Project compliance with agency-imposed ToY restrictions on certain construction activities will further reduce or minimize potential EFH and fisheries impacts.

The EFH analysis also shows there are no EFH species that are endemic to the Project area on a year-round basis. Most species utilizing the offshore benthic environment are either foraging or transitory such that construction activities will not disrupt species use of EFH in the surrounding areas in supporting other life-cycle stages of that particular species. The use of jet plow embedment technology to install planned submarine cables will also serve to minimize seabed sediment disturbance compared to other available technologies such as dredging or seabed surface displacement plowing. Given the known physical and geological oceanographic conditions of offshore Project areas, a rapid recovery and recolonization of temporarily disturbed EFH designated seabed areas is expected.

For Project effects related to riprap rock or other seabed scour protection measures used at the water/seafloor interface to protect the monopile foundation, the loss of monotypical sandy seafloor EFH conditions will improve EFH at these locations by presenting a more diverse benthic habitat condition than what previously existed. The seabed habitat would provide deep water seabed habitat as well as rocky interstitial habitat created by the scour aprons. Experience has shown that this diversification of the seabed habitat is beneficial to maintaining species abundance and diversity within the wind farm areas.

3.1.3.2 Effect of Sediment Contaminants

In the fall of 2016 and 2017, three (3)-meter deep vibracores were collected along the length of the formerly planned offshore export cable route from the Lease area to the planned shoreline and onshore cable landfall locations. Of the six (6) vibracore sediment cores taken, only one (1) sediment core sample exceeded published DNREC's EMS Screening Levels (DNREC 2018). However, the results for this outlier sample reflect somewhat of an anomaly . Additionally, the use of jet plow embedment technology to install planned submarine cables will also serve to minimize seabed sediment disturbance compared to other available technologies such as dredging or seabed surface displacement plowing. Given the known physical and geological oceanographic conditions of offshore Project areas, a rapid deposition of the disturbed sediments in adjacent areas is anticipated, which would minimize the movement of sediment contaminants.

3.1.3.3 Effects of Accidental Hazardous Material Spill

Although it is highly unlikely given the strict operating guidelines and protocols for offshore marine construction activities as well as USCG vessel safety operation rules and regulations, accidental spills of oil or hazardous material may occur. An incidental spill of a hazardous material in the water or on the seabed would be immediately contained and mitigated in accordance with US Wind's Oil Spill Response Plan and vessel operation health and safety requirements.

If an accidental release of a hazardous material did occur, it would likely be water surface oriented and not water column oriented. This would result in minimal or no impacts to seabed EFH but may restrict or inhibit pelagic fisheries use or transit of this impacted area.

An Oil Spill Response Plan (Appendix I-A) will be implemented to avoid or minimize the likelihood and impact of an accidental release of oil or hazardous materials to the ocean or estuarine environments.

3.1.3.4 Effects of Possible Bentonite Release

Because low impact HDD cable conduit installation procedures will be used to facilitate shoreline landfall transition of the subsea cable system, drilling muds and fluids will be generated at the shoreline area and along the HDD conduits nearshore horizontal alignment terminating at its offshore exit hole to accept the subsea cable pull to its upland transition vault. Drilling fluids are typically a mixture of fat clays (bentonite) and water that help to keep downhole pressure to prevent the drill hole from collapsing. A comprehensive drilling fluid monitoring plan will be employed throughout the HDD drilling and conduit installation process. Given the local shoreline and nearshore subsurface geological conditions and with proper drill site monitoring, a "frack out" or fluid plumes associated with HDD drilling operations are not expected to occur. If a breakout were to occur, it would be identified quickly, and proper remedial actions will go into place to stop any further leakage using various HDD drilling methodologies. A full HDD Drilling Monitoring Plan will be prepared and approved by agencies prior to construction.

3.1.3.5 Sound Impacts

Pile driving and foundation/scour protection work activities for WTG and OSS monopile foundations in the offshore Lease area will likely produce sub-aerial and sub-sea surface sound impacts that could affect EFH fisheries and benthic species. The fundamental mitigation EFH measure is avoidance. Based on similar experience, pelagic fish and some demersal fish will likely vacate the Project area when they initially perceive the presence of construction vessels and pile driving equipment and associated underwater sound generation. However, flounders, rays, and sharks, and squids, which do not have swim bladders, have a higher tolerance for noise, and it is reported that some fish species are able to repair or replace damaged sensory hairs to restore any temporary loss of hearing, if this occurred (Brignull et al. 2009, Monroe et al 2015). Salmonids and possibly other fish are also able to heal minor noise-induced injuries within a few days. Consequently, it is expected that many EFH fish species will not be physically impacted by construction sounds because they will likely leave the active Project area to avoid the higher decibel levels. For example, Atlantic cod and herring would be more vulnerable to sound impacts because they use swim bladders for hearing. Bluefin and yellowfin tuna would have an intermediate sensitivity to noise because they have swim bladders, but do not use them for hearing. Eggs and larvae of EFH species would also have an intermediate sensitivity to noise because their limited mobility would increase the duration of their exposure. Atlantic surf clam and ocean quahog may be susceptible to noise impacts due to their lack of mobility as well. Nonetheless, fish that experience severe or fatal injuries would likely be too few in number to impact populations of EFH species (Popper et al. 2014).

3.1.3.6 Habitat Alteration/Creation

Construction of certain components of the Project (monopile foundation, seabed scour protection systems, and jet plow embedment of the subsea cable) will result in the temporary or permanent loss of soft-bottom habitat where the WTGs, OSSs, the Met Tower and scour protection will either temporarily or permanently alter existing EFH habitat.

These temporary and permanent habitat losses may force some EFH species to seek alternate locations. Since the Lease area is a broad seabed area that has the same relative geological and biological conditions, it is expected that abundant alternate soft-bottom habitat locations would be accessible to these species. Sessile organisms that inhabit the footprint of the WTGs, OSSs, Met Tower or the offshore export cables are likely to experience high mortality rates but are expected to rapidly recolonize. Areas of temporary disturbances along the cable route would become available again in approximately 6 months to 1 year depending on location, time of year, and local natural sedimentation rates.

The WTGs, OSSs, Met Tower and Offshore Export Cable Corridors have been sited to avoid sensitive habitats. For example, the Project avoids the habitat area of particular concern (HAPC) for sandbar shark in the nearshore area off of the Delaware coast and into Delaware Bay, which is located north of the Project area. There may be small or isolated areas of seagrass beds in the Indian River Bay which constitute as summer flounder HAPC and will be avoided. Other sensitive habitats, including those mapped as complex habitats, constitute a minority of the Project area. Although these complex habitats cannot be completely avoided, impacts may be minimized through micrositing of infrastructure. Additionally, it is expected that use of work vessel dynamic positioning systems (no anchors) will significantly reduce or eliminate the use of anchors on the seabed. Midline buoys will be used when anchoring is required in order to minimize seabed anchor chain drag or surface scarring.

The proposed placement of riprap rock material on the seabed surrounding each foundation for WTG and OSS will eliminate soft bed habitat and replace it with large areas of hard, vertical substrate. These structures are expected to act as artificial reefs and provide additional habitat for communities that differ from those on adjacent natural substrates (Wilhelmsson and Malm 2008; Glasby 1999; Connell 2000), creating a new food source for species living within the Project area. Man-made hard surfaces can host and create new and different EFH attributes to these offshore locations. This includes feeding, foraging, and predator protection for a wider variety of fish species utilization, biological and food source growth within and on the ragged rock surfaces, and a more diverse and abundant benthic community where none previously existed.

3.2 Operational Impacts

3.2.1 Habitat Alteration

Direct loss or recovery of soft-bottom monotypic seabed habitat associated with the installation of the WTGs, OSSs, Met Tower, and foundation scour protection would either result in permanent loss, temporary loss, or replacement of that habitat. Permanent losses of EFH habitat at each WTG foundation location will be replaced by rocky subtidal bottom habitat or replacement after construction is complete. These losses represent a relatively small area of ocean bottom in comparison to the undisturbed soft-bottom habitat areas within the Project area. As previously described, the creation of hard-bottom complex habitat via stone riprap scour armor around the foundation base for each WTG is expected to positively impact local EFH source and species biodiversity by providing different substrate and new habitat value for species that may otherwise not survive in soft-bottom habitats. This addition of new complex habitat will also help mitigate impacts to existing complex habitat that may occur during construction. Once constructed, routine operation and maintenance activities are expected to be minimal and infrequent. There are no O&M vessel or service activities anticipated that would disturb seabed habitat surrounding the WTGs and OSSs unless inter-array cables or scour protection require repairs. Once submarine cables are buried 1-3 m below the present bottom there should be no need to disturb the seabed or bay bottom above cables unless a repair is required.

3.2.2 Sound Impacts

Sources of sound emissions both above and below the sea surface associated with the Project operation and maintenance is also expected to be minimal and infrequent and largely related to crew and service vessel transfers of equipment or person-power needed to maintain the electrical facilities. Sound emitted by operating WTG's from blade interaction with wind is also expected to result in minimal to no impacts associated with EFH seabed resources.

3.2.3 Effects of Electric & Magnetic Fields (EMF)

Once the export cable system is energized and in operation, some levels of EMF would be emitted (as would any other AC electric transmission system) while buried 1-3 m below the present sea bottom. 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). Thus, the submarine cables are not expected to have significant EMF level effects at the EFH seabed surface. No adverse thermal or EMF impacts from the submarine cables are expected.

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 will be strongest near the ocean floor and will only be detectable within a few meters of the cable route (Normandeau Associates Inc. 2011). As mentioned previously, shielding and burying submarine cables will also minimize or avoid seabed surface EMF impacts.

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). 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, than levels demonstrated to have no impact on other fish species (i.e., Atlantic salmon or American eel) (Exponent 2023). Thus, no adverse impacts to EFH are expected from EMF.

3.3 Decommissioning Impacts

The Project Decommissioning Plan is detailed in Volume I, Section 7 of the COP. As part of the COP, US Wind is required to describe the decommissioning plan for the removal of the facility after the wind farm is no longer in operation. US Wind plans to seek approval from BOEM to leave some components in place, such as buried cables and scour protection, to minimize the potential impacts to the seabed and EFH during decommissioning. If BOEM requires that the buried cables and scour protection be removed during Project decommissioning, the EFH impacts associated with their removal will be similar to those described during their installation.

4.0 Conclusion

Although construction of the Project has been designed using low impact installation techniques and marine construction technologies, it will likely result in both temporary and permanent impacts to EFH resources identified within the Project area (Table 6 and Table 7). Permanent impacts to EFH resources will only occur in the offshore Lease area build out due to monopile installations and placement of seabed scour protection features at the base of each WTG and OSS, which will displace the existing EFH characteristics with different seabed EFH resources of rocky or coarse bottom. This is expected to increase the diversity and abundance of new and different EFH resources in this offshore area and create new areas of complex habitat.

Project infrastructure has been sited to avoid sensitive habitats, including HAPCs and complex habitats, such as SAV, as much as practicable. Micrositing may also provide additional opportunities to minimize impacts to these habitats. Additionally, the use of low-impact jet plow embedment technologies, monopile foundation for WTGs (versus multiple (4) pile lattice foundations or jackets), and HDD shoreline landfall transition methods are proposed to avoid or minimize direct or indirect impacts to surrounding seabed EFH resources. The Project's proposed submarine cables will be located in a narrow and defined seafloor corridor and will be embedded to 1-3m, no more than 4m, below the present bottom using low-impact jet plow technologies. Submarine cables would be buried beneath the EFH seabed resources and no other expected adverse impacts are expected once installed. The Project will also use HDD methods at the planned shoreline landfall location to avoid direct disturbance of more sensitive and diverse nearshore and barrier beach shoreline EFH resources as compared to direct open cut and fill trenching across the barrier beach. HDD also precludes future liability associated with potential cable exposure due to shoreline erosion or accretion and avoids direct disturbance of coastal terrestrial protected resources like wetlands and shore bird breeding habitat.

Table 6. Offshore Area and Duration of Habitat Impacts

Characterization*	Entire Offshore Project Area		Lease Area		Common Offshore Export Cable Corridor		Offshore Export Cable Corridor 1		Offshore Export Cable Corridor 2	
	Temp Area (km^2)	Perm Area (km^2)	Temp Area (km^2)	Perm Area (km^2)	Temp Area (km^2)	Perm Area (km^2)	Temp Area (km^2)	Perm Area (km^2)	Temp Area (km^2)	Perm Area (km^2)
Soft	250.98	0.096	226.99	0.096	13.06	0	5.29	0	5.63	0
Complex	1.28	0.014	0.80	0.014	0.25	0	0.23	0	0	0

Table 6. Offshore Area and Duration of Habitat Impacts

Characterization*	Entire Offshore Project Area		Lease Area		Common Offshore Export Cable Corridor		Offshore Export Cable Corridor 1		Offshore Export Cable Corridor 2	
	Temp Area (km^2)	Perm Area (km^2)	Temp Area (km^2)	Perm Area (km^2)	Temp Area (km^2)	Perm Area (km^2)	Temp Area (km^2)	Perm Area (km^2)	Temp Area (km^2)	Perm Area (km^2)
Heterogeneous Complex	58.90	0.000	41.00	0	4.86	0	3.28	0	9.77	0
Large Grained Complex	0.07	0.000	0.03	0	0	0	0.003	0	0.03	0
Total	**311.22**	**0.11**	**268.82**	**0.11**	**18.17**	**0**	**8.80**	**0**	**15.43**	**0**
*As defined in GARFO's March 29, 2021 "Updated Recommendations for Mapping Fish Habitat."										

Table 7. Onshore Area and Duration of Habitat Impacts

Characterization*	Entire Onshore Project Area		Onshore Export Cable Common Corridor		Onshore Export Cable North Corridor		Onshore Export Cable South Corridor	
	Temp Area (km^2)	Perm Area (m^2)	Temp Area (km^2)	Perm Area (m^2)	Temp Area (km^2)	Perm Area (m^2)	Temp Area (km^2)	Perm Area (m^2)
Soft	12.83	0	6.02	0	3.00	0	3.81	0
Complex	0	0	0	0	0	0	0	0
Heterogeneous Complex	0	0	0	0	0	0	0	0
Large Grained Complex	0	0	0	0	0	0	0	0
Total	**12.83**	**0**	**6.02**	**0**	**3.00**	**0**	**3.81**	**0**
*As defined in GARFO's March 29, 2021 "Updated Recommendations for Mapping Fish Habitat."								

The chosen methods of Project construction, including low-impact jet plow embedment, HDD, dynamic positioning vessels, and soft-start procedures for pile driving in conjunction with adherence to regulations pertaining to vessel speed, spill response, and construction time of year restrictions will minimize construction impacts to EFH. The impacts of any necessary maintenance and decommissioning would be similar in nature but of a lesser magnitude than the impacts incurred during construction, and the same avoidance, minimization, and mitigation measures would be used.

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