Appendix D: Planned Activities Scenario

Appendix D. Planned Activities Scenario

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D.1 Ongoing and Planned Activities Scenario

This appendix describes the other ongoing or planned activities that could occur within the analysis area for each resource and contribute to baseline conditions and trends for resources considered in this Environmental Impact Statement (EIS). The Maryland Offshore Wind Project comprises the construction, operation and maintenance (O&M), and conceptual decommissioning of a wind energy project located within the Bureau of Ocean Energy Management's (BOEM) Renewable Energy Lease No. OCS-A 0490, located in federal waters 10.1 statute miles (mi) (16.2 kilometers [km]) off the coast of Maryland.

The geographic analysis area varies for each resource as shown below in Table D-1. BOEM anticipates that impacts could occur between the start of Project construction in 2024 and the completion of Project decommissioning in approximately 2050. The geographic analysis area is defined by the impact producing factor (IPF) with the maximum geographic area of impact, for example sound during pile driving. For the mobile resources—bats, birds, finfish and invertebrates, marine mammals, and sea turtles—the species potentially impacted are those that occur within the area of impact of the Proposed Action. The geographic analysis area for these mobile resources is the general range of the species. The purpose is to capture the cumulative impacts on each of those resources that are impacted by the Proposed Action as well as the impacts that would still occur under the No Action Alternative.

In this appendix, distances in miles are in statute miles (miles used in the traditional sense) or nautical miles (miles used specifically for marine navigation). This appendix uses statute miles more commonly and refers to them simply as miles, whereas nautical miles are referred to by name.

Table D-1. Resource-specific geographic analysis areas

Resource	Geographic Analysis Area	Rationale
Air quality	The geographic analysis area includes the airshed within 25 miles (40 kilometers) of the Lease Area (corresponding to the OCS permit area) and the airshed within 15.5 miles (25 kilometers) of onshore construction areas and ports that may be used for the Project.	The geographic analysis area encompasses the region subject to U.S. Environmental Protection Agency (USEPA) review as part of an OCS permit for the Project under the Clean Air Act (CAA). The geographic analysis area also considers potential air quality impacts associated with the onshore construction areas and the port(s) outside of the OCS permit area. Given the generally low emissions of the sea vessels and equipment that would be used during proposed construction activities, any potential air quality impacts would likely be within a few miles of the source. BOEM selected the 15.5-mile (25-kilometer) distance to provide a reasonable buffer.

Resource	Geographic Analysis Area	Rationale
Bats	The geographic analysis area comprises the U.S. shoreline from Maine to Florida, and extends 100 miles (161 kilometers) offshore and 5 miles (8 kilometers) inland to capture the range of movement for species in this group.	The bat geographic analysis area was established to capture most of the movement range for migratory species. The offshore boundary was identified to capture the migratory movements of most species in this group, while the onshore boundaries cover onshore habitats utilized by species that may be affected by both onshore and offshore proposed Project components. While these species have been documented traversing the open ocean and have the potential to encounter wind turbine generators (WTGs), use of offshore habitat is thought to be limited and generally restricted to spring and fall migration. The onshore limit of the geographic scope is intended to cover a majority of the onshore habitat used by those species that may encounter the Project during the majority of their life cycles.
Benthic resources	The geographic analysis area includes both a 10-mile (16.1-kilometer) radius/buffer around the Lease Area and a 330-foot buffer around the export cable route.	The geographic analysis area is based on where the most widespread impact (i.e., suspended sediment) from the proposed Project could affect benthic resources. This area would account for transport of water masses and for benthic invertebrate larval transport due to ocean currents. Although sediment transport beyond 10 miles (16.1 kilometers) is possible, sediment transport related to proposed Project activities would likely be on a smaller spatial scale than 10 miles (16.1 kilometers).

Resource	Geographic Analysis Area	Rationale
Birds	The geographic analysis area includes the United States coastline from Maine to Florida; the offshore limit is 100 miles (161 kilometers) from the Atlantic shore and the onshore limit is 0.5 mile (0.8 kilometer) inland.	The geographic analysis area was established to capture resident species and migratory species that winter as far south as South America and the Caribbean, and those that breed in the Arctic or along the Atlantic Coast that travel through the area. The offshore limit was established to cover the migratory movement of most species in this group. The onshore limit was established to cover onshore habitats used by the species that may be affected by onshore and offshore components of the proposed Project.
Coastal habitat and fauna	The geographic analysis area, includes the area within a 1.0- mile (1.6-kilometer) buffer of the Onshore Project area[1].	BOEM expects the resources in this area to have small home ranges. These resources are unlikely to be affected by impacts outside their home ranges.
Commercial fisheries and for-hire recreation fishing	The geographic analysis area includes the waters managed by the New England Fishery Management Council (NEFMC) and Mid-Atlantic Fishery Management Council (MAFMC), NOAA's Highly Migratory Species Office, and the Atlantic States Marine Fisheries Commission (ASMFC) for federal fisheries within the U.S. Exclusive Economic Zone (from 3 to 200 nautical miles [5.6 to 370.4 kilometers] from the coastline, plus the state waters (out to 3 nautical miles [5.6 kilometers] from the coastline) of North Carolina to Maine.	The boundaries for the commercial fisheries geographic analysis area were developed to consider impacts on federally permitted vessels operating in all fisheries in state and EEZ waters surrounding the proposed Project, vessels from the Project area that may transit to fishing grounds in other Atlantic regions, as well as potential impacts on federally managed species of commercial importance that have ranges which overlap with the Project area.
Cultural, historical, and archaeological	The geographic analysis area is equivalent to the Project's offshore and onshore area of potential effects (APEs), as defined in the implementing regulations for the National Historic Preservation Act (NHPA) Section 106 at 36 CFR Part 800, Protection of Historic Properties.	In 36 CFR 800.16(d), the APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alteration in the character or use of historic properties, if any such properties exist."

Resource	Geographic Analysis Area	Rationale
Demographics, employment, and economic characteristics	The geographic analysis area includes the counties where proposed onshore infrastructure and primary ports (Sparrows Point and Ocean City Maryland) are located, as well as the counties within the visual analysis area: Sussex County, Delaware; Baltimore and Worcester Counties, Maryland; Cape May County, New Jersey; and Accomack County, Virginia.	These counties are the most likely to experience beneficial or adverse economic impacts from the proposed Project.
Environmental justice	The geographic analysis area includes the counties where proposed onshore infrastructure and potential ports are located, as well as the counties in closest proximity to the Lease Area: Worcester County (including Ocean City), Maryland; Sussex County, Delaware (including the City of Lewes); Sparrows Point (Port of Baltimore), Maryland; Cape Charles, Portsmouth, Virginia; and Port Norris, New Jersey.	These counties are the most likely to experience beneficial or adverse environmental justice impacts from the proposed Project related to onshore and offshore construction and use of port facilities.
Finfish, invertebrates, and essential fish habitat	The geographic analysis area includes the Northeast Continental Shelf Large Marine Ecosystem (LME) and the Southeast Continental Shelf LME. The Northeast Continental Shelf LME extends from the southern edge of the Scotian Shelf (in the Gulf of Maine) to Cape Hatteras, North Carolina, and the Southeast Continental Shelf LME extends from Cape Hatteras to the Straits of Florida.	These LMEs are likely to capture the majority of movement ranges for most invertebrates and finfish species. The entirety of the geographic analysis area includes only U.S. waters. Due to the size of the geographic analysis area, the analysis in this EIS focuses on finfish and invertebrates that would be likely to occur in the Project area and be affected by Project activities.

Resource	Geographic Analysis Area	Rationale
Land use and coastal infrastructure	The geographic analysis area includes Worcester County, Maryland and Sussex County, Delaware, as well as municipalities surrounding the ports that would be used to support Project construction and O&M: Sparrows Point (Baltimore) and Ocean City, Maryland, Portsmouth (Hampton Roads), Virginia, Lewes, Delaware, Port Norris, New Jersey and Cape Charles, Virginia.	These areas encompass locations where BOEM anticipates direct and indirect impacts associated with proposed onshore facilities and ports.
Marine mammals	The geographic analysis area includes the Canadian Scotian Shelf, Northeast U.S. Continental Shelf, and Southeast Continental Shelf LMEs[2].	This area is likely to capture the majority of the movement range for most species in this group but does not include all areas that would be transited by Project vessels (e.g., Europe if local supply chains cannot be established).
Navigation and vessel traffic	The geographic analysis area includes coastal and marine waters within a 12-nautical mile (22.2-kilometer) buffer of the Lease Area, as well as waterways leading to ports that may be used by the Project.	These areas encompass locations where BOEM anticipates direct and indirect impacts associated with Project construction, operations and maintenance, and conceptual decommissioning.
Other uses	**Aviation and Air Traffic, Military and National Security, and Radar Systems**: areas within 10 miles (16.1 kilometers) of the export cable route and Lease Area. **Cables and pipelines**: areas within 1 mile (1.6 kilometers) of the export cable route and Lease Area that could affect future siting or operation of cables and pipelines. **Scientific research and survey**s: same analysis area as finfish, invertebrates, and EFH. **Marine minerals**: areas within 0.31 mile (0.5 kilometer) of the export cable route and Lease Area that could affect marine minerals extraction.	These areas encompass locations where BOEM anticipates direct and indirect impacts associated with Project construction, operations and maintenance, and conceptual decommissioning.

Resource	Geographic Analysis Area	Rationale
Recreation and tourism	The recreation and tourism geographic analysis area that consists of a 40-mile (64-kilometer) area measured from the borders of the Lease Area, encompassing the New Jersey, Delaware, Maryland, and Virginia coastlines from Cape May, New Jersey to Chincoteague, Virginia as well as onshore Project facilities and surrounding areas within sight of those facilities. The GAA also encompasses the area near Sparrows Point, Maryland (the site of the offshore wind manufacturing and assembly facility being funded by U.S. Wind), nearby land areas along the Chesapeake Bay coastline of Baltimore County, and nearby open-water areas of the Chesapeake Bay.	This geographic analysis area was selected to coincide with the Maryland Offshore Wind Project visual impact assessment visual analysis area corresponding to the theoretical limits of project visibility.
Sea turtles	The sea turtle geographic analysis area encompasses two LMEs, namely the Northeast U.S. OCS and Southeast U.S. OCS LMEs.	These LMEs capture most of the movement range of sea turtles within the U.S. Atlantic Ocean waters. The geographic analysis area does not include all areas that could be transited by Project vessels (e.g., it does not consider vessel transits from Europe)
Scenic and visual resources	The geographic analysis area for non-historic visual resources encompasses a 40-mile (64.4-kilometer) radius extending from the boundary of the Lease Area encompassing the onshore visually sensitive resources within New Jersey, Delaware and Maryland. The onshore geographic analysis area encompasses: The onshore geographic analysis area encompasses the 1-mile perimeters from the onshore substations, landfall, inshore export cable routes to the onshore substations, the connection from the onshore substation to the existing electrical grid and O&M facility in Ocean City, MD.	This geographic analysis area was selected to coincide with the Maryland Offshore Wind Project visual impact assessment visual analysis area to address Project visibility from sensitive resources and encompass all locations where BOEM anticipates direct and indirect impacts associated with Project construction, operations and maintenance, and conceptual decommissioning.

Resource	Geographic Analysis Area	Rationale
Water quality	**Offshore:** the offshore geographic analysis area, includes coastal waters within a 10- mile (16-kilometer) buffer around the Offshore Project area and a 15.5-mile (25- kilometer) buffer around the ports that may be used by the Project. **Onshore**: the onshore geographic analysis area includes an onshore component that includes any sub-watershed that is intersected by the Onshore Project area[1].	The offshore geographic analysis area accounts for limited transport of water masses due to ocean currents. The onshore geographic analysis area was chosen to capture the extent of the natural network of waterbodies that could be affected by construction and operational activities of the proposed Project.
Wetlands	The wetlands geographic analysis area includes all subwatersheds that intersect the Onshore Project area[1].	This area encompasses all wetlands and surface waters that are most likely to experience impacts from the proposed Project.

[1] Includes landfalls, onshore export cable route corridors, onshore substations, grid interconnections, and O&M facility.
[2] Large Marine Ecosystems are delineated based on ecological criteria including bathymetry, hydrography, productivity, and trophic relationships among populations of marine species, and the National Oceanic and Atmospheric Administration uses them as the basis for ecosystem-based management.

D.2 Ongoing and Planned Activities

This section includes a list and description of ongoing and planned activities that could contribute baseline conditions and trends within the geographic analysis area for each resource topic analyzed in this EIS. Projects or actions that are considered speculative per the definition provided in 43 Code of Federal Regulations (CFR) 46.30[1] are noted in subsequent tables but excluded from the cumulative impact analysis in Chapter 3 of the EIS.

Ongoing and planned activities described in this section consist of 11 types of actions: (1) other offshore wind energy development activities; (2) undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); (3) tidal energy projects; (4) marine minerals use and ocean-dredged material disposal; (5) military use; (6) marine transportation; (7) fisheries use and management; (8) global climate change; (9) oil and gas activities; (10) onshore development activities; and (11) research, monitoring, and survey activities.

[1] 43 CFR 46.30 – Reasonably foreseeable future actions include those federal and non-federal activities not yet undertaken, but sufficiently likely to occur, that a responsible official of ordinary prudence would take such activities into account in reaching a decision. The federal and non-federal activities that BOEM must take into account in the analysis of cumulative impacts include, but are not limited to, activities for which there are existing decisions, funding, or proposals identified by BOEM. Reasonably foreseeable future actions do not include those actions that are highly speculative or indefinite.

BOEM analyzed the possible extent of future other offshore wind energy development activities on the Atlantic Outer Continental Shelf (OCS) to determine reasonably foreseeable cumulative effects measured by installed power capacity (see**,** Table D2-1 in Attachment D-2).

D.2.1 Offshore Wind Energy Development Activities

D.2.1.1. Site Characterization Studies

A lessee is required to provide the results of site characterization activities with its site assessment plan (SAP) and Construction and Operations Plan (COP). Lessees have up to five years to perform site characterization activities before they must submit a COP (30 CFR 585.235(a)(2)). For the purposes of the cumulative effects analysis, BOEM makes the following assumptions for survey and sampling activities:

- Site characterization would occur on all existing leases and potential export cable routes.
- Site characterization would likely take place in the first three years following execution of a lease, based on the fact that a lessee would likely want to generate data for its COP at the earliest possible opportunity.
- Lessees would likely survey most or all of the proposed lease area during the five-year site assessment term to collect required geophysical information for siting of a meteorological tower, two buoys, and commercial facilities (wind turbines). The surveys may be completed in phases, with the meteorological tower and buoy areas likely to be surveyed first.
- Lessee would not use air guns, which are typically used for deep penetration two-dimensional or three-dimensional exploratory seismic surveys to determine the location, extent, and properties of oil and gas resources (BOEM 2016).

Table D-2 describes the typical site characterization surveys, the types of equipment and method used, and which resources the survey information would inform.

Table D-2. Site characterization survey assumptions

Survey Type	Survey Equipment and Method	Resource Surveyed or Information Used to Inform
High-resolution geophysical surveys	Side-scan sonar, sub-bottom profiler, magnetometer, multi- beam echosounder	Shallow hazards, archaeological, Bathymetric charting, benthic habitat
Geotechnical/ sub-bottom sampling	Vibracores, deep borings, cone penetration tests	Geological
Biological	Grab sampling, benthic sled, underwater imagery/ sediment profile imaging	Benthic habitat

Survey Type	Survey Equipment and Method	Resource Surveyed or Information Used to Inform
Biological	Aerial digital imaging; visual observation from boat or airplane	Birds, marine mammals, sea turtles
Biological	Ultrasonic detectors installed on survey vessels used for other surveys	Bats
Biological	Visual observation from boat or airplane	Marine fauna (marine mammals and sea turtles)
Biological	Direct sampling of fish and invertebrates	Fish and invertebrates

Source: BOEM (2016)

D.2.1.2. Site Assessment Activities

After SAP approval, a lessee can evaluate the meteorological conditions, such as wind resources, with the approved installation of meteorological towers and buoys. Meteorological buoys have become the preferred meteorological and oceanographic (metocean) data collection platform for developers, and BOEM expects that most future site assessments will use buoys instead of towers (BOEM 2021a). The installation and operation of meteorological buoys involves substantially less activity and a much smaller footprint than the construction and operation of a meteorological tower. Site assessment activities have been approved or are in the process of being approved for multiple lease areas consisting of one to three meteorological buoys per SAP (Table D2-1 in Attachment D-2). Site assessment would likely take place starting within one to two years of lease execution, because preparation of a SAP (and subsequent BOEM review) takes time. The No Action Alternative and cumulative analyses consider these site assessment activities.

D.2.1.3. Construction and Operation of Offshore Wind Facilities

Table D2-1 in Attachment D-2 lists all offshore wind development activities that BOEM considers reasonably foreseeable by lease areas and projects.

D.2.2 Commercial Fisheries Cumulative Fishery Effects Analysis

Table D-3 details the future construction of offshore wind projects from Maine to North Carolina including Skipjack and GSOE I, that are proposed offshore Maryland and Delaware adjacent to Maryland Offshore Wind. Also included are all of the projects currently in various stages of planning within BOEM's offshore leases from Massachusetts to North Carolina.

Projected construction dates for each offshore wind project are listed in Table D2-1 in Attachment D-2, and each project will require a National Environmental Policy Act (NEPA) process with an EIS or environmental assessment prior to approval.

Table D-3 summarizes (1) the incremental number of construction foundation locations that are projected to be active in each region during each year between 2021 and 2030; (2) the number of operational turbines in each region at the beginning of each year between 2021 and 2030; and (3) the total number of active construction locations and operational turbine foundations across the Atlantic OCS by year.

Note that the Kitty Hawk Offshore Wind and Kitty Hawk South projects are included despite their location in the National Marine Fisheries Service (NMFS) South Atlantic Region. Fishing vessels operating in fisheries managed by the NMFS Greater Atlantic Regional Office regularly harvest in this area. It is also likely that vessels participating in fisheries managed by the NMFS Southeast Regional Office will be affected by the Kitty Hawk Offshore Wind and Kitty Hawk South projects, although revenues from these fisheries have not been included in the Fishery Management Plan Revenue Exposure Analysis (BOEM 2020).

BOEM assumes proposed offshore wind projects will include the same or similar components as the proposed Project: wind turbines, offshore and onshore cable systems, offshore substations (OSSs), onshore O&M facilities, and onshore interconnection facilities. BOEM further assumes that other potential offshore wind projects will employ the same or similar construction, O&M, and conceptual decommissioning activities as the proposed Project. However, future offshore wind projects would be subject to evolving economic, environmental, and regulatory conditions. Lease areas may be split into multiple projects, expanded, or removed, and development within a particular lease area may occur in phases over long periods of time (e.g., Kitty Hawk Offshore Wind and Kitty Hawk South). Research currently being conducted in combination with data gathered regarding physical, biological, socioeconomic, and cultural resources during development of initial offshore wind projects in the United States could affect the design and implementation of future projects, as could advancements in technology. For the cumulative impact analysis, all proposed projects included in Table D2-1 in Attachment D-2 are analyzed in Chapter 3 of this EIS. For a list of mitigation measures that were considered in the impact analysis in Chapter 3 of this EIS, please see EIS Appendix G, *Mitigation and Monitoring*.

Table D-3. Future offshore wind project construction schedule (number of foundations; dates shown as of October 24, 2022).

Project/Region*	BOEM Lease Area	Developer	Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and beyond
Other State Waters Projects													
New England Aqua Ventus I	N/A	New England Aqua Ventus, LLC	-	-	-	2	-	-	-	-	-	-	-
Estimated Other State Waters Construction			-	-	-	2	0	0	0	0	0	0	0
Estimated O&M Total			0	0	0	0	2	2	2	2	2	2	2
Existing and Ongoing Projects													
Block Island Wind Farm	N/A	Deepwater Wind LLC (Ørsted)	5	-	-	-	-	-	-	-	-	-	-
Vineyard Wind 1	part of OCS-A 0501	Vineyard Wind LLC (Avangrid Renewables/Copenhagen Investment Partners)	-	-	-	64	-	-	-	-	-	-	-
South Fork Wind	OCS-A 0517	South Fork Wind, (Ørsted)	-	-	-	13	-	-	-	-	-	-	-
Coastal Virginia Offshore Wind	OCS-A 0497	Dominion Energy	2	-	-	-	-	-	-	-	-	-	-
Estimated Existing and Ongoing Construction			7	0	0	79	0	0	0	0	0	0	0

Project/Region*	BOEM Lease Area	Developer	Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and beyond
Estimated O&M Total			7	7	7	86	86	86	86	86	86	86	86
Planned Projects													
Massachusetts/Rhode Island Region													
Revolution Wind	part of OCS-A 0486	Revolution Wind LLC (Ørsted/Eversource)	-	-	-	102		-	-	-	-	-	-
Sunrise Wind	OCS-A 0487	Sunrise Wind LLC (Ørsted/Eversource)	-	-	-		96	-	-	-	-	-	-
Mayflower Wind SouthCoast	OCS-A 0521	Mayflower Wind LLC (OW Ocean Winds/Shell)	-	-	-	-	-	149	-	-	-	-	-
Park City Wind	OCS-A 0534 and part of OCS-A 0501	Avangrid Renewables LLC	-	-	-	-	64			-	-	-	-
Commonwealth Wind	OCS-A 0534 and part of OCS-A 0501	Avangrid Renewables	-	-	-	-	91			-	-	-	-
Beacon Wind 1	part of OCS-A 0520	Equinor/BP	-	-	-	-	79	-	-	-	-	-	-
Beacon Wind 2	part of OCS-A 0520	Equinor/BP	-	-	-	-	-	78	-	-	-	-	-

Project/Region*	BOEM Lease Area	Developer	Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and beyond
Bay State Wind	part of OCS-A 0500	Baystate Wind LLC (Ørsted/Eversource)	-	-	-	-	-	112					
TBD	OCS-A 0487 remainder	Sunrise Wind LLC (Ørsted/Eversource)	-	-	-	-	-						
TBD	OCS-A 0500 remainder	Baystate Wind LLC (Ørsted/Eversource)	-	-	-	-	-	232					
Liberty Wind	part of OCS-A 0522	Vineyard Offshore	-	-	-	-	-						
Estimated Annual MA/RI Construction			0	0	0	102	330	493	0	0	0	0	0
Estimated O&M Total			0	0	0	0	102	432	925	925	925	925	925
New York/ New Jersey Region													
Ocean Wind 1	OCS-A 0498	Ocean Wind LLC (Ørsted)	-	-	-	-	101	-	-	-	-	-	-
Atlantic Shores Wind South	OCS-A 0499	Atlantic Shores Offshore Wind, LLC (EDF Renewables/ Shell)	-	-	-	-	-	11	200		-	-	-
Ocean Wind 2	part of OCS- A 0532	Ocean Wind LLC (Ørsted)	-	-	-	-	-	-	113	-	-	-	-
Empire Wind 1	part of OCS-A 0512	Equinor/BP	-	-	-	58				-	-	-	-

Project/Region*	BOEM Lease Area	Developer	Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and beyond
Empire Wind 2	part of OCSA 0512	Equinor/BP	-	-	-	91				-	-	-	-
Atlantic Shores Wind North	OCS-A 0549	Atlantic Shores Offshore Wind, LLC	-	-	-	-	-	-	160				
Blue Point Wind	OCS-A 0537	OW Ocean Winds East LLC	-	-	-	-	-	-	102				
Attentive Energy	OCS-A 0538	Attentive Energy LLC (TotalEnergies Renewables USA)	-	-	-	-	-	-	104				
Community Wind	OCS-A 0539	Bight Wind Holdings, LLC (RWE/National Grid)	-	-	-	-	-	-	148				
Atlantic Shores Offshore Wind Bight	OCS-A 0541	Atlantic Shores Offshore Wind Bight, LLC	-	-	-	-	-	-	95				
Leading Light Wind	OCS-A 0542	Invenergy Wind Offshore LLC (Invenergy /energyRe)	-	-	-	-	-	-	99				
Vineyard Mid-Atlantic	OCS-A 0544	Vineyard Offshore	-	-	-	-	-	-	104				
Estimated Annual NY/NJ Construction			0	0	0	149	101	11	1,125	0	0	0	0
Estimated O&M Total			0	0	0	0	149	250	261	1,386	1,386	1,386	1,386
Delaware/Maryland Region													

Project/Region*	BOEM Lease Area	Developer	Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and beyond
Skipjack Wind I	part of OCS-A 0519	Skipjack Wind, LLC (Ørsted)	-	-	-	-	17	-	-	-	-	-	-
Maryland Offshore Wind	OCS-A 0490	US Wind, LLC	-	-	-	-	126	-	-	-	-	-	-
Garden State Offshore Energy	OCS-A 0482	GSOE I, LLC	-	-	-	93	-	-	-	-	-	-	-
Skipjack Wind II	part of OCS-A 0519	Skipjack Wind, LLC (Ørsted)	-	-	-		-	-	-	-	-	-	-
Estimated Annual DE/MD Construction			0	0	0	93	143	0	0	0	0	0	0
Estimated O&M total			0	0	0	0	93	236	236	236	236	236	236
Virginia/North Carolina Region													
Coastal Virginia Offshore Wind – Commercial	OCS-A 0483	Dominion Energy	-	-	-	208					-	-	-
Kitty Hawk Wind North	part of OCS-A 0508	Avangrid Renewables	-	-	-	-	70						
Kitty Hawk Wind South	part of OCS-A 0508	Avangrid Renewables	-	-	-	-	-	-	-	123			
Estimated Annual VA/NC Construction			0	0	0	208	70	0	0	123	0	0	0

Project/Region*	BOEM Lease Area	Developer	Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and beyond
Estimated O&M total			0	0	0	0	208	278	278	278	401	401	401
Total Foundations													
Estimated Annual total construction			0	0	0	552	644	504	1,125	123	0	0	0
Estimated O&M total			0	0	0	0	552	1,196	1,700	2,825	2,948	2,948	2,948

*Projects in italics have already been constructed or are currently in construction. Completed and ongoing projects are not included in total foundation calculations.

D.2.3 Incorporation by Reference of Cumulative Impacts Study and the Analyses Therein

BOEM has completed a study of IPFs on the North Atlantic OCS to consider in an offshore wind development cumulative impacts scenario (BOEM 2019). That study is incorporated in this document by reference. The study identifies cause-and-effect relationships between renewable energy projects and resources potentially affected by such projects. It further classifies those relationships into a manageable number of IPFs through which renewable energy projects could affect resources. It also identifies the types of actions and activities to be considered in a cumulative impacts scenario. The study identifies actions and activities that may affect the same physical, biological, economic, or cultural resources as renewable energy projects and states that such actions and activities may have the same IPFs as offshore wind projects.

The BOEM (2019) study identifies the relationships between IPFs associated with specific past, present, and reasonably foreseeable actions and activities in the North Atlantic OCS to consider in a NEPA cumulative impacts scenario. These IPFs and their relationships were utilized in the EIS analysis of cumulative impacts, and the application of which IPF applied to which resource was decided by BOEM.

As discussed in the BOEM (2019) study, reasonably foreseeable activities other than offshore wind projects may also affect the same resources as the proposed Project or other offshore wind projects, possibly via the same IPFs or via IPFs through which offshore wind projects do not contribute. This Appendix lists reasonably foreseeable non-offshore wind activities that may contribute to the cumulative impacts of the proposed Project.

D.2.4 Undersea Transmission Lines, Gas Pipelines, and Other Submarine Cables

Anthropogenic hazards, including in-service and abandoned submarine telecommunication cables that may be present in the offshore export cable corridor and in the vicinity of the Lease Area, will be identified through the geological and geophysical (G&G) survey campaigns were conducted in 2020 and 2021, and additional campaigns are scheduled to be conducted for the Lease Area. Based on general knowledge of the Offshore Project area it is anticipated that anthropogenic hazards could be present in the Offshore Project area to some capacity. In-depth descriptions of anthropogenic hazards will be provided in the supplemental filing once the future G&G survey campaigns have been completed.

D.2.5 Dredging and Port Improvement Projects

The following dredging projects have been proposed or studied at ports that may be used by the Project in Virginia and are either in operation or are considered reasonably foreseeable:

- A channel deepening project at the Port of Virginia is currently underway with the U.S. Army Corps of Engineers (USACE) and a private contractor engaged in dredging approximately 1.1 million cubic yards (841,010 cubic meters) of sediment from the federal channel in Norfolk Harbor and Newport News, Virginia (USACE 2019). The project is anticipated to be completed in 2024, resulting in a channel depth of over 50 feet (15 meters) in the harbor, which will allow it to accommodate two ultra- large container vessels simultaneously (Virginia Port Authority 2021). The Norfolk dredging project is anticipated to be completed by 2024 (Port of Virginia 2022).

D.2.6 Marine Minerals Use and Ocean-Dredged Material Disposal

BOEM's Marine Mineral Program manages non-energy minerals (primarily sand and gravel) on the OCS and leases access to these resources to target shoreline erosion, beach renourishment, and restoration projects. The Marine Mineral Program identifies larger sand resource areas and then partners with USACE, states, and localities on winnowing down these larger areas into sand borrow areas, based on need for beach renourishment. USACE also identifies borrow areas within state waters for beach renourishment. There are no active OCS lease areas for marine minerals within the geographic analysis area.

BOEM's Marine Mineral Program has identified four sand resource areas off the coast of Delaware that were designated based on the likelihood that usable sand resources exist in the area (Area B, Area C, Central Region Shoal, and Fenwick Shoal. Many of the aforementioned sand resources are suitable sources for replenishing sand along the coast of Maryland and Delaware. It is estimated that there are more than 8,934 million cubic feet (253 million cubic meters) of sand with high resource potential and more than 3,521 million cubic feet (100 million cubic meters) of sand with moderate resource potential in the Maryland sand resource areas and 1,236 million cubic feet (35 million cubic meters) of usable sand resources in the Delaware Sand Resource Area (Louis Berger Group Inc. 1999).

As of May 2019, the USACE North Atlantic Division indicated that the Bethany & South Bethany Beach nourishment project along the southeast Delaware coastline has a sand deficit of approximately 3.9 million cubic yards for full project lifecycle (last nourishment planned for 2057). Although the sand sources for these projects lie within State waters and there are no current plans to source material from the OCS, the depletion of local sand sources coupled with perpetual need for sand highlights the need for alternative sand sources such as those located on the OCS (Ramsey et al., 2019). Recent BOEM-funded research was conducted by the Delaware Geological Survey (DGS) to address future need as well as gain a better understanding of the stratigraphic framework in the region.

To help meet the sand resource needs of coastal communities, BOEM-funded reconnaissance, and design-level OCS studies along the East Coast from Rhode Island to Florida have identified potential future sand resources in many areas. Sand resources identified nearest the Project include OCS locations

offshore of all of the beaches noted above; many of these potential sand resources are located within 5 miles of the Project Lease Area and associated planned infrastructure (e.g., export cables).

The U.S. Environmental Protection Agency (USEPA) Region 3 (including Delaware, Maryland, Pennsylvania, and Virginia), and USEPA Region 4 (including North Carolina and South Carolina) are responsible for designating and managing ocean disposal sites for materials offshore in the region of the Project. The USACE issues permits for ocean disposal sites; all ocean sites are for the disposal of dredged material permitted or authorized under the Marine Protection, Research, and Sanctuaries Act (16 United States Code [USC] 1431 et seq. and 33 USC 1401 et seq.). There are two active projects along the Virginia Coast with dredge disposal sites located offshore Norfolk, Virginia (Norfolk site) and Virginia Beach, Virginia (Dam Neck site) (USACE 2021).

D.2.7 National Security and Military Use

The Lease Area is within the Virginia Capes Range Complex and the Virginia Capes Operating Area (OPAREA). The Virginia Capes (VACAPES) Range Complex is comprised of the VACAPES OPAREA, which is located offshore of the states of Virginia, North Carolina, Maryland, and Delaware. The northernmost boundary of the VACAPES Range Complex is located 37 nautical miles (68.5 kilometers) off the entrance to Delaware Bay at latitude 38°45'N, the farthest point of the eastern boundary is 184 nautical miles (340.8 kilometers) east of Chesapeake Bay at longitude 72°41' W, and the southernmost point is 105 nautical miles (194.5 kilometers) southeast of Cape Hatteras, North Carolina, at latitude 39°19' N. The western boundary of the VACAPES Range Complex OPAREA lies 3 nautical miles (5.6 kilometers) from the shoreline at the boundary separating state and Federal waters (50 CFR § 218.1). The total operational area encompasses approximately 27,661 square nautical miles (94,875 square kilometers) of surface waters (Virginia Capes Range Complex Final Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) 2009).

This Range Complex is used for the U.S. Atlantic Fleet training and testing exercises and supports training and testing by other services, primarily the U.S. Air Force; the AEGIS Combat Systems Center (ACSC) is also located in this area. The Range Complex is controlled by the Fleet Area Control and Surveillance Facility Virginia Capes, Naval Air Station, Oceana. Subsurface, surface, and surface to air exercises are conducted in the VACAPES OPAREA. Naval operations include Naval Air Station Oceana and Naval Air Station Dam Neck Annex in the City of Virginia Beach and Naval Auxiliary Landing Field Fentress in the City of Chesapeake.

The Project is located below a variety of U.S. territorial and international airspace classifications, including some controlled and special-use airspace. The Project area is entirely within the Air Defense Identification Zone (ADIZ), in which all aircraft are subject to ready identification in the interest of national security. Most of the Project area underlies both the Atlantic Low Control Area, which is designated as Class E controlled airspace above 1,700 feet (518 meters), and the Virginia Capes Operating Area (VACAPES) "W-386," which is a National Defense Operating Area off the mid-Atlantic coast that is used for various surface, subsurface, and air-to-surface exercises.

D.2.8 Marine Transportation

Marine transportation in the region is diverse and sourced from many ports and private harbors. Commercial vessel traffic in the region includes research, tug/barge, liquid tankers (such as those used for liquid petroleum), cargo, military and search-and-rescue vessels, and commercial fishing vessels.

Recreational vessel traffic includes cruise ships, sailboats, and charter boats. A number of federal agencies, state agencies, educational institutions, and environmental non-governmental organizations participate in ongoing research offshore including oceanographic, biological, geophysical, and archaeological surveys. The Mid-Atlantic Regional Planning Body (RPB) (comprising Delaware, Maryland, New Jersey, New York, Pennsylvania, and Virginia as well as federally recognized Tribes) anticipates that regional commercial shipping may increase and navigation routes may change in response to increasing demand for larger ships to transport goods (Mid-Atlantic Regional Planning Body 2016).

The Port of Virginia recently completed land-side projects to expand cargo and rail capacity and a dredging project to increase depth of Norfolk Harbor to 55 feet is scheduled for completion in 2024 (Port of Virginia 2020a).

D.2.9 National Marine Fisheries Service Activities

Research and enhancement permits may be issued for marine mammals protected by the Marine Mammal Protection Act (MMPA) and for threatened and endangered species under the Endangered Species Act (ESA). NMFS is anticipated to continue issuing research permits under Section 10(a)(1)(A) of the ESA to allow take of certain ESA-listed species for scientific research. Scientific research permits issued by NMFS currently authorize studies on ESA-listed species in the Atlantic Ocean. Current fisheries management and ecosystem monitoring surveys conducted by or in coordination with the Northeast Fisheries Science Center (NEFSC) could overlap with offshore wind lease areas in the Mid-Atlantic region.

Surveys include (1) the NEFSC Bottom Trawl Survey, a more than 50-year multispecies stock assessment tool using a bottom trawl; (2) the NEFSC Sea Scallop/Integrated Habitat Survey, a sea scallop stock assessment and habitat characterization tool, using a bottom dredge and camera tow; (3) the NEFSC Surfclam/Ocean Quahog Survey, a stock assessment tool for both species using a bottom dredge; and (4) the NEFSC Ecosystem Monitoring Program, a more than 40-year shelf ecosystem monitoring program using plankton tows and conductivity, temperature, and depth units. Given the potential impacts on National Oceanic and Atmospheric Administration (NOAA) Fisheries scientific surveys resulting from offshore wind development, BOEM and NOAA have committed to addressing these impacts through the implementation of a programmatic mitigation approach that is currently under development.

The regulatory process administered by NMFS, which includes stock assessments for all marine mammals and 5-year reviews for all ESA-listed species, assists in informing decisions on take authorizations and the assessment of project-specific and cumulative impacts that consider past, present, and reasonably foreseeable future actions in biological opinions. Stock assessments completed regularly under the MMPA include estimates of potential biological removal that stocks of marine mammals can sustainably absorb. MMPA take authorizations require that a proposed action have no more than a negligible impact on species or stocks, and that a proposed action impose the least

practicable adverse impact on the species. MMPA authorizations are reinforced by monitoring and reporting requirements so that NMFS is kept informed of deviations from what has been approved. Biological opinions for federal and non-federal actions are similarly grounded in status reviews and conditioned to avoid jeopardy and to allow continued progress toward recovery. These processes help to ensure that, through compliance with these regulatory requirements, a proposed action would not have a measurable impact on the conservation, recovery, and management of the resource.

D.2.10 Directed Take Permits for Scientific Research and Enhancement

NMFS issues permits for research on protected species for scientific purposes. These scientific research permits include the authorization of directed take for activities such as capturing animals and taking measurements and biological samples to study their health, tagging animals to study their distribution and migration, photographing and counting animals to get population estimates, taking animals in poor health to an animal hospital, and filming animals. NMFS also issues permits for enhancement purposes; these permits are issued to enhance the survival or recovery of a species or stock in the wild by taking actions that increase an individual's or population's ability to recover in the wild. Scientific research and enhancement permits have been issued previously for satellite, acoustic, and multi-sensor tagging studies on large and small cetaceans, research on reproduction, mortality, health, and conservation issues for North Atlantic Right Whales, and research on population dynamics of harbor and grey seals. Reasonably foreseeable future impacts from scientific research and enhancement permits include physical and behavioral stressors (e.g., restraint and capture, marking, implantable and suction tagging, biological sampling).

D.2.11 Fisheries Use and Management

NMFS implements regulations to manage commercial and recreational fisheries in federal waters, including those within which the Project would be located; the State of Maryland regulates commercial fisheries in state waters (within 3 nautical miles [5.6 kilometers; 3.5 miles] of the coastline).

The Project overlaps NMFS' Mid-Atlantic regional council that manages federal fisheries: Mid-Atlantic Fisheries Management Council (MAFMC) includes New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina (MARCO 2016). The council manages species with many fishery management plans that are frequently updated, revised, and amended and coordinate with each other to jointly manage species across jurisdictional boundaries (MAFMC 2019). Many of the fisheries managed by the council are fished for in state waters or outside of the Mid-Atlantic region, so the council works with the Atlantic States Marine Fisheries Commission (ASMFC). ASMFC is composed of the 15 Atlantic coast states and coordinates the management of marine and anadromous resources found in the states' marine waters.

The fishery management plans of the MAFMC and ASMFC were established, in part, to manage fisheries to avoid overfishing. They accomplish this through an array of management measures, including annual catch quotas, minimum size limits, and closed areas. These various measures can further reduce (or increase) the size of landings of commercial fisheries in the Mid-Atlantic region.

NMFS also manages highly migratory species (HMS), such as tuna and sharks, that can travel long distances and cross domestic boundaries. Table D-4 summarizes other fishery management plans and actions in the region.

The Maryland Department of Natural Resources Fishing and Boating Services is responsible for managing commercial and recreational fishing which include estuarine and migratory fish stocks. In Delaware, the Delaware Department of Natural Resources and Environmental Control Fisheries section is responsible for managing commercial and recreational fishing. Both state agencies are responsible for the development and enforcement of state and federal regulations pertaining to marine fish and fisheries, and also coordinate with the ASMFC and the MAMFC to ensure proper management of migratory species and other coastal resources.

Table D-4. Other fishery management plans

Area	Plan and Projects
Atlantic States Marine Fisheries Commission (ASMFC)	ASMFC Five-Year Strategic Plan 2019–2023 (ASMFC 2020); ASMFC 2022 Action Plan to Reduce Atlantic Sturgeon Bycatch in Federal Large Mesh Gillnet Fisheries (ASMFC 2021); Management, Policy and Science Strategies for Adapting Fisheries Management to Changes in Species Abundance and Distribution Resulting from Climate Change (ASMFC 2018)
Maryland	2015 Fishery Management Plans (Maryland Department of Natural Resources 2016) – Chesapeake Bay Fishery Management Plans

D.2.12 Global Climate Change

Climate change results primarily from the increasing concentration of greenhouse gases (GHGs) in the atmosphere, which causes planet-wide physical, chemical, and biological changes, substantially affecting the world's oceans and lands. Changes include increases in global atmospheric and oceanic temperature, shifting weather patterns, rising sea levels, and changes in atmospheric and oceanic chemistry (Blunden and Arndt 2020). Section 7.6.1.4 of the Programmatic EIS for Alternative Energy Development and Production and Alternate Use of Activities on the Outer Continental Shelf (BOEM 2007) describes global climate change with respect to assessing renewable energy development. Climate change is predicted to affect Northeast fishery species differently (Hare et al. 2016), and the NMFS biological opinion discusses in detail the potential impacts of global climate change on protected species that occur within the Proposed Action Area (NMFS 2013).

The Intergovernmental Panel on Climate Change (IPCC) released a special report in October 2018 that compared risks associated with an increase of global warming of 1.5 degrees Celsius (°C) and an increase of 2°C. The report found that climate-related risks depend on the rate, peak, and duration of global warming, and that an increase of 2°C was associated with greater risks associated with climatic changes such as extreme weather and drought; global sea level rise; impacts on terrestrial ecosystems; impacts on marine biodiversity, fisheries, and ecosystems and their functions and services to humans; and impacts on health, livelihoods, food security, water supply, and economic growth (IPCC 2018).

Table D-5 summarizes regional plans and policies that are in place to address climate change, and Table D-6 summarizes regional resiliency plans.

Table D-5. Climate change plans and policies

Plans and Policies	Summary/Goals
The Greenhouse Gas Emissions Reduction Act 2030 GGRA Plan (February 19, 2021)	The Maryland Greenhouse Gas Emissions Reduction Act of 2016 establishes greenhouse gas emission reduction goals. The Act required the State of Maryland to adopt a final plan by 2019 that reduces statewide greenhouse gas emissions by 40% from 2006 levels by 2030. The GGRA Plan (Maryland Department of the Environment 2021) provides an implementation strategy for the 2030 greenhouse gas emissions reduction goal.
Maryland Renewable Energy Portfolio Standard	The Renewable Portfolio Standard (RPS) Program requires electricity suppliers to meet a prescribed minimum portion of their retail electricity sales with various renewable energy sources, which have been classified within the RPS Statute as Tier 1 and Tier 2 renewable sources. The program is implemented through the creation, sale, and transfer of Renewable Energy Credits (RECs) (Maryland Public Service Commission 2021).
Delaware Climate Action Plan (November 2021)	The Climate Action Plan guides state efforts to minimize greenhouse gas emissions, which drive the climate change seen today, and maximize resilience to climate change impacts.
Delaware's Renewable Energy Portfolio Standards Act: A 2005 law, updated in 2021	Delaware's Renewable Energy Portfolio Standards Act: A 2005 law, updated in 2021, requiring the state's utilities to get an increasing percentage of electricity from renewable sources.
Delaware's Regional Greenhouse Gas Initiative	An 11-state carbon dioxide cap-and trade program for carbon dioxide emissions from power generation facilities.

Table D-6. Resiliency plans and policies

Plans and Policies	Summary/Goals
Maryland Commission on Climate Change – Adaptation and Resiliency Workgroup	The Maryland Commission on Climate Change (MCCC), codified by legislation in 2015, is tasked with advising the Governor and General Assembly on ways to mitigate the causes of, prepare for, and adapt to the consequences of climate change, including participation in development of climate action plans. The MCCC is chaired by the Maryland Department of Environment (MDE) Secretary. The Commission is organized into four working groups: Adaptation and Resiliency; Education, Communication, and Outreach; Greenhouse Gas Mitigation; and Science and Technical. The Adaptation and Resiliency Work Group (ARWG) is charged with developing and implementing a comprehensive strategy for reducing Maryland's climate change vulnerability and providing state and local governments with tools to plan for and adapt to climate impacts such as extreme weather and sea level rise.
Delaware Resilient Community Partnership program	The Resilient Community Partnership program provides technical assistance and potential funding to plan for and reduce the impacts of coastal hazards related to flooding from sea level rise, coastal storms and climate change through the development of planning strategies at the local level.

D.2.13 Oil and Gas Activities

The proposed Project area is located in the Mid-Atlantic Planning Area of the OCS Oil and Gas Leasing Program (National OCS Program) comprising Delaware, Maryland, Virginia, and North Carolina (BOEM 2021b). There are no active oil and gas leases in the Mid-Atlantic Planning Area. On September 8, 2020, the White House issued a presidential memorandum for the Secretary of the Interior on the withdrawal of certain areas of the United States OCS from leasing disposition for 10 years, including the areas currently designated by BOEM as the South Atlantic and Straits of Florida Planning Areas (The White House 2020a). The South Atlantic Planning Area includes the OCS off South Carolina, Georgia, and northern Florida. On September 25, the White House issued a similar memorandum for the Mid-Atlantic Planning Area that lies south of the northern administrative boundary of North Carolina (The White House 2020b). This withdrawal prevents consideration of these areas for any leasing for purposes of exploration, development, or production during the 10-year period beginning July 1, 2022, and ending June 30, 2032. The remaining portion of the Mid-Atlantic Planning Area was not included in DOI's Proposed Program for the 2023-2028 National Outer Continental Shelf Oil and Gas Leasing Program, which was released in July 2022.

BOEM issues G&G permits to obtain data for hydrocarbon exploration and production; locate and assess marine mineral resources; aid in locating sites for alternative energy structures and pipelines; identify possible anthropogenic, seafloor, or geological hazards; and locate potential archaeological and benthic resources. G&G surveys are typically classified into categories by equipment type and survey technique. There are currently no such permit applications under review for areas offshore Maryland or Delaware; there is one permit application for an air gun seismic survey under review for areas offshore Norfolk, Virginia (BOEM 2021b).

Several liquefied natural gas (LNG) ports are located on the East Coast of the United States. Table D-7 lists existing, approved, and proposed LNG ports on the East Coast of the United States that provide (or may in the future provide) services such as natural gas export, natural gas supply to the interstate pipeline system or local distribution companies, or storage of LNG for periods of peak demand, or production of LNG for fuel and industrial use (FERC 2018).

Table D-7. Liquid natural gas terminals located in the eastern United States

Terminal Name	Type	Company	Jurisdiction	Distance from Project (approximate)	Status
Everett, Massachusetts	Import terminal	GDF SUEZ—DOMAC	Federal Energy Regulatory Commission (FERC)	445 miles northeast	Existing

Terminal Name	Type	Company	Jurisdiction	Distance from Project (approximate)	Status
Offshore Boston, Massachusetts	Import terminal	Neptune LNG	U.S. Department of Transportation Maritime Administration (MARAD)/ U.S. Coast Guard (USCG)	545 miles northeast	Existing, Decommissioning in Progress
Offshore Boston, Massachusetts	Import terminal, authorized to re-export delivered LNG	Excelerate Energy—Northeast Gateway	MARAD/USCG	545 miles northeast (Buoy B)	Existing
Cove Point, Maryland (Chesapeake Bay)	Import terminal Export terminal	Dominion—Cove Point LNG	FERC	90 miles west	Existing
Elba Island, Georgia (Savannah River)	Import and Export terminals	Southern LNG	FERC	345 miles southwest	Existing
Jacksonville, Florida	Export terminal	Eagle LNG Partners	FERC	495 miles southwest	Approved, not under construction

Source: FERC (2021a, 2021b)

D.2.14 Onshore Development Activities

Onshore development activities that may contribute to cumulative impacts include visible infrastructure such as onshore wind turbines and cell towers, port development, and other energy projects such as transmission and pipeline projects. Coastal development projects permitted through regional planning commissions, counties, and towns may also contribute to cumulative impacts. These may include residential, commercial, and industrial developments spurred by population growth in the region (Table D- 8).

Table D-8. Existing, approved, and proposed onshore development activities

Type	Description
Local planning documents	• The 2017 Comprehensive Plan Update for Ocean City Maryland guides the general arrangement of land uses within the community such as: housing, commercial, recreation and public facilities (Town of Ocean City, Maryland 2017). • The 5 Year Comprehensive Plan Update: An Addendum to the 2015 Comprehensive Plan (City of Lewes, Delaware 2022). • Sussex County Comprehensive Plan (Sussex County 2019).
Onshore wind projects – Delaware and Maryland	• The only significant wind generation system installed in the State of Delaware is the utility-scale 2-megawatt (2-MW) wind turbine located at the University of Delaware's (UD) Hugh R. Sharp Campus in Lewes. • The Criterion Wind Project is a 70 MW wind farm located on Backbone Mountain east of Oakland, Maryland. • Great Bay Wind Energy Center is a proposed 150 MW wind farm located in Somerset Count, Maryland.
Communications towers – Worcester County, Maryland	From AntennaSearch.com 2021a-b: • There are 144 towers and 9 antennas within a 3.0-mile (1.8-kilometer) radius of Ocean City, Maryland. • There are 144 towers and 92 antennas within a 3.0-mile (1.8-kilometer) radius of Fenwick Island, Maryland.
Communications towers – Sussex County, Delaware	From AntennaSearch.com 2021c-e: • 0 towers and 10 antennas within a 3.0-mile (1.8-kilometer) radius of the Indian River Bay Inlet, Rehoboth Beach, Delaware. • There are 9 towers and 77 antennas within a 3.0-mile (1.8-kilometer) radius of Bethany Beach, Delaware. • There are 10 towers and 87 antennas within a 3.0-mile (1.8-kilometer) radius of Lewes, Delaware.

Type	Description
Port studies/ upgrades –Delaware, Maryland, and Virginia	• Port of Baltimore - Port of Baltimore received $15.6 million from the Federal Railroad Administration (FRA) Consolidated Rail and Infrastructure Safety Improvements (CRISI) program for its Rail Capacity Modernization Project. • Port of Baltimore – The Port of Baltimore received a $1.8 million grant from the US Environmental Protection Agency (EPA) to fund its Diesel Equipment Upgrade Program, seeking to replace older cargo handling equipment and dray trucks with newer, cleaner, and more efficient models. • Baltimore County's Tradepoint Atlantic facility - $13.2 million in upgrades were recently completed at the Sparrows Point Port upgrades as an offshore wind staging center. The port infrastructure upgrades included establishing both a lift-on/lift-off and roll-on/roll-off berth within Tradepoint Atlantic's port facility for handling offshore wind components such as wind turbine blades, foundations, nacelles, and towers. A study commissioned by the Virginia Department of Mines Minerals and Energy and published in 2015 evaluated ten Virginia ports for their readiness to accommodate offshore wind manufacturing and construction activities and also evaluated five commercial shipyards for their readiness to manufacture offshore electrical substations. Using requirements including water side infrastructure, onshore infrastructure, and access requirements, five ports in Virginia more identified with a high level of readiness to support offshore wind, including the following: • Portsmouth Marine Terminal • Newport News Marine Terminal (Virginia Port Authority 2022) • Peck Marine Terminal • Virginia Renaissance Center (Jacoby Development 2017) • BASF Portsmouth Portsmouth and Newport News Marine Terminals were identified by the study team to have the highest level of port readiness due to the ample space available to accommodate multiple co-located offshore wind construction and deployment activities (BVG Associates 2015). In January 2020, the State of Virginia leased 40 acres of land within the Portsmouth Marine Terminal to Ørsted to support the CVOW-C Project (*Virginian Pilot* 2020a). The Portsmouth Marine Terminal was temporarily closed to shipping in April 2020 in response to COVID-19 restrictions (*Virginian Pilot* 2020b; Port of Virginia 2020b). The State of Virginia plans to invest $40 million from its 2021 budget to upgrade the Portsmouth Marine Terminal, near Norfolk, Virginia to handle offshore wind manufacturing, handling, and transportation (Reuters 2021).

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Attachment D-1. Ongoing and Future Non-Offshore Wind Activity Analysis

List of Tables

BOEM developed the following tables based on their 2019 study National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf (BOEM 2019), which evaluates potential impacts associated with ongoing and future non-offshore wind activities.

Table D1-1. Summary of activities and the associated impact-producing factors for air quality

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	Accidental releases of air toxics HAPs are due to potential chemical spills. Ongoing releases occur in low frequencies. These may lead to short-term periods of toxic pollutant emissions through surface evaporation. According to the U.S. Department of Energy, 31,000 barrels of petroleum are spilled into U.S. waters from vessels and pipelines in a typical year. Approximately 40.5 million barrels of oil were lost as a result of tanker incidents from 1970 to 2009, according to International Tanker Owners Pollution Federation Limited, which collects data on oil spills from tankers and other sources. From 1990 to 1999, the average annual input to the coastal Northeast was 220,000 barrels of petroleum and offshore it was up to less than 70,000 barrels.	Accidental releases of air toxics or HAPS will be due to potential chemical spills. See Table D1-22 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 30 years would increase the risk of accidental releases. These may lead to short-term periods of toxic pollutant emissions through evaporation. Air quality impacts will be short-term and limited to the local area at and around the accidental release location.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Air emissions: Construction and decommissioning	Air emissions originate from combustion engines and electric power generated by burning fuel. These activities are regulated under the CAA to meet set standards. Air quality has generally improved over the last 30 years; however, some areas in the Northeast have experienced a decline in air quality over the last 2 years. Some areas of the Atlantic coast remain in nonattainment for ozone, with the source of this pollution from power generation. Many of these states have made commitments toward cleaner energy goals to improve this, and offshore wind is part of these goals. Primary processes and activities that can affect the air quality impacts are expansions and modifications to existing fossil fuel power plants, onshore and offshore activities involving renewable energy facilities, and various construction activities.	The largest air quality impacts over the next 30 years will occur during the construction phase of any one project; however, projects will be required to comply with the CAA. During the limited construction and decommissioning phases, emissions may occur that are above de minimis thresholds and will require offsets and mitigation. Primary emission sources will be increased commercial vehicular traffic, air traffic, public vehicular traffic, and combustion emissions from construction equipment and fugitive emissions from construction-generated dust. As projects come online, power generation emissions overall will decline, and the industry as a whole will have a net benefit on air quality.
Air emissions: O&M	See above	Activities associated with operation and maintenance of onshore wind projects will have a proportionally very small contribution to emissions compared to the construction and decommissioning activities over the next 30 years. Emissions will largely be due to commercial vehicular traffic and operation of emergency diesel generators. Such activity will result in short-term, intermittent, and widely dispersed emissions and small air quality impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Air emissions: Power generation emissions reductions	See above	Many Atlantic states have committed to clean energy goals, with offshore wind being a large part of that. Other reductions include transitioning to onshore wind and solar. The No Action Alternative without implementation of other future offshore wind projects would likely result in increased air quality impacts regionally due to the need to construct and operate new energy generation facilities to meet future power demands. These facilities may consist of new natural- gas-fired power plants, coal-fired, oil-fired, or clean-coal- fired plants. These types of facilities would likely have larger and continuous emissions and result in greater regional scale impacts on air quality.
Air Emissions: Greenhouse Gases	The construction, operation, and decommissioning of offshore wind projects would produce GHG emissions (nearly all CO_2) that can contribute to climate change; however, these contributions would be minuscule compared to aggregate global emissions. CO_2 is relatively stable in the atmosphere and generally mixed uniformly throughout the troposphere and stratosphere. Hence the impact of GHG emissions does not depend upon the source location. Increasing energy production from offshore wind projects will likely decrease GHGs emissions by replacing energy from fossil fuels.	Development of future onshore wind projects will produce a small overall increase in GHG emissions over the next 30 years. However, these contributions would be very small compared to the aggregate global emissions. The impact on climate change from these activities would be very small. As more projects come online, some reduction in GHG emissions from modifications of existing fossil fuel facilities to reduce power generation. Overall, it is anticipated that there would be no cumulative impact on global warming as a result of onshore wind project activities.

CAA = Clean Air Act; CO_2 = carbon dioxide; GHG = greenhouse gas; HAP = hazardous air pollutant; hazmat = hazardous materials; IPF = impact-producing factor; O&M = operations and maintenance

Table D1-2. Summary of activities and the associated impact-producing factors for bats

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	Accidental releases of air toxics HAPs are due to potential chemical spills. Ongoing releases occur in low frequencies. These may lead to short-term periods of toxic pollutant emissions through surface evaporation. According to the U.S. Department of Energy, 31,000 barrels of petroleum are spilled into U.S. waters from vessels and pipelines in a typical year. Approximately 40.5 million barrels of oil were lost as a result of tanker incidents from 1970 to 2009, according to International Tanker Owners Pollution Federation Limited, which collects data on oil spills from tankers and other sources. From 1990 to 1999, the average annual input to the coastal Northeast was 220,000 barrels of petroleum and offshore it was up to less than 70,000 barrels.	Accidental releases of air toxics or HAPS will be due to potential chemical spills. See Table D1-22 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 30 years would increase the risk of accidental releases. These may lead to short-term periods of toxic pollutant emissions through evaporation. Air quality impacts will be short-term and limited to the local area at and around the accidental release location.
Air emissions: Construction and decommissioning	Air emissions originate from combustion engines and electric power generated by burning fuel. These activities are regulated under the CAA to meet set standards. Air quality has generally improved over the last 30 years; however, some areas in the Northeast have experienced a decline in air quality over the last 2 years. Some areas of the Atlantic coast remain in nonattainment for ozone, with the source of this pollution from power generation. Many of these states have made commitments toward cleaner energy goals to improve this, and offshore wind is part of these goals. Primary processes and activities that can affect the air quality impacts are expansions and modifications to existing fossil fuel power plants, onshore and offshore activities involving renewable energy facilities, and various construction activities.	The largest air quality impacts over the next 30 years will occur during the construction phase of any one project; however, projects will be required to comply with the CAA. During the limited construction and decommissioning phases, emissions may occur that are above de minimis thresholds and will require offsets and mitigation. Primary emission sources will be increased commercial vehicular traffic, air traffic, public vehicular traffic, and combustion emissions from construction equipment and fugitive emissions from construction-generated dust. As projects come online, power generation emissions overall will decline, and the industry as a whole will have a net benefit on air quality.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded and would result in high-intensity, low-exposure level, long-term, but localized intermittent risk to bats in nearshore waters. Direct impacts are not expected to occur as recent research has shown that bats may be less sensitive to temporary threshold shifts than other terrestrial mammals (Simmons et al. 2016). Indirect impacts (i.e., displacement from potentially suitable habitats) could occur as a result of construction activities, which could generate noise sufficient to cause avoidance behavior (Schaub et al. 2008). Construction activity would be temporary and highly localized.	Similar to ongoing activities, noise associated with pile driving activities would be limited to nearshore waters, and these high-intensity, but low-exposure risks would not be expected to result in direct impacts. Some indirect impacts (i.e., displacement from potentially suitable foraging habitats) could occur as a result of construction activities, which could generate noise sufficient to cause avoidance behavior (Schaub et al. 2008). Construction activity would be temporary and highly localized and no population- level effects would be expected.
Noise: Construction	Onshore construction occurs regularly for generic infrastructure projects in the bats geographic analysis area. There is a potential for displacement caused by equipment if construction occurs at night (Schaub et al. 2008). Any displacement would only be temporary. No individual or population-level impacts would be expected. Some bats roosting in the vicinity of construction activities may be disturbed during construction but would be expected to move to a different roost farther from construction noise. This would not be expected to result in any impacts as frequent roost switching is a common component of a bat's life history (Hann et al. 2017; Whitaker 1998).	Onshore construction is expected to continue at current trends. Some behavioral responses and avoidance of construction areas may occur (Schaub et al. 2008). However, no injury or mortality would be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Migration disturbances	There may be few structures scattered throughout the offshore bats geographic analysis area, such as navigation and weather buoys and light towers (NOAA 2020a). Migrating bats can easily fly around or over these sparsely distributed structures, and no migration disturbance would be expected. Bat use of offshore areas is very limited and generally restricted to spring and fall migration. Very few bats would be expected to encounter structures on the OCS and no population-level effects would be expected.	The infrequent installation of future new structures in the marine environment of the next 30 years is expected to continue. As described under Ongoing Activities, these structures would not be expected to cause disturbance to migrating tree bats in the marine environment.
Presence of structures: Turbine strikes	There may be few structures in the offshore bats geographic analysis area, such as navigation and weather buoys, turbines, and light towers (NOAA 2020a). Migrating tree bats can easily fly around or over these sparsely distributed structures, and no strikes would be expected.	The infrequent installation of future new structures in the marine environment of the next 30 years is expected to continue. As described under Ongoing Activities, these structures would not be expected to result in increased collision risk to migrating tree bats in the marine environment.
Land disturbance: onshore construction	Onshore construction activities are expected to continue at current trends. Potential direct effects on individuals may occur if construction activities include tree removal when bats are potentially present. Injury or mortality may occur if trees being removed are occupied by bats at the time of removal. While there is some potential for indirect impacts associated with habitat loss, no individual or population- level effects would be expected.	Future non-offshore wind development would continue to occur at the current rate. This development has the potential to result in habitat loss and could result in injury or mortality of individuals.

CAA = Clean Air Act; HAP = hazardous air pollutant; hazmat = hazardous materials; IPF = impact-producing factor; NOAA = National Oceanic and Atmospheric Administration; OCS = outer continental shelf

Table D1-3. Summary of activities and the associated impact-producing factors for benthic resources

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See Table D1-22 for a discussion of ongoing accidental releases. Accidental releases of hazmat occur periodically, mostly consisting of fuels, lubricating oils, and other petroleum compounds. Because most of these materials tend to float in seawater, they rarely contact benthic resources. The chemicals with potential to sink or dissolve rapidly often dilute to non-toxic levels before they affect benthic resources. The corresponding impacts on benthic resources are rarely noticeable.	Gradually increasing vessel traffic over the next 30 years would increase the risk of accidental releases. See previous cell and Table D1-22 on water quality for details.
Accidental releases: Invasive species	Invasive species are periodically released accidentally during ongoing activities, including the discharge of ballast water and bilge water from marine vessels. The impacts on benthic resources (e.g., competitive disadvantage, smothering) depend on many factors, but can be noticeable, widespread, and permanent.	No future activities were identified within the geographic analysis area other than ongoing activities.
Accidental releases: Trash and debris	Ongoing releases of trash and debris occurs from onshore sources, fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines, and pipeline laying. However, there does not appear to be evidence that ongoing releases have detectable impacts on benthic resources.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring	Regular vessel anchoring related to ongoing military, survey, commercial, and recreational activities continue to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. These impacts include increased turbidity levels and the potential for direct contact to cause injury and mortality of benthic resources, as well as physical damage to their habitats. All impacts are localized; turbidity is temporary; injury and mortality are recovered in the short term; and physical damage can be permanent if it occurs in eelgrass beds or hard bottom.	No future activities were identified within the geographic analysis area other than ongoing activities.
EMFs	EMFs continuously emanate from existing telecommunication and electrical power transmission cables. New cables generating EMFs are infrequently installed in the geographic analysis area. Some benthic species can detect EMFs, although EMFs do not appear to present a barrier to movement. The extent of impacts (behavioral changes) is likely less than 50 feet (15.2 meters) from the cable and the intensity of impacts on benthic resources is likely undetectable.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
New cable emplacement/ maintenance	Cable maintenance activities infrequently disturb benthic resources and cause temporary increases in suspended sediment; these disturbances would be local and limited to the emplacement corridor. New cables are infrequently added near shore. Cable emplacement/maintenance activities injure and kill benthic resources, and result in temporary to long-term habitat alterations. The intensity of impacts depends on the time (season) and place (habitat type) where the activities occur. (See also the IPFs of Seabed profile alterations and Sediment deposition and burial.)	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Onshore/ offshore construction	See Table D1-11 on finfish, invertebrates, and EFH. Detectable impacts of construction noise on benthic resources rarely, if ever, overlap from multiple sources.	See Table D1-11 on finfish, invertebrates, and EFH. Detectable impacts of construction noise on benthic resources would rarely, if ever, overlap from multiple sources.
Noise: G&G	See Table D1-11 on finfish, invertebrates, and EFH. Detectable impacts of G&G noise on benthic resources rarely, if ever, overlap from multiple sources.	See Table D1-11 on finfish, invertebrates, and EFH. Detectable impacts of G&G noise on benthic resources would rarely, if ever, overlap from multiple sources.
Noise: O&M	See Table D1-11 on finfish, invertebrates, and EFH.	See Table D1-11 on finfish, invertebrates, and EFH.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water or through the seabed can cause injury or mortality to benthic resources in a small area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Cable laying/trenching	Infrequent trenching activities for pipeline and cable laying, as well as other cable burial methods, emit noise. These disturbances are local, temporary, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines are likely to occur in the geographic analysis area. These disturbances would be infrequent over the next 30 years, local, temporary, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.
Port utilization: Expansion	See Table D1-11 on finfish, invertebrates, and EFH.	See Table D1-11 on finfish, invertebrates, and EFH.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear are periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb, injure, or kill benthic resources, creating small, short-term, localized impacts.	Future new cables would present additional risk of gear loss, resulting in small, short-term, localized impacts (disturbance, injury).
Presence of structures: Hydrodynamic disturbance	See Table D1-11 on finfish, invertebrates, and EFH.	See Table D1-11 on finfish, invertebrates, and EFH.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables continuously create uncommon relief in a mostly sandy seascape. Structure-oriented fishes are attracted to these locations. Increased predation upon benthic resources by structure-oriented fishes can adversely affect populations and communities of benthic resources. These impacts are local and permanent.	New cables installed in the geographic analysis area over the next 30 years would likely require hard protection atop portions of the route (see the "new cable emplacement/maintenance" row in this table). Any new towers, buoy, or piers would also create uncommon relief in a mostly flat, sandy seascape. Structure-oriented fishes could be attracted to these locations. Increased predation upon benthic resources by structure-oriented fishes could adversely affect populations and communities of benthic resources. These impacts are expected to be local and to be permanent as long as the structures remain.
Presence of structures: Habitat conversion	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables continuously provide uncommon hard-bottom habitat. A large portion is homogeneous sandy seascape but there is some other hard or complex habitat. Benthic species dependent on hard-bottom habitat can benefit on a constant basis, although the new habitat can also be colonized by invasive species (e.g., certain tunicate species). Structures are periodically added, resulting in the conversion of existing soft-bottom and hard- bottom habitat to the new hard-structure habitat.	See above for quantification and timing. Any new towers, buoy, piers, or cable protection structures would create uncommon relief in a mostly sandy seascape. Benthic species dependent on hard-bottom habitat could benefit, although the new habitat could also be colonized by invasive species (e.g., certain tunicate species). Soft bottom is the dominant habitat type in the region, and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010).
Presence of structures: cable infrastructure	The presence of cable infrastructure, especially hard protection atop cables, causes impacts through entanglement/gear loss/damage, fish aggregation, and habitat conversion. Therefore, see those sub-IPFs within Presence of structures.	See other sub-IPFs within Presence of structures.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Discharges	The gradually increasing amount of vessel traffic is increasing the cumulative permitted discharges from vessels. Many discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated. However, there does not appear to be evidence that the volumes and extents have any impact on benthic resources.	There is the potential for new ocean dumping/dredge disposal sites in the Northeast. Impacts (disturbance, reduction in fitness) of infrequent ocean disposal to benthic resources are short term because spoils are typically recolonized naturally. In addition, the USEPA has established dredge spoil criteria and it regulates the disposal permits issued by the USACE; these discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated.
Cable emplacement and maintenance; Seabed profile alterations	Ongoing sediment dredging for navigation purposes results in localized short-term impacts (habitat alteration, injury, and mortality) on benthic resources through this IPF. Dredging typically occurs only in sandy or silty habitats, which are abundant in the geographic analysis area and are quick to recover from disturbance. Therefore, such impacts, while locally intense, have little impact on benthic resources in the geographic analysis area.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Cable emplacement and maintenance; Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local, limited to the emplacement corridor. Sediment deposition could have adverse impacts on some benthic resources, especially eggs and larvae, including smothering and loss of fitness. Impacts may vary based on season/time of year. Where dredged materials are disposed benthic resources are smothered. However, such areas are typically recolonized naturally in the short term. Most sediment dredging projects have time-of-year restrictions to minimize impacts on benthic resources. Most benthic resources in the geographic analysis area are adapted to the turbidity and periodic sediment deposition that occur naturally in the geographic analysis area.	The USACE and private ports may undertake dredging projects periodically. Where dredged materials are disposed benthic resources are buried. However, such areas are typically recolonized naturally in the short term. Most benthic resources in the geographic analysis area are adapted to the turbidity and periodic sediment deposition that occur naturally in the geographic analysis area.

EFH = Essential Fish Habitat; EMF = electromagnetic field; G&G = geological and geophysical; hazmat = hazardous materials; IPF = impact-producing factor; O&M = operations and maintenance; USACE = U.S. Army Corps of Engineers; USEPA = U.S. Environmental Protection Agency

Table D1-4. Summary of activities and the associated impact-producing factors for birds

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See Table D1-22 for a qualitative analysis of these risks. Ongoing releases are frequent/chronic. Ingestion of hydrocarbons can lead to morbidity and mortality due to decreased hematological function, dehydration, drowning, hypothermia, starvation, and weight loss (Briggs et al. 1997, Haney et al. 2017, Paruk et al. 2016). Additionally, even small exposures that result in feather oiling can lead to sublethal effects that include changes in flight efficiencies and result in increased energy expenditure during daily and seasonal activities including chick provisioning, commuting, courtship, foraging, long-distance migration, predator evasion, and territory defense (Maggini et al. 2017). These impacts rarely result in population-level impacts.	See Table D1-22 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 30 years would increase the potential risk of accidental releases and associated impacts, including mortality, decreased fitness, and health effects on individuals. Impacts are unlikely to affect populations.
Accidental releases: Trash and debris	Trash and debris are accidentally discharged through onshore sources; fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation, navigation, and traffic; survey activities; and cables, lines, and pipeline laying on an ongoing basis. In a study from 2010, students at sea collected more than 520,000 bits of plastic debris per square mile. In addition, many fragments come from consumer products blown out of landfills or tossed out as litter. (Law et al. 2010). Birds may accidentally ingest trash mistaken for prey. Mortality is typically a result of blockages caused by both hard and soft plastic debris (Roman et al. 2019).	As population and vessel traffic increase gradually over the next 30 years, accidental release of trash and debris may increase. This may result in increased injury or mortality of individuals. However, there does not appear to be evidence that the volumes and extents would have any impact on bird populations.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Light: Vessels	Ocean vessels have an array of lights including navigational lights, deck lights, and interior lights. Such lights can attract some birds. The impact is localized and temporary. This attraction would not be expected to result in an increased risk of collision with vessels. Population-level impacts would not be expected.	Gradually increasing vessel traffic over the next 30 years would increase the potential for bird and vessel interactions. While birds may be attracted to vessel lights, this attraction would not be expected to result in increased risk of collision with vessels. No population-level impacts would be expected.
Light: Structures	Buoys, towers, and onshore structures with lights can attract birds. Onshore structures like houses and ports emit a great deal more light than offshore buoys and towers. This attraction has the potential to result in an increased risk of collision with lighted structures (Hüppop et al. 2006). Light from structures is widespread and permanent near the coast, but minimal offshore.	Light from onshore structures is expected to gradually increase in proportion with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
New cable emplacement/ maintenance	Cable emplacement and maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be temporary and generally limited to the emplacement corridor. Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances will be temporary and limited to the emplacement corridor. Suspended sediment could impair the vision of diving birds that are foraging in the water column (Cook and Burton 2010). However, given the localized nature of the potential impacts, individuals would be expected to successfully forage in nearby areas not affected by increased sedimentation and no biologically significant impacts on individuals or populations would be expected.	Future new cables, would occasionally disturb the seafloor and cause temporary increases in suspended sediment, resulting in localized, short-term impacts. The FCC has two pending submarine telecommunications cable applications in the North Atlantic. Impacts would be temporary and localized, with no biologically significant impacts on individuals or populations.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Aircraft	Aircraft routinely travel in the geographic analysis area for birds. With the possible exception of rescue operations and survey aircraft, no ongoing aircraft flights would occur at altitudes that would elicit a response from birds. If flights are at a sufficiently low altitude, birds may flush, resulting in non- biologically significant increased energy expenditure. Disturbance, if any, would be localized and temporary and impacts would be expected to dissipate once the aircraft has left the area.	Aircraft noise is likely to continue to increase as commercial air traffic increases; however, very few flights would be expected to be at a sufficiently low altitude to elicit a response from birds. If flights are at a sufficiently low altitude, birds may flush, resulting in non-biologically significant increased energy expenditure. Disturbance, if any, would be localized and temporary and impacts would be expected to dissipate once the aircraft has left the area.
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities could result in diving birds leaving the local area. Non-diving birds would be unaffected. Any displacement would only be temporary during non- migratory periods, but impacts could be greater if displacement were to occur in preferred feeding areas during seasonal migration periods.	Same as ongoing activities, with the addition of possible future oil and gas surveys.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water could result in intermittent, temporary, localized impacts on diving birds due to displacement from foraging areas if birds are present in the vicinity of pile-driving activity. The extent of these impacts depends on pile size, hammer energy, and local acoustic conditions. No biologically significant impacts on individuals or populations would be expected.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Onshore construction	Onshore construction is routinely used in generic infrastructure projects. Equipment could potentially cause displacement. Any displacement would only be temporary, and no individual fitness or population-level impacts would be expected.	Onshore construction will continue at current trends. Some behavior responses could range from escape behavior to mild annoyance, but no individual injury or mortality would be expected.
Noise: Vessels	Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Subsurface noise from vessels could disturb diving birds foraging for prey below the surface. The consequence to birds would be similar to noise from G&G but likely less because noise levels are lower.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Presence of structures: Entanglement, gear loss, gear damage	Each year, 2,551 seabirds die annually from interactions with U.S. commercial fisheries on the Atlantic (Sigourney et al. 2019). Even more die due to abandoned commercial fishing gear (nets). In addition, recreational fishing gear (hooks and lines) is periodically lost on existing buoys, pilings, hard protection, and other structures and has the potential to entangle birds.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various hard protections atop cables create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these objects. These impacts are local and can be short term to permanent. These fish aggregations can provide localized, short term to permanent, beneficial impacts on some bird species because it could increase prey species availability.	New cables, installed incrementally in the geographic analysis area for birds over the next 20 to 30 years, would likely require hard protection atop portions of the cables (see New cable emplacement/maintenance row). Any new towers, buoys, or piers would also create uncommon relief in a mostly flat seascape. Structure-oriented fishes could be attracted to these locations. Abundance of certain fishes may increase. These impacts are expected to be local and may be short term to permanent. These fish aggregations can provide localized, short-term to permanent beneficial impacts on some bird species due to increased prey species availability.
Presence of structures: Migration disturbances	A few structures may be scattered about the offshore geographic analysis area for birds, such as navigation and weather buoys and light towers (NOAA 2020a). Migrating birds can easily fly around or over these sparsely distributed structures.	The infrequent installation of future new structures in the marine or onshore environment over the next 30 years would not be expected to result in migration disturbances.
Presence of structures: Turbine strikes, displacement, and attraction	A few structures may be in the offshore geographic analysis area for birds, such as navigation and weather buoys, turbines, and light towers (NOAA 2020a). Given the limited number of structures currently in the geographic analysis area, individual- and population-level impacts due to displacement from current foraging habitat would not be expected. Stationary structures in the offshore environment would not be expected to pose a collision risk to birds. Some birds like cormorants and gulls may be attracted to these structures and opportunistically roost on these structures.	The installation of future new structures in the marine or onshore environment over the next 30 years would not be expected to result in an increase in collision risk or to result in displacement. Some potential for attraction and opportunistic roosting exists but would be expected to be limited given the anticipated number of structures.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Traffic: Aircraft	General aviation accounts for approximately two bird strikes per 100,000 flights (Dolbeer et al. 2019). Additionally, aircraft are used for scientific and academic surveys in marine environments.	Bird fatalities associated with general aviation would be expected to increase with the current trend in commercial air travel. Aircraft will continue to be used to conduct scientific research studies as well as wildlife monitoring and pre- construction surveys. These flights would be well below the 100,000 flights and no bird strikes would be expected to occur.
Land disturbance: Onshore construction	Onshore construction activity will continue at current trends. There is some potential for indirect impacts associated with habitat loss and fragmentation.	Future non-offshore wind development would continue to occur at the current rate. This development has the potential to result in habitat loss but would not be expected to result in injury or mortality of individuals.

FCC = Federal Communications Commission; G&G = geological and geophysical; hazmat = hazardous materials; IPF = impact- producing factor; NOAA = National Oceanic and Atmospheric Administration

Table D1-5. Summary of activities and the associated impact-producing factors for terrestrial and coastal fauna

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Land disturbance: Erosion and sedimentation	Periodic ground-disturbing activities contribute to elevated levels of erosion and sedimentation, but usually not to a degree that affects terrestrial and coastal fauna, assuming that industry standard BMPs are implemented.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance: Onshore construction	Periodic clearing of shrubs and tree saplings along existing utility ROWs causes disturbance and temporary displacement of mobile species and may cause direct injury or mortality of less-mobile species, resulting in short-term impacts that are less than noticeable. Continual development of residential, commercial, industrial, solar, transmission, gas pipeline, onshore wind turbine, and cell tower projects also causes disturbance, displacement, and potential injury or mortality of fauna, resulting in small temporary impacts.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance: Onshore, land use changes	Periodically, undeveloped parcels are cleared and developed for human uses, permanently changing the condition of those parcels as habitat for terrestrial fauna. Continual development of residential, commercial, industrial, solar, transmission, gas pipeline, onshore wind turbine, transportation infrastructure, sewer infrastructure, and cell tower projects could permanently convert various areas.	No future activities were identified within the geographic analysis area other than ongoing activities.
Climate change: Warming and sea level rise, altered habitat/ecology	Climate change, influenced in part by greenhouse gas emissions, is altering the seasonal timing and patterns of species distributions and ecological relationships, likely causing permanent changes of unknown intensity gradually over the next 30 years.	No future activities were identified within the geographic analysis area other than ongoing activities.

BMPs = best management practices; IPF = impact-producing factor; ROW = right-of-way

Table D1-6. Summary of activities and the associated impact-producing factors for coastal habitats

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/ hazmat	See Table D1-22 for a discussion of ongoing accidental releases. Accidental releases of fuel/fluids/hazmat have the potential to cause habitat contamination and harm to the species that build biogenic coastal habitats (e.g., eelgrass, oysters, mussels, slipper limpets, salt marsh cordgrass) from releases or cleanup activities. Only a portion of the ongoing releases contact coastal habitats in the geographic analysis area. Impacts are small, localized, and temporary.	See Table D1-22 for a discussion of accidental releases.
Accidental releases: Trash and debris	Ongoing releases of trash and debris occur from onshore sources, fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines and pipeline laying. As population and vessel traffic increase, accidental releases of trash and debris may increase. Such materials may be obvious when they come to rest on shorelines; however, there does not appear to be evidence that the volumes and extents would have any detectable impact on coastal habitats.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
Anchoring	Vessel anchoring related to ongoing military, survey, commercial, and recreational activities will continue to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. These impacts include increased turbidity levels and potential for direct contact to cause physical damage to coastal habitats. All impacts are localized; turbidity is short term and temporary; physical damage can be permanent if it occurs in eelgrass beds or hard bottom.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
EMF	EMFs continuously emanate from existing telecommunication and electrical power transmission cables. New cables generating EMFs are infrequently installed in the analysis area. The extent of impacts is likely less than 50 feet from the cable, and the intensity of impacts on coastal habitats is likely undetectable.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
Light: Vessels	Navigation lights and deck lights on vessels would be a source of ongoing light. The extent of impacts is limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats is likely undetectable.	Light is expected to continue to increase gradually with increasing vessel traffic over the next 30 years. The extent of impacts would likely be limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats would likely be undetectable.
Light: Structures	Ongoing lights from navigational aids and other structures onshore and nearshore. The extent of impacts is likely limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats is likely undetectable.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
New cable emplacement/ maintenance	Ongoing cable maintenance activities infrequently disturb bottom sediments; these disturbances are local and limited to the emplacement corridor (see the Sediment deposition and burial IPF).	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Onshore/offshore construction	Ongoing noise from construction occurs frequently near shores of populated areas in New England and the mid-Atlantic, but infrequently offshore. Noise from construction near shore is expected to gradually increase over the next 30 years in line with human population growth along the coast of the geographic analysis area. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary.	No future activities were identified within the analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: G&G	Site characterization surveys and scientific surveys are ongoing. The intensity and extent of the resulting impacts are difficult to generalize but are local and temporary.	Site characterization surveys, scientific surveys, and exploratory oil and gas surveys are anticipated to occur infrequently over the next 30 years. Site characterization surveys typically use sub-bottom profiler technologies that generate less- intense sound waves similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water or through the seabed can reach coastal habitats. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the analysis area other than ongoing activities.
Noise: Cable laying/trenching	Rare but ongoing trenching for pipeline and cable laying activities emits noise; cable burial via jet embedment also causes similar noise impacts. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on coastal habitats are discountable compared to the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines may occur in the geographic analysis area infrequently over the next 30 years. These disturbances would be temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on coastal habitats are discountable compared to the impacts of the physical disturbance and sediment suspension.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Habitat conversion	Various structures, including pilings, piers, towers, riprap, buoys, and various means of hard protection, are periodically added to the seascape, creating uncommon relief in a mostly flat seascape, and converting previously existing habitat (whether hard-bottom or soft-bottom) to a type of hard habitat, although it differs from the typical hard-bottom habitat in the analysis area, namely, coarse substrates in a sand matrix. The new habitat may or may not function similarly to hard-bottom habitat typical in the region (Kerckhof et al. 2019; HDR 2019). Soft bottom is the dominant habitat type on the OCS, and structures do not meaningfully reduce the amount of soft-bottom habitat available (Guida et al. 2017; Greene et al. 2010). Structures can also create an artificial reef effect, attracting a different community of organisms.	Any new cable or pipeline installed in the geographic analysis area would likely require hard protection atop portions of the route (see cells to the left). Such protection is anticipated to increase incrementally over the next 30 years. Where cables would be buried deeply enough that protection would not be used, presence of the cable would have no impact on coastal habitats.
Presence of structures: Transmission cable infrastructure	Various means of hard protection atop existing cables can create uncommon hard- bottom habitat. Where cables are buried deeply enough that protection is not used, presence of the cable has no impact on coastal habitats.	See above.
Land disturbance: Erosion and sedimentation	Ongoing development of onshore properties, especially shoreline parcels, periodically causes short-term erosion and sedimentation of coastal habitats.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance: Onshore construction	Ongoing development of onshore properties, especially shoreline parcels, periodically causes short-term to permanent degradation of onshore coastal habitats.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance: Onshore, land use changes	Ongoing development of onshore properties, especially shoreline parcels, periodically causes the conversion of onshore coastal habitats to developed space.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Cable emplacement and maintenance: Seabed profile alterations	Ongoing sediment dredging for navigation purposes results in localized, short-term impacts on coastal habitats through this IPF. Dredging typically occurs only in sandy or silty habitats, which are abundant in the analysis area and are quick to recover from disturbance. Therefore, such impacts, while locally intense, have little effect on the general character of coastal habitats.	No future activities were identified within the geographic analysis area other than ongoing activities.
Cable emplacement and maintenance: Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition within coastal habitats. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local, limited to the emplacement corridor. No dredged material disposal sites were identified within the geographic analysis area.	No future activities were identified within the geographic analysis area other than ongoing activities.

EMF = electromagnetic field; G&G = geological and geophysical; hazmat = hazardous materials; IPF = impact-producing factor

Table D1-7. Summary of activities and the associated impact-producing factors for commercial fisheries and for-hire recreational fishing

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring	Impacts from anchoring occur due to ongoing military, survey, commercial, and recreational activities. The short- term, localized impact on this resource is the presence of a navigational hazard (anchored vessel) to fishing vessels.	Impacts from anchoring may occur on a semi-regular basis over the next 30 years due to offshore military operations, survey activities, commercial vessel traffic, and recreational vessel traffic. Anchoring could pose a temporary (hours to days), localized (within a few hundred meters of anchored vessel) navigational hazard to fishing vessels.
New cable emplacement/ maintenance	New cable emplacement and infrequent cable maintenance activities disturb the seafloor, increase suspended sediment, and cause temporary displacement of fishing vessels. These disturbances would be local and limited to the emplacement corridor.	Future new cables and cable maintenance would occasionally disturb the seafloor and cause temporary displacement in fishing vessels and increases in suspended sediment resulting in local, short-term impacts. The FCC has two pending submarine telecommunication cable applications in the North Atlantic. If the cable routes enter the geographic analysis area for this resource, short-term disruption of fishing activities would be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Construction, trenching, operations and maintenance	Noise from construction occurs frequently in coastal habitats in populated areas in New England and the mid-Atlantic, but infrequently offshore. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary. Infrequent offshore trenching could occur in connection with cable installation. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Low levels of elevated noise from operational WTGs likely have low to no impacts on fish and no impacts at a fishery level. Noise is also created by operations and maintenance of marine minerals extraction, which has small, local impacts on fish, but likely no impacts at a fishery level.	Noise from construction near shore is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource. Noise from sand and gravel mining could occur. New or expanded marine minerals extraction may increase noise during their operations and maintenance over the next 30 years. Impacts from construction, operations, and maintenance would likely be small and local on fish, and not seen at a fishery level. Periodic trenching would be needed for repair or new installation of underground infrastructure. These disturbances would be temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on commercial fish species are typically less prominent than the impacts of the physical disturbance and sediment suspension. Therefore, fishery-level impacts are unlikely.
Noise: G&G	Ongoing site characterization surveys and scientific surveys produce noise around sites of investigation. These activities can disturb fish and invertebrates in the immediate vicinity of the investigation and can cause temporary behavioral changes. The extent depends on equipment used, noise levels, and local acoustic conditions.	Site characterization surveys, scientific surveys, and exploratory oil and gas surveys are anticipated to occur infrequently over the next 30 years. Seismic surveys used in oil and gas exploration create high-intensity impulsive noise to penetrate deep into the seabed, potentially resulting in injury or mortality to finfish and invertebrates in a small area around each sound source and short-term stress and behavioral changes to individuals over a greater area. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves more similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when ports or marinas, piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water or through the seabed can cause injury or mortality to finfish and invertebrates in a small area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area, leading to temporary local impacts on commercial fisheries and for-hire recreational fishing. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the analysis area other than ongoing activities.
Noise: Vessels	Vessel noise is anticipated to continue at levels similar to current levels. While vessel noise may have some impact on behavior, it is likely limited to brief startle and temporary stress responses. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	Planned new barge route and dredging disposal sites would generate vessel noise when implemented.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 30 years.	Ports would need to perform maintenance and upgrades to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep- draft vessels as they continue to increase in size. Port utilization is expected to increase over the next 30 years, with increased activity during construction. The ability of ports to receive the increase in vessel traffic may require port modifications, such as channel deepening, leading to local impacts on fish populations. Port expansions could also increase vessel traffic and competition for dockside services, which could affect fishing vessels.
Presence of structures: Navigation hazard and allisions	Structures within and near the cumulative lease areas that pose potential navigation hazards include the Block Island Wind Farm WTGs, buoys, and shoreline developments such as docks and ports. An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. Two types of allisions occur: drift and powered. A drift allision generally occurs when a vessel is powered down due to operator choice or power failure. A powered allision generally occurs when an operator fails to adequately control their vessel movements, or is distracted.	No known reasonably foreseeable structures are proposed to be located in the geographic analysis area that could affect commercial fisheries. Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb habitats and potentially harm individuals, creating small, localized, short-term impacts on fish, but likely no impacts at a fishery level.	No future activities were identified within the analysis area other than ongoing activities.
Presence of structures: Habitat conversion and fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly sandy seascape. A large portion is homogeneous sandy seascape but there is some other hard or complex habitat. Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat. Structure-oriented fishes are attracted to these locations. These impacts are local and can be short term to permanent. Fish aggregation may be considered adverse, beneficial, or neither. Commercial and for-hire recreational fishing can occur near these structures. For-hire recreational fishing is more popular, as commercial mobile fishing gear risk snagging on the structures.	New cables, installed incrementally in the analysis area over the next 20 to 30 years, would likely require hard protection atop portions of the route (see New cable emplacement/maintenance IPF above). Any new towers, buoys, or piers would also create uncommon relief in a mostly flat seascape. Structure-oriented species could be attracted to these locations. Structure-oriented species would benefit (Claisse et al. 2014, Smith et al. 2016). This may lead to more and larger structure-oriented fish communities and larger predators opportunistically feeding on the communities, as well as increased private and for-hire recreational fishing opportunities. Soft bottom is the dominant habitat type in the region, and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010). These impacts are expected to be local and may be long-term.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Migration disturbances	Human structures in the marine environment, e.g., shipwrecks, artificial reefs, buoys, and oil platforms, can attract finfish and invertebrates that approach the structures during their migrations. This could slow species migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement than structure (Secor et al. 2018). There is no evidence to suggest that structures pose a barrier to migratory animals.	The infrequent installation of future new structures in the marine environment over the next 30 years may attract finfish and invertebrates that approach the structures during their migrations. This could tend to slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement (Secor et al. 2018). Migratory animals would likely be able to proceed from structures unimpeded. Therefore, fishery-level impacts are not anticipated.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	No known reasonably foreseeable structures are proposed for location in the geographic analysis area that could affect commercial fisheries and for-hire recreational fishing.
Presence of structures: Transmission cable infrastructure	The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between mainland and islands. Seven subsea cable corridors cross cumulative lease areas. Shoreline developments are ongoing and include docks, ports, and other commercial, industrial, and residential structures.	No known proposed structures (other than those associated with offshore wind development) are reasonably foreseeable and proposed to be located in the geographic analysis area for this resource.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Traffic: Vessels and vessel collisions	No substantial changes are anticipated to the vessel traffic volumes. The geographic analysis area would continue to have numerous ports and the extensive marine traffic related to shipping, fishing, and recreation would continue to be important to the region's economy. The region's substantial marine traffic may result in occasional collisions. Vessels need to navigate around structures to avoid allisions. When multiple vessels need to navigate around a structure, then navigation is more complex, as the vessels need to avoid both the structure and each other. The risk for collisions is ongoing but infrequent.	New vessel traffic in the geographic analysis area would consistently be generated by proposed barge routes and dredging demolition sites. Marine commerce and related industries would continue to be important to the regional economy.

FCC = Federal Communications Commission; G&G = geological and geophysical; IPF = impact-producing factor; WTG = wind turbine generator

Table D1-8. Summary of activities and the associated impact-producing factors for cultural resources

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/ hazmat	See Table D1-22 for water quality for a quantitative analysis of these risks. Accidental releases of fuel/fluids/hazmat occur during vessel use for recreational, fisheries, marine transportation, or military purposes, and other ongoing activities. Both released fluids and cleanup activities that require the removal of contaminated soils and seafloor sediments can cause impacts on cultural resources because resources are impacted during by the released chemicals as well as the ensuing cleanup activities.	Gradually increasing vessel traffic over the next 30 years would increase the risk of accidental releases within the geographic analysis area for cultural resources, increasing the frequency of small releases. Although the majority of anticipated accidental releases would be small, resulting in small-scale impacts on cultural resources, a single, large-scale accidental release such as an oil spill, could have significant impacts on marine and coastal cultural resources. A large-scale release would require extensive cleanup activities to remove contaminated materials resulting in damage to or the complete removal of terrestrial and marine cultural resources. In addition, the accidentally released materials in deep-water settings could settle on seafloor cultural resources such as wreck sites, accelerating their decomposition or covering them and making them inaccessible/unrecognizable to researchers, resulting in a significant loss of historic information. As a result, although considered unlikely, a large-scale accidental release and associated cleanup could result in permanent, geographically extensive, and large-scale impacts on cultural resources.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Trash and debris	Accidental releases of trash and debris occur during vessel use for recreational, fisheries, marine transportation, or military purposes and other ongoing activities. While the released trash and debris can directly affect cultural resources, the majority of impacts associated with accidental releases occur during cleanup activities, especially if soil or sediment removed during cleanup affect known and undiscovered archaeological resources. In addition, the presence of large amounts of trash on shorelines or the ocean surface can impact the cultural value of TCPs for stakeholders. State and federal laws prohibiting large releases of trash would limit the size of any individual release and ongoing local, state, and federal efforts to clean up trash on beaches and waterways would continue to mitigate the effects of small-scale accidental releases of trash.	Future activities with the potential to result in accidental releases include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications). Accidental releases would continue at current rates along the northeast Atlantic coast.
Anchoring	The use of vessel anchoring and gear (i.e., wire ropes, cables, chain, sweep on the seafloor) that disturbs the seafloor, such as bottom trawls and anchors, by military, recreational, industrial, and commercial vessels can impact cultural resources by physically damaging maritime archaeological resources such as shipwrecks and debris fields.	Future activities with the potential to result in anchoring/gear utilization include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); military use; marine transportation; fisheries use and management; and oil and gas activities. These activities are likely to continue to occur at current rates along the entire coast of the eastern United States.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Gear utilization: Dredging	Activities associated with dredge operations and activities could damage marine archaeological resources. Ongoing activities identified by BOEM with the potential to result in dredging impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities.	Dredging activities would gradually increase through time as new offshore infrastructure is built, such as gas pipelines and electrical lines, and as ports and harbors are expanded or maintained.
Light: Vessels	Light associated with military, commercial, or construction vessel traffic can temporarily affect coastal historic structures and TCP resources when the addition of intrusive, modern lighting changes the physical environment ("setting") of cultural resources. The impacts of construction and operations lighting would be limited to cultural resources on the shoreline for which a nighttime sky is a contributing element to historic integrity. This excludes resources that are closed at night, such as historic buildings, lighthouses, and battlefields, and resources that generate their own nighttime light, such as historic districts. Offshore construction activities that require increased vessel traffic, construction vessels stationed offshore, and construction area lighting for prolonged periods can cause more sustained and significant visual impacts on coastal historic structure and TCP resources.	Future activities with the potential to result in vessel lighting impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities. Light pollution from vessel traffic would continue at the current intensity along the northeast coast, with a slight increase due to population increase and development over time.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Light: Structures	The construction of new structures that introduce new light sources into the setting of historic architectural properties or TCPs can result in impacts, particularly if the historic or cultural significance of the resource is associated with uninterrupted nighttime skies or periods of darkness. Any tall structure (commercial building, radio antenna, large satellite dishes, etc.) requiring nighttime hazard lighting to prevent aircraft collision can cause these types of impacts.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
Port utilization: Expansion	Major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The MCT was upgraded by the Port of New Bedford specifically to support the construction of offshore wind facilities. Expansion of port facilities can introduce large, modern port infrastructure into the viewsheds of nearby historic properties, impacting their setting and historic significance.	Future activities with the potential to result in port expansion impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean- dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities. Port expansion would continue at current levels, which reflect efforts to capture business associated with the offshore wind industry (irrespective of specific projects).
Presence of structures	The only existing offshore structures within the viewshed of the geographic analysis area are minor features such as buoys.	Non-offshore wind structures that could be viewed would be limited to meteorological towers. Marine activity would also occur within the marine viewshed of the geographic analysis area.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
New cable emplacement/ maintenance	Current offshore construction activity is limited to subsea fiber optic and electrical transmission cables, including six existing power cables in the geographic analysis area.	Future activities with the potential to result in seafloor disturbances similar to offshore impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; and oil and gas activities. Such activities could cause impacts on submerged archaeological resources including shipwrecks and formerly subaerially exposed pre-contact Native American archaeological sites.
Land disturbance: Onshore construction	Onshore construction activities can impact archaeological resources by damaging or removing resources.	Future activities that could result in terrestrial land disturbance impacts include onshore residential, commercial, industrial, and military development activities in central Cape Cod, particularly those proximate to OECRs and interconnection facilities. Onshore construction would continue at current rates.

BOEM = Bureau of Ocean Energy Management; hazmat = hazardous materials; IFP = impact-producing factor; MCT = New Bedford Marine Commerce Terminal; OECR = offshore export cable route; TCP = Traditional Cultural Property

Table D1-9. Summary of activities and the associated impact-producing factors for demographics, employment, and economics

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Energy generation/ security	In 2017, Massachusetts energy production totaled 125.2 trillion Btu, of which 72.4 trillion Btu was from renewable sources, including geothermal, hydroelectric, wind, solar, and biomass (U.S. Energy Information Administration 2018).	Ongoing development of onshore solar and wind energy would provide diversified, small-scale energy generation. State and regional energy markets would require additional peaker plants and energy storage to meet the electricity needs when utility scale renewables are not producing.
Light: Structures	Offshore buoys and towers emit low-intensity light, while onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
Light: Vessels	Ocean vessels have an array of lights including navigational lights and deck lights.	Anticipated modest growth in vessel traffic would result in some growth in the nighttime traffic of vessels with lighting.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors. In the geographic analysis area for demographics, employment, and economics there are six existing power cables.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. Future new cables would disturb the seafloor and cause temporary increases in suspended sediment resulting in infrequent, localized, short-term impacts over the next 30 years.
Noise: O&M	Limited to South Fork Wind Project.	Not applicable.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area.	No future activities were identified within the geographic analysis area for demographics, employment, and economics other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Cable laying/trenching	Infrequent trenching for pipeline and cable laying activities emit noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	Periodic trenching would be needed over the next 30 years for repair or new installation of underground infrastructure.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Planned new barge route and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The MCT was upgraded by the port specifically to support the construction of offshore wind energy facilities.	Ports would need to perform maintenance and upgrade facilities over the next 30 years to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Port utilization: Maintenance/ dredging	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. As ports expand, maintenance dredging of shipping channels is expected to increase.	Ports would need to perform maintenance and upgrades over the next 30 years to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Presence of structures: Allisions	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. The likelihood of allisions is expected to continue at or near current levels.	Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. Such loss and damage are direct costs for gear owners and are expected to continue at or near current levels.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly flat seascape. Structure- oriented fishes are attracted to these locations, which may be known as fish aggregating devices (FADs). Recreational and commercial fishing can occur near the FADs, although recreational fishing is more popular, because commercial mobile fishing gear is more likely to snag on FADs.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Habitat conversion	Structures, including foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly flat seascape. Structure- oriented species thus benefit on a constant basis.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, because vessels need to avoid both the structure and each other.	Vessel traffic, overall, is not expected to meaningfully increase over the next 30 years. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Viewshed	No existing offshore structures are within the viewshed of the Wind Farm Area except buoys.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Transmission cable infrastructure	The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between mainland and islands. Additional communication cables run between the U.S. East Coast and European countries along the eastern Atlantic.	No known proposed structures not associated with offshore wind development are reasonably foreseeable.
Traffic: Vessels	Geographic analysis area ports and marine traffic related to shipping, fishing, and recreation are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes.	New vessel traffic near the geographic analysis area would be generated by proposed barge routes and dredging demolition sites over the next 30 years. Marine commerce and related industries would continue to be important to the geographic analysis area economy.
Traffic: Vessel collisions	The region's substantial marine traffic may result in occasional vessel collisions, which would result in costs to the vessels involved. The likelihood of collisions is expected to continue at or near current rates.	No substantial changes anticipated.
Land disturbance: Onshore construction	Onshore development activities support local population growth, employment, and economies. Disturbances can cause temporary, localized traffic delays and restricted access to adjacent properties. The rate of onshore land disturbance is expected to continue at or near current rates.	Onshore development projects would be ongoing in accordance with local government land use plans and regulations.

FAD = fish aggregating device; FCC = Federal Communications Commission; IPF = impact-producing factor; MCT = New Bedford Marine Commerce Terminal; O&M = operations and maintenance

Table D1-10. Summary of activities and the associated impact-producing factors for environmental justice

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Air emissions: Construction/ decommissioning	Ongoing population growth and new development within the analysis area is likely to increase traffic with a resulting increase in emissions from motor vehicles. Some new industrial development may result in emissions-producing uses. At the same time, many industrial waterfront areas near environmental justice communities are losing industrial uses and converting to more commercial or residential uses.	New development may include emissions-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations will continue to lose industrial uses, with no new industrial development to replace it. Cities such as New Bedford are promoting start-up space and commercial uses to re-use industrial space.
Air emissions: Operations and maintenance	Ongoing population growth and new development within the analysis area is likely to increase traffic with a resulting increase in emissions from motor vehicles. Some new industrial development may result in emissions-producing uses. At the same time, many industrial waterfront areas near environmental justice communities are losing industrial uses and converting to more commercial or residential uses.	New development may include emissions-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations will continue to lose industrial uses, with no new industrial development to replace it. Cities such as New Bedford are promoting start-up space and commercial uses to re-use industrial space.
Light: Structures	Offshore buoys and towers emit low-intensity light, while onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. Future new cables would disturb the seafloor and cause temporary increases in suspended sediment, resulting in infrequent, localized, short-term impacts over the next 30 years.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Operations and maintenance	Offshore operations and maintenance of existing wind energy projects generates negligible amounts of noise.	There are no reasonably foreseeable offshore facilities that would generate noise from operations/maintenance.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area.	No future activities were identified within the analysis area other than ongoing activities.
Noise: Trenching	Infrequent trenching for pipeline and cable laying activities emits noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	Periodic trenching would be needed over the next 30 years for repair or new installation of underground infrastructure.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Planned new barge route and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The MCT at the Port of New Bedford is a completed facility developed by the port specifically to support the construction of offshore wind facilities.	Ports would need to perform maintenance and upgrade facilities to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Entanglement, gear loss/ damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. Such loss and damage are direct costs for gear owners and are expected to continue at or near current levels.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, because vessels need to avoid both the structure, and each other.	Vessel traffic is generally not expected to meaningfully increase over the next 30 years. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Viewshed	There are no existing offshore structures within the viewshed of the Wind Farm Area except buoys.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Transmission cable infrastructure	Seven subsea cable corridors cross cumulative lease areas.	Existing cable operation and maintenance activities would continue within the analysis area.
Traffic: Vessels	Geographic analysis area ports and marine traffic related to shipping, fishing and recreation are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes.	New vessel traffic near the geographic analysis area would be generated by proposed barge routes and dredging demolition sites over the next 30 years. Marine commerce and related industries would continue to be important to the geographic analysis area employment.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Land disturbance: Erosion and sedimentation	Potential erosion and sedimentation from development and construction is controlled by local and state development regulations.	New development activities would be subject to erosion and sedimentation regulations.
Land disturbance: Onshore construction	Onshore development supports local population growth, employment, and economics.	Onshore development would continue in accordance with local government land use plans and regulations.
Land disturbance: Onshore, land use changes	Onshore development would result in changes in land use in accordance with local government land use plans and regulations.	Development of onshore solar and wind energy would provide diversified, small-scale energy generation.

FCC = Federal Communications Commission; IPF = impact-producing factor; MCT = New Bedford Marine Commerce Terminal

Table D1-11. Summary of activities and the associated impact-producing factors for finfish, invertebrates, and essential fish habitat

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/ hazmat	See Table D1-22 for a quantitative analysis of these risks. Ongoing releases are frequent/chronic. Impacts, including mortality, decreased fitness, and contamination of habitat, are localized and temporary, and rarely affect populations.	See Table D1-22 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 30 years would increase the risk of accidental releases. Impacts are unlikely to affect populations.
Accidental releases: Invasive species	Invasive species are periodically released accidentally during ongoing activities, including the discharge of ballast water and bilge water from marine vessels. The impacts on finfish, invertebrates, and EFH depend on many factors, but can be widespread and permanent.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Anchoring	Vessel anchoring related to ongoing military use, and survey, commercial, and recreational activities continues to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. Impacts on finfish, invertebrates, and EFH are greatest for sensitive EFH (e.g., eelgrass, hard bottom) and sessile or slow-moving species (e.g., corals, sponges, and sedentary shellfish).	Impacts from anchoring may occur on a semi-regular basis over the next 30 years due to offshore military operations, survey activities, commercial vessel traffic, or recreational vessel traffic. These impacts would include increased turbidity levels and potential for direct contact causing mortality of benthic species and, possibly, degradation of sensitive habitats. All impacts would be localized; turbidity would be temporary; impacts from direct contact would be recovered in the short term. Degradation of sensitive habitats such as certain types of hard bottom (e.g., boulder piles), if it occurs, could be long-term.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
EMF	EMF emanates continuously from installed telecommunication and electrical power transmission cables. Biologically significant impacts on finfish, invertebrates, and EFH have not been documented for AC cables (CSA Ocean Sciences, Inc. and Exponent 2019 and see Thomsen et al. 2015), but behavioral impacts have been documented for benthic species (skates and lobster) near operating DC cables (Hutchison et al. 2018). The impacts are localized and affect the animals only while they are within the EMF. There is no evidence to indicate that EMF from undersea AC power cables negatively affects commercially and recreationally important fish species within the southern New England area (CSA Ocean Sciences, Inc. and Exponent 2019).	During operation, future new cables would produce EMF. (See cell to the left.) Submarine power cables in the geographic analysis area for this resource are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels. EMF of any two sources would not overlap (even for multiple cables within a single OECC). Although the EMF would exist as long as a cable was in operation, impacts, on finfish, invertebrates, and EFH would likely be difficult to detect.
Light: Vessels	Marine vessels have an array of lights including navigational lights and deck lights. There is little downward-focused lighting, and therefore only a small fraction of the emitted light enters the water. Light can attract finfish and invertebrates, potentially affecting distributions in a highly localized area. Light may also disrupt natural cycles, e.g., spawning, possibly leading to short- term impacts.	See cell to the left.
Light: Structures	Offshore buoys and towers emit light, and onshore structures, including buildings and ports, emit a great deal more on an ongoing basis. Light can attract finfish and invertebrates, potentially affecting distributions in a highly localized area. Light may also disrupt natural cycles, e.g., spawning, possibly leading to short-term impacts. Light from structures is widespread and permanent near the coast, but minimal offshore.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances are local, limited to the cable corridor. New cables are infrequently added near shore. Cable emplacement/ maintenance activities disturb, displace, and injure finfish and invertebrates and result in temporary to long-term habitat alterations. The intensity of impacts depends on the time (season) and place (habitat type) where the activities occur. (See also the IPF of Sediment deposition and burial.)	Future new cables would occasionally disturb the seafloor and cause temporary increases in suspended sediment, resulting in local short-term impacts. The FCC has two pending submarine telecommunication cable applications in the North Atlantic. If the cable routes enter the geographic analysis area for this resource, short- term disturbance would be expected. The intensity of impacts would depend on the time (season) and place (habitat type) where the activities would occur.
Noise: Aircraft	Noise from aircraft reaches the sea surface on a regular basis. However, there is not likely to be any impact of aircraft noise on finfish, invertebrates, and EFH, as very little of the aircraft noise propagates through the water.	Aircraft noise is likely to continue to increase as commercial air traffic increases. However, there is not likely to be any impact of aircraft noise on finfish, invertebrates, and EFH.
Noise: Onshore/offshore construction	Noise from construction occurs frequently in near shores of populated areas in New England and the mid-Atlantic but infrequently offshore. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary. See also sub-IPF for Noise: Pile driving.	Noise from construction near shores is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: G&G	Ongoing site characterization surveys and scientific surveys produce noise around sites of investigation. These activities can disturb finfish and invertebrates in the immediate vicinity of the investigation and can cause temporary behavioral changes. The extent depends on equipment used, noise levels, and local acoustic conditions.	Site characterization surveys, scientific surveys, and exploratory oil and gas surveys are anticipated to occur infrequently over the next 30 years. Seismic surveys used in oil and gas exploration create high-intensity impulsive noise to penetrate deep into the seabed, potentially resulting in injury or mortality to finfish and invertebrates in a small area around each sound source and short-term stress and behavioral changes to individuals over a greater area. Site characterization surveys typically use sub- bottom profiler technologies that generate less-intense sound waves more similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary.
Noise: O&M	Some finfish and invertebrates may be able to hear the continuous underwater noise of operational WTGs. As measured at the Block Island Wind Farm, this low frequency noise barley exceeds ambient levels at 164 feet (50 meters) from the WTG base. Based on the results of Thomsen et al. (2015), sound pressure levels would be expected to be at or below ambient levels at relatively short distances (approximately 164 feet [50 meters]) from WTG foundations. These low levels of elevated noise likely have little to no impact. Noise is also created by operations and maintenance of marine minerals extraction and commercial fisheries, each of which has small local impacts.	New or expanded marine minerals extraction and commercial fisheries may intermittently increase noise during their operations and maintenance over the next 30 years. Impacts would likely be small and local.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water or through the seabed can cause injury or mortality to finfish and invertebrates in a small area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area. Eggs, embryos, and larvae of finfish and invertebrates could also experience developmental abnormalities or mortality resulting from this noise, although thresholds of exposure are not known (Weilgart 2018, Hawkins and Popper 2017). Potentially injurious noise could also be considered as rendering EFH temporarily unavailable or unsuitable for the duration of the noise. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Noise: Cable laying/ trenching	Infrequent trenching activities for pipeline and cable laying, as well as other cable burial methods, emit noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines are likely to occur in the geographic analysis area for this resource. These disturbances would be infrequent over the next 30 years, temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.
Noise: Vessels	While ongoing vessel noise may have some effect on behavior, it is likely limited to brief startle and temporary stress responses. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	See cell to the left.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 30 years.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future. In addition, the general trend along the coast from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase may require port modifications, leading to local impacts. Future channel deepening activities will likely be undertaken. Existing ports have already affected finfish, invertebrates, and EFH, and future port projects would implement BMPs to minimize impacts. Although the degree of impacts on EFH would likely be undetectable outside the immediate vicinity of the ports, adverse impacts on EFH for certain species or life stages may lead to impacts on finfish and invertebrates beyond the vicinity of the port.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb habitats and potentially harm individuals, creating small, localized, short-term impacts.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Hydrodynamic disturbance	Manmade structures, especially tall vertical structures such as foundations for towers of various purposes, continuously alter local water flow at a fine scale. Water flow typically returns to background levels within a relatively short distance from the structure. Therefore, impacts on finfish, invertebrates, and EFH are typically undetectable. Indirect impacts of structures influencing primary productivity and higher trophic levels are possible but are not well understood. New structures are periodically added.	Tall vertical structures can increase seabed scour and sediment suspension. Impacts would likely be highly localized and difficult to detect. Indirect impacts of structures influencing primary productivity and higher trophic levels are possible but are not well understood.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly sandy seascape. Structure- oriented fishes are attracted to these locations. These impacts are local and often permanent. Fish aggregation may be considered adverse, beneficial, or neutral.	New cables, installed incrementally in the geographic analysis area for this resource over the next 20 to 30 years, would likely require hard protection atop portions of the route (see the New cable emplacement/ maintenance IPF). Any new towers, buoys, or piers would also create uncommon relief in a mostly sandy seascape. Structure- oriented fishes could be attracted to these locations. Abundance of certain fishes may increase. These impacts are local and may be permanent.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Habitat conversion	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly sandy seascape. A large portion is homogeneous sandy seascape but there is some other hard or complex habitat. Structure-oriented species thus benefit on a constant basis; however, the diversity may decline over time as early colonizers are replaced by successional communities dominated by blue mussels and anemones (Degraer et al. 2019 [Chapter 7]). Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat.	New cable, installed incrementally in the analysis area over the next 20 to 30 years, would likely require hard protection atop portions of the route (see New cable emplacement/ maintenance). Any new towers, buoys, or piers would also create uncommon relief in a mostly sandy seascape. Structure-oriented species would benefit (Claisse et al. 2014, Smith et al. 2016); however, the diversity may decline over time as early colonizers are replaced by successional communities dominated by blue mussels and anemones (Degraer et al. 2019 [Chapter 7]). Soft bottom is the dominant habitat type from Cape Hatteras to the Gulf of Maine (over 60 million acres), and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010).
Presence of structures: Migration disturbances	Human structures in the marine environment, e.g., shipwrecks, artificial reefs, and oil platforms, can attract finfish and invertebrates that approach the structures during their migrations. This could slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement than structure is (Moser and Shepherd 2009; Fabrizio et al. 2014; Secor et al. 2018). There is no evidence to suggest that structures pose a barrier to migratory animals.	The infrequent installation of future new structures in the marine environment over the next 30 years may attract finfish and invertebrates that approach the structures during their migrations. This could tend to slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement (Moser and Shepherd 2009; Fabrizio et al. 2014; Secor et al. 2018). Migratory animals would likely be able to proceed from structures unimpeded.
Presence of structures: Cable infrastructure	See other sub-IPFs within the Presence of structures IPF. See Table D1-6 on Coastal Habitats.	See other sub-IPFs within the Presence of structures IPF. See Table D1-6 on Coastal Habitats.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Cable emplacement and maintenance: Seabed profile alterations	Ongoing sediment dredging for navigation purposes results in localized short-term impacts (habitat alteration, change in complexity) on finfish, invertebrates, and EFH through this IPF. Dredging is most likely in sand wave areas where typical jet plowing is insufficient to meet target cable burial depth. Sand waves that are dredged would likely be redeposited in like-sediment areas. Any particular sand wave may not recover to the same height and width as pre-disturbance; however, the habitat function would largely recover post-disturbance. Therefore, seabed profile alterations, while locally intense, have little impact on finfish, invertebrates, and EFH on a regional (Cape Hatteras to Gulf of Maine) scale.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Cable emplacement and maintenance: Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local, limited to the emplacement corridor. Sediment deposition could have negative impacts on eggs and larvae, particularly demersal eggs such as longfin squid, which are known to have high rates of egg mortality if egg masses are exposed to abrasion or burial. Impacts may vary based on season/time of year.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.

AC = alternating current; DC = direct current; EFH = essential fish habitat; EMF = electromagnetic field; FCC = Federal Communications Commission; G&G = geological and geophysical; hazmat = hazardous materials; IPF = impact-producing factor; O&M = operations and maintenance; OCS = Outer Continental Shelf; OECC = offshore export cable corridor; WTG = wind turbine generator

Table D1-12. Summary of activities and the associated impact-producing factors for land use and coastal infrastructure

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/ hazmat	Various ongoing onshore and coastal construction projects include the use of vehicles and equipment that contain fuel, fluids, and hazardous materials that could be released.	Ongoing onshore construction projects involve vehicles and equipment that use fuel, fluids, or hazardous materials could result in an accidental release. Intensity and extent would vary, depending on the size, location, and materials involved in the release.
Light: Structures	Various ongoing onshore and coastal construction projects have nighttime activities, as well as existing structures, facilities, and vehicles that would use nighttime lighting.	Ongoing onshore construction projects involving nighttime activity could generate nighttime lighting. Intensity and extent would vary, depending on the location, type, direction, and duration of nighttime lighting.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The MCT at the Port of New Bedford is a completed facility developed by the port specifically to support the construction of offshore wind facilities.	Ports would need to perform maintenance and upgrade facilities to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Presence of structures: Viewshed	The only existing offshore structures within the offshore viewshed of the Project are minor features such as buoys.	Non-offshore wind structures that could be viewed in conjunction with the offshore components would be limited to met towers. Marine activity would also occur within the marine viewshed.
Presence of structures: Transmission cable infrastructure	Onshore buried transmission cables are present in the area near the Project onshore and offshore improvements. Onshore activities would only occur where permitted by local land use authorities, which would avoid long-term land use conflicts.	No known proposed structures are reasonably foreseeable and proposed to be located in the geographic analysis area for land use and coastal infrastructure.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Land disturbance: Onshore construction	Onshore construction supports local population growth, employment, and economics.	Onshore development would continue in accordance with local government land use plans and regulations.
Land disturbance: Onshore, land use changes	New development or redevelopment would result in changes in land use in accordance with local government land use plans and regulations.	Ongoing and future development and redevelopment is anticipated to reinforce existing land use patterns, based on local government planning documents.

IPF = impact-producing factor; hazmat = hazardous materials; MCT = New Bedford Marine Commerce Terminal; met = meteorological

Table D1-13. Summary of activities and the associated impact-producing factors for marine mammals

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/ hazmat	See Table D1-22 for a quantitative analysis of these risks. Ongoing releases are frequent/chronic. Marine mammal exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality or sublethal effects on the individual fitness, including adrenal effects, hematological effects, liver effects lung disease, poor body condition, skin lesions, and several other health affects attributed to oil exposure (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008, Smith et al. 2017; Sullivan et al. 2019; Takeshida et al. 2017). Additionally, accidental releases may result in impacts on marine mammals due to effects on prey species (Table D1-11).	See Table D1-22 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 30 years would increase the risk of accidental releases. Marine mammal exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality or sublethal effects on the individual fitness, including adrenal effects, hematological effects, liver effects lung disease, poor body condition, skin lesions, and several other health affects attributed to oil exposure (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008, Smith et al. 2017; Sullivan et al. 2019; Takeshida et al. 2017). Additionally, accidental releases may result in impacts on marine mammals due to effects on prey species (Table D1-11).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Trash and debris	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines and pipeline laying, and debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low quantity, local, and low-impact events. Worldwide 62 of 123 (50.4%) marine mammal species have been documented ingesting marine litter (Werner et al. 2016). Stranding data indicate potential debris induced mortality rates of 0 to 22%. Mortality has been documented in cases of debris interactions, as well as blockage of the digestive track, disease, injury, and malnutrition (Baulch and Perry 2014). However, it is difficult to link physiological effects on individuals to population-level impacts (Browne et al. 2015).	As population and vessel traffic increase gradually over the next 30 years, accidental release of trash and debris may increase. Trash and debris may continue to be accidentally released through fisheries use and other offshore and onshore activities. There may also be a long-term risk from exposure to plastics and other debris in the ocean. Worldwide 62 of 123 (50.4%) of marine mammal species have been documented ingesting marine litter (Werner et al. 2016). Mortality has been documented in cases of debris interacts, as well as blockage of the digestive track, disease, injury, and malnutrition (Baulch and Perry 2014).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
EMF	EMFs emanate constantly from installed telecommunication and electrical power transmission cables. Marine mammals appear to have a detection threshold for magnetic intensity gradients (i.e., changes in magnetic field levels with distance) of 0.1% of the earth's magnetic field or about 0.05 µT (Kirschvink 1990) and are thus likely to be very sensitive to minor changes in magnetic fields (Walker et al. 2003). There is a potential for animals to react to local variations of the geomagnetic field caused by power cable EMFs. Depending on the magnitude and persistence of the confounding magnetic field, such an effect could cause a trivial temporary change in swim direction or a longer detour during the animal's migration (Gill et al. 2005). Such an effect on marine mammals is more likely to occur with direct current cables than with AC cables (Normandeau et al. 2011). However, there are numerous transmission cables installed across the seafloor and no impacts on marine mammals have been demonstrated from this source of EMF.	During operation, future new cables would produce EMF. Submarine power cables in the marine mammal geographic analysis area are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels. EMF of any two sources would not overlap. Although the EMF would exist as long as a cable was in operation, impacts, if any, would likely be difficult to detect, if they occur at all. Marine mammals have the potential to react to submarine cable EMF, however, no effects from the numerous submarine cables have been observed. Further, this IPF would be limited to extremely small portions of the areas used by migrating marine mammals. As such, exposure to this IPF would be low, and as a result impacts on marine mammals would not be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
New cable emplacement/ maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be local and generally limited to the emplacement corridor. Data are not available regarding marine mammal avoidance of localized turbidity plumes; however, Todd et al. (2015) suggest that since some marine mammals often live in turbid waters and some species of mysticetes and sirenians employ feeding methods that create sediment plumes, some species of marine mammals have a tolerance for increased turbidity. Similarly, McConnell et al. (1999) documented movements and foraging of grey seals in the North Sea. One tracked individual was blind in both eyes, but otherwise healthy. Despite being blind, observed movements were typical of the other study individuals, indicating that visual cues are not essential for grey seal foraging and movement (McConnell et al. 1999). If elevated turbidity caused any behavioral responses such as avoiding the turbidity zone or changes in foraging behavior, such behaviors would be temporary, and any impacts would be temporary and short term. Turbidity associated with increased sedimentation may result in temporary, short-term impacts on marine mammal prey species (Table D1-11).	The FCC has two pending submarine telecommunication cable application in the North Atlantic. The impact on water quality from accidental sediment suspension during cable emplacement is temporary and short term. If elevated turbidity caused any behavioral responses such as avoidance of the turbidity zone or changes in foraging behavior, such behaviors would be temporary, and any negative impacts would be temporary and short term. Turbidity associated with increased sedimentation may result in temporary, short-term impacts on some marine mammal prey species (Table D1-11).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Aircraft	Aircraft routinely travel in the marine mammal geographic analysis area. With the possible exception of rescue operations, no ongoing aircraft flights would occur at altitudes that would elicit a response from marine mammals. If flights are at a sufficiently low altitude, marine mammals may respond with behavioral changes, including short surface durations, abrupt dives, and percussive behaviors (i.e., breaching and tail slapping) (Patenaude et al. 2002). These brief responses would be expected to dissipate once the aircraft has left the area. Similarly, aircraft have the potential to disturb hauled out seals if aircraft overflights occur within 2,000 feet (610 meters) of a haul out area (Efroymson et al. 2000). However, this disturbance would be temporary and short term, and would result in minimal energy expenditure. These brief responses would be expected to dissipate once the aircraft has left the area.	Future low altitude aircraft activities such as survey activities and navy training operations could result in short-term responses of marine mammals to aircraft noise. If flights are at a sufficiently low altitude, marine mammals may respond with behavior changes, including short surface durations, abrupt dives, and percussive behaviors (i.e., breaching and tail slapping) (Patenaude et al. 2002). These brief responses would be expected to dissipate once the aircraft has left the area.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities have the potential to result in high-intensity, high- consequence impacts, including auditory injuries, stress, disturbance, and behavioral responses, if present within the ensonified area (NOAA 2018). Survey protocols and underwater noise mitigation procedures are typically implemented to decrease the potential for any marine mammal to be within the area where sound levels are above relevant harassment thresholds associated with an operating sound source to reduce the potential for behavioral responses and injury (PTS/TTS) close to the sound source. The magnitude of effects, if any, is intrinsically related to many factors, including: acoustic signal characteristics, behavioral state (e.g., migrating), biological condition, distance from the source, duration and level of the sound exposure, as well as environmental and physical conditions that affect acoustic propagation (NOAA 2018).	Same as ongoing activities, with the addition of possible future oil and gas exploration surveys.
Noise: Turbines	Marine mammals would be able to hear the continuous underwater noise of operational WTGs. As measured at the Block Island Wind Facility, this low frequency noise barely exceeds ambient levels at 164 feet (50 meters) from the WTG base. Based on the results of Thomsen et al. (2015) and Kraus et al. (2016), sound pressure levels would be expected to be at or below ambient levels at relatively short distances from the WTG foundations.	This sub-IPF does not apply to future non-offshore wind development.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water or through the seabed can result in high- intensity, low-exposure level, long-term, but localized intermittent risk to marine mammals. Impacts would be localized in nearshore waters. Pile driving activities may negatively affect marine mammals during foraging, orientation, migration, predator detection, social interactions, or other activities (Southall et al. 2007). Noise exposure associated with pile-driving activities can interfere with these functions and have the potential to cause a range of responses, including insignificant behavioral changes, avoidance of the ensonified area, PTS, harassment, and ear injury, depending on the intensity and duration of the exposure. BOEM assumes that all ongoing and potential future activities will be conducted in accordance with a project-specific IHA to minimize impacts on marine mammals.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.
Noise: Cable laying/ trenching	N/A	Cable laying impacts resulting from future non-offshore wind activities would be identical to those described for future offshore wind projects.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Vessels	Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, scientific and academic research vessels, as well as other construction vessels. The frequency range for vessel noise falls within marine mammals' known range of hearing and would be audible. Noise from vessels presents a long-term and widespread impact on marine mammals across most oceanic regions. While vessel noise may have some effect on marine mammal behavior, it would be expected to be limited to brief startle and temporary stress response. Results from studies on acoustic impacts from vessel noise on odontocetes indicate that small vessels at a speed of 5 knots in shallow coastal water can reduce the communication range for bottlenose dolphins within 164 feet (50 meters) of the vessel by 26% (Jensen et al. 2009). Pilot whales in a quieter, deep-water habitat could experience a 50% reduction in communication range from a similar size boat and speed (Jensen et al. 2009). Since lower frequencies propagate farther away from the sound source compared to higher frequencies, low frequency cetaceans are at a greater risk of experiencing Level B Harassment produced by vessel traffic.	Any offshore projects that require the use of ocean vessels could potentially result in long-term but infrequent impacts on marine mammals, including temporary startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes. However, BOEM expects that these brief responses of individuals to passing vessels would be unlikely given the patchy distribution of marine mammals and no stock or population-level effects would be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Port expansion activities are localized to nearshore habitats, and are expected to result in temporary, short-term impacts, if any, on marine mammals. Vessel noise may affect marine mammals, but response would be expected to be temporary and short term (see Vessels: Noise sub-IPF above). The impacts on water quality from sediment suspension during port expansion activities is temporary and short term and would be similar to those described under the New cable emplacement/ maintenance IPF above.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase in larger ships will require port modifications. Future channel deepening activities are being undertaken to accommodate deeper draft vessels for the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long-term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future. Additional impacts associated with the increased risk of vessel strike could also occur (see the Traffic: Vessel collisions sub-IPF below).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Entanglement or ingestion of lost fishing gear	There are more than 130 artificial reefs in the Mid-Atlantic region. This sub-IPF may result in long-term, high-intensity impacts, but with low exposure due to localized and geographic spacing of artificial reefs, long-term. Currently bridge foundations and the Block Island Wind Facility may be considered artificial reefs and may have higher levels of recreational fishing, which increases the chances of marine mammals encountering lost fishing gear, resulting in possible ingestions, entanglement, injury, or death of individuals (Moore and van der Hoop 2012), if present nearshore where these structures are located. There are very few, if any, areas within the OCS geographic analysis area for marine mammals that would serve to concentrate recreational fishing and increase the likelihood that marine mammals would encounter lost fishing gear.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Habitat conversion and prey aggregation	There are more than 130 artificial reefs in the Mid-Atlantic region. Hard-bottom (scour control and rock mattresses) and vertical structures (bridge foundations and Block Inland Wind Facility WTGs) in a soft-bottom habitat can create artificial reefs, thus inducing the 'reef' effect (Taormina et al. 2018; NMFS 2015). The reef effect is usually considered a beneficial impact, associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for seals and small odontocetes compared to the surrounding soft-bottoms.	The presence of structures associated with non- offshore wind development in nearshore coastal waters have the potential to provide habitat for seals and small odontocetes as well as preferred prey species. This "reef effect" has the potential to result in long-term, low-intensity benefits. Bridge foundations will continue to provide foraging opportunities for seals and small odontocetes with measurable benefits to some individuals. Hard-bottom (scour control and rock mattresses used to bury the offshore export cables) and vertical structures (i.e., WTG and ESP foundations) in a soft- bottom habitat can create artificial reefs, thus inducing the "reef effect" (Taormina et al. 2018; Causon and Gill 2018). The reef effect is usually considered a beneficial impact, associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for marine mammals compared to the surrounding soft-bottoms.
Presence of structures: Avoidance/ displacement	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably contributing to this sub-IPF. There may be some impacts resulting from the existing Block Island Wind Facility, but given that there are only five WTGs, no measurable impacts are occurring.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Behavioral disruption - breeding and migration	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Displacement into higher risk areas (Vessels and Fishing)	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.
Traffic: Vessel collisions	Current activities that are contributing to this sub-IPF include port traffic levels, fairways, traffic separation schemes, commercial vessel traffic, recreational and fishing activity, and scientific and academic vessel traffic. Vessel strike is relatively common with cetaceans (Kraus et al. 2005) and one of the primary causes of death to NARWs with as many as 75% of known anthropogenic mortalities of NARWs likely resulting from collisions with large ships along the US and Canadian eastern seaboard (Kite-Powell et al. 2007). Marine mammals are more vulnerable to vessel strike when they are within the draft of the vessel and when they are beneath the surface and not detectable by visual observers. Some conditions that make marine mammals less detectable include weather conditions with poor visibility (e.g., fog, rain, and wave height) or nighttime operations. Vessels operating at speeds exceeding 10 knots have been associated with the highest risk for vessel strikes of NARWs (Vanderlaan and Taggart 2007). Reported vessel collisions with whales show that serious injury rarely occurs at speeds below 10 knots (Laist et al. 2001). Data show that the probability of a vessel strike increases with the velocity of a vessel (Pace and Silber 2005; Vanderlaan and Taggart 2007).	Vessel traffic associated with non-offshore wind development has the potential to result in an increased collision risk. While these impacts would be high consequence, the patchy distribution of marine mammals makes stock or population-level effects unlikely (Navy 2018).

µT = microtesla; BOEM = Bureau of Ocean Energy Management; EMF = electromagnetic field; ESP = electrical service platform; FCC = Federal Communications Commission; G&G = geological and geophysical; hazmat = hazardous material; IHA = Incidental Harassment Authorization; IPF = impact-producing factor; N/A = not applicable; NARW = North Atlantic right whale; NOAA = National Oceanic and Atmospheric Administration; OCS = Outer Continental Shelf; PTS = permanent threshold shift; TTS = temporary threshold shift; WTG = wind turbine generator

Table D1-14. Summary of activities and the associated impact-producing factors for navigation and vessel traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring	Larger commercial vessels (specifically tankers) sometimes anchor outside of major ports to transfer their cargo to smaller vessels for transport into port, an operation known as lightering. More frequently, commercial vessels anchor while waiting on berthing space or arrival of a pilot boat. These anchors have deeper ground penetration and are under higher stresses. Smaller vessels (commercial fishing or recreational vessels) would anchor for fishing and other recreational activities. These activities cause temporary to short-term impacts on navigation in the immediate anchorage area. All vessels may anchor in an emergency scenario (such as power loss) if they lose power to prevent them from drifting and creating navigational hazards for other vessels or drifting into structures.	Lightering and other anchoring operations are expected to continue at or near current levels, with the expectation of moderate increase commensurate with any increase in tankers visiting ports. Deep-draft visits to major port visits are expected to increase as well, increasing the potential for an emergency need to anchor, creating navigational hazards for other vessels. Recreational activity and commercial fishing activity would likely stay largely the same related to this IPF.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in port usage by some fishing or recreational vessel operators.	Ports would need to perform maintenance and perform upgrades to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size. Impacts would be short term and could include congestion in ports, delays, and changes in port usage by some fishing or recreational vessel operators.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Allisions	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. There are two types of allisions that occur: drift and powered. A drift allision generally occurs when a vessel is powered down due to operator choice or power failure. A powered allision generally occurs when an operator fails to adequately control their vessel movements or is distracted.	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 30 years. Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Presence of structures: Fish aggregation	Items in the water, such as ghost fishing gear, buoys, and energy platform foundations can create an artificial reef effect, aggregating fish. Recreational and commercial fishing can occur near artificial reefs. Recreational fishing is more popular than commercial near artificial reefs as commercial mobile fishing gear can risk snagging on the artificial reef structure.	Fishing near artificial reefs is not expected to change meaningfully over the next 30 years.
Presence of structures: Habitat conversion	Equipment in the ocean can create a substrate for mollusks to attach to, and fish eggs to settle near. This can create a reef-like habitat and benefit structure-oriented species on a constant basis.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Migration disturbances	Noise-producing activities, such as pile driving and vessel traffic, may interfere and adversely affect marine mammals during foraging, orientation, migration, response to predators, social interactions, or other activities. Marine mammals may also be sensitive to changes in magnetic field levels. The presence of structures and operation noise could cause mammals to avoid areas.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions. When multiple vessels need to navigate around a structure, then navigation is made more complex, as the vessels need to avoid both the structure and each other.	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 30 years. Even with increased port visits by deep-draft vessels, this is still a relatively small adjustment when considering the whole of New England vessel traffic. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space use conflicts	Currently, the offshore area is occupied by marine trade, stationary and mobile fishing, and survey activities.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: cable infrastructure	See IPF for Anchoring.	See IPF for Anchoring.
New cable emplacement/ maintenance	Within the geographic analysis area for navigation and vessel traffic, existing cables may require access for maintenance activities. Infrequent cable maintenance activities may cause temporary increases in vessel traffic and navigational complexity.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. Future new cables would cause temporary increases in vessel traffic during installation or maintenance, resulting in infrequent, localized, short-term impacts over the next 30 years. Care would need to be taken by vessels that are crossing the cable routes during these activities.
Traffic: Aircraft	USCG SAR helicopters are the main aircraft that may be flying at low enough heights to risk interaction with WTGs. USCG SAR aircraft need to fly low enough that they can spot objects in the water.	SAR operations could be expected to increase with any increase in vessel traffic. However, as vessel traffic volume is not expected to increase appreciably, neither should SAR operations. Draft EIS Section 3.6.6 provides a discussion of navigation impacts on fishing vessel traffic.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Traffic: Vessels	See the sub-IPF for Presence of structures: Navigation hazard.	See the sub-IPF for Presence of structures: Navigation hazard.
Traffic: Vessels, collisions	See the sub-IPF for Presence of structures: Navigation hazard.	See the sub-IPF for Presence of structures: Navigation hazard.

BOEM = Bureau of Ocean Energy Management; EIS = environmental impact statement; FCC = Federal Communications Commission; IPF = impact-producing factor; SAR = search and rescue; USCG = U.S. Coast Guard; WTG = wind turbine generator

Table D1-15. Summary of activities and the associated impact-producing factors for other uses: military and national security uses

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Allisions	Existing stationary facilities that present allision risks include the five offshore wind turbines associated with Block Island Wind Farm, dock facilities, meteorological buoys associated with offshore wind lease areas, and other offshore or shoreline-based structures.	No additional non-offshore wind stationary structures were identified within the geographic analysis area. Stationary structures such as private or commercial docks may be added close to the shoreline.
Presence of structures: Fish aggregation	Existing stationary facilities that act as FADs include offshore wind turbines associated with Block Island Wind Farm.	No future non-offshore wind additional stationary structures that would act as FADs were identified within the geographic analysis area.
Presence of structures: Navigation hazard	Existing stationary facilities within the geographic analysis area that present navigational hazards include the five WTGs in the Block Island Wind Farm, onshore wind turbines, communication towers, dock facilities, and other onshore and offshore commercial, industrial, and residential structures.	No future non-offshore wind stationary structures were identified within the offshore analysis area. Onshore, development activities are anticipated to continue with additional proposed communications towers and onshore commercial, industrial, and residential developments.
Presence of structures: Space use conflicts	Existing stationary facilities within the geographic analysis area that present a navigational hazard include the five WTGs in the Block Island Wind Farm, onshore wind turbines, communication towers, dock facilities, and other onshore and offshore commercial, industrial, and residential structures.	No future non-offshore wind stationary structures were identified within the offshore analysis area. Onshore, development activities are anticipated to continue with additional proposed communications towers and onshore commercial, industrial, and residential developments.
Presence of structures: cable infrastructure	Seven subsea cable corridors cross cumulative lease areas.	Submarine cables would remain in current locations with infrequent maintenance continuing along those cable routes for the foreseeable future.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Traffic: Vessels	Current vessel traffic in the region is described in draft EIS Section 3.6.6. Vessel activities associated with offshore wind in the cumulative lease areas is currently limited to site assessment surveys.	Continued vessel traffic in the region, as described in draft EIS Section 3.6.6.
Traffic: Vessels, collisions	Current vessel traffic in the region is described in draft EIS Section 3.6.6. Vessel activities associated with offshore wind in the cumulative lease areas is currently limited to site assessment surveys.	Continued vessel traffic in the region is described in draft EIS Section 3.6.6.

FAD = fish aggregating device; EIS = environmental impact statement; IPF= impact-producing factor; WTG = wind turbine generator

Table D1-16. Summary of activities and the associated impact-producing factors for other uses: aviation and air traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Navigation hazard	Existing aboveground stationary facilities within the geographic analysis area that present navigational hazards include the five WTGs in the Block Island Wind Farm, onshore wind turbines, communication towers, dock facilities, and other onshore and offshore structures exceeding 200 feet in height.	No future non-offshore wind stationary structures were identified within the offshore analysis area. Onshore development activities are anticipated to continue with additional proposed communications towers.
Presence of structures: Space use conflicts	Existing aboveground stationary facilities within the geographic analysis area that could cause space use conflicts for aircraft include the five WTGs associated with Block Island Wind Farm, onshore wind turbines, communication towers, and other onshore and offshore structures exceeding 200 feet in height.	No future non-offshore wind stationary structures were identified within the offshore analysis area. Onshore, development activities are anticipated to continue with additional proposed communications towers.

IPF = impact-producing factor; WTG = wind turbine generator

Table D1-17. Summary of activities and the associated impact-producing factors for other uses: cables and pipelines

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Allisions and navigation hazards	Structures within and near the geographic analysis area that pose potential allision hazards include the five Block Island Wind Farm WTGs, meteorological buoys associated with offshore wind lease areas, and shoreline developments such as docks, ports, and other commercial, industrial, and residential structures.	Reasonably foreseeable non-offshore wind structures that could affect submarine cables have not been identified in the geographic analysis area.
Presence of structures: Space use conflicts	Two submarine cables cross the far western portion of OCS-A 0487. These cables are associated with a larger network of submarine cables that make landfall near Charlestown, Massachusetts.	Reasonably foreseeable non-offshore wind structures have not been identified in the geographic analysis area.
Presence of structures: Transmission cable infrastructure	Seven subsea cable corridors cross cumulative lease areas.	Reasonably foreseeable non-offshore wind structures have not been identified in the geographic analysis area.

IPF = impact-producing factor; WTG = wind turbine generator

Table D1-18. Summary of activities and the associated impact-producing factors for other uses: radar systems

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Navigation hazards	Wind developments in the direct line-of-sight with, or extremely close to, radar systems can cause clutter and interference. Existing wind developments in the area include scattered onshore wind turbines, and five WTGs in the Block Island Wind Farm.	Reasonably foreseeable non-offshore wind structures proposed for construction in the lease areas that could affect radar systems have not been identified.

IPF = impact-producing factor; WTG = wind turbine generator

Table D1-19. Summary of activities and the associated impact-producing factors for other uses: scientific research and surveys

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Navigation hazards	Stationary structures are limited in the open ocean environment of the geographic analysis area, and include met buoys associated with site assessment activities, the five Block Island Wind Farm WTGs, and the two CVOW WTGs. Other lease areas within the geographic analysis area are not yet developed and are in various stages of permitting.	Reasonably foreseeable non-offshore wind activities would not implement stationary structures within the open ocean environment that would pose navigational hazards and raise the risk of allisions for survey vessels and collisions for survey aircraft.

CVOW = Coastal Virginia Offshore Wind; IPF = impact-producing factor; WTG = wind turbine generator

Table D1-20. Summary of activities and the associated impact-producing factors for recreation and tourism

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring	Anchoring occurs due to ongoing military, survey, commercial, and recreational activities.	Impacts from anchoring would continue, and may increase due to offshore military operations, survey activities, commercial vessel traffic, and recreational vessel traffic. Modest growth in vessel traffic could increase the temporary, localized impacts of navigational hazards, increased turbidity levels, and potential for direct contact causing mortality of benthic resources.
Light: Vessels	Ocean vessels have an array of lights including navigational lights and deck lights.	Anticipated modest growth in vessel traffic would result in some growth in the nighttime traffic of vessels with lighting.
Light: Structures	Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors.	Cable maintenance or replacement of existing cables in the geographic analysis area would occur infrequently, and would generate short-term disturbances.
Noise: O&M	Limited to Block Island Wind Farm	Not applicable
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area.	No future activities were identified within the recreation and tourism geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Cable laying/trenching	Offshore trenching occurs periodically in connection with cable installation or sand and gravel mining.	No future activities were identified within the recreation and tourism geographic analysis area other than ongoing activities.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The MCT was upgraded by the port specifically to support the construction of offshore wind energy facilities.	Ports would need to perform maintenance and upgrade facilities over the next 30 years to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep- draft vessels as they continue to increase in size.
Port utilization: Maintenance/ dredging	No major ports are within the geographic analysis area. Periodic maintenance is necessary for harbors within the analysis area.	Ongoing maintenance and dredging of harbors within the geographic analysis area will continue as needed. No specific projects are known.
Presence of structures: Allisions	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. The likelihood of allisions is expected to continue at or near current levels.	Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures.	No future activities were identified within the recreation and tourism geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these locations. Recreational and commercial fishing can occur near these aggregation locations, although recreational fishing is more popular, because commercial mobile fishing gear is more likely to snag on structures.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Habitat conversion	Structures, including foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly flat seascape. Structure- oriented species thus benefit on a constant basis.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, because vessels need to avoid both the structure and each other.	Vessel traffic, overall, is not expected to meaningfully increase over the next 30 years. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Viewshed	The only existing offshore structures within the viewshed of the Project are minor features such as buoys.	Non-offshore wind structures that could be viewed in conjunction with the offshore components of the Project would be limited to meteorological towers. Marine activity would also occur within the marine viewshed.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Traffic: Vessels	Geographic analysis area ports and marine traffic related to shipping, fishing, and recreation are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes.	New vessel traffic near the geographic analysis area would be generated by proposed barge routes and dredging demolition sites over the next 30 years. Marine commerce and related industries would continue to be important to the geographic analysis area economy.
Traffic: Vessel collisions	The region's substantial marine traffic may result in occasional vessel collisions, which would result in costs to the vessels involved. The likelihood of collisions is expected to continue at or near current rates.	An increased risk of collisions is not anticipated from future activities.

IPF = impact- producing factor; MCT = New Bedford Marine Commerce Terminal; O&M = operations and maintenance

Table D1-21. Summary of activities and the associated impact-producing factors for sea turtles

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/ hazmat	See Table D1-22 for a quantitative analysis of these risks. Ongoing releases are frequent and chronic. Sea turtle exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality (Shigenaka et al. 2010) or sublethal effects on individual fitness, including adrenal effects, dehydration, hematological effects, increased disease incidence, liver effects, poor body condition, skin effects, skeletomuscular effects, and several other health effects that can be attributed to oil exposure (Camacho et al. 2013; Bembenek-Bailey et al. 2019; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to effects on prey species (Table D1-11).	See Table D1-22 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 30 years would increase the risk of accidental releases. Sea turtle exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality (Shigenaka 2010; Wallace et al. 2010) or sublethal effects on individual fitness, including adrenal effects, dehydration, hematological effects, increased disease incidence, liver effects, poor body condition, skin effects, skeletomuscular effects, and several other health effects that can be attributed to oil exposure (Camacho et al. 2013; Bembenek-Bailey et al. 2019; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to effects on prey species (Table D1-11).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Trash and debris	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities, cables, lines, and pipeline laying, as well as debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low quantity, local, and low-impact events. Direct ingestion of plastic fragments is well documented and has been observed in all species of sea turtles (Bugoni et al. 2001; Hoarau et al. 2014; Nelms et al. 2016; Schuylar et al. 2014). In addition to plastic debris, ingestion of tar, paper, StyrofoamTM, wood, reed, feathers, hooks, lines, and net fragments have also been documented (Thomás et al. 2002). Ingestion can also occur when individuals mistake debris for potential prey items (Gregory 2009; Hoarau et al. 2014; Thomás et al. 2002). Potential ingestion of marine debris varies among species and life history stages due to differing feeding strategies (Nelms et al. 2016). Ingestion of plastics and other marine debris can result in both lethal and sublethal impacts on sea turtles, with sublethal effects more difficult to detect (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). Long- term sublethal effects may include dietary dilution, chemical contamination, depressed immune system function, poor body condition, as well as reduced growth rates, fecundity, and reproductive success. However, these effects are cryptic and clear causal links are difficult to identify (Nelms et al. 2016).	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines and pipeline laying, and debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low quantity, local, and low-impact events. Direct and indirect ingestion of plastic fragments and other marine debris is well documented and has been observed in all species of sea turtles (Bugoni et al. 2001; Gregory 2009; Hoarau et al. 2014; Nelms et al. 2016; Schuylar et al. 2014; Thomás et al. 2002). Ingestion can result in both lethal and sublethal impacts on sea turtles, with sublethal effects more difficult to detect (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). However, these effects are cryptic and clear causal links are difficult to identify (Nelms et al. 2016).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
EMF	EMFs emanate constantly from installed telecommunication and electrical power transmission cables. Sea turtles appear to have a detection threshold of magnetosensitivity and behavioral responses to field intensities ranging from 0.0047 to 4000 µT for loggerhead turtles, and 29.3 to 200 µT for green turtles, with other species likely similar due to anatomical, behavioral, and life history similarities (Normandeau et al. 2011). Juvenile or adult sea turtles foraging on benthic organisms may be able to detect magnetic fields while they are foraging on the bottom near the cables and up to potentially 82 feet (25 meters) in the water column above the cable. Juvenile and adult sea turtles may detect the EMF over relatively small areas near cables (e.g., when resting on the bottom or foraging on benthic organisms near cables or concrete mattresses). There are no data on impacts on sea turtles from EMFs generated by underwater cables, although anthropogenic magnetic fields can influence migratory deviations (Luschi et al. 2007; Snoek et al. 2016). However, any potential impacts from AC cables on turtle navigation or orientation would likely be undetectable under natural conditions, and thus would be insignificant (Normandeau et al. 2011).	During operations, future new cables would produce EMF. Submarine power cables in the geographic analysis area for sea turtles are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels. (Section 5.2.7 of BOEM's 2007 Final Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf) EMF of any two sources would not overlap. Although the EMF would exist as long as a cable was in operation, impacts, if any, would likely be difficult to detect, if they occur at all. Further, this IPF would be limited to extremely small portions of the areas used by resident or migrating sea turtles. As such, exposure to this IPF would be low, and as a result, impacts on sea turtles would not be expected.
Light: Vessels	Ocean vessels such as ongoing commercial vessel traffic, recreational and fishing activity, scientific and academic research traffic have an array of lights including navigational, deck lights, and interior lights. Such lights have some limited potential to attract sea turtles, although the impacts, if any, are expected to be localized and temporary.	Construction, operations, and decommissioning vessels associated with non-offshore wind activities produce temporary and localized light sources that could result in the attraction or avoidance behavior of sea turtles. These short- term impacts are expected to be of low intensity and occur infrequently.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Light: Structures	Artificial lighting on nesting beaches or in nearshore habitats has the potential to result in disorientation to nesting females and hatchling turtles. Artificial lighting on the OCS does not appear to have the same potential for effects. Decades of oil and gas platform operation in the Gulf of Mexico, that can have considerably more lighting than offshore WTGs, has not resulted in any known impacts on sea turtles (BOEM 2019).	Non-offshore wind activities would not be expected to appreciably contribute to this sub-IPF. As such, no impact on sea turtles would be expected.
New cable emplacement/ maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be local and generally limited to the emplacement corridor. Data are not available regarding effects of suspended sediments on adult and juvenile sea turtles, although elevated suspended sediments may cause individuals to alter normal movements and behaviors. However, these changes are expected to be too small to be detected (NOAA 2020b). Sea turtles would be expected to swim away from the sediment plume. Elevated turbidity is most likely to affect sea turtles if a plume causes a barrier to normal behaviors, but no impacts would be expected due to swimming through the plume (NOAA 2020b). Turbidity associated with increased sedimentation may result in short-term, temporary impacts on sea turtle prey species (Table D1-11).	The FCC has two pending submarine telecommunication cable application in the North Atlantic. The impact on water quality from accidental sediment suspension during cable emplacement is short term and temporary. If elevated turbidity caused any behavioral responses such as avoidance of the turbidity zone or changes in foraging behavior, such behaviors would be temporary, and any impacts would be short term and temporary. Turbidity associated with increased sedimentation may result in short-term, temporary impacts on some sea turtle prey species (Table D1-11).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Aircraft	Aircraft routinely travel in the geographic analysis area for sea turtles. With the possible exception of rescue operations, no ongoing aircraft flights would occur at altitudes that would elicit a response from sea turtles. If flights are at a sufficiently low altitude, sea turtles may respond with a startle response (diving or swimming away), altered submergence patterns, and a temporary stress response (NSF and USGS 2011; Samuel et al. 2005). These brief responses would be expected to dissipate once the aircraft has left the area.	Future low altitude aircraft activities such as survey activities and navy training operations could result in short-term responses of sea turtles to aircraft noise. If flights are at a sufficiently low altitude, sea turtles may respond with a startle response (diving or swimming away), altered submergence patterns, and a temporary stress response (NSF and USGS 2011; Samuel et al. 2005). These brief responses would be expected to dissipate once the aircraft has left the area.
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities have the potential to result in some impacts including potential auditory injuries, short-term disturbance, behavioral responses, and short-term displacement of feeding or migrating sea turtles, if present within the ensonified area (NSF and USGS 2011). The potential for PTS and TTS is considered possible in proximity to G&G surveys utilizing air guns, but impacts are unlikely as turtles would be expected to avoid such exposure and survey vessels would pass quickly (NSF and USGS 2011). No significant impacts would be expected at the population level.	Same as ongoing activities, with the addition of possible future oil and gas exploration surveys.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Turbines	Available evidence suggests that typical underwater noise levels from operating WTGs would be below current cumulative injury and behavioral effect thresholds for sea turtles. Operating turbines were determined to produce underwater SPL ranging from 110 to 125 dB re 1 µPa, occasionally reaching as high as 128 dB re 1 µPa, in the 10-Hz to 8-kHz range (Tougaard et al. 2020). As measured at the Block Island Wind Facility, low frequency operational noise barely exceeds ambient levels at 164 feet (50 meters) from the WTG base (Miller and Potty 2017). Operational noise impacts would be expected to be negligible.	This sub-IPF does not apply to future non- offshore wind development.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water or through the seabed can result in high- intensity, low-exposure levels, and long-term, but localized intermittent risk to sea turtles. Impacts, potentially including behavioral responses, masking, TTS, and PTS, would be localized in nearshore waters. Data regarding threshold levels for impacts on sea turtles from sound exposure during pile driving are very limited, and no regulatory threshold criteria have been established for sea turtles. Based on current literature, the following thresholds are used to assess impacts on turtles: • Potential mortal injury: SPL over 48 hours 210 dB re 1 µPa or greater than Lpk 207 dB re 1 µPa (Popper et al. 2014) • Auditory injury (PTS): SEL_{24h} 204 dB re 1 μPa^2 s, Lpk 232 dB re 1 µPa (Navy 2017) • Auditory injury (TTS): SEL_{24h} 189 dB re 1 μPa^2 s, Lpk 226 dB re 1 µPa (Navy 2017) • Behavioral harassment: SPL 175 dB re 1 µPa (Navy 2017)	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Cable laying/ trenching	N/A	Cable laying impacts resulting from future non- offshore wind activities would be identical to those described for future offshore wind projects.
Noise: Vessels	The frequency range for vessel noise (10 to 1000 Hz; MMS 2007) overlaps with sea turtles' known hearing range (less than 1,000 Hz with maximum sensitivity between 200 to 700 Hz; Bartol 1994) and would therefore be audible. However, Hazel et al. (2007) suggest that sea turtles' ability to detect approaching vessels is primarily vision-dependent, not acoustic. Sea turtles may respond to vessel approach or noise with a startle response (diving or swimming away) and a temporary stress response (NSF and USGS 2011). Samuel et al. (2005) indicated that vessel noise could have an effect on sea turtle behavior, especially their submergence patterns.	See Section 3.19.6. Any offshore projects that require the use of ocean vessels could potentially result in long-term but infrequent impacts on sea turtles, including temporary startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes, especially their submergence patterns (NSF and USGS 2011; Samuel et al. 2005). However, BOEM expects that these brief responses of individuals to passing vessels would be unlikely given the patchy distribution of sea turtles and no stock or population-level effects would be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Port expansion activities are localized to nearshore habitats, and are expected to result in short-term, temporary impacts, if any, on sea turtles. Vessel noise may affect sea turtles, but response would be expected to be short term and temporary (see the Vessels: Noise sub-IPF above). The impact on water quality from sediment suspension during port expansion activities is short-term, temporary, and would be similar to those described under the New cable emplacement/maintenance IPF above.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase in larger ships will require port modifications. Future channel deepening activities are being undertaken to accommodate deeper draft vessels for the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long-term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future. Additional impacts associated with the increased risk of vessel strikes could also occur (see the Traffic: Vessel collisions sub-IPF below).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Entanglement or ingestion of lost fishing gear	The Mid-Atlantic region has more than 130 artificial reefs. Currently bridge foundations and the Block Island Wind Facility may be considered artificial reefs and may have higher levels of recreational fishing, which increases the chances of sea turtles encountering lost fishing gear, resulting in possible ingestions, entanglement, injury, or death of individuals (Berreiros and Raykov 2014; Gregory 2009; Vegter et al. 2014) if present where these structures are located. At the scale of the OCS geographic analysis area for sea turtles, there are very few areas that would serve to concentrate recreational fishing and increase the likelihood that sea turtles would encounter lost fishing gear.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Presence of structures: Habitat conversion and prey aggregation	The Mid-Atlantic region has more than 130 artificial reefs. Hard-bottom (scour control and rock mattresses) and vertical structures (bridge foundations and Block Inland Wind Facility WTGs) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (Taormina et al. 2018; NMFS 2015). The reef effect is usually considered a beneficial impact, associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for sea turtles compared to the surrounding soft-bottoms.	The presence of structures associated with non-offshore wind development in nearshore coastal waters has the potential to provide habitat for sea turtles as well as preferred prey species. This reef effect has the potential to result in long-term, low-intensity beneficial impacts. Bridge foundations will continue to provide foraging opportunities for sea turtles with measurable benefits to some individuals.
Presence of structures: Avoidance/ displacement	No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to this sub-IPF. There may be some impacts resulting from the existing Block Island Wind Facility, but given that there are only five WTGs, no measurable impacts are occurring.	Not contemplated for non-offshore wind facility sources.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Behavioral disruption - breeding and migration	No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Displacement into higher risk areas (Vessels and Fishing)	No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.
Traffic: Vessel collisions	Current activities contributing to this sub-IPF include port traffic levels, fairways, traffic separation schemes, commercial vessel traffic, recreational and fishing activity, and scientific and academic vessel traffic. Propeller and collision injuries from boats and ships are common in sea turtles. Vessel strike is an increasing concern for sea turtles, especially in the southeastern United States, where development along the coasts is likely to result in increased recreational boat traffic. In the United States, the percentage of strandings of loggerhead sea turtles that were attributed to vessel strikes increased from approximately 10% in the 1980s to a record high of 20.5% in 2004 (NMFS and USFWS 2007). Sea turtles are most susceptible to vessel collisions in coastal waters, where they forage from May through November. Vessel speed may exceed 10 knots in such waters, and evidence suggests that they cannot reliably avoid being struck by vessels exceeding 2 knots (Hazel et al. 2007).	Vessel traffic associated with non-offshore wind development has the potential to result in an increased collision risk. While these impacts would be high consequence, the patchy distribution of sea turtles makes stock or population-level effects unlikely (Navy 2018).

µPa = micropascal; µT = microtesla; AC = alternating current; BOEM = Bureau of Ocean Energy Management; dB = decibel; EMF = electromagnetic field; FCC = Federal Communications Commission; G&G = geological and geophysical; hazmat = hazardous materials; Hz = hertz; IPF = impact-producing factor; kHz = kilohertz; Lpk = peak sound pressure level; N/A = not applicable; NMFS = National Marine Fisheries Service; NOAA = National Oceanic and Atmospheric Administration; NSF = National Science Foundation; OCS = Outer Continental Shelf; PTS = permanent threshold shift; SEL_{24h} = sound exposure level over 24 hours; SPL = sound pressure level; TTS = temporary threshold shift; USFWS = U.S. Fish and Wildlife Service; USGS = U.S. Geological Survey; WTG = wind turbine generator

Table D1-22. Summary of activities and the associated impact-producing factors for water quality

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	Accidental releases of fuels and fluids occur during vessel usage for dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable lines, and pipeline-laying activities. According to the DOE, 31,000 barrels of petroleum are spilled into U.S. waters from vessels and pipelines in a typical year. Approximately 40.5 million barrels of oil were lost as a result of tanker incidents from 1970 to 2009, according to International Tanker Owners Pollution Federation Limited, which collects data on oil spills from tankers and other sources. From 1990 to 1999, the average annual input to the coastal Northeast was 220,000 barrels of petroleum and into the offshore was <70,000 barrels. Impacts on water quality would be expected to brief and localized from accidental releases.	Future accidental releases from offshore vessel usage, spills, and consumption will likely continue on a similar trend. Impacts are unlikely to affect water quality.
Accidental releases: Trash and debris	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities, and cables, lines, and pipeline laying. Accidental releases of trash and debris are expected to be low probability events. BOEM assumes operator compliance with federal and international requirements for management of shipboard trash; such events also have a relatively limited spatial impact.	As population and vessel traffic increase gradually over the next 30 years, accidental release of trash and debris may increase. However, there does not appear to be evidence that the volumes and extents anticipated would have any effect on water quality.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring	Impacts from anchoring occur due to ongoing military use and survey, commercial, and recreational activities.	Impacts from anchoring may occur semi-regularly over the next 30 years due to offshore military operations or survey activities. These impacts would include increased seabed disturbance resulting in increased turbidity levels. All impacts would be localized, short term, and temporary.
New cable emplacement/ maintenance	Elevated suspended sediment concentrations can occur under natural tidal conditions and increase during storms, trawling, and vessel propulsion. Survey activities, and new cable and pipeline-laying activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances would be short term, and either be limited to the emplacement corridor or localized.	Suspension of sediments may continue to occur infrequently over the next 30 years due to survey activities, and submarine cable, lines, and pipeline-laying activities. Future new cables would occasionally disturb the seafloor and cause short-term increases in turbidity and minor alterations in localized currents resulting in local short-term impacts. The FCC has two pending submarine telecommunication cable applications in the North Atlantic. If the cable routes enter the water quality geographic analysis area, short-term disturbance in the form of increased suspended sediment and turbidity would be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase in larger ships will require port modifications, which, along with additional vessel traffic, could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long-term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future.	The general trend along the coastal region from Virginia to Maine is that port activity will increase modestly over the next 30 years. Port modifications and channel deepening activities are being undertaken to accommodate the increase in vessel traffic and deeper draft vessels that transit the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future.
Presence of structures	The installation of onshore and offshore structures leads to alteration of local water currents. These disturbances would be local but, depending on the hydrologic conditions, have the potential to impact water quality through the formation of sediment plumes.	Impacts associated with the presence of structures includes temporary sediment disturbance during maintenance. This sediment suspension would lead to interim and localized impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Discharges	Discharges impact water quality by introducing nutrients, chemicals, and sediments to the water. There are regulatory requirements related to prevention and control of discharges, the prevention and control of accidental spills, and the prevention and control of nonindigenous species.	Increased coastal development is causing increased nutrient pollution in communities. In addition, ocean disposal activity in the North and Mid-Atlantic is expected to gradually decrease or remain stable. Impacts of ocean disposal on water quality are minimized because USEPA has established dredge spoil criteria and regulate the disposal permits issued by USACE. The impact on water quality from sediment suspension during these future activities would be short term and localized.
Land disturbance: erosion and sedimentation	Ground disturbance activities may lead to unvegetated or otherwise unstable soils. Precipitation events could potentially mobilize the soils into nearby surface waters, leading to potential erosion and sedimentation effects and subsequent increased turbidity.	Ground disturbance associated with construction and installation of onshore components could lead to unvegetated or unstable soils. Precipitation events could mobilize these soils leading to erosion and sedimentation effects and turbidity. The impacts for future offshore wind through this IPF would be staggered in time and localized. The impacts would be short term and localized with an increased likelihood of impacts limited to onshore construction periods.
Land disturbance: Onshore construction	Onshore construction activities may lead to unvegetated or otherwise unstable soils as well as soil contamination due to leaks or spills from construction equipment. Precipitation events could potentially mobilize the soils into nearby surface waters, leading to increased turbidity and alteration of water quality.	The general trend along coastal regions is that port activity will increase modestly in the future. This increase in activity includes expansion needed to meet commercial, industrial, and recreational demand. Modifications to cargo-handling equipment and conversion of some undeveloped land to meet port demand would be required to receive the increase in larger ships.

BOEM = Bureau of Ocean Energy Management; DOE = U.S. Department of Energy; FCC = Federal Communications Commission; hazmat = hazardous materials; IPF = impact-producing factor; OCS = Outer Continental Shelf; USACE = U.S. Army Corps of Engineers; USEPA = Environmental Protection Agency

Table D1-23. Summary of activities and the associated impact-producing factors for wetlands

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Land disturbance: Erosion and sedimentation	Ground disturbance activities may lead to unvegetated or otherwise unstable soils. Precipitation events could potentially mobilize the soils into nearby wetlands, leading to potential erosion and sedimentation effects and subsequent increased turbidity.	Ground disturbance associated with construction and installation of onshore components could lead to unvegetated or unstable soils. Precipitation events could mobilize these soils, leading to erosion and sedimentation effects and turbidity. Impacts from future offshore wind activities through this IPF would be staggered in time and localized. The impacts would be short term and localized, with an increased likelihood of impacts limited to onshore construction periods.
Land disturbance: Onshore construction	Onshore construction activities may lead to unvegetated or otherwise unstable soils as well as soil contamination due to leaks or spills from construction equipment. Precipitation events could potentially mobilize the soils into nearby wetlands, leading to increased turbidity and alteration of water quality.	The general trend along coastal regions is that port activity and land development will increase modestly in the future. This increase in activity includes expansion needed to meet commercial, industrial, and recreational demand. Modifications to cargo-handling equipment and conversion of some undeveloped land to meet port demand would be required to receive the increase in larger ships.

IPF = impact-producing factor

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Attachment D-2.
Maximum-case scenario estimates for Offshore Wind Projects

List of Tables

The following tables provide maximum-case scenario estimates of potential offshore wind project impacts assuming maximum build-out, using Maryland Offshore Wind Project EIS geographic analysis areas. BOEM developed these estimates based on offshore wind demand, as discussed in their 2019 study *National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf* (BOEM 2019). Estimates disclosed in this EIS's Chapter 3, No Action analyses were developed by summing acreage or number calculations across all lease areas noted as occurring within, or overlapping, a given geographic analysis area. This likely overestimates some impacts in cases where lease areas only partially overlap analysis areas. However, this approach was used to provide the most conservative estimate of future offshore wind development.

Table D2-1. Offshore wind leasing activities on the U.S. East Coast: projects and assumptions (Part 1, turbine and cable design parameters)

Project/Region	BOEM Lease Area	Developer	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[1]						Estimated Construction Schedule[2]	Turbine Number[3]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles) [4]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Inter-Array Cable Length (statute miles) [5]	Hub Height (feet) [6]	Rotor Diameter (feet) [6]	Height of Turbine (feet) [6]
				Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation and Tourism									
Other State Waters Projects																		
New England Aqua Ventus I	N/A	New England Aqua Ventus, LLC	State Project					X		2024	2	11	-	-	-	-	450	520
Block Island Wind Farm	N/A	Deepwater Wind LLC (Ørsted)	Built					X		Built	5	30	28	5	2	328	541	659
Total State Waters										N/A	7	41	28	5	2	N/A	N/A	N/A
Massachusetts/Rhode Island Region																		
Vineyard Wind 1	part of OCS-A 0501	Vineyard Wind LLC (Avangrid Renewables/Copenhagen Investment Partners)	COP Approved (ROD issued 2021), PPA					X		2023	62	800	98	6.5	171	451	721	812
South Fork Wind	OCS-A 0517	South Fork Wind, (Ørsted)	COP Approved (ROD issued 2021), PPA					X		2023	12	130	139	6.5	24	358	543	614
Sunrise Wind	OCS-A 0487	Sunrise Wind LLC (Ørsted/Eversource)	COP, PPA					X		2024	94	934	105	6.5	180	459	656	787
Revolution Wind	part of OCS-A 0486	Revolution Wind LLC (Ørsted/Eversource)	COP, PPA					X		2024	100	880	42	131	155	512	722	873
Park City Wind	OCS-A 0534 and part of OCS-A 0501	Avangrid Renewables LLC	COP, PPA					X		2024	62	804	125	10	139	702	935	1,171
Commonwealth Wind	OCS-A 0534 and part of OCS-A 0501	Avangrid Renewables	COP, PPA					X		2025 or later	88	1,725	226	10	201	702	935	1,171

Project/Region	BOEM Lease Area	Developer	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[1]						Estimated Construction Schedule[2]	Turbine Number[3]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles) [4]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Inter-Array Cable Length (statute miles) [5]	Hub Height (feet) [6]	Rotor Diameter (feet) [6]	Height of Turbine (feet) [6]
				Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation and Tourism									
SouthCoast Wind (formerly Mayflower Wind)	OCS-A 0521	Mayflower Wind LLC (OW Ocean Winds/Shell)	COP, PPA					X		2024	147	2,400	1,184	6.5	497	605	919	1,066
Beacon Wind 1	part of OCS-A 0520	Equinor/BP	COP, PPA, SAP					X		2024-2026	94	1,230	202	6.5	187	591	984	1,083
Beacon Wind 2	part of OCS-A 0520	Equinor/BP	COP (unpublished)					X		2027-2029	94	1,100	202	6.5	187	591	984	1,083
Bay State Wind	part of OCS-A 0500	Baystate Wind LLC (Ørsted/Eversource)	Planning					X		By 2030	94	1,128	139	6.5	148	492	722	853
Liberty Wind	part of OCS-A 0522	Vineyard Offshore	Planning					X		By 2030	160	2,400	532	6.5	221	787	1,050	1,312
OCS-A 0500 remainder	OCS-A 0500 remainder	Baystate Wind LLC (Ørsted/Eversource)	Planning					X		By 2030	116	1,392	-	-	240	492	722	853
OCS-A 0487 remainder	OCS-A 0487 remainder	Sunrise Wind LLC (Ørsted/Eversource)	Planning					X					-			492	722	853
Total MA/RI Leases										N/A	1,123	14,923	2,994	N/A	2,350	N/A	N/A	N/A

Project/Region	BOEM Lease Area	Developer	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[1]						Estimated Construction Schedule[2]	Turbine Number[3]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles) [4]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Inter-Array Cable Length (statute miles) [5]	Hub Height (feet) [6]	Rotor Diameter (feet) [6]	Height of Turbine (feet) [6]
				Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation and Tourism									
New York/New Jersey Region																		
Ocean Wind 1	OCS-A 0498	Ocean Wind LLC (Ørsted)	COP, PPA					X	X7	2024-2025	98	1,100	17511	98	190	512	788	906
Atlantic Shores Wind South	OCS-A 0499	Atlantic Shores Offshore Wind, LLC (EDF Renewables/Shell)	COP, PPA					X	X8	2025	136	1,510	342	58	274	522	919	1,049
Ocean Wind 2	part of OCS- A 0532	Ocean Wind LLC (Ørsted)	Planning					X	X9	By 2030, spread over 2026-2030	109	1,148	-	5	173	512	788	906
Empire Wind 1	part of OCS-A 0512	Equinor/BP	COP, PPA					X		2023-2026	57	816	46	5	134	525	853	951
Empire Wind 2	part of OCS-A 0512	Equinor/BP	COP, PPA,					X		2024-2027	90	1,260	30	5	166	525	853	951
Atlantic Shores Wind North	OCS-A 0549	Atlantic Shores Offshore Wind, LLC	Planning					X	X10	2026	157	2,355	330	58	528	576	919	1,049
Blue Point Wind	OCS-A 0537	OW Ocean Winds East LLC	Planning					X		By 2030, spread over 2026-2030	80	11,502	-	5	120	1,009	1,230	1,312
Attentive Energy	OCS-A 0538	Attentive Energy LLC (TotalEnergies Renewables USA)	Planning					X			100		-	5	120	1,009	1,230	1,312
Community Wind	OCS-A 0539	Bight Wind Holdings, LLC (RWE/National Grid)	Planning					X			145		-	5	120	1,009	1,230	1,312
Atlantic Shores Offshore Wind Bight	OCS-A 0541	Atlantic Shores Offshore Wind Bight, LLC	Planning					X			93		-	5	120	1,009	1,230	1,312
Leading Light Wind	OCS-A 0542	Invenergy Wind Offshore LLC (Invenergy /energyRe)	Planning					X			97		-	5	120	1,009	1,230	1,312

Project/Region	BOEM Lease Area	Developer	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[1]						Estimated Construction Schedule[2]	Turbine Number[3]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles) [4]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Inter-Array Cable Length (statute miles) [5]	Hub Height (feet) [6]	Rotor Diameter (feet) [6]	Height of Turbine (feet) [6]
				Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation and Tourism									
Vineyard Mid-Atlantic	OCS-A 0544	Vineyard Offshore	Planning					X			102		-	5	120	1,009	1,230	1,312
Total NY/NJ Leases[12]										N/A	1,264	19,691	923	N/A	2,185	N/A	N/A	N/A
Delaware/Maryland Region																		
Skipjack Wind I	part of OCS-A 0519	Skipjack Wind, LLC (Ørsted)	COP, PPA	X		X		X	X	2024	16	192	40	10	24	492	722	822
Maryland Offshore Wind	OCS-A 0490	US Wind, LLC	COP, PPA	X	X	X	X	X	X	2024	121	2,000	142	7	152	528	820	938
Garden State Offshore Energy	OCS-A 0482	GSOE I, LLC	Planning	X		X		X	X	By 2030, spread over 2023-2030	94	1,128	-	-	139	492	722	853
Skipjack Wind II	part of OCS-A 0519	Skipjack Wind, LLC (Ørsted)		X		X		X	X	By 2030,		1,128	-	-	139	492	722	853
Total DE/MD Leases										N/A	231	4,448	182	N/A	454	N/A	N/A	N/A
South Atlantic Region																		
Coastal Virginia Offshore Wind	OCS-A 0497	Dominion Energy	Built	X	X	X	X	X		Built	2	12	22	3	9	364	506	620
Coastal Virginia Offshore Wind – Commercial	OCS-A 0483	Dominion Energy	COP	X	X	X	X	X		2023	205	3,000	417	5	300	489	761	869
Kitty Hawk Wind North	part of OCS-A 0508	Avangrid Renewables	COP	X	X	X	X	X		2027	69	1,242	112	30	149	574	935	1,042
Kitty Hawk Wind South	part of OCS-A 0508	Avangrid Renewables	COP	X	X	X	X	X		2027-2028	121	2,178	353	30	200	574	935	1,042
Carolina Long Bay	OCS-A-0345	TotalEnergies Renewable Wind, LLC	Planning	X	X	X	X	X		By 2030,	64	785	-	-	179	492	722	812

Project/Region	BOEM Lease Area	Developer	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[1]						Estimated Construction Schedule[2]	Turbine Number[3]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles) [4]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Inter-Array Cable Length (statute miles) [5]	Hub Height (feet) [6]	Rotor Diameter (feet) [6]	Height of Turbine (feet) [6]
				Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation and Tourism									
Carolina Long Bay	OCS-A-0346	Duke Energy Renewables Wind, LLC	Planning	X	X	X	X	X		By 2030,	64	788	-	-	95	492	722	812
Total South Atlantic Leases										N/A	523	7,993	882	N/A	923	N/A	N/A	N/A
OCS Total[13]										N/A	3,141	47,055	4,953	N/A	5,912	N/A	N/A	N/A

[1] This column identifies project/lease areas that are applicable to each resource based on the geographic analysis areas shown in each resource section of the EIS.

[2] The estimated construction schedule is based on information known at the time of this analysis and could be different when an applicant submits a COP.

[3] The number of turbines for those lease areas without an announced number of turbines has been calculated based on lease size, a 1×1-nm (2×2-km) grid spacing, or the generating capacity.

[4] BOEM assumes that each offshore wind development would have its own cable (both onshore and offshore) and that future projects would not utilize a regional transmission line. The length of offshore export cable for those lease areas without a known project size is assumed to include two offshore cables totaling 120 miles (193 kilometers). The offshore export cable would be buried a minimum of 4 feet (1.2 meters) but not more than 10 feet (3.1 meters).

[5] If information for a future project could not be obtained from a COP, the length of inter-array cabling is assumed to be the average amount per foundation based on the COPs submitted to date, which is 1.48 miles (2.4 kilometers). In addition, for those lease areas that require more than 7 one OSS, it is assumed that an additional 6.2 miles (9.9 kilometers) of inter-link cable would be required to link the two OSSs. Inter-array cable is assumed to be buried between 4 and 6 feet (1.2 and 1.8 feet).

[6] The hub height, rotor diameter, and turbine height for lease areas is based on worst-case scenario for the resource area. Presentation of heights vary by COP and may be presented relative to mean lower low water (MLLW), mean sea level, or height above highest astronomical tide.

[7] Approximately 10 of the WTG positions in this lease area would be within 40 miles of (and thus potentially visible to) observers in the GAA associated with land use and coastal infrastructure and demographics, employment, and economics.

[8] None of these WTGs would be visible from the GAA associated with land use and coastal infrastructure or demographics, employment, and economics.

[9] Approximately 77 WTG positions in this lease area would be within 43 miles of (and thus potentially visible to) observers in the GAA associated with land use and coastal infrastructure and demographics, employment, and economics.

[10] Approximately 36 of these positions would be within 40 miles of (and thus potentially visible to) observers in the GAA for visual resources and recreation/tourism.

[11] New York's demand is not double-counted, this total comes from looking at New York's state demand, not adding up the potential of the areas because that would double-count New York.

[12] Includes cable length from offshore export cables and offshore substation interconnector cables.

[13] BOEM recognizes that the estimates presented within this analysis are likely high, conservative estimates; however, BOEM believes that this analysis is appropriately capturing the potential cumulative impacts and errs on the side of maximum impacts. Totals by lease area and by OCS may not fully sum due to rounding errors.

The spacing/layout for projects are as follows: NE State water projects include a single strand of wind turbine generators (WTGs) and no offshore substation (OSS). For projects in the RI, MA, NY, NJ, DE, MD lease areas, a 1×1–nm grid spacing is assumed. For the CVOW Project, the spacing is 0.7 nm; and the Dominion commercial lease area off the coast of Virginia would utilize 0.5-nm average spacing, which is less than the 1×1–nm spacing due to the need to attain the state's goals.

"-"= no information available; CT = Connecticut; CVOW = Coastal Virginia Offshore Wind; DE = Delaware; FDR = Facility Design Report; FIR = Fabrication and Installation Report; MA = Massachusetts; MD = Maryland; NC = North Carolina; NE = New England; NJ = New Jersey; NY = New York; PP = Power Purchase Agreement; RAP = research activities plan; RI = Rhode Island; SAP = Site Assessment Plan, VA = Virginia

Table D2-2. Offshore Wind development activities on the U.S. East Coast: projects and assumptions (Part 2, seabed/anchoring disturbance and scour protection)

Project/Region	BOEM Lease Area	Developer	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[2]						Estimated Foundation Number[2]	Total Footprint of Foundations (acres)[3]	Seabed Disturbance Based on Addition of Scour Protection (Foundation+Scour Protection) [4]	Offshore Export Cable Seabed Disturbance (acres)[5]	Offshore Export Cable Hard Protection (acres)[6]	Anchoring Disturbance (acres)[7]	Inter-array Construction Footprint/Seabed Disruption (acres)[8]	Inter-array Operating Footprint/Seabed Disruption (acres)[9]	Inter-array Cable Hard Protection (acres)[10]
				Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, [illegible]	Visual, Recreation and Tourism									
Delaware/Maryland Region																		
Skipjack Wind I	part of OCS-A 0519	Skipjack Wind, LLC (Ørsted)	COP, PPA, SAP	X		X		X	X	17	4.4	21	32	5	0.1	250	33	0
Maryland Offshore Wind	OCS-A 0490	US Wind, LLC	COP, PPA, SAP	X	X	X	X	X	X	125	32	59	32	17	0.3	1,837	246	0
Garden State Offshore Energy	OCS-A 0482	GSOE I, LLC	Collectively the technical capacity of this group is 1,080 MW (90 turbines). The remaining capacity may be utilized by demand from NJ or MD.	X		X		X	X	96	25	121	157.6	4.8	0.5	1,410.9	189.2	0
Skipjack Wind II	part of OCS-A 0519	Skipjack Wind, LLC (Ørsted)		X		X		X	X									
Total DE/MD Leases										238	61	202	222	27	1	3,498	468	0
South Atlantic Region																		
Coastal Virginia Offshore Wind	OCS-A 0497	Dominion Energy	RAP, FDR/FIR	X	X	X	X	X		2	0.1	2	11	3	0.1	5	3	0
Coastal Virginia Offshore Wind – Commercial	OCS-A 0483	Dominion Energy	COP, SAP	X	X	X	X	X		208	4	198	13,244	0	1	14,819	38	0
Kitty Hawk Wind North	part of OCS-A 0508	Avangrid Renewables	COP, SAP	X	X	X	X	X		70	1	66	407	32	2	5,931	14	0
Kitty Hawk Wind South	part of OCS-A 0508	Avangrid Renewables	COP	X	X	X	X	X		123	1	100	1,284	49	9	7,957	19	0
Carolina Long Bay	OCS-A-0345	TotalEnergies Renewable Wind, LLC	Planning	X	X	X	X	X		65	17	82	158	24	0.5	4,631	12	17
Carolina Long Bay	OCS-A-0346	Duke Energy Renewables Wind, LLC	Planning	X	X	X	X	X		65	17	82	158	24	0.5	4,631	12	17
Total South Atlantic Leases										531	40	528	15,251[11]	129	13	37,696	95	34

Project/Region	BOEM Lease Area	Developer	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[2]														
				Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, [illegible]	Visual, Recreation and Tourism	Estimated Foundation Number[2]	Total Footprint of Foundations (acres)[3]	Seabed Disturbance Based on Addition of Scour Protection (Foundation+Scour Protection) [illegible][4]	Offshore Export Cable Seabed Disturbance (acres)[5]	Offshore Export Cable Hard Protection (acres)[6]	Anchoring Disturbance (acres)[7]	Inter-array Construction Footprint/Seabed Disruption (acres)[8]	Inter-array Operating Footprint/Seabed Disruption (acres)[9]	Inter-array Cable Hard Protection (acres)[10]
Total MA/RI Leases										1,142	232	3,238	8,847	574	3,872	11,574	1,143	671
Total NJ/NJ Leases										1,295	232	1,470	9,851	939	1,151	19,033	2,552	603
OCS Total										3,206	565	5,438	33,949	1,669	5,037	72,074	4,258	1,308

[1] This column identifies project/lease areas that are applicable to each resource based on the geographic analysis areas.

[2.] The estimated number of foundations is the total number of turbines plus OSS. If information for a future project could not be obtained from a publicly available COP, it is assumed that for every 50 turbines there would be one OSS installed.

[3.] If information for a future project could not be obtained from a publicly available COP, the foundation footprint is assumed to be 0.04 acre, which is based on the largest monopile reported (12 MW) for all lease areas.

[4.] The seabed disturbance with the addition of scour protection was calculated based on scour protection expected in submitted COPs. If information for a future project could not be obtained from a publicly available COP, it is assumed that for all lease areas that a 12-MW foundation with addition of scour protection would be 0.85 acre per foundation.

[5.] Offshore export cable seabed bottom disturbance is assumed to be due to installation of the export cable, the use of jack-up vessels, and the need to perform dredging. If information for a future project could not be obtained from a publicly available COP, export cable seabed disturbance assumed to be 6.06 acres per mile.

[6.] If information for a future project could not be obtained from a publicly available COP, the offshore export cable hard protection is assumed to be similar to Vineyard Wind 1 Project, which is 0.357 acre per mile of offshore export cable.

[7.] If information for a future project could not be obtained from a publicly available COP, anchoring disturbance for other lease areas is assumed to be a rate equal to 0.10 acre per mile of offshore export cable.

[8.] If information for a future project could not be obtained from a publicly available COP, inter-array construction seabed disturbance is assumed to be 6.06 acres per mile.

[9.] If information for a future project could not be obtained from a publicly available COP, the inter-array operating footprint is assumed to be a rate equal to the average amount per foundation of 1.43 acres per foundation.

[10.] If information for a future project could not be obtained from a publicly available COP, the inter-array cable hard protection is assumed to be zero.

[11.] Kitty Hawk South has 3 export cables (92 km to Virginia, 322 km to North Carolina, and an additional 154 km of inshore export cable to North Caroline) for a total of 568 km (352.9 miles), and corridor widths between 1,520-m-wide to Virginia and 1,000-m-wide corridors to North Carolina to allow for optimal routing of the cables.

Table D2-3. Offshore Wind development activities on the U.S. East Coast: projects and assumptions (Part 3, gallons of coolant, oils, lubricants, and diesel fuel)

Project/Region	BOEM Lease Area	Developer	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[1]						Total Coolant Fluids in WTGs (gallons)	Total Coolant Fluids in OSS or ESP (gallons)	Total Oils and Lubricants in WTGs (gallons)	Total Oils and Lubricants in OSS or ESP (gallons)	Total Diesel Fuel in WTGs (gallons)	Total Diesel Fuel in OSS or ESP (gallons)
				Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation and Tourism						
Delaware/Maryland Region															
Skipjack Wind I	part of OCS-A 0519	Skipjack Wind, LLC (Ørsted)	COP, PPA, SAP	X		X		X	X	48,523	1,496	57,508	92,726	6,558	50,450
Maryland Offshore Wind	OCS-A 0490	US Wind, LLC	COP, PPA, SAP	X	X	X	X	X	X	366,953	5,985	434,905	370,903	49,595	201,801
Garden State Offshore Energy	OCS-A 0482	GSOE I, LLC	Collectively the technical capacity of this group is 1,080 MW (90 turbines). The remaining capacity may be utilized by demand from NJ or MD.	X		X		X	X	285,071	2,992.3	337,859.8	185,451.6	3,8528.5	100,900.3
Skipjack Wind II	part of OCS-A 0519	Skipjack Wind, LLC (Ørsted)		X		X		X	X						
Total DE/MD Leases										700,547	10,473	830,273	649,081	94,682	353,151
South Atlantic Region															
Coastal Virginia Offshore Wind	OCS-A 0497	Dominion Energy	RAP, FDR/FIR	X	X	X	X	X		846	0	7,660	0	1,586	0
Coastal Virginia Offshore Wind – Commercial	OCS-A 0483	Dominion Energy	COP, SAP	X	X	X	X	X		855,670	0	437,060	258,300	0	20,409
Kitty Hawk Wind North	part of OCS-A 0508	Avangrid Renewables	COP, SAP	X	X	X	X	X		29,165	46	229,800	61,780	47,580	2,848

Project/Region	BOEM Lease Area	Developer	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[1]						Total Coolant Fluids in WTGs (gallons)	Total Coolant Fluids in OSS or ESP (gallons)	Total Oils and Lubricants in WTGs (gallons)	Total Oils and Lubricants in OSS or ESP (gallons)	Total Diesel Fuel in WTGs (gallons)	Total Diesel Fuel in OSS or ESP (gallons)
				Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation and Tourism						
Kitty Hawk Wind South	part of OCS-A 0508	Avangrid Renewables	COP	X	X	X	X	X		51,144	93	447,507	247,117	95,894	11,396
Carolina Long Bay	OCS-A-0345	TotalEnergies Renewable Wind, LLC	Planning	X	X	X	X	X		151,025	23	180,881	94,533	23,385	5,776
Carolina Long Bay	OCS-A-0346	Duke Energy Renewables Wind, LLC	Planning	X	X	X	X	X		151,025	23	180,601	94,533	23,385	5,776
Total South Atlantic Leases										1,238,875	185	1,483,509	756,263	191,830	46,205
Total MA/RI Leases										4,085,387	88,358	5,532,683	3,824,889	876,190	788,265
Total NY/NJ Leases										3,833,289	46,381	4,543,136	2,874,500	518,085	1,468,278
OCS Total										9,858,098	145,397	12,389,601	8,104,733	1,680,787	2,655,899

[1] This column identifies project/lease areas that are applicable to each resource based on the geographic analysis areas.

ESP = electrical service platform; NJ = New Jersey; NY = New York; OSS = offshore substation; PPA = Power Purchase Agreement

Table D2-4. Offshore Wind development activities on the U.S. East Coast: projects and assumptions (Part 4, OCS construction and operations emissions)

Project/Region[1]	BOEM Lease Area	Developer	Status	Construction Emissions							Operation Emissions						
				NO_x (tons)	VOC (tons)	CO (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	CO_2 (tons)	NO_x (tpy)	VOC (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	CO_2 (tpy)
Delaware/Maryland Region																	
Skipjack Wind I	part of OCS-A 0519	Skipjack Wind, LLC (Ørsted)	COP, PPA, SAP	863.60	21.26	191.28	28.55	28.22	6.42	55,719.61	50.08	0.91	11.81	1.64	1.57	0.14	3,359.35
Maryland Offshore Wind	OCS-A 0490	US Wind, LLC	COP, PPA, SAP	6,350.00	156.36	1,406.45	209.95	207.52	47.17	409,703.04	368.26	6.70	86.82	12.07	11.55	1.01	24,701.07
Garden State Offshore Energy	OCS-A 0482	GSOE I, LLC	Collectively the technical capacity of this group is 1,080 MW (90 turbines). The remaining capacity may be utilized by demand from NJ or MD.	4,876.80	120.08	1,080.15	161.24	159.38	36.23	314,651.94	282.82	5.15	66.68	9.27	8.87	0.78	18,970.43
Skipjack Wind II	part of OCS-A 0519	Skipjack Wind, LLC (Ørsted)															
Total DE/MD Leases (without Proposed Actions)				5740.4	141.34	1271.43	189.79	187.6	42.65	370371.6	332.9	6.06	78.49	10.91	10.44	0.92	22329.78

[1] This column identifies project/lease areas that are applicable to each resource based on the geographic analysis areas.
The spacing/layout for projects/regions are as follows: for the projects in the Delaware/Maryland lease areas, BOEM assumes that a 1 × 1–nm grid spacing also would be utilized.

References

Bureau of Ocean Energy Management (BOEM). 2019. National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf. Available: https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/IPFs-in-the-Offshore-Wind-Cumulative-Impacts-Scenario-on-the-N-OCS.pdf. Accessed: January 2023.