Appendix D

Ongoing and Planned Activities Scenario

Contents

List of Tables

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D.1 Ongoing and Planned Activities Scenario

This appendix describes the other ongoing and planned activities that could occur within the geographic analysis area for each resource and contribute to baseline conditions and trends for resources considered in this Draft EIS. The *Project* here is the construction and installation, O&M, and conceptual decommissioning of two wind energy facilities (Project 1 and Project 2) within BOEM's Renewable Energy Lease Number OCS-A 0499, approximately 8.7 miles (14 kilometers)[1] from the New Jersey shoreline at its closest point.

The geographic analysis area varies for each resource as described in the individual resource sections of Chapter 3 and shown below in Table D-1. BOEM anticipates that impacts could occur from the start of Project construction in 2024 through the 3-year Project decommissioning period: approximately 2058 to 2060 for Project 1 and approximately 2059 to 2061 for Project 2.[2] The geographic analysis area is defined by the anticipated geographic extent of impacts for each resource. For the mobile resources—bats, birds, finfish and invertebrates, marine mammals, and sea turtles—the species potentially affected 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 or the movement range of a population or stock; though the analysis does not include stocks or populations of some species that range beyond the geographic analysis area, the conclusions in the analysis will not be impacted (see Table D-1). The purpose is to capture the cumulative impacts on each of those resources that would be affected 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.

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[1] Equates to 7.6 nautical miles. 1 nautical mile = 1.1508 statute miles.

[2] Atlantic Shores South decommissioning commences in approximately 2058 for Project 1 and 2059 for Project 2 and is based on a 4-year construction period (2024–2027) followed by a 30-year operating period. Atlantic Shores' lease with BOEM (Lease OCS-A 0499) has an operations term of 25 years that commences on the date of COP approval (see https://www.boem.gov/sites/default/files/documents/oil-gas-energy/leasing/OCS-A%200499%20Lease.pdf; see also 30 CFR 585.235(a)(3)). Atlantic Shores would need to request and be granted a lease renewal from BOEM in order to operate the proposed Project for 30 years. While Atlantic Shores has not made such a request, this Draft EIS uses the longer period in order to avoid possibly underestimating any potential effect.

Table D-1. Resource-specific geographic analysis areas

Resource	Geographic Analysis Area	Rationale
Air quality	The airshed within 25 miles (40 kilometers) of the WTA (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 (Figure 3.4.1-1)	The geographic analysis area encompasses the geographic region subject to USEPA review as part of an OCS permit for the Project under the CAA. The geographic analysis area also considers potential air quality impacts associated with the onshore construction areas and the mustering 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.
Bats	The United States coastline from Maine to Florida, extending 100 miles (161 kilometers) offshore and 5 miles (8 kilometers) inland (Figure 3.5.1-1)	The geographic analysis area for bats was established to capture most of the movement range for migratory species. The offshore limit was established to capture the migratory movements of most species in this group, while the onshore limits cover onshore habitats used by species that may be affected by onshore and offshore components of the proposed Project.
Benthic resources	A 10-mile (16.1-kilometer) buffer around the WTA and a 330-foot buffer around the Offshore and Inshore ECCs (Figure 3.5.2-1)	The geographic analysis area is based upon where the most widespread impact (namely, suspended sediment) from the proposed Project could affect benthic resources. This area would account for some 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).
Birds	The United States coastline from Maine to Florida, extending 100 miles (161 kilometers) offshore and 0.5 mile (0.8 kilometer) inland (Figure 3.5.3-1)	The geographic analysis area for birds 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	A 1.0-mile (1.6-kilometer) buffer of the Onshore Project area[1] (Figure 3.5.4-1 and Figure 3.5.4-2)	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.

Resource	Geographic Analysis Area	Rationale
Commercial fisheries and for-hire recreation fishing	Waters within the Greater Atlantic Region managed by NEFMC and MAFMC for federal fisheries within the U.S. Exclusive Economic Zone (from 3 to 200 nautical miles from the coastline), plus the state waters within the Greater Atlantic Region (from 0 to 3 nautical miles from the coastline) extending from Maine to Cape Hatteras, North Carolina (Figure 3.6.1-1)	The boundaries for the geographic analysis area were developed to consider impacts on federally permitted vessels operating in all fisheries in state and U.S. Exclusive Economic Zone waters surrounding the proposed Project.
Cultural, historical, and archaeological	The APE for terrestrial and marine archaeology and analysis of visual effects on historic properties (Figure 3.6.2-1)	The APE is a geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.
Demographics, employment, and economic characteristics	The counties in closest proximity to the Onshore and Offshore Project[1,2] areas and the counties or incorporated cities where POI and landfall locations and potential port cities are located, including POI and landfall locations in Atlantic and Monmouth Counties, New Jersey, and port locations in Atlantic County (Atlantic City Harbor); Salem County (New Jersey Wind Port) and Gloucester County (Paulsboro Marine Terminal and Repauno Port and Rail Terminal) New Jersey; the city of Portsmouth, Virginia (Portsmouth Marine Terminal); and Nueces and San Patricio Counties, Texas (Port of Corpus Christi) (Figure 3.6.3-1)	These counties are the most likely to experience beneficial or adverse economic impacts from the proposed Project.
Environmental justice	The counties or incorporated cities closest to the Onshore and Offshore Project[1,2] areas and the counties where proposed onshore infrastructure and potential port cities are located: New Castle County in Delaware; Atlantic, Gloucester, Monmouth, Ocean and Salem Counties in New Jersey; Delaware and Philadelphia Counties in Pennsylvania; the City of Portsmouth in Virginia; and the Port of Corpus Christi in Nueces and San Patricio County, Texas (Figure 3.6.4-1 through Figure 3.6.4-8)	These counties or incorporated cities, and environmental justice communities within, are the most likely to experience impacts from the proposed Project.

Resource	Geographic Analysis Area	Rationale
Finfish, invertebrates, and EFH	The Northeast Continental Shelf LME,[3] which extends from the southern edge of the Scotian Shelf (in the Gulf of Maine) to Cape Hatteras, North Carolina; the northern portion of the geographic analysis area extends beyond U.S. waters while the width tapers to within U.S. waters toward the southern boundary (Figure 3.5.5-1)	This area is likely to capture the majority of the movement range across all life stages for most species in this group. Many species that occur in the LME have broad ranges that extend beyond the geographic analysis area. Some of these species have distinct populations or stocks within the geographic analysis area that are not connected with populations or stocks of the same species outside of it (e.g., the red drum "*Sciaenops ocellatus*"). The individual populations or stocks of these species are typically managed separately due to lack of connectivity and for practical reasons. In most cases individuals of one population rarely occur in the geographic extent of another population and may be genetically distinct, as is the case with red drum (Vaughan and Carmichael 1999). In some cases, however, individuals from one population may occur within the geographic extent of another (e.g., Atlantic sturgeon). Furthermore, some species only occur seasonally (e.g., giant manta ray). For the purposes of the analysis in Section 3.5.5, these nuances are stated explicitly in discussions on particular species.
Land use and coastal infrastructure	Atlantic City (Atlantic City Harbor), Howell Township, and Egg Harbor Township, New Jersey; and municipal boundaries surrounding ports in Salem and Gloucester Counties, New Jersey; Norfolk County, Virginia; and in San Patricio and Nueces Counties, Texas (Figure 3.6.5-1)	These areas encompass locations where BOEM anticipates direct and indirect impacts associated with proposed onshore facilities and ports.
Marine mammals	The Scotian Shelf, Northeast Shelf, and Southeast Shelf LMEs (Figure 3.5.6-1)	This area is likely to capture the majority of the movement range for most species in this group.
Navigation and vessel traffic	Coastal and marine waters within a 10-mile (16.1-kilometer) buffer of the Offshore Project area and adjacent Lease Areas OCS-A 0498 (Ocean Wind 1), OCS-A-0532 (Ocean Wind 2), and OCS-A 0549 (Atlantic Shores North), as well as waterways leading to ports in New Jersey, Virginia, and Texas that may be used by the Project (Figure 3.6.6-1)	These areas encompass locations where BOEM anticipates direct and indirect impacts associated with Project construction and installation, O&M, 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 ECCs and WTA and the Ocean Wind 1, Ocean Wind 2, and Atlantic Shores North Lease Areas, as well as Atlantic City International Airport, Ocean City Municipal Airport, Woodbine Municipal Airport, Cape	These areas encompass locations where BOEM anticipates direct and indirect impacts associated with Project construction and installation, O&M, and conceptual decommissioning.

Resource	Geographic Analysis Area	Rationale
	May County Airport, and Warren Grove Range Airport (Figure 3.6.7-1) **Cables and Pipelines:** Areas within 1 mile (1.6 kilometers) of the ECCs and WTA that could affect future siting or operation of cables and pipelines (Figure 3.6.7-1) **Scientific Research and Surveys:** Same geographic analysis area as finfish, invertebrates, and essential fish habitat (Figure 3.5.5-1) **Marine Minerals:** Areas within 0.25 mile (0.4 kilometer) of the ECCs and WTA that could affect marine minerals extraction (Figure 3.6.7-1)	
Recreation and tourism	The 45.1-mile (72.6-kilometer) radius visual geographic analysis area measured from the borders of the WTA (Figure 3.6.8-1)	This geographic analysis area was selected to coincide with the Atlantic Shores South VIA visual geographic analysis area corresponding to the theoretical limits of Project visibility.
Sea turtles	The Northeast Shelf, Southeast Shelf, and Gulf of Mexico LMEs (Figure 3.5.7-1)	This area is likely to capture the majority of the movement range for most species in this group.
Scenic and visual resources	The 45.1-mile (72.6-kilometer) radius visual geographic analysis area measured from the borders of the WTA (Figure 3.6.9-1 and Figure 3.6.9-2)	This geographic analysis area was selected to coincide with the Atlantic Shores South VIA visual geographic analysis area and to include the Cape May Lighthouse to address Project visibility from sensitive resources and encompass all locations where BOEM anticipates direct and indirect impacts associated with Project construction and installation, O&M, and conceptual decommissioning.
Water quality	**Offshore**: Includes the marine waters within a 10-mile (16-kilometer) buffer around the Offshore Project area encompassing the OCS waters of the WTA to the nearshore and intertidal waters along the ECCs to each landfall site and a 15.5-mile (25-kilometer) buffer around the ports in New Jersey, Virginia, and Texas that may be used by the Project **Onshore**: Includes any subwatershed intersected by the Onshore Project area (Figure 3.4.2-1) and any documented water supplies within the Onshore Project Area.	The offshore geographic analysis area accounts for some 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 operation activities of the proposed Project. The characterization of water quality in the affected environment is based on available scientific literature, published state and federal agency research, online data portals, and online mapping databases.
Wetlands	Subwatersheds that intersect the Onshore Project area (Figure 3.5.8-1)	This area encompasses all wetlands and surface waters that are most likely to experience impacts from the proposed Project.

APE = area of potential effects; CAA = Clean Air Act; ECC = export cable corridor; LME = large marine ecosystem; OCS = Outer Continental Shelf; POI = point of interconnection; WTA = wind turbine area

[1] Includes landfalls, onshore ECCs, onshore substations, grid interconnections, and O&M facility.

[2] Includes the WTA and the offshore and inshore export cable corridors.

[3] LMEs are delineated based on ecological criteria including bathymetry, hydrography, productivity, and trophic relationships among populations of marine species, and NOAA 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 Draft EIS. Projects or actions that are considered speculative per the definition provided in 43 CFR 46.30[3] are noted in subsequent tables but excluded from the cumulative impact analysis in Chapter 3.

Ongoing and planned activities described in this section consist of 10 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, management, and monitoring surveys; (8) global climate change; (9) oil and gas activities; and (10) onshore development activities.

BOEM analyzed the possible extent of future other offshore wind energy development activities on the Atlantic OCS to determine reasonably foreseeable cumulative effects measured by installed power capacity. Table D.A2-1 in Attachment D2 represents the status of projects as of July 8, 2022. The methodology for developing the scenario is the same as for the Vineyard Wind 1 project and details of the scenario development are described in the Vineyard Wind 1 Final EIS (BOEM 2021a).

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 SAP and COP. For the purposes of the cumulative impact analysis, BOEM makes the following assumptions for survey and sampling activities to characterize a maximum-case scenario:

- Site characterization would occur on all existing leases and potential export cable routes.
- Site characterization would likely take place in the first 3 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 5-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.

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[3] 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.

- 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
HRG 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, marine archaeology
Biological	Grab sampling, benthic sled, underwater imagery/sediment profile imaging	Benthic habitat
	Aerial digital imaging; visual observation from boat or airplane	Birds, marine mammals, sea turtles
	Ultrasonic detectors installed on survey vessels used for other surveys	Bats
	Visual observation from boat or airplane	Marine fauna (marine mammals and sea turtles)
	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 metocean data collection platform for developers, and BOEM expects that most future site assessments will use buoys instead of towers (BOEM 2021d). 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 D.A2-1 in Attachment D2). Site assessment would likely take place starting within 1 to 2 years of lease execution, because preparation of an 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 D.A2-1 in Attachment D2 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 depicts offshore wind projects from Maine to North and South Carolina that are currently in various stages of planning within BOEM's offshore leases, including Ocean Wind 1, Ocean Wind 2, and Atlantic Shores North that are proposed offshore New Jersey adjacent to Atlantic Shores South, and Empire Wind 1 and Empire Wind 2 that are proposed offshore New York. Projected construction dates for each offshore wind project are listed in Table D.A2-1 in Attachment D2, and each project will require a NEPA process with an EIS or environmental assessment prior to approval.

Table D-3 summarizes (1) the incremental number of construction locations that are projected to be active in each region during each year between 2023 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 turbines across the Atlantic OCS by year.

The following assumptions have been made with respect to lease areas and portions of lease areas that are included in the assessment, noting that unless noted in the bulleted list, the entire lease area for a project listed in Table D-3 is included in the quantitative analysis of commercial fishing revenues at risk:

- Vineyard Wind 1 occupies only the northwestern portion of OCS-A 0501 and could affect 51 percent of the commercial fishing revenue generated in the Lease Area (NMFS 2021).
- Sunrise Wind will be built in the southeastern portion of the Lease Area, and it is assumed that it could affect 55 percent of the commercial fishing revenue generated in OCS-A 0487.
- Bay State Wind occupies only the northeastern portion of OCS-A 0500 and could affect 41 percent of the commercial fishing revenue generated in the Lease Area (NMFS 2021).
- Park City Wind could affect 65 percent of the revenues generated in the southwestern portion of OCS-A 0501 that was not used by Vineyard Wind 1; Commonwealth Wind is assumed to comprise the remaining 35 percent. The southwestern portion of OCS-A 0501 comprises 49 percent of the commercial fisheries revenue generated in the entire Lease Area (NMFS 2021).
- South Coast Wind comprises only the northwestern portion of OCS-A 0521 and could affect 56 percent of the commercial fishing revenue generated in the Lease Area (NMFS 2021).
- Vineyard Wind NE occupies the northeastern portion of OCS-A 0522 and could affect 41 percent of the commercial fishing revenue generated in the Lease Area (NMFS 2021).
- Empire Wind 1 is built in the northwestern portion of OCS-A 0512. This area could affect 26 percent of the commercial fishing revenue in the Lease Area (NMFS 2021).
- Empire Wind 2 is built in the southeastern portion of OCS-A 0512. This area could affect 75 percent of the commercial fishing revenue in the Lease Area (NMFS 2021).

- US Wind/Maryland Offshore Wind is built in the southeastern portion of OCS-A 0490. This area could affect 54 percent of the commercial fishing revenue in the Lease Area (NMFS 2021).
- Skipjack is built in the southern portion of OCS-A 0519. This area could affect 26 percent of the commercial fishing revenue in the Lease Area (NMFS 2021).

Note that the Kitty Hawk North and Kitty Hawk South (North Carolina) projects and TotalEnergies Renewables and Duke Energy Renewables projects (South Carolina) are included despite their location in the 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 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, 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 and installation, O&M, and conceptual decommissioning activities as the proposed Project. However, 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. 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 analysis of ongoing and planned activities, the proposed projects included in Table D.A2-1 in Attachment D2 are analyzed in Chapter 3 of this Draft EIS. For a list of mitigation measures that were considered in the impact analysis in Chapter 3 of this Draft EIS, please see Appendix G, *Mitigation and Monitoring*.

Table D-3. Planned offshore wind project construction schedule (dates shown as of March 17, 2023)[1]

Project/Region	Number of Foundations: Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and Beyond
NE Aquaventis (Maine state waters)	-	-	-	-	2	-	-	-	-	-	-
Total Other State Waters Projects	-	-	-	-	2	-	-	-	-	-	-
Estimated Other State Waters Construction Total	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**
Estimated O&M Total	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**2**	**2**	**2**	**2**
EXISTING AND ONGOING PROJECTS											
Block Island (Rhode Island state waters)	5	-	-	-	-	-	-	-	-	-	-
Vineyard Wind 1, part of OCS-A 0501	-	-	-	63	-	-	-	-	-	-	-
South Fork, OCS-A 0517	-	-	-	13	-	-	-	-	-	-	-
CVOW, OCS-A 0497	2	-	-	-	-	-	-	-	-	-	-
Estimated Existing and Ongoing Project Construction Total	**7**	**0**	**0**	**76**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Estimated O&M Total	**0**	**7**	**7**	**7**	**83**	**83**	**83**	**83**	**83**	**83**	**83**
PLANNED PROJECTS											
Massachusetts/Rhode Island Region											
Sunrise Wind, OCS-A 0487	-	-	-	-	95	-	-	-	-	-	-
Revolution Wind, part of OCS-A 0486	-	-	-	-	102	-	-	-	-	-	-
New England Wind OCS-A 0534 and portion of OCS-A-501 (Phase 1 [i.e., Park City Wind)[2]	-	-	-	-	64	-	-	-	-	-	-
New England Wind OCS-A 0534 and portion of OCS-A-501 (Phase 2 [i.e., Commonwealth Wind)[2]	-	-	-	-	-	66	-	-	-	-	-
South Coast Wind OCS-A 0521	-	-	-	-	149	-	-	-	-	-	-
Beacon Wind 1, part of OCS-A 0520[3]	-	-	-	-	-	-	78	-	-	-	-
Beacon Wind 2, part of OCS-A 0520[3]	-	-	-	-	-	-	-	79	-	-	-
Bay State Wind, part of OCS-A 0500	-	-	-	-	-	-	96	-	-	-	-
OCS-A 0500 remainder	-	-	-	-	-	-	119	-	-	-	-
OCS-A 0487 remainder	-	-	-	-	-	-		-	-	-	-
Vineyard Wind NE, OCS-A 0522	-	-	-	-	-	-	160	-	-	-	-

	Number of Foundations										
Project/Region	**Before 2021**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030 and Beyond**
Estimated Massachusetts/Rhode Island Construction Total	**0**	**0**	**0**	**0**	**410**	**66**	**453**	**79**	**0**	**0**	**0**
Estimated O&M Total	**0**	**0**	**0**	**0**	**0**	**410**	**476**	**929**	**1,008**	**1,008**	**1,008**
New York/New Jersey Region											
Atlantic Shores South, OCS-A 0499	-	-	-	-	-	11	200	-	-	-	-
Atlantic Shores North, OCS-A 0549	-	-	-	-	-	-	165	-	-	-	-
Ocean Wind 1, part of OCS-A 0498	-	-	-	-	101	-	-	-	-	-	-
Ocean Wind 2, part of OCS- A 0532	-	-	-	-	-	-	111	-	-	-	-
Empire Wind 1, part of OCS-A 0512	-	-	-	58	-	-	-	-	-	-	-
Empire Wind 2, part of OCS-A 0512	-	-	-	91	-	-	-	-	-	-	-
OW Ocean Winds East LLC, OCS-A 0537	-	-	-	-	-	-	82	-	-	-	-
Attentive Energy LLC OCS-A 0538	-	-	-	-	-	-	102	-	-	-	-
Bight Wind Holdings, LLC OCS-A 0539	-	-	-	-	-	-	148	-	-	-	-
Atlantic Shores Offshore Wind Bight, LLC OCS-A 0541	-	-	-	-	-	-	95	-	-	-	-
Invenergy Wind Offshore LLC, OCS-A 0542	-	-	-	-	-	-	99	-	-	-	-
Vineyard Mid-Atlantic LLC, OCS-A 0544	-	-	-	-	-	-	104	-	-	-	-
Estimated New York/New Jersey Construction Total	**0**	**0**	**0**	**149**	**101**	**11**	**1,106**	**0**	**0**	**0**	**0**
Estimated O&M Total	**0**	**0**	**0**	**0**	**149**	**250**	**261**	**1,367**	**1,367**	**1,367**	**1,367**
Delaware/Maryland Region											
Skipjack, part of OCS-A 0519	-	-	-	-	17	-	-	-	-	-	-
US Wind/Maryland Offshore Wind, part of OCS-A 0490	-	-	-	-	125	-	-	-	-	-	-
GSOE I, OCS-A 0482	-	-	-	96	-	-	-	-	-	-	-
OCS-A 0519 remainder	-	-	-		-	-	-	-	-	-	-
Estimated Delaware/Maryland Construction	**0**	**0**	**0**	**96**	**142**	**0**	**0**	**0**	**0**	**0**	**0**
Estimated O&M Total	**0**	**0**	**0**	**0**	**96**	**238**	**238**	**238**	**238**	**238**	**238**
Virginia/North Carolina/South Carolina Region											
CVOW-C, OCS-A 0483	-	-	-	205	-	-	-	-	-	-	-

Project/Region	Number of Foundations										
	Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and Beyond
Kitty Hawk North, OCS-A 0508	-	-	-	-	-	-	70	-	-	-	-
Kitty Hawk Wind South, OCS-A 0508 remainder	-	-	-	-	-	-	123	-	-	-	-
TotalEnergies Renewables Wind, OCS-A 0545	-	-	-	-	-	-	65	-	-	-	-
Duke Energy Renewables Wind, OCS-A 0546	-	-	-	-	-	-	65	-	-	-	-
Estimated annual Virginia/North Carolina Construction Total	**0**	**0**	**0**	**205**	**0**	**0**	**323**	**0**	**0**	**0**	**0**
Estimated O&M Total	**0**	**0**	**0**	**0**	**205**	**205**	**205**	**528**	**528**	**528**	**528**
Total											
Estimated Total construction	**7**	**0**	**0**	**526**	**655**	**77**	**1,882**	**79**	**0**	**0**	**0**
Estimated O&M Total	**0**	**7**	**7**	**7**	**533**	**1,188**	**1,265**	**3,147**	**3,226**	**3,226**	**3,226**

[1] BOEM recognizes that the estimates presented within this cumulative analysis are likely high, conservative estimates; however, BOEM believes that this analysis appropriately captures the potential cumulative impacts and errs on the side of maximum impacts.
[2] New England Wind Phase I and Phase 2 would collectively have no more than 130 foundations, and the maximum number of foundations for Phase I would be 64.
[3] Beacon Wind 1 and Beacon Wind 2 would collectively have no more than 157 foundations. BOEM made the assumption to split the foundation numbers evenly across both projects.
CVOW = Coastal Virginia Offshore Wind; GSOE = Garden State Offshore Energy

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). The 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 impact 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 ongoing and planned activities in the North Atlantic OCS to consider in a NEPA cumulative impacts scenario. These IPFs and their relationships were utilized in the Draft 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

Several in-service and abandoned submarine telecommunication cables are present in the offshore export cable corridor and in the vicinity of the Atlantic Shores South Lease Area (COP Volume I, Figure 4.5-11; COP Volume II, Figure 7.7-2, Atlantic Shores 2023). The Monmouth ECC could have up to 15 crossings that each export cable will need to complete, while the Atlantic ECC could have up to four crossings for each export cable. It is also estimated that up to 10 interarray cable crossings and up to two interlink cable crossings may be required.

The offshore wind projects listed in Table D.A2-1 in Attachment D2 that have a COP under review are presumed to include at least one identified cable route. Proposed cable routes have not yet been announced for the remainder of the projects.

D.2.5 Tidal Energy Projects

The Roosevelt Island Tidal Energy Project is in the East Channel of the East River, a tidal strait connecting Long Island Sound with the Atlantic Ocean in New York Harbor. In 2005, Verdant Power petitioned FERC for permission for the first U.S. commercial license for tidal power. In 2012, FERC issued a 10-year license to install up to 1 MW of power (30 turbines/10 TriFrames) at the Roosevelt Island Tidal Energy Project (FERC 2012). In October 2020, Verdant Power installed three tidal power turbines with its new

TriFrame mount at its Roosevelt Island Tidal Energy site in New York's East River (U.S. DOE 2021; Verdant Power 2021). See the South Fork Wind Farm and South Fork Export Cable Project Final EIS (BOEM 2021b) for descriptions of other tidal projects that are more distant from the Atlantic Shores South Project in Maine and Massachusetts.

D.2.6 Dredging and Port Improvement Projects

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

- The State of New Jersey is planning to build an offshore wind port on the eastern shore of the Delaware River in Lower Alloways Creek, Salem County, approximately 7.5 miles (12.1 kilometers) southwest of the city of Salem. The New Jersey Economic Development Authority is leading the development of the project on behalf of the state, working alongside key departments and agencies such as the Governor's Office, the Department of the Treasury, and BPU. The development plan includes dredging the Delaware River Channel and construction commenced in September 2021 with a targeted completion date of late 2023 (New Jersey Wind Port 2021; Salem County 2021). The Delaware River Channel dredging project provides deepening of the existing Delaware River Federal Navigation Channel, bend widening, partial deepening of the Marcus Hook anchorage, and relocation and addition of aids to navigation. The deeper channel will allow for more efficient transportation of containerized, dry and liquid bulk, break bulk, roll-on/roll-off, and project cargoes to and from Delaware River ports (USACE 2021). The channel project will improve port access to the New Jersey Offshore Wind Port, Paulsboro Marine Terminal, and Repauno Port and Rail Terminal proposed to be used for activities associated with the Atlantic Shores South Project.
- The City of Atlantic City, New Jersey, secured authorization from USACE (CENAP-OPR-2021-00573-95) to perform 10-year maintenance dredging of 13 city waterways. All dredged material, estimated to be approximately 568,129 cubic yards (434,365 cubic meters) will be removed from approximately 97.3 acres (39.4 hectares) of sea bottom and disposed of at three locations in Atlantic County and Gloucester County, New Jersey. The dredging activities associated with the connected action would be performed under this authorization (USACE 2022a).
- A channel deepening project at the Port of Virginia is currently underway with 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). This channel deepening project will improve port access, including access to the Portsmouth Marine Terminal proposed to be used for activities associated with the Atlantic Shores South Project.
- In 2018, two NJDOT projects, High Bar Harbor channel and Barnegat Light Stake channel, both near Barnegat Inlet in Ocean and Long Beach Townships, New Jersey, underwent dredging of

approximately 39,150 cubic yards (29,932 cubic meters) and 3,230 cubic yards (2,470 cubic meters), respectively, to maintain the depths of these channels. Maintenance dredging for both projects is authorized until December 2025 and is expected to occur before the permits expire (USACE 2015a, 2015b). Barnegat Light is the primary commercial seaport on Long Beach Island and is the homeport to approximately 36 commercial vessels. Barnegat Light's two commercial docks are home to several scallop vessels, longliners, and a fleet of smaller inshore gillnetters (New Jersey Department of Agriculture 2020).

- USACE has received numerous permit applications for private dock, boat lift, and bulkhead repairs in Barnegat Bay, New Jersey (USACE 2022b).

D.2.7 Marine Minerals Use and Ocean Dredged Material Disposal

The closest previous lease in BOEM's Marine Minerals Program for sand borrow areas for beach replenishment is known as the D2 borrow area, offshore New Jersey near Harvey Cedars, Surf City, Long Beach Township, Ship Bottom, and Beach Haven (Lease Number OCS-A-0505; executed 7/1/2014). The lessee (USACE and NJDEP) was approved through September 30, 2018, for the use of up to 10,000,000 cubic yards (7,645,548 cubic meters) of material to be used for the Long Beach Island Coastal Storm Risk Management Project, Barnegat Inlet to Little Egg Inlet. Dredging associated with this lease concluded on September 30, 2018, with a reported total dredge volume of approximately 9,217,383 cubic yards (7,047,194 cubic meters). Periodic nourishment for this project has been authorized in a 7-year cycle, with an estimated final nourishment year of 2055 (Cresitello 2020).

To help meet the sand resource needs of coastal communities, BOEM-funded reconnaissance, or 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 within 5 miles (8 kilometers) of the Project Lease Area and associated planned infrastructure (e.g., export cables).

USEPA Region 2 is responsible for designating and managing ocean disposal sites for materials offshore in the region of the Project. USACE issues permits for ocean disposal sites; all ocean sites are for the disposal of dredged material permitted or authorized under the MPRSA (16 USC 1431 et seq. and 33 USC 1401 et seq.). There are four active projects along the New Jersey Coast, with the closest dredge disposal site offshore Atlantic City, New Jersey (USACE 2021b).

D.2.8 National Security and Military Use

There is a designated U.S. Navy at-sea area referred to as an OPAREA off the coast of New Jersey. The Atlantic City OPAREA extends from Seaside Heights to Sea Isle City and encompasses a majority of the Offshore Project area. This range complex is used for 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 conducts operations in this area. It is controlled by the Fleet Area Control and Surveillance Facility Virginia Capes, Naval Air Station, Oceana. The Atlantic City SUA, within the OPAREA, is used for surface-to-air gunnery exercises and is, therefore, designated as Warning Area 107 for nonparticipating pilots (COP Volume II, Section 7.7; Atlantic Shores 2023).

Within the Offshore Project area, there is the potential to encounter MEC that are the result of military testing and training. MEC is inclusive of UXO and discarded military munitions or constituents that could pose an explosive hazard. Two site-specific studies were commissioned by Atlantic Shores to gain a more detailed understanding of the potential for MEC in the Offshore Project area: the MEC Hazard Assessment and the MEC Risk Assessment with Risk Mitigation Strategy (COP Volume II, Appendix II-A4, Atlantic Shores 2023). The studies determined that the Offshore Project area is within low hazard zones (Zones 2 and 3) for MEC, and that the likelihood of encountering buried items that constitute a notable safety risk is below the industry standard of As Low as Reasonably Practicable. Furthermore, the studies recommended that Atlantic Shores avoid the use of high-resolution magnetometry surveys to detect buried items.

If any anthropogenic hazard cannot be avoided, appropriate mitigation measures will be developed in consultation with BOEM and other appropriate resource agencies.

D.2.9 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, tankers (such as those used for liquid petroleum), cargo, cruise ships, smaller passenger vessels, and commercial fishing vessels. Recreational vessel traffic includes private motorboats and sailboats. 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. Most vessel traffic, excluding recreational vessels, tends to travel within established vessel traffic routes and the number of trips, as well as the number of unique vessels, has remained consistent (USCG 2021). In response to future offshore wind projects in the New York Bight, multiple additional fairways and a new anchorage may be established to route existing vessel traffic around wind energy projects (USCG 2021). One new regional maritime highway project received funding from the Maritime Administration. A new barge service (Davisville/Brooklyn/Newark Container-on-Barge Service) is proposed to run twice each week in state waters between Newark, New Jersey and Brooklyn, New York.

USCG chartered a workgroup on May 11, 2011, to gather data, identify existing and future waterway usage, and conduct modeling and analysis of traffic patterns in light of the complex interactions of the various factors that would affect navigational safety along the Atlantic Coast of the United States including potential navigational conflicts with various planned WEAs. USCG published the workgroup's Interim Report (77 *Federal Register* 55781; September 11, 2012) and a notification (81 *Federal Register* 13307; March 14, 2016) that announced the availability of the final report (the Atlantic PARS) issued by the Atlantic Coast Port Access Route Study workgroup. USCG announced the final report to be complete as published on April 5, 2017 (82 *Federal Register* 16510). Similarly, and especially relevant to this EIS analysis, USCG completed a PARS for the Seacoast of New Jersey including Offshore Approaches to the Delaware Bay, Delaware, in 2022 (87 *Federal Register* 16759). The information in the New Jersey PARS and the ACPARS Final Reports along with the other PARSs referenced in Section 3.6.6—including the *Consolidated Port Approaches and International Entry and Departure Transit Areas Port Access Route Studies*—served to gauge and inform the navigational assessment of the Proposed Action and cumulative impacts.

D.2.10 National Marine Fisheries Service and New Jersey Department of Environmental Protection Activities

Research and enhancement permits may be issued for marine mammals protected by the MMPA and for threatened and endangered species protected under the 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 NEFSC could overlap with offshore wind lease areas in the New England region and south into 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. Additionally, NJDEP has conducted the New Jersey Ocean Trawl Program annually for over 30 years to document the occurrence, distribution, and relative abundance of marine recreational and non-recreational fish species in New Jersey coastal waters. Similarly, the NJDEP surfclam surveys were performed annually from 1988 to 2019 to document the occurrence, distribution, and abundance of surfclams in New Jersey coastal waters. Nearshore survey activities associated with the NorthEast Area Monitoring and Assessment Program overlap with the western edge of the Project area. These surveys are anticipated to continue within the region, regardless of offshore wind 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 ongoing and planned activities 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.2.10.1 Directed Take Permits for Scientific Research and Enhancement

NMFS issues permits for research on protected species for scientific purposes. These 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 NARWs; and research on population dynamics of harbor and gray 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.2.10.2 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 New Jersey regulates commercial fisheries in state waters (within 3 nautical miles of the coastline). The majority of the New Jersey coastline in the vicinity of the Atlantic and Monmouth ECCs is open for shell fishing; however, both ECCs traverse prohibited areas for shellfish harvesting close to shore (NJDEP 2022). The Project layout has been developed in coordination with the surfclam/quahog dredging fleet, which is the predominant commercial fishery within the WTA (Atlantic Shores 2023). The Project overlaps two of NMFS' eight regional councils to manage federal fisheries: MAFMC, which includes New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina; and NEFMC, which includes Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut (NEFMC 2016). The councils manage species with many FMPs 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 councils are fished for in state waters or outside of the mid-Atlantic region, so the council works with 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. In addition, the states and NMFS, under the framework of ASMFC's *Amendment 3 to the Interstate Fishery Management Plan for American Lobster*, cooperatively manage the American lobster resource and fishery (NOAA 1997).

The FMPs of the councils 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 Northeast and mid-Atlantic regions.

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

Table D-4. Other fishery management plans

Area	Plan and Projects
ASMFC	ASMFC *Five-Year Strategic Plan 2019–2023* (ASMFC 2019) ASMFC 2022 Action Plan (ASMFC 2021) *Management, Policy and Science Strategies for Adapting Fisheries Management to Changes in Species Abundance and Distribution Resulting from Climate Change* (ASMFC 2018)
New York	*New York Ocean Action Plan 2017–2027*: adaptive management plan (NYSDEC 2017) New York State filed a petition with NOAA, NMFS, and MAFMC to demand that commercial fluke allocations be revised to provide fishers with equitable access to summer flounder. New York is also reviewing other species where there is an unfair allocation, including black sea bass and bluefish, and may pursue similar actions (83 *Federal Register* 31945 July 10, 2018).
Long Island Regional Development Council	East Hampton Shellfish Hatchery project to consolidate the hatchery's municipal hatchery and nursing facilities. Haskell's seafood facility in East Quogue is proposed to become a fully functioning seafood processing plant.
New Jersey	NJDEP Division of Fish and Wildlife Marine Fisheries Management Rule Amendment Proposal with amendments to rules governing crab and lobster management, commercial Atlantic menhaden fishery, marine fisheries, and fishery management in New Jersey was published in the March 1, 2021, New Jersey Register (New Jersey Division of Fish and Wildlife 2021).
Virginia	The Virginia Marine Resources Commission implements current and long-term state policies affecting saltwater fisheries, both recreational and commercial, in Virginia's tidal waters and conservation and enhancement of finfish and shellfish resources (Virginia Marine Resources Commission 2021).
Texas	The Texas Parks and Wildlife Department implements fisheries management programs including operation of hatcheries and development of artificial reefs and habitat projects (TPWD 2021).

D.2.11 Global Climate Change

Climate change results primarily from the increasing concentration of 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* (Minerals Management Service 2007) describes global climate change with respect to assessing renewable energy development. Key drivers of climate change are increasing atmospheric concentrations of CO_2 and other GHGs, such as CH_4 and N_2O. These GHGs reduce the ability of solar radiation to re-radiate out of Earth's atmosphere and into space. Although all three of these GHGs have natural sources, the majority of these GHGs are released from anthropogenic activity. Since the industrial revolution, the rate at which solar radiation is re-radiated back into space has slowed, resulting in a net increase of energy in the Earth's system (Solomon et al.

2007). This energy increase presents as heat, raising the planet's temperature and causing climate change.

Fluorinated gases are a type of GHG released in trace amounts but are highly efficient at preventing solar radiation from being re-radiated back into space. They have a much longer lifespan than CO_2, CH_4, and N_2O. Fluorinated gases have no natural sources, are either a product or byproduct of manufacturing, and can have 23,000 times the warming potential of an equal amount of CO_2. These gases include hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride, and SF_6. These gases are currently being phased out; however, SF_6 is still used in WTG switchgears and OSS high-voltage and medium-voltage gas-insulated switchgears.

Local emissions, such as those from wind energy projects, would contribute to global emissions and those global emissions do have impacts whose localized effects are increasingly elucidated through research. For example, a recent study concerning the NARW provides evidence that the whale's feeding area moved north following relocation of its food source related to climate change, and whale mortality may have increased because of fewer controls on fishing activities in the new, more northerly area (Meyer-Gutbrod et al. 2021). Climate change is predicted to affect Northeast fishery species in different ways (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 released a special report in October 2018 that compared risks associated with an increase of global warming of 1.5°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). High global temperatures increase the chances of sea level rise by the end of the century, with a projected relative sea level rise of 2.0 to 7.2 feet (0.6 to 2.2 meters) along the contiguous United States coastline by 2100 (NOAA 2022). Expected relative sea level rise would cause tide and storm surge heights to increase, leading to a shift in the U.S. coastal flood regimes by 2050 with major and moderate high tide flood events occurring as frequently as moderate and minor high tide flood events occur today (NOAA 2022).

The 2019 report *New Jersey's Rising Seas and Changing Coastal Storms: Report of the 2019 Science and Technical Advisory Panel* (Kopp et. al. 2019) reported that along the New Jersey Coast, sea level rose 17.6 inches (0.5 meter) from 1911 (the inception of the Atlantic City tide-gauge record) to 2019, and 8.2 inches (0.2 meter) from 1979 to 2019. The report concludes that New Jersey coastal areas have at least a 66-percent chance to experience sea level rise of 0.5 to 1.1 feet (0.2 to 0.3 meter) between 2000 and 2030, and of 0.9 to 2.1 feet (0.3 to 0.6 meter) between 2000 and 2050. The report estimates less than 5 percent chance that sea level rise will exceed 1.3 feet (0.4 meter) by 2030 and 2.6 feet (0.8 meter) by 2050.

The *2020 New Jersey Scientific Report on Climate Change* (NJDEP 2020) reported that annual temperature in New Jersey has increased by 3.5°F since 1895, and that historically unprecedented warming is projected for the 21st century, with average annual temperatures in New Jersey increasing by 4.1°F to 5.7°F by 2050. The 2020 report also estimated that there is a 50-percent chance that sea level rise in New Jersey will meet or exceed 1.4 feet (0.4 meter) and a 17 percent chance it will exceed 2.1 feet (0.6 meter) by 2050. These levels increase to 3.3 and 5.1 feet (1.0 to 1.6 meters) by the end of the 21st century under a moderate GHG emissions scenario. The report estimates that "sunny day flooding" will occur more often across the entire coastal area of New Jersey due to sea level rise.

The *Global and Regional Sea Level Rise — Scenarios for the United States* report (NOAA 2022) prepared by the U.S. Sea Level Rise and Coastal Flood Hazard Scenarios and Tools Interagency Task Force provides datasets for sea level rise scenarios to 2150 by decade that include estimates of vertical land motion and a set of extreme water level probabilities for various heights along the U.S. coastline. The report concludes that the expected relative sea level by 2050 will cause tide and storm surge heights to increase and will lead to a shift in U.S. coastal flood regimes, with major and moderate high tide flood events occurring as frequently as moderate and minor high tide flood events occur today. The report also concludes that unless additional risk-reduction measures are implemented, U.S. coastal infrastructure, communities, and ecosystems will face significant consequences from sea level rise.

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

Table D-5. Climate change plans and policies

Plans and Policies	Summary/Goal
New Jersey	
New Jersey Energy Master Plan (State of New Jersey 2019, 2020a)	Updated in 2019, the plan sets the framework to implement Executive Order 28 by decarbonizing and modernizing New Jersey's energy system, expanding the clean energy innovation economy, and accelerating the deployment of renewable energy resources to meet New Jersey's offshore wind energy generation goal.
Executive Order 28: Measures to Advance New Jersey's Clean Energy Economy (2018)	Sets target of total conversion of the state's energy production profile to 100% clean energy sources on or before January 1, 2050.
Executive Order 307: Increase Offshore Wind Goal to 11 gigawatts by 2040 (2022)	Establishes a goal of 11 GW of offshore wind energy generation by 2040.
Executive Order 100: Protecting Against Climate Threats (PACT); Land Use Regulations and Permitting (2020)	Establishes a GHG monitoring and reporting program, establishes criteria to govern and reduce emissions, and integrates climate change considerations, such as sea level rise, into regulatory and permitting programs.

Plans and Policies	Summary/Goal
Virginia	
Virginia Carbon Rule (June 25, 2020)	Under the Virginia Carbon Rule, Virginia is to establish a GHG cap-and-trade program and is to join the Regional Greenhouse Gas Initiative, a regional cap-and trade-program that reduces climate pollution from fossil fuel-fired power plants. The Virginia Department of Environmental Quality issued a Draft Report on March 11, 2022, pursuant to Virginia Executive Order 9, *Protecting Ratepayers from the Rising Cost of Living Due to the Regional Greenhouse Gas Initiative*, January 15, 2022. The Draft Report includes an attached draft *Process for Addressing EO-9 Emergency Regulation and Repeal CO_2 Emissions Trading Program*. As of July 2022, no action had been taken by the Virginia Department of Environmental Quality regarding Virginia's participation in the Regional Greenhouse Gas Initiative.
Virginia Clean Economy Act (April 12, 2020)	The Virginia Clean Economy Act establishes an electric power renewable portfolio standard for Virginia electric power companies to become 100% carbon-free by 2050 and requires closure of coal-fired electric power plants, establishes energy efficiency standards, and promotes offshore wind development and solar and distributed generation.
Virginia Department of Environmental Quality Strategic Plan (2021)	The Virginia Department of Environmental Quality Strategic Plan establishes the objective to support the Commonwealth's resilience efforts by encouraging climate change adaptation through programmatic outreach and requirements, and strategies to make climate change adaptation an explicit, expected outcome of appropriate Virginia agency programs and initiatives. The Strategic Plan incorporates climate resilience, adaptation, and mitigation.

Table D-6. Resiliency plans and policies in the Lease Area

Plans and Policies	Summary
New Jersey	
New Jersey Draft Climate Change Resilience Strategy (NJDEP 2021)	This is New Jersey's first statewide climate resiliency strategy and was released as a draft in April 2021. The *Draft Climate Change Resilience Strategy* develops a framework for policy, regulatory, and operational changes to support the resilience of New Jersey's communities, economy, and infrastructure. It includes 125 recommended actions across the following six priority areas: build resilient and healthy communities, strengthen the resilience of New Jersey's ecosystems, promote coordinated governance, invest in information, increase public understanding, promote climate-informed investments and innovative financing, and coastal resilience plan.
Virginia	
Virginia Coastal Zone Management Program 2020 Coastal Needs Assessments and Fiscal Year 2021–2025 Strategies (Section 309)	The Virginia Coastal Zone Management Program assesses Virginia's coastal resources and management efforts every 5 years, including coastal hazards and ocean resources. The 5-year grant strategies are applied to result in new enforceable policies to better manage high-priority resources or issues; initiatives include responses to results of the Virginia Coastal Zone Management Program Phase I Coastal Hazards Assessment. Climate resiliency was selected by the Coastal Policy Team as a Fiscal Year 2020–2023 focal area theme to help meet the goals and needs in the statewide resiliency plan.
Virginia Clean Energy and Community Flood Preparedness Act	This act creates a Virginia Community Flood Preparedness Fund to enhance flood prevention, protection, and coastal resilience.

Plans and Policies	Summary
Texas	
Texas Coastal Resiliency Master Plan (2019)	Texas General Land Office 2019 *Texas Coastal Resiliency Master Plan* is the second installment of a statewide plan to protect and promote a vibrant and resilient Texas coast (GLO 2019). The Resiliency Master Plan identifies eight priority Issues of Concern that encompass risks and threats to the viability of coastal communities, habitats, and industries: • Altered, Degraded or Lost Habitat • Gulf Beach Erosion and Dune Degradation • Bay Shoreline Erosion • Existing and Future Coastal Storm Surge Damage • Coastal Flood Damage • Impact on Water Quality and Quantity • Impact on Coastal Resources • Abandoned or Derelict Vessels, Structures and Debris

D.2.12 Oil and Gas Activities

The proposed Project area is in the North Atlantic Planning Area of the OCS Oil and Gas Leasing Program (National OCS Program). 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, 2020, 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 oil and gas exploration, development, or production during the 10-year period beginning July 1, 2022 and ending June 30, 2032. However, currently, there has been no decision by the Secretary of the Interior regarding future oil and gas leasing in the North Atlantic or remainder of the Mid-Atlantic Planning Areas. Existing leases in the withdrawn areas are not affected.

BOEM issues geological and geophysical permits to obtain data for hydrocarbon exploration and production; locate and monitor marine mineral resources; aid in locating sites for alternative energy structures and pipelines; identify possible human-made, seafloor, or geological hazards; and locate potential archaeological and benthic resources. Geological and geophysical surveys are typically classified into categories by equipment type and survey technique. There are currently no such permits under review for areas offshore New York and New Jersey (BOEM 2021c).

Several liquefied natural gas ports are on the East Coast of the United States. Table D-7 lists existing, approved, and proposed liquified natural gas ports on the East Coast that provide (or may provide in the future) services such as natural gas export, natural gas supply to the interstate pipeline system or local distribution companies, storage of liquified natural gas for periods of peak demand, or production of liquified natural gas for fuel and industrial use (FERC 2022a; FERC 2022b).

Table D-7. Liquefied natural gas terminals in the Eastern United States

Terminal Name	Type	Company	Jurisdiction	Distance from Project (approximate)	Status
Everett, MA	Import terminal	GDF SUEZ—DOMAC	FERC	90 miles north	Existing
Offshore Boston, MA	Import terminal	Neptune LNG	MARAD/USCG	100 miles north	Existing
Offshore Boston, MA	Import terminal, authorized to re-export delivered LNG	Excelerate Energy—Northeast Gateway	MARAD/USCG	95 miles north (Buoy B)	Existing
Cove Point, MD (Chesapeake Bay)	Import terminal / Export terminal	Dominion—Cove Point LNG	FERC	340 miles southwest	Existing
Elba Island, GA (Savannah River)	Import terminal	El Paso—Southern LNG	FERC	835 miles southwest	Existing
Elba Island, GA (Savannah River)	Import terminal / Export terminal	Southern LNG Company	FERC	835 miles southwest	Existing
Jacksonville, FL	Export terminal	Eagle LNG Partners	FERC	960 miles southwest	Proposed

Source: FERC 2022a; 2022b.
DOMAC = Distrigas of Massachusetts; GDF = Gaz de France; FL = Florida; GA = Georgia; LNG = liquified natural gas; MA = Massachusetts; MARAD = U.S. Department of Transportation Maritime Administration; MD = Maryland

D.2.13 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	Ocean County Planning Board Comprehensive Master Plan (Ocean County 2011) Ocean County Master Plan Amendments (Ocean County 2016, Ocean County 2018) Monmouth County Planning Board Master Plan (Monmouth County 2016) Atlantic County Planning Board Master Plan (Atlantic County 2018) City of Atlantic City Master Plan (City of Atlantic City 2016) Cape May County Comprehensive Plan (Cape May County 2022) City of Sea Isle City 2017 Master Plan Reexamination Report (City of Sea Isle City 2017) Township of Egg Harbor Community Development Plan for Business Districts / Economic Development Element (Egg Harbor Township 2017) City of Ocean City Master Plan Reexamination Report (City of Ocean City 2019)
Onshore wind projects	According to the U.S. Geological Survey, there is one onshore wind project within the 40-mile (64-kilometer) viewshed of the Project. The Jersey Atlantic Wind Farm consists of five 1.5 MW turbines with a tip height of 389 feet (118.6 meters) and rotor diameter of 253 feet (77.0 meters) (Hoen et al. 2021).

Type	Description
Transmission projects	In October 2022, the State of New Jersey selected the Larrabee Tri-Collector Solution (LTCS)—an offshore wind transmission project proposed by Mid-Atlantic Offshore Development (MAOD) and Jersey Central Power & Light Company—as part of the nation's first State Agreement Approach (SAA) solicitation. The LTCS is to be located at an approximately 100-acre (40.5-hectare) site, west of Brook Road and south of Randolph Road in Howell Township, New Jersey. The LTCS would serve as the POI for up to three projects. New Jersey's "Third Offshore Wind Solicitation" (https://www.nj.gov/bpu/pdf/boardorders/2023/20230306/8D%20ORDER%20OSW%20Third%20Solicitation.pdf), released March 6, 2023, solicits applications by interested developers by June 23, 2023.
Communications towers	There are numerous communication towers in communities within the viewshed of the Project. For example, there are 99 communication towers and 561 antennas within a 3-mile radius of Atlantic City; 73 communication towers and 98 antennas within a 3-mile (5-kilometer) radius of Ocean City; and 20 communication towers and 72 antennas within a 3-mile (5-kilometer) radius of Cape May (AntennaSearch.com 2022).
Development projects	A $2.7 million development project has been proposed for the former site of Bader Field, Atlantic City, adjacent to the Atlantic City estuary and in the vicinity of the Atlantic Landfall site and the Cardiff Onshore Interconnection Cable Route. The 143-acre (58-hectare) Bader Field, now vacant, was the site of the first airport in the U.S. The proposed development would include a 2.44-mile (4-kilometer) auto course, about 2,000 units of housing in various price ranges, a retail promenade, and other auto-themed attractions (Associated Press 2022). As part of a comprehensive flood-control strategy, Ocean City, New Jersey is spending $25 million through 2025 to build new pumping stations, drainage systems, berms and retention walls, and new elevated road construction to control flooding in low-lying areas (City of Ocean City 2021a, 2021b).
Port studies/ upgrades	The State of New Jersey is planning to build an offshore wind port on the eastern shore of the Delaware River in Lower Alloways Creek, Salem County, approximately 7.5 miles (12 kilometers) southwest of the city of Salem. The port site is adjacent to PSEG's Hope Creek Nuclear Generating Station. NJEDA is leading the development of the project on behalf of the state, working alongside key departments and agencies such as the Governor's Office, the Department of the Treasury, and BPU. Construction is planned to commence in 2021 with a targeted completion date of late 2023. The development plan includes construction of a heavy-lift wharf with a dedicated delivery berth and an installation berth that can accommodate jack-up vessels, a 30-acre (12-hectare) marshalling area for component assembly and staging, a dedicated overland heavy-haul transportation corridor, and potential for additional laydown areas. NJEDA estimates the project will cost $300 to $400 million (New Jersey Wind Port 2021). The Atlantic Shores South, Ocean Wind 1, and Ocean Wind 2 projects have committed to building a nacelle assembly facility at the New Jersey Wind Port. The nacelle houses the components that convert the mechanical energy of the rotating blades into electrical energy and is the highest value-added offshore wind component. Atlantic Shores South plans to partner with MHI Vestas for this facility while Ocean Wind will collaborate with General Electric (BPU 2021). In 2020, the State of New Jersey announced a $250 million investment in a manufacturing facility to build steel components for offshore wind turbines at the Paulsboro Marine Terminal on the Delaware River in New Jersey (State of New Jersey 2020b). Construction on the facility began in January 2021, with production anticipated to begin in 2023 (New Jersey Business 2020). The Atlantic Shores South, Ocean Wind 1, and Ocean Wind 2 projects will utilize the foundation manufacturing facility at the Paulsboro Marine Terminal (BPU 2021).

Type	Description
	A study commissioned by the Virginia Department of Energy and published in 2015 evaluated 10 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, five ports in Virginia were identified with a high level of readiness to support offshore wind: • Portsmouth Marine Terminal • Newport News Marine Terminal • Peck Marine Terminal • Virginia Renaissance Center • 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). Following the study, 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). The Channel Improvement Project for the Port of Corpus Christi, Texas will increase the channel depth from -47 feet MLLW to -54 feet MLLW and widen it to 530 feet, with an additional 400 feet of barge shelves. The proposed budget of $157.3 million is the largest single-year budgetary allocation from the federal government compared to prior years' budgets. The project has received nearly $250 million in federal appropriations to USACE thus far, with the Port of Corpus Christi appropriating another $190 million in cost share funds. The Channel Improvement Project is a four-phase project, with Phase 1 completed and Phases 2 and 3 under construction in 2022 (Port of Corpus Christi 2022).

NJEDA = New Jersey Economic Development Authority

Attachment D1: Ongoing and Planned Non-Offshore Wind Activity Analysis

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BOEM developed the following tables based on its 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. The content of these tables has been vetted by cooperating agencies to the EIS and therefore has been included in whole for their use in impact and cumulative analyses, and for ease in reference by the reader.

Table D.A1-1. Summary of non-offshore wind activities and the associated impact-producing factors for air quality

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	Accidental releases of air toxics or HAPs are due to potential chemical spills. Ongoing releases would 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 would be due to potential chemical spills. See Table D.A1-23 for an analysis of these risks. Gradually increasing vessel traffic over the next 34 years[4] would increase the risk of accidental releases. These may lead to short-term periods of toxic pollutant emissions through evaporation. Air quality impacts would 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 35 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 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; therefore, 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.	The largest air quality impacts over the next 34 years would 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 would 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 would decline, and the industry as a whole would have a net benefit on air quality.
Air emissions: O&M		Activities associated with O&M of onshore wind projects would have a proportionally very small contribution to emissions compared to the construction and installation and decommissioning activities over the next 34 years. Emissions would largely be due to commercial vehicular traffic and operation of emergency diesel generators. Such activity would result in short-term, intermittent, and widely dispersed emissions and small air quality impacts.
Air emissions: Power generation emissions reductions		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: GHGs		Development of future onshore wind projects would produce a small overall increase in GHG emissions over the next 34 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, there would be 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.

hazmat = hazardous materials

[4] The 34-year period for the Project is based on a 4-year construction period (2024–2027) and a 30-year operating period; decommissioning of Project 1 commencing in 2058.

Table D.A1-2. Summary of non-offshore wind activities and the associated impact-producing factors for bats

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
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.
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 TTS 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.
Presence of structures: Migration disturbances	There may be a few structures scattered throughout the offshore bats geographic analysis area, such as navigation and weather buoys and light towers. 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 34 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 a few structures in the offshore bats geographic analysis area, such as navigation and weather buoys, turbines, and light towers. 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 34 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

Table D.A1-3. Summary of non-offshore wind activities and the associated impact-producing factors for benthic resources

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	See Table D.A1-23 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 34 years would increase the risk of accidental releases. See the previous cell and Table D.A1-23 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 occur from onshore sources, fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, and 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.
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.
Cable emplacement and maintenance	Cable maintenance activities infrequently disturb benthic resources and cause temporary increases in suspended sediment; these disturbances would be localized 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.
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.
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 localized and 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.	USACE or 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.
Discharges/intakes	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 on benthic resources are short term because spoils are typically recolonized naturally. In addition, USEPA has established dredge spoil criteria and it regulates the disposal permits issued by USACE; these discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated.
Electric and magnetic fields and cable heat	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.
Noise: Onshore/offshore construction	See Table D.A1-10 on finfish, invertebrates, and EFH. Detectable impacts of construction noise on benthic resources rarely, if ever, overlap from multiple sources.	See Table D.A1-10 on finfish, invertebrates, and EFH. Detectable impacts of construction noise on benthic resources would rarely, if ever, overlap from multiple sources.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Noise: G&G	See Table D.A1-10 on finfish, invertebrates, and EFH. Detectable impacts of G&G noise on benthic resources rarely, if ever, overlap from multiple sources.	See Table D.A1-10 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 D.A1-10 on finfish, invertebrates, and EFH.	See Table D.A1-10 on finfish, invertebrates, and EFH.
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 of 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 localized and 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 34 years and localized and temporary, and would 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 D.A1-10 on finfish, invertebrates, and EFH.	See Table D.A1-10 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 D.A1-10 on finfish, invertebrates, and EFH.	See Table D.A1-10 on finfish, invertebrates, and EFH.
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 localized and permanent.	New cables installed in the geographic analysis area over the next 34 years would likely require hard protection atop portions of the route (see the "Cable emplacement and maintenance" IPF). Any new towers, buoys, 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 localized 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, buoys, 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.	See other sub-IPFs within Presence of structures.

hazmat = hazardous materials

Table D.A1-4. Summary of non-offshore wind activities and the associated impact-producing factors for birds

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	See Table D.A1-23 for an 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 cause 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 D.A1-23 for an analysis of these risks. Gradually increasing vessel traffic over the next 34 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 34 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.
Cable emplacement and 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, with no biologically significant impacts on individuals or populations.
Lighting: 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 34 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.
Lighting: 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.
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.
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.
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 behavioral responses could range from escape behavior to mild annoyance, but no individual injury or mortality would be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Noise: Vessels	Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Sub-surface noise from vessels could disturb diving birds foraging for prey below the surface. The consequence to birds would be similar to that of 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.
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 localized and can be short term to permanent. Fish aggregation 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 34 years, would likely require hard protection atop portions of the cables (see the "Cable emplacement and maintenance" IPF). 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 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. 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 34 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. 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 34 years would not be expected to cause 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.
Traffic: Aircraft	General aviation accounts for approximately two bird strikes per 100,000 flights (Dolbeer et al. 2022). In addition to general aviation, 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 would 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.

hazmat = hazardous materials

Table D.A1-5. Summary of non-offshore wind activities and the associated impact-producing factors for coastal habitat and fauna

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Land disturbance: Onshore construction	Onshore residential, commercial, and industrial development are expected to continue at current trends. Construction activities may result in loss of coastal habitat and temporary or permanent displacement and injury to or mortality of individual animals, but population-level effects would not be expected.	Onshore residential, commercial, and industrial development are expected to continue at current trends. Impacts would be similar to those from 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.
Noise: Onshore construction	Onshore construction noise is expected to result in short-term, temporary, localized impacts. Impacts are expected to be limited to avoidance of construction activity and noise.	Onshore residential, commercial, and industrial development are expected to continue at current trends. Impacts would be similar to those from ongoing activities.
Traffic: Vehicle collisions	Vehicle collisions may result in injury to or mortality of individual animals, but population-level effects would not be expected.	Impacts from vehicle collisions with wildlife are expected to continue and to be similar to those from ongoing activities.

Table D.A1-6. Summary of non-offshore wind activities and the associated impact-producing factors for commercial fisheries and for-hire recreational fishing

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 34 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.
Cable emplacement and 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 localized 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 localized, short-term impacts. If the cable routes enter the geographic analysis area for this resource, short-term disruption of fishing activities would be expected.
Noise: Construction, trenching, O&M	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 are difficult to generalize, but impacts are localized and temporary. Infrequent offshore trenching could occur in connection with cable installation. These disturbances are temporary and localized, and extend only a short distance beyond the emplacement corridor. Low levels of elevated noise from operational WTGs are likely have low to no impacts on fish and no impacts at a fishery level. Noise is also created by O&M of marine minerals extraction, which has small, localized 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 dredging and sand and gravel mining could occur. New or expanded marine minerals extraction may increase noise during their O&M over the next 34 years. Impacts from construction, operations, and maintenance would likely be small and localized 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 and localized, 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 34 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 localized and temporary.
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 of 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, localized 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 geographic 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.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 34 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 34 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 localized 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 offshore wind turbines, 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.
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 geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
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 localized and can be short term to permanent. Fish aggregation may be considered adverse, beneficial, or neutral. Commercial and for-hire recreational fishing can occur near these structures. For-hire recreational fishing is more popular, as commercial mobile fishing gear risks snagging on the structures.	New cables, installed incrementally in the geographic analysis area over the next 20 to 34 years, would likely require hard protection atop portions of the route (see "Cable emplacement/ and maintenance" IPF). 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 and 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 localized and may be long term.
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 34 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 future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Presence of structures: Cable infrastructure	The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between mainland and islands. Shoreline developments are ongoing and include docks, ports, and other commercial, industrial, and residential structures.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
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.

Table D.A1-7. Summary of non-offshore wind activities and the associated impact-producing factors for cultural resources

Associated IPF: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	See Table D.A1-23 for an 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 or seafloor sediments can cause impacts on cultural resources because resources are affected by the released chemicals as well as the ensuing cleanup activities.	Gradually increasing vessel traffic over the next 34 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 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.
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 affect 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 affect 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.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and could cause impacts on submerged archaeological resources. These disturbances would be localized and limited to emplacement corridors.	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.
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.
Land disturbance: Onshore construction	Onshore construction activities can affect 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 the central Atlantic, particularly those proximate to offshore ECCs and interconnection facilities. Onshore construction would continue at current rates.
Lighting: 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 operational 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.
Lighting: 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 (e.g., commercial building, radio antenna, large satellite dishes) 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.

Associated IPF: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Port utilization: Expansion	Major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing continual upgrades and maintenance. Expansion of port facilities can introduce large, modern port infrastructure into the viewsheds of nearby historic properties, affecting 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.

hazmat = hazardous materials

Table D.A1-8. Summary of non-offshore wind activities and the associated impact-producing factors for demographics, employment, and economics

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be localized and limited to emplacement corridors. There are six existing power cables in the geographic analysis area for demographics, employment, and economics.	Future new cables would disturb the seafloor and cause temporary increases in suspended sediment resulting in infrequent, localized, short-term impacts over the next 34 years.
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.
Lighting: 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.
Lighting: 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.
Noise: Cable laying/ trenching	Infrequent trenching for pipeline and cable-laying activities emit noise. These disturbances are temporary and localized, 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 34 years for repair or new installation of underground infrastructure.
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 and localized, 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.
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 undergoing continual upgrades and maintenance. The New Jersey Wind Port is being developed and the Paulsboro Marine Terminal is being upgraded specifically to support the construction of offshore wind energy facilities.	Ports would need to perform maintenance and upgrade facilities over the next 34 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 34 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.
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 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 34 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	No existing offshore structures are within the viewshed of the offshore wind lease 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.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Traffic: Vessels	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 34 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.

FAD = fish aggregating device

Table D.A1-9. Summary of non-offshore wind activities and the associated impact-producing factors for environmental justice

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Air emissions: Construction/ decommissioning	Ongoing population growth and new development within the geographic analysis area is likely to increase traffic, resulting in increases in emissions from motor vehicles. Some new industrial development may result in emission-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 emission-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.
Air emissions: O&M	Ongoing population growth and new development within the geographic analysis area is likely to increase traffic, resulting in increases in emissions from motor vehicles. Some new industrial development may result in emission-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 emission-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.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be localized and limited to emplacement corridors.	Future new cables would disturb the seafloor and cause temporary increases in suspended sediment, resulting in infrequent, localized, short-term impacts over the next 34 years.
Land disturbance: Erosion and sedimentation	Potential erosion and sedimentation from development and construction are 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.
Lighting: 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.
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 and localized, and extend only a short distance beyond the work area.	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Trenching	Infrequent trenching for pipeline and cable-laying activities emits noise. These disturbances are temporary and localized, 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 34 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.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing continual upgrades and maintenance. The New Jersey Wind Port is being developed and the Paulsboro Marine Terminal is being upgraded specifically to support the construction of offshore wind energy 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: 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 34 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 offshore wind lease area except buoys.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Cable infrastructure	Existing submarine cables cross cumulative lease areas.	Existing cable O&M activities would continue within the geographic analysis area.
Traffic: Vessels	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.	Vessel traffic is not expected to meaningfully increase over the next 34 years. Marine commerce and related industries would continue to be important to area employment.

Table D.A1-10. Summary of non-offshore wind activities and the associated impact-producing factors for finfish, invertebrates, and essential fish habitat

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See Table D.A1-23 for an 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 D.A1-23 for an analysis of these risks. Gradually increasing vessel traffic over the next 34 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 continue 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 34 years due to offshore military operations, survey activities, commercial vessel traffic, and 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, and 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.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances are localized and 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 localized short-term impacts. 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.
Cable emplacement/ 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 localized and 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.
Electric and magnetic fields and cable heat	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; 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 (CSA Ocean Sciences, Inc. and Exponent 2019).	During operation, future new cables would produce EMF. Submarine power cables in the geographic analysis area are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels. 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.
Lighting: 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.	Vessels would continue to be a light source within the geographic analysis area.
Lighting: 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.
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 localized and temporary. See also sub-IPF for Noise: Pile driving.	Noise from construction nearshore 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	Planned 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 34 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 of 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 localized 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 barely exceeds ambient levels at 164 feet (50 meters) from the WTG base. Based on the results of Thomsen et al. (Thomsen et al. 2015), SPLs 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 O&M of marine minerals extraction and commercial fisheries, each of which has small, localized impacts.	New or expanded marine minerals extraction and commercial fisheries may intermittently increase noise during their O&M over the next 34 years. Impacts would likely be small and localized.
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 of 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 and localized, 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 34 years, temporary, and localized, and would 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.	Vessels would continue to be a noise source within the geographic analysis area.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 34 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, 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 localized 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.
Presence of structures: Hydrodynamic disturbance	Human-made 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.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 sandy seascape. Structure-oriented fishes are attracted to these locations. These impacts are localized 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 34 years, would likely require hard protection atop portions of the route (see the 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 localized and may be permanent.
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 geographic analysis area over the next 20 to 34 years, would likely require hard protection atop portions of the route (see 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 [24 million hectares]) 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 new structures in the marine environment over the next 34 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 D.A1-5 on coastal habitats.	See other sub-IPFs within the Presence of structures IPF. See Table D.A1-5 on coastal habitats.

AC = alternating current; DC = direct current; hazmat = hazardous materials

Table D.A1-11. Summary of non-offshore wind activities and the associated impact-producing factors for land use and coastal infrastructure

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 hazmat that could be released.	Ongoing onshore construction projects involve vehicles and equipment that use fuel, fluids, or hazmat could result in an accidental release. Intensity and extent would vary depending on the size, location, and materials involved in the release.
Lighting: 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 undergoing continual upgrades and maintenance. The New Jersey Wind Port is being developed and the Paulsboro Marine Terminal is being upgraded specifically to support the construction of offshore wind energy 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 are minor features such as buoys.	Non-offshore wind structures that could be viewed in conjunction with the offshore components would be limited to meteorological towers. Marine activity would also occur within the marine viewshed.
Presence of structures: Cable infrastructure	Onshore buried cables 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.
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.

hazmat = hazardous materials

Table D.A1-12. Summary of non-offshore wind activities and the associated impact-producing factors for marine mammals

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	See Table D.A1-23 for an 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 individual fitness, including adrenal effects, hematological effects, liver effects, lung disease, poor body condition, skin lesions, and several other health effects attributed to oil exposure (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshita et al. 2017). Additionally, accidental releases may result in impacts on marine mammals due to effects on prey species (Table D.A1-10).	See Table D.A1-23 for an analysis of these risks. Gradually increasing vessel traffic over the next 34 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 individual fitness, including adrenal effects, hematological effects, liver effects, lung disease, poor body condition, skin lesions, and several other health effects attributed to oil exposure (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshita et al. 2017). Additionally, accidental releases may result in impacts on marine mammals due to effects on prey species (Table D.A1-10).
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, localized, 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 tract, 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 34 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 interactions, as well as blockage of the digestive tract, disease, injury, and malnutrition (Baulch and Perry 2014).
Electric and magnetic fields and cable heat	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. Furthermore, 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 impacts on marine mammals would not be expected.
Cable emplacement and maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be localized 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 because 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 gray seals in the North Sea. One tracked individual was blind in both eyes, but otherwise healthy. Despite the individual's blindness, observed movements were typical of the other study individuals, indicating that visual cues are not essential for gray seal foraging and movement (McConnell et al. 1999). 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 temporary and short term. Turbidity associated with increased sedimentation may result in temporary, short-term impacts on marine mammal prey species (Table D.A1-10).	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 D.A1-10).
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). 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 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 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.
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 marine mammals are present within the ensonified area (NOAA 2018). Survey protocols and underwater noise mitigation procedures are typically	Same as ongoing activities, with the addition of possible future oil and gas exploration surveys.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
	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, and environmental and physical conditions that affect acoustic propagation (NOAA 2018).	
Noise: Turbines	Marine mammals would be able to hear the continuous underwater noise of operational WTGs. As measured at the Block Island Wind Farm, 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), SPLs 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.
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 has 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 Incidental Harassment Authorization 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	Noise from cable laying could periodically occur in the geographic analysis area.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.
Noise: Vessels	Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, scientific and academic research vessels, and 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). Because lower frequencies propagate farther away from the sound source compared to higher frequencies, LFC 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.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing 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 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, 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).
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. Currently bridge foundations and the Block Island Wind Farm 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	Planned 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 Island Wind Farm 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 has 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 OSS 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 Farm, 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.
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, TSS, 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 U.S. 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, 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 of high consequence, the patchy distribution of marine mammals makes stock or population-level effects unlikely (Navy 2018).

µT = microtesla; AC = alternating current; hazmat = hazardous materials

Table D.A1-13. Summary of non-offshore wind activities and the associated impact-producing factors for navigation and vessel traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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. 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 anchoring operations are expected to continue at or near current levels, with the expectation of moderate increases commensurate with any increase in tankers visiting ports. Deep-draft visits to major ports are expected to increase as well, increasing the potential for an emergency need to anchor and creating navigational hazards for other vessels. Recreational and commercial fishing activity would likely stay largely the same related to this IPF.
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.	Future new cables would cause temporary increases in vessel traffic during installation or maintenance, resulting in infrequent, localized, short-term impacts over the next 34 years. Care would need to be taken by vessels that are crossing the cable routes during these activities.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing 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.
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.	Although there are some exceptions (ferry traffic and cruise ships), BOEM expects vessel traffic to remain relatively steady into the reasonably foreseeable future (BOEM 2019:57). 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 the 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 34 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 with 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 operational noise could cause mammals to avoid areas.	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. 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.	Although there are some exceptions (ferry traffic and cruise ships), BOEM expects vessel traffic to remain relatively steady into the reasonably foreseeable future (BOEM 2019:57). Even with increased port visits by deep-draft vessels, this is still a relatively small effect when considering the whole of Atlantic Coast vessel traffic. The presence of navigational 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 “Anchoring” IPF.	See “Anchoring” IPF.
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 3.16 provides a discussion of navigation impacts on fishing vessel traffic.
Traffic: Vessels	See “Presence of structures: Navigation hazard” sub-IPF.	See “Presence of structures: Navigation hazard” sub-IPF.
Traffic: Vessels, collisions	See “Presence of structures: Navigation hazard” sub-IPF.	See “Presence of structures: Navigation hazard” sub-IPF.

Table D.A1-14. Summary of non-offshore wind activities and the associated impact-producing factors for other uses: military and national security use

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Presence of structures: Allisions	Existing stationary facilities that present allision risks include buoys used to mark inlet approaches, channels, shoals (NOAA 2021), 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	No existing stationary structures that would act as FADs were identified within the geographic analysis area.	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 buoys used to mark inlet approaches, channels, shoals (NOAA 2021), dock facilities, meteorological buoys associated with offshore wind lease areas, and other offshore or shoreline-based structures.	No future non-offshore wind stationary structures were identified within the offshore geographic analysis area. Onshore development activities are anticipated to continue with additional proposed communication towers and onshore commercial, industrial, and residential developments.
Presence of structures: Space-use conflicts	Existing stationary facilities within the geographic analysis area that could present a space-use conflict include onshore wind turbines, communication towers, and other onshore commercial, industrial, and residential structures.	No future non-offshore wind stationary structures were identified within the offshore geographic analysis area. Onshore development activities are anticipated to continue with additional proposed communication towers and onshore commercial, industrial, and residential developments.
Presence of structures: Cable infrastructure	Existing submarine cables cross cumulative lease areas.	Submarine cables would remain in current locations with infrequent maintenance continuing along those cable routes for the foreseeable future.
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 are 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 are 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

Table D.A1-15. Summary of non-offshore wind activities and the associated impact-producing factors for other uses: aviation and air traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Presence of structures: Towers	Existing aboveground stationary facilities within the geographic analysis area that present aviation hazards include onshore wind turbines, communication towers, dock facilities, and other onshore structures exceeding 200 feet (61 meters) in height.	No future non-offshore wind stationary structures were identified within the offshore geographic analysis area. Onshore development activities are anticipated to continue with additional proposed communication 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 onshore wind turbines, communication towers, and other onshore structures exceeding 200 feet (61 meters) in height.	No future non-offshore wind stationary structures were identified within the offshore geographic analysis area. Onshore development activities are anticipated to continue with additional proposed communication towers.

Table D.A1-16. Summary of non-offshore wind activities and the associated impact-producing factors for other uses: cables and pipelines

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Presence of structures: Allisions and navigation hazards	Structures within and near the geographic analysis area that pose potential allision hazards include buoys used to mark inlet approaches, channels, shoals, 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	Existing submarine cables cross cumulative lease areas and create potential space-use conflicts with marine mineral and sand borrow areas.	Reasonably foreseeable non-offshore wind structures that could create space-use conflicts with submarine cables have not been identified in the geographic analysis area.
Presence of structures: Cable infrastructure	Existing submarine cables cross cumulative lease areas.	Reasonably foreseeable non-offshore wind structures have not been identified in the geographic analysis area.

Table D.A1-17. Summary of non-offshore wind activities and the associated impact-producing factors for other uses: marine minerals

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Presence of structures: Space-use conflicts	Existing structures within the cumulative lease areas create potential space-use conflicts with marine mineral and sand borrow areas.	Reasonably foreseeable non-offshore wind structures could have a small, long-term effect on marine mineral extraction.
Presence of structures: Cable infrastructure	Marine mineral extraction typically occurs within 8 miles (13 kilometers) of the shoreline, limiting adverse impacts on the offshore export cable routes.	Future cable installation would require consultation with the BOEM Marine Minerals Program.

Table D.A1-18. Summary of non-offshore wind activities and the associated impact-producing factors for other uses: radar systems

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Presence of structures: Towers	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 the Jersey-Atlantic Wind Farm in Atlantic City, New Jersey.	Reasonably foreseeable non-offshore wind structures proposed for construction in the offshore wind lease areas that could affect radar systems have not been identified.

Table D.A1-19. Summary of non-offshore wind activities and the associated impact-producing factors for other uses: scientific research and surveys

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Presence of structures: Navigation hazards	Stationary structures are limited in the open ocean environment of the geographic analysis area and include meteorological buoys associated with site assessment activities, the five Block Island Wind Farm WTGs, and the two Coastal Virginia Offshore Wind WTGs.	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.

Table D.A1-20. Summary of non-offshore wind activities and the associated impact-producing factors for recreation and tourism

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be localized 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.
Lighting: 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.
Lighting: 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.
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 and localized, 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.
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 undergoing continual upgrades and maintenance.	Ports would need to perform maintenance and upgrade facilities over the next 34 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	Periodic maintenance is necessary for harbors within the geographic 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.
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.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
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 34 years. The presence of navigational 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.
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 34 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.

Table D.A1-21. Summary of non-offshore wind activities and the associated impact-producing factors for sea turtles

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Wind Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	See Table D.A1-23 for an 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. 2021) 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. 2021; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to effects on prey species (Table D.A1-10).	See Table D.A1-23 for an analysis of these risks. Gradually increasing vessel traffic over the next 34 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 et al. 2021; 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. 2021; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to effects on prey species (Table D.A1-10).
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, localized, 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; Schuyler et al. 2014). In addition to plastic debris, ingestion of tar, paper, Styrofoam™, wood, reed, feathers, hooks, lines, and net fragments has 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, and 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, localized, 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; Schuyler 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).
Cable emplacement and maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be localized 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 2020). 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 2020). Turbidity associated with increased sedimentation may result in short-term, temporary impacts on sea turtle prey species (Table D.A1-10).	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 D.A1-10).
Electric and magnetic fields and cable heat	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; 2020). 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 (BOEM 2007: Section 5.2.7). 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. Furthermore, 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 impacts on sea turtles would not be expected.
Lighting: Vessels	Ocean vessels such as ongoing commercial vessel traffic, recreational and fishing activity, and 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 attraction or avoidance behavior of sea turtles. These short-term impacts are expected to be of low intensity and occur infrequently.
Lighting: 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, which 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.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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.
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 noise on the order of 110 to 125 $dB_{RMS,}$ occasionally reaching as high as 128 dB_{RMS}, in the 10-Hz to 8-kilohertz range (Tougaard et al. 2020). As measured at the Block Island Wind Farm, 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-level, 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: 210 dB cumulative SPL or greater than 207 dB peak SPL (Popper et al. 2014) Potential mortal injury: 204 dB_{SEL}, 232 dB_{PEAK} (PTS) 189 dB_{SEL}, 226 dB_{PEAK} (TTS) (Navy 2017) Behavioral harassment: 175 dB referenced to 1 μPa RMS (Navy 2017)	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
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.	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.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing 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 impacts on water quality from sediment suspension during port expansion activities is short term and temporary, and would be similar to those described under the 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	Planned 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 Farm 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, Block Island Wind Farm WTGs, and two WTGs with the Coastal Virginia Offshore Wind pilot project) 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 Farm (five WTGs) and Coastal Virginia Offshore Wind pilot project (two WTGs) but, given the limited number of 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 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, TSS, 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 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 of high consequence, the patchy distribution of sea turtles makes stock or population-level effects unlikely (Navy 2018).

μT = microtesla; AC = alternating current

Table D.A1-22. Summary of non-offshore wind activities and the associated impact-producing factors for scenic and visual resources

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases	Ongoing offshore and onshore construction projects involve the use of vehicles, vessels, and equipment that contain fuel, fluids, and hazmat that have the potential for accidental release. Offshore and onshore construction can also result in sedimentation from land and seabed disturbance and accidental releases of trash and debris with associated visual impacts.	Future offshore and onshore construction projects have the potential to result in accidental releases from vehicles, vessels, and equipment that contain fuel, fluids, and hazmat. Future offshore and onshore construction could also result in sedimentation from land and seabed disturbance and accidental releases of trash and debris with associated visual impacts.
Land disturbance	Onshore human-caused and naturally occurring erosion and sedimentation results from construction, maintenance, and weather events.	Ongoing onshore construction projects could generate noticeable disturbance in the landscape. Intensity and extent would vary depending on the location, type, and duration of activities.
Lighting	Offshore vessels have an array of lights including navigational lights, deck lights, and interior lights. Various ongoing onshore and coastal construction projects have nighttime activities, as well as existing structures, facilities, and vehicles that would require 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.
Presence of structures:	Buoys are the only existing stationary structures within the offshore viewshed of the Project. Typically, buoys are visible only in the immediate foreground (less than 1 mile [1.6 kilometers]). Stationary and moving barges, boats, and ships also are visible in the daytime and nighttime viewsheds.	Onshore wind-related structures that could be viewed in conjunction with the offshore project components would be limited to meteorological towers, substations, and electrical transmission towers and conductors.
Traffic	Ongoing activities contribute air, marine, and onshore traffic and visible congestion.	Planned onshore and offshore construction projects involving vessel, vehicle, and helicopter traffic could generate noticeable changes in the characteristic seascape and landscape and viewer experience. Intensity and extent of the changes would vary depending on the location, type, direction, and duration of the traffic.

Table D.A1-23. Summary of non-offshore wind activities and the associated impact-producing factors for water quality

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 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 into the offshore was fewer than 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 34 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.
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 34 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.
Cable emplacement and 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 limited to the emplacement corridor or localized.	Suspension of sediments may continue to occur infrequently over the next 34 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 localized, short-term impacts. 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.
Discharges/intakes	Discharges affect water quality by introducing nutrients, chemicals, and sediments to the water. There are regulatory requirements related to prevention and control of discharges, accidental spills, and 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 regulates the disposal permits issued by USACE. The impact on water quality from sediment suspension during these future activities would be short term and localized.
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 34 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 localized but, depending on the hydrologic conditions, have the potential to affect 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.
Land disturbance: Erosion and sedimentation	Ground-disturbing 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.

hazmat = hazardous materials

Table D.A1-24. Summary of non-offshore wind activities and the associated impact-producing factors for wetlands

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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.

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Attachment D2: Maximum-Case Scenario Estimates for Offshore Wind Projects

The following tables provide maximum-case scenario estimates of potential offshore wind project impacts assuming maximum buildout within the Atlantic Shores South Draft EIS geographic analysis areas. BOEM developed these estimates based on offshore wind demand, as discussed in its 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 Draft 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.

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Table D.A2-1. Offshore Wind development activities on the U.S. East Coast: projects and assumptions (part 1, turbine and cable design parameters) (data as of March 17, 2023)[1]

Region	Lease, Project, Lease Remainder[2]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[3]								Estimated Construction Schedule[4]	Turbine Number[5]	Generating Capacity (MW)[6]	Offshore Export Cable Length (statute miles)[7]	Offshore Export Cable Installation Tool Disturbance Width (feet)[8]	Interarray Cable Length (statute miles)[9]	Hub Height (feet)[10]	Rotor Diameter (feet)[11]	Height of Turbine (feet)[12]
			Air Quality, Water Quality, Benthic, Wetlands, Navigation, Demographics	Finfish, Invertebrates, EFH	Birds, Bats, Marine Mammals, Sea Turtles, Fisheries, Research Surveys	Coastal Habitats	Environmental Justice	Cultural Resources	Other Marine Uses (excluding research surveys & navigation)	Scenic and Visual Resources, Recreation & Tourism									
ME	Aquaventis (Maine state waters)	State Project	-	-	-	-	-	-	-	-	2024	2	11					450	520
	Total Other State Waters											**2**	**11**						
EXISTING AND ONGOING PROJECTS																			
MA/RI	Block Island (state waters)	Built	-	X	X	-	-	-	-	-	Built	5	30	28	5	2	328	541	659
MA/RI	Vineyard Wind 1 part of OCS-A 0501	COP Approved (ROD issued 2021), PPA, SAP	-	X	X	-	-	-	-	-	2023	62	800	98	6.5	171	451	721	812
MA/RI	South Fork, OCS-A 0517	COP Approved (ROD issued 2021), PPA, SAP	-	X	X	-	-	-	-	-	2023	12	132	139	6.5	24	358	543	614
VA/NC	CVOW, OCS-A 0497	RAP, FDR/FIR	-	X	X	-	-	-	-	-	Built	2	12	27	3.3	9	364	506	620
	Total Existing and Ongoing Projects											**81**	**974**	**292**		**206**			
PLANNED PROJECTS																			
Massachusetts/Rhode Island Region																			
MA/RI	Sunrise Wind, OCS-A 0487	COP, PPA, SAP	-	X	X	-	-	-	-	-	2024	94	934	209.2	13	180	459	656	787
MA/RI	Revolution Wind, part of OCS-A 0486	COP, PPA, SAP	-	X	X	-	-	-	-	-	2024	100	880	42	6.5	155	512	722	873
MA/RI	New England Wind, OCS-A 0534, and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	COP, PPA, SAP	-	X	X	-	-	-	-	-	2024	62	804	125	10	139	702	935	1,171
MA/RI	New England Wind, OCS-A 0534, and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	COP, PPA, SAP	-	X	X	-	-	-	-	-	2025 or later	63	1,725	226	10	201	702	935	1,171
MA/RI	South Coast OCS-A 0521	COP, PPA, SAP	-	X	X	-	-	-	-	-	2024	147	2,400	1,179	6.5	497	605	919	1,066
MA/RI	Beacon Wind 1, part of OCS-A 0520	COP (unpublished), PPA, SAP	-	X	X	-	-	-	-	-	2026-2029	77	1,230	202	6.5	187	591	984	1,083
MA/RI	Beacon Wind 2, part of OCS-A 0520	COP (unpublished), PPA, SAP	-	X	X	-	-	-	-	-	2027-2030	78	1,100	202	6.5	187	591	984	1,083
MA/RI	Bay State Wind, part of OCS-A 0500	SAP, COP (unpublished)	-	X	X	-	-	-	-	-	By 2030, spread over 2026-2030	94	1,128	139	6.5	148	492	722	853
MA/RI	OCS-A 0500 remainder	Planning	-	X	X	-	-	-	-	-	By 2030, spread over 2026-2030	116	1,392	200	7	240	492	722	853
MA/RI	OCS-A 0487 remainder	Planning	-	X	X	-	-	-	-	-	By 2030, spread over 2026-2030			200	7		492	722	853

Region	Lease, Project, Lease Remainder[2]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[3]								Estimated Construction Schedule[4]	Turbine Number[5]	Generating Capacity (MW)[6]	Offshore Export Cable Length (statute miles)[7]	Offshore Export Cable Installation Tool Disturbance Width (feet)[8]	Interarray Cable Length (statute miles)[9]	Hub Height (feet)[10]	Rotor Diameter (feet)[11]	Height of Turbine (feet)[12]
			Air Quality, Water Quality, Benthic, Wetlands, Navigation, Demographics	Finfish, Invertebrates, EFH	Birds, Bats, Marine Mammals, Sea Turtles, Fisheries, Research Surveys	Coastal Habitats	Environmental Justice	Cultural Resources	Other Marine Uses (excluding research surveys & navigation)	Scenic and Visual Resources, Recreation & Tourism									
MA/RI	Vineyard Wind NE, part of OCS-A 0522	Planning		X	X						By 2030, spread over 2026-2030	157	2,400	532	33	221	787	1,050	1,312
	Total MA/RI Leases											**988**	**13,993**	**3,256**		**2,155**			
New York/New Jersey Region																			
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	X	X	X	X	X	X	X	2025-2027	200	2,837[13]	441	3.3	547	574	919	1,049
NY/NJ	Atlantic Shores North, OCS-A 0549	COP (unpublished), SAP	X	X	X	X	X	X	X	X	By 2030, spread over 2026-2030	157	2,355	331	3.3	528	574	919	1,049
NY/NJ	Ocean Wind 1, part of OCS-A 0498	COP, PPA, SAP	X	X	X		X	X	X	X	2024-2025	98	1,100	194[14]	7	190	512	788	906
NY/NJ	Ocean Wind 2, part of OCS- A 0532	PPA	X	X	X		X	X	X	X	By 2030, spread over 2026-2030	111	1,554	200	7	173	512	788	906
NY/NJ	Empire Wind 1, part of OCS-A 0512	COP, PPA, SAP		X	X						2023–2026	57	816	46	5	133	525	853	951
NY/NJ	Empire Wind 2, part of OCS-A 0512	COP, PPA, SAP		X	X						2023–2027	90	1,260	30	5	166	525	853	951
NY/NJ	OW Ocean Winds East LLC OCS-A 0537	Planning		X	X						By 2030, spread over 2026-2030	100		200	7	120	1,009	1,230	1,312
NY/NJ	Attentive Energy LLC OCS-A 0538	Planning		X	X		X			X	By 2030, spread over 2026-2030	102		200	7	120	1,009	1,230	1,312
NY/NJ	Bight Wind Holdings LLC OCS-A 0539	Planning		X	X		X	X		X	By 2030, spread over 2026-2030	145	11,502	200	7	120	1,009	1,230	1,312
NY/NJ	Atlantic Shores Offshore Wind Bight LLC OCS-A 0541	Planning		X	X		X	X		X	By 2030, spread over 2026–2030	93		200	7	120	1,009	1,230	1,312
NY/NJ	Invenergy Wind Offshore LLC OCS-A 0542	Planning		X	X		X	X		X	By 2030, spread over 2026-2030	97		200	7	120	1,009	1,230	1,312
NY/NJ	Vineyard Mid-Atlantic LLC OCS-A 0544	Planning		X	X						By 2030, spread over 2026-2030	102		200	7	120	1,009	1,230	1,312
	Total NY/NJ Leases											**1,352**	**21,424**	**2,442**		**2,457**			

Region	Lease, Project, Lease Remainder[2]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[3]								Estimated Construction Schedule[4]	Turbine Number[5]	Generating Capacity (MW)[6]	Offshore Export Cable Length (statute miles)[7]	Offshore Export Cable Installation Tool Disturbance Width (feet)[8]	Interarray Cable Length (statute miles)[9]	Hub Height (feet)[10]	Rotor Diameter (feet)[11]	Height of Turbine (feet)[12]
			Air Quality, Water Quality, Benthic, Wetlands, Navigation, Demographics	Finfish, Invertebrates, EFH	Birds, Bats, Marine Mammals, Sea Turtles, Fisheries, Research Surveys	Coastal Habitats	Environmental Justice	Cultural Resources	Other Marine Uses (excluding research surveys & navigation)	Scenic and Visual Resources, Recreation & Tourism									
Maryland/Delaware Region																			
DE/MD	Skipjack, part of OCS-A 0519	COP, PPA, SAP		X	X			X		X	2024	16	192	40	6.5	23.7	492	722	822
DE/MD	US Wind/Maryland Offshore Wind, part of OCS-A 0490	COP, PPA, SAP		X	X						2024	121	2,000	145	6.5	152	528	820	938
DE/MD	GSOE I, OCS-A 0482	Planning		X	X			X		X	By 2030, spread over 2023–2030	94	1,128	200	6.5	139.1	492	722	853
DE/MD	OCS-A 0519 remainder	Planning		X	X					X			1,128	200	6.5	139.1	492	722	853
	Total DE/MD Leases											**231**	**4,448**	**585**		**453.9**			
Virginia/North Carolina/South Carolina Region																			
VA/NC	CVOW-C, OCS-A 0483	COP, SAP		X	X						2025–2027	202	3,000	417	5	300	489	761	869
VA/NC	Kitty Hawk North, OCS-A 0508	COP, SAP		X	X						2024–2030	69	1,242	112	30	149	574	935	1,042
VA/NC	Kitty Hawk Wind South OCS-A 0508	COP		X	X						2026-2027	121	2,178	353	30	200	574	935	1,042
SC	TotalEnergies Renewables Wind, OCS-A 0545	Planning			X						By 2030, spread over 2026-2030	64	785	200	6.5	179.1	492	722	853
SC	Duke Energy Renewables Wind, OCS-A 0546	Planning			X						By 2030, spread over 2026-2030	64	788	200	6.5	94.7	492	722	853
	Total VA/NC/SC Leases											**520**	**7,993**	**1,282**		**922.8**			
	OCS TOTAL (PLANNED)[9,10]											**3,091**	**47,858**	**7,565**		**5,989**			
	OCS TOTAL[9,10]											**3,174**	**48,843**	**7,857**		**6,195**			

[1] BOEM recognizes that the estimates presented within this cumulative 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.
[2] The spacing/layout for projects are as follows: NE State water projects include a single strand of WTGs and no OSS. For projects in the RI, MA, NY, NJ, DE, MD, VA, and NC lease areas, a 1×1–nm grid spacing is assumed, if not included in the COP. 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.
[3] This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.
[4] 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. This estimate is for offshore components only.
[5] 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 grid spacing, or the generating capacity.
[6] BOEM obtained project generating capacity from the COP (if available). If not included in the COP, BOEM used this formula: turbine number * expected turbine size (MW).
[7] 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. In cases where the export cable value was provided to BOEM as a range, BOEM used the higher value.
[8] BOEM used the estimated disturbance width provided in the COP (if available). If not available, BOEM assumed the disturbance width to be 6.5 feet based on COPs submitted to BOEM date.
[9] BOEM used the interarray cable length provided in the COP (if available). If not available, BOEM used this formula: turbine number * 1.48 miles.
[10] BOEM used the hub height provided in COP, if available. For those projects without announced WTG dimensions, BOEM used the known dimensions of turbines of the same capacity as the prototype capacity, rounded to the nearest even number, for the current year in DOE's most recent Offshore Wind Market Report.
[11] BOEM used the rotor diameter provided in COP, if available. For those projects without announced WTG dimensions, BOEM used the known dimensions of turbines of the same capacity as the prototype capacity, rounded to the nearest even number, for the current year in DOE's most recent Offshore Wind Market Report.
[12] BOEM used the turbine height provided in the COP (if available). If not available, BOEM used this formula: total height of turbine = rotor diameter (feet) + 100 feet OR 853 feet, whichever is higher.
[13] Atlantic Shores South consists of two energy facilities (Project 1 and Project 2). Project 1 would have a capacity of 1,510 MW; Project 2's capacity is not yet determined, but Atlantic Shores has a goal of 1,327 MW.
[14] Includes cable length from offshore export cables and substation interconnector cables.
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; nm = nautical mile; NY = New York; PPA = Power Purchase Agreement; RAP = research activities plan; RI = Rhode Island; SC = South Carolina

Table D.A2-2. Offshore wind development activities on the U.S. East Coast: projects and assumptions (part 2, seabed/anchoring disturbance and scour protection) (data as of March 17, 2023)[1]

Region	Lease/Project/Lease Remainder	Status	Geographic Analysis Area (X denotes lease area is within or overlaps analysis area)[2]								Estimated Foundation Number[3]	Foundation Footprint (acres)[4]	Seabed Disturbance (Foundation + Scour Protection) (acres)[5]	Offshore Export Cable Seabed Disturbance (acres)[6]	Offshore Export Cable Footprint (acres)[7]	Offshore Export Cable Hard Protection (acres)[8]	Anchoring Disturbance (acres)[9]	Interarray Construction Footprint/Seabed Disturbance (acres)[10]	Interarray Operating Footprint/ Seabed Disturbance (acres)[11]	Interarray Cable Hard Protection (acres)[12]
			Air Quality, Water Quality, Benthic, Wetlands, Navigation, Demographics	Finfish, Invertebrates, EFH	Birds, Bats, Marine Mammals, Sea Turtles, Fisheries, Research Surveys	Coastal Habitat	Environmental Justice	Cultural Resources	Other Marine Uses (excluding research surveys & navigation)	Scenic & Visual Resources, Recreation & Tourism										
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	X	X	X	X	X	X	X	211	21	289	294	294	294	714	282	301	301
NY/NJ	Atlantic Shores North, OCS-A 0549	COP (unpublished), SAP	X	X	X	X	X	X	X	X	165	25	190	3,393	393	393	416	2,162	301	301
NY/NJ	Ocean Wind 1, part of OCS-A 0498	COP, PPA, SAP	X	X	X	-	X	X	X	X	101	4	84	1,935[13]	78	94	19	1,850[14]	144	77
NY/NJ	Ocean Wind 2, part of OCS-A 0532	PPA	X	X	X	-	X	X	X	X	111	17	130	170	24	24	336	1631	219	0
NY/NJ	Empire Wind 1, part of OCS-A 0512	COP, PPA, SAP	-	X	X	-	-	-	-	-	58	1	52	368	37	33	9	534	82	26
NY/NJ	Empire Wind 2, part of OCS-A 0512	COP, PPA, SAP	-	X	X	-	-	-	-	-	91	2	82	360	24	32	9	633	129	32
NY/NJ	OW Ocean Wind East LLC OCS-A 0537	Planning	-	X	X	-	-	-	-	-	82	21	103	170	24	24	336	1,205	162	0
NY/NJ	Attentive Energy LLC OCS-A 0538	Planning	-	X	X	-	X	-	-	X	102	27	129	170	24	24	336	1,499	201	0
NY/NJ	Bight Wind Holdings LLC OCS-A 0539	Planning	-	X	X	-	X	X	-	X	148	38	186	170	24	24	336	2,175	292	0
NY/NJ	Atlantic Shores Offshore Wind Bight LLC OCS-A 0541	Planning	-	X	X	-	X	X	-	X	95	25	120	170	24	24	336	1,396	187	0
NY/NJ	Invenergy Wind Offshore LLC OCS-A 0542	Planning	-	X	X	-	X	X	-	X	99	26	125	170	24	24	336	1,455	195	0
NY/NJ	Vineyard Mid-Atlantic LLC OCS-A 0544	Planning	-	X	X	-	-	-	-	-	104	27	131	170	24	24	336	1,529	205	0
	Total NY/NJ Leases										**1,391**	**234**	**1,621**	**7,540**	**994**	**1,014**	**3,519**	**16,351**	**2,418**	**737**
DE/MD	Skipjack, part of OCS-A 0519	COP, PPA, SAP	-	X	X	-	-	X	-	X	17	4	21	32	5	5	67	5	3	0
DE/MD	GSOE I, OCS-A 0482	Planning	-	X	X	-	-	X	-	X	96[15]	25[15]	121[15]	158[15]	24	5[15]	336[15]	1,411[15]	189[15]	0[15]
	Total MA, RI, DE, MD, NC, VA Leases										**1,859**	**334**	**4,073**	**24,532**	**1,620**	**749**	**4,537**	**53,049**	**1,717**	**671**
	OCS TOTAL										**3,226**	**568**	**5,694**	**32,072**	**2,614**	**1,763**	**8,056**	**69,400**	**4,135**	**1,408**

[1] BOEM recognizes that the estimates presented within this cumulative 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.
[2] This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.
[3] BOEM used the estimated number of foundations from the COP (if available). It is the total number of turbines plus OSSs and met towers. 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.
[4] BOEM used the estimated foundation footprint acreage provided in the COP (if available). If not available, BOEM used this formula: foundation footprint = 0.26 acre * foundation number.
[5] The WTG seabed disturbance with the addition of scour protection was calculated based on scour protection expected in submitted COPs. If not available, BOEM used this formula: (1 acre * foundation #) + foundation footprint.
[6] BOEM used the estimated offshore export cable seabed disturbance provided in the COP (if available). If not available, BOEM used this formula: ((COP export cable length OR estimated export cable length) * 5,280 feet/mile * installation tool disturbance width) / (43,560 square feet/acre)
[7] BOEM used the estimated offshore export cable footprint provided in the COP (if available). If not available, BOEM used this formula: export cable length OR estimated export cable length * 5,280 feet (1 mile)/43,560 square feet/acre.
[8] BOEM used the estimated offshore export cable hard protection area provided in the COP (if available). If not available, BOEM used this formula: (COP export cable length OR estimated export cable length * 5,280 feet/mile * 0.20 * 9.8 feet) / (43,560 square feet/acre).
[9] BOEM used the estimated anchoring disturbance area provided in the COP (if available). If not available, BOEM used this formula: (COP export cable length OR estimated export cable length) * (the corresponding subregion total COP anchoring disturbance per export cable length total).
[10] BOEM used the estimated interarray construction footprint/seabed disruption area provided in the COP (if available). If not available, BOEM used this formula: foundation # * (the corresponding subregion total COP interarray construction seabed disruption per foundation total).
[11] BOEM used the estimated interarray operating footprint/seabed disruption area provided in the COP (if available). If not available, BOEM used this formula: foundation # * (the corresponding subregion total COP interarray operating seabed disruption per foundation total)
[12] BOEM used the estimated interarray hard protection area provided in the COP (if available). If not available, BOEM assumed the interarray cable hard protection to be zero.
[13] Includes disturbance from offshore export cables and substation interconnector cables. Assumes an 82-foot-wide corridor would be disturbed per cable, based on the Ocean Wind 1 COP.
[14] Assumes an 82-foot-wide corridor would be disturbed, based on the Ocean Wind 1 COP.
[15] Numbers represent the maximum collective amount within Lease Areas OCS-A 0482 and part of OCS-A 0519.
GSOE = Garden State Offshore Energy; NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement

Table D.A2-3. Offshore wind development activities on the U.S. East Coast: projects and assumptions (part 3, gallons of coolant, oils, lubricants, and diesel fuel) (data as of March 17, 2023)[1]

Region	Lease/Project/Lease Remainder	Status	Geographic Analysis Area (X denotes lease area is within or overlaps analysis area)[2]								Total Coolant Fluids in WTGs (gallons)[3]	Total Coolant Fluids in OSSs or ESPs (gallons)[4]	Total Oils and Lubricants in WTGs (gallons)[5]	Total Oils and Lubricants in OSSs or ESPs (gallons)[6]	Total Diesel Fuel in WTGs (gallons)[7]	Total Diesel Fuel in OSSs or ESPs (gallons)[8]
			Air Quality, Water Quality, Benthic, Wetlands, Navigation, Demographics	Finfish, Invertebrates, EFH	Birds, Bats, Marine Mammals, Sea Turtles, Fisheries, Research Surveys	Coastal Habitat	Environmental Justice	Cultural Resources	Other Marine Uses (excluding research surveys & navigation)	Scenic & Visual Resources, Recreation & Tourism						
NY/NJ	Atlantic Shores South, OCS-A 0499[9]	COP, PPA, SAP	X	X	X	X	X	X	X	X	820,000	10,300	606,200	370,050	80,000	75,000
NY/NJ	Atlantic Shores North OCS-A 0549[10]	COP (unpublished), SAP	X	X	X	X	X	X	X	X	643,700	9,150	530,817	557,850	62,800	557,850
NY/NJ	Ocean Wind 1, part of OCS-A 0498	COP, PPA	X	X	X	-	X	X	X	X	39,690	4,488	187,964	238,707	77,714	158,502
NY/NJ	Ocean Wind 2, part of OCS-A 0532[11]	PPA	X	X	X	-	X	X	X	X	330,561	2,992	391,774	185,452	44,677	5,225
NY/NJ	Empire Wind 1, part of OCS-A 0512	COP, PPA, SAP	-	X	X	-	-	-	-	-	49,704	0	236,037	158,503	0	7,925
NY/NJ	Empire Wind 2, part of OCS-A 0512	COP, PPA, SAP	-	X	X	-	-	-	-	-	78,480	0	372,690	158,503	0	7,925
NY/NJ	OW Ocean Winds East LLC OCS-A 0537[11]	Planning	-	X	X	-	-	-	-	-	242,613	2,992	287,540	185,452	32,790	100,900
NY/NJ	Attentive Energy LLC OCS-A 0538[11]	Planning	-	X	X	-	X	-	-	X	303,267	2,992	359,425	185,452	40,988	100,900
NY/NJ	Bight Wind Holdings LLC OCS-A 0539[11]	Planning	-	X	X	-	X	-	X	X	439,736	4,488	521,167	278,177	59,432	151,350
NY/NJ	Atlantic Shores Offshore Wind Bight LLC OCS-A 0541[11]	Planning	-	X	X	-	X	-	X	X	282,038	2,992	334,266	185,452	38,119	100,900
NY/NJ	Invenergy Wind Offshore LLC OCS-A 0542[11]	Planning	-	X	X	-	X	-	X	X	294,169	2,992	348,643	185,452	39,758	100,900
NY/NJ	Vineyard Mid-Atlantic LLC OCS-A 0544[11]	Planning	-	X	X	-	-	-	-	X	309,332	2,992	366,614	185,452	41,807	100,900
	Total NY/NJ Leases										**1,958,866**	**18,540**	**3,419,659**	**2,886,168**	**815,260**	**1,447,202**
	Total MA, RI, DE, MD, NC, VA Leases										**6,024,807**	**99,017**	**7,846,464**	**5,230,232**	**1,162,701**	**1,187,620**
	OCS TOTAL										**9,858,097**	**145,397**	**12,389,601**	**8,104,734**	**1,680,786**	**2,655,897**

[1] BOEM recognizes that the estimates presented within this cumulative 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.
[2] This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.
[3] BOEM estimated the total coolant fluids in WTGs using this formula: (sum of all coolants provided in the COP [any material used as a coolant, not including water]) * turbine #.
[4] BOEM estimated the total coolant fluids in OSSs or ESPs using this formula: (sum of all coolants provided in the COP [any material used as a coolant, not including water]) * ESP/OSS #.
[5] BOEM estimated the total oils and lubricants in WTGs using this formula: (sum of all oils & lubricants provided in the COP) * turbine #.
[6] BOEM estimated the total oils and lubricants in OSSs or ESPs using this formula: (sum of all oils & lubricants provided in the COP) * turbine #.
[7] BOEM estimated the total diesel fuel in WTGs using this formula: (sum of all diesel fuel provided in the COP) * turbine #.
[8] BOEM estimated the total diesel fuel in OSSs or ESPs using this formula: (sum of all diesel fuel provided in the COP) * ESP/OSS #.
[9] Atlantic Shores South may include up to 10 small OSSs, up to 5 medium OSSs, or up to 4 large OSSs. The total values for diesel fuel, coolants, and oils/lubricants for Atlantic Shores OSS in Table D.A2-3 are based on 4 large OSSs; 4 large OSSs would result in larger volumes of diesel fuel, coolants, and oils/lubricants than would 10 small OSSs or 5 medium OSSs. The total values for 10 small OSSs for Atlantic Shores South would be 75,000 gallons diesel fuel; 370,050 gallons oils/lubricants, and 10,300 coolants. The total values for 5 medium OSSs would be 60,000 gallons diesel fuel, 555,050 gallons oils/lubricants, and 10,250 gallons coolants.
[10] Quantities of coolant, oil and lubricants, and diesel fuel are scaled to Atlantic Shores South based on number of turbines and OSSs; with assumption of 3 large OSS.
[11] Quantities of coolant, oil and lubricants, and diesel fuel are scaled to Ocean Wind 1 based on number of turbines and OSSs.
ESP = electrical service platform; NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement

Table D.A2-4. Offshore wind development activities on the U.S. East Coast: projects and assumptions (part 4, OCS construction and operation emissions) (data as of March 17, 2023)

			Geographic Analysis Area (X denotes lease area is within or overlaps analysis area)[1]																
Region	Lease/Project/Lease Remainder[1]	Status	Air Quality, Water Quality, Benthic, Wetlands, Navigation, Demographics	Finfish, Invertebrates, EFH	Birds, Bats, Marine Mammals, Sea Turtles, Fisheries, Research Surveys	Coastal Habitat	Environmental Justice	Marine Archaeology	Other Marine Uses (excluding research surveys & navigation)	Visual, Recreation & Tourism	2023	2024	2025	2026	2027	2028	2029	2030	Beyond 2030
Nitrogen oxides (tons)																			
NY/NJ	Ocean Wind 1, part of OCS-A 0498	COP, PPA	X	X	X		X	X	X	X	5	11,168	159	159	159	159	159	159	159
NY/NY	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	X	X	X	X	X	X	X	--	2,089	2,089	2,089	2,089	519	519	519	519
NY/NJ	Ocean Wind 2, part of OCS-A 0532	PPA	X	X	X		X	X	X	X	--	--	--	2,531	2,531	2,531	2,531	2,531	180
NY/NJ	Atlantic Shores North OCS-A 0549	COP (unpublished), SAP	X	X	X	X	X	X	X	X	--	--	--	1,312	1,312	1,312	1,312	1,312	407
	Total Air Quality Analysis Area										5	13,257	2,248	6,091	6,091	4,521	4,521	4,521	1,265
Volatile organic compounds (tons)																			
NY/NJ	Ocean Wind 1, part of OCS-A 0498	COP, PPA	X	X	X		X	X	X	X	<1	293	4	4	4	4	4	4	4
NY/NY	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	X	X	X	X	X	X	X	--	40	40	40	40	9	9	9	9
NY/NJ	Ocean Wind 2, part of OCS- A 0532	PPA	X	X	X		X	X	X	X	--	--	--	66	66	66	66	66	4
NY/NJ	Atlantic Shores North OCS-A 0549	COP (unpublished), SAP	X	X	X	X	X	X	X	X	--	--	--	25	25	25	25	25	7
	Total Air Quality Analysis Area										<1	333	44	136	136	104	104	104	24
Carbon monoxide (tons)																			
NY/NJ	Ocean Wind 1, part of OCS-A 0498	COP, PPA	X	X	X		X	X	X	X	3	2,154	40	40	40	40	40	40	40
NY/NY	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	X	X	X	X	X	X	X	--	503	503	503	503	121	121	121	121
NY/NJ	Ocean Wind 2, part of OCS- A 0532	PPA	X	X	X		X	X	X	X	--	--	--	489	489	489	489	489	45
NY/NJ	Atlantic Shores North OCS-A 0549	COP (unpublished), SAP	X	X	X	X	X	X	X	X	--	--	--	316	316	316	316	316	95
	Total Air Quality Analysis Area									X	3	2,657	543	1,348	1,348	966	966	966	302

Particulate matter, 10 microns or less (tons)																			
NY/NJ	Ocean Wind 1, part of OCS-A 0498	COP, PPA	X	X	X		X	X	X	X	<1	365	6	6	6	6	6	6	6
NY/NY	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	X	X	X	X	X	X	X	--	70	70	70	70	17	17	17	17
NY/NJ	Ocean Wind 2, OCS- A 0532	PPA	X	X	X		X	X	X	X	--	--	--	83	83	83	83	83	6
NY/NJ	Atlantic Shores North OCS-A 0549	COP (unpublished), SAP	X	X	X	X	X	X	X	X	--	--	--	44	44	44	44	44	13
	Total Air Quality Analysis Area										<1	435	76	202	202	149	149	149	42
Particulate matter, 2.5 microns or less (tons)																			
NY/NJ	Ocean Wind 1, part of OCS-A 0498	COP, PPA	X	X	X		X	X	X	X	<1	349	5	5	5	5	5	5	5
NY/NY	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	X	X	X	X	X	X	X	--	68	68	68	68	16	16	16	16
NY/NJ	Ocean Wind 2, part of OCS- A 0532	PPA	X	X	X		X	X	X	X	--	--	--	79	79	79	79	79	6
NY/NJ	Atlantic Shores North OCS-A 0549	COP (unpublished), SAP	X	X	X	X	X	X	X	X	--	--	--	43	43	43	43	43	13
	Total Air Quality Analysis Area										<1	417	73	195	195	143	143	143	40
Sulfur dioxide (tons)																			
NY/NJ	Ocean Wind 1, part of OCS-A 0498	COP, PPA	X	X	X		X	X	X	X	<1	115	1	1	1	1	1	1	1
NY/NY	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	X	X	X	X	X	X	X	--	7	7	7	7	1	1	1	1
NY/NJ	Ocean Wind 2, part of OCS- A 0532	PPA	X	X	X		X	X	X	X	--	--	--	26	26	26	26	26	1
NY/NJ	Atlantic Shores North OCS-A 0549	COP (unpublished), SAP	X	X	X	X	X	X	X	X	--	--	--	4	4	4	4	4	1
	Total Air Quality Analysis Area										<1	122	8	39	39	33	33	33	4
Carbon dioxide (tons)																			
NY/NJ	Ocean Wind 1, part of OCS-A 0498	COP, PPA	X	X	X		X	X	X	X	3,539	652,774	11,752	11,752	11,752	11,752	11,752	11,752	11,752
NY/NY	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	X	X	X	X	X	X	X	--	142,818	142,818	142,818	142,818	33,566	33,566	33,566	33,566
NY/NJ	Ocean Wind 2, part of OCS-A 0532	PPA	X	X	X		X	X	X	X	--	--	--	148,675	148,675	148,675	148,675	148,675	13,311
NY/NJ	Atlantic Shores North OCS-A 0549	COP (unpublished), SAP	X	X	X	X	X	X	X	X	--	--	--	87,516	87,516	87,516	87,516	87,516	26,349
	Total Air Quality Analysis Area										3,539	795,592	154,570	390,761	390,761	281,510	281,510	281,510	84,978

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

Note: Emissions for Ocean Wind 2 and Atlantic Shores North are scaled from Ocean Wind 1 and Atlantic Shores South, respectively, based on number of turbines and estimated construction schedule.

NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement

Attachment D3: References Cited

AntennaSearch.com. 2022. Tower and Antenna Database. Updated June 5, 2022. Available: www.antennasearch.com.

Associated Press 2022. *Vacant Atlantic City airport could become car lovers' dream.* By Wayne Parry, February 25, 2022. Available: https://apnews.com/article/technology-business-atlantic-city-cb64791aa0983ebb3cf6993aa9295c1f. Accessed: May 2022.

Atlantic Shores Offshore Wind, LLC (Atlantic Shores). 2023. *Atlantic Shores Offshore Wind: Construction and Operations Plan*. Lease Area OCS-A 0499. May. Available: https://www.boem.gov/renewable-energy/state-activities/atlantic-shores-south.

Atlantic States Marine Fisheries Commission (ASMFC). 2018. *Management, Policy and Science Strategies for Adapting Fisheries Management to Changes in Species Abundance and Distribution Resulting from Climate Change*. February. Available: http://www.asmfc.org/files/pub/ClimateChangeWorkGroupGuidanceDocument_Feb2018.pdf. Accessed: January 2019.

Atlantic States Marine Fisheries Commission (ASMFC). 2019. *ASMFC Five-Year Strategic Plan 2019–2023*. Available: http://www.asmfc.org/files/pub/2019-2023StrategicPlan_Final.pdf. Accessed: March 2022.

Atlantic States Marine Fisheries Commission (ASMFC). 2021. *Atlantic States Marine Fisheries Commission 2022 Action Plan*. Available: http://www.asmfc.org/files/pub/2022ActionPlan.pdf. Accessed: March 2022.

Atlantic County 2018. *Atlantic County Planning Board Master Plan*. Atlantic County, New Jersey Master Plan, May 2018. Prepared by Heyer, Gruel & Associates and Michael Baker International. Available: https://www.atlantic-county.org/documents/planning/Master%20Plan_5-1-18.pdf. Accessed: March 2022.

Bartol, S. M. 1994. Auditory Evoked Potentials of the Loggerhead Sea Turtle (*Caretta caretta*). Master's Thesis, College of William and Mary – Virginia Institute of Marine Science. 66 pp.

Baulch, S., and C. Perry. 2014. Evaluating the Impacts of Marine Debris on Cetaceans. *Marine Pollution Bulletin* 80:210–221. Available: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwibhLySt4j6AhV-j2oFHVjhD3kQFnoECBgQAQ&url=https%3A%2F%2Fwww.researchgate.net%2Ffile.PostFileLoader.html%3Fid%3D523ff97fcf57d74e7d043cb9%26assetKey%3DAS%253A272142459965441%25401441895226384&usg=AOvVaw0JCZW81NT0UAQlZD0G_9X1. Accessed: September 2022.

Bembenek-Bailey, S. A., J. N. Niemuth, P. D. McClellan-Green, M. H. Godfrey, C. A. Harms, H. Gracz, and M. K. Stoskopf. 2019. NMR Metabolomics Analysis of Skeletal Muscle, Heart, and Liver of Hatchling

Loggerhead Sea Turtles (*Caretta caretta*) Experimentally Exposed to Crude Oil and/or Corexit. *Metabolites* 2019(9):21. Available: DOI: 10.3390/metabo9020021. Accessed: September 2022.

Berreiros J. P., and V. S. Raykov. 2014. Lethal Lesions and Amputation Caused by Plastic Debris and Fishing Gear on the Loggerhead Turtle *Caretta* (Linnaeus, 1758). Three case reports from Terceira Island, Azores (NE Atlantic). *Marine Pollution Bulletin* 86:518–522. Available: https ://www.researchgate.net/publication/263928443_Lethal_lesions_and_amputation_caused_by_plastic_debris_and_fishing_gear_on_the_loggerhead_turtle_Caretta_caretta_Linnaeus_1758_Three_case_reports_from_Terceira_Island_Azores_NE_Atlantic. Accessed: September 2022.

Blunden, J., and D. S. Arndt. 2020. State of the Climate in 2019. *Bulletin of the American Meteorological Society* 101(8):S1–S429. Available: https://sites.bu.edu/cliveg/files/2020/08/Dunn-BAMS-2020.pdf. Accessed: September 2022.

Briggs, K. T., M. E. Gershwin, and D. W. Anderson. 1997. Consequences of Petrochemical Ingestion and Stress on the Immune System of Seabirds. *ICES Journal of Marine Science* 54:718–725. Available: https://academic.oup.com/icesjms/article/54/4/718/607510. Accessed: September 2022.

Browne, M. A., A. J. Underwood, M. G. Chapman, R. Williams, R. C. Thompson, and J. A. van Franeker. 2015. Linking Effects of Anthropogenic Debris to Ecological Impacts. *Proceedings of the Royal Society B* 282:20142929. Available: https://royalsocietypublishing.org/doi/10.1098/rspb.2014.2929. Accessed September 2022.

Bugoni, L., L. Krause, and M. V. Petry. 2001. Marine Debris and Human Impacts on Sea Turtles in Southern Brazil. *Marine Pollution Bulletin* 42(12):1330–1334. Available: https://www.academia.edu/15335402/Marine_Debris_and_Human_Impacts_on_Sea_Turtles_in_Southern_Brazil. Accessed: September 2022.

Bureau of Ocean Energy Management (BOEM). 2007. *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf*. October. OCS EIS/EA MMS 2007-046.

Bureau of Ocean Energy Management (BOEM). 2016. *Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York*. OCS EIS/EA BOEM 2016-070. October.

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: December 2020.

Bureau of Ocean Energy Management (BOEM). 2020. *Fishery Management Plan Revenue Exposure Analysis.* Revenue exposure by Fishery Management Plan for calendar years 2020 through 2030 based on data provided by National Marine Fisheries Service.

Bureau of Ocean Energy Management (BOEM). 2021a. *Vineyard Wind 1 Offshore Wind Energy Project Final Environmental Impact Statement*. OCS EIS/EA, BOEM 2021-0012. March.

Bureau of Ocean Energy Management (BOEM). 2021b. *South Fork Wind Farm and South Fork Export Cable Project Final Environmental Impact Statement*. OCS EIS/EA, BOEM 2020-057. August.

Bureau of Ocean Energy Management (BOEM). 2021c. *Submitted Atlantic OCS Region Permit Requests*. Available: https://www.boem.gov/submitted-atlantic-ocs-region-permit-requests. Accessed: July 2021.

Bureau of Ocean Energy Management (BOEM). 2021d. *Commercial and Research Wind Lease and Grant Issuance and Associated Site Assessment Activities on the Atlantic Outer Continental Shelf of the New York Bight*. OCS EIS/EA BOEM 2021-073. December.

BVG Associates. 2015. *Virginia Offshore Port Readiness Evaluation. Report 1: An evaluation of 10 Virginia ports.* A report to the Virginia Department of Mines, Minerals and Energy. April. Available: https://www.hrpdcva.gov/uploads/docs/Port%20Readiness%20Evaluation%20-%20An%20Evaluation%20of%2010%20Virginia%20Ports.pdf. Accessed: April 2022.

Camacho, M., O. P. Luzardo, L. D. Boada, L. F. L. Jurado, M. Medina, M. Zumbado, and J. Orós. 2013. Potential Adverse Health Effects of Persistent Organic Pollutants on Sea Turtles: Evidence from a Cross-Sectional Study on Cape Verde Loggerhead Sea Turtles. *Science of the Total Environment*. Available: https://www.semanticscholar.org/paper/Potential-adverse-health-effects-of-persistent-on-a-Camacho-Luzardo/842a0ed990cad4034b890e2f082edcc146446c86. Accessed September 2022.

Causon, Paul D., and Andrew B. Gill. 2018. Linking Ecosystem Services with Epibenthic Biodiversity Change Following Installation of Offshore Wind Farms. *Environmental Science and Policy* 89:340–347. Available: https ://www.sciencedirect.com/science/article/pii/S1462901118304556/pdfft?md5=b728b2b7a9e61e28e5901a5806772e71&pid=1-s2.0-S1462901118304556-main.pdf. Accessed September 2022.

Cape May County. 2022. *Cape May County Comprehensive Plan*. Cape May County Planning Board. Prepared by: T&M Associates, Adopted: January 20, 2022. Available: https://capemaycountynj.gov/DocumentCenter/View/9239/Cape-May-County-Comprehensive-Plan-Adopted-January-20-2022. Accessed March 2022.

City of Atlantic City. 2016. *City of Atlantic City Master Plan*. Master Plan Reexamination Report, April 2016. Prepared For City of Atlantic City, Prepared By Maser Consulting P.A. Clinton, NJ. May 2016. Available: https://www.acnj.gov/_Content/pdf/AC-MP-RE-EXAM-April2016.pdf. Accessed March 2022.

City of Ocean City. 2019. *Master Plan Reexamination Report.* January. Available: https://services.ocnj.us/government/documents/department-documents/planning-department/93-2018-master-plan-re-examination-adopted-1-10-19-1/file. Accessed: July 2021.

City of Ocean City. 2021a. *City of Ocean City New Jersey Capital Plan 2021-2025*. Available: https://www.ocnj.us/media/Projects/2021-2025%20Capital%20Plan%20Spreadsheet.pdf. Accessed March 2022.

City of Ocean City. 2021b. *City of Ocean City New Jersey Capital Plan Presentation (2021)*. Available: https://www.ocnj.us/media/Projects/2021%20%E2%80%93%202025%20Capital%20Plan%20Presentation.pdf. Accessed April 2022.

City of Sea Isle City. 2017. *2017 Master Plan Reexamination Report.* August. Available: https://drive.google.com/file/d/12A9D8hpf34is4hCL1OdlMmGZ6RuXjUPh/view. Accessed: July 2021.

Claisse, Jeremy T., Daniel J. Pondella II, Milton Love, Laurel A. Zahn, Chelsea M. Williams, Jonathan P. Williams, and Ann S. Bull. 2014. Oil Platforms off California Are Among the Most Productive Marine Fish Habitats Globally. *Proceedings of the National Academy of Sciences of the United States of America* 111(43):15462–15467. October 28, 2014. First published October 13, 2014. Available: https://doi.org/10.1073/pnas.1411477111. Accessed: March 2020.

Cook, A.S.C.P., and N.H.K. Burton. 2010. *A review of Potential Impacts of Marine Aggregate Extraction on Seabirds*. Marine Environment Protection Fund Project 09/P130. Available: https://www.bto.org/sites/default/files/shared_documents/publications/research-reports/2010/rr563.pdf. Accessed: February 2020.

Cresitello, Donald E. 2020. *Senior Coastal Planner, Planning and Policy Division, U.S. Army Corps of Engineers – North Atlantic Division. Emailed transmittal of unpublished NAD Sediment Needs Analysis to Jeffrey Waldner, P.G., Physical Scientist/Oceanographer, Bureau of Ocean Energy Management, Marine Minerals Division* on September 1.

CSA Ocean Sciences, Inc. and Exponent. 2019. *Evaluation of Potential EMF Effects on Fish Species of Commercial or Recreational Fishing Importance in Southern New England*. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2019-049. Available: https://espis.boem.gov/final%20reports/BOEM_2019-049.pdf. Accessed: September 2022.

Degraer, S., R. Brabant, B. Rumes, and L. Vigin, eds. 2019. *Environmental Impacts of Offshore Wind Farms in the Belgian Part of the North Sea: Marking a Decade of Monitoring, Research and Innovation*. Brussels: Royal Belgian Institute of Natural Sciences, OD Natural Environment, Marine Ecology and Management, 134 pp. Available: https://tethys.pnnl.gov/sites/default/files/publications/Degraer-2019-Offshore-Wind-Impacts.pdf. Accessed: September 2022.

Dolbeer, R. A., M. J. Begier, P. R. Miller, J. R. Weller, and A. L. Anderson. 2022. *Wildlife Strikes to civil aircraft in the United States, 1990 – 2021*. Federal Aviation Administration National Wildlife Strike Database Serial Report Number 25. 95 pp. + Appendices. June. Available:

https://www.faa.gov/airports/airport_safety/wildlife/media/Wildlife-Strike-Report-1990-2021.pdf. Accessed: September 2022.

Efroymson, R. A., W. Hodge Rose, S. Nemth, and G. W. Suter II. 2000. *Ecological Risk Assessment Framework for Low Altitude Overflights by Fixed-Wing and Rotary-Wing Military Aircraft*. Research sponsored by Strategic Environmental Research and Development Program of the U.S. Department of Defense under Interagency Agreement 2107-N218-S1. Publication No. 5010, Environmental Sciences Division, ORNL. Available: https://info.ornl.gov/sites/publications/Files/Pub57022.pdf. Accessed: September 2022.

Egg Harbor Township. 2017. *Township of Egg Harbor Community Development Plan for Business Districts / Economic Development Element*. Prepared by: Polistina & Associates / Rutala Associates. Prepared for: Township of Egg Harbor, Atlantic County, New Jersey. Available: https://cms9files.revize.com/eggharbornj/Land%20Use/LPS755%20FINAL.pdf. Accessed: March 2022.

Fabrizio, M. C., J. P. Manderson, and J. P. Pessutti. 2014. Home Range and Seasonal Movements of Black Sea Bass (*Centropristis striata*) during their Inshore Residency at a Reef in the Mid-Atlantic Bight. *Fishery Bulletin* 112:82–97 (2014). Doi: 10.7755/FB.112.1.5. Available: https://www.researchgate.net/publication/272708889_Home_range_and_seasonal_movements_of_Black_Sea_Bass_Centropristis_striata_during_their_inshore_residency_at_a_reef_in_the_mid-Atlantic_Bight. Accessed : September 2022.

Federal Energy Regulatory Commission (FERC). 2012. Order Issuing Project Pilot License. Verdant Power, LLC. Project Number 12611-005. Available: https://www.ferc.gov/media/news-releases/2012/2012-1/01-23-12-order.pdf?csrt=4969462846396361735. Accessed: October 2018.

Federal Energy Regulatory Commission (FERC). 2022a. North American LNG Import Terminals – Existing, Approved, Not Yet Built, and Proposed, and North American LNG Export Terminals. Available: https://cms.ferc.gov/media/north-american-lng-export-terminals-existing-approved-not-yet-built-and-proposed-8. Last updated August 30. 2022. Accessed: September 2022.

Federal Energy Regulatory Commission (FERC). 2022b. North American LNG Import Terminals – Existing, Approved, Not Yet Built, and Proposed, and North American LNG Import Terminals, Existing, Approved, Not Yet Built, and Proposed. Available: https://cms.ferc.gov/media/north-american-lng-import-terminals-existing-approved-not-yet-built-and-proposed-8. Last Updated August 30, 2022. Accessed: September 2022.

Gall, S. C., and R. C. Thompson. 2015. The Impact of Marine Debris on Marine Life. *Marine Pollution Bulletin* 92:170–179.

Gill, A. B., I. Gloyne-Phillips, K. J. Neal, and J. A. Kimber. 2005. The Potential Effects of Electromagnetic Fields Generated by Sub-Sea Power Cables Associated with Offshore Wind Farm Developments on Electrically and Magnetically Sensitive Marine Organisms — A *Review*. Collaborative Offshore Wind

Research into the Environment (COWRIE), Ltd, UK. Available: https://tethys.pnnl.gov/sites/default/files/publications/The_Potential_Effects_of_Electromagnetic_Fields_Generated_by_Sub_Sea_Power_Cables.pdf. Accessed September 2022.

Greene, J. K., M. G. Anderson, J. Odell, and N. Steinberg (editors). 2010. *The Northwest Atlantic Marine Ecoregional Assessment: Species, Habitats and Ecosystems. Phase One*. The Nature Conservancy, Eastern U.S. Division, Boston, MA. Available: http://www.conservationgateway.org/conservationbygeography/northamerica/unitedstates/edc/documents/namera-phase1-fullreport.pdf. Accessed September 2022.

Gregory, M. R. 2009. Environmental Implications of Plastic Debris in Marine Settings – Entanglement, Ingestion, Smothering, Hangers-on, Hitch-Hiking, and Alien Invasion. *Philosophical Transactions of the Royal Society* B 364:2013–2025. Available: https://royalsocietypublishing.org/doi/epdf/10.1098/rstb.2008.0265. Accessed: September 2022.

Guida, V., A. Drohan, H. Welch, J. McHenry, D. Johnson, V. Kentner, J. Brink, D. Timmons, and E. Estela-Gomez. 2017. *Habitat Mapping and Assessment of Northeast Wind Energy Areas*. U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2017-088. Available: https://espis.boem.gov/final%20reports/5647.pdf. Accessed September 2022.

Haney, J. C., P. G. R. Jodice, W. A. Montevecchi, and D. C. Evers. 2017. Challenges to Oil Spill Assessments for Seabirds in the Deep Ocean. *Archives of Environmental Contamination and Toxicology* 73:33–39. Available: https://ncbi.nlm.nih.gov/pmc/articles/PMC5511315/pdf/244_2016_Article_355.pdf. Accessed September 2022.

Hann, Z. A., M. J. Hosler, and P. R. Mooseman, Jr. 2017. Roosting Habits of Two Lasiurus borealis (eastern red bat) in the Blue Ridge Mountains of Virginia. *Northeastern Naturalist* 24(2):N15–N18. Available: https://www.researchgate.net/profile/Paul-Moosman/publication/317264718_Roosting_Habits_of_Two_Lasiurus_borealis_Eastern_Red_Bat_in_the_Blue_Ridge_Mountains_of_Virginia/links/592ec07445851553b6612788/Roosting-Habits-of-Two-Lasiurus-borealis-Eastern-Red-Bat-in-the-Blue-Ridge-Mountains-of-Virginia.pdf. Accessed: September 2022.

Hare, J. A., W. E. Morrison, M. W. Nelson, M. M. Stachura, E. J. Teeters, and R. B. Griffis. 2016. A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf. *PLOS ONE* 11(2): e0146756. DOI: 10.1371/journal.pone.0146756. Available: https://www.researchgate.net/publication/292978736_A_Vulnerability_Assessment_of_Fish_and_Invertebrates_to_Climate_Change_on_the_Northeast_US_Continental_Shelf. Accessed: September 2022.

Hawkins, A., and A. Popper. 2017. A Sound Approach to Assessing the Impact of Underwater Noise on Marine Fishes and Invertebrates. *ICES Journal of Marine Science* 74(3):635–651. DOI: 10.1093/

icesjms/fsw205. Available: https://academic.oup.com/icesjms/article/74/3/635/2739034. Accessed: September 2022.

Hazel, J., I. R. Lawler, H. Marsh, and S. Robson. 2007. Vessel Speed Increases Collision Risk for the Green Turtle *Chelonia mydas*. *Endangered Species Research* 3:105–113. Available: https://www.int-res.com/articles/esr2007/3/n003p105.pdf. Accessed: September 2022.

Hoarau, L., L. Ainley, C. Jean, and S. Ciccione. 2014. Ingestion and Defecation of Marine Debris by Loggerhead Sea Turtles, from By-catches in the South-West Indian Ocean. *Marine Pollution Bulletin* 84:90–96. Available: http://seaturtle.org/library/HoarauL_2014_MarPollBull.pdf. Accessed September 2022.

Hoen, B. D., J. E. Diffendorfer, J. T. Rand, L. A. Kramer, C. P. Garrity, and H. E. Hunt. 2021. *United States Wind Turbine Database ver. 5.1, August 2022:* U.S. Geological Survey, American Clean Power Association, and Lawrence Berkeley National Laboratory data release. Available: https://doi.org/10.5066/F7TX3DN0.

Hüppop, O., J. Dierschke, K. Exo, E. Frerich, and R. Hill. 2006. Bird Migration and Potential Collision Risk with Offshore Wind Turbines. *Ibis* 148:90–109. Available: https://www.researchgate.net/publication/227769181_Bird_migration_studies_and_potential_collision_risk_with_wind_turbines. Accessed: September 2022.

Hutchison, Zoë, Peter Sigray, Haibo He, Andrew Gill, John King, and Carol Gibson. 2018. *Electromagnetic Field (EMF) Impacts on Elasmobranch (Shark, Rays, and Skates) and American Lobster Movement and Migration from Direct Current Cables*. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2018-003. Available: https://espis.boem.gov/final%20reports/5659.pdf. Accessed: September 2022.

Intergovernmental Panel on Climate Change (IPCC). 2018. *IPCC Special Report on Impacts of Global Warming of 1.5 Degrees Celsius Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty: Summary for Policymakers*. Available: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf. Accessed: April 2022.

Jensen, J. H., L. Bejder, M. Wahlberg, N. Aguilar Solo, M. Johnson, and P. T. Madsen. 2009. Vessel Noise Effects on Delphinid Communication. *Marine Ecology Progress Series* 395:161–175. Available: https://tethys.pnnl.gov/sites/default/files/publications/Vessel_Noise_Effects_on_Delphinid_Communication.pdf. Accessed: September 2022.

Kellar, N. M., T. R. Speakman, C. R. Smith, S. M. Lane, B. C. Balmer, M. L. Trego, K. N. Catelani, M. N. Robbins, C. D. Allen, R. S. Wells, E. S. Zolman, T. K. Rowles, and L. H. Schwacke. 2017. Low Reproductive Success Rates of Common Bottlenose Dolphins *Tursiops truncatus* in the Northern Gulf of Mexico Following the Deepwater Horizon Disaster (2010-2015). *Endangered Species Research*

33:1432–158. Available: https://repository.library.noaa.gov/view/noaa/20458. Accessed: September 2022.

Kirschvink, J. L. 1990. Geomagnetic Sensitivity in Cetaceans an Update with Live Strandings Recorded in the US. In *Sensory Abilities of Cetaceans*, edited by J. Thomas and R. Kastelein. Plenum Press, NY. Available: http://web.gps.caltech.edu/~jkirschvink/pdfs/Kirschvink1990_Chapter_GeomagneticSensitivityInCetace.pdf. Accessed: September 2022.

Kite-Powell, H. L., A. Knowlton, and M. Brown. 2007. *Modeling the Effect of Vessel Speed on Right Whale Ship Strike Risk*. Unpublished Report for NOAA/NMFS Project NA04NMF47202394. 8 pp. Available: https://tethys.pnnl.gov/sites/default/files/publications/Kite-Powell-et-al-2007.pdf. Accessed: September 2022.

Kopp, R.E., C. Andrews, A. Broccoli, A. Garner, D. Kreeger, R. Leichenko, N. Lin, C. Little, J.A. Miller, J.K. Miller, K.G. Miller, R. Moss, P. Orton, A. Parris, D. Robinson, W. Sweet, J. Walker, C.P. Weaver, K. White, M. Campo, M. Kaplan, J. Herb, and L. Auermuller. *New Jersey's Rising Seas and Changing Coastal Storms: Report of the 2019 Science and Technical Advisory Panel*. Rutgers, The State University of New Jersey. Prepared for the New Jersey Department of Environmental Protection. Trenton, New Jersey. 2019. Available: https://climatechange.rutgers.edu/images/STAP_FINAL_FINAL_12-4-19.pdf. Accessed: March 2022.

Kraus, S. D., M. W. Brown, H. Caswell, C. W. Clark, M. Fujiwara, P. H. Hamilton, R. D. Kenney, A. R. Knowlton, S. Landry, C. A. Mayo, W. A. McLellan, M. J. Moore, D. P. Nowacek, D. A. Pabst, A. J. Read, and R. M. Rolland. 2005. North Atlantic Right Whales in Crisis. *Science* 309:561–562. https://www.science.org/doi/10.1126/science.1111200.

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

Laist, D. W., A. R. Knowlton, J. G. Mead, A. S. Collet, and M. Podesta. 2001. Collisions between Ships and Whales. *Marine Mammal Science* 17(1):35–75. Available: https://www.mmc.gov/wp-content/uploads/shipstrike.pdf. Accessed: September 2022.

Law, K. L., S. Morét-Ferguson, N. A. Maximenko, G. Proskurowski, E. E. Peacock, J. Hafner, and C. M. Reddy. 2010. Plastic Accumulation in the North Atlantic Subtropical Gyre. *Science* 329:1185–1188. Available: http://www.ccpo.odu.edu/~klinck/Reprints/PDF/lawScience2010.pdf. Accessed : September 2022.

Luschi, P., S. Benhamou, C. Girard, S. Ciccione, D. Roos, J. Sudre, and S. Benvenuti. 2007. Marine Turtles use Geomagnetic Cues during Open Sea Homing. *Current Biology* 17:126–133. Available: https://www.cell.com/current-biology/fulltext/S0960-9822(06)02582-

6?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0960982206025826%3Fshowall%3Dtrue. Accessed: September 2022.

Maggini, I., L. V. Kennedy, A. Macmillan, K. H. Elliot, K. Dean, and C. G. Guglielmo. 2017. Light Oiling of Feathers Increases Flight Energy Expenditure in a Migratory Shorebird. *Journal of Experimental Biology* 220:2372–2379. Available: https://journals.biologists.com/jeb/article-pdf/220/13/2372/1896963/jeb158220.pdf. Accessed: September 2022.

Mazet, J. A. K., I. A. Gardner, D. A. Jessup, and L. J. Lowenstine. 2001. Effects of Petroleum on Mink Applied as a Model for Reproductive Success in Sea Otters. *Journal of Wildlife Diseases* 37(4):686–692. Available: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj-n4C3wIj6AhW9nGoFHSaeAEIQFnoECAMQAQ&url=https%3A%2F%2Fbioone.org%2Fjournals%2Fjournal-of-wildlife-diseases%2Fvolume-37%2Fissue-4%2F0090-3558-37.4.686%2FEFFECTS-OF-PETROLEUM-ON-MINK-APPLIED-AS-A-MODEL-FOR%2F10.7589%2F0090-3558-37.4.686.pdf&usg=AOvVaw3QV73ZwdELg5dMqzcDtZOF. Accessed: September 2022.

McConnell, B. J., M. A. Fedak, P. Lovell, and P. S. Hammond. 1999. Movements and Foraging Areas of Grey Seals in the North Sea. *Journal of Applied Ecology* 36:573–590. Available: https://besjournals.onlinelibrary.wiley.com/doi/full/10.1046/j.1365-2664.1999.00429.x. Accessed: September 2022.

Meyer-Gutbrod, E. L., C. H. Greene, K. T. A. Davies, and D. G. Johns. 2021. *Ocean Regime Shift is Driving Collapse of the North Atlantic Right Whale Population*. *Oceanography* 34(3):22–31 (September 2021). Available: https://tos.org/oceanography/assets/docs/34-3_meyer-gutbrod.pdf. Accessed: January 2022.

Mid-Atlantic Fishery Management Council (MAFMC). 2019. "*About the Council*." Available: http://www.mafmc.org/about/. Accessed: January 2019.

Miller, J. H., and G. R. Potty. 2017. Overview of Underwater Acoustic and Seismic Measurements of the Construction and Operation of the Block Island Wind Farm. *Journal of the Acoustical Society of America* 141(5):3993–3993. DOI: 10.1121/1.4989144. https://asa.scitation.org/doi/10.1121/1.4989144

Minerals Management Service (MMS). 2007. Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement. October. OCS EIS/EA MMS 2007-046. Available: https://www.boem.gov/Guide-To-EIS/. Accessed: July 2018.

Mitchelmore, C. L., C. A. Bishop, and T. K. Collier. 2017. *Toxicological Estimation of Mortality of Oceanic Sea Turtles Oiled during the Deepwater Horizon Oil Spill*. *Endangered Species Research* 33:39–50. Available: https://www.int-res.com/articles/esr2017/33/n033p039.pdf. Accessed: September 2022.

Mohr, F. C., B. Lasely, and S. Bursian. 2008. *Chronic Oral Exposure to Bunker C Fuel Oil Causes Adrenal Insufficiency in Ranch Mink*. *Archive of Environmental Contamination and Toxicology* 54:337–347. Available: https://www.researchgate.net/publication/6076300_Chronic_Oral_Exposure_to_Bunker_C_Fuel_Oil_Causes_Adrenal_Insufficiency_in_Ranch_Mink_Mustela_vison. Accessed: September 2022.

Monmouth County, New Jersey. 2016. *Monmouth County Planning Board Master Plan*. Prepared by the Monmouth County Division of Planning, Adopted October 17, 2016. Monmouth County Planning Board Resolution #2016 –10. Available: https://www.visitmonmouth.com/Page.aspx?Id=4197. Accessed: March 2022.

Moore, M. J., and J. M. van der Hoop. 2012. The Painful Side of Trap and Fixed Net Fisheries: Chronic Entanglement of Large Whales. *Journal of Marine Biology* 2012:Article ID 230653, 4 pp. Available: https://www.hindawi.com/journals/jmb/2012/230653/. Accessed: September 2022.

Moser, J., and G. R. Shepherd. 2009. Seasonal Distribution and Movement of Black Sea Bass (*Centropristis striata*) in the Northwest Atlantic as Determined from a Mark-Recapture Experiment. *J. Northw. Atl. Fish. Sci.* 40:17–28. Doi:10.2960/J.v40.m638. Available: https://journal.nafo.int/Volumes/Articles/ID/445/Seasonal-Distribution-and-Movement-of-Black-Sea-Bass-emCentropristis-striataem-in-the-Northwest-Atlantic-as-Determined-from-a-Mark-Recapture-Experiment. Accessed: September 2022.

National Marine Fisheries Service. 2021. *Landings and Revenue Data for Wind Energy Areas, 2008-2021.* Available: https://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/WIND/ALL_WEA_BY_AREA_DATA.html. Accessed: January 2023.

National Marine Fisheries Service (NMFS). 2013. *Endangered Species Act Section 7 Consultation Biological Opinion for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf in Massachusetts, Rhode Island, New York and New Jersey Wind Energy Areas*. NER-2012-9211. Available: https://repository.library.noaa.gov/view/noaa/29291.

National Marine Fisheries Service (NMFS). 2015. *Endangered Species Act (ESA) Section 7 Consultation Biological Opinion, Deepwater Wind: Block Island Wind Farm and Transmission System*. June 5. Available: https://repository.library.noaa.gov/view/noaa/29136.

National Marine Fisheries Service and U.S. Fish and Wildlife Service (NMFS and USFWS). 2007. *Loggerhead Sea Turtle (*Caretta caretta*) 5-Year Review: Summary and Evaluation*. Available: https://repository.library.noaa.gov/view/noaa/17039. Accessed: September 2022.

National Oceanic and Atmospheric Administration (NOAA). 1997. *Amendment 3 to the Interstate Fishery Management Plan for American Lobster*. Available: http://www.asmfc.org/uploads/file/lobsterAmendment3.pdf. Accessed: February 2019.

National Oceanic and Atmospheric Administration (NOAA). 2018. *Biological Opinion on the Bureau of Ocean Energy Management's Issuance of Five Oil and Gas Permits for Geological and Geophysical Seismic Surveys off the Atlantic Coast of the United States, and the National Marine Fisheries Services' Issuance of Associated Incidental Harassment Authorizations*. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. 267 pp. + appendices. Available: https://repository.library.noaa.gov/view/noaa/19552. Accessed: September 2022.

National Oceanic and Atmospheric Administration (NOAA). 2020. *Section 7 Effect Analysis: Turbidity in the Greater Atlantic Region*. NOAA Greater Atlantic Regional Fisheries Office. Available: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-effect-analysis-turbidity-greater-atlantic-region. Accessed: September 2022.

National Oceanic and Atmospheric Administration (NOAA). 2021. United States Coast Pilot 3. Chapter 4, New Jersey Coast. Available: https://nauticalcharts.noaa.gov/publications/coast-pilot/index.html. Accessed: September 2021.

National Oceanic and Atmospheric Administration (NOAA). 2022. *Global and Regional Sea Level Rise — Scenarios for the United States: Updated Mean Projections and Extreme Water Level Probabilities Along U.S. Coastlines*. National Oceanic and Atmospheric Administration, U.S. Department of Commerce, National Ocean Service, Silver Spring Maryland February 2022. Available: https://aambpublicoceanservice.blob.core.windows.net/oceanserviceprod/hazards/sealevelrise/noaa-nos-techrpt01-global-regional-SLR-scenarios-US.pdf. Accessed: March 2022.

National Science Foundation (NSF) and U.S. Geological Survey (USGS). 2011. *Final Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for marine seismic research funded by the National Science Foundation or conducted by the U.S. Geological Survey*. 514 pp. Available: https://www.nsf.gov/geo/oce/envcomp/usgs-nsf-marine-seismic-research/nsf-usgs-final-eis-oeis_3june2011.pdf. Accessed: September 2022.

Nelms, S. E., E. M. Duncan, A. C. Broderick, T. S. Galloway, M. H. Godfrey, M. Hamann, P. K. Lindeque, and Brendan J. Godley. 2016. Plastic and Marine Turtles: a Review and Call for Research. *ICES Journal of Marine Science* 73(2):165–181. Available: https://www.semanticscholar.org/paper/Plastic-and-marine-turtles%3A-a-review-and-call-for-Nelms-Duncan/9795caeaf06327bba646f738c5607a0239d72cf6. Accessed: September 2022.

New England Fishery Management Council (NEFMC). 2016. *Omnibus Essential Fish Habitat Amendment 2, Volume 6: Cumulative Effects, Compliance with Applicable Law and References*. Available: https://s3.amazonaws.com/nefmc.org/OA2-FEIS_Vol_6_FINAL_170303.pdf. Accessed: October 2018.

New Jersey Board of Public Utilities (BPU). 2021. *NJBPU Approves Nation's Largest Combined Offshore Wind Award to Atlantic Shores and Ocean Wind II.* Press Release. Available: https://www.bpu.state.nj.us/bpu/newsroom/2021/approved/20210630.html. Accessed: July 2021.

New Jersey Business. 2020. *Paulsboro Marine Terminal Gets Record Offshore Wind Manufacturing Investment.* Available: https://njbmagazine.com/njb-news-now/paulsboro-marine-terminal-gets-biggest-offshore-wind-manufacturing-investment-in-us-history/. Accessed: July 2021.

New Jersey Department of Agriculture. *New Jersey Fishing and Aquaculture: Harvesting the Garden State's Waters.* Available: https://www.jerseyseafood.nj.gov/seafoodreport.pdf. Accessed: January 2023.

New Jersey Department of Environmental Protection (NJDEP). 2020. *New Jersey Scientific Report on Climate Change, Version 1.0*. (Eds. R. Hill, M.M. Rutkowski, L.A. Lester, H. Genievich, N.A. Procopio). Trenton, NJ. 184 pp. Available: https://dspace.njstatelib.org/xmlui/bitstream/handle/10929/68415/nj-scientific-report-2020.pdf?sequence=1&isAllowed=y. Accessed: March 2022.

New Jersey Department of Environmental Protection (NJDEP). 2021. *Draft Climate Change Resilience Strategy.* Available: https://www.nj.gov/dep/climatechange/resilience-strategy.html. Accessed: July 2021.

New Jersey Department of Environmental Protection (NJDEP). 2022. National Shellfish Sanitation Program (NSSP). Available: https://www.state.nj.us/dep/wms/bmw/nssphome.html. Accessed: December 2022.

New Jersey Division of Fish and Wildlife. 2021. *Marine Fisheries Management Rule Amendment Proposal with Amendments to Rules governing Crab and Lobster Management, Commercial Atlantic Menhaden Fishery, Marine Fisheries, and Fishery Management in New Jersey*. Published March 1, 2021, NJ Register. Available: https://www.nj.gov/dep/fgw/news/2021/marine_rules_proposed.htm. Accessed: July 2021.

New Jersey Wind Port. 2021. "*About the New Jersey Wind Port.*" Available: https://nj.gov/windport/about/index.shtml. Accessed: July 2021.

New York State Department of Environmental Conservation (NYSDEC). 2017. *New York Ocean Action Plan 2017–2027*. Available: https://www.dec.ny.gov/docs/fish_marine_pdf/nyoceanactionplan.pdf.

Normandeau Associates, Inc., Exponent, Inc., T. Tricas, and A. Gill. 2011. *Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species*. Final Report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Pacific OCS Region, Camarillo, CA. OCS Study BOEMRE 2011-09. Available: https://tethys.pnnl.gov/sites/default/files/publications/EMF_from_Undersea_Power_Cables_on_Elasmobranches.pdf.

Ocean County, New Jersey. 2011. *Ocean County Planning Board Comprehensive Master Plan*. December. Available: https://www.co.ocean.nj.us/WebContentFiles/fedb8826-cb81-4b9f-be8d-e71e4fcd1fa4.pdf. Accessed: July 2021.

Ocean County, New Jersey. 2016*. Ocean County Master Plan Amendments*. 2016. Available: https://www.planning.co.ocean.nj.us/frmSROceanCountyComprehensiveMasterPlan. Accessed: March 2022.

Ocean County, New Jersey. 2018. *Ocean County Master Plan Amendments*. 2018. Available: https://www.planning.co.ocean.nj.us/frmSROceanCountyComprehensiveMasterPlan. Accessed: March 2022.

Pace, R. M., and G. K. Silber. 2005. *Simple Analysis of Ship and Large Whale Collisions: Does Speed Kill?* Presentation at the Sixteenth Biennial Conference on the Biology of Marine Mammals, San Diego, CA, December 2005. Available: https://www.researchgate.net/publication/341001162_Pace_Silber_Vessel_Speed_and_Ship_Strikes_Poster_San_Diego_2005MMS/link/5ea95be292851cb267630d51/download.

Paruk, J. D., E. M. Adams, H. Uher-Koch, K. A. Kovach, D. Long, IV, C. Perkins, N. Schoch, and D. C. Evers. 2016. Polycylic Aromatic Hydrocarbons in Blood Related to Lower Body Mass in Common Loons. *Science of the Total Environment* 565:360–368. https://www.sciencedirect.com/science/article/abs/pii/S0048969716308531

Patenaude, N. J., W. J. Richardson, M. A. Smultea, W. R. Koski, and G. W. Miller. 2002. Aircraft Sound and Disturbance to Bowhead and Beluga Whales During Spring Migration in the Alaskan Beaufort Sea. *Marine Mammal Science* 18(2):309–335. Available: https://www.academia.edu/7642184/aircraft_sound_and_disturbance_to_bowhead_and_beluga_whales_during_spring_migration_in_the_alaskan_beaufort_sea. Accessed: September 2022.

Popper, Arthur N., Anthony D. Hawkins, Richard R. Fay, David A. Mann, Soraya Bartol, Thomas J. Carlson, Sheryl Coombs, William T. Ellison, Roger L. Gentry, Michele B. Halvorsen, Svein Løkkeborg, Peter H. Rogers, Brandon L. Southall, David G. Zeddies, and William N. Tavolga. 2014. *Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report.* Prepared by ANSI — Accredited Standards Committee S3/SC1 and Registered with ANSI. ASAPress/Springer. ASA S3/SC1.4 TR-2014. Available: https://www.researchgate.net/publication/279347068_Sound_Exposure_Guidelines/link/5596735d08ae99aa62c777b9/download.

Port of Corpus Christi 2022. *Port of Corpus Christi Ship Channel Improvement Project Included in President Biden's Proposed FY '23 Budget*, March 28, 2022. Available: https://portofcc.com/port-of-corpus-christi-ship-channel-improvement-project-included-in-president-bidens-proposed-fy-23-budget/. Accessed: May 2022.

Reuters. 2021. *US Port Spend Brings Offshore Wind Factories Closer*. Reporting by: Neil Ford. Editing by: Robin Sayles. Available: https://www.reutersevents.com/renewables/wind/us-port-spend-brings-offshore-wind-factories-closer. Accessed: July 2021.

Roman, L., B. D. Hardesty, M. A. Hindell, and C. Wilcox. 2019. A Quantitative Analysis Linking Seabird Mortality and Marine Debris Ingestion. *Scientific Reports* 9(1):1–7. Available: https://www.nature.com/articles/s41598-018-36585-9. Accessed: September 2022.

Salem County. 2021. *NJ Offshore Wind Port Project Wins National Award*, December 3, 2021. Available: https://www.salemcountynj.gov/nj-offshore-wind-port-project-wins-national-award/. Accessed: April 2022.

Samuel, Y., S. J. Morreale, C. W. Clark, C. H. Greene, and M. E. Richmond. 2005. Underwater, Low-frequency Noise in a Coastal Sea Turtle Habitat. *Journal of the Acoustical Society of America* 117(3):1465–1472. Available: https://www.researchgate.net/publication/7929208_Underwater_low-frequency_noise_in_a_coastal_sea_turtle_habitat. Accessed: September 2022/

Schaub, A., J. Ostwald, and B. M. Siemers. 2008. Foraging Bats Avoid Noise. *Journal of Experimental Biology* 211:3147–3180. Available: https://journals.biologists.com/jeb/article/211/19/3174/18275/Foraging-bats-avoid-noise. Accessed: September 2022.

Schuyler, Q. A., C. Wilcox, K. Townsend, B. D. Hardesty, and N. J. Marshall. 2014. Mistaken Identity? Visual Similarities of Marine Debris to Natural Prey Items of Sea Turtles. *BMC Ecology* 14(14). 7 pp. Avaialble: https://bmcecol.biomedcentral.com/articles/10.1186/1472-6785-14-14. Accessed: September 2022.

Secor, D. H., F. Zhang, M. H. P. O'Brien, and M. Li. 2018. Ocean Destratification and Fish Evacuation Caused by a Mid-Atlantic Tropical Storm. *ICES Journal of Marine Science* 76(2):573–584. Available: https://doi.org/10.1093/icesjms/fsx241. Accessed: September 2022.

Shigenaka, G., B, Stacy, and B. Wallace. 2021. *Oil and Sea Turtles: Biology, Planning, and Response*. NOAA Office of Restoration and Response Publication. 150 pp. Available: https://response.restoration.noaa.gov/sites/default/files/Oil_Sea_Turtles_2021.pdf. Accessed: September 2022.

Sigourney, D. B. C. D. rphanides, J. M. Hatch. 2019. *Estimates of Seabird Bycatch in Commercial Fisheries off the East Coast of the United States from 2015-2016*. NOAA Technical Memorandum NMFS-NE-252. Woods Hole, Massachusetts. 27 pp. Available: https://repository.library.noaa.gov/view/noaa/23022. Accessed: September 2022.

Simmons, A. M., K. N. Horn, M. Warnecke, and J. A. Simmons. 2016. Broadband Noise Exposure Does Not Affect Hearing Sensitivity in Big Brown Bats (Eptesicus fuscus). *Journal of Experimental Biology* 219:1031–1040. Available: https://journals.biologists.com/jeb/article/219/7/1031/17807/Broadband-noise-exposure-does-not-affect-hearing. Accessed: September 2022.

Smith, C. R., T. K. Rowles, L. B. Hart, F. I. Townsend, R. S. Wells, E. S. Zolman, B. C. Balmer, B. Quigley, M. Ivnacic, W. McKercher, M. C. Tumlin, K. D. Mullin, J. D. Adams, Q. Wu, W. McFee, T. K. Collier, and L. H. Schwacke. 2017. Slow Recovery of Barataria Bay Dolphin Health Following the Deepwater Horizon Oil Spill (2013-2014) with Evidence of Persistent Lung Disease and Impaired Stress Response. *Endangered Species Research* 33:127–142. Available: https://www.int-res.com/articles/esr2017/33/n033p127.pdf. Accessed: September 2022.

Smith, James, Michael Lowry, Curtis Champion, and Iain Suthers. 2016. A Designed Artificial Reef Is Among the Most Productive Marine Fish Habitats: New Metrics to Address Production Versus Attraction. *Marine Biology* 163:188. Available: http://www.famer.unsw.edu.au/publications/Smith2016a.pdf. Accessed: September 2022.

Snoek, R., R. de Swart, K. Didderen, W. Lengkeek, and M. Teunis. 2016. *Potential Effects of Electromagnetic Fields in the Dutch North Sea.* Phase I Final Report submitted to Rijkswaterstaat Water, Verkeer en Leefmgeving. Available: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiVnMPp4of6AhVbFmIAHYTiDpUQFnoECAMQAw&url=https%3A%2F%2Fwww.noordzeeloket.nl%2Fpublish%2Fpages%2F122296%2Fpotential_effects_of_electromagnetic_fields_in_the_dutch_north_sea_-_phase_1_desk_study_rws_wvl.pdf&usg=AOvVaw1_5LQ7sbKGZXAsivHdBB4z. Accessed: September 2022.

Snoek, R., C. Böhm, K. Didderen, W. Lengkeek, F.M.F. Driessen, M.A.M. Maathuis. 2020. *Potential Effects of Eelectromagnetic Fields in the Dutch North Sea. Phase 2 –Pilot Field Study*. Phase 2 Final Report submitted to Rijkswaterstaat Water, Verkeer en Leefmgeving. Available: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiDoIeT9If6AhU1j2oFHa-dAZAQFnoECAUQAQ&url=https%3A%2F%2Fwww.noordzeeloket.nl%2Fpublish%2Fpages%2F173407%2Fpotential_effects_of_electromagnetic_fields_in_the_dutch_north_sea_-_phase_12pilot_study_rws_wvl.pdf&usg=AOvVaw3lTx4IkLsEK62eGdy20Sfx. Accessed: September 2022.

Solomon, S., D. Qin, M. Manning, R. B. Alley, T. Berntsen, et al. 2007. *Technical Summary. Climate change 2007: The Physical Science Basis* In Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller, editors. Fourth Assessment Report of the Intergovernmental Panel on Climate Change. P. 75.Southall, B., A. Bowles, W. Ellison, J. Finneran, R. Gentry, C. Greene Jr., D. Kastak, D. Ketten, J. Miller, P. Nachtigall, W. Richardson, J. Thomas, and P. Tyack. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. *Aquatic Mammals* 33(4):411–509. Available: https://tethys.pnnl.gov/publications/marine-mammal-noise-exposure-criteria-initial-scientific-recommendations. Accessed: September 2022.

State of New Jersey. 2019. 2019 *New Jersey Energy Master Plan – Pathway To 2050*. Available: http://d31hzlhk6di2h5.cloudfront.net/20200127/84/84/03/b2/2293766d081ff4a3cd8e60aa/NJBPU_EMP.pdf. Accessed: March 2022.

State of New Jersey. 2020a. *Press Release: Governor Murphy Unveils Energy Master Plan and Signs Executive Order Directing Sweeping Regulatory Reform to Reduce Emissions and Adapt to Climate Change*. Published January 27, 2020. Available: https://www.nj.gov/governor/news/news/562020/approved/20200127a.shtml. Accessed: March 2022.

State of New Jersey. 2020b. *Governor Murphy Announces $250 Million Total Investment in State-of-the-Art Manufacturing Facility to Build Wind Turbine Components to Serve Entire U.S. Offshore Wind Industry*. December 21. Available: https://www.nj.gov/governor/news/news/562020/20201222a.shtml. Accessed: July 2021.

Sullivan, L., T. Brosnan, T. K. Rowles, L. Schwacke, C. Simeone, and T. K. Collier. 2019. *Guidelines for Assessing Exposure and Impacts of Oil Spills on Marine Mammals*. NOAA Tech. Memo. NMFS-OPR-62, 82 pp. Available: https://repository.library.noaa.gov/view/noaa/22425. Accessed: September 2022.

Takeshita, R., L. Sullivan, C. Smith, T. Collier, A. Hall, T. Brosnan, T. Rowles, and L. Schwacke. 2017. The Deepwater Horizon Oil Spill Marine Mammal Injury Assessment. *Endangered Species Research* 33:96–106. Available: https://opensky.ucar.edu/islandora/object/articles%3A19572. Accessed: September 2022.

Taormina, B, J. Bald, A. Want, G. D. Thouzeau, M. Lejart, N. Desroy, and A. Carlier. 2018. A Review of Potential Impacts of Submarine Power Cables on the Marine Environment: Knowledge Gaps, Recommendations and Future Directions. *Renewable and Sustainable Energy Reviews* 96(2018):380–391. Available: https://www.researchgate.net/publication/327079114_A_review_of_potential_impacts_of_submarine_power_cables_on_the_marine_environment_Knowledge_gaps_recommendations_and_future_directions. Accessed: September 2022.

Texas General Land Office (GLO). 2019. Texas Coastal Resiliency Master Plan – Overview. Available: https://coastalstudy.texas.gov/resources/files/2019-coastal-master-plan-overview.pdf.

Texas Parks and Wildlife Department. 2021. Fisheries Management at TPWD. Available: https://tpwd.texas.gov/fishboat/fish/management/.

The White House. 2020a. *Memorandum on the Withdrawal of Certain Areas of the United States Outer Continental Shelf from Leasing Disposition*. Available: https://trumpwhitehouse.archives.gov/presidential-actions/memorandum-withdrawal-certain-areas-united-states-outer-continental-shelf-leasing-disposition/. Accessed: April 2022.

The White House. 2020b. *Presidential Determination on the Withdrawal of Certain Areas of the United States Outer Continental Shelf from Leasing Disposition*. Available: https://trumpwhitehouse.archives.gov/presidential-actions/presidential-determination-withdrawal-certain-areas-united-states-outer-continental-shelf-leasing-disposition/. Accessed: April 2022.

Tomás, J., R. Guitart, R. Mateo, and J. A. Raga. d. Marine Debris Ingestion in Loggerhead Turtles, *Caretta caretta*, from the Western Mediterranean. *Marine Pollution Bulletin* 44:211–216.

Thomsen, Frank, A. B. Gill, Monika Kosecka, Mathias Andersson, Michel André, Seven Degraer, Thomas Folegot, Joachim Gabriel, Adrian Judd, Thomas Neumann, Alain Norro, Denise Risch, Peter Sigray, Daniel Wood, and Ben Wilson. 2015. *MaRVEN – Environmental Impacts of Noise, Vibrations and Electromagnetic Emissions from Marine Renewable Energy*. 10.2777/272281. Available: https://tethys.pnnl.gov/publications/marven-environmental-impacts-noise-vibrations-electromagnetic-emissions-marine. Accessed: September 2022.

Todd, V. L. G., I. B. Todd, J. C. Gardiner, E. C. N. Morrin, N. A. MacPherson, N. A. DiMarzio, and F. Thomsen. 2015. A Review of Impacts on Marine Dredging on Marine Mammals. *ICES Journal of Marine Science* 72(2):328–340. Available: doi:10.1093/icesjms/fsu187. Accessed: September 2022.

Tougaard, J., L. Hermannsen, and P. T. Madsen. 2020. How Loud is the Underwater Noise from Operating Offshore Wind Turbines? *Journal of the Acoustical Society of America* 148(5):2885–2893. Available: https://www.researchgate.net/publication/346282877_How_loud_is_the_underwater_noise_from_operating_offshore_wind_turbines. Accessed September 2022.

Tournadre, J. 2014. Anthropogenic Pressure on the Open Ocean: The Growth of Ship Traffic Revealed by Altimeter Data Analysis. *Geophysical Research Letters* 41:7924–7932. DOI: 10.1002/2014GL061786. Available: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2014GL061786. Accessed: September 2022.

U.S. Army Corps of Engineers (USACE). 2015a. New Jersey Department of Transportation, Permit CENAP-OP-R-2015-510-35.

U.S. Army Corps of Engineers (USACE). 2015b. New Jersey Department of Transportation, Permit CENAP-OP-R-2015-511-35.

U.S. Army Corps of Engineers (USACE). 2019. *Dredging to Start in Norfolk Harbor Inner Channels*. U.S. Army Corps of Engineers Headquarters Website. By: Vince Little. December 26. Available: https://www.usace.army.mil/Media/News/NewsSearch/Article/2047595/dredging-to-start-in-norfolk-harbor-inner-channels/. Accessed: July 2021.

U.S. Army Corps of Engineers (USACE). 2021a. *Newark Bay, New Jersey Federal Navigation Project Maintenance Dredging*. Public Notice No. Newark Bay, NJ FY21. May. Available: https://www.nan.usace.army.mil/Portals/37/docs/regulatory/publicnotices/Operation%20and%20Maintenance/2021/PN%20-%20NB21%2040%20and%2050%20foot%20Reaches.pdf. Accessed: September 2022.

U.S. Army Corps of Engineers (USACE). 2021b. *Ocean Dredged Material Disposal Site Database*. Available: https://odd.el.erdc.dren.mil/ODMDSSearch.cfm. Accessed: July 2021.

U.S. Army Corps of Engineers (USACE). 2022a. CE NAP-OPR (File Number, NAP-2021-00573-95) *Memorandum for Record: Department of the Army Environmental Assessment and Statement of Findings for the Above-Referenced Standard Individual Permit Application.*

U.S. Army Corps of Engineers (USACE). 2022b. USACE project list for Barnegat Bay. Personal communication with Brian R. Anthony, Senior Staff Biologist, U.S. Army Corps of Engineers, Philadelphia District, Regulatory Branch. April 1.

U.S. Coast Guard (USCG). 2021. *Port Access Route Study: Northern New York Bight.* USCG-2020-0278. December 2021. Available: https://www.regulations.gov/document/USCG-2020-0278-0067. Accessed: March 2022.

U.S. Department of Energy. 2021. U.S. Department of Energy Office of Energy Efficiency and Renewable Energy. Water Power Technologies Office. Tidal Testing Underway in New York's East River. January 13, 2021. Available: https://www.energy.gov/eere/water/articles/tidal-testing-underway-new-york-s-east-river. Accessed: September 2022.

U.S. Department of the Navy (Navy). 2017. C*riteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III)*. Technical report. Available: https://nwtteis.com/portals/nwtteis/files/technical_reports/Criteria_and_Thresholds_for_U.S._Navy_Acoustic_and_Explosive_Effects_Analysis_June2017.pdf.

U.S. Department of the Navy (Navy). 2018. *Hawaii-Southern California Training and Testing EIS/OEIS*. Available: https://www.hstteis.com/Documents/2018-Hawaii-Southern-California-Training-and-Testing-Final-EIS-OEIS/Final-EIS-OEIS.

Vanderlaan, A. S. M., and C. T. Taggart. 2007. Vessel Collisions with Whales: The Probability of Lethal Injury Based on Vessel Speed. *Marine Mammal Science* 23(1):144–156. Available: https://www.phys.ocean.dal.ca/~taggart/Publications/Vanderlaan_Taggart_MarMamSci-23_2007.pdf. Accessed: September 2022.

Vargo, S., P. Lutz, D. Odell, E. Van Vleet, and G. Bossart. 1986. *Effects of Oil on Marine Turtles. Final Report prepared for the Minerals Management Service (MMS).* 12 pp. Available: http://www.seaturtle.org/PDF/VargoS_1986a_MMSTechReport.pdf. Accessed: September 2022.

Vaughan, D. S. and J. T. Carmichael. 1999. Assessment of Atlantic Red Drum for 1999: Northern and Southern Regions. NOAA Technical Memorandum NMFS-SEFSC-447. 83 pp.

Vegter, A. C., M. Barletta, C. Beck, J. Borrero, H. Burton, M. L. Campbell, M. F. Costa, M. Eriksen, C. Eriksson, A. Estrades, K. V. K. Gilardi, B. D. Hardesty, J. A. Ivar do Sul, J. L. Lavers, B. Lazar, L. Lebreton, W. J. Nichols, C. A. Ribic, P. G. Ryan, Q. A. Schuyler, S. D. A. Smith, H. Takada, K. A. Townsend, C. C. C. Wabnitz, C. Wilcox, L. C. Young, and M. Hamann. 2014. Global Research Priorities to Mitigate Plastic Pollution Impacts on Marine Wildlife. *Endangered Species Research* 25:225–247. Available: https://www.int-res.com/articles/esr_oa/n025p225.pdf. Accessed: September 2022.

Verdant Power. 2021. *Press Release: Most Marine Renewable Energy Produced in the United States Has Been in New York City by Verdant Power – A Tidal Energy Company with Global Commercial Operations Underway.* New York, NY, June 23, 2021 Available: https://www.verdantpower.com/rite-performance-06-23-21. Accessed September 2022.

Virginia Marine Resources Commission. 2021. *Fisheries Management*. Virginia Marine Resources Commission, 2021. Available: https://mrc.virginia.gov/fmac/fmoverview.shtm. Accessed: September 2022.

Virginia Port Authority. 2021. *Dredging to Make Virginia the East Coast's Deepest Port is Underway*. Port of Virginia Press Release. Contact Joseph D. Harris. Available: https://www.portofvirginia.com/who-we-are/newsroom/dredging-to-make-virginia-the-east-coasts-deepest-port-is-underway/. Accessed: July 2021.

Walker, M. M., C. E. Diebel, and J. L. Kirschvink. 2003. Detection and Use of the Earth's Magnetic Field by Aquatic Vertebrates. In *Sensory Processing in Aquatic Environments*, edited by S. P. Collin and N. J. Marshall, pp. 53–74. Springer-Verlag, New York. Available: http://web.gps.caltech.edu/~jkirschvink/pdfs/WalkerAquatic.pdf. Accessed: September 2022.

Wallace, B. P., B. A. Stacey, E. Cuevas, C. Holyake, P. H. Lara, A. C. J. Marcondes, J. D. Miller, H. Nijkamp, N. J. Pilcher, I. Robinson, N. Rutherford, and G. Shigenaka. 2010. Oil Spills and Sea Turtles: Documented Effects and Considerations for Response and Assessment Efforts. *Endangered Species Research* 41:17–37.2020. Available: https://doi.org/10.3354/esr01009. Accessed September 2022.

Weilgart, Lindy. 2018. The Impact of Ocean Noise Pollution on Fish and Invertebrates. Report for OceanCare. Switzerland. Available: https://www.oceancare.org/wp-content/uploads/2017/10/OceanNoise_FishInvertebrates_May2018.pdf. Accessed: April 2020.

Werner, S., A. Budziak, J. van Franeker, F. Galgani, G. Hanke, T. Maes, M. Matiddi, P. Nilsson, L. Oosterbaan, E. Priestland, R. Thompson, J. Veiga, and T. Vlachogianni. 2016. *Harm Caused by Marine Litter. MSFD GES TG Marine Litter — Thematic Report*. JRC Technical report; EUR 28317 EN; doi:10.2788/690366. Available: https://mcc.jrc.ec.europa.eu/documents/201709180716.pdf. Accessed: September 2022.

Whitaker, J. O., Jr. 1998. Life History and Roost Switching in Six Summer Colonies of Eastern Pipistrelles in Buildings. *Journal of Mammalogy* 79(2):651–659. Available: https://watermark.silverchair.com/79-2-651.pdf. Accessed: September 2022.