Appendix F: Assessment of Resources with Moderate (or Lower) Impacts

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F.1 Introduction

To focus on the impacts of most concern in the main body of this Final PEIS, BOEM has included the analysis of resources with no greater than **moderate** adverse impacts below. These include:

- Air quality and greenhouse gas emissions
- Water quality
- Bats
- Birds
- Coastal habitat and fauna
- Sea turtles
- Wetlands
- Demographics, employment, and economics
- Land use and coastal infrastructure
- Recreation and tourism

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3.4 Physical Resources

3.4.1 Air Quality and Greenhouse Gas Emissions

This section discusses potential impacts on air quality from the Proposed Action, alternatives, and ongoing and planned activities in the air quality and GHG emissions geographic analysis area. The air quality and GHG emissions geographic analysis area, as shown on Figure 3.4.1-1, includes the airshed within 25 miles (40 kilometers) of the NY Bight lease areas and the airshed within 15.5 miles (25 kilometers) of potential onshore construction areas and activities at representative ports supporting offshore construction for the NY Bight projects. In accordance with BOEM practice, the geographic analysis area for activities on the leases encompasses the geographic region that BOEM anticipates would be subject to USEPA review as part of OCS air permitting under the Clean Air Act (CAA) (42 USC 7409) for the NY Bight projects. 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 dispersion characteristics of emissions from marine vessels, equipment, vehicles, and other similar emission sources that would be used during proposed construction activities, the maximum potential air quality impacts would likely occur within a few miles of the emissions sources. For onshore areas, BOEM selected the 15.5-mile (25-kilometer) distance to assure that the locations of maximum potential air quality impact would be considered.

The air quality impact analysis in this PEIS is intended to be incorporated by reference into the project-specific environmental analyses for individual COPs expected for each of the NY Bight lease areas. Refer to Appendix C, *Tiering Guidance,* which identifies additional analyses anticipated to be required for the project-specific environmental analysis of individual COPs.

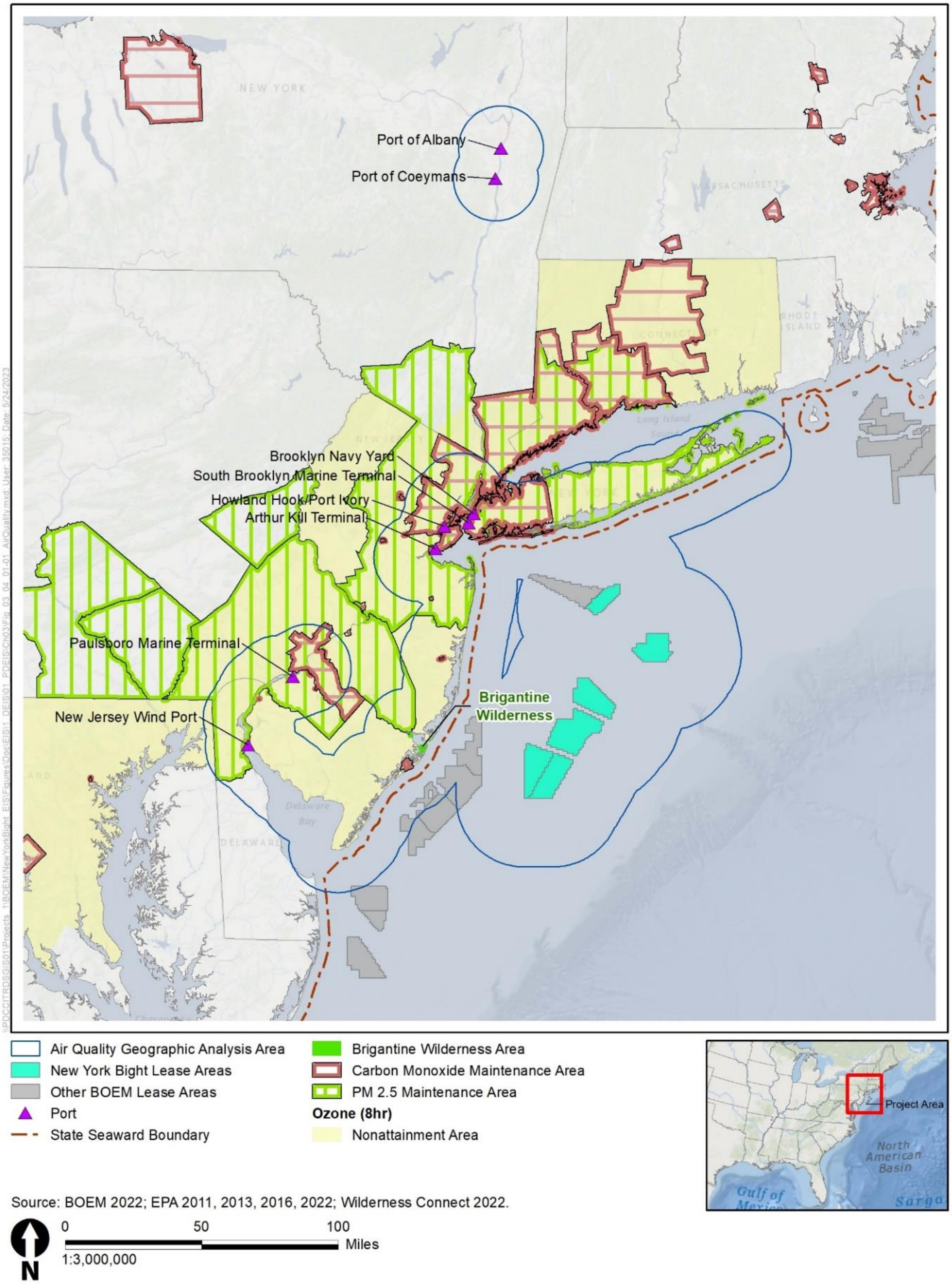

Figure 3.4.1-1. Air quality and GHG emissions geographic analysis area and attainment status

3.4.1.1 Description of the Affected Environment and Future Baseline Conditions

The overall geographic analysis area for air quality covers portions of northern and central Delaware, northeastern New Jersey, New York City, and Long Island; the area around the Port of Albany, New York; and over the ocean southeast of New York Harbor, as well as much of southern New Jersey and the adjacent portions of Delaware Bay and the Atlantic Ocean. This includes the air above the NY Bight projects and adjacent OCS area, potential offshore and onshore export cable routes, onshore substations and converter stations, construction staging areas, onshore construction and proposed project-related sites, and ports used to support construction and O&M activities. Appendix B, *Supplemental Information and Additional Figures and Tables,* provides information on climate and meteorological conditions in the NY Bight region.

Air quality within a region is measured in comparison to the National Ambient Air Quality Standards (NAAQS), which are established by USEPA pursuant to the CAA (42 USC 7409) for several common pollutants, known as criteria pollutants, to protect human health and welfare. The criteria pollutants are carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM) with diameter of 10 microns and smaller (PM_{10}), particulate matter with diameter of 2.5 microns and smaller ($PM_{2.5}$), and sulfur dioxide (SO_2). Table B.1-11 in Appendix B shows the NAAQS. New York and New Jersey have established ambient air quality standards (AAQS) that are similar to the NAAQS. Emissions of lead from offshore wind projects would be negligible because lead is not a component of liquid or gaseous fuels; accordingly, lead is not analyzed in this PEIS. Ozone is not emitted directly but is formed in the atmosphere from precursor chemicals, primarily nitrogen oxides (NO_X) and VOCs, in the presence of sunlight. Potential impacts of a project on O_3 levels are evaluated in terms of NO_X and VOC emissions.

USEPA designates all areas of the country as attainment, nonattainment, or unclassified for each criteria pollutant. An attainment area is an area where all criteria pollutant concentrations are within all NAAQS. A nonattainment area does not meet the NAAQS for one or more pollutants. Unclassified areas are those where attainment status cannot be determined based on available information and are regulated as attainment areas; this includes all of the OCS. An area can be in attainment for some pollutants and nonattainment for others. If an area was nonattainment at any point in the last 20 years but currently meets the NAAQS, then the area is designated a maintenance area. Nonattainment and maintenance areas are required to prepare a State Implementation Plan (SIP), which describes the region's program to attain and maintain compliance with the NAAQS. The attainment status of an area can be found at 40 CFR part 81 and in the USEPA Green Book (USEPA 2022). Attainment status for criteria pollutants is determined through evaluation of air quality data from a network of monitors.

The nearest onshore designated areas to the NY Bight lease areas are the New York City boroughs of Brooklyn, Queens, and Staten Island; the southern portion of Nassau County and the southwestern portion of Suffolk County, New York; and the northeastern portion of Monmouth County, New Jersey, as well as Ocean, Atlantic, and Cape May Counties in New Jersey. Parts or all of these counties are in designated nonattainment or maintenance areas for CO, $PM_{2.5}$, or O_3. The nonattainment areas include facilities that the NY Bight projects could use at the Port of Albany, Port of Coeymans, Brooklyn Navy Yard, South Brooklyn Marine Terminal, Howland Hook/Port Ivory, Arthur Kill Terminal, Paulsboro Marine

Terminal, and the New Jersey Wind Port. Figure 3.4.1-1 displays the nonattainment and maintenance areas[1] that intersect the geographic analysis area.

The CAA prohibits federal agencies from approving any activity that does not conform to a SIP. This prohibition applies only with respect to nonattainment or maintenance areas. Conformity to a SIP means conformity to a SIP's purpose of reducing the severity and number of violations of the NAAQS to achieve attainment of such standards. The activities for which BOEM has authority are outside of any nonattainment or maintenance area and therefore not subject to the requirement to show conformity. However, agencies issuing future approvals related to offshore wind projects in the NY Bight are responsible for evaluating the applicability of the CAA General Conformity requirements to their actions.

The CAA defines Class I areas as certain national parks and wilderness areas where very little degradation of air quality is allowed. Class I areas consist of national parks larger than 6,000 acres and wilderness areas larger than 5,000 acres that were in existence before August 1977. Projects subject to federal permits are required to notify the federal land manager responsible for designated Class I areas within 62 miles (100 kilometers) of a project.[2] The federal land manager identifies appropriate air quality–related values for the Class I area and evaluates the impact of a project on air quality–related values. The Brigantine Wilderness Area, approximately 35 miles (56 kilometers) southwest of the nearest edge of the NY Bight lease areas, is the only Class I area within 62 miles (100 kilometers) of the NY Bight projects. Air quality–related values identified by the U.S. Fish and Wildlife Service (USFWS) for Brigantine Wilderness include aquatic resources, fauna/wildlife, soils, vegetation, visibility, and acidic deposition (CSU 2022). Because there is the potential to affect a Class I area, these impacts will need to be evaluated for each NY Bight project within 62 miles (100 kilometers) of the Brigantine Wilderness Area.

The CAA amendments (42 USC 7401 et seq., Section 328) directed USEPA to establish requirements to control air pollution from the Atlantic OCS. The OCS Air Regulations (40 CFR 55) establish the applicable air pollution control requirements, including provisions related to permitting, monitoring, reporting, fees, compliance, and enforcement for facilities subject to the CAA. These regulations apply to OCS sources that are beyond state seaward boundaries. Projects within 25 nautical miles (46 kilometers) of a state seaward boundary are required to comply with the air quality requirements of the nearest or corresponding onshore area, including applicable permitting requirements.

3.4.1.2 Impact Level Definitions for Air Quality and Greenhouse Gas Emissions

Definitions of adverse impact levels are provided in Table 3.4.1-1. Beneficial impacts on air quality are described using the definitions described in Section 3.3.2 (Table 3.3-1). Impact levels for air quality are

[1] Figure 3.4.1-1 also indicates the nonattainment area for the 1979 1-hour ozone NAAQS, which USEPA has revoked; however, this area still must meet the provisions of the former State Implementation Plan for the 1-hour ozone standard.
[2] The 100-kilometer distance applies to notification and is not a threshold for use in evaluating impacts. Impacts at Class I areas at distances greater than 100 kilometers may need to be considered for larger emission sources if there is reason to believe that such sources could affect the air quality in the Class I area (USEPA 1992).

intended to serve NEPA purposes only, and are not intended to establish thresholds or other requirements with respect to permitting under the CAA.

Table 3.4.1-1. Adverse impact level definitions for air quality and GHG emissions

Impact Level	Definition
Negligible	Increases in ambient pollutant concentrations due to project emissions would be so small that they would be extremely difficult or impossible to discern or measure.
Minor to Moderate	Increases in ambient pollutant concentrations due to project emissions would be detectable but would not lead to exceedance of the NAAQS.
Major	Increases in ambient pollutant concentrations due to project emissions potentially would lead to exceedance of the NAAQS.

Accidental releases and air emissions are contributing IPFs to impacts on air quality. However, these IPFs may not necessarily contribute to each individual issue outlined in Table 3.4.1-2.

Table 3.4.1-2. Issues and indicators to assess impacts on air quality and GHG emissions

Issue	Impact Indicator
Compliance with NAAQS	Emissions (U.S. tons per year) during construction, operation, and conceptual decommissioning from marine vessels, vehicles, and equipment activity within 25 miles of the outer edge of the NY Bight lease areas. The significance thresholds for criteria pollutants are the NAAQS.
GHG emissions	GHG emissions (metric tons per year) during construction, operation, and conceptual decommissioning; operational GHG emissions reductions due to displacement of fossil-fuel power plants by wind energy. There are currently no significance thresholds for GHG emissions.

3.4.1.3 Impacts of Alternative A – No Action – Air Quality and Greenhouse Gas Emissions

When analyzing the impacts of the No Action Alternative on air quality, BOEM considered the impacts of past and ongoing trends and activities, including ongoing non-offshore-wind and ongoing offshore wind activities on the baseline conditions for air quality. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore-wind and offshore wind activities, which are described in Appendix D, *Planned Activities Scenario*.

3.4.1.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for air quality described in Section 3.4.1.1, *Description of the Affected Environment and Future Baseline Conditions*, would continue to follow current regional trends, and respond to IPFs introduced by other ongoing non-offshore-wind and offshore wind activities. Ongoing non-offshore-wind activities within the geographic analysis area that contribute to impacts on air quality are generally associated with existing onshore land uses, including residential, commercial, industrial, and transportation activities as well as onshore construction activities. Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on air quality include ongoing construction of Ocean Wind 1 (OCS-A 0498) and Empire Wind (OCS-A 0512). Ongoing construction of Ocean Wind 1 and Empire Wind would have the same types of impacts on air quality that are described in Section 3.4.1.3.2, *Cumulative Impacts of the No Action Alternative,* for all ongoing and planned offshore wind activities in the geographic analysis area.

In March 2023, DOE announced the release of its Offshore Wind Energy Strategy, a comprehensive summary of DOE's efforts to meet President Biden's goal[3] to deploy 30 GW of offshore wind energy by 2030 and set the nation on a pathway to 110 GW or more by 2050. In addition, states in the region have developed policies and plans to encourage and develop renewable energy sources in the region, as summarized below.

New York

Power sector trends in New York State indicate that without recent GHG reduction initiatives, the largest shares of total electricity generation would remain natural gas, nuclear, and imported power. With the last coal-fired plants in New York having closed in 2020, future emissions would decrease slightly due to improvements in efficiency (New York State Climate Action Council 2022). Under the No Action Alternative, without implementation of other offshore wind projects, the electricity that would have been generated by offshore wind would likely be provided by a similar mix of generation sources (the "grid mix"), with an increased reliance on solar power and other renewable energy sources to meet New York State's renewable energy goals, as discussed further below (New York State Climate Action Council 2022).

In 2014, Governor Andrew Cuomo launched an energy policy, Reforming the Energy Vision, to build an integrated energy network able to harness the combined benefits of the central grid with clean, locally generated power. The State Energy Plan (New York State 2015) set a roadmap for the Reforming the Energy Vision policy, combining agency coordination, regulatory reform, and measures to encourage private capital investment. The initiatives outlined in the State Energy Plan, along with private sector innovation and investment fueled by Reforming the Energy Vision, were intended to put New York State on a path to achieving the following GHG emissions limits and clean energy goals:

- 40 percent reduction in GHG emissions from 1990 levels.
- 50 percent of energy generation from renewable energy sources.
- 600 trillion British thermal unit–increase in statewide energy efficiency (reduction in energy use through efficiency improvements).

In 2019, the New York State Climate Leadership and Community Protection Act (CLCPA) set an expanded Clean Energy Standard and provided statutory requirements that supersede the Reforming the Energy Vision policy and State Energy Plan goals. The CLCPA requires that 70 percent of New York's electricity come from renewable sources by 2030 and 100 percent of electricity come from zero-emission sources

[3] Executive Order on Tackling the Climate Crisis at Home and Abroad, January 27, 2021.

by 2040. In addition, the CLCPA requires that New York reduce statewide GHG emissions to at least 40 percent below 1990 levels by 2030 and at least 85 percent below 1990 levels by 2050.

Lastly, NYSERDA led the development of the New York State Offshore Wind Master Plan and is leading the coordination of offshore wind opportunities in New York State and supporting the development of 9,000 MW of offshore wind energy by 2035.

New Jersey

The New Jersey Department of Environmental Protection (NJDEP) has projected that under a scenario of continuation of current regulations and policies, emissions from electricity generation would decline slowly through 2050 due to improvements in efficiency and switching to cleaner fuels (NJDEP 2019). Under the No Action Alternative, without implementation of other offshore wind projects, the electricity that would have been generated by offshore wind would likely be provided by fossil fuel-fired facilities.[4] As a result, a continuation of ongoing activities under the No Action Alternative could lead to less decline in emissions than would occur with offshore wind development. An overall mix of natural gas, solar, wind, and energy storage would likely occur in the future due to market forces and state energy policies. New Jersey Executive Order 307 (September 21, 2022) sets a goal of developing 11,000 MW of offshore wind energy off the coast of New Jersey by 2040. The New Jersey Energy Master Plan (New Jersey Board of Public Utilities 2019) sets a goal of transitioning New Jersey to 100 percent renewable electricity by 2050. In addition to electricity generation, emissions from other ongoing activities including vessel and vehicle emissions and accidental releases of fuel or other hazardous material would continue to contribute to ongoing regional air quality impacts.

3.4.1.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore-wind activities and planned offshore wind activities (without the six NY Bight projects).

Planned non-offshore-wind activities that could contribute to air quality impacts include construction of undersea transmission lines and transmission systems, gas pipelines, and other submarine cables; marine minerals use and ocean-dredged material disposal; military use; marine transportation; oil and gas activities; and onshore development activities (Appendix D). These planned non-offshore-wind activities have the potential to affect air quality through their emissions. Impacts associated with climate change could affect ambient air quality through increased formation of ozone and PM associated with increasing air temperatures.

Ongoing and planned offshore wind activities within the geographic analysis area that contribute to impacts on air quality and greenhouse gas emissions are listed in Table 3.4.1-3.

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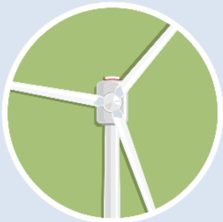
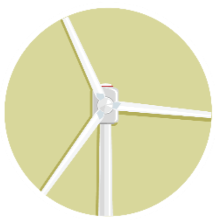
[4] In 2020, the generation mix of the PJM Interconnection, the regional grid that serves New Jersey, was approximately 40 percent natural gas, 34 percent nuclear, 19 percent coal, 3 percent wind, 2 percent hydroelectric, and 2 percent other sources, on an annual average basis (Monitoring Analytics 2021).

Table 3.4.1-3. Ongoing and planned offshore wind in the geographic analysis area for air quality and GHG emissions

Ongoing/Planned	Projects by Region
Ongoing – 3 projects[1] 	**NY/NJ** • Ocean Wind 1 (OCS-A 0498) • Empire Wind 1 (OCS-A 0512) • Empire Wind 2 (OCS-A 0512)
Planned – 3 projects[2] 	**NY/NJ** • Ocean Wind 2 (OCS-A 0532) • Atlantic Shores North (OCS-A 0549) • Atlantic Shores South (OCS-A 0499)

NJ = New Jersey; NY = New York

Note: The 15.5-mile onshore buffer of the air quality geographic analysis area overlaps with a very small portion of the Garden State Offshore Energy (GSOE) I (OCS-A 0482) lease area. BOEM has not included the GSOE I project in the air quality analysis because the overlap is small and it is unlikely any onshore component of the NY Bight projects would be located in the southern part of New Jersey within 15.5 miles of the GSOE I lease area. Additionally, BOEM is including estimated emissions for the complete buildout of the Ocean Wind 1, Ocean Wind 2, and Atlantic Shores South lease areas in the analysis even though only a portion of those lease areas fall within the geographic analysis area (see Figure 3.4.1-1). Therefore, even by excluding the GSOE I project, BOEM's analysis likely overestimates the emissions for the No Action Alternative and the cumulative analysis of air quality impacts.

[1] Refer to footnotes 9 and 10 in PEIS Chapter 1 for additional information on the status of Ocean Wind 1, Empire Wind 1, and Empire Wind 2.

[2] Status as of September 20, 2024.

BOEM expects ongoing and planned offshore wind activities to affect air quality through the following primary IPFs.

Air emissions: Most air pollutant emissions and air quality impacts from ongoing and planned offshore wind projects would occur during construction, potentially from multiple projects occurring simultaneously. All projects would be required to obtain an OCS air quality permit from USEPA and to comply with any other applicable requirements of the CAA. Primary emission sources would include increased public and commercial vehicular traffic, air traffic, combustion emissions from construction equipment, and fugitive particle emissions from construction-generated dust. As wind energy projects come online, power generation emissions overall could decrease, and the region as a whole could realize a net benefit to air quality.

The ongoing and planned offshore wind projects that may result in air pollutant emissions and air quality impacts within the air quality geographic analysis area would produce an estimated 9,561 MW of renewable power from the installation of 697 WTGs (Appendix D, Table D2-1). Based on the assumed offshore construction schedule in Appendix D, Table D2-1, those projects within the geographic analysis area would have overlapping construction periods beginning in 2024 and continuing through 2030.

During the construction phase, the total emissions of criteria pollutants and O_3 precursors from offshore wind projects other than the NY Bight projects proposed within the air quality geographic analysis area, summed over all construction years, are estimated to be 11,582 tons of CO, 47,127 tons of NO_X, 1,501 tons of PM_{10}, 1,361 tons of $PM_{2.5}$, 635 tons of SO_2, 1,811 tons of VOCs, and 3,043,329 tons of carbon dioxide (CO_2) (Appendix D, Table D2-4). Most emissions would occur from diesel-fueled construction equipment, vessels, and commercial vehicles. The magnitude of the emissions and the resulting air quality impacts would vary spatially and temporally during the construction phases. Construction activity would occur at different locations and could overlap temporally with activities at other locations, including operational activities at previously constructed projects. As a result, air quality impacts would be minor to moderate, shifting spatially and temporally across the air quality geographic analysis area. Conceptual decommissioning would involve vessels and equipment similar to those used for construction, and impacts of conceptual decommissioning are expected to be similar to the impacts of construction.

During operations, emissions from offshore wind projects within the air quality geographic analysis area would overlap temporally, but operations would contribute few criteria pollutant emissions compared to construction and conceptual decommissioning. Operational emissions would come largely from commercial vessel traffic and emergency diesel generators. The aggregate operational emissions for all projects within the air quality analysis area would vary by year as successive projects begin operation. Estimated operational emissions would be 228–694 tons per year of CO, 479–1,963 tons per year of NO_X, 13–60 tons per year of PM_{10}, 12–55 tons per year of $PM_{2.5}$, 7–17 tons per year of SO_2, 21–59 tons per year of VOCs, and 45,918–159,045 tons per year of CO_2 (Appendix D, Table D2-4)[5]. Cumulatively, operational emissions would result in negligible air quality impacts because emissions would be intermittent, localized, and dispersed throughout the lease areas and vessel routes from the onshore O&M facilities.

Offshore wind energy development could help reduce emissions from onshore energy sources, potentially improving regional air quality and reducing GHGs. Millstein et al. (2018) estimated that between 2007 and 2015, wind power in the U.S. avoided as much as 127,698,000 metric tons (MT) of CO_2 per year, 147,000 MT of SO_2 per year, 93,000 MT of NO_X per year, and 9,000 MT of $PM_{2.5}$ per year. A study by DOE estimated emissions for a future scenario with wind energy supplying 10 percent of total U.S. electricity demand by 2020, 20 percent by 2030, and 35 percent by 2050. The study estimated cumulative emissions reductions from 2013 to 2050 of 2.6 million MT of SO_2, 4.7 million MT of NO_X, and 0.5 million MT of $PM_{2.5}$ (DOE 2015). Similarly, the study scenario was estimated to reduce GHG emissions in the electric sector by 130 million MT of CO_2 equivalent (CO_2e) in 2020, 380 million MT CO_2e in 2030, and 510 million MT CO_2e in 2050 (DOE 2015).

An analysis by Barthelmie and Pryor (2021) calculated that, depending on global trends in GHG emissions and the amount of wind energy expansion, development of wind energy could reduce

[5] Aggregate operational emissions do not include operational emissions from Atlantic Shores North, as such emissions are not available in Appendix D, Table D2-4.

predicted increases in global surface temperature by 0.5–1.4 degrees Fahrenheit (°F) (0.3–0.8 degrees Celsius [°C]) by 2100.

Estimations and evaluations of potential health and climate benefits from offshore wind activities for specific regions and project sizes rely on information about the air pollutant emission contributions of the existing and projected mixes of power generation sources, and generally estimate the annual health benefits of an individual commercial scale offshore wind project to be valued in the hundreds of millions of dollars (Kempton et al. 2005; Buonocoure et al. 2016).

The potential health benefits of avoided emissions can be evaluated using USEPA's CO-Benefits Risk Assessment (COBRA) health impacts screening and mapping tool (USEPA 2020a). COBRA is a tool that estimates the health and economic benefits of clean energy policies. For example, COBRA was used to analyze the avoided emissions that were calculated for development of 8.6 GW of reasonably foreseeable wind power on the OCS. Table 3.4.1-4 presents the estimated monetized health benefits and avoided mortality for this example scenario.

Table 3.4.1-4. COBRA estimate of annual avoided health effects with 8.6 GW reasonably foreseeable offshore wind power

Discount Rate[1] (2023)	Monetized Total Health Benefits (million U.S. dollars/year)		Avoided Mortality (cases/year)	
	Low Estimate[2]	High Estimate[2]	Low Estimate[2]	High Estimate[2]
3%	$288	$649	25.868	58.534
7%	$252	$571	25.868	58.534

[1] The discount rate is used to express future economic values in present terms. Not all health effects and associated economic values occur in the year of analysis. Therefore, COBRA accounts for the "time value of money" preference (i.e., a general preference for receiving economic benefits now rather than later) by discounting benefits received later (USEPA 2020b).
[2] The low and high estimates are derived using two sets of assumptions about the sensitivity of adult mortality and non-fatal heart attacks to changes in ambient $PM_{2.5}$ levels. Specifically, the high estimates are based on studies that estimated a larger effect of changes in ambient $PM_{2.5}$ levels on the incidence of these health effects (USEPA 2020b).

BOEM anticipates that the air quality impacts associated with ongoing and planned offshore wind activities in the geographic analysis area would result in minor to moderate adverse impacts due to emissions of criteria pollutants, VOCs, HAPs, and GHGs, mostly released during construction and conceptual decommissioning. Impacts would be minor to moderate because these emissions would increase ambient pollutant concentrations, though not by enough to cause a violation of the NAAQS, New Jersey AAQS, or New York AAQS. Offshore wind projects likely would lead to reduced emissions from fossil-fuel power plants and consequently minor to moderate beneficial impacts on air quality (see Table 3.3-1 for definitions of beneficial impacts).

Construction and operation of ongoing and planned offshore wind projects would produce GHG emissions that would contribute to climate change. CO_2 is relatively stable in the atmosphere and, for the most part, mixed uniformly throughout the troposphere and stratosphere. As such, the impact of GHG emissions does not depend upon the source location. Increasing energy production from offshore wind projects could reduce regional GHG emissions by displacing energy from fossil fuels. The amount of emissions reduction from displaced generation is uncertain because the future grid mix is not known. This reduction would likely more than offset the relatively small GHG emissions from offshore wind projects. This reduction in regional GHG emissions would be noticeable in the regional context and contribute to addressing climate change, and would represent a minor to moderate beneficial impact in the regional context but a negligible beneficial impact in the global context (see Table 3.3-1 for definitions of beneficial impacts).

Accidental releases: Ongoing and planned offshore wind activities could release air toxics or HAPs because of accidental chemical spills within the air quality geographic analysis area. Section 3.4.2, *Water Quality*, includes a discussion of the nature of releases anticipated. Based on Appendix D, Table D2-3, up to about 2,022,116 gallons (7.7 million liters) of coolants, 4,583,097 gallons (17.3 million liters) of oils and lubricants, and 743,373 (2.8 million liters) of diesel fuel would be contained in the 738 wind turbine and substation structures for the wind energy projects within the air quality geographic analysis area. If accidental releases occur, they would be most likely during construction but could occur during operations and conceptual decommissioning of offshore wind facilities. These may lead to short-term periods (hours to days)[6] of HAPs emissions through surface evaporation. HAPs emissions would consist of VOCs, which are important for O_3 formation. By comparison, the smallest tanker vessel operating in these waters (a general-purpose tanker) has a capacity of between 3.2 and 8 million gallons (12.1 million and 30.3 million liters). Tankers are relatively common in these waters, and the total WTG chemical storage capacity within the geographic analysis area for air quality is much less than the volume of hazardous liquids transported by ongoing activities (U.S. Energy Information Administration 2014). BOEM expects air quality impacts from accidental releases would be negligible because impacts would be short term and limited to the area near the accidental release location. Accidental spills would occur infrequently over a 35-year period with a higher probability of spills during future project construction, but they would not be expected to contribute appreciably to cumulative impacts on air quality.

3.4.1.3.3 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, air quality would continue to be affected by existing environmental trends and ongoing activities. More, higher-emitting, fossil-fuel power plants would be kept in service to meet future power demand under the No Action Alternative compared to the action alternatives. These impacts would be partially mitigated once the approved Ocean Wind 1 offshore wind project is operational. BOEM expects ongoing offshore wind and non-offshore-wind activities would continue to have regional air quality impacts primarily through air pollutant emissions, accidental releases, and climate change. BOEM anticipates that ongoing activities would likely result in **moderate** impacts on air quality because of air pollutant emissions and GHGs.

Cumulative Impacts of the No Action Alternative. Under the No Action Alternative, air quality would continue to be affected by natural and human-caused IPFs. Planned non-offshore-wind activities may also contribute to impacts on air quality because air pollutant and GHG emissions would increase through construction and operation of new energy generation facilities to meet future power demands. Continuation of current regional trends in energy development could include new power plants that

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[6] For example, small diesel fuel spills (500–5,000 gallons) usually will evaporate and disperse within a day or less (NOAA 2006).

could contribute to air quality and GHG impacts in New York, New Jersey, and the neighboring states. BOEM expects the combination of ongoing and planned activities other than offshore wind to result in **moderate** impacts on air quality, primarily driven by recent market and permitting trends indicating future fossil-fueled electric generating units would most likely include natural-gas-fired facilities (BOEM 2017a; BOEM 2021).

Offshore wind activities in the geographic analysis area would contribute to the emissions of criteria pollutants, VOCs, HAPs, and GHGs, mostly released during construction and conceptual decommissioning. Impacts would be minor to moderate because these emissions would increase ambient pollutant concentrations, though not by enough to cause a violation of the NAAQS, New Jersey AAQS, or New York AAQS or contribute substantially to an existing violation. Pollutant emissions during operations would be generally lower and more transient. Most air pollutant emissions and air quality impacts would occur during multiple overlapping project construction phases from 2024 through 2030 (Appendix D, Table D2-4). Overall, adverse air quality impacts from offshore wind projects are expected to be relatively small and transient. Offshore wind projects likely would lead to reduced emissions from fossil-fuel power plants and consequently **minor** to **moderate beneficial** impacts on regional air quality after offshore wind projects are operational.

BOEM anticipates that the cumulative impacts of the No Action Alternative would likely result in **moderate** impacts due to emissions of criteria pollutants, VOCs, and HAPs, mostly released during construction and conceptual decommissioning. Impacts would be **moderate** because these emissions would increase ambient pollutant concentrations (more than would activities without offshore wind or offshore wind alone), though not by enough to cause a violation of the NAAQS, New Jersey AAQS, or New York AAQS or contribute substantially to an existing violation.

3.4.1.4 Impacts of Alternative B – No Identification of AMMM Measures at the Programmatic Stage – Air Quality and Greenhouse Gas Emissions

Alternative B considers the potential impacts of future offshore wind development for the NY Bight area without the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts.

3.4.1.4.1 Impacts of One Project

A single NY Bight project may generate emissions and affect air quality in the New York-New Jersey region and nearby coastal waters during construction and installation, O&M, and conceptual decommissioning activities. Onshore emissions would occur in the onshore export cable corridors and at POIs. Offshore emissions would be released over the OCS and state waters. Offshore emissions would occur in any one of the six NY Bight lease areas and the offshore export cable corridors.

The emissions estimates in this section do not include emissions from raw material extraction, materials processing, and manufacturing of components, i.e., full life-cycle analysis. However, recently published studies have analyzed the life-cycle impacts of offshore wind (Ferraz de Paula and Carmo 2022; Rueda-Bayona et al. 2022; Shoaib 2022). These studies concluded that the materials that have the greatest impact on life-cycle emissions generally are steel and concrete, and that materials recycling rates have a large influence on life-cycle emissions. The National Renewable Energy Laboratory (NREL) harmonized approximately 3,000 life cycle assessment studies with around 240 published life-cycle analyses of land-based and offshore wind technologies (NREL 2021). Though wind has higher upstream emissions than many other generation methods, its life-cycle GHG emissions are orders of magnitude lower. NREL (2021) estimated that the central 50 percent of GHG estimates reviewed were in the range of 9.4–14 grams of CO_2e per kilowatt-hour (g CO_2-eq/kWh) while life-cycle GHG estimates for coal and natural gas are on the scale of 1,000 grams CO_2-eq/kWh (Dolan and Heath 2012) and 480 grams CO_2-eq/kWh (O'Donoughue et al. 2014), respectively.

One NY Bight project would provide beneficial impacts on the air quality near the proposed location and the surrounding region to the extent that energy produced by that one project would displace energy produced by fossil-fuel power plants.

Air emissions – construction: Fuel combustion and solvent use would cause construction-related emissions. The air pollutants would include criteria pollutants, VOCs, and HAPs, as well as GHGs. During the construction phase, the activities of additional workers, increased traffic congestion, additional commuting miles for construction personnel, and increased air-polluting activities of supporting businesses also could have impacts on air quality. BOEM used its Wind Tool model (BOEM 2017b) to estimate the construction emissions for a single NY Bight project based on a maximum-case scenario (280 WTGs and 5 OSSs) of the RPDE. The total estimated construction emissions of each pollutant are summarized in Table 3.4.1-5. BOEM assumes that construction of a NY Bight project would start in 2026 at the earliest. The duration of construction for a single NY Bight project is anticipated to occur during the period of 2026–2030, and possibly beyond.

Table 3.4.1-5. Total construction emissions (U.S. tons, except GHGs in metric tons) for a single NY Bight project

Period	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	CO_2	CH_4	N_2O	CO_2e
Total	5,555	26,104	527	504	1,014	755	1,533,965	10	75	1,556,503

CH_4 = methane; CO_2e = carbon dioxide equivalent; N_2O = nitrous oxide
CO_2e values were calculated using the 100-year Global Warming Potential (GWP) values from the Intergovernmental Panel on Climate Change's (IPCC) Fourth Assessment Report (Forster et al. 2007).

Offshore Construction

Emissions from potential sources or construction activities would vary throughout the construction and installation of offshore components. Emissions from offshore activities would occur during pile and scour protection installation, offshore cable laying, turbine installation, and substation/converter station installation. Offshore construction-related emissions also would come from diesel-fueled generators used to temporarily supply power to the WTGs and substation/converter stations so that workers could operate lights, controls, and other equipment before cabling is in place. There also would be emissions from engines used to power pile-driving hammers and air compressors used to supply compressed air to noise-mitigation devices during pile-driving (if used). Emissions from vessels and helicopters used to transport workers, supplies, and equipment to and from the construction areas would result in additional air quality impacts. A NY Bight project may need to use emergency generators at times, potentially resulting in increased emissions for limited periods.

Air quality impacts due to a single NY Bight project within the air quality geographic analysis area are anticipated to be small relative to larger emission sources such as fossil-fuel power plants.[7] The largest air quality impacts are anticipated during construction, with smaller and more infrequent impacts anticipated during conceptual decommissioning.

The majority of air pollutant and GHG emissions from a single NY Bight project alone would come from the main engines, auxiliary engines, and auxiliary equipment on marine vessels used during offshore construction activities. Emissions from the OCS source, as defined in the CAA, would be allowed as part of the OCS permit for which each project must apply. A NY Bight project must demonstrate compliance with the NAAQS and must demonstrate no adverse impact on air quality–related values. The OCS air permitting process includes air dispersion modeling of emissions to demonstrate compliance with the NAAQS. As part of the air quality–related values analysis, a NY Bight project must demonstrate that significant visibility degradation at a Class I area would not occur as a result of increased haze or plumes.

Onshore Construction

Onshore activities of a NY Bight project would consist primarily of tunneling/drilling/excavation for cable installation, duct bank construction, cable-pulling operations, and substation or converter station construction. Emissions would be primarily from operation of diesel-powered equipment and vehicle activity such as bulldozers, excavators, and diesel trucks, and fugitive particulate emissions from excavation and hauling of soil.

These emissions would be highly variable and limited in spatial extent at any given period and would result in minor to moderate impacts (less than the NAAQS), as they would be temporary in nature. Fugitive particulate emissions would vary depending on the spatial extent of the excavated areas, soil type, soil moisture content, and magnitude and direction of ground-level winds.

Air emissions – O&M: During O&M, air quality impacts are anticipated to be smaller in magnitude compared to construction and conceptual decommissioning. Offshore O&M activities would consist of WTG operations, planned maintenance, and unplanned emergency maintenance and repairs. The WTGs operating would have no pollutant emissions. The WTGs are not anticipated to include permanently installed emergency generators; however, a temporary backup diesel generator may be installed at a turbine during the commissioning phase until the grid connection is made. Emergency generators on the substations/converter stations would operate only during emergencies or testing, so emissions from these sources would be small and transient. Pollutant emissions from O&M would be mostly the result of operations of ocean vessels and helicopters used for maintenance activities. Crew transfer vessels and helicopters would transport crews to the NY Bight offshore project area for inspections, routine

[7] For example, the annual operational emissions from a single NY Bight project would represent the following percentages of the emissions from fossil-fuel power plants in New Jersey, based on the USEPA 2020 National Emissions Inventory (USEPA 2023): CO 2%; NO_X 7%; PM_{10}, $PM_{2.5}$, and SO_2 less than 1% each; and VOC less than 2%.

maintenance, and repairs. Jack-up vessels, multipurpose offshore support vessels, and rock-dumping vessels would travel infrequently to the NY Bight offshore project area for significant maintenance and repairs. The annual estimated emissions for O&M of one NY Bight project are summarized in Table 3.4.1-6.

Table 3.4.1-6. Operations and maintenance (O&M) emissions (U.S. tons, except GHGs in metric tons) from a single NY Bight project

Period	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	CO_2	CH_4	N_2O	CO_2e
Annual	52	227	5	4	9	5	12,505	0.1	0.6	13,971
Operating Lifetime (35 years)	1,810	7,928	159	154	308	186	437,688	4	21	488,998

CH_4 = methane; CO_2e = carbon dioxide equivalent; N_2O = nitrous oxide
CO_2e values were calculated using the 100-year GWP values from the IPCC's Fourth Assessment Report (Forster et al. 2007).

If one NY Bight project were to use switchgear containing the GHG SF_6, then additional GHG emissions could occur from leakage of SF_6 from switchgear. SF_6 is a synthetic gas that has been used as an anti-arcing insulator in electrical systems for approximately 70 years. It is a dense gas and a potent GHG, with an environmental lifespan of thousands of years. There are international efforts to minimize and eventually phase out the production and use of this gas. Potential emissions of SF_6 are not shown in Table 3.4.1-6 because it is unknown whether SF_6 would be used. Based on other projects, if SF_6 were used in all project switchgear then the total quantity of SF_6 contained in project switchgear could be about 66,400 pounds (30,100 kilograms). At an assumed leakage rate of 0.5 percent per year, the GHG emissions from this quantity of SF_6 would be 3,431 metric tons of CO_2e per year. However, this is a conservative assumption because SF_6 may not be used.

Depending on the wind conditions at the time of emissions, it is likely that not all emissions generated offshore would reach land. BOEM anticipates that air quality impacts from O&M of one NY Bight project would be minor (less than the NAAQS), occurring for short periods of time several times per year during the estimated 35 years of activity.

Emissions from onshore O&M activities would be limited to periodic use of construction vehicles and equipment. Onshore O&M activities would include occasional inspections and repairs to onshore substations/converter stations and splice vaults, which would require minimal use of worker vehicles and construction equipment. BOEM anticipates that air quality impacts due to onshore O&M from one NY Bight project would be minor, intermittent, and occurring for short periods.

Increases in renewable energy could lead to reductions in emissions from fossil-fuel power plants. BOEM used its Wind Tool (BOEM 2017b) to estimate the emissions avoided as a result of a NY Bight project. Once operational, the 280 WTGs from a single NY Bight project would result in annual avoided emissions of 1,818 tons of NO_X, 268 tons of $PM_{2.5}$, 999 tons of SO_2, and 5,414,326 metric tons of CO_2. The avoided CO_2 emissions are equivalent to the emissions generated by about 1,200,000 passenger vehicles in a year (USEPA 2020c). Accounting for construction emissions and assuming conceptual decommissioning emissions would be the same, and including emissions from future operations, a single NY Bight project would offset emissions related to its construction and conceptual decommissioning within different time periods of operation depending on the pollutant: NO_X would be offset in approximately 28 years of operation, $PM_{2.5}$ in 4 years, SO_2 in 2 years, and CO_2 in 7 months. If emissions from future operations and conceptual decommissioning were not included, the times required for emissions to "break even" would be shorter. From that point, one NY Bight project would have lower emissions that otherwise might be generated from another fossil fuel source.

The potential health benefits of avoided emissions can be evaluated using USEPA's COBRA health impacts screening and mapping tool as discussed in Section 3.4.1.3.2, *Cumulative Impacts of the No Action Alternative*. COBRA was used to analyze the avoided emissions that were calculated for a NY Bight project. Table 3.4.1-7 presents the results.

Table 3.4.1-7. COBRA estimate of annual avoided health effects with a single NY Bight project

Discount Rate[1] (2023)	Monetized Total Health Benefits (million U.S. dollars/year)		Avoided Mortality (cases/year)	
	Low Estimate[2]	High Estimate[2]	Low Estimate[2]	High Estimate[2]
3%	$149	$337	13.416	30.358
7%	$131	$296	13.416	30.358

[1] The discount rate is used to express future economic values in present terms. Not all health effects and associated economic values occur in the year of analysis. Therefore, COBRA accounts for the "time value of money" preference (i.e., a general preference for receiving economic benefits now rather than later) by discounting benefits received later (USEPA 2020b).
[2] The low and high estimates are derived using two sets of assumptions about the sensitivity of adult mortality and non-fatal heart attacks to changes in ambient $PM_{2.5}$ levels. Specifically, the high estimates are based on studies that estimated a larger effect of changes in ambient $PM_{2.5}$ levels on the incidence of these health effects (USEPA 2020b).

The overall impacts of GHG emissions can be assessed using "social costs." The "social cost of carbon," "social cost of nitrous oxide," and "social cost of methane"—together, the "social cost of greenhouse gases" (SC-GHG)—are estimates of the monetized damages associated with incremental increases in GHG emissions in a given year. NEPA does not require monetizing costs and benefits but allows the use of the social cost of carbon, SC-GHG, or other monetized costs and benefits of GHGs in weighing the merits and drawbacks of alternative actions. In January 2023, CEQ issued interim guidance (CEQ 2023) that updated and reinstated its 2016 guidance document (CEQ 2016) on consideration of GHGs and climate change under NEPA. The interim guidance recommends that agencies provide context for GHG emissions, including through the use of SC-GHG estimates, to translate climate impacts into the more accessible metric of dollars.

For federal agencies, the best currently available estimates of SC-GHG are the interim estimates of the social costs of CO_2, methane (CH_4), and nitrous oxide (N_2O) developed by the Interagency Working Group (IWG) on SC-GHG and published in its Technical Support Document (IWG 2021). IWG's SC-GHG estimates are based on complex models describing how GHG emissions affect global temperatures, sea level rise, and other biophysical processes; how these changes affect society through, for example, agricultural, health, or other effects; and monetary estimates of the market and nonmarket values of these effects. One key parameter in the models is the discount rate, which is used to estimate the present value of the stream of future damages associated with emissions in a particular year. The discount rate accounts for the "time value of money," i.e., a general preference for receiving economic benefits now rather than later, by discounting benefits received later. A higher discount rate assumes that future benefits or costs are more heavily discounted than benefits or costs occurring in the present (i.e., future benefits or costs are less valuable or are a less significant factor in present-day decisions). IWG developed the current set of interim estimates of SC-GHG using three different annual discount rates: 2.5 percent, 3 percent, and 5 percent (IWG 2021).

There are multiple sources of uncertainty inherent in the SC-GHG estimates. Some sources of uncertainty relate to physical effects of GHG emissions, human behavior, future population growth and economic changes, and potential adaptation (IWG 2021). To better understand and communicate the quantifiable uncertainty, the IWG method generates several thousand estimates of the social cost for a specific gas, emitted in a specific year, with a specific discount rate. These estimates create a frequency distribution based on different values for key uncertain climate model parameters. The shape and characteristics of that frequency distribution demonstrate the magnitude of uncertainty relative to the average or expected outcome.

To further address uncertainty, IWG recommends reporting four SC-GHG estimates in any analysis. Three of the SC-GHG estimates reflect the average damages from the multiple simulations at each of the three discount rates. The fourth value represents higher-than-expected economic impacts from climate change. Specifically, it represents the 95th percentile of damages estimated, applying a 3 percent annual discount rate for future economic effects. This is a low-probability but high-damage scenario and represents an upper bound of damages within the 3 percent discount rate model. The estimates below follow the IWG recommendations.

Table 3.4.1-8 presents the SC-GHG associated with estimated emissions from a single NY Bight project. These estimates represent the present value of future market and nonmarket costs associated with CO_2, methane, and nitrous oxide emissions. In accordance with IWG's recommendation, four estimates were calculated based on IWG estimates of social cost per metric ton of emissions for a given emissions year and estimates of emissions from one NY Bight project in each year. In Table 3.4.1-8, negative values represent social benefits of avoided GHG emissions. The negative values for net SC-GHG indicate that the impact of one NY Bight project on GHG emissions and climate would be a net benefit in terms of SC-GHG.

Table 3.4.1-8. Estimated social cost of GHGs associated with a single NY Bight project

Description	Social Cost of GHGs (2020$)[1,2]			
	Average Value, 5% Discount Rate	Average Value, 3% Discount Rate	Average Value, 2.5% Discount Rate	95th Percentile Value, 3% Discount Rate
SC-CO_2				
Construction, Operation, and Conceptual Decommissioning	$34,033,000	$141,232,000	$219,195,000	$428,483,000
Avoided Emissions	-1,772,701,000	-7,652,784,000	-11,928,208,000	-23,421,568,000
Net SCC- CO_2	-1,738,668,000	-7,511,552,000	-11,709,013,000	-22,993,085,000

Description	Social Cost of GHGs (2020$)[1,2]			
	Average Value, 5% Discount Rate	Average Value, 3% Discount Rate	Average Value, 2.5% Discount Rate	95th Percentile Value, 3% Discount Rate
SC-CH_4				
Construction, Operation, and Conceptual Decommissioning	$11,000	$31,000	$43,000	$82,000
Avoided Emissions	-7,379,000	-21,843,000	-30,449,000	-58,202,000
Net SCC-CH_4	-7,368,000	-21,812,000	-30,406,000	-58,120,000
SC-N_2O				
Construction, Operation, and Conceptual Decommissioning	$668,000	$2,582,000	$3,992,000	$6,860,000
Avoided Emissions	-8,598,000	-34,635,000	-53,797,000	-92,390,000
Net SCC-N_2O	-7,930,000	-32,053,000	-49,805,000	-85,530,000
Total SC-GHG[3]				
Construction, Operation, and Conceptual Decommissioning	$34,712,000	$143,845,000	$223,230,000	$435,425,000
Avoided Emissions	-1,788,678,000	-7,709,262,000	-12,012,454,000	-23,572,160,000
Net SC-GHG	-1,753,966,000	-7,565,417,000	-11,789,224,000	-23,136,735,000

[1] The following calendar years were assumed in calculating SC-GHG: construction 2026–2028, operation (35 years) 2029–2064, and decommissioning 2065–2067.
[2] Negative cost values indicate benefits.
[3] SC-GHG is the sum of the social costs for CO_2, CH_4, and N_2O.
Estimates are over the lifetime of a single NY Bight project. Estimates are rounded to the nearest $1,000.

Table 3.4.1-9 presents the annual emissions, avoided emissions, and net emissions of CO_2 over the operational lifetime of a single NY Bight project. Net emissions are the NY Bight project emissions minus the avoided emissions. The lifetime net emissions for the No Action Alternative (which has no avoided emissions) represents the amount of emissions that would occur from the grid (as configured in 2018) to produce the same quantity of electrical energy as would have been produced by one NY Bight project. The No Action Alternative would result in no emissions during construction and O&M because no project would be built, but would also offer no avoided emissions, resulting in higher GHG emissions over the project duration due to not displacing fossil-fueled power generation via offshore wind. The emissions not avoided, 5,414,326 MT per year of CO_2 (Table 3.4.1-9), would be equivalent to about 1,200,000 additional passenger vehicles per year. These estimates are relative to the 2018 grid configuration as noted, but the actual annual quantity of avoided emissions attributable to this proposed facility is expected to diminish over time if the electric grid becomes lower-emitting due to the addition of other renewable energy facilities and retirement of high-emitting generators.

Table 3.4.1-9. Net emissions of CO_2 for a single NY Bight project

Alternative	CO_2 Emissions (metric tons)[1,2]					
	Construction	Operation				Construction + Operation
	Construction (Total)	O&M Emissions (Annual)	Avoided Emissions (Annual)	Net Emissions (Annual)	Operational Lifetime Net Emissions (Total)	Total Lifetime Net Emissions
No Action	0	0	0	0	0	189,501,413 [3]
One NY Bight Project	1,533,965	13,785	-5,414,326	-5,400,541	-189,018,942	-187,484,977

[1] Positive values are emissions increases; negative values are emissions decreases.

[2] Emissions from decommissioning are not included.

[3] Represents emissions from the grid in the absence of one NY Bight project.

One NY Bight project would produce GHG emissions that contribute to climate change; however, its contribution would be less than the emissions reductions from fossil-fueled sources during operation of the NY Bight project. Because GHG emissions disperse and mix within the troposphere, the climatic impact of GHG emissions does not depend upon the source location. Therefore, regional climate impacts are largely a function of global emissions. Nevertheless, a single NY Bight project would have an overall net beneficial impact on criteria pollutant and O_3 precursor emissions as well as GHGs, compared to a similarly sized fossil-fuel power plant or to the generation of the same amount of energy by the existing grid.

Climate change can make ecosystems, resources, and communities more susceptible as well as lessen resilience to other environmental impacts apart from climate change. In some instances, this may exacerbate the environmental effects of a project. Although one NY Bight project would produce criteria pollutant emissions, the predicted impacts would be within applicable standards and would be unlikely to contribute substantially to increasing susceptibility or decreasing resilience of ecosystems. Similarly, foreseeable climate change would be unlikely to contribute substantially to increasing the impacts of criteria pollutant emissions from a single NY Bight project.

Air emissions – decommissioning: At the end of the operational lifetime of one NY Bight project, the lessee would decommission the project's facilities. All structures above the seabed level or aboveground would be completely removed. The dismantling and removal of the turbine components (blades, nacelle, and tower) and other offshore components would largely be a "reverse installation" process subject to the same constraints as the original construction phase. Onshore conceptual decommissioning activities would include removal of facilities and equipment and restoration of the sites to pre-project conditions where warranted. Emissions from conceptual decommissioning of a single NY Bight project were not quantified but are expected to be less than for construction. One NY Bight project likely would pursue a separate OCS Air Permit for those activities because it might assume that marine vessels, equipment, and construction technology will change substantially in the next 35 years and in the future will have lower emissions than current vessels and equipment. BOEM anticipates minor and temporary air quality impacts from a single NY Bight project due to conceptual decommissioning.

Accidental releases: One NY Bight project could release VOCs or HAPs because of accidental chemical spills. Accidental releases—including spills from vessel collisions and allisions—may lead to short-term periods of VOC and HAP emissions through evaporation. VOC emissions also would be a precursor to O_3 formation. Air quality impacts would be short term and limited to the local area at and around the accidental release location. BOEM anticipates that a major spill is very unlikely due to vessel and offshore wind energy industry safety measures, as discussed in Section 3.4.2, *Water Quality*, as well as the distributed nature of the material. BOEM anticipates that these activities would have a negligible air quality impact as a result of one NY Bight project.

Similarly, a catastrophic failure of switchgear could release SF_6. Such a failure would be extremely unlikely and no such release is expected. Even if all of the SF_6 from all project switchgear were released, the contribution of GHGs to the atmosphere would be negligible relative to the avoided GHG emissions associated with project operation.

3.4.1.4.2 Impacts of Six Projects

With six NY Bight projects, the total emissions and SC-GHG described for a single NY Bight project would be multiplied by as much as six.[8] BOEM anticipates that air quality impacts from construction, operation, and conceptual decommissioning of six NY Bight projects would be minor to moderate (i.e., would not cause an exceedance of the NAAQS). However, to the extent that project activities overlap, impacts at any particular time or place could be greater than for one NY Bight project. If projects do not overlap, then impacts may not be greater in degree than for one NY Bight project but would occur over a longer time or larger area.

Air emissions – construction: As with one NY Bight project, BOEM assumes that construction of six NY Bight projects would start in 2026 at the earliest. The offshore and onshore construction activities for six NY Bight projects would be of the same types as described for one NY Bight project. However, the estimated construction emissions given in Table 3.4.1-5 for a single NY Bight project would be multiplied by as much as six with six NY Bight projects. Construction and operation of six NY Bight projects could overlap in time, and potentially in space if common port facilities or cable corridors are used. Several factors could influence the amount of overlap, such as availability of vessels and port facilities and the rate of progress of baseline surveys. As with one NY Bight project, most emissions with six NY Bight projects would occur from diesel-fueled construction equipment, vessels, and commercial vehicles. The magnitude of the emissions and the resulting air quality impacts would vary spatially and temporally during the construction phases.

Air emissions – O&M: The types of O&M activities, vessels, and equipment with six NY Bight projects would be the same as those for one NY Bight project. However, with six NY Bight projects, the O&M emissions and SC-GHG described for one NY Bight project would be multiplied by as much as six. As with

[8] As indicated in Section 2.1.2.2, the number of WTGs in the six NY Bight lease areas is expected to be less than 1,680 (280 WTGs multiplied by 6 projects). However, in the interest of capturing the highest amount of potential emissions, this section describes emission estimates as being as much as six times greater than a single NY Bight project. Therefore, this analysis likely overstates total emissions and impacts for six NY Bight projects.

a single NY Bight project, the air quality impacts during O&M are anticipated to be smaller in magnitude compared to construction and conceptual decommissioning.

Increases in renewable energy could lead to reductions in emissions from fossil-fuel power plants. Emissions avoided with six NY Bight projects would be greater than with a single NY Bight project. The amount of energy contributed to the grid with six NY Bight projects could be large enough to affect electricity pricing, which could influence decisions by power plant operators to reduce output or take plants offline in response, to a greater degree than with a single NY Bight project.

The potential health benefits of avoided emissions with six NY Bight projects would be greater than with one NY Bight project. As well, the SC-GHG with six NY Bight projects would indicate greater social benefits than with one NY Bight project. Six NY Bight projects would have negligible impacts on climate change and an overall net beneficial impact on criteria pollutant and O_3 precursor emissions as well as GHGs, compared to the generation of the same amount of energy by the existing grid. Based on the avoided GHG emissions described for a single NY Bight project, operation of six NY Bight projects would result in annual avoided emissions of 10,908 tons of NO_X, 1,608 tons of $PM_{2.5}$, 5,994 tons of SO_2, and 32,485,956 metric tons of CO_2 per year.

Air emissions – decommissioning: As with one NY Bight project, BOEM anticipates that each of the six NY Bight projects would pursue a separate OCS Air Permit for decommissioning activities because it is assumed that marine vessels, equipment, and construction technology will change substantially in the next 35 years and in the future will have lower emissions than current vessels and equipment. BOEM anticipates minor and temporary air quality impacts from six NY Bight projects due to conceptual decommissioning.

Accidental releases: Six NY Bight projects could release VOCs or HAPs because of accidental chemical spills, although the potential volume and number of spills would be greater. As with a single NY Bight project, air quality impacts would be short term and limited to the local area at and around the accidental release location. BOEM anticipates that these activities would have a negligible air quality impact as a result of six NY Bight projects.

3.4.1.4.3 Cumulative Impacts of Alternative B

The analysis of cumulative impacts of six NY Bight projects considered the impacts of six NY Bight projects in combination with other ongoing and planned activities. The OCS permit application for each of the six NY Bight projects, which BOEM anticipates the lessees will file after the COPs are submitted and this PEIS is finalized, will give some indication of impacts, but the analysis in those applications would be focused on each individual project. To accurately assess cumulative impacts, a more comprehensive modeling study would be required. BOEM is considering conducting or participating in a regional modeling study that would assess development impacts of six NY Bight projects along with other planned and reasonably foreseeable projects.

Air emissions – construction: Six NY Bight projects would contribute a noticeable addition to the cumulative impacts on air quality associated with offshore construction, which would be moderate during construction. Impacts would be greatest during overlapping construction activities, but these effects would be short term in nature because supply chain demand and vessel availability are limiting factors of the construction of six NY Bight projects in the geographic analysis area. Six NY Bight projects would contribute a noticeable addition to cumulative air quality impacts associated with onshore construction, which would be minor to moderate.

Air emissions – O&M: O&M of six NY Bight projects would contribute a noticeable addition to cumulative impacts, which would be moderate. O&M emissions from ongoing and planned activities, including six NY Bight projects, could begin between 2026 and 2030. Some emissions associated with O&M activities of six NY Bight projects could overlap with offshore and non-offshore-wind construction-related emissions. Six NY Bight projects would also contribute a noticeable addition to the cumulative GHG impacts on air quality, which would be beneficial from the net decrease in GHG emissions to the extent that fossil-fuel power plants would reduce operations as a result of increased energy generation from offshore wind projects. The GHG emissions benefits would diminish over time as the grid becomes cleaner and the emissions displaced by wind energy become less (on a per-megawatt-hour basis) than at the time six NY Bight projects would begin operation.

A known impact of offshore wind facilities on meteorological conditions is the wake effect. A WTG extracts energy from the free flow of wind, creating turbulence downstream of the WTG. Under certain conditions, offshore wind farms can also affect temperature and moisture downwind of the facilities. Section B.1.4, *Potential General Impacts of Offshore Wind Facilities on Meteorological Conditions*, in Appendix B provides further information on these effects. For large numbers of WTGs in a single region, these effects can be large enough to have potential local climate impacts. Akhtar et al. (2022) used a high-resolution regional climate model to investigate the impact on the sea surface climate of large-scale offshore wind farms that are proposed for the North Sea. Their results showed local decreases in wind speed, local increases in precipitation, a significant reduction in the air-sea heat fluxes and a local, annual mean net cooling of the lower atmosphere in the wind farm areas. The atmosphere below the hub height showed an increase in temperature, which is on the order of up to 10 percent of the climate change signal at the end of the century, but it is much smaller than the interannual climate variability. In contrast, wind speed changes with wind farms were larger than projected mean wind speed changes due to climate change. Based on the modeling results the authors suggest that the impacts of large clustered offshore wind farms should be considered in climate change impact studies.

Air emissions – decommissioning: Conceptual decommissioning of six NY Bight projects would contribute a noticeable addition to the cumulative air quality impacts, which would represent a moderate impact. Because the emissions related to conceptual decommissioning activities would be widely dispersed and transient, BOEM expects all air quality impacts to occur close to the emitting sources.

Accidental releases: Six NY Bight projects would contribute an undetectable addition to the cumulative accidental release impacts on air quality, which would be negligible due to the short-term nature and localized potential effects. Accidental spills would occur infrequently over the 35-year period with a higher probability of spills during construction of projects.

3.4.1.4.4 Conclusions

Impacts of Alternative B. A single NY Bight project and six NY Bight projects under Alternative B would result in a net decrease in overall emissions (larger decrease for six NY Bight projects than for one NY Bight project) over the region compared to the emissions from conventional fossil-fuel power plants. Although there could be some short-term air quality impacts due to various activities associated with construction and installation, O&M, and conceptual decommissioning, emissions would be relatively small and limited in duration. Alternative B would result in air quality–related health effects avoided in the region due to the reduction in emissions associated with fossil-fuel energy generation. As described above, the impact from air pollutant emissions is anticipated to be minor, and the impact from accidental releases would be negligible. Considering all IPFs together, **minor** to **moderate** air quality impacts would likely be anticipated for a limited time during construction and installation, O&M, and conceptual decommissioning. Six NY Bight projects would have a greater impact than one NY Bight project, but the impact level would remain the same. There would be a **minor beneficial** impact on air quality near the NY Bight area and the surrounding region overall to the extent that the wind energy produced would displace energy produced by fossil-fuel power plants. Six NY Bight projects would have a greater beneficial impact than one NY Bight project, but the impact level would remain the same. Because of the amount of emissions, the fact that emissions would be spread out in time, and the large geographic area over which they would be dispersed (throughout the lease areas and the vessel routes from the onshore facilities), air pollutant concentrations associated with the NY Bight projects are not expected to exceed the NAAQS, New Jersey AAQS, and New York AAQS.

Cumulative Impacts of Alternative B. The impacts contributed by six NY Bight projects to the cumulative impacts on air quality would range from undetectable to noticeable, with noticeable beneficial impacts. BOEM anticipates that the cumulative impacts associated with six NY Bight projects would likely result in **moderate** impacts and **moderate beneficial** impacts. The main driver for this adverse impact rating is emissions related to construction activities increasing commercial vessel traffic, air traffic, and truck and worker vehicle traffic. Combustion emissions from construction equipment, and fugitive emissions, would be higher during overlapping construction activities but short term in nature, as the overlap would be limited in time to the construction period. Therefore, the adverse impact on air quality would likely be **moderate** because, while emissions would increase ambient pollutant concentrations, the concentrations are not expected to exceed the NAAQS, New Jersey AAQS, and New York AAQS.

Six NY Bight projects and other offshore wind projects would benefit air quality in the region surrounding the six NY Bight projects to the extent that energy produced by offshore wind projects would displace energy produced by fossil-fuel power plants. Though the benefit is regional, BOEM anticipates a **moderate beneficial** impact because the magnitude of the potential reduction in emissions from displacing fossil-fuel generated power would be small relative to total energy generation emissions in the area.

At present, there is limited data available on which to base an assessment of six NY Bight projects' cumulative impacts. The cumulative impact rating of **moderate** adverse and **moderate beneficial** is based on the projected emissions levels, the geographic dispersal of the emission sources, existing pollutant concentrations as measured by NJDEP and New York State Department of Environmental Conservation (NYSDEC), regional meteorology, and expected levels of avoided emissions. The available data on offshore wind projects consist primarily of previous EISs for such projects and the modeling studies performed for OCS permit applications to date, which are all for single projects. As noted above, to accurately assess cumulative impacts of six NY Bight projects along with other planned and reasonably foreseeable projects a more comprehensive, regional-scale modeling study would be required. BOEM expects that, over time, air quality modeling studies performed for OCS permits or by review agencies will provide further insight into cumulative air quality impacts.

3.4.1.5 Impacts of Alternative C (Proposed Action) – Identification of AMMM Measures at the Programmatic Stage – Air Quality and Greenhouse Gas Emissions

Alternative C, the Proposed Action, considers the potential impacts of future offshore wind development in the NY Bight area with the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts. Alternative C consists of two sub-alternatives – Sub-alternative C1: Previously Applied AMMM Measures, and Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures. The analysis for Sub-alternative C1 is presented as the change in impacts from those impacts discussed under Alternative B, and the analysis for Sub-alternative C2 is presented as the change from those impacts discussed in Sub-alternative C1. Refer to Table G-1 in Appendix G, *Mitigation and Monitoring*, for a complete description of AMMM measures that make up the Proposed Action.

3.4.1.5.1 Sub-alternative C1 (Preferred Alternative): Previously Applied AMMM Measures

Sub-alternative C1 analyzes the AMMM measures that BOEM has required as conditions of approval for previous activities proposed by lessees in COPs submitted for the Atlantic OCS or through related consultations. However, BOEM has not identified any previously applied AMMM measures for air quality, and therefore, the impacts on air quality under Sub-alternative C1 are the same as for Alternative B.

3.4.1.5.2 Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures

Sub-alternative C2 analyzes the AMMM measures under Sub-alternative C1 plus the AMMM measures that have not been previously applied. However, BOEM has not identified any previously applied AMMM measures for air quality under Alternative C1, and has not identified any AMMM measures under Sub-alternative C2 that were not previously applied. Therefore, the impacts on air quality under Sub-alternative C2 are the same as Sub-alternative C1.

3.4.1.5.3 Conclusions

Impacts of Alternative C. Under Sub-alternative C1, BOEM has not identified any previously applied AMMM measures for air quality. Therefore, impacts under Sub-alternative C1 would be the same as under Alternative B. Under Sub-alternative C2, BOEM has not identified any AMMM measures for air quality that were not previously proposed. Therefore, impacts under Sub-alternative C2 would be the same as under Alternative B and Sub-alternative C1. Under Sub-alternative C1 and Sub-alternative C2, for one NY Bight project and six NY Bight projects, **minor to moderate** air quality impacts would likely be anticipated for a limited time during construction and installation, O&M, and conceptual decommissioning, with **minor beneficial** impacts.

Cumulative Impacts of Alternative C. As with Alternative B, the impacts contributed by six NY Bight projects to the cumulative impacts on air quality with Sub-alternative C1 and Sub-alternative C2 would range from undetectable to noticeable, with noticeable beneficial impacts. BOEM anticipates that under Sub-alternatives C1 and C2 the cumulative impacts associated with six NY Bight projects would likely be **moderate** adverse and **moderate beneficial**. These impact ratings are the same as expected with Alternative B.

3.4.1.6 Recommended Practices for Consideration at the Project-Specific Stage

BOEM is recommending that lessees consider analyzing the RPs in Table 3.4.1-10 to further reduce potential air quality and greenhouse gas emissions impacts. Refer to Table G-2 in Appendix G for a complete description of the RPs.

Table 3.4.1-10. Recommended Practices for air quality and greenhouse gas emissions impacts and related benefits

Recommended Practice	Potential Benefit
AQ-1: Use a substitute insulator gas rather than SF_6 in the switchgear and transmission systems, if feasible.	Using a substitute insulator gas rather than SF_6 in the switchgear and transmission systems would reduce potential SF_6 emissions during construction, operations, and decommissioning.
AQ-2: Replace diesel fuel and marine fuel oil with alternative fuels such as natural gas, propane, or hydrogen, to the extent feasible.	Replacing diesel fuel and marine fuel oil with alternative fuels such as natural gas, propane, or hydrogen would reduce criteria air pollutant and GHG emissions during construction, operations, and decommissioning.
AQ-3: Replace combustion engines with zero-emissions technology (e.g., fuel cell-electric or battery-electric), if feasible.	Replacing combustion engines with zero-emissions technology (e.g., fuel cell-electric or battery-electric) would reduce criteria air pollutant and GHG emissions during construction, operations, and decommissioning.
AQ-4: Implement exhaust aftertreatment, such as scrubbers for SO_2 and selective catalytic reduction for NO_X, on a vessel-specific basis, if feasible.	Using exhaust aftertreatment, such as scrubbers for SO_2 and selective catalytic reduction for NO_X, for example, would reduce SO_2 and NO_X emissions, respectively.
AQ-5: Use diesel particulate filters and diesel oxidation catalysts to retrofit older (USEPA Tiers 1–3) diesel engines, if feasible.	Using diesel particulate filters and diesel oxidation catalysts to retrofit older (USEPA Tiers 1–3) diesel engines would reduce diesel particulate matter emissions and associated health risks.
AQ-6: Require their contractors to use ports equipped with shore power and zero-emissions material-handling equipment and construction firms that offer	Using ports equipped with shore power and zero-emissions material-handling equipment, in addition to alternative-fueled or zero-emissions equipment and

Recommended Practice	Potential Benefit
alternative-fueled or zero-emissions equipment and vehicles, if feasible.	vehicles, would reduce criteria air pollutant and GHG emissions during construction.
AQ-7: Require their contractors to use a combination of combustion and post-combustion controls to meet or exceed applicable marine engine standards.	Using a combination of combustion and post-combustion controls to meet or exceed applicable marine engine standards would reduce criteria air pollutant and GHG emissions during construction, operations, and decommissioning.
AQ-8: Perform and present a technical feasibility analysis for air quality RPs 1 through 5 (AQ-1 – AQ-5), ensuring a comprehensive review of each measure's effectiveness, and readiness for implementation. The technical feasibility analysis should be submitted as part of a brief memo following finalization of the Facility Design Report and Fabrication and Installation Report, totaling no more than 10 pages.	Performance of technical feasibility analysis would ensure a comprehensive review of each measure's effectiveness and readiness for implementation, which potentially could lead to more reduction of criteria air pollutant and GHG emissions than would otherwise occur.
MUL-12: Incorporate ecological design elements where practicable. For example, nature inclusive design products are an alternative to conventional concrete that could result in reduced GHG emissions.	Using ecological design elements, such as alternatives to conventional concrete, could reduce criteria air pollutant and GHG emissions during construction.

3.4 Physical Resources

3.4.2 Water Quality

This section discusses potential impacts on water quality from the Proposed Action, alternatives, and ongoing and planned activities in the water quality geographic analysis area. The water quality geographic analysis area, as shown on Figure 3.4.2-1, includes a 10-mile (16.1-kilometer) radius around the NY Bight lease areas along with inshore waterways around representative ports that may be used for the NY Bight projects. The offshore geographic analysis area accounts for some transport of water masses due to ocean currents. The inshore geographic analysis area was chosen to capture the extent of the natural network of waterbodies that could be affected by port utilization for construction and operation activities of the NY Bight projects.

The water quality impact analysis in this PEIS is intended to be incorporated by reference into the project-specific environmental analyses for individual COPs expected for each of the NY Bight lease areas. Refer to Appendix C, *Tiering Guidance*, which identifies additional analyses anticipated to be required for the project-specific environmental analysis of individual COPs. Project- and site-specific analysis of water quality impacts, including the analysis of offshore and onshore cable and landfall installation, would be required in the COP NEPA document.

3.4.2.1 Description of the Affected Environment and Future Baseline Conditions

Waters in the geographic analysis area include both offshore waters and inshore waterways. The offshore waters include the Atlantic Ocean within the NY Bight lease areas that include vessel routes to/from representative port facilities. Inshore waterways include those of the Delaware Bay, Delaware River, Raritan Bay, Sandy Hook Bay, Newark Bay, East River, Passaic River, Hackensack River, Hudson River, and New York Bay to potential transmission POIs. As the exact locations and activities for each project are not known at this programmatic stage, the project-specific NEPA analysis will include inshore areas for each NY Bight lease area if conditions or activities are different than the analyses of representative areas and projects included in this PEIS.

Table 3.4.2-1 identifies key parameters that characterize water quality, with several of these parameters being accepted proxies for ecosystem health (e.g., dissolved oxygen, nutrient levels). Temperature and salinity delineate fresh from marine surface waters. States assess a variety of other water quality parameters (bacteria, metals, total suspended solids, etc.) as part of their requirements to evaluate and list state waters as impaired under CWA Section 303(d). If a water body is classified as non-attaining per the 303(d) requirements, a designated beneficial use (e.g., recreation, fish consumption) is considered impaired by an exceedance of one or more water quality parameters.

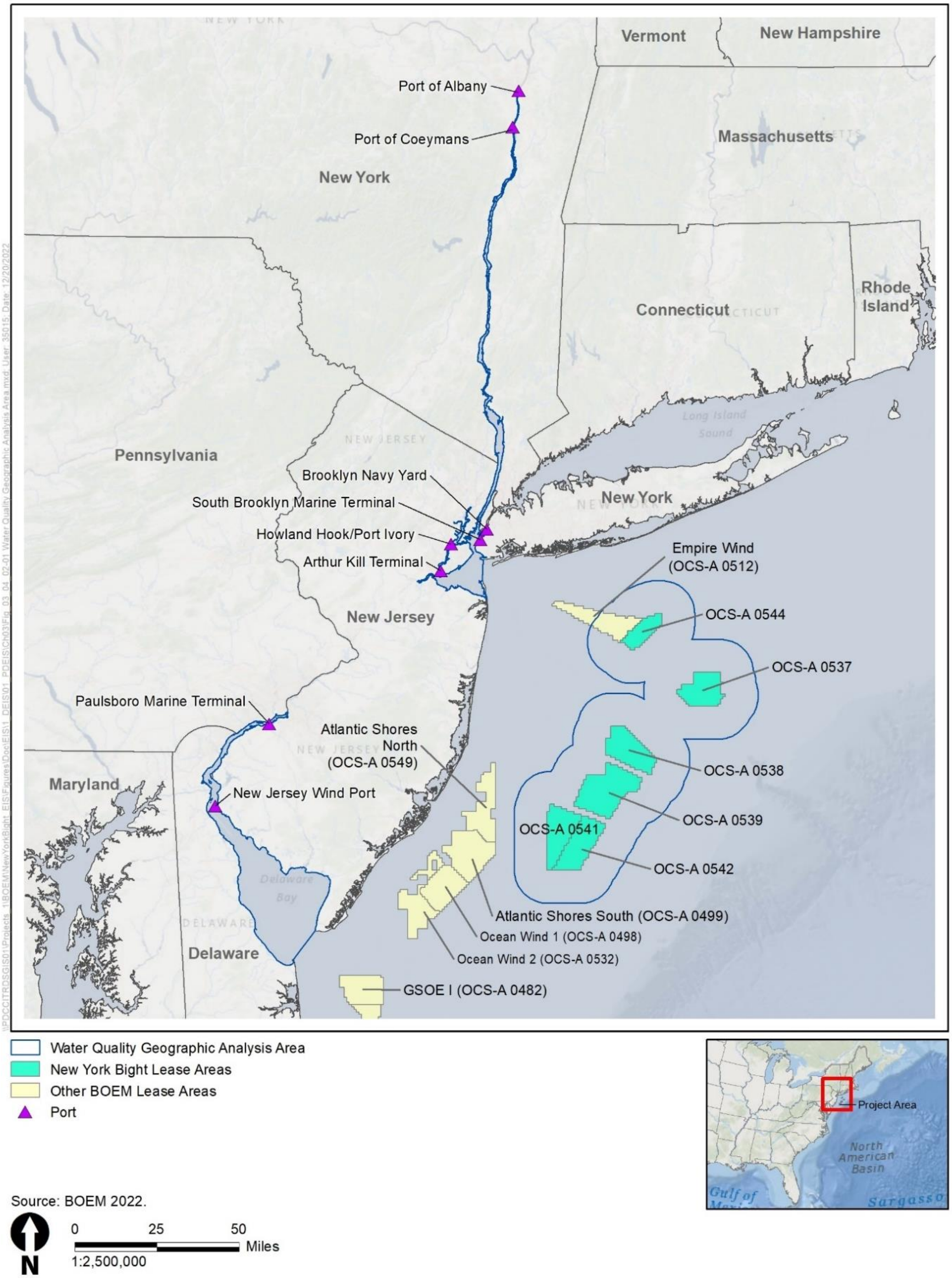


Figure 3.4.2-1. Water quality geographic analysis area

Table 3.4.2-1. Key water quality parameters with characterizing descriptions

Parameter	Characterizing Description
Temperature	Water temperature heavily affects species distribution in the ocean with large-scale changes that may impact seasonal phytoplankton blooms.
Salinity	Salinity, or salt concentration, also affects species distribution. Seasonal variation is smaller than year-to-year variation and less predictable than temperature changes (Wallace et al. 2018).
Dissolved oxygen	Dissolved oxygen concentrations should be above 5 mg/L to maintain a stable environment; lower levels may affect sensitive organisms (USEPA 2000).
Chlorophyll *a*	Chlorophyll *a* is an indicator of primary productivity. The USEPA considers estuarine and marine levels of chlorophyll <5 µg/L to be good, 5 to 20 µg/L to be fair, and >20 µg/L to be poor (USEPA 2021a).
Turbidity	Turbidity is a measure of water clarity. High turbidity reduces light penetration, reduces ecological productivity, and provides attachment places for other pollutants (USGS 2018). Marine waters generally have less turbidity than estuaries.
Nutrients	Phytoplankton are the foundation of the marine food web, and their associated growth rates depend on nutrient (e.g., nitrogen, phosphorus, and carbon, plus calcium and silicon are various micronutrients) availability in the water. Excess nutrients (i.e., from natural or human-derived sources) can cause problematic algal blooms that significantly lower dissolved oxygen concentrations in ambient waters.

mg/L = milligrams per liter; µg/L = microgram per liter.

The offshore U.S. waters of the Atlantic Ocean, including potential offshore export cable corridors and lease areas, have little variation in salinity and temperature though a vertical variation (i.e., stratification) occurs on a seasonal basis (conductivity-temperature-depth data from the World Ocean Database 2021). Stratification typically is strongest in the summer when surface waters are warmer and somewhat less saline than bottom waters; well-mixed and more uniform vertical salinity and temperature profiles are evident in the fall. In late spring and early summer, a strong thermocline develops at an approximately 20-meter depth across the entire shelf of the Mid-Atlantic Bight, isolating a continuous mid-shelf cold pool of water that extends from Nantucket to Cape Hatteras (Miles et al. 2021). The Mid-Atlantic Bight Cold Pool holds nutrients over the shelf during the spring and summer, which in turn promotes phytoplankton productivity and affects fish distributions and behavior (Lentz 2017; Miles et al. 2021; Nye et al. 2009).

The Mid-Atlantic Bight Cold Pool is highly dynamic over its annual lifespan and among years (Chen and Curchitser 2020), experiencing significant changes in stratification, with peak stratification occurring in summer and with weaker stratification occurring during its formation and breakdown in spring and fall (Miles et al 2021). Additionally, the isolated volume of cold bottom water shifts location, predominately moving southwestward along the shelf as it slowly warms through the season (Miles et al. 2021).

As of 2022, the offshore U.S. waters of the Atlantic Ocean are considered attainable (i.e., meeting water quality standards/goals) per the 303(d) requirements. With increasing distance from shore, oceanic circulation patterns play an increasingly larger role in dispersing and diluting anthropogenic contaminants and determining water quality. Waters are assessed as impaired when an applicable water quality standard is not being attained. The top causes of pollution associated with impairment in assessed bays and estuaries are mercury, most common in fish tissue; polychlorinated biphenyls (PCBs), persisting in sediments and fish tissue; and pathogens, which indicate possible fecal contamination (USEPA 2017). PCBs in sediments, among other legacy chemicals (i.e., mercury, dichlorodiphenyltrichloroethane, and dioxin), potentially exceed water quality standards and can be resuspended in the water column during major storm events or from activities such as dredging.

Waterbodies within the state of New York include 1,530 square miles (3,963 square kilometers) of estuaries. As of 2016, the most recent reporting year for 303(d), 29 percent of the impaired coastal waters for fishing in New York state was impaired because of bacteria and other microbes (USEPA 2022). Waterbodies within the state of New Jersey include 1,098 square miles (2,844 square kilometers) of estuarine/ocean waters. The top reasons for impairment of coastal waters in New Jersey are low oxygen (48 percent) for aquatic life and PCBs (39 percent) in fish tissue affecting fish consumption (USEPA 2022). Waterbodies within the state of Delaware include 902 square miles (2,336 square kilometers) of estuarine waters with 100 percent of coastal waters impaired for fish consumption due to PCBs and 33 percent impaired for fish, aquatic life, and wildlife due to low oxygen; however, Delaware is seeing reductions in nutrients and toxins through the implementation of the Watershed Approach to Toxics Assessment and Restoration Program (USEPA 2022).

Table 3.4.2-2 lists the 303(d) non-attainable waterbodies per state authority for the waterbodies (oceans, estuaries, bays, rivers, and lakes) within the geographic analysis area. The estuaries and rivers (inshore waterways) are impaired for fish consumption due to various pollutants such as mercury, PCBs and other toxins, dioxin, and chlordane in fish tissues and for shellfish restrictions due to fecal coliform.

The USEPA monitors water quality trends over time through a national coastal condition assessment. This assessment establishes a water quality index to describe the water quality of various coastal areas by assigning three condition levels (good, fair, and poor) for several water quality parameters. Table 3.4.2-3 lists the USEPA Region 2 (including New Jersey and New York) and 3 (Mid-Atlantic, including Delaware) condition levels per parameter for 2005, 2010, and 2015 (USEPA 2021b). Regions 2 and 3 include the offshore waters and inshore waterways in the geographic analysis area. Since 2005, the percentage of “good” ratings has increased for most of the parameters analyzed (i.e., water clarity ratings within the good category have increased from 72.5 percent in 2005 to 93.3 percent in 2015 for Region 2 and from 4.17 percent in 2005 to 52.5 percent in 2015 for Region 3). Exceptions to this trend are evident for dissolved phosphorus for both regions and chlorophyll *a* for Region 2. Dissolved phosphorus in Region 2 increased, resulting in a greater number of “fair” ratings from 2005 to 2015 as well as fewer “good” ratings from 2010 to 2015. For Region 3, dissolved phosphorus increased, resulting in fewer “good” ratings from 2005 to 2015. In Region 2, chlorophyll *a* decreased, resulting in a greater number of “good” ratings from 2005 to 2010; however, it increased from 2010 to 2015, resulting in fewer “good” ratings. Overall, based on the USEPA’s National Coastal Condition Assessment (USEPA 2021b), water quality is in good condition for both regions.

Table 3.4.2-2. 303(d) non-attainable waterbodies per State authority found in the geographic analysis area

Waterbody	Last Year Reported	CWA 303(d) Classification	Non-attainable Use	Impairment
Under Delaware Authority				
Delaware River	2022	Impaired	1) Fish Consumption (Zones 5 and 5c) 2) Fish, Aquatic Life, and Wildlife (Zone 5c)	1) Dieldrin; dioxin; furan compounds; PCBs 2) Dissolved oxygen
Delaware Bay	2022	Impaired	1) Fish Consumption	1) Mercury; PCBs
Under New Jersey Authority				
Delaware River	2020	Impaired	1) Fish Consumption	1) Chlordane, DDT, dieldrin; mercury and PCBs in fish tissue
Delaware Bay	2020	Impaired	1) Aquatic Life 2) Fish Consumption 3) Shellfish Harvesting	1) Turbidity 2) Chlordane, DDT, dieldrin, and mercury; PCBs in fish tissue 3) Fecal coliform
Coastal Atlantic Water (Herring Island to Barnegat Inlet)	2020	Impaired	1) Aquatic Life	1) Dissolved oxygen
Upper New York Bay/ Kill Van Kull	2020	Impaired	1) Aquatic Life 2) Fish Consumption	1) Index of biological integrity[1] 2) Benzo[a]pyrene (PAHs), heptachlor epoxide, and PCBs; chlordane, dieldrin, dioxin, and hexachlorobenzene in fish tissue
Kill Van Kull West	2020	Impaired	1) Aquatic Life 2) Fish Consumption	1) Index of biological integrity 2) Benzo[a]pyrene (PAHs) and heptachlor epoxide; chlordane, dieldrin, dioxin, hexachlorobenzene, and PCBs in fish tissue
East River-Hudson River	2020	Impaired	1) Aquatic Life 2) Fish Consumption	1) Index of biological integrity; total phosphorous 2) Benzo[a]pyrene (PAHs) and heptachlor epoxide; chlordane, DDT, dieldrin, dioxin, hexachlorobenzene, and mercury and PCBs in fish tissue
Hackensack River	2020	Impaired	1) Aquatic Life 2) Fish Consumption	1) Dissolved oxygen; index of biological integrity; nickel 2) Benzo[a]pyrene (PAHs), heptachlor epoxide, and nickel; chlordane, DDT, dieldrin, dioxin, mercury, and PCBs in fish tissue

Waterbody	Last Year Reported	CWA 303(d) Classification	Non-attainable Use	Impairment
Under New York Authority				
Upper New York Bay	2018	Impaired	1) Fish consumption	1) Copper, dioxin, PCBs
Lower East River	2018	Impaired	1) Secondary contact recreation	1) Dissolved oxygen, floating debris, PCBs, trash
Hudson River	2018	Impaired	1) Fish and shellfish consumption	1) PCBs
Long Island Sound	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Manhasset Bay	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Hempstead Harbor	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Oyster Bay Harbor	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Dosoris Pond	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Mill Neck Creek	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Cold Spring Harbor	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
South Oyster Bay	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
East Bay	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Middle Bay	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Garret Lead/East Channel	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Reynolds Channel, East	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Freeport Cr/East Meadow Br, Lower	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Hempstead Bay, Broad Channel	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Hewlett Bay	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Brosewere Bay	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
East Rockaway Inlet	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Woodmere Channel	2018	Impaired	1) Shellfish consumption	1) Fecal coliform
Bannister Creak/Bay	2018	Impaired	1) Shellfish consumption	1) Fecal coliform

Source: USEPA 2022, NYSDEC 2020.
[1] An environmental scoring tool that transforms raw biological data collected from a water body into a simple numerical score of overall ecological condition.
CWA = Clean Water Act; DDT = dichlorodiphenyltrichloroethane; PAHs = polycyclic aromatic hydrocarbons; PCBs = polychlorinated biphenyls.

Table 3.4.2-3. Water quality conditions in estuarine coastal areas for the USEPA Regions 2 and 3 to stations based on data collected in 2005, 2010, and 2015

Parameter	2005	2010	2015
Region 2, including New Jersey, New York			
Dissolved oxygen	Fair (17.2%), good (59.6%)	Fair (22.1%), good (71.8%)	Fair (27%), good (73%)
Chlorophyll *a*	Fair (25.2%), good (36.7%)	Fair (28.9%), good (61%)	Fair (35.1%), good (52%)
Water clarity	Fair (1.2%), good (72.5%)	Fair (5.3%), good (86.2%)	Fair (5.1%), good (93.3%)
Dissolved nitrogen	Fair (9.8%), good (54.9%)	Fair (19.8%), good (74.2%)	Fair (11.9%), good (82.7%)
Dissolved phosphorous	Fair (34.2%), good (19.2%)	Fair (70.7%), good (1.3%)	Fair (79.1%), good (5.6%)
Region 3, including Delaware			
Dissolved oxygen	Fair (20%), good (62%)	Fair (10.7%), good (62.5%)	Fair (14.3%), good (65.4%)
Chlorophyll *a*	Fair (56%), good (7.3%)	Fair (88%), good (5.6%)	Fair (71.2%), good (9.4%)
Water clarity	Fair (31.3%), good (41.7%)	Fair (28.7), good (49.1%)	Fair (18.3%), good (52.5%)
Dissolved nitrogen	Fair (14.8%), good (76.2%)	Fair (11.3%), good (83.4%)	Fair (7.4%), good (89.1%)
Dissolved phosphorous	Fair (23.6%), good (64.8%)	Fair (29.4%), good (60.4%)	Fair (37.6%), good (52.5%)

Source: USEPA 2021b, the *U.S. EPA National Coastal Condition Assessment*.

The NY Bight is a storm-dominated shelf, with the general southwestward drift of water modulated by more intense storm-induced flows (Vincent et al. 1981). The northeast area of the geographic analysis area (Figure 3.4.2-1) is characterized by moderate ocean currents, with very few observations of speeds greater than 1.3 miles per hour (0.6 meter per second) (UKHO 2009). The net direction of currents south of Long Island Sound, New York is southwest along-coast (Levin et al. 2018; Lentz 2008; UKHO 2009). In the Southern New England and Mid-Atlantic Bight subregions (Clark and Brown 1977), the direction of currents on the shelf is offshore and south (Townsend et al. 2004). Across the shelf in deeper waters, the current flows in the opposite direction of the shelf current (Stevenson et al. 2004). Although ocean currents are largely stable, local-scale (i.e., meters to a few kilometers) variability in currents is observed, in part due to wind and tides and their combined effects.

Groundwater reservoirs underlie areas where onshore project activities could occur. Some of these reservoirs provide water supplies to communities, including USEPA-designated sole source aquifers, which are aquifers that supply at least 50-percent of the drinking water for an area with no other sources available if the aquifer is contaminated. Sole-source aquifers that overlap areas where onshore project activities may occur include the New Jersey Coastal Plains aquifer system, Kings/Queens Counties (Brooklyn-Queens) aquifer system, and the Nassau/Suffolk Counties Long Island aquifer system.

A series of representative ports have been identified for analysis within the PEIS. These ports include the Brooklyn Navy Yard, South Brooklyn Marine Terminal, Howland Hook/Port Ivory, Arthur Kill Terminal, Paulsboro Marine Terminal, New Jersey Wind Port, Port of Albany, and Port of Coeymans.

Ongoing activities that define current conditions and trends within the geographic analysis area that contribute to impacts on water quality resources are diverse and numerous: weather/natural events; global climate change; terrestrial runoff and point source discharges; atmospheric deposition related to urbanization; forestry practices; municipal waste discharges; agriculture; marine vessel traffic related discharges, including the potential for accidental releases and marine debris; wastewater; marine minerals use and ocean-dredged material disposal regulated by the U.S. Army Corps of Engineers (USACE); bridge and coastal road construction; fisheries use, management, and monitoring surveys; recreation and tourism; port expansions; undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; and military operations.

As one of the key drivers behind water quality change over time, climate change (including warming sea temperatures, rising sea levels, ocean acidification, etc.) can affect water quality, causing changes and variability within the ecosystem. Northeast regional ocean temperatures have warmed faster than the global ocean over the last two decades according to the National Oceanic and Atmospheric Administration (NOAA 2021). Additionally, there is some evidence indicating that the Mid-Atlantic Bight Cold Pool is both warming and shrinking due to the effects of climate change, which will likely affect species distributions and total ecosystem productivity in the Mid-Atlantic Bight (Friedland et al. 2022).

3.4.2.2 Impact Level Definitions for Water Quality

Definitions of potential impact levels are provided in Table 3.4.2-4. Beneficial impacts on water quality are described using the definitions described in Section 3.3.2 (see Table 3.3-1).

Table 3.4.2-4. Adverse impact level definitions for water quality

Impact Level	Definition
Negligible	There would be no measurable impacts, or impacts would be so small that they would be extremely difficult or impossible to discern or measure.
Minor	Changes would be measurable but would not result in degradation of water quality in exceedance of water quality standards.
Moderate	Changes would be measurable and would result in localized, short-term degradation of water quality in exceedance of water quality standards.
Major	Changes would be measurable and would result in extensive, long-term degradation of water quality in exceedance of water quality standards.

Accidental releases, anchoring, cable emplacement and maintenance, discharges/intakes, land disturbance, port utilization, and presence of structures are contributing IPFs to impacts on water quality. However, these IPFs may not necessarily contribute to each individual issue outlined in Table 3.4.2-5.

Table 3.4.2-5. Issues and indicators to assess impacts on water quality

Issue	Impact Indicator
Runoff, sedimentation, sediment movement, suspension or resuspension, changes to stratification or mixing patterns, or release of contaminants.	Changes to turbidity, nutrients, dissolved oxygen, temperature, salinity, or chlorophyll *a*. Introduction of new contaminants/oil or changes to sediments, or changes in flows.
Disturbance or seepage to groundwater resources.	Changes to turbidity, nutrients, dissolved oxygen, temperature, salinity, or chlorophyll *a*. Introduction of new contaminants/oil or changes to sediments, or changes in flows.

3.4.2.3 Impacts of Alternative A – No Action – Water Quality

When analyzing the impacts of the No Action Alternative on water quality, BOEM considered the impacts of ongoing activities, including non-offshore-wind and offshore wind activities on the baseline conditions for water quality. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with the other planned non-offshore and offshore wind activities, which are described in Appendix D*, Planned Activities Scenario*.

3.4.2.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, water quality is likely to continue to follow current regional trends and respond to current environmental and societal activities. Ongoing activities within the geographic analysis area that contribute to impacts on water quality generally relate to or include stormwater runoff, ground disturbance (e.g., construction) and erosion, point and non-point source discharges, and atmospheric deposition (see Appendix D, Table D1-23). Empire Wind (OCS-0512) is the only ongoing offshore wind project in the offshore geographic analysis area. Impacts from ongoing construction of the Empire Wind project are described as part of the cumulative impacts of the No Action Alternative in Section 3.4.2.3.2. The accumulation of pollutants in surface waters from stormwater runoff and leaching into groundwater can result in exceedances of water quality standards that can affect the uses of the water (e.g., drinking water, aquatic life, recreation). While water quality impacts may be temporary and localized (e.g., construction), and state and federal statutes, regulations and permitting requirements (e.g., Clean Water Act Section 402) avoid or minimize these impacts, issues with water quality can still persist, resulting in minor impacts.

Additionally, global climate change is an ongoing and developing phenomenon, in the absence of offshore wind development, that causes ocean acidification, warming sea temperatures, rising sea levels, and changes in ocean circulation patterns that can affect water quality.

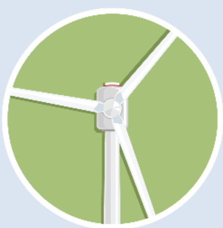
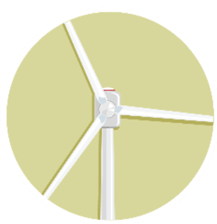
3.4.2.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore-wind activities and planned offshore wind activities (without the NY Bight projects).

Other planned non-offshore-wind activities that affect water quality include onshore development activities (including urbanization, forestry practices, municipal waste discharges, and agriculture), marine transportation-related discharges, dredging and port improvement projects, commercial fishing, military use, and new submarine cables, transmission systems (e.g., PBI), and pipelines (see Appendix D, Section D.2 for a description of planned activities). Water quality impacts from these activities, especially from dredging and harbor, port, and terminal operations, are expected to be localized and temporary to permanent, depending on the nature of the activities and associated IPFs. Similar to ongoing activities, the discharge of contaminated runoff into surface waters and groundwater can result in exceedances of water quality standards that can affect water uses (e.g., drinking water, aquatic life, recreation). State and federal water quality protection requirements and permitting would result in avoiding and minimizing these impacts.

Ongoing and planned offshore wind activities within the geographic analysis area that contribute to impacts on water quality are listed in Table 3.4.2-6. Empire Wind (OCS-A 0512) is the only ongoing offshore wind project in the offshore geographic analysis area (Table 3.4.2-6). The inshore waterways leading to ports that may be used by the NY Bight projects may also be used by other planned offshore wind projects along the U.S. Atlantic coast. If construction of offshore export cables for the NY Bight projects overlap with other offshore wind projects, impacts from these other projects are expected to be similar to those described in the following IPFs.

Table 3.4.2-6. Ongoing and planned offshore wind in the geographic analysis area for water quality

Ongoing/Planned	Projects by Region
Ongoing – 2 projects[1] 	**NY/NJ** • Empire Wind 1 (OCS-A 0512) • Empire Wind 2 (OCS-A 0512)
Planned – 0 projects[2] 	**NY/NJ** • None within the geographic analysis area

NJ = New Jersey; NY = New York.
[1] Refer to footnote 10 in PEIS Chapter 1 for additional information on the status of Empire Wind 1 and 2.
[2] Status as of September 20, 2024.

Accidental releases: Planned non-offshore-wind and offshore wind activities could expose offshore and inshore waterways to contaminants (such as fuel; sewage; solid waste; or chemicals, solvents, oils, or grease from equipment) in the event of a spill or release during routine vessel use, collisions and allisions, or equipment failure including WTGs or OSSs. As described in Section 2.3, *Non-Routine Activities and Events*, accidental releases of chemicals, gases, or man-made debris may occur as a result of a structural failure and could result in impacts on water quality. All planned non-offshore-wind and offshore wind activities would be required to comply with regulatory requirements related to the prevention and control of accidental spills administered by the USCG and BSEE. OSRPs or Construction Spill Prevention Control and Countermeasures (SPCCs) are required for every project and would provide for rapid spill response, clean up, and other measures that would help to minimize potential impacts on affected resources from spills. BOEM assumes all projects and activities would comply with laws and regulations to minimize releases.

Vessel activity would increase during offshore wind construction and installation stages and would therefore increase the potential for vessel allisions/collisions and fuel spills. The probability of a fuel spill would be minimized by preventative measures (i.e., onboard containment measures and OSRPs/SPCCs) during routine vessel operations (i.e., fuel transfer). The extent and persistence of water quality impacts from a fuel spill would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures.

Using the assumptions in Appendix D, Table D2-3, approximately 128,184 gallons (485,229 liters) of coolants and 1,053,770 gallons (3,988,953 liters) of fuels, oils, and lubricants would be involved during construction of the WTGs and OSSs for the Empire Wind 1 and 2 (OCS-A 0512) projects (the only ongoing offshore wind projects within the water quality geographic analysis area). Other chemicals, including grease, paints, and sulfur hexafluoride, would also be used at the offshore wind projects, and black and grey water may be stored in vessels and at onshore facilities. BOEM's study "Environmental Risks, Fate and Effects of Chemicals Associated with Wind Turbines on the Atlantic Outer Continental Shelf" presented extensive analysis and modeling to determine the probability and potential environmental consequences of a chemical spill at offshore wind facilities (Bejarano et al. 2013). The modeling effort revealed the most likely type of spill is a non-routine event and could occur from the WTGs at a volume of 90 to 440 gallons (341 to 1,666 liters), at a rate of one time in 1 to 5 years, or a diesel fuel spill of up to 2,000 gallons (7,571 liters) at a rate of one time in 91 years. The likelihood of a spill occurring from multiple WTGs and OSSs at the same time is very low and, therefore, the potential impacts from a spill larger than 2,000 gallons (7,571 liters) are largely discountable. BOEM anticipates that the likelihood of a non-routine catastrophic, or maximum-case scenario, release of all oils and chemicals to be very low (Bejarano et al. 2013). Small-volume spills could occur during OSS transformer maintenance or transfer of fluids (oils and chemicals), while low-probability small- or large-volume spills could occur due to vessel collisions, allisions such as a vessel striking against a WTGs/OSS, or incidents such as toppling during a storm or earthquake.

The use of heavy equipment onshore could result in potential spills during use or refueling activities. Onshore construction and installation activities and associated equipment would involve fuel and lubricating and hydraulic oils.

Trash and debris accidentally released into the marine environment can harm marine animals through entanglement and ingestion. All vessel operators are required to adhere to the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) Annex V requirements, USEPA and USCG regulations, and BSEE regulations. Therefore, it would be infrequent and negligible.

An accidental release would generally be localized and likely result in no degradation to water quality in exceedance of water quality standards. In the unlikely event a large spill occurred, impacts on water quality would be short- to long-term and negligible to moderate, depending on the type and volume of material released and the specific conditions (e.g., depth, currents, weather conditions) at the spill location, as well as the effectiveness of spill response measures. Due to the low likelihood of an accidental spill occurring and the expected size of the most likely spill, the overall impact of accidental releases is anticipated to be localized, resulting in no to little degradation to water quality in exceedance of water quality standards. As such, accidental releases from planned non-offshore and offshore wind development would not be expected to contribute appreciably to the cumulative impacts on water quality.

Anchoring: Anchoring associated with planned non-offshore and offshore wind activities could contribute to changes in water quality through resuspension of sediments during construction and installation, O&M, and conceptual decommissioning stages. Additional anchoring associated with military use and survey, commercial, and recreational activities could also contribute to changes in water quality. Disturbances to the seabed during anchoring would temporarily increase suspended sediment and turbidity levels in and immediately adjacent to the anchorage area. The intensity and extent of the additional sediment suspension effects would be less than that of cable emplacement (see *Cable emplacement and maintenance* IPF) and would therefore be unlikely to have an impact beyond the immediate vicinity.

BOEM estimates that approximately 18 acres (7.3 hectares) of seabed could be affected by anchoring for the Empire Wind (OCS-A 0512) projects within the NY Bight water quality geographic analysis area (Appendix D, Table D2-2). Due to the current ambient conditions and the localized area of disturbances around each of the individual anchors, the overall impact of increased sediment and turbidity from vessel anchoring is anticipated to be minor and localized, and it would not result in degradation of ambient water quality. Therefore, anchoring would not be expected to appreciably contribute to the cumulative impacts on water quality.

Cable emplacement and maintenance: The installation of array cables and offshore export cables would include site preparation activities (e.g., boulder removal), cable installation via jetting (primary method), plowing, trenching, and dredging, which can cause temporary increases in turbidity and sediment resuspension. A sediment transport analysis model was conducted for the only ongoing offshore wind projects within the geographic analysis area, the Empire Wind 1 and 2 projects (OCS-A 0512) (Tetra Tech 2022). The model showed the displacement of sediments would be low, and that sediments would remain suspended for a short period of time (4 hours) and typically dissipate to background levels very close to the trench.

The model simulated jet plowing, the primary installation method to be used for the Empire Wind projects (OCS-A 0512). The sediment transport model predicted that the sediment plume would typically travel between 328 feet (100 meters) and 1,640 feet (500 meters) during flood and ebb conditions but could travel more than 3,280 feet (1,000 meters) in some areas with stronger currents. Maximum plume concentrations at 3,280 feet (1,000 meters) would be below 30 milligrams per liter at all stations, with the exception of the two stations with strong currents. Project-specific NEPA analysis will provide greater details for the specific New York Bight lease areas.

Coarse particles (medium sand and larger) would not be suspended in the water column from jet plow activities. Fine sand would settle to the bed in less than 1 minute and within 3 feet (1 meter) to 16 feet (5 meters) of the trench centerline, depending on current velocities. Silts and clays would remain suspended for approximately 4 hours and would be transported farther from the trench. The maximum deposition thickness would be at the trench centerline, with an average deposition thickness of 9.52 inches (24 centimeters). Deposition thickness would decrease rapidly with distance from the jet plow; at a distance of 82 feet (25 meters), the average deposit thickness would be less than 0.37 inch (0.95 centimeter) for flood tides, and less than 0.08 inch (0.20 centimeter) for ebb tides. Within 492 feet (150 meters) of the trench, deposition thicknesses would be negligible, at less than 0.04 inch (0.1 centimeter), along most of the proposed submarine export cable routes. The mass flow excavation installation method was also modeled because there are some known locations for Empire Wind where jet plowing would not be feasible. The plume distance and distance at which sediment would settle from the trench would be similar to or less than under jet plowing.

Due to the prevailing ambient water quality conditions, localized areas of disturbances, and range of variability within the water column, the overall impacts of increased sediments and turbidity from cable emplacement and maintenance are anticipated to be minor, localized, and short-term, resulting in no degradation to ambient water quality. New cable emplacement and maintenance activities would not be expected to appreciably contribute to cumulative impacts on water quality.

Port utilization: Planned non-offshore and offshore wind activities could increase port utilization, possibly including port expansion/modification. Port expansion could include dredging, deepening, and construction of new berths, resulting in increased potential for increased turbidity, sedimentation, and accidental releases (fuel spills, trash/debris, etc.). However, any port expansions/modifications would comply with all applicable permit requirements. Vessels would adhere to all USCG and MARPOL 73/78 Annex V requirements and, as applicable, the NPDES vessel general permit. Due to construction timeframes and decreased operational traffic, the overall impact of accidental spills and sedimentation during port utilization is anticipated to be minor, localized, and short-term, resulting in little to no degradation to water quality. Port utilization is not expected to contribute to cumulative impacts on water quality.

Presence of structures: Empire Wind 1 and 2 (OCS- A 0512) (the only ongoing wind projects in the NY Bight water quality geographic analysis area) would result in 140 structures in the water, 135 acres (55 hectares) of impact from installation of foundations and scour protection, and 123 acres (49.8 hectares) of impact from hard protection (e.g., armoring) for the offshore export cables and interarray cables. These structures would result in some alteration of local water currents leading to increased movement, suspension, and deposition of sediments, but significant scour is not expected in deep water locations, where most of the structures would be located. Scouring that leads to impacts on water quality through the formation of sediment plumes generally occurs in shallow areas with tidally dominated currents (Harris et al. 2011). Structures may reduce wind-forced mixing of surface waters, whereas water flowing around the foundations may increase vertical mixing.

Offshore wind facilities could have impacts on atmospheric and oceanographic processes (including the Mid-Atlantic Bight Cold Pool) through the presence of structures and the extraction of energy from the wind. There has been extensive research into characterizing and modeling atmospheric wakes created by wind turbines to design the layout of wind facilities and hydrodynamic wake/turbulence related to predicting seabed scour. However, relatively few studies have analyzed the hydrodynamic wakes coupled with the interaction of atmospheric wakes with the sea surface. Further, even fewer studies have analyzed wakes and their impact on regional scale oceanographic processes (i.e., Mid-Atlantic Bight Cold Pool) and potential secondary changes to primary production and ecosystems. Studies on this topic have focused on ocean modeling rather than field measurement campaigns.

The general understanding of offshore wind–related impacts on hydrodynamics is derived primarily from European-based studies. A synthesis of European studies by Van Berkel et al. (2020) summarized the potential effects of wind turbines on hydrodynamics, the wind field, and fisheries. Local to a wind facility, the range of potential impacts include increased turbulence downstream, remobilization of sediments, reduced flow inside wind farms, downstream changes in stratification, redistribution of water temperature, and changes in nutrient upwelling and primary productivity. Human-made structures, especially tall vertical structures such as foundations, alter local water flow at a fine scale by potentially reducing wind-driven mixing of surface waters or increasing vertical mixing as water flows around the structure (Carpenter et al. 2016; Cazenave et al. 2016; Segtnan and Christakos 2015). When water flows around the structure, turbulence is introduced that influences local current speed and direction. Turbulent wakes have been observed and modeled at the kilometer scale (Cazenave et al. 2016; Vanhellemont and Ruddick 2014). While impacts on current speed and direction decrease rapidly around monopiles, there is a potential for hydrodynamic effects out to a kilometer from a monopile (Li et al. 2014). Direct observations of the influence of a monopile extended to at least 984 feet (300 meters); however, changes were indistinguishable from natural variability in a subsequent year (Schultze et al. 2020). The range of observed changes in current speed and direction 984 to 3,281 feet (300 to 1,000 meters) from a monopile is likely related to local conditions, wind farm scale, and sensitivity of the analysis. In strongly stratified locations such as the NY Bight, the mixing seen at monopiles is often masked by processes forcing toward stratification (Schultze et al. 2020), but the introduction of nutrients from depth into the surface mixed layer can lead to a local increase in primary production (Floeter et al. 2017; refer to Section 3.5.5, *Finfish, Invertebrates, and Essential Fish Habitat*, Section 3.5.6, *Marine Mammals*, Section 3.5.7, *Sea Turtles*, and Section 3.6.1, *Commercial Fisheries and For-Hire Recreational Fishing*, regarding hydrodynamic and atmospheric wake effects on primary production). The same factors that form and maintain the Mid-Atlantic Bight Cold Pool are likely to limit the extent of measurable hydrodynamic effects. Localized mixing will still occur, bringing nutrients to the surface.

A hydrodynamic model was run for four different WTG build-out scenarios of the offshore Rhode Island and Massachusetts lease areas that found offshore wind projects have the potential to alter local and regional physical oceanic processes (e.g., currents, temperature stratification), via their influence on currents from WTG foundations and by extracting energy from the wind (Johnson et al. 2021). The model demonstrated that introduction of the WTGs modifies the oceanic responses of current magnitude (flow speed), wave heights, and temperature in the following three ways:

- WTGs exert a drag force on flowing water, resulting in a reduction in current magnitude.

- Current magnitude and wave height are reduced as the WTGs extract energy from the wind, reducing the wind field surrounding the WTGs and therefore reducing the energy transfer from the wind to the sea.
- The presence of the WTGs initiates a downstream wake, where eddies and turbulence influence the temperature stratification through vertical mixing.

The changes in currents and mixing would fluctuate seasonally and regionally and affect water quality parameters (e.g., temperature, dissolved oxygen, salinity). Each of the three ways in which WTGs modify ocean conditions could influence ocean mixing and, in turn, stratification that is a key characteristic of the Mid-Atlantic Bight Cold Pool. However, the net impact of offshore wind farms on ocean stratification is dependent on the relative contribution of these three processes and potentially other currently unknown processes in a particular wind farm facility (Miles et al. 2021). WTGs and the OSSs would be placed in water depths ranging from 100 to 200 feet (31 to 61 meters) where current speeds are relatively low, and offshore cables would be buried where possible. Cable armoring would be used where burial is not possible, such as in hard-bottomed areas. BOEM anticipates that developers would implement BMPs to minimize seabed disturbance from foundations, scour protection, and cable installation. As a result, impacts on offshore water quality would likely be minor and localized and would not degrade water quality in exceedance of water quality standards.

The exposure of offshore wind structures, which are mainly made of steel, to the marine environment can result in corrosion without protective measures. Corrosion is a general problem for offshore infrastructures, and corrosion protection systems are necessary to maintain their structural integrity. Protective measures for corrosion (e.g., coatings, cathodic protection systems) are often in direct contact with seawater and have different potentials for emissions of metals or organic compounds into the marine environment, e.g., galvanic anodes emitting metals, such as aluminum, zinc, and indium, and organic coatings releasing organic compounds due to weathering or leaching.

Research conducted in the North Sea found that galvanic anodes result in the continuous emission of inorganic matter into the local marine environment for the life of the project. Reese et al. (2020) stated that more than 80 kilograms of aluminum-anode material per monopile foundation per year are emitted into the marine environment. Kirchgeorg et al. (2018) found that the use of aluminum anodes would reduce the total annual emissions by a factor of approximately 2.5 (5,511 pounds [118, 000 kilograms]) due to the higher current capacity than zinc anodes for an offshore wind farm with 80 WTG monopile foundations. Depending on the pH of the ambient water, Reese et al. (2020) found that, along with the main elements that compose a galvanic anode, toxicologically relevant elements such as zinc, cadmium, and lead will be emitted during the anode's lifetime. In-situ measurements of the leached elements are confounded by background levels of these elements in both sediment and seawater within the wind farms (Reese et al. 2020).

The current understanding of chemical emissions for offshore wind structures is that emissions appear to be low, suggesting a low environmental impact, especially compared to other offshore activities; however, these emissions may become more relevant for the marine environment with increased numbers of offshore wind projects and a better understanding of the potential long-term effects of corrosion protection systems (Kirchgeorg et al. 2018). Based on the current understanding of offshore wind structure corrosion effects on water quality, BOEM anticipates the potential impact to be minor. The presence of structures would not be expected to appreciably contribute to the cumulative impacts on water quality.

Discharges/intakes: While WTGs and OSSs are typically self-contained and do not generate discharges under normal operating conditions, some offshore wind projects may use HVDC converter stations that would convert AC to DC before transmission to onshore project components. The most effective way to cool these HVDC systems is by pumping in seawater through a heat exchanger to cool the deionized water within the system (Middleton and Barnhart 2022) and then discharge warmer water back into the ocean. The seawater is filtered through 500 microns to remove sand and other small particles. While the discharge is warmer than the surrounding ocean water, it is normally considered to have a minimal effect because thermal discharge will be quickly absorbed by the surrounding water mass and returned to ambient temperatures within a minimal distance from the discharge pipe. The discharge pipes are typically positioned about 30 feet (9.1 meters) above the seafloor. Chemicals such as bleach (sodium hypochlorite) in a concentration of roughly 10 to 200 parts per million would be used to prevent the growth of biofilms and encrusting organisms in the system. As a result, due to potential impacts on water quality to surrounding sea water, a USEPA NPDES permit would be required (Middleton and Barnhart 2022). Empire Wind 1 and 2 (OCS-A 0512) are the only ongoing offshore wind projects in the geographic analysis area and have not proposed the use of HVDC substations.

Planned offshore wind activities would result in a small increase in overall vessel traffic, with a short-term peak during construction. Vessel activity associated with planned offshore wind construction activities within the geographic analysis area for water quality, excluding the NY Bight lease areas, is expected to occur regularly beginning in 2023 and continuing through 2030 and then lessen to near existing condition levels during operations. Increased vessel traffic would be localized near affected ports and offshore construction areas. Planned offshore wind activities would result in an increase in regulated discharges from vessels, particularly during construction and conceptual decommissioning, but the events would be staggered over time and localized. Offshore permitted discharges would include uncontaminated bilge water and treated liquid wastes. BOEM assumes that all vessels/facilities operating in the same area will comply with federal and state regulations on effluent discharge, including the requirement for a USEPA NPDES permit and interim requirements of the Vessel Incidental Discharge Act (85 *Federal Register* 67818). All planned offshore wind projects would be required to comply with regulatory requirements related to the prevention and control of discharges and the prevention and control of nonindigenous species. All vessels would need to comply with USCG ballast water management requirements outlined in 33 CFR part 151 and 46 CFR part 162. Furthermore, all vessels would need to meet USCG bilge water regulations outlined in 33 CFR part 151, and allowable vessel discharges, such as bilge and ballast water, would be restricted to uncontaminated or properly treated liquids. Therefore, due to the minimal amounts of allowable discharges from vessels associated with planned non-offshore and offshore wind activities, BOEM expects impacts on water quality resulting from vessel discharges are likely to be minimal and not result in degradation of water quality in exceedance of water quality standards.

The overall impacts of discharges from vessels are anticipated to be negligible due to the staggered increase in vessels from various projects; the current regulatory requirements administered by the USEPA, USACE, USCG, and BSEE; and the restricted allowable discharges. Based on the above, the level of impact in the water quality geographic analysis area from planned non-offshore and offshore wind activities would be similar to existing conditions and would not be expected to appreciably contribute to the cumulative impacts on water quality.

Land disturbance: Planned non-offshore and offshore wind activities could include onshore components that could contribute to water quality impacts through sedimentation and accidental spills of fuels and lubricants. BOEM assumes that each project would avoid and minimize water quality impacts through BMPs, OSRPs/SPCCs, stormwater pollution prevention plans (SWPPPs), and compliance with applicable permit requirements. Overall, the impacts from onshore activities that occur near waterbodies could result in temporary introduction of sediments or pollutants into inshore waterways in small amounts where erosion and sediment controls fail. Land disturbance for planned offshore wind activities that are at a distance from waterbodies and that implement erosion and sediment control measures would be less likely to affect water quality. Impacts on water quality would be minor and localized with no degradation in water quality in exceedance of water quality standards and would be limited to periods of onshore construction and periodic maintenance over the life of each project. Land disturbance from planned non-offshore and offshore wind activities is not expected to appreciably contribute to the cumulative impacts on water quality.

3.4.2.3.3 Conclusions

Impacts of the No Action Alternative. Water quality would continue to follow current regional trends and respond to current environmental and societal activities, including climate change. BOEM expects ongoing non-offshore-wind activities would likely have temporary and **negligible** to **minor** impacts on water quality primarily through accidental releases and sediment suspension related to vessel traffic, port utilization, presence of structures, discharges/intakes, and land disturbance.

Cumulative Impacts of the No Action Alternative. Under the No Action Alternative, existing environmental trends and ongoing activities, including climate change, would continue to affect water quality in the geographic analysis area. Planned non-offshore-wind activities—including installation of new submarine cables and pipelines, onshore development, marine surveys, and port improvements—would contribute to cumulative impacts on water quality and would likely be undetectable. Similarly, planned offshore wind projects would also contribute to water quality impacts from sediment resuspension during construction and conceptual decommissioning, specifically from cable laying (including seabed preparations and pre-installation grapple runs), vessel discharges, sediment contamination, discharges from the WTGs and OSSs during operation, sediment plumes due to scour, and erosion and sedimentation from onshore construction. Construction and conceptual decommissioning activities associated with planned offshore wind activities would lead to increases in sediment suspension and turbidity. However, sediment suspension and turbidity increases would be temporary and localized, and BOEM anticipates the impacts to be minor. BOEM has considered the possibility of impacts resulting from accidental releases. A moderate impact could occur if there was a large-volume, catastrophic release; however, the probability of catastrophic release occurring is very low and the expected size of the most likely spill would be very small and of low frequency. Therefore, the cumulative impacts of the No Action Alternative on water quality from ongoing and planned activities would likely be **negligible** to **minor** because any potential detectable impacts are not anticipated to exceed water quality standards.

3.4.2.4 Impacts of Alternative B – No Identification of AMMM Measures at the Programmatic Stage – Water Quality

3.4.2.4.1 Impacts of One Project

Alternative B considers the potential impacts of future offshore wind development for the NY Bight area without the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts.

Accidental releases: Accidental releases during construction and installation, O&M, and conceptual decommissioning could involve fuel, oil, and lubricants. As discussed in Section 3.4.2.3, *Impacts of Alternative A – No Action – Water Quality*, the risk of a spill from an offshore structure would be low, and any effects would likely be localized. Increased vessel activity during construction, installation, and conceptual decommissioning would increase the potential for vessel allisions/collisions and fuel spills. However, collisions and allisions are anticipated to be unlikely based on the following factors that would be considered for a single NY Bight project and applied at the project-specific NEPA stage: USCG requirement for lighting on vessels, NOAA vessel speed restrictions, the lighting and marking plan that would be implemented, and the inclusion of a single NY Bight project's components on navigation charts. The single NY Bight project's SPCC and OSRP would be implemented and adhered to, which would provide for rapid spill response, cleanup, and other measures to minimize any potential impact on affected resources from spills and accidental releases, including spills resulting from catastrophic events.

In the unlikely event an allision or collision involving vessels or components associated with one single NY Bight project resulted in a large spill, impacts from a single NY Bight project alone on water quality would be short- to long-term depending on the type and volume of material released and the specific conditions (e.g., depth, currents, weather conditions) at the location of the spill. Overall, the probability of an oil or chemical spill occurring that is large enough to affect water quality is extremely low, and the degree of impact on water quality would depend on the spill volume. This risk and impact would be minor and localized with no degradation in water quality in exceedance of water quality standards, with the unlikely event of a large accidental release potentially causing a moderate and short-term impact.

Increased accidental releases of trash and debris may occur from vessels primarily during construction but also during operations and conceptual decommissioning of planned offshore wind facilities. BOEM assumes all vessels would comply with laws and regulations to properly dispose of marine debris and to minimize releases. In the event of a release, it would likely be an accidental, localized event in the vicinity of projects; therefore, project-related marine debris would only have a short-term effect on water quality.

The onshore construction site size and overall weather conditions can affect the total volume of stormwater discharge. Through the SWPPP and applicable NPDES permits for a NY Bight project, proper spill containment gear and absorption materials would be required to be maintained for immediate use in the event of any inadvertent spills or leaks. BOEM anticipates that the impacts from accidental releases on water quality would result in negligible and temporary impacts on surface and groundwater quality including sole source aquifers as a result of releases from heavy equipment during construction or conceptual decommissioning and other cable installation activities.

Anchoring: During construction, installation, and conceptual decommissioning activities, there is a potential for increased vessel anchoring. Anchoring can cause resuspension and deposition of sediments in the immediate area of disturbance. The anticipated acreage of impact from anchoring is not known for one NY Bight project; however, assuming anchoring impacts are similar to Empire Wind (OCS-A 0512), which has proposed 18 acres (7.3 hectares) of potential anchor disturbance, the impacts on water quality from a single NY Bight project due to anchoring would be localized, temporary, and minor during construction and conceptual decommissioning. Anchoring during operation would decrease due to fewer vessels required during operation, resulting in reduced impacts.

Cable emplacement and maintenance: The installation of array cables and offshore export cables would be conducted via jet plow, mechanical plow, or mechanical trenching, which can cause temporary increases in turbidity and sediment resuspension. Other projects using similar installation methods observed minor impacts on water quality due to the localized nature of the disturbance (Latham et al. 2017). Impacts from suspended contaminated sediments if present would result in detectable, localized, short-term degradation of water quality in exceedance of water quality standards along the offshore export cable corridor. A sediment transport model for Empire Wind (OCS-A 0512) (Tetra Tech 2022), which may be representative of the NY Bight lease areas, indicated that displacement of sediments would be low, would remain suspended for a short period of time (4 hours), and typically dissipate to background levels (Section 3.4.2.3.2 contains additional details on the sediment transport modeling). Based on the RPDE (Chapter 2, Section 2.1.2, *Alternative B – No Identification of AMMM Measures at Programmatic Stage*), a single NY Bight project offshore export cable emplacement would disturb an estimated maximum width of 131 feet (40 meters) of seabed, with up to 929 miles (1,495 kilometers) of export cable. Impacts on water quality from construction and conceptual decommissioning due to new cable emplacement and maintenance would be short-term and minor.

Port utilization: The Brooklyn Navy Yard, South Brooklyn Marine Terminal, Howland Hook Port Ivory, Arthur Kill Terminal, Paulsboro Marine Terminal, New Jersey Wind Port, Port of Albany, and Port of Coeymans have been identified for analysis within the PEIS, although not all ports would be used at the same time. Each port facility under consideration already has sufficient existing infrastructure or has an area where other entities intend to develop infrastructure with the capacity to support offshore wind activity, including one NY Bight project. Activities associated with the development of a single NY Bight project would add to existing baseline impacts on water quality due to routine port operations. If port expansions or modifications are necessary for a single NY Bight project, they would be completed in accordance with state and federal regulations and permits and would be completed in collaboration with multiple entities (e.g., port owners, local governmental agencies, states, other offshore wind developers). Port expansion could include dredging, deepening, and construction of new berths, resulting in impacts on water quality through accidental spills, leaks, or discharges or sedimentation during port use. Specific ports and expansions will be further discussed in project-specific COPs and COP-level NEPA analyses. Additionally, impacts on water quality would result from vessel traffic. The increase in vessel activity during the construction and installation stage of a single NY Bight project would be small. Multiple authorities regulate water quality impacts from port activities, and vessel activity would decrease during operations and conceptual decommissioning stages. Therefore, impacts of construction, operation, and conceptual decommissioning on water quality from port utilization would be negligible.

Presence of structures: A single NY Bight project would add up to 280 WTGs and would include a disturbance width of up to 131 feet (40 meters) per export cable. As described under the No Action Alternative, results from a hydrodynamic modeling study found that offshore wind projects have the potential to alter local and regional physical oceanic processes (e.g., currents, temperature stratification) via their influence on currents from WTG foundations and by extracting energy from the wind (Johnson et al. 2021). These disturbances would be localized but, depending on the hydrologic conditions, have the potential to impact water quality through altering mixing patterns and the formation of sediment plumes.

BOEM expects an analysis for potential for scouring and mobility of the seabed using information collected during the marine site investigations during COP development to identify areas within the NY Bight lease areas where significant scour could occur around foundations and other hard structures (dependent on water currents, wave action, and water depths). Low current speeds and minimal seabed mobility are good indicators that potential significant scour would not occur. The addition of scour protection would minimize the potential for scour at the base of foundations. Also, limited scour is anticipated around the cables due to the cable burial depths (3 to 9.8 feet [0.9 to 3 meters] for interarray cables and 3 to 19.6 feet (0.9 to 6 meters) for export cables).

In addition, as described under the No Action Alternative, the exposure of offshore wind structures to the marine environment can result in emissions of metals and organic compounds from corrosion protection systems. However, the current understanding of chemical emissions for offshore wind structures is that emissions appear to be low, suggesting a low environmental impact (Kirchgeorg et al. 2018).

Impacts on water quality from the presence of structures during construction and installation, O&M, and conceptual decommissioning would be reoccurring and continual but range from negligible to minor.

Discharges/intakes: Construction of a single NY Bight project would generate up to 51 vessels operating in a lease area or over the offshore export cable route at any given time (Section 3.6.6, *Navigation and Vessel Traffic*). Various vessel types (e.g., installation, cable-laying, support, transport/feeder, and crew vessels) would be deployed throughout the NY Bight project area during the construction and installation phase. Impacts from discharges from vessel traffic from one NY Bight project would be similar as described under the No Action Alternative as all vessels would need to comply with USCG ballast water discharge and other regulatory requirements, which would minimize impacts. Based on the BMPs and compliance with applicable vessel requirements, BOEM anticipates that the impacts on water quality from discharges would be minor during construction and, to a lesser degree, during O&M and conceptual decommissioning activities due to the decrease in the number of vessels needed for these activities.

Sediment resuspension during potential dredging for one NY Bight project could result in release of sediment contaminants into the water column. The dredged material would be transported for disposal at a licensed facility in accordance with applicable regulations and permit requirements. The total suspended sediments and associated contaminant concentrations generated by the in-water activities would be temporary and would result in minor short-term impacts on water quality.

One NY Bight project may use a HVDC converter OSS that would convert AC to DC before transmission to onshore project components. These HVDC systems are typically cooled by an open loop system that intakes cool sea water and discharges warmer water back into the ocean (Middleton and Barnhart 2022). Chemicals such as bleach (sodium hypochlorite) would be used to prevent growth in the system and keep pipes clean. The warm water discharged is generally considered to have a minimal effect as it will be mixed by the surrounding water and returned to ambient temperatures over time. Even though localized effects on water quality from the discharge of warmer water could take place in the area immediately surrounding the outlet pipe, the overall impacts are expected to be minimal with no degradation of water quality. CWA Section 316(b) requires NPDES permits to ensure that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available to minimize adverse environmental impacts.

Land disturbance: Onshore components of one NY Bight project are anticipated to include a specific transmission POI in New York or New Jersey and an interconnection point to a regional offshore grid substation. Proper erosion and sedimentation controls would be maintained to avoid and minimize unstable soils that could potentially be moved by wind and runoff into surface waters or groundwater resources and increase turbidity per permitting requirements or the applicable rules/regulations. This would continue protecting groundwater as drinking water resources, including sole source aquifers. BOEM assumes a SWPPP would be developed and implemented and the appropriate NPDES permit obtained to avoid and minimize water quality impacts during construction. HDD is expected to be used at landfall sites to minimize land disturbance near the shoreline. It is possible that potential, limited sediment releases could occur during the HDD, but impacts would be localized and not long lasting. As such, impacts on water quality from land disturbance is anticipated to be temporary, lasting only the duration of construction, and would be negligible.

3.4.2.4.2 Impacts of Six Projects

The same IPFs (accidental releases, anchoring, cable emplacement and maintenance, presence of structures, discharges/intakes, and land disturbance) described for a single NY Bight project apply to six NY Bight projects with more of a potential for impacts due to the greater amount of offshore and onshore development under six NY Bight projects. This includes an increase in the number of vessels for potential accidental releases and discharges/intakes that could affect water quality as well as additional anchoring and cable emplacement and maintenance causing increased sediment resuspension and deposition. Under six NY Bight projects, up to 1,125 foundation locations for WTGs and OSSs could be installed, which would increase the potential for scour and mobility of the seabed and include hydrodynamic impacts from the WTGs. However, due to the anticipated low currents and the use of scour protection, potential sediment transport would be minimized. Therefore, the impacts from presence of structures would increase for six NY Bight projects due to the increased number of WTGs and the associated hydrodynamic changes; however, impacts on water quality would be minimized due to the use of scour protection. If multiple projects are being constructed within the same timeframe, the impacts on water quality would be greater than those identified for one NY Bight project but not enough to change the overall impact ratings that range from negligible to minor, depending on the IPF, since the projects would likely not overlap each other geographically and the most impacts would be localized and short-term. As stated for one NY Bight project, multiple authorities regulate the impacts on water quality through permits and regulations that would still apply to six NY Bight projects.

Port utilization is still anticipated to be negligible (see Section 3.4.2.4.1, *Impacts on One Project*). The increase in vessel activity would be small with multiple authorities regulating water quality impacts. If any port expansions are required to accommodate six NY Bight projects, the impact on water quality is anticipated to be minor due to the port improvements complying with all applicable permit requirements to minimize, reduce, or avoid impacts.

3.4.2.4.3 Cumulative Impacts of Alternative B

The construction and installation, O&M, and conceptual decommissioning of Alternative B would contribute to the primary IPFs of accidental releases, anchoring, cable emplacement and maintenance, port utilization, presence of structures, discharges/intakes, and land disturbance and result in sediment resuspension and deposition, an increased potential for accidental releases, and changes to water mixing patterns that could affect water quality. However, impacts on water quality would range from negligible to minor, depending on the IPF, given the short-term temporary impacts of suspended sediment including contaminant resuspension, and the regulatory and permitting requirements to avoid and minimize impacts on water quality. In the unlikely event of an accidental release, the impacts would remain moderate.

In context of reasonably foreseeable environmental trends and planned actions, if multiple projects are constructed within the same timeframe, impacts of Alternative B would range from undetectable to noticeable. If construction timeframes of the six NY Bight projects were staggered, this could further minimize the potential for overlapping impacts. BOEM anticipates that the cumulative impacts associated with Alternative B when combined with past, present, and future activities would be minor and would not alter the overall character of water quality in the geographic analysis area for all IPFs except for a large accidental release, which would remain moderate.

The measurable impacts anticipated would be small, and water quality would recover completely without remedial or mitigating action. Six NY Bight projects would contribute to—but would not have an appreciable change to—the overall impact rating within the geographic area.

3.4.2.4.4 Conclusions

Impacts of Alternative B. Construction and installation, O&M, and conceptual decommissioning of Alternative B for either one NY Bight project or six NY Bight projects would likely have **negligible** to **minor** impacts on water quality, depending on the IPF, with the unlikely event of a large accidental release potentially causing a **moderate** impact.

Cumulative Impacts of Alternative B. Alternative B would contribute to the cumulative impact rating primarily through the increased turbidity, potential contaminant resuspension, and sedimentation due to anchoring and cable emplacement during construction, and alteration of water currents and increased sedimentation during O&M due to the presence of structures. Considering all the IPFs together, BOEM anticipates that the impacts of six NY Bight projects in the geographic analysis area combined with ongoing activities, planned offshore wind activities, and reasonably foreseeable environmental trends would likely result in **negligible** to **minor** cumulative impacts on water quality. BOEM has considered the possibility of impacts resulting from accidental releases. A **moderate** cumulative impact could occur if there was a large-volume, catastrophic release; however, the probability of this occurring is very low. In context of reasonably foreseeable environmental trends, the impacts contributed by Alternative B to the cumulative impacts on water quality would be undetectable.

3.4.2.5 Impacts of Alternative C (Proposed Action) – Identification of AMMM Measures at the Programmatic Stage – Water Quality

Alternative C, the Proposed Action, considers the potential impacts of future offshore wind development for the NY Bight Area with the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts. Alternative C consists of two sub-alternatives – Sub-alternative C1: Previously Applied AMMM Measures, and Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures. The analysis for Sub-alternative C1 is presented as the change in impacts from those impacts discussed under Alterative B, and the analysis for Sub-alternative C2 is presented as the change from Sub-alternative C1. Refer to Table G-1 in Appendix G, *Mitigation and Monitoring*, for a complete description of AMMM measures that make up the Proposed Action.

3.4.2.5.1 Sub-Alternative C1 (Preferred Alternative): Previously Applied AMMM Measures

Sub-alternative C1 analyzes the AMMM measures that BOEM has required as conditions of approval for previous activities proposed by lessees in COPs submitted for the Atlantic OCS or through related consultations (Table 3.4.2-7).

Table 3.4.2-7. Summary of previously applied avoidance, minimization, mitigation, and monitoring measures for water quality

Measure ID	Measure Summary
WQ-1	This measure would require lessees avoid using zinc sacrificial anodes on external components of WTG and OSS foundations to reduce the release of metal contaminants in the water column.
WQ-2	This measure proposes lessees submit an Oil Spill Response Plan (33 U.S.C. 1321) subject to BSEE review and approval that would contain information regarding facility location, oil type, notification procedures, clean-up equipment, sensitive resources at risk, and other information.
MUL-1	This measure proposes training, recovery, prevention, and reporting to reduce and eliminate trash and debris in order to reduce impacts from entanglement, ingestion, smothering of benthic species, and pollutants in the water column.
MUL-2	This measure proposes submittal and implementation of an anchoring plan to reduce impacts from turbidity and avoid anchor placement in sensitive habitats, including hardbottom and structurally complex habitats, as well as any known or potential cultural resources.

Impacts of One Project

AMMM measures are intended to minimize marine debris emanating from project vessels and shoreline activities, turbidity resulting from anchoring, and sediment disturbance. Identification of AMMM measures under Sub-alternative C1 could minimize some impacts on accidental releases and anchoring. Impacts for other IPFs would remain the same as described under Alternative B.

Accidental releases: MUL-1 would potentially reduce water quality impacts because there would theoretically be a reduced amount of trash and debris entering the water, and therefore fewer pollutants that could have negative impacts on water quality. WQ-1 would reduce the potential for water quality impacts from the release of metal contaminants into the water column by avoiding the use of zinc sacrificial anodes on WTG and OSS foundations. WQ-2 would require lessees prepare an Oil Spill Response Plan subject to BSEE review, which would minimize the potential effects from accidental oil spills by ensuring spills are cleaned up effectively and in a timely manner.

Anchoring: MUL-2 would require an Anchoring Plan, which could minimize sediment disturbance and the related turbidity through the use of anchor chain midline buoys to prevent cable sweep as well as not side-casting materials during cable emplacement, thereby reducing turbidity impacts on water quality.

Impacts of Six Projects

Identification of the AMMM measures for six NY Bight projects would have greater benefits to the overall water quality from NY Bight project activities than measures for one NY Bight project by minimizing local water quality impacts from turbidity, debris, and discharges due to the potential larger geographic area where impacts on water quality would be reduced. The potential impacts on water quality for six NY Bight projects under Sub-alternative C1 compared to six NY Bight projects under Alternative B are not anticipated to be substantially different.

Cumulative Impacts of Sub-Alternative C1 (Preferred Alternative)

Under Sub-alternative C1, the same ongoing and planned non-offshore-wind and offshore wind activities that would occur with Alternative B would continue to contribute to the primary IPFs of accidental releases, anchoring, cable emplacement and maintenance, port utilization, presence of structures, discharges/intakes, and land disturbance. Impacts on water quality are anticipated to be the same as described under Alternative B for six NY Bight projects with reduction through AMMM measures by minimizing local water quality impacts from turbidity, debris, and discharges. In context of reasonably foreseeable environmental trends, the impacts contributed by Sub-alternative C1 to the cumulative impacts on water quality would be undetectable. Impacts would remain minor for all IPFs, except for a large accidental release, which would remain moderate.

3.4.2.5.2 Sub-Alternative C2: Previously Applied and Not Previously Applied AMMM Measures

Sub-alternative C2 analyzes the AMMM measures under Sub-alternative C1 plus the AMMM measures that have not been previously applied. However, BOEM has not identified AMMM measures that have not been previously applied for water quality, and therefore, the impacts on water quality under Sub-alternative C2 are the same as Sub-alternative C1.

3.4.2.5.3 Conclusions

Impacts of Alternative C. AMMM measures would reduce impacts from trash and debris, anchoring, and sediment disturbance under Sub-alternative C1. However, these reductions likely would not alter the impact rating from Alternative B for either one NY Bight project or six NY Bight projects (**negligible** to **minor**; **moderate** for a large spill). Because no not previously applied AMMM measures were identified under Sub-alternative C2 impacts would remain the same as Sub-alternative C1 for both one and six NY Bight projects.

Cumulative Impacts of Alternative C. BOEM anticipates that the cumulative impacts for six NY Bight projects on water quality in the geographic analysis area would likely be **negligible** to **minor**, depending on the IPF, with the unlikely event of a large accidental release potentially causing a **moderate** impact. In context of reasonably foreseeable environmental trends, the impacts contributed by Sub-alternative C1 to the cumulative impacts on water quality would be undetectable. The identification of AMMM measures that would have otherwise not been implemented under Alternative B would not alter the impact rating. Because no not previously applied AMMM measures were identified under Sub-alternative C2, impacts would remain the same as Sub-alternative C1.

3.4.2.6 Recommended Practices for Consideration at the Project-Specific Stage

In addition to the AMMM measures identified under Sub-alternatives C1 and C2, BOEM is recommending lessees consider analyzing the RPs in Table 3.4.2-8 to further reduce potential water quality impacts. Refer to Table G-2 in Appendix G for a complete description of the RPs.

Table 3.4.2-8. Recommended Practices for water quality impacts and related benefits

Recommended Practice	Potential Benefit
MUL-21: Use or upgrade/retrofit to the best available technology, including new and emerging technology, when possible, which may include using closed-loop cooling systems.	A closed-loop subsea cooler system is an emerging technology, that, if applied, would not involve the intake or discharge of seawater, potentially reducing the potential effects from this IPF.
MUL-27: Employ methods to minimize sediment disturbance.	The impacts from turbidity through the use of anchor chain midline buoys to prevent cable sweep, as well as not side-casting materials during cable emplacement, could reduce turbidity impacts on water quality.
MUL-28: Develop an *Inadvertent Returns Plan*, and details preferred drilling solutions and methods.	This RP would potentially reduce pollutant impacts on water quality, as an *Inadvertent Returns Plan* would address prevention, control, and cleanup of potential inadvertent return and would avoid discharging drilling fluids onto the seabed.

3.5 Biological Resources

3.5.1 Bats

This section discusses potential impacts on bat resources from the Proposed Action, alternatives, and ongoing and planned activities in the geographic analysis area. The bat geographic analysis area, as shown on Figure 3.5.1-1, includes the United States coastline from Maine to Florida and extends 100 miles (161 kilometers) offshore and 5 miles (8 kilometers) inland to capture the movement range for species in this group. The offshore limit was established to capture the migratory movement 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 NY Bight projects.

The bat impact analysis in this PEIS is intended to be incorporated by reference into the project-specific environmental analyses for individual COPs expected for each of the NY Bight lease areas. Because the locations of onshore components for the NY Bight projects are not known at this time, the analysis of onshore bat impacts is dependent on a hypothetical project analysis, and impact conclusions consider a maximum-case scenario for onshore development. Additional detailed site-specific analysis will be required for individual COPs. Refer to Appendix C, *Tiering Guidance*, which identifies additional analyses anticipated to be required for the project-specific environmental analysis of individual COPs.

3.5.1.1 Description of the Affected Environment and Future Baseline Conditions

The number of bat species in the geographic analysis area varies by state, ranging from 8 species (Rhode Island, New Hampshire, and Maine) to 17 (Virginia and North Carolina) (Rhode Island Department of Environmental Management n.d.; Maine Department of Inland Fisheries and Wildlife 2021; New Hampshire Fish and Game n.d.; Virginia Department of Wildlife Resources 2021; North Carolina Wildlife Resources Commission 2017). There are 9 bat species present in New Jersey and New York, 8 of which may be present in coastal New Jersey and New York, and 6 that are year-round residents (Table 3.5.1-1) (NYSDEC n.d.; Maslo, B., Leu, K., 2013).

Bats are terrestrial species that spend almost their entire lives on or over land. Bat species can be broken down into cave-hibernating bats and migratory tree bats based on their wintering strategy. Both groups are nocturnal insectivores that use a variety of forested and open habitats for foraging during the summer. Migratory tree bats fly to southern parts of the United States in the winter. On occasion, migratory tree bats may potentially occur offshore during spring and fall migration and under very specific conditions like low wind and high temperatures. Recent studies, combined with historical anecdotal accounts, indicate that migratory tree bats periodically travel offshore during spring and fall migration, with 80 percent of acoustic detections occurring in August and September (Dowling et al. 2017; Hatch et al. 2013; Pelletier et al. 2013; Stantec 2016). However, unlike migratory tree bats, the likelihood of detecting a *Myotis* species or other cave bat is substantially less in offshore areas, including at distances of lease areas on the OCS (Pelletier et al. 2013).

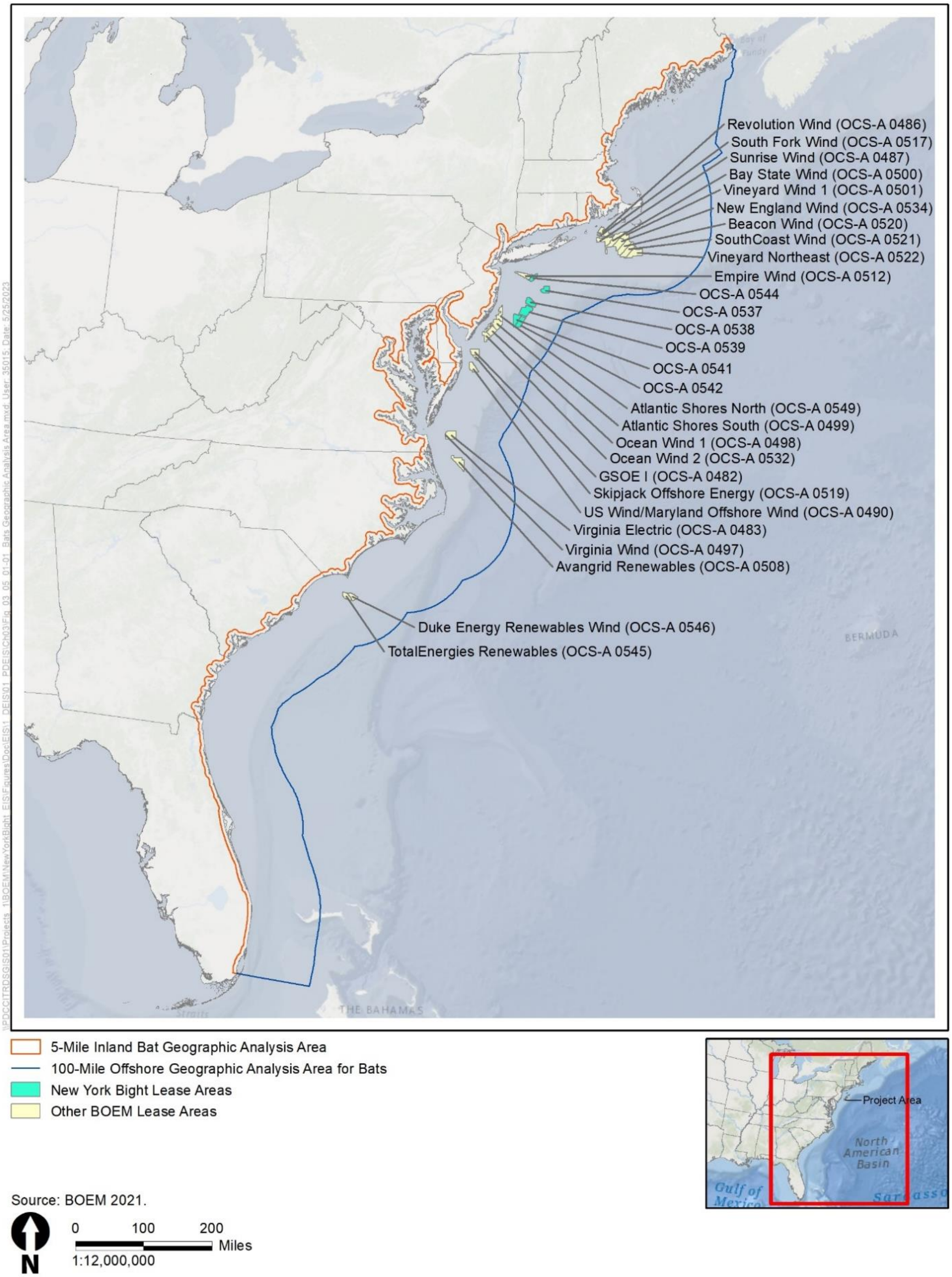


Figure 3.5.1-1. Bats geographic analysis area

Table 3.5.1-1. Bats present in New Jersey and New York and their conservation status

Common Name	Scientific Name	NY Status	NJ Status	Federal Status
Cave-Hibernating Bats				
Eastern small-footed bat[1]	*Myotis leibii*	Species of Concern	--	--
Little brown bat[1]	*Myotis lucifugus*	Species of Greatest Conservation Need	--	Under Review[3]
Northern long-eared bat[1, 2]	*Myotis septentrionalis*	Endangered	Endangered	Endangered
Indiana bat[4]	*Myotis sodalis*	Endangered	Endangered	Endangered
Tri-colored bat[1]	*Perimyotis subflavus*	Proposed Endangered	Proposed Endangered	Proposed Endangered
Big brown bat[5]	*Eptesicus fuscus*	--	--	--
Migratory Tree Bats				
Eastern red bat[5]	*Lasiurus borealis*	--	--	--
Hoary bat[5]	*Lasiurus cinereus*	--	--	--
Silver-haired bat[5]	*Lasionycteris noctivagans*	--	--	--

Source: USFWS 2021

[1] Currently a candidate for state listing as endangered pending rule promulgation (NJDEP 2013).

[2] On November 29, 2022, USFWS announced its intention to reclassify the northern long-eared bat as endangered. The new rule pertaining to the further conservation of the species took effect on March 31, 2023.

[3] Currently under a USFWS discretionary status review. Results of the review may be to propose listing, make a species a candidate for listing, provide notice of a not warranted candidate assessment, or other action as appropriate.

[4] Range does not indicate species presence in coastal New Jersey and New York.

[5] Currently a candidate for New Jersey state listing as special concern pending rule promulgation (NJDEP 2013).

The presence of bats has been documented in the offshore marine environment in the United States (Cryan and Brown 2007; Dowling et al. 2017; Hatch et al. 2013; Pelletier et al. 2013). Bats have been documented temporarily roosting on structures (i.e., lighthouses) on nearshore islands and there is evidence of eastern red bats migrating offshore in the Atlantic. In a Mid-Atlantic bat acoustic study conducted for a total of 86 nights during the spring and fall of 2009 and 2010, the maximum distance that bats were detected from shore was 13.6 miles (21.9 kilometers) and the mean distance was 5.2 miles (8.4 kilometers) (Sjollema et al. 2014). In Maine, bats were detected on islands up to 25.8 miles (41.6 kilometers) from the mainland (Peterson et al. 2014). In the Mid-Atlantic acoustic study, eastern red bats represented 78 percent of all bat detections offshore and bat activity decreased as wind increased (Sjollema et al. 2014). In addition, eastern red bats were detected in the Mid-Atlantic up to 27.3 miles (44 kilometers) offshore by high-definition video aerial surveys (Hatch et al. 2013).

The available data indicates that bat activity levels are generally lower offshore compared to onshore (Hein et al. 2021). A bat migration study in the North Sea off Belgium found that the number of bat detections was up to 24 times lower at offshore locations compared to the onshore locations (Brabant et al. 2021). During shipboard acoustic surveys conducted by Stantec in 2017 at the operational Block Island Wind Farm in Rhode Island, 911 bat passes were detected offshore. Bats were detected during 41 of 125 (33 percent) survey nights (Stantec 2018). The overall bat detection rate (passes/detector night) was 7.3, with up to 190 passes recorded during a single night. In addition, USDOE funded an acoustic survey of bat activity offshore and at coastal sites (onshore mainland locations on and near the shoreline) in the New England Gulf of Maine, mid-Atlantic coast, and Great Lakes regions from 2012–2014 (Stantec 2016). This was a very large survey effort across a wide area that detected a total of

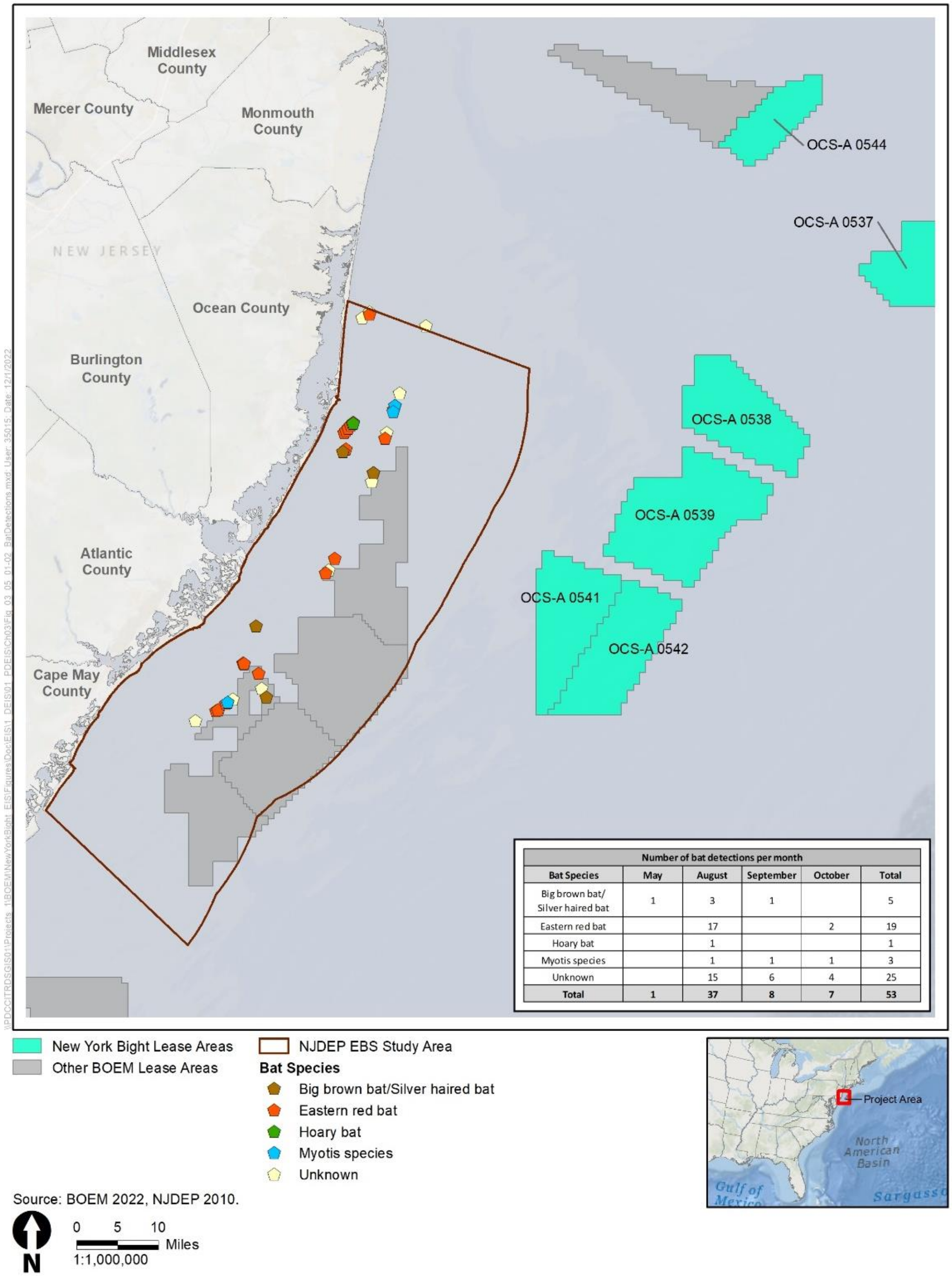
565,158 bat passes during a total of 17,730 detector nights. The mean number of bat passes per night in offshore open water was 4.96, while the number of bat passes per night for coastal onshore was significantly higher at 112.6. Surveys also found that 90 percent of bat passes occurred at times when wind speeds were below 5.0 m/s and temperatures were at or above 15.0 degrees Celsius (Stantec 2018).

Cave-hibernating bats hibernate regionally in caves, mines, and other structures and feed primarily on insects in terrestrial and freshwater habitats. These species generally exhibit lower activity in the offshore environment than the migratory tree bats (Sjollema et al. 2014), with movements primarily during the fall. In the Mid-Atlantic, the maximum distance *Myotis* bats were detected offshore was 7.2 miles (11.5 kilometers) (Sjollema et al. 2014). A recent nano-tracking study on Martha's Vineyard recorded little brown bat movements off the island in late August and early September, with one individual flying from Martha's Vineyard to Cape Cod (Dowling et al. 2017). Big brown bats were also detected migrating from the island later in the year (October–November) (Dowling et al. 2017). These findings are supported by an acoustic study conducted on islands and buoys off the Gulf of Maine that indicated the greatest percentage of activity was in July–October (Peterson et al. 2014). Given that the use of the coastline as a migratory pathway by cave-hibernating bats is likely limited to their fall migration period, that acoustic studies indicate lower use of the offshore environment by cave-hibernating bats, and that cave-hibernating bats do not regularly feed on insects over the ocean, exposure to the NY Bight lease areas is unlikely for this group.

Tree bats migrate south to overwinter and have been documented in the offshore environment (Hatch et al. 2013). Eastern red bats have been detected migrating from Martha's Vineyard late in the fall, with one bat tracked as far south as Maryland (Dowling et al. 2017). These results are supported by historical observations of eastern red bats offshore and recent acoustic and survey results (Hatch et al. 2013; Peterson et al. 2014; Sjollema et al. 2014). While little data is available throughout all six NY Bight lease areas, there is some bat data collected by NYSERDA in Lease Areas OCS-A 0537 and OCS-A 0539. NYSERDA remote metocean data from one buoy (latitude 39.9692, longitude -72.7166) in NY Bight Lease Area OCS-A 0537 and one buoy (latitude 39.54677, longitude -73.4292) in NY Bight Lease Area OCS-A 0539 detected nine silver-haired bats and one unknown low-frequency bat between September 2019 and September 2022 (NYSERDA 2022). The buoy in Lease Area OCS-A 0539 detected three bats in September/October 2019 and no bats for the remaining years. The buoy in Lease Area OCS-A 0537 detected three bats in September 2019, one bat in August 2020, and two bats in October 2020; no bats were detected in the remaining time frame.

Closer to the New Jersey coast, and outside of the NY Bight lease areas, the NJDEP Ecological Baseline Studies (EBS) surveys recorded several observations of bats flying over the ocean (NJDEP 2010), with observations of migratory tree bats in the near-shore portion of the Ocean Wind 1 and Atlantic Shores North project lease areas off of New Jersey (Figure 3.5.1-2). In addition to the NJDEP EBS survey data, offshore acoustic bat surveys were conducted in 2020 and 2021 in Lease Area OCS-A 0499 (Atlantic Shores South), which is near the southern end of the NY Bight lease areas (Atlantic Shores 2022). Eastern red bat represented the most detections (495), followed by big brown/silver-haired bat group (478), silver-haired bat (80), hoary bat (37), big brown bat (26), tri-colored bat (5), and *Myotis* spp. (3). Overall, 1,124 total bat detections were identified to species or species group across the 180 survey nights in the Lease Area OCS-A 0499. This averages to 6.2 bat detections per detector-night, which is a small fraction of bat passage rates typically found onshore during migration in eastern North America. For a nearby onshore comparison, Johnson et al. (2011) found bat activity along the coast of Maryland to average 25 passes per detector-night over the span of an entire year. During fall migration, the number of bat passes there commonly exceeded 500 per detector-night and peaked around 1,000 (Johnson et al. 2011), compared to an average of only 6.2 bat passes per night in Lease Area OCS-A 0499 during a similar time of year. Further, recent offshore acoustic surveys recorded bats within Lease Area OCS-A 0512 (Empire Wind project; adjacent to one of the NY Bight lease areas), with observations primarily composed of eastern red bats and silver-haired bats, concentrated during fall migration. Big brown bats were documented infrequently in Lease Area OCS-A 0512, and hoary bats were also detected in the offshore environment, but closer to shore and not within Lease Area OCS-A 0512. Given that tree bats have been detected in the offshore environment, they may pass through the NY Bight lease areas during the migration period, although BOEM would anticipate even lower bat use of the NY Bight lease areas because these areas are even farther offshore on the OCS than the NJDEP EBS survey area, Atlantic Shores South, and Empire Wind survey area (as shown by the NYSERDA buoy data).

Onshore coastal areas throughout the geographic analysis area provide a variety of habitats that support a diversity of bat species. The New Jersey coast, where potential onshore export cables for the NY Bight lease areas would be constructed and operated, consists of a diverse set of habitats including coastal wetlands, forested wetlands, forested uplands, forested lowlands, barrier beaches, and bay island habitats that can support a diversity of bat species. Forested habitats can provide roosting areas for both migratory and non-migratory species. All bat species present in New Jersey (migratory and non-migratory) are known to utilize forested areas (of varying types) during summer for roosting and foraging. Some of these species roost solely in the foliage of trees, while others select dead and dying trees where they roost in peeling bark or inside crevices. Some species may select forest interior sites, while others prefer edge habitats. Caves and mines provide key habitat for non-migratory bats. These locations serve as winter hibernacula, fall swarm locations (areas where mating takes place in the fall months), and summer roosting locations for some individuals. Hibernacula are documented in New Jersey, but the numbers of individuals at the sites have declined dramatically because of the fungal disease white-nose syndrome (WNS) (New Jersey Division of Fish and Wildlife 2017). Overall, while both cave-hibernating and migratory tree bats may occur along the New Jersey coast, BOEM anticipates the onshore export cables to be mostly co-located with existing disturbed areas (e.g., roads, transmission lines) and substations and other facilities to be sited in previously disturbed areas.



Number of bat detections per month					
Bat Species	**May**	**August**	**September**	**October**	**Total**
Big brown bat/ Silver haired bat	1	3	1		5
Eastern red bat		17		2	19
Hoary bat		1			1
Myotis species		1	1	1	3
Unknown		15	6	4	25
Total	**1**	**37**	**8**	**7**	**53**

Figure 3.5.1-2. Bat occurrences in the NJDEP EBS

The New York coast, where potential onshore export cables could be constructed and operated for the NY Bight projects, consists primarily of highly urbanized environments and existing infrastructure with few natural habitat areas. Areas of New York City (e.g., the boroughs of Brooklyn and Queens) are highly developed with commercial, industrial, and residential development and are expected to provide little, if any, bat habitat. East of Queens, Long Island is still highly developed as part of the greater New York City metropolitan area, but more natural areas are present moving eastward, with isolated areas of shrub and forest habitats with little connectivity to larger habitat areas. These habitats may support bats for foraging and roosting during summer (i.e., foliage trees, dead and dying trees with peeling bark and crevices), but these areas are not expected to be important habitat for any species because they are typically isolated by surrounding developments. Hibernacula are documented in New York, but the numbers of individuals at the sites have declined dramatically because of WNS (Ingersoll et al. 2016; New Jersey Division of Fish and Wildlife 2017). Since 2011, WNS has substantially reduced *Myotis* bat populations in New York (New Jersey Division of Fish and Wildlife 2017). Therefore, the presence of both cave-hibernating and migratory tree bats that may occur along the western Long Island coast is expected to be minimal.

One bat species protected under the ESA may occur in the area where the NY Bight lease areas' onshore wind project components would likely be sited: the northern long-eared bat (USFWS 2021). It is not expected that northern long-eared bats will be present in the NY Bight lease areas themselves. A 2016 tracking study on Martha's Vineyard (July–October 2016) did not record any offshore movements (Dowling et al. 2017). If northern long-eared bats were to migrate over water, movements would likely be close to the mainland. The related little brown bat has been documented to migrate from Martha's Vineyard to Cape Cod, and northern long-eared bat may likewise migrate to mainland hibernacula from these islands in August–September (Dowling et al. 2017). Given that there is little evidence of use of the offshore environment by northern long-eared bats, exposure to the NY Bight lease areas, if it occurs, is anticipated to be minimal. On June 20, 2024, BOEM initiated consultation with the USFWS on a Programmatic Framework ESA Section 7 consultation.

Cave bat species, including the northern long-eared bat, are experiencing drastic declines due to WNS. WNS has been confirmed present in every state in the geographic analysis area, except Florida (Whitenosesyndrome.org 2021). WNS was confirmed present in New York in 2006 and has killed large numbers of cave bats during hibernation—more than 90 percent at many sites (Whitenosesyndrome.org 2021). WNS was confirmed present in New Jersey in 2009 and, as in New York, has killed large numbers of cave bats during hibernation—more than 90 percent at many sites (Whitenosesyndrome.org 2021; New Jersey Division of Fish and Wildlife 2019). However, New Jersey's bat population appears to be stabilizing (New Jersey Division of Fish and Wildlife 2019). Development of the NY Bight lease areas, including onshore wind components (e.g., export cables) have the potential to affect cave bat populations already affected by WNS. The unprecedented mortality of more than 5.5 million bats in northeastern North America as of 2015 reduces the likelihood of many individuals being present within the onshore project area (USFWS 2015). However, given the drastic reduction in cave bat populations in the region, the biological significance of mortality resulting from offshore wind projects in the NY Bight lease areas, if any, may be increased.

3.5.1.2 Impact Level Definitions for Bats

Definitions of impact levels are provided in Table 3.5.1-2. Issues and indicators to assess impacts on bats are described using the definitions described in the Table 3.5.1-3.

Table 3.5.1-2. Impact level definitions for bats

Impact Level	Definition
Negligible	There would be no measurable impacts, or impacts would be so small that it is extremely difficult or impossible to discern or measure.
Minor	Most impacts could be avoided; if impacts occur, the loss of one or few individuals or temporary alteration of habitat could represent a minor impact, depending on the time of year and number of individuals involved.
Moderate	Impacts are unavoidable but would not result in population-level effects or threaten overall habitat function.
Major	Impacts would result in severe, long-term habitat or population-level effects on species.

Land disturbance, noise, and presence and operation and conceptual decommissioning of structures are contributing IPFs to impacts on bats. However, these IPFs may not necessarily contribute to each individual issue outlined in Table 3.5.1-3.

Table 3.5.1-3. Issues and indicators to assess impacts on bats

Issue	Impact Indicator
Collision/attraction	Qualitative estimate of collision risk
Displacement/barrier effects/disturbance	Changes to noise levels Projected traffic patterns/volume changes
Habitat loss and modification	Area of suitable habitat removed or modified

3.5.1.3 Impacts of Alternative A – No Action – Bats

When analyzing the impacts of the No Action Alternative on bats, BOEM considered the impacts of ongoing activities, including ongoing non-offshore-wind and ongoing offshore wind activities on the baseline conditions for bats. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with the other planned non-offshore-wind and offshore wind activities, as described in Appendix D, *Planned Activities Scenario*. Separate impact conclusions are presented for both scenarios.

3.5.1.3.1 Impacts of the No Action Alternative

Under Alternative A, baseline conditions for bats described in Section 3.5.1.1, *Description of the Affected Environment and Future Baseline Conditions*, would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities. Ongoing activities within the geographic analysis area that contribute to impacts on bats are generally associated with onshore construction and climate change. Onshore construction activities and associated impacts are expected to continue at current trends and have the potential to affect bat species through temporary and permanent habitat removal and temporary noise impacts, which could cause avoidance behavior and displacement. Mortality of individual bats could occur, but population-level effects would not be anticipated. Impacts associated with climate change have the potential to reduce reproductive output and increase individual mortality and disease occurrence.

Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on bats are listed in Table 3.5.1-4. The effects of approved projects have been evaluated through previous NEPA review and are incorporated by reference. Ongoing O&M of the Block Island and Coastal Virginia Offshore Wind Pilot projects and ongoing construction of the Vineyard Wind 1 (OCS-A 0501), South Fork Wind (OCS-A 0517), Ocean Wind 1 (OCS-A 0498),Revolution Wind (OCS-A 0486), Sunrise Wind (OCS-A 0487), New England Wind (OCS-A 0534) Phase 1 and 2, Empire Wind (OCS-A 0512) 1 and 2, and CVOW-Commercial (OCS-A 0483) projects would affect bats through the primary IPFs of noise, presence of structures, and land disturbance. Ongoing offshore wind activities would have the same types of impacts from noise, presence of structures, and land disturbance that are described in detail in Section 3.5.1.3.3, *Cumulative Impacts of the No Action Alternative,* for planned offshore wind activities, but the impacts would be of lower intensity.

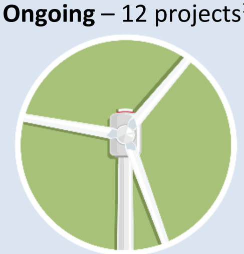
3.5.1.3.2 Impacts of the No Action Alternative on ESA-Listed Bats

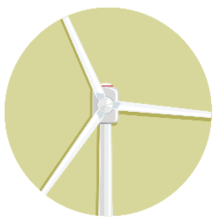
The federally endangered northern long-eared bat is the only bat species listed as threatened or endangered under the ESA that may be affected by offshore wind activities. As described below, northern long-eared bats are not expected to use the OCS in any significant numbers, if at all. The IPFs described previously for all bats would also apply to the northern long-eared bat. Any future federal activities that could affect the northern long-eared bat would need to comply with ESA Section 7 to ensure that proposed activities do not jeopardize the continued existence of the species. Future non-federal activities would be addressed under ESA Section 10 to ensure that proposed activities do not jeopardize the continued existence of the species.

3.5.1.3.3 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impact of the No Action Alternative in combination with other planned non-offshore-wind activities and planned offshore wind activities (without the NY Bight projects). Table 3.5.1-4 lists the ongoing and planned offshore wind activities in the geographic analysis area for bats.

Table 3.5.1-4. Ongoing and planned offshore wind in the geographic analysis area for bats

Ongoing/Planned	Projects by Region
Ongoing – 12 projects[1] 	**MA/RI** • Block Island (State waters) • Vineyard Wind 1 (OCS-A 0501) • Revolution Wind (O CS-A 0486) • South Fork Wind (OCS-A 0517) • Sunrise Wind (OCS-A 0487) • New England Wind (OCS-A 0534) Phase 1 • New England Wind (OCS-A 0534) Phase 2

Ongoing/Planned	Projects by Region
	NY/NJ • Ocean Wind 1 (OCS-A 0498) • Empire Wind 1 (OCS-A 0512) • Empire Wind 2 (OCS-A 0512) **VA/NC** • CVOW-Pilot (OCS-A 0497) • CVOW-Commercial (OCS-A 0483)
Planned – 18 projects[2] 	**MA/RI** • SouthCoast Wind (OCS-A 0521) • Beacon Wind 1 (OCS-A 0520) • Beacon Wind 2 (OCS-A 0520) • Bay State Wind (OCS-A 0500) • OCS-A 0500 remainder • OCS-A 0487 remainder • Vineyard Wind Northeast (OCS-A 0522) **NY/NJ** • Ocean Wind 2 (OCS-A 0532) • Atlantic Shores North (OCS-A 0549) • Atlantic Shores South (OCS-A 0499) **DE/MD** • Skipjack (OCS-A 0519) • US Wind/Maryland Offshore Wind (OCS-A 0490) • GSOE I (OCS-A 0482) • OCS-A 0519 remainder **VA/NC** • Kitty Hawk North (OCS-A 0508) • Kitty Hawk South (OCS-A 0508) **SC** • Duke Energy Renewables Wind (OCS-A 0546) • TotalEnergies Renewables (OCS-A 0545)

CVOW = Coastal Virginia Offshore Wind; DE = Delaware; GSOE = Garden State Offshore Energy; MA = Massachusetts; MD = Maryland; NC = North Carolina; NJ = New Jersey; NY = New York; RI = Rhode Island; SC = South Carolina; VA = Virginia

[1] Refer to footnotes 9 and 10 in PEIS Chapter 1 for additional information on the status of Ocean Wind 1, Empire Wind 1, and Empire Wind 2.

[2] Status as of September 20, 2024.

Other planned non-offshore-wind activities that may affect bats include new submarine cables, transmission systems (e.g., PBI) and pipelines, oil and gas activities, increasing onshore construction, marine minerals extraction, port expansions, and installation of new structures on the OCS (see Appendix D for a description of planned activities). These activities may result in temporary or permanent displacement and injury or mortality to individual bats, but population-level effects would not be expected.

The sections below summarize the potential impacts of other offshore wind activities on bats during construction and installation, O&M, and conceptual decommissioning of the projects. The federally listed northern long-eared bat is the only bat species listed under the ESA that may be affected by other offshore wind activities. Impacts on the northern long-eared bat would most likely be limited to onshore impacts, and generally during onshore facility construction.

Noise: Anthropogenic noise on the OCS associated with planned offshore wind development, including noise from pile-driving and construction activities, has the potential to affect bats on the OCS. Additionally, onshore construction noise has the potential to affect bats. BOEM anticipates that these impacts would be temporary and highly localized.

The construction of 1,682 WTGs and 48 OSSs associated with planned offshore wind projects on the Atlantic OCS would create noise and may temporarily affect some migrating tree bats, if conducted at night during spring or fall migration. The greatest impact of noise is likely to be caused by pile-driving activities during construction. Noise from pile-driving would likely occur during installation of foundations for offshore structures at a typical frequency of 4 to 6 hours at a time during construction. Construction activity would be temporary and highly localized. Auditory impacts are not expected to occur, as recent research has shown that bats may be less sensitive to temporary threshold shifts (TTS) than other terrestrial mammals (Simmons et al. 2016). Offshore habitat-related 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 by individual migrating tree bats (Schaub et al. 2008). These impacts would likely be limited to behavioral avoidance of pile-driving or construction activity, and no temporary or permanent hearing loss would be expected (Simmons et al. 2016). However, these impacts are highly unlikely to occur, as use of the OCS by bats is limited, and only during spring and fall migration.

Some potential for temporary, localized habitat impacts arising from onshore construction noise exists; however, no auditory impacts on bats would be expected to occur. Recent literature suggests that bats are less susceptible to temporary or permanent hearing loss from exposure to intense sounds (Simmons et al. 2016). Nighttime work may be required on an as-needed basis. Some temporary displacement or avoidance of potentially suitable foraging habitat could occur, but these impacts would not be expected to be biologically significant. 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 common among bats (Hann et al. 2017; Whitaker 1998).

Non-routine activities associated with the offshore wind facilities would generally require intense, temporary activity to address emergency conditions. The noise made by onshore construction equipment or offshore repair vessels could temporarily deter bats from approaching the site of a given non-routine event. Impacts on bats, if any, would be temporary and last only as long as repair or remediation activities were necessary to address these non-routine events.

Given the temporary and localized nature of potential impacts and the expected biologically insignificant response to those impacts, no individual fitness or population-level impacts would be expected to occur as a result of onshore or offshore noise associated with planned offshore wind development.

Presence of structures: Ongoing and planned offshore wind-related activities would account for up to 2,459 WTGs and 66 OSSs in the geographic analysis area, and the presence of these structures could result in potential long-term effects on bats. Cave bats (including the federally listed northern long-eared bat) do not tend to fly offshore (even during fall migration), and, therefore, exposure to construction vessels during construction or maintenance activities, or the rotor-swept zone (RSZ) of operating WTGs in the offshore wind lease areas, is expected to be negligible, if exposure occurs at all (BOEM 2015; Pelletier et al. 2013).

As discussed above tree bats may occur in the offshore marine environment (Cryan and Brown 2007; Dowling et al. 2017; Hatch et al. 2013; Pelletier et al. 2013) and potentially pass through the offshore wind lease areas during the fall migration; however, bat activity levels are generally lower offshore compared to onshore (Hein et al. 2021, Brabant et al. 2021). The low presence of bats in the offshore environment of the Atlantic OCS is further supported by multi-year post-construction bat monitoring at the existing Block Island Wind Farm (five wind turbines offshore Block Island, Rhode Island) and the Coastal Virginia Offshore Wind Pilot (two turbines offshore Virginia), as well as lease-area-specific bat surveys (e.g., Atlantic Shores and Empire Wind). These monitoring and survey results are summarized below.

- **Block Island Wind Farm (Stantec 2020):** Three years of post-construction bat monitoring with bat detectors deployed for 1,808 calendar nights from August 3, 2017, to February 4, 2020. Collectively, the detectors operated successfully for 1,707 detector-nights, during which time 2,294 bat passes were detected. The overall bat detection rate during the survey period (passes/detector-night) was 1.3. Detection rates were highest during August and September, with no bat passes recorded from December through April. Eastern red bats and silver-haired bats accounted for a combined 76.5 percent of the passes. Big brown and hoary bats comprised the majority of the remaining passes. Two passes identified as little brown bats were plausible, but the monitoring report notes that these could have been fragments of eastern red bat call sequences. No northern long-eared bats were detected.
- **Coastal Virginia Offshore Wind Pilot (Dominion Energy 2022):** Post-construction monitoring occurred from April 1 to June 15, 2021 (spring season); August 15 to October 31, 2021 (fall season); and January 15 to March 15, 2022 (winter season). Across all bat detection sensors during the entire three season monitoring period, there were 521 detections of bats. Only two bat detections occurred in the spring, and the remaining 519 occurred in the fall (mostly in September); no bats were detected in the winter. The detection rate for the fall season was 6.6 bats per detector-day. Slightly over half (56 percent) of detections occurred when turbine blades were spinning, and bats avoided collisions while foraging within the RSZ using microavoidance behavior. Bats detected included the silver-haired bat, hoary bat, and eastern red bat. No federally or state listed bat species were detected during the survey period.
- **Lease Area OCS-A 0499 (Atlantic Shores South [Atlantic Shores 2022]):** Offshore acoustic bat surveys were conducted in the lease area in 2020 and 2021. Overall, there were 1,124 total bat detections identified to species or species group across the 180 survey nights. This averages to

6.2 bat detections per detector-night. Detections occurred from July to October, with peak activity in August and September, and the latest detection occurring on November 1. Eastern red bat represented the most detections (495), followed by big brown/silver-haired bat group (478), silver-haired bat (80), hoary bat (37), big brown bat (26), tri-colored bat (5), and *Myotis* spp. (3).

- **Lease Area OCS-A 0512 (Empire Wind [TetraTech 2022]):** Offshore acoustic bat surveys were conducted in the lease area in 2018. Overall, there were 584 total bat detections identified to species level or frequency group across 188 survey nights. This averages to 3.1 bat detections per detector-night. There was a minimum of zero passes and a maximum of 133 passes recorded in a single night. Eastern red bat represented the most detections (229) followed by silver-haired bat (184), unidentified high frequency bat (133), unidentified low frequency bat (21), and big brown bat (17). Detection rates were highest in early August through early November.

These bat survey data indicate that bat presence in the offshore environment is a small fraction of bat passage rates typically found onshore during migration in eastern North America. For a nearby onshore comparison, Johnson et al. (2011) found bat activity along the coast of Maryland to average 25 passes per detector-night over the span of an entire year. During fall migration, the number of bat passes there commonly exceeded 500 per detector-night and peaked around 1,000 (Johnson et al. 2011), compared to an average of only 1.3 for Block Island Wind Farm, 6.6 for Coastal Virginia Offshore Wind Pilot, 6.2 in Lease Area OCS-A 0499 (Atlantic Shores South), and 3.1 in Lease Area OCS-A 0512 (Empire Wind) during a similar time of year. As another comparison, a recent study farther inland, along Lake Erie, reported an average of 155 bat passes per detector-night during the fall migration period of 2020 (Haddaway and McGuire 2022). As such, while some bats may fly offshore during migration, they appear to represent a very small percentage of their species' total population onshore. In addition to ongoing monitoring of the Block Island Wind Farm and Coastal Virginia Offshore Wind Pilot (summarized above), the Vineyard Wind 1 and South Fork Wind Farm projects have post-construction requirements to monitor bat activity, which will provide additional information to developers and agencies on bat activities near wind farms and to help minimize bat impacts.

Based on recent bat survey data on the Atlantic OCS (as described above), the limited number of tree bat species that may encounter the operating WTGs in the offshore wind lease areas would likely be composed of the eastern red bat, hoary bat, big brown bats, and silver-haired bat. Offshore O&M would present a seasonal risk factor to migratory tree bats that may utilize the offshore habitats during fall migration. While some potential exists for migrating tree bats to encounter operating WTGs during fall migration, the overall occurrence of bats on the OCS is relatively very low (as previously described). Additionally, unlike with terrestrial migration routes, there are no landscape features that would concentrate bats and thereby increase exposure to the offshore wind lease areas. There is some evidence that bats could use offshore structures to provide shelter from adverse weather or to rest after a long flight (Solick and Newman 2021), which could increase exposure and risk of collision with turbine blades. While bats have been found roosting in the nacelles of turbines close to shore (3.6 miles [5.8 kilometers]) in the Baltic Sea (Ahlén et al. 2009), given the low presence of bats offshore of New York and New Jersey and the farther distance of offshore wind projects from shore in the geographic analysis area, the potential for bats to roost on WTGs is expected to be low.

Given the expected infrequent and limited use of the OCS by migrating tree bats, very few individuals would be expected to encounter operating WTGs or other structures associated with offshore wind development. Further, with the typical spacing between many structures associated with planned offshore wind development being 0.6 to 1 nautical mile (1.1 to 1.9 kilometers) and the distribution of anticipated projects, the limited number of individual bats migrating over the OCS within the RSZ of project WTGs would likely pass through projects with only slight course corrections, if any, to avoid operating WTGs (Baerwald and Barclay 2009; Cryan and Barclay 2009; Fiedler 2004; Hamilton 2012; Smith and McWilliams 2016). As seen with some birds (Masden et al. 2012; Peschko et al. 2021), wide spacing between WTG rows is expected to reduce barrier effects by providing bats ample space to fly through wind farms while staying far away from the nearest WTG. As such, BOEM expects that adverse impacts of additional energy expenditure due to course corrections to avoid WTGs are not expected to be biologically significant. Furthermore, the potential collision risk to migrating tree bats differs with climatic conditions; for example, bat activity is associated with relatively low wind speeds and warm temperatures (Arnett et al. 2008; Cryan and Brown 2007; Fiedler 2004; Kerns et al. 2005). Post-construction acoustic and video monitoring of bats at the Coastal Virginia Offshore Wind Pilot Project from the spring of 2021 through winter of 2022 found bat activity to decline with increasing wind speed and no video evidence of collisions with the WTGs (Dominion Energy 2022). Given the relatively low numbers of tree bats in the offshore environment, the wide spacing of WTGs, and the intermittence of projects, the likelihood of collisions is expected to be low; therefore, impacts on bats would be negligible. Additionally, the likelihood of a migrating individual encountering one or more operating WTGs during adverse weather conditions is extremely low, as bats onshore and offshore have been shown to suppress activity during periods of strong winds, low temperatures, and rain (Arnett et al. 2008; Erickson et al. 2002; Sjollema et al. 2014; Dominion Energy 2022).

Land disturbance: Construction of onshore power infrastructure would be required to connect offshore wind energy projects to the electrical grid. Typically, this would require only small amounts of habitat removal, if any, and would occur in previously disturbed areas. Transmission infrastructure, such as PBI, would likely be primarily co-located with existing roads and rights-of-way. However, the conversion of habitat would likely still occur. PBI would potentially have an impact on 2 acres of wetland (including forested wetland) habitat and 4 acres of forest (deciduous, evergreen, and mixed) habitat. Habitat and/or species surveys may be conducted in accordance with federal and state requirements to support federal and state agency consultation and permitting requirements, and consultation and permitting may require that construction activities be seasonally restricted to occur when bats are inactive. Short-term and long-term impacts associated with habitat loss or avoidance during construction may occur, but no injury or mortality of individuals would be expected. As such, onshore construction activities associated with offshore wind development would not be expected to appreciably contribute to overall impacts on bats.

In addition to electrical infrastructure, some amount of habitat conversion may result from port expansion activities required to meet the demands for fabrication, construction, transportation, and installation of wind energy structures. The general trend along the coastal region from Virginia to Maine points to port activity increasing modestly, requiring some conversion of undeveloped land to meet port demand. This conversion would result in permanent habitat loss for local bat populations. However, the increase from planned offshore wind development would be a minimal contribution in the port expansion required to meet increased commercial, industrial, and recreational demand.

3.5.1.3.4 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, bats would continue to be affected by existing environmental trends and ongoing activities. BOEM expects ongoing activities to have continuing temporary, long-term, and permanent impacts (disturbance, displacement, injury, mortality, and habitat conversion) on bats primarily through onshore construction impacts, the presence of structures, and climate change. Given the infrequent and limited anticipated use of the OCS by migrating tree bats during spring and fall migration and given that cave bats do not typically occur on the OCS, ongoing offshore wind activities would not appreciably contribute to impacts on bats. Temporary disturbance and permanent loss of habitat onshore may occur as a result of ongoing offshore wind development. However, habitat removal is anticipated to be minimal, and any impacts resulting from habitat loss or disturbance would not be expected to result in individual fitness or population-level effects within the geographic analysis area. The No Action Alternative would likely result in **negligible** impacts on bats.

Cumulative Impacts of the No Action Alternative. Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and bats would continue to be affected by natural and human-caused IPFs. Planned activities would contribute to the impacts on bats due to habitat loss from increased onshore construction. In the offshore environment, impacts are anticipated to be negligible because bat presence on the OCS is anticipated to be limited. Impacts on onshore bat habitat are expected to be negligible to minor, depending on the amount and quality of forest habitat removed. Overall, BOEM anticipates cumulative impacts of the No Action Alternative would likely be **negligible** to **minor.**

3.5.1.4 Impacts of Alternative B – No Identification of AMMM Measures at the Programmatic Stage – Bats

3.5.1.4.1 Impacts of One Project

Alternative B considers the potential impacts of future offshore wind development for the NY Bight area without the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts.

Noise: Pile-driving noise and onshore and offshore construction noise associated with a single NY Bight project is expected to result in temporary and highly localized impacts. Auditory 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). Impacts, if any, are expected to be limited to behavioral avoidance of pile-driving or construction activity, and no temporary or permanent hearing loss would be expected (Simmons et al. 2016).

Presence of structures: The various types of impacts on bats that could result from the presence of structures, such as migration disturbance and turbine strikes, are described in detail in *Cumulative Impacts of the No Action Alternative*. Between 50 and 280 WTGs and 1 and 5 OSSs on the OCS would result from one NY Bight project where few currently exist. The structures, and related bat impacts, associated with one NY Bight project would remain at least until conceptual decommissioning of the project is complete and could pose long-term effects on bats.

Migratory tree bats have the potential to pass through the NY Bight lease areas and be exposed to structures, but, overall, a small number of bats is expected in the lease areas given their distance from shore and low occurrence on the OCS. As detailed in Section 3.5.1.3.3, *Cumulative Impacts of the No Action Alternative* section, and Section 3.5.1.1, *Description of the Affected Environment and Future Baseline Conditions*, bat surveys (in lease areas on the OCS), buoy data on the OCS, and recent bat monitoring at existing wind turbines on the OCS, indicate that bats are generally absent on the OCS during most of the year, with very limited presence typically during the late summer/fall months (August–October). Compared to bat presence in the onshore environment, bat presence offshore represents a very small percentage of bat species' total population onshore. The NY Bight lease areas are also farther offshore on the OCS compared to most other projects (like Ocean Wind 1 [OCS-A 0498] and Atlantic Shores South [OCS-A 0499]), and BOEM anticipates that bat numbers would be even lower due to distance. Therefore, because available information and bat survey data on the OCS indicate bat presence on the OCS is limited in both numbers and time of year, BOEM anticipates the presence of structures would have a negligible impact on bat populations.

Land disturbance: Impacts associated with construction of onshore elements of a single NY Bight project could occur if construction activities take place during the active season (generally April through October), and may result in injury or mortality of individuals, particularly juveniles who are unable to flush from a roost, if occupied by bats at the time of removal. There would be some potential for habitat impacts on bats as a result of the loss of potentially suitable roosting or foraging habitat. However, BOEM anticipates that impacts on bat habitat from onshore construction activities would be limited because, based on recent proposed offshore wind projects, whenever possible, facilities (including overhead transmission lines) would be co-located with existing developed areas (i.e., roads and existing transmission lines) to limit disturbance. In addition, New York State restricts tree clearing from March through November on Long Island. Where necessary, construction of onshore facilities may require clearing and some permanent removal of some trees along the edge of the construction corridor. Any habitat that may be present within permanent substation/converter station sites or other permanent facilities would be converted to developed land with landscaping for the duration of the NY Bight project's operational lifetime, which would be considered a long-term effect. While BOEM anticipates tree clearing to be minimal due to the likely placement of onshore project components in previously disturbed areas and adherence to requirements to minimize impacts identified through state permitting and ESA consultation, it is possible that areas of forest that support bats could be temporarily and permanently cleared depending on the siting of the NY Bight project's onshore components. Disturbance to the land surface or terrestrial habitat during the course of conceptual decommissioning would be minimal, such as disconnecting and cutting buried cables at the fence site below ground.

Applicants could also leave some onshore facilities in place for future use. Therefore, onshore temporary impacts of conceptual decommissioning would be negligible. Overall, BOEM anticipates habitat loss would be limited, and any potential effects would be indirect and unlikely to affect individual or population levels of bat species. However, the area of suitable bat habitat removed could vary, depending on the specific siting of the onshore project components.

3.5.1.4.2 Impacts of Six Projects

The same noise and presence of structure IPF impact types and mechanisms described under one NY Bight project apply to six NY Bight projects. There would be more potential for impacts for these IPFs due to the greater amount of offshore and onshore development under six NY Bight projects. However, noise impacts are still expected to be minimal because noise has limited effects on bats (see Section 3.5.1.4.1, *Impacts of One Project*), and a greater number of offshore structures are unlikely to change the intensity of the impact because bat presence on the OCS is low. Therefore, noise impacts and offshore structures under six NY Bight projects are anticipated to have negligible impacts on bats.

The same land disturbance IPF impact types and mechanisms described under one NY Bight project apply to six NY Bight projects. Similar to a single NY Bight project, the level of impact of bats from land disturbance depends on the amount of bat habitat affected from the onshore project components, particularly forest habitat. While BOEM anticipates that impacts on bat habitat from onshore construction activities under six NY Bight projects would be limited, it is possible that areas of forest that support bats could be temporarily and permanently cleared. Under six NY Bight projects, the potential for this possibility would be greater compared to one NY Bight project due to the increased amount of offshore wind development that would occur.

3.5.1.4.3 Impacts of Alternative B on ESA-Listed Bats

As stated previously, the presence of northern long-eared bat on the offshore environment would generally be limited, and there would be more potential effects from onshore activities. On June 20, 2024, BOEM initiated consultation with the USFWS on a Programmatic Framework ESA Section 7 consultation.

3.5.1.4.4 Cumulative Impacts of Alternative B

The construction and installation, O&M, and conceptual decommissioning of both onshore and offshore infrastructure for offshore wind activities across the geographic analysis area would also contribute to the primary IPFs of noise, presence of structures, and land disturbance. Given that the use of the OCS by migrating tree bats during spring and fall migration is anticipated to be infrequent and limited and given that cave bats do not typically occur on the OCS, offshore wind activities would not appreciably contribute to impacts on bats. Temporary disturbance and permanent loss of onshore habitat may occur as a result of constructing onshore infrastructure such as onshore substations and onshore export cables for offshore wind development. Any habitat removal is anticipated to be minimal, and any impacts resulting from habitat loss or disturbance would not be expected to result in individual fitness or population-level effects within the geographic analysis area. However, the area of suitable bat habitat removed could vary, depending on the specific siting of the onshore project components.

The cumulative impacts on bats would likely be negligible in the offshore environment because the occurrence of bats offshore is low. This conclusion would not change even if all six of the individual NY Bight projects are constructed all at once or staggered. Onshore habitat loss is expected to be minimal and would result in negligible impacts, but a greater area of habitat loss could result in increased impacts. If construction of the onshore components of the projects is staggered, then there could be less of an effect on bats in the short term than if all six NY Bight projects were constructed at once. In the context of reasonably foreseeable environmental trends, BOEM anticipates the contribution of impacts of six NY Bight projects to the cumulative noise, presence of structures, and land disturbance impacts on bats would be undetectable.

3.5.1.4.5 Conclusions

Impacts of Alternative B. Construction, installation, and conceptual decommissioning of Alternative B, whether one NY Bight project or six NY Bight projects, would likely have **negligible** to **minor** impacts on bats, depending on the amount and quality of forest habitat removed. The main significant risk would be from operation of the offshore WTGs and potential onshore removal of habitat, which could lead to long-term impacts in the form of mortality, although BOEM anticipates this to be rare due to limited bat presence on the OCS in both numbers and time of year. Noise effects from construction are expected to be limited to temporary and localized behavioral avoidance that would cease once construction is complete.

Cumulative Impacts of Alternative B. BOEM anticipates that the cumulative impacts on bats in the geographic analysis area would likely be **negligible** to **minor** under six NY Bight projects. In context of reasonably foreseeable environmental trends, the impact of six NY Bight projects to the cumulative impacts on bats would be undetectable. Because the occurrence of bats offshore is low, six NY Bight projects would contribute to the cumulative impacts primarily through the long-term impacts from onshore habitat loss related to onshore substations and cables.

3.5.1.5 Impacts of Alternative C (Proposed Action) – Identification of AMMM Measures at the Programmatic Stage – Bats

Alternative C, the Proposed Action, considers the potential impacts of future offshore wind development for the NY Bight area with the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts. Alternative C consists of two sub-alternatives – Sub-alternative C1: Previously Applied AMMM Measures, and Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures. The analysis for Sub-alternative C1 is presented as the change in impacts from those impacts discussed under Alternative B, and the analysis for Sub-alternative C2 is presented as the change from those impacts discussed in Sub-alternative C1. Refer to Table G-1 in Appendix G, *Mitigation and Monitoring*, for a complete description of AMMM measures that make up the Proposed Action.

3.5.1.5.1 Sub-alternative C1 (Preferred Alternative): Previously Applied AMMM Measures

Sub-alternative C1 analyzes the AMMM measures that BOEM has required as conditions of approval for previous activities proposed by lessees in COPs submitted for the Atlantic OCS or through related consultations (Table 3.5.1-5).

Table 3.5.1-5. Summary of previously applied avoidance, minimization, mitigation, and monitoring measures for bats

Measure ID	Measure Summary
BB-1	This measure proposes requiring that any occurrence of dead or injured ESA-listed birds or bats be reported as soon as practicable, which would improve the understanding of ESA-listed bat interactions with wind farms.
BB-2	This measure proposes annual reporting requirements for dead or injured birds or bats, which would improve the overall understanding of bat interactions with wind farms.
BB-3	This measure proposes lessees prepare and implement a Bird and Bat Post-Construction Monitoring Plan, which would include monitoring, reporting requirements, and adaptive management to reduce impacts on bats from offshore wind farms.

Impacts of One Project

The identification of AMMM measures under Sub-alternative C1 could potentially reduce impacts on bats compared to those under Alternative B for the presence of structures IPF. Impacts for other IPFs would remain the same as described under Alternative B.

Presence of structures: Development and implementation of a *Bird and Bat Post-Construction Monitoring Plan* (BB-3) would support advancement of the understanding of bat interactions with offshore wind farms through monitoring, reporting requirements, and adaptive management. Depending on the results of the post-construction monitoring, new mitigation and monitoring measures may be required by BOEM if impacts on bats in the offshore environment deviate substantially from the impact analysis. The immediate reporting of dead or injured ESA-listed bats and annual reporting of any dead or injured bats would improve overall understanding of bat interactions with offshore wind and may reduce overall impacts on bats over time (BB-1, BB-2). Dead bat reporting could also lead to new mitigation or monitoring methods to reduce impacts on bats.

Overall, while the identification of the AMMM measures under Sub-alternative C1 for this IPF could reduce impacts on bats, BOEM anticipates the impacts from presence of structures from one project in the NY Bight lease areas would be similar to Alternative B and remain negligible. This impact determination is primarily based on the current understanding that bat presence in the offshore environment is low.

Impacts of Six Projects

The same IPF impact types and mechanisms described under one NY Bight project apply to six NY Bight projects. AMMM measures identified under Sub-alternative C1 for six NY Bight projects could similarly reduce impacts on bats as described for a single NY Bight project, but the benefits would apply to more projects and cover a large geographic extent. However, because presence of bats on the OCS is low and because bat habitat impacts in the onshore environment are unknown, the potential impacts on bats for six NY Bight projects under Sub-alternative C1 compared to one NY Bight project are not anticipated to be substantially different. For the same reasons, the potential impacts on bats for six NY Bight projects under Sub-alternative C1 compared to six NY Bight projects under Alternative B are not anticipated to be substantially different and remain negligible to minor.

Impacts of Sub-alternative C1 (Preferred Alternative) on ESA-Listed Bats

The identification of AMMM measures would result in similar reductions in impacts for ESA-listed bats as described for all bats for one NY Bight project and six NY Bight projects, with the exception of AMMM measure BB-1, which is designed specifically to mitigate impacts on ESA-listed bats. BB-1 would improve the understanding of ESA-listed bat interactions with WTGs through immediate reporting requirements. The northern long-eared bat is the only bat species listed as threatened or endangered under the ESA that may be affected by Sub-alternative C1. As stated previously, the presence of northern long-eared bat in the offshore environment would generally be limited, with more potential effects from onshore activities.

Cumulative Impacts of Sub-alternative C1 (Preferred Alternative)

Similar to Alternative B, the cumulative impacts on bats under Sub-alternative C1 would likely be negligible in the offshore environment because the occurrence of bats offshore is low. Onshore habitat loss may be reduced if lessees design the onshore project components to avoid sensitive onshore bat habitat, but there is still the possibility of larger habitat areas removed, which could result in potential minor impacts from land disturbance. In context of reasonably foreseeable environmental trends, the impacts of Sub-alternative C1 to the cumulative noise, presence of structures, and land disturbance impacts on bats would be undetectable.

3.5.1.5.2 Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures

Sub-alternative C2 analyzes the AMMM measures under Sub-alternative C1 plus the AMMM measures that have not been previously applied. However, BOEM has not identified any AMMM measures that have not been previously applied for bats, and, therefore, the impacts on bats under Sub-alternative C2 are the same as Sub-alternative C1.

3.5.1.5.3 Conclusions

Impacts of Alternative C. Construction, installation, and conceptual decommissioning of the NY Bight projects under Sub-alternative C1 or Sub-alternative C2, whether one NY Bight project or six NY Bight projects, would likely have **negligible** to **minor** impacts on bats, depending on the amount and quality of forest habitat removed. The AMMM measures under Sub-alternative C1 and Sub-alternative C2 would provide some certainty in reducing impacts on bats in the offshore environment and, therefore, could reduce potential impacts on bats compared to Alternative B. However, bat presence in the offshore environment is low and generally limited to a few months out of the year, and the AMMM measures may not significantly reduce impacts. Onshore habitat impacts under Sub-alternative C1 and Sub-alternative C2 could be reduced by lessees designing the projects to avoid onshore bat habitat. However, because the location of onshore infrastructure is not known, there could still be a range of potential impacts on habitat regardless of the AMMM measures, resulting in **negligible** to **minor** impacts. Noise effects from construction are expected to be limited to temporary and localized behavioral avoidance that would cease once construction is complete.

Cumulative Impacts of Alternative C. BOEM anticipates that the cumulative impacts on bats in the geographic analysis area would likely be **negligible** to **minor** for six NY Bight projects. In context of reasonably foreseeable environmental trends, the impacts contributed by Sub-alternative C1 and Sub-alternative C2 to the cumulative impacts on bats would be undetectable. Because the occurrence of bats offshore is low, Sub-alternative C1 and Sub-alternative C2 would contribute to the cumulative impacts primarily through the long-term impacts from onshore habitat loss related to onshore construction. If the lessees design onshore project components to avoid bat habitat there may be reduced bat impacts onshore, but the extent of this reduction cannot be known at this time.

3.5.1.6 Recommended Practices for Consideration at the Project-Specific Stage

In addition to the AMMM measures identified under Alternative C, BOEM is recommending lessees consider analyzing the RPs in Table 3.5.1-6 to further reduce potential bat impacts. Refer to Table G-2 in Appendix G for a complete description of the RPs.

Table 3.5.1-6. Recommended Practices for bat impacts and related benefits

Recommended Practice	Potential Benefit
BB-4: Prepare a framework for a *Bird and Bat Post-Construction Monitoring Plan* to be submitted with the COP.	Developing a framework for a *Bird and Bat Post-Construction Monitoring Plan* would provide the public and agencies an opportunity to provide early feedback on the plan.
MUL-5: Use equipment, technology, and best practices to produce the least amount of noise possible to reduce noise impacts.	Using noise reduction measures to produce the least amount of noise practicable would likely minimize disturbance/displacement impacts.
MUL-21: Use the best available technology, including new and emerging technology, when possible, to reduce impacts, such as the use of MERLIN radar systems.	Assessing and monitoring bat mortality risk through radar sensors and avian-detection software (e.g., MERLIN) would provide information on avian occurrence in a wind farm area and could be used to inform post-construction operational mitigation.
MUL-23: Avoid or reduce potential impacts on important environmental resources by adjusting project design, which may minimize impacts on bats associated with onshore activities.	Adjusting project design to minimize impacts, such as routing cable in previously disturbed areas, has the potential to reduce impacts on individual bats and their habitats from onshore activities.
MUL-25: Use consistent turbine grid layouts, markings, and lighting in lease areas. Turbines should have one of the two lines of orientation in the grid layout spaced at least 1 nm apart.	Providing more structure-free areas in the lease area and reducing the total number of structures would potentially reduce interactions between bats and WTGs.

Recommended Practice	Potential Benefit
MUL-26: Coordinate regional monitoring and surveys.	Coordinating monitoring and survey efforts across lease areas in the NY Bight to standardize approaches would contribute to understanding potential impacts to bats at a regional scale.

3.5 Biological Resources

3.5.3 Birds

This section discusses potential impacts on bird resources from the Proposed Action, alternatives, and ongoing and planned activities in the geographic analysis area for birds. The geographic analysis area for birds, as shown on Figure 3.5.3-1, includes the United States coastline from Maine to Florida, extending 100 miles (161 kilometers) offshore and 0.5 mile (0.8 kilometer) inland to capture the movement range for species in this group. 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 NY Bight projects.

The bird impact analysis in this PEIS is intended to be incorporated by reference into the project-specific environmental analyses for individual COPs expected for each of the NY Bight lease areas. Because the locations of onshore components for the NY Bight projects are not known at this time, the analysis of onshore bird impacts is dependent on a hypothetical project analysis, and impact conclusions consider a maximum-case scenario for onshore development. Additional detailed site-specific analysis will be required for individual COPs. Refer to Appendix C, *Tiering Guidance*, which identifies additional analyses anticipated to be required for the project-specific environmental analysis of individual COPs.

3.5.3.1 Description of the Affected Environment and Future Baseline Conditions

This section discusses bird species that use offshore and onshore habitats, including both resident bird species that use the NY Bight lease areas during all (or portions of) the year and migrating bird species with the potential to pass through the lease areas during fall migration, spring migration, or both. Given the differences in life history characteristics and habitat use between offshore and onshore bird species, the following discusses each group separately. This section also discusses bald and golden eagles, and addresses federally listed threatened and endangered birds, which are further addressed as part of the Programmatic Framework ESA Section 7 consultation that BOEM initiated with the USFWS on June 20, 2024.

The Mid-Atlantic Coast plays an important role in the ecology of many bird species. The Atlantic Flyway, which follows the Atlantic Coast, is an important migratory route for many bird species moving from breeding grounds in New England and eastern Canada to winter habitats in North, Central, and South America. Bays, beaches, coastal forests, marshes, and wetlands provide important stopover and foraging habitat for migrating birds (MMS 2007). Section 4.2.4 of the Atlantic OCS Proposed Geological and Geophysical Activities Programmatic EIS (BOEM 2014a) discusses the use of the Atlantic Coast habitats by migratory birds.

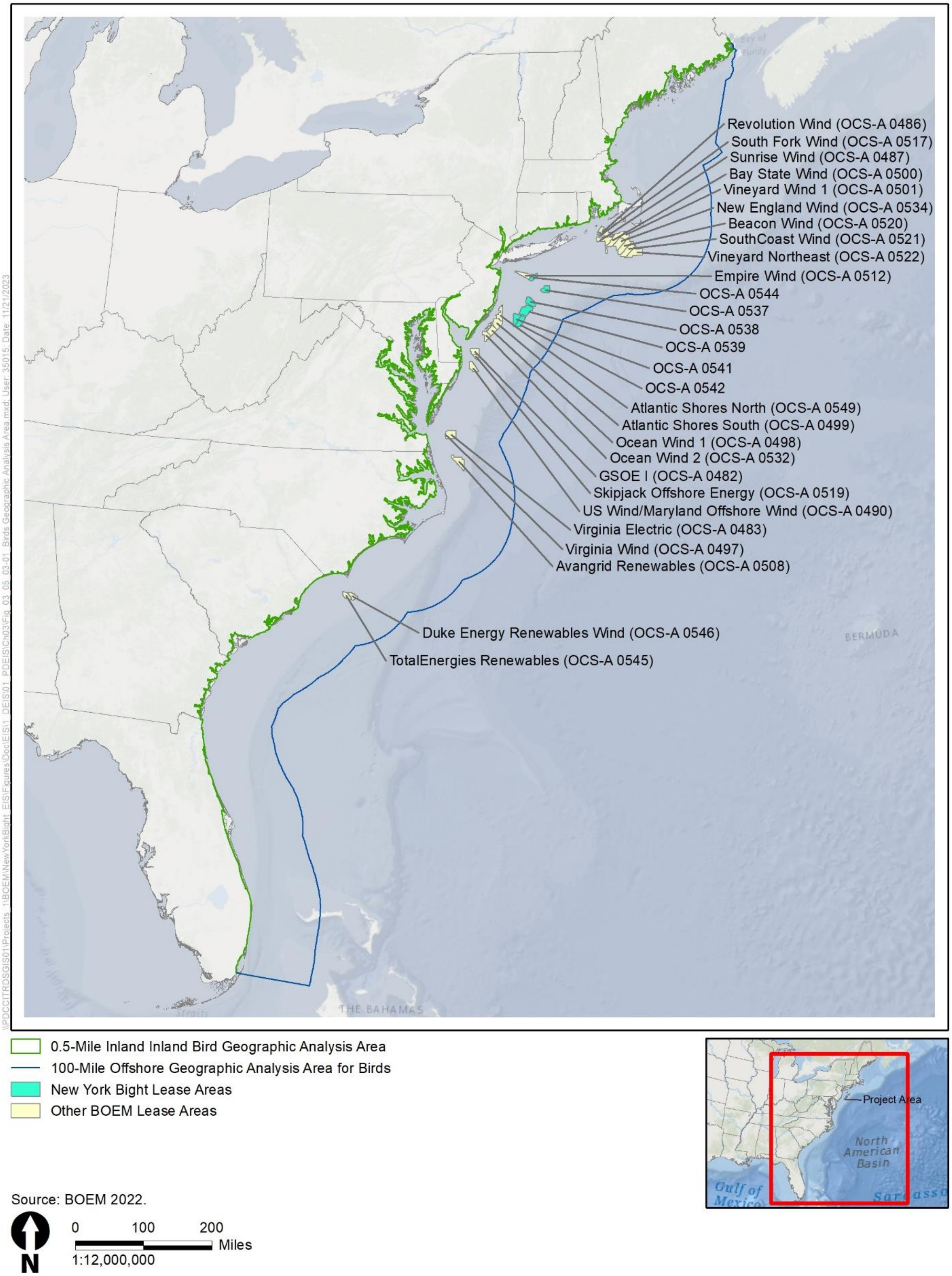


Figure 3.5.3-1. Bird geographic analysis area

Birds in the geographic analysis area are subject to pressure from ongoing activities, such as onshore construction, marine minerals extraction, port expansions, and installation of new structures in the OCS, but particularly from accidental releases; new cable, transmission line, and pipeline emplacement; interactions with fisheries and fishing gear; and climate change. More than one-third of bird species that occur in North America (37 percent, 432 species) are at risk of extinction unless significant conservation actions are taken (NABCI 2016). This is likely representative of the conditions of birds within the geographic analysis area. Species that live or migrate through the Atlantic Flyway have historically been, and will continue to be, subject to a variety of ongoing anthropogenic stressors—including hunting pressure (approximately 86,000 seaducks are harvested annually [Roberts 2019]), commercial fisheries by-catch (approximately 2,600 seabirds are killed annually on the Atlantic [Hatch 2017; Sigourney et al. 2019]), and climate change—which may have adverse impacts on bird species. Additional protections for migratory birds are provided through the Migratory Bird Treaty Act of 1918 (MBTA), which makes it illegal to “take” migratory birds, their eggs, feathers, or nests. The official list of migratory birds protected under the MBTA, and the international treaties that the MBTA implements, is found at 50 CFR 10.13.

According to the North American Bird Conservation Initiative (NABCI), more than half of the offshore bird species (57 percent, 31 species) have been placed on the NABCI watch list as a result of small ranges, small and declining populations, and threats to required habitats. This watch list identified species of high conservation concern based upon high vulnerability to a variety of factors, including population size, breeding distribution, non-breeding distribution, threats to breeding, threats to non-breeding, and population trends (NABCI 2016). Globally, monitored offshore bird populations have declined by nearly 70 percent from 1950 to 2010, which may be representative of the overall population trend of seabirds (Paleczny et al. 2015) including those that forage, breed, and migrate over the Atlantic OCS. Overall, offshore bird populations are decreasing; however, considerable differences in population trajectories of offshore bird families have been documented.

Coastal birds, especially those that nest in coastal marshes and other low-elevation habitats, are vulnerable to sea level rise and the increasing frequency of strong storms as a result of global climate change. According to NABCI, nearly 40 percent of the more than 100 bird species that rely on coastal habitats for breeding or for migration are on the NABCI watch list. Many of these coastal species have small population sizes or restricted distributions, making them especially vulnerable to habitat loss/degradation and other stressors (NABCI 2016). Some of the main drivers of threats to birds include habitat loss, habitat fragmentation, collisions with glass windows and power lines, invasive species, predators, toxic chemicals, and climate change (USFWS 2021a).

Marine-Life Data and Analysis Team (MDAT) marine bird models have been developed to describe regional-scale patterns of bird abundance (Curtice et al. 2016; Winship et al. 2018), including on U.S. Atlantic waters. The MDAT analysis integrates survey data (1978–2016) from the Atlantic Offshore Seabird Dataset Catalog with a range of environmental variables to produce long-term average annual and seasonal models. These models were recently updated by Winship et al. (2023) to include monthly predictions of relative abundance for 49 species from more recent survey data. Like the previous MDAT model, the updated models are based on data collected at much larger geographic and temporal scales than a survey for a particular area (e.g., a digital aerial survey of a lease area) and data that were also collected using a range of survey methods. The larger geographic scale is helpful for determining the importance of the NY Bight lease areas to marine birds relative to other available locations in the Northwest Atlantic and is thus important for determining overall exposure of birds to offshore wind lease areas. Limitations of the model data are described in detail in Winship et al. (2023). Figure 3.5.3-2 shows the MDAT model for total marine avian relative annual abundance distribution in U.S. Atlantic waters and indicates an overall low abundance of birds on the OCS, with much higher abundances along the nearshore areas of the coastline. Table 3.5.3-1 shows the annual percentage of the 49 marine avian species populations that overlap with anticipated offshore wind energy development on the OCS, which indicates that only a small percentage of a species' population would potentially occur in the wind development areas during annual migration. Overall, the MDAT models indicate marine bird presence on the OCS is low, including in the NY Bight lease areas.

NYSERDA conducted four aerial digital surveys for avian and marine wildlife between 2018 and 2019 in the NY Bight area, including surveys in summer 2018 (6 days in August), fall 2018 (4 days in November/December), winter 2018–2019 (3 days in February), and spring 2019 (2 days in April) (NYSERDA 2022). The aerial data provide coverage for all of four NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, and OCS-A 0544), a portion of OCS-A 0542, and none of OCS-A 0541 (Appendix B, *Supplemental Information and Additional Figures and Tables,* Figure B.2-1). The three most common avian species observed during the surveys were the red phalarope (*Phalaropus fulicarius*), Bonaparte's gull (*Chroicocephalus philadelphia*), and an unknown large shearwater-species.

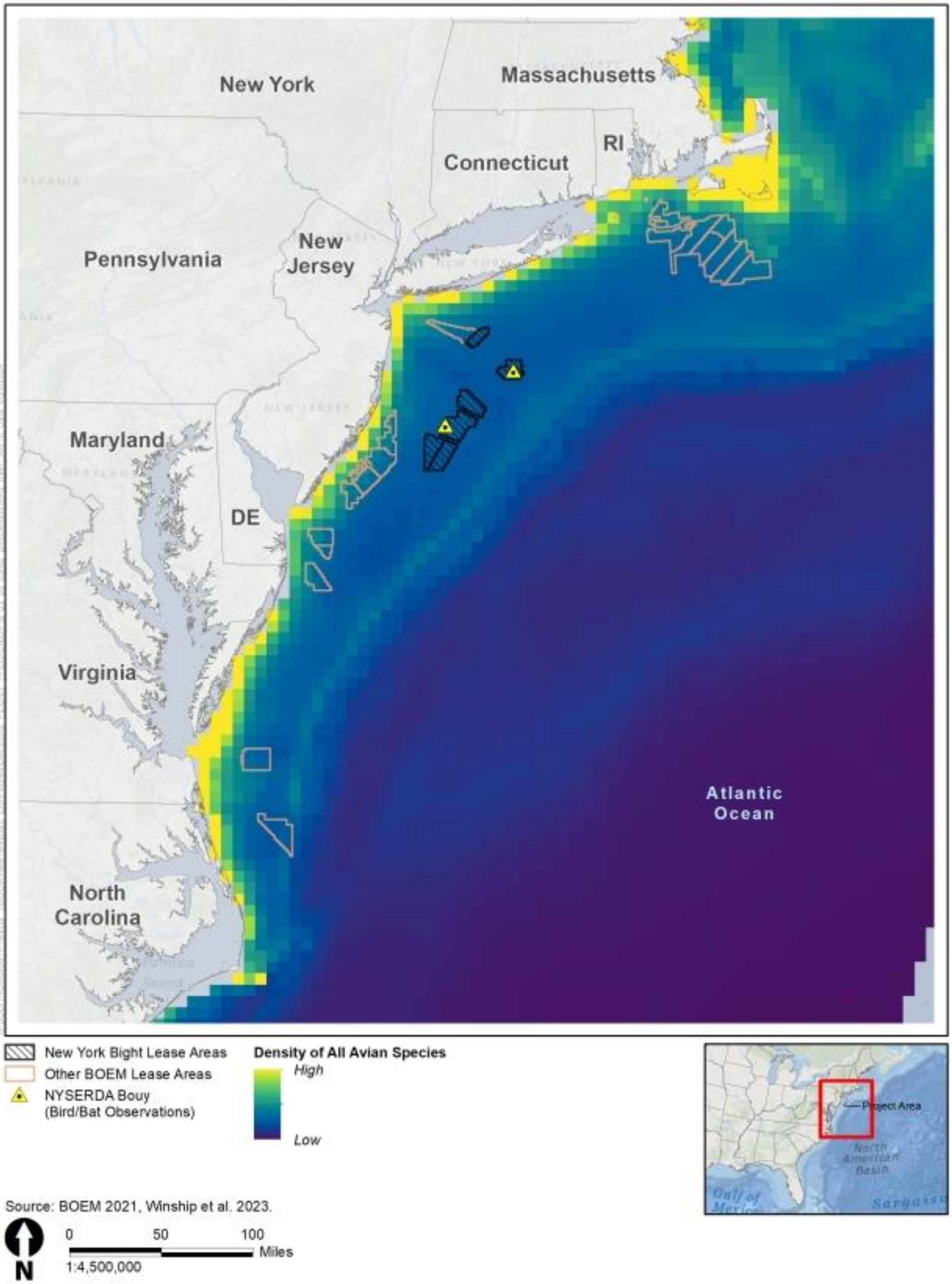


Figure 3.5.3-2. Total avian relative annual abundance distribution map

Table 3.5.3-1. Annual percentage of Atlantic seabird population (1993–2019) that overlaps with anticipated offshore wind energy development on the OCS

Species	Population %	Species	Population %
Artic Tern (*Sterna paradisaea*)	0.97	Long-tailed Ducks (*Clangula hyemalis*)	2.90
Atlantic Puffin (*Fratercula arctica*)	1.10	Manx Shearwater (*Puffinus puffinus*)[1]	1.00
Audubon Shearwater (*Puffinus lherminieri*)[1]	0.08	Northern Fulmar (*Fulmarus glacialis*)	0.63
Black-capped Petrel (*Pterodroma hasitata*)[1]	0	Northern Gannet (*Morus bassanus*)	2.50
Black Guillemot (*Cepphus grille*)	0.64	Parasitic Jaeger (*Stercorarius parasiticus*)	1.40
Black-legged Kittiwake (*Rissa tridactyla*)	2.30	Pomarine Jaeger (*Stercorarius pomarinus*)	0.81
Black Scoter (*Melanitta americana*)	0.92	Razorbill (*Alca torda*)	1.90
Bonaparte's Gull (*Chroicocephalus philadelphia*)	2.80	Ring-billed Gull (*Larus delawarensis*)	0.93
Brown Pelican (*Pelecanus occidentalis*)	0.07	Red-breasted Merganser (*Mergus serrator*)	1.00
Band-rumped Storm-Petrel (*Oceanodroma castro*)[1]	0.03	Red Phalarope (*Phalaropus fulicarius*)	0.89
Common Eider (*Somateria mollissima*)	0.60	Red-necked Phalarope (*Phalaropus lobatus*)	0.73
Common Loon (*Gavia immer*)	4.10	Roseate Tern (*Sterna dougallii*)	1.60
Common Murre (*Uria aalge*)	1.40	Royal Tern (*Thalasseus maximus*)	0.20
Common Tern (*Sterna hirundo*)	1.10	Red-throated Loon (*Gavia stellate*)	2.70
Cory's Shearwater (*Calonectris borealis*)[1]	0.59	Sooty Shearwater (*Ardenna grisea*)	1.10
Double-crested Cormorant (*Phalacrocorax auritus*)	1.40	Sooty Tern (*Onychoprion fuscatus*)	0.03
Dovekie (*Alle alle*)	1.80	South Polar Skua (*Stercorarius maccormicki*)	1.50
Great Black-backed Gull (*Larus marinus*)	1.30	Surf Scoter (*Melanitta perspicillata*)	1.50
Great Shearwater (*Puffinus gravis*)	0.70	Thick-billed Murre (*Uria lomvia*)	0.57
Great Skua (*Stercorarius skua*)	1.60	Wilson's Storm-Petrel (*Oceanites oceanicus*)	0.79
Herring Gull (*Larus argentatus*)	1.30	White-winged Scoter (*Melanitta deglandi*)	3.30
Horned Grebe (*Podiceps auritus*)	1.50	Lesser Black-backed Gull	1.50
Laughing Gull (*Leucophaeus atricilla*)	0.88	Black Tern (*Chlidonias niger*)[1]	0.91
Leach's Storm-Petrel (*Oceanodroma leucorhoa*)	0.13	Forster's Tern (*Sterna forsteri*)	2.40
Least Tern (*Sternula antillarum*)[1]	0.11		

Source: calculated into percentages from Appendix H in Winship et al. (2023).
[1] Species considered Birds of Conservation Concern in Bird Conservation Regions M16, M18, and M19 by USFWS (2021b).

Appendix B, Table B.2-1 identifies the number of observations by species and by lease area from the NYSERDA aerial surveys. Two meteorological buoys deployed by NYSERDA, and located within Lease Areas OCS-A 0537 and OCS-A 0539, have been used to collect avian data. The buoys include nanotag antennas that provide species-specific information gleaned from tagged birds, as well as bird acoustic sensors that constantly record diurnal and nocturnal bird calls. The two buoys detected 215 bird passes, consisting of nine species, between September 2019 and September 2022 (Normandeau Associates Inc. 2022). The most common bird detected at both buoys was the herring gull (*Larus argentatus smithsonianus*), with a total of 203 total pass observations, or 94 percent of all birds passes detected. The remaining 6 percent of birds detected at one or both buoys included American redstart, green heron, least bittern, palm warbler, ring-billed gull, white-throated sparrow, wood thrush, and yellow warbler (refer to Appendix B, Table B.2-2 for full percentages of the species observed).

Satellite telemetry datasets from the Northeast Ocean Data Portal show fine-scale use and movement patterns from three species of diving bird—including the surf scoter (*Melanitta perspicillata*), red-throated loon (*Gavia stellata*), and northern gannet (*Morus bassanus*), over the course of 5 years. The data that was collected represents the utilization distributions for each species throughout the Mid-Atlantic U.S. waters during different times of the year. The utilization distributions represent the probability that an animal will occur within a specific area during a specified time of year. The surf scoter and red-throated loon are less active within the geographic analysis area during fall migration and overwinter distribution, but heavily utilize the Mid-Atlantic Flyway during spring migration. In contrast, the northern gannet utilizes the Mid-Atlantic Flyway and passes through the geographic analysis area year-round for foraging and migration (Northeast Ocean Data Portal 2022; Appendix B, Figures B.2-2, B.2-3, and B.2-4).

Table 3.5.3-2 briefly describes the bird presence in the offshore project area by bird group based on information from other offshore lease areas (e.g., Empire Wind OCS-A 0512, Ocean Wind 1 OCS-A 0498, Atlantic Shores South OCS-A 0499). The table breaks down birds into six groups—shorebirds, wading birds, raptors, songbirds, coastal waterbirds, and marine birds. Marine birds are broken down further by family group.

Table 3.5.3-2. Bird presence in the offshore project area by bird group

Bird Group	Potential Bird Presence in the Offshore Project Area
Shorebirds	Shorebirds (e.g., black-bellied plover, semipalmated plover) are typically coastal breeders and foragers and generally avoid straying out over deep waters during breeding. Primarily, exposure of shorebirds to the offshore infrastructure would be limited to the spring and fall migration periods.
Wading Birds	Most long-legged wading birds, such as herons and egrets, breed and migrate in coastal and inland areas. Like the smaller shorebirds, wading birds are believed to avoid straying out over deep waters but may fly offshore during spring and fall migration periods.
Raptors	The degree to which raptors might occur offshore is dictated primarily by their morphology and flight strategy (i.e., flapping versus soaring), which influences species' ability or willingness to cross large expanses of open water where thermal formation is poor (Kerlinger 1985). Among raptors, falcons are the most likely to be encountered in offshore settings along the Atlantic Flyway (DeSorbo et al. 2012, 2018). Merlins are the most abundant diurnal raptor observed at offshore islands during migration. Both have been observed offshore on vessels and offshore oil platforms considerable distances from shore.
Songbirds	Songbirds (e.g., warblers, sparrows) almost exclusively use terrestrial, freshwater, and coastal habitats and do not use the offshore marine system except during migration. Many North American breeding songbirds migrate to the tropical regions, many in flocks. On their

Bird Group	Potential Bird Presence in the Offshore Project Area
	migrations, neotropical migrants generally travel at night and at high altitudes where favorable winds can aid them along their trip. Songbirds regularly cross large bodies of water (Bruderer and Lietchi 1999; Gauthreaux and Belser 1999), and there is some evidence that species migrate over the northern Atlantic (Adams et al. 2015). Some birds may briefly fly over the water while others, like the blackpoll warbler, are known to migrate over vast expanses of ocean (Faaborg et al. 2010; DeLuca et al. 2015). Evidence for a variety of species suggests that overwater migration in the Atlantic is much more common in fall (than in spring), when the frequency of overwater flights increases perhaps due to consistent tailwinds (Morris et al. 1994; Hatch et al. 2013; Adams et al. 2015; DeLuca et al. 2015).
Coastal Waterbirds	Coastal waterbirds use terrestrial or coastal wetland habitats and rarely use the marine offshore environment. This group includes aquatic species not captured in other groupings, such as grebes and waterfowl, that are generally restricted to freshwater or use saltmarshes or beaches. Waterfowl comprise a broad group of geese and ducks, most of which spend much of the year in terrestrial or coastal wetland habitats. The diving ducks generally winter on open freshwater, as well as brackish or saltwater. Species that regularly winter on saltwater, including mergansers, scaup, and goldeneyes, usually restrict their distributions to shallow, very nearshore waters. Because most coastal waterbirds spend a majority of the year in freshwater aquatic systems and nearshore marine systems, there is little to no use of the offshore environment around lease areas during any season. A subset of diving ducks has a strong affinity for saltwater, either year-round or outside of the breeding season; these species are known as seaducks.
Marine Birds (by family group)	
Loons	Common loons and red-throated loons are known to use the Atlantic OCS in winter. Analysis of satellite-tracked red-throated loons, captured and tagged in the Mid-Atlantic area, found their winter distributions to be largely inshore of the Mid-Atlantic WEAs, although they did overlap with OCS lease areas during spring migration (Gray et al. 2016).
Seaducks	The seaducks (e.g., black scoter, surf scoter, common eider) use the Atlantic OCS heavily in winter. Most of these seaducks dive to forage on mussels and other benthic invertebrates, and generally winter in shallower inshore waters or out over large offshore shoals, where they can access benthic prey. Seaducks tracked with satellite transmitters remained largely inshore of the lease areas (Spiegel et al. 2017). Based on digital aerial survey data and MDAT models, seaduck exposure is expected to be minimal and would be primarily limited to migration or travel between wintering sites.
Petrel group	In the Atlantic, this group consists mostly of shearwaters (e.g., Cory's shearwater, great shearwater, sooty shearwater) and storm-petrels (e.g., Wilson's storm-petrel) that breed in the southern hemisphere and visit the northern hemisphere in vast numbers during the austral winter (boreal summer). These species use the Atlantic OCS region so heavily that, in terms of sheer numbers, they easily outnumber the locally breeding species and year-round residents at this time of year. Several of the species (e.g., Cory's shearwater, Wilson's storm-petrel) are found in high densities across the broader region, concentrating beyond the Atlantic OCS and in the Gulf of Maine as shown in the MDAT avian abundance models.
Gannets, Cormorants, and Pelicans	Northern gannets use the Atlantic OCS during winter and migration. They are opportunistic foragers, capable of long-distance oceanic movements. The double-crested cormorant is the most likely species of cormorant in the offshore environment of the lease areas, but regional MDAT abundance models show that cormorants are concentrated closer to shore and not commonly encountered well offshore (Curtice et al. 2016; Winship et al. 2018). Brown pelicans are rare in the area, as only one was detected during surveys performed for adjacent OCS locations, and New Jersey is at the northern extent of its range; therefore, they are unlikely to pass through the NY Bight lease areas in any numbers.
Gulls, skuas, and jaegers	The regional MDAT abundance models show that these birds have wide distributions, ranging from near shore (gulls) to offshore (jaegers). Herring gulls and great black-backed

Bird Group	Potential Bird Presence in the Offshore Project Area
	gulls are resident in the region year-round, and are found farther offshore during the non-breeding season. The parasitic jaeger is often observed closer to shore during migration than the other species and great skuas may migrate along the Atlantic OCS outside the breeding season.
Terns	Black tern, least tern, common tern, Forster's tern, roseate tern, and royal tern have been observed in and around the NY Bight lease areas. Terns generally restrict themselves to coastal waters during breeding, although they may pass through the NY Bight lease areas during migration. Roseate terns are federally listed.
Auks	Auk species present are generally northern or Arctic-breeders that winter along the Atlantic OCS (e.g., common murre, dovekie, razorbill). The annual abundance and distribution of auks along the eastern seaboard in winter is erratic and is dependent upon broad climatic conditions and the availability of prey. The MDAT abundance models show that during winter auks are generally concentrated offshore, along the shelf edge, and southwest of Nova Scotia.

MDAT = Marine-life Data and Analysis Team

Within the Atlantic Flyway, much of the bird activity is concentrated along the coastline (Watts 2010). Waterbirds use a corridor between the coast and several kilometers out onto the OCS, whereas land birds tend to use a wider corridor extending from the coastline to tens of kilometers inland (Watts 2010). Although both groups may occur over land or water within the flyway and may extend considerable distances from shore, the highest diversity and density are centered on the shoreline.

There are four species of birds listed as threatened or endangered under the ESA that may occur in the offshore and onshore project areas: the threatened piping plover (*Charadrius m. melodus*), endangered roseate tern (*Sterna d. dougallii*), threatened Rufa subspecies of the red knot (*Calidris canutus rufa*), and the Eastern rail (*Laterallus jamaicensis jamaicensis*) (addressed as part of the Programmatic Framework ESA Section 7 consultation BOEM initiated with USFWS on June 20, 2024). In terms of ESA-listed bird species by state, four are listed under the ESA in New Jersey and three are listed in New York. Currently, there is no designated critical habitat for any ESA-listed bird species in New Jersey, and critical habitat in New York is designated only for piping plover along the Lake Ontario shoreline, which would be outside of the project area for any of the NY Bight lease areas. In April 2023, USFWS issued a proposed rule (88 *Federal Register* 22530) to designate approximately 680,000 acres as critical habitat for rufa red knot across 13 states, including portions of New York and New Jersey in the geographic analysis area.

Bald eagles (*Haliaeetus leucocephalus*) are federally protected by the Bald and Golden Eagle Protection Act (16 USC 668 et seq.), as are golden eagles (*Aquila chrysaetos*). Golden eagles are found throughout the United States, but mostly in the western half of the United States and are rare in the eastern states (Cornell University 2019). Golden eagles do not fly over the ocean. As with bald eagles, the general morphology of golden eagles dissuades long-distance movements in offshore settings (Kerlinger 1985), as the species generally relies upon thermal formations, which develop poorly over the open ocean, during long-distance movements. As such, golden eagles are unlikely to fly through the NY Bight lease areas.

Bald eagles are broadly distributed across North America and generally nest and perch in areas associated with water (lakes, rivers, bays) in both freshwater and marine habitats, often remaining largely within roughly 1,640 feet (500 meters) of the shoreline (Buehler 2000). Bald eagles are year-round residents in New York and New Jersey and occur in a variety of terrestrial environments, typically near water such as coastlines, rivers, and large lakes (New York Natural Heritage Program 2022; NJDEP n.d.). There are high numbers of observations along the New Jersey and New York coastlines with few bald eagles observed offshore, plus one unusual siting in 2020 of a bald eagle about 40 miles offshore New Jersey (eBird 2024). While it is possible that a bald eagle may be found offshore, the general morphology of bald eagles dissuades long-distance movements in offshore settings, as the species generally relies upon thermal formations, which develop poorly over the open ocean, during long-distance movements. As such, bald eagles are unlikely to fly through the NY Bight lease areas.

3.5.3.2 Impact Level Definitions for Birds

Definitions of potential impact levels are provided in Table 3.5.3-3. Beneficial impacts on birds are described using the definitions provided in Section 3.3.2 (Table 3.3-1).

Table 3.5.3-3. Adverse impact level definitions for birds

Impact Level	Definition
Negligible	There would be no measurable impacts, or impacts would be so small that they would be extremely difficult or impossible to discern or measure.
Minor	Most impacts would be avoided; if impacts occur, the loss of one or a few individuals or temporary alteration of habitat could represent a minor impact, depending on the time of year and number of individuals involved.
Moderate	Impacts would be unavoidable but would not result in population-level effects or threaten overall habitat function.
Major	Impacts would result in severe, long-term habitat or population-level effects on species.

Accidental releases, cable emplacement and maintenance, land disturbance, lighting, noise, presence of structures, and traffic are contributing IPFs to impacts on birds. However, these IPFs may not necessarily contribute to each individual issue outlined in Table 3.5.3-4.

Table 3.5.3-4. Issues and indicators to assess impacts on birds

Issue	Impact Indicator
Collision/injury/electrocution	Qualitative estimate of species vulnerability to collision/electrocution
Displacement/barrier effects	Changes to noise levels Projected traffic patterns/volume changes
Habitat loss/modification	Acres of habitat removal or modification

3.5.3.3 Impacts of Alternative A – No Action – Birds

When analyzing the impacts of the No Action Alternative on birds, BOEM considered the impacts of ongoing activities, including ongoing non-offshore-wind and ongoing offshore wind activities on the baseline conditions for birds. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore-wind and offshore wind activities, which are described in Appendix D*, Planned Activities Scenario*.

3.5.3.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, the baseline conditions for birds described in Section 3.5.3.1, *Description of Affected Environment and Future Baseline Conditions*, would continue to follow current regional trends and react to IPFs introduced by other ongoing non-offshore-wind and offshore wind activities. Ongoing non-offshore-wind activities within the geographic analysis area that contribute to impacts on birds are typically associated with onshore construction, coastal lighting, etc. Impacts may also result from activities in the offshore environment (vessel traffic, commercial fisheries, etc.) and climate change. Onshore construction activities and associated impacts are expected to follow current trends and have the potential to affect bird species from temporary and permanent habitat removal or alteration, temporary noise impacts related to construction activities, collisions with proposed structures, and lighting effects, which could cause avoidance behavior and potential displacement as well as injury to or mortality of individual birds. Activities in the offshore environment could result in bird avoidance behavior and displacement; however, local population-level effects are not anticipated for onshore and offshore activities because the level of activity and disturbance is anticipated to remain relatively small compared to total habitat in the geographic analysis area. Impacts of climate change such as increased storm severity and frequency, ocean acidification, altered migration patterns, increased disease frequency, and increased erosion and sediment deposition, have the potential to result in long-term, potentially high-consequence risks to birds and could lead to changes in prey abundance and distribution, changes in nesting and foraging habitat abundance and distribution, and changes to migration patterns and timing.

Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on birds are listed in Table 3.5.3-5. The effects of approved projects have been evaluated through previous NEPA review and are incorporated by reference. Ongoing O&M of the Block Island and Coastal Virginia Offshore Wind Pilot projects and ongoing construction of the Vineyard Wind 1 (OCS-A 0501), South Fork Wind (OCS-A 0517), Ocean Wind 1 (OCS-A 0498), Revolution Wind (OCS-A 0486), Sunrise Wind (OCS-A 0487), New England Wind (OCS-A 0534) Phase 1 and 2, Empire Wind (OCS-A 0512) 1 and 2, and CVOW-Commercial (OCS-A 0483) projects would affect birds through the primary IPFs of accidental releases, lighting, cable emplacement and maintenance, noise, presence of structures, traffic, and land disturbance. Ongoing offshore wind activities would have the same type of impacts from these IPFs that are described in detail in Section 3.5.3.3.3, *Cumulative Impacts of the No Action Alternative,* for ongoing and planned offshore wind activities, but the impacts would be of lower intensity.

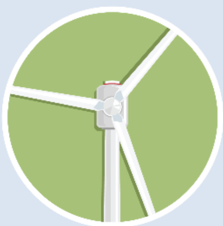
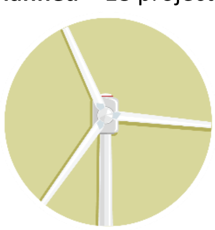
3.5.3.3.2 Impacts of the No Action Alternative on ESA-Listed Species

There are four ESA-listed bird species that may occur within the geographic analysis area; however, the potential occurrence of these listed bird species is expected to be low. The IPFs described in Section 3.5.3.3.3 for all birds would also apply to ESA-listed bird species. Any future federal activities that could affect any listed bird species would need to comply with ESA Section 7 to ensure that the proposed activities do not jeopardize the continued existence of the species. Future non-federal activities would be addressed under ESA Section 10 to ensure that proposed activities do not jeopardize the continued existence of the species.

3.5.3.3.3 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impact of the No Action Alternative in combination with other planned non-offshore-wind activities and planned offshore wind activities (without the NY Bight projects). Other planned non-offshore-wind activities that may affect birds include installation of new submarine pipelines, cables, and transmission systems (e.g., PBI), increasing onshore construction, marine mineral extraction, port expansions, and the installation of new structures on the OCS (see Appendix D for a description of planned activities). These activities may result in temporary and permanent impacts on birds including disturbance, potential displacement, injury, mortality, habitat degradation, and habitat alteration. Table 3.5.3-5 lists the ongoing and planned offshore wind activities in the geographic analysis area for birds.

Table 3.5.3-5. Ongoing and planned offshore wind in the geographic analysis area for birds

Ongoing/Planned	Projects by Region
Ongoing – 12 projects[1] 	**MA/RI** • Block Island (state waters) • Vineyard Wind 1 (OCS-A 0501) • South Fork Wind (OCS-A 0517) • Revolution Wind (OCS-A 0486) • Sunrise Wind (OCS-A 0487) • New England Wind (OCS-A 0534) Phase 1 • New England Wind (OCS-A 0534) Phase 2 **NY/NJ** • Ocean Wind 1 (OCS-A 0498) • Empire Wind 1 (OCS-A 0512) • Empire Wind 2 (OCS-A 0512) **VA/NC** • CVOW-Pilot (OCS-A 0497) • CVOW-Commercial (OCS-A 0483)
Planned – 18 projects[2] 	**MA/RI** • SouthCoast Wind (OCS-A 0521) • Beacon Wind 1 (OCS-A 0520) • Beacon Wind 2 (OCS-A 0520) • Bay State Wind (OCS-A 0500) • OCS-A 0500 remainder • OCS-A 0487 remainder • Vineyard Wind Northeast (OCS-A 0522) **NY/NJ** • Ocean Wind 2 (OCS-A 0532) • Atlantic Shores North (OCS-A 0549) • Atlantic Shores South (OCS-A 0499) **DE/MD** • Skipjack (OCS-A 0519) • US Wind/Maryland Offshore Wind (OCS-A 0490) • GSOE I (OCS-A 0482) • OCS-A 0519 remainder **VA/NC** • Kitty Hawk North (OCS-A 0508)

Ongoing/Planned	Projects by Region
	• Kitty Hawk South (OCS-A 0508) **SC** • Duke Energy Renewables Wind (OCS-A 0546) • Total Energies Renewables (OCS-A 0545)

CVOW = Coastal Virginia Offshore Wind; DE = Delaware; GSOE = Garden State Offshore Energy; MA = Massachusetts; MD = Maryland; NC = North Carolina; NJ = New Jersey; NY = New York; RI = Rhode Island; SC = South Carolina; VA = Virginia
[1] Refer to footnotes 9 and 10 in PEIS Chapter 1 for additional information on the status of Ocean Wind 1, Empire Wind 1, and Empire Wind 2.
[2] Status as of September 20, 2024.

BOEM expects other offshore wind development activities to affect birds through the following IPFs.

Accidental releases: The accidental release of fuel/fluids, other contaminants, trash, and debris could occur as a result of offshore wind activities. The assumed risk of any type of accidental release would be increased primarily during construction activities, but also during operations and conceptual decommissioning of offshore wind facilities. Ingestion of hazardous contaminants, such as fuel and fluids from vessels, has the potential to result in lethal and sublethal impacts on birds, including decreased hematological function, dehydration, drowning, hypothermia, starvation, and weight loss (Briggs et al. 1997; Haney et al. 2017; Paruk et al. 2016). Additionally, small exposures to vessel fuel/fluids that result in oiling of feathers can lead to sublethal effects such as changes in flight efficiencies that result in increased energy expenditure during daily and seasonal activities. These daily and seasonal activities include, but are not limited to, chick provisioning, commuting, courtship, foraging, long-distance migration, predator evasion, and territory defense (Maggini et al. 2017). Based on the volumes potentially involved (refer to Appendix D), the likely amount of hazardous contaminant releases associated with offshore wind development would fall within the range of accidental releases that already occur on an ongoing basis from non-offshore-wind activities and would represent a minor impact on birds.

Vessel compliance with USCG regulations would minimize trash or other debris; therefore, BOEM expects accidental trash releases from offshore wind vessels to be rare and localized. In the unlikely event of a release, lethal and sublethal impacts on local bird species could occur resulting in blockages caused by both hard and soft plastic debris (Roman et al. 2019). Given that accidental releases are anticipated to occur primarily during construction activities, BOEM expects that accidental releases of trash and debris would have minor impacts on birds.

Air emissions: The secondary standards of the NAAQS (see Section 3.4.1.1) specifically aim to safeguard the environment, including wildlife and their habitats. Air pollution can directly impact birds via physical harm, such as damage to respiratory systems, or indirectly via changes to habitat conditions, food supplies, and/or species interactions (Lianga et al. 2020). Emissions from fossil fuel combustion include NO_X gases, which interact with ultraviolet radiation in sunlight to form surface-level ozone. A recent study found that air quality improvements limiting ozone over the past 4 decades have stemmed the decline in U.S. bird populations, averting the loss of 1.5 billion birds, particularly among land birds smaller than 142 grams (Liang et al. 2020). By limiting ozone precursor pollutants, such as NO_X, the NAAQS helps prevent harmful effects on vegetation, water bodies, and soil, thus ensuring healthier ecosystems. It is reasonable to assume that the displacement of fossil fuels by the generation of electricity by offshore wind would further reduce ozone and consequently result in minor to moderate beneficial impacts on air quality (see Section 3.4.1). This decrease in NO_X emissions and surface-level ozone formation would consequently have a minor to moderate beneficial impact on populations of small land birds.

Lighting: Offshore wind development would result in additional nighttime light from vessels and offshore wind structures. Construction vessels have an array of lights that could attract some birds and potential prey species to construction zones, potentially exposing them to collision risks with vessels during the construction period. The resulting vessel-related lighting impacts would be localized and minor for bird species.

Up to 2,459 WTGs and 66 OSSs from ongoing and planned offshore wind projects would have navigational and FAA hazard lighting in accordance with BOEM's lighting and marking guidelines. This lighting has some potential to result in long-term impacts and may pose an increased collision or predation risk to migrating birds (Hűppop et al. 2006), particularly to night-flying migrants during low-visibility weather conditions. However, this risk would be minimized through the use of red flashing FAA lighting (Kerlinger et al. 2010). Overall, BOEM anticipates lighting impacts related to offshore wind structures and vessels would be minor.

Cable emplacement and maintenance: Generally, emplacement of submarine cables would result in increased suspended sediments that may affect diving birds, displacement of foraging individuals, or decreased foraging success, and have impacts on some prey species (e.g., benthic assemblages) (Cook and Burton 2010). Impacts associated with cable emplacement would be temporary and localized, and birds would be able to successfully forage in adjacent areas not affected by increased suspended sediments. Any dredging necessary prior to cable installation could also contribute to additional impacts. Disturbed seafloor from construction of offshore wind projects may affect some bird prey species; however, assuming planned projects use installation procedures similar to those proposed in other recent COPs (e.g., Empire Wind OCS-A 0512, Ocean Wind 1 OCS-A 0498), the duration and extent of impacts would be short-term and localized, and benthic assemblages would be expected to recover from disturbance. See Section 3.5.2, *Benthic Resources*, and Section 3.5.5, *Finfish, Invertebrates, and Essential Fish Habitat* for additional information on benthic and fish impacts. Once the cables are installed, limited to no maintenance would be required except if repairs are needed to fix a damaged cable, in which case impacts on birds would be similar to those described for construction but more limited in geographic scope. Impacts would be minor because suspended sediments and potential displacement of foraging birds would be short-term and benthic habitats would recover.

Noise: Anthropogenic noise on the OCS associated with offshore wind development, including noise from aircraft, pile-driving activities, G&G surveys, offshore construction, and vessel traffic, has the potential to result in impacts on birds on the OCS. Additionally, onshore construction noise has the potential to result in impacts on birds. BOEM anticipates that these impacts would be localized and temporary. Potential impacts could be greater if avoidance and displacement of birds occurs during seasonal migration periods. Aircraft flying at low altitudes cause birds to flush, resulting in increased energy expenditure. Disturbance, if any, would be temporary and localized, with impacts dissipating once the aircraft has left the area. No individual or population-level effects would be expected.

Construction of up to 1,682 WTGs and 48 OSSs associated with planned offshore wind projects would create noise and may temporarily affect diving birds. The greatest impact of noise is likely to be created by pile-driving activities during construction. Noise transmitted through water has the potential to result in temporary displacement of diving birds but would be localized to the space around each pile. The impacts from such noise can cause short-term stress and behavioral changes ranging from mild annoyance to escape behavior (BOEM 2014b, 2016). Additionally, localized noise impacts on prey species may affect bird foraging success. Similar to pile-driving, G&G site characterization surveys for offshore wind facilities, which would occur sporadically, would produce high-intensity impulsive noise around sites of investigation, leading to similar impacts.

Onshore noise associated with intermittent construction of required offshore wind development infrastructure may also result in localized and short-term impacts, including avoidance and displacement, though no individual fitness or population-level effects would be anticipated to occur. Noise associated with vessel traffic could disturb some individual diving birds, but they would likely acclimate to the noise or retreat, potentially resulting in a temporary loss of habitat (BOEM 2012). However, brief, temporary responses, if any, would be expected to decrease once the vessel has passed or the individual has moved away. No individual fitness or population-level effects would be anticipated. Overall, noise impacts on birds are anticipated to be minor because noise would primarily occur during construction (i.e., be short term) and localized.

Presence of structures: The presence of structures can lead to long-term effects on birds, both beneficial and adverse, through fish aggregation and associated increase in foraging opportunities, as well as entanglement with lost fishing gear, migration disturbances, and WTG strikes and displacement. These impacts may arise from buoys, meteorological towers, foundations, scour and cable protections, and transmission cable infrastructure. BOEM predicts that structures would be added and that they would remain until conceptual decommissioning of each facility is complete, approximately 35 years following construction.

The primary threat to birds from the presence of structures would be from collision with WTGs. The Atlantic Flyway is an important migratory corridor for as many as 164 species of waterbirds, and a similar number of land birds, with the greatest volume of birds using the Atlantic Flyway during spring and fall migration (Watts 2010). Along the Atlantic Flyway, much of the bird activity is concentrated along the coastline (Watts 2010). Waterbirds use a corridor between the coast and several kilometers out onto the OCS, while land birds tend to use a wider corridor extending from the coastline to tens of kilometers inland (Watts 2010). While both groups may occur over land or water within the flyway and may extend considerable distances from shore, the highest diversity and density are centered on the shoreline. Building on this information, Robinson Willmott et al. (2013) evaluated the sensitivity of bird resources to collision and displacement due to offshore wind development on the Atlantic OCS and included the 164 species selected by Watts (2010) plus an additional 13 species, for a total of 177 species that may occur on the Atlantic OCS from Maine to Florida during all or some portion of the year.

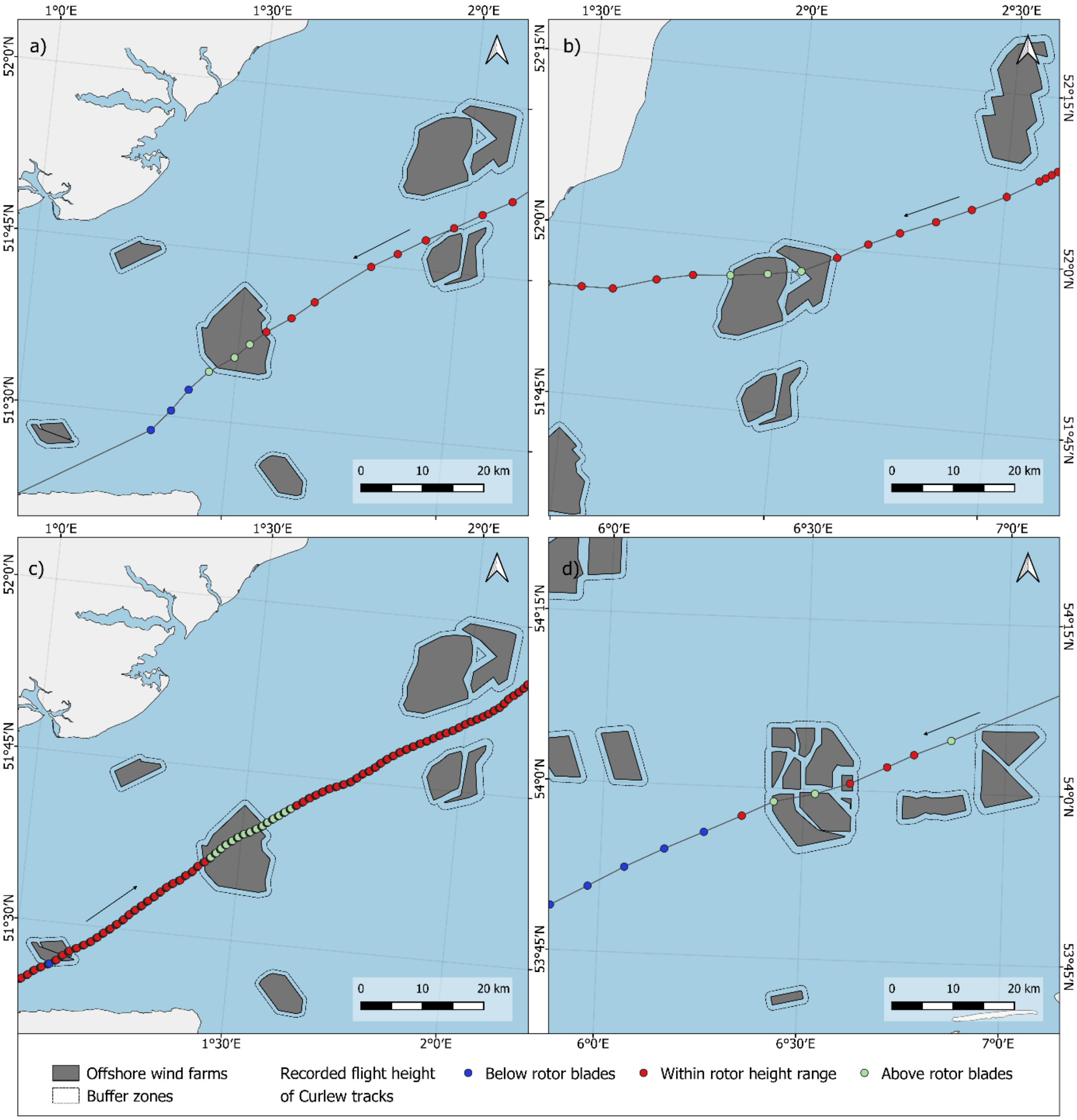
As discussed in Robinson Willmott et al. (2013) and consistent with Garthe and Hüppop (2004), Furness and Wade (2012), and Furness et al. (2013), species with high scores for sensitivity for collision include gulls, jaegers, and the northern gannet (*Morus bassanus*). A collision sensitivity ranking of migratory birds near the Nysted wind farm in Denmark by Desholm (2009) also found that waterbirds and birds of prey had higher collision sensitivity scores and passerines had lower collision sensitivity scores. In many cases, high collision sensitivity is driven by high occurrence on the OCS, low avoidance rates with high uncertainty, and time spent in the RSZ. Many of the species addressed in Robinson Willmott et al. (2013) have low collision sensitivity, including passerines that spend very little time on the Atlantic OCS during migration and typically fly above the RSZ. Robinson Willmott et al. (2013) stated that because of identified data gaps and related uncertainty, particularly concerning species-specific flight altitude and avoidance behavior, their results should be interpreted with caution. As discussed by Watts (2010), 55 seabird species could encounter operating WTGs on the Atlantic OCS. However, generally the abundance of bird species that overlap with the anticipated development of wind energy facilities on the Atlantic OCS is relatively small (Figure 3.5.3-2). Of the 55 bird species, 49 have sufficient survey data to calculate the modeled percentage of a species population that would overlap with the anticipated offshore wind development on the Atlantic OCS (Winship et al. 2023); the relative annual exposure of these species is generally very low, ranging from 0.00 to 4.10 percent (Table 3.5.3-1). The estimated percentage of federally listed species and Birds of Conservation Concern populations that overlap offshore wind development areas ranges from only 0.00 to 1.00 percent (Table 3.5.3-1). BOEM assumes that the 49 species (89 percent) with sufficient data to model the relative distribution and abundance on the Atlantic OCS are representative of the 55 species that may overlap with offshore wind development on the Atlantic OCS.

Ongoing and planned offshore wind development would result in up to 2,459 WTGs in the bird geographic analysis area (Appendix D, Tables D.A2-1 and D.A2-2). In the contiguous United States, bird collisions with operating onshore WTGs are relatively rare events. Loss et al. (2013) estimated 140,000 to 328,000 (mean = 234,000) birds killed annually from 44,577 onshore monopile wind turbines across the contiguous United States. Bird collisions with onshore monopile turbines in the eastern United States is estimated at 6.86 birds per turbine per year (Loss et al. 2013). Based on this mortality rate, an estimated 16,869 birds could be killed annually from the 2,459 WTGs that would be added for offshore wind development. This represents a maximum-case scenario and does not consider mitigating factors, such as landscape and weather patterns, or bird species that are expected to occur. Given that the relative density of birds in the OCS is low, relatively few birds are likely to encounter offshore WTGs (see Figure 3.5.3-2). Potential annual bird kills from offshore WTGs would be relatively low compared to other causes of migratory bird deaths in the United States; feral cats are the primary cause of migratory bird deaths in the United States (2.4 billion per year), followed by collisions with building glass (599 million per year), collisions with vehicles (214.5 million per year), poison (72 million per year), collisions with electrical lines (25.5 million per year), collisions with communication towers (6.6 million per year), and electrocutions (5.6 million per year) (USFWS 2021a).

Not all individuals that occur or migrate along the Atlantic Coast are expected to encounter the RSZ of one or more operating WTGs associated with planned offshore wind development. Generally, only a small percentage of a species' seasonal population would potentially encounter operating WTGs (Table 3.5.3-1). The addition of WTGs to the offshore environment may result in increased functional loss of habitat for those species with higher displacement sensitivity. However, a recent study of long-term data collected in the North Sea found that despite the extensive observed displacement of loons in response to the development of 20 wind farms, there was no decline in the region's loon population (Vilela et al. 2021). Furthermore, substantial foraging habitat for resident birds would remain available outside of the proposed offshore lease areas, and no individual fitness or population-level impacts would be expected to occur.

Vattenfall (a European energy company) recently studied bird movements within an offshore wind farm situated 1.9–3 miles (3–4.9 kilometers) off the coast of Aberdeen, Scotland (Vattenfall 2023). The purpose of the study was to improve the understanding of seabird flight behavior inside an offshore wind farm with a focus on the bird breeding period and post-breeding period when densities are highest. The study was robust in that seabirds were tracked inside the array with video cameras and radar tracks, which allowed for measuring avoidance movements (meso- and micro-avoidance)[1] with high confidence and at the species level. Detailed statistical analyses of the seabird flight data were enabled both by the large sample sizes and by the high temporal resolution in the combined radar track and video camera data. Meso-avoidance behavior showed that species avoided the RSZ by flying in between the turbines with very few avoiding by changing their flight altitude in order to fly either below or above the rotors. The most frequently recorded adjustment under micro-avoidance behavior was birds flying along the plane of the rotor; other adjustments included crossing the rotor either obliquely or perpendicularly, and some birds cross the rotor-swept area without making any adjustments to the spinning rotors. The study concluded that, together with the recorded high levels of micro-avoidance in all species (>0.96), it is now evident that seabirds will be exposed to very low risks of collision in offshore wind farms during daylight hours. This was substantiated by the fact that no collisions or even narrow escapes were recorded in over 10,000 bird videos during the 2 years of monitoring covering the April–October period. The study's calculated micro-avoidance rate (above 0.96) is similar to Skov et al. (2018). Further evidence supporting turbine avoidance can be found in Schwemmer et al. (2023), in which 70 percent of approaching 143 Global Positioning System (GPS) tracked Eurasian curlews (*Numenius arquata arquata*) demonstrated horizontal avoidance responses when approaching offshore wind farms in the Baltic and North Seas. While most curlews avoided entire wind farms, others changed their flight altitude to fly below or above the RSZ as they pass through the wind farm (Figure 3.5.3-3, Figure 3.5.3-4, and Figure 3.5.3-5). Given that curlews and red knots are in the same family (Scolopacidae) and are ecologically similar, it is reasonable to expect that red knots would behave similarly to curlews when encountering wind farms and turbines.

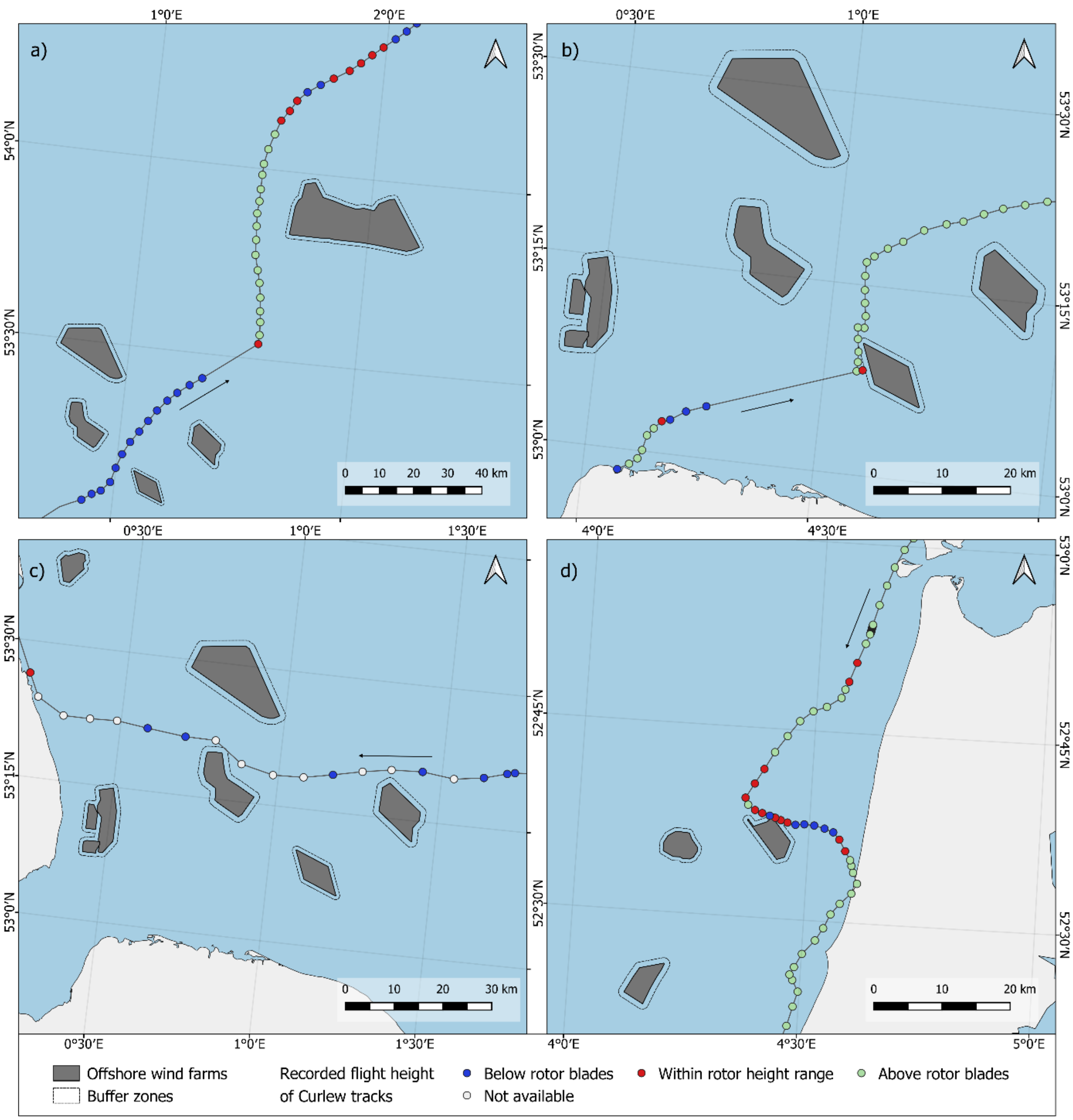
[1] Micro-avoidance is flight behavior within and in the immediate vicinity of individual wind turbine rotor-swept areas (i.e., last second action to avoid collision); meso-avoidance is flight behavior within and in the immediate vicinity of the wind farm (i.e., anticipatory/impulsive evasion of rows of turbines in a wind farm).



Source: Figure S2 in Schwemmer et al. (2023).

Note: a) "London Array" (UK; rotor level: 27–147 meters); b) "Galloper" and "Greater Gabbard" (UK; mean rotor level: 26.1–145.9 meters); c) "London Array" (UK; rotor level 27–147 meters); d) "Alpha Ventus," "Borkum Riffgrund 1," "Borkum Riffgrund 2" "Merkur," "Triane Windpark," "Borkum I," and "Trianel Windpark Borkum II" (Germany; mean rotor level: 27.3– 166.2 meters). Different colors of GPS fixes represent different flight altitudes.

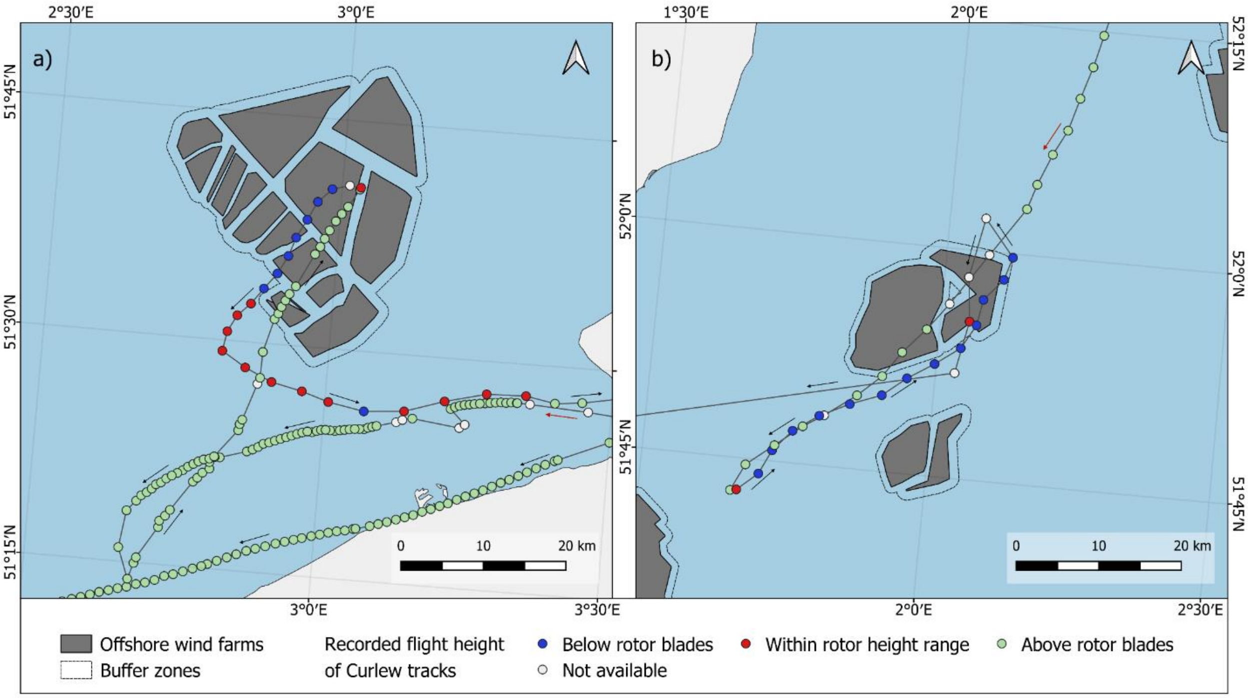
Figure 3.5.3-3. Four examples of curlews approaching offshore wind farms that show avoidance in the vertical plane by increasing flight altitudes



Source: Figure S3 in Schwemmer et al. (2023).

Note: a) "Hornsea Project One" (United Kingdom; rotor level: 36–190 meters); b) "Sheringham Shoal" (United Kingdom; rotor level: 26.5–133.5 meters); c) "Race Bank" (United Kingdom; rotor level 23–177 meters); d) "Egmond aan Zee" (The Netherlands; rotor level: 25–115 meters). Different colors of GPS fixes represent different flight altitudes.

Figure 3.5.3-4. Four examples of curlews approaching offshore wind farms that show avoidance in the horizontal plane by changing flight directions



Source: Figure S4 in Schwemmer et al. (2023).

Note: Left panel: offshore wind farm cluster belonging to Belgium and The Netherlands. The bird entered the North Sea approaching from The Netherlands, performed a loop in the south, entered the cluster and returned to a roost in The Netherlands where it stayed for 9 days before continuing its journey in a straight track. Right panel: "Galloper" and "Greater Gabbard" belonging to the United Kingdom. The bird entered from the north, crossed the cluster, performed a circle in the south, entered the cluster again, performed another circle in the north, entered the cluster for a third time, and left the area towards the southwest. Arrows depict flight directions.

Figure 3.5.3-5. Non-directional flights within or in the vicinity of two offshore wind farm clusters made by two curlews tagged as breeding in north Germany

Because most offshore structures would likely be spaced 0.6 to 1 nm (1.1 to 1.9 kilometers) apart, sufficient space between WTGs should allow birds that are not flying above WTGs to fly through individual lease areas without changing course or to make minor course corrections to avoid the WTGs in operation. The effects of offshore wind farms on bird movement ultimately depends on the bird species, size of the offshore wind farm, spacing of turbines, and extent of extra energy costs incurred by the displacement of flying birds (relative to normal flight costs pre-construction) and their ability to compensate for this degree of added energy expenditure. Little quantitative information is available on how offshore wind farms may act as a barrier to movement, but Madsen et al. (2012) modeled bird movement through offshore wind farms using bird (common eider) movement data collected at the Nysted offshore wind farm in the western Baltic Sea just south of Denmark. After running several hundred thousand simulations for different layouts/configurations for a 100 WTG offshore wind farm, the proportion of birds traveling between the turbines increased as distance between turbines increased. With eight WTG columns at 200 meters (0.1 nm) spacing, no birds passed between the turbines. However, increasing inter-turbine distance to 500 meters (0.27 nm) increased the percentage of birds to more than 20 percent, while a spacing of 1,000 meters (0.54 nm) increased this further to 99 percent. The 0.6 to 1 nm spacing estimated for most structures that will be proposed on the Atlantic OCS is greater than the distance at which 99 percent of the birds passed through in the model. As such, adverse impacts of additional energy expenditure due to minor course corrections or complete avoidance of the lease areas would not be expected to be biologically significant. Any additional flight distances would likely be small for most migrating birds when compared with the overall migratory distances traveled, and no individual fitness or population-level effects would be expected to occur. Similar results were also reported for foraging birds. A recent study based on GPS tracking of sandwich terns (*Thalasseus sandvicensis)* near several European wind farms found that avoidance rates of offshore wind turbines increased with turbine density (van Bemmelen et al. 2023); interestingly, the turbines in those wind farms were much closer to each other than anticipated in the NY Bight, suggesting the proposed turbine spacing may not create a barrier that would displace foraging sandwich terns or other tern species.

The addition of WTGs to the offshore environment may result in increased functional loss of habitat for those species with higher displacement sensitivity. Displacement and avoidance can cause birds to expend more energy and to forage in other areas. However, overall habitat loss due to displacement is unlikely to affect population trends because of the relatively small size of wind farm project areas in relation to the available foraging habitat (Fox and Petersen 2019). A recent study of long-term data collected in the North Sea found that despite the substantial observed displacement of loons in response to the development of 20 wind farms, there was no decline in the region’s local loon population (Vilela et al. 2021). Extensive foraging habitat for resident birds would remain available outside of the offshore lease areas; therefore, the impacts on birds due to the presence of operating WTGs would likely be low.

In the Northeast and Mid-Atlantic waters, there are 2,570 seabird fatalities through interaction with commercial fishing gear each year; of those, 84 percent are with gillnets involving shearwaters/fulmars and loons (Hatch 2017). Abandoned or lost fishing nets from commercial fishing may get tangled with foundations, reducing the chance that abandoned gear would cause additional harm to birds and other wildlife if left to drift until sinking or washing ashore. A reduction in derelict fishing gear (in this case by entanglement with foundations) has a beneficial impact on bird populations (Regular et al. 2013). In contrast, the presence of structures may also increase recreational fishing and, thus, expose individual birds to harm from fishing line and hooks.

The presence of new structures could result in increased prey items for some local marine bird species. Offshore wind foundations could increase the mixing of surface waters and deepen the regional thermocline, resulting in the potential increase in pelagic productivity in local areas (English et al. 2017). Additionally, new structure installation may create habitat for structure-oriented or hard-bottom species, typically referred to as “reef effect.” This reef effect has been observed around WTGs, which can result in local increases in biomass and diversity (Causon and Gill 2018). Recent studies have revealed increased biomass for benthic fish and invertebrates, and potentially for pelagic fish, marine mammals, and birds (Raoux et al. 2017; Pezy et al. 2018; Wang et al. 2019), indicating that the installation of offshore wind energy facilities can generate beneficial permanent impacts on local ecosystems, resulting in increased foraging opportunities for individuals of local marine bird species. BOEM anticipates that the presence of structures may result in permanent beneficial impacts. Conversely, increased foraging opportunities could attract marine birds, potentially exposing those individuals to increased collision risk associated with operating WTGs.

Overall, the abundance of bird species that overlap with ongoing wind energy facilities on the Atlantic OCS is relatively small, and the presence of structures is anticipated to have minor impacts on birds.

Traffic (aircraft): General aviation traffic is responsible for approximately two bird strikes per 100,000 flights (Dolbeer et al. 2019). Because aircraft flights associated with offshore wind development are anticipated to be minimal, aircraft strikes with birds are highly unlikely to occur. As such, aircraft traffic impacts would be negligible and would not be expected to appreciably contribute to overall impacts on birds.

Land disturbance: Onshore construction of offshore wind and transmission infrastructure has the potential to result in some impacts due to habitat loss or fragmentation. While transmission infrastructure, such as PBI, would likely be primarily co-located with existing roads and rights-of way, habitat alteration from planned non-offshore wind activities may occur. Habitat and/or species surveys may be conducted in accordance with federal and state requirements to support federal and state agency consultation and permitting requirements, and consultation and permitting may require that construction activities be seasonally restricted to occur when impacts to birds can be avoided or minimized. However, onshore construction would be expected to account for only a very small increase in development relative to other ongoing development activities. Further, construction would be expected to generally occur in previously disturbed habitats, and no individual fitness or population-level impacts on birds would be expected to occur. As such, onshore construction associated with planned offshore wind development would be minor and would not be expected to appreciably contribute to overall impacts on birds.

3.5.3.3.4 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, birds would continue to be affected by existing environmental trends and ongoing activities. BOEM anticipates ongoing activities to have continuing temporary and permanent impacts (disturbance, displacement, injury, mortality, habitat degradation, habitat alteration) on birds primarily through construction activities and climate change. Given that the abundance of bird species that overlap with ongoing wind energy facilities on the Atlantic OCS is relatively small, ongoing wind activities would not significantly contribute to impacts on birds. Temporary disturbance and permanent loss of onshore habitat may occur as a result of offshore wind development. However, habitat removal is expected to be minimal, and any impacts resulting from habitat loss or disturbance would not be anticipated to result in individual fitness or population-level effects within the geographic analysis area. The No Action Alternative would likely result in **negligible** to **minor** impacts on birds.

Cumulative Impacts of the No Action Alternative. Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and birds would continue to be affected by natural and anthropogenic IPFs. Additionally, planned activities would contribute to the impacts on birds due to habitat loss from increased onshore construction and interactions with offshore developments. BOEM anticipates that the impacts associated with offshore wind activities in the geographic analysis area would result in adverse impacts but could potentially include beneficial impacts because of the presence of structures and reduction in ozone levels from fossil fuel displacement. The majority of offshore structures in the geographic analysis area would be attributable to offshore wind development. Migratory birds that use the offshore wind lease areas during all or parts of the year would either be exposed to new collision risk or experience long-term functional habitat loss due to behavioral avoidance and displacement from wind lease areas on the OCS. The offshore wind development would also be responsible for the majority of impacts related to new cable emplacement and pile-driving noise, but effects on birds resulting from these IPFs would be localized and temporary and would not be expected to be biologically significant. BOEM anticipates that the cumulative impacts of the No Action Alternative would likely have a **negligible** to **moderate** impact on birds but could also include moderate beneficial impacts because of the presence of offshore structures. In addition, the displacement of fossil fuels in the generation of electricity by offshore wind would further reduce ozone and consequently result in minor to moderate beneficial impacts to populations of small land birds. The overall beneficial impact on birds due to presence of offshore structures and displacement of fossil fuels would be **minor beneficial** to **moderate beneficial**.

3.5.3.4 Impacts of Alternative B – No Identification of AMMM Measures at the Programmatic Stage – Birds

3.5.3.4.1 Impacts of One Project

Alternative B considers the potential impacts of future offshore wind development for the NY Bight area without the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts.

Accidental releases: Because a NY Bight project would be required to comply with federal and state requirements related to the prevention and control of accidental releases, the expected impacts of accidental releases associated with one NY Bight project would be negligible and would not increase impacts beyond those described for the No Action Alternative.

Air emissions: Similar to the No Action Alternative, the displacement of fossil fuels in the generation of electricity by offshore wind would contribute toward limiting ozone precursor pollutants (such as NO_X), which would result in healthier ecosystems. This decrease in NO_X emissions and surface-level ozone formation would consequently have a minor to moderate beneficial impact on populations of small land birds.

Lighting: Nighttime lighting associated with up to 280 WTGs, 5 OSSs, and multiple vessels (during construction, operations, and conceptual decommissioning) could represent a source of bird attraction, with the same types of impacts on birds described for the No Action Alternative. Similar to the No Action Alternative, vessel-related lighting impacts during construction and operation would be localized and a low risk for bird species. For offshore structure lighting, in the absence of light reduction measures (e.g., aircraft detection lighting system [ADLS]), potential offshore structure lighting impacts during operations could result in moderate impacts on birds.

Cable emplacement and maintenance: Installation of 1,479 miles (2,380 kilometers) of interarray and export cables from a single NY Bight project would result in increased suspended sediments and disturbed seafloor that may affect diving birds, displacement of foraging individuals, or decreased foraging success, and have impacts on some benthic prey species. However, assuming cable installation and maintenance in the NY Bight lease areas would be similar to the installation methods and maintenance activities employed at adjacent wind projects (e.g., Empire Wind OCS-A 0512, Ocean Wind 1 OCS-A 0498), impacts from suspended sediments would be short term and localized, and birds would be able to successfully forage in adjacent areas not affected by increased suspended sediment. In addition, due to the short term and localized nature of the suspended sediment impact, benthic assemblages would be expected to recover from seafloor disturbance. Therefore, impacts from cable emplacement and maintenance are anticipated to be minor.

Noise: Pile-driving noise from up to 280 WTGs, as well as onshore and offshore construction noise, associated with one NY Bight project is anticipated to result in temporary and highly localized impacts. Dredging vessels and other construction noise could temporarily disturb and displace some bird species, but they are likely already acclimated to noise in an urban environment and would be able to easily avoid the noise impacted areas. Under a single NY Bight project, BOEM anticipates noise impacts on birds to be minor and limited to behavioral avoidance of pile-driving or construction activity.

Presence of structures: The numerous types of impacts on birds that could result from the presence of structures, such as migration disturbance, habitat loss/fragmentation, and turbine strikes, are described in detail in Section 3.5.3.3.3. Between 50–280 WTGs and 1–5 OSSs on the OCS would result from a single NY Bight project where few currently exist. The structures, and related bird impacts, associated with one NY Bight project would remain at least until conceptual decommissioning is complete and could pose long-term effects on birds, both disadvantageous and beneficial.

There are few resources that show the level of bird use of the OCS and the ultimate consequences of mortality, if any, associated with operating WTGs. Migratory birds have the potential to pass through the NY Bight lease areas, but overall, a small number is expected within the lease areas given their distance from shore.

As depicted for the offshore wind lease areas on Figure 3.5.3-2, avoiding areas with high concentrations of birds was a factor in selecting locations for offshore wind lease areas on the OCS. All six NY Bight lease areas are located at least 20 nautical miles (37 kilometers) offshore. Within the Atlantic Flyway along the North American Atlantic Coast, much of the bird activity is concentrated along the coastline (Watts 2010). Waterbirds use a corridor between the coast and several kilometers out onto the OCS, while land birds tend to use a wider corridor extending from the coastline to tens of kilometers inland (Watts 2010). However, operation of WTGs in the NY Bight lease areas could result in impacts on some individuals of offshore bird species and possibly some individuals of coastal and inland bird species during spring and fall migration. These impacts could arise through direct mortality from collisions with WTGs or through behavioral avoidance and habitat loss (Drewitt and Langston 2006; Fox et al. 2006; Goodale and Millman 2016). The predicted activity of bird populations that have a higher sensitivity to collision (as defined by Robinson Willmott et al. [2013]) is relatively low in the OCS during all seasons of the year (Figure 3.5.3-6), suggesting that bird fatalities due to collision are likely to be low. Similarly, the predicted activity of bird populations that have a higher sensitivity to displacement is relatively low in the OCS (Figure 3.5.3-7).

When WTGs are present, many birds would avoid the WTG site altogether, especially the species that ranked "high" in vulnerability to displacement by offshore wind energy development (Robinson Willmott et al. 2013). In addition, many birds would likely adjust their flight paths to avoid WTGs by flying above, below, or between them (e.g., Desholm and Kahlert 2005; Plonczkier and Simms 2012; Skov et al. 2018), and others may take extra precautions to avoid WTGs when the WTGs are moving (Johnston et al. 2014). Several species have very high avoidance rates; for example, the northern gannet, black-legged kittiwake, herring gull, and great black-backed gull have measured avoidance rates of at least 99.6 percent (Skov et al. 2018). As mentioned in Section 3.5.3.3.3, Vattenfall (a European energy company) recently studied bird movements within an offshore wind farm situated 1.9 to 3 miles (3 to 4.9 kilometers) off the coast of Aberdeen, Scotland (Vattenfall 2023). The study's calculated micro-avoidance rate (>0.96) is similar to Skov et al. (2018). Further evidence supporting turbine avoidance can be found in Schwemmer et al. (2023), in which 70 percent of approaching Eurasian curlews (*Numenius arquata arquata*) demonstrated horizontal avoidance responses when approaching offshore wind farms in the Baltic and North Seas.

Avian collision risk impact assessments have been performed for adjacent OCS lease areas (e.g., Empire Wind OCS-A 0512 and Ocean Wind 1 OCS-A 0498) and provide some insight into the potential collisions risk for the NY Bight lease areas. The majority of the bird species identified in the impact assessment for Empire Wind are expected to have "minimal" to "low" overall exposure risk. Similar to Empire Wind, the avian impact assessment performed for Ocean Wind 1 determined the overall exposure risk to be "minimal" to "low." Further, coastal birds are considered to have minimal exposure (occurrence) within the NY Bight lease areas because they are far enough offshore to be beyond the range of most breeding terrestrial or coastal bird species. Falcons may be potentially exposed to the NY Bight lease areas during migration; however, the proportion of migrating falcons that may be attracted to offshore wind energy projects for perching, roosting, and foraging is uncertain, as is the extent to which individuals might avoid WTGs or collide with them.

Overall, because the presence of birds in the offshore environment is generally low, and avian risk analyses conducted by nearby lease areas indicate low risk, BOEM anticipates the presence of structures from one project in the NY Bight lease areas would have a minor impact on birds.

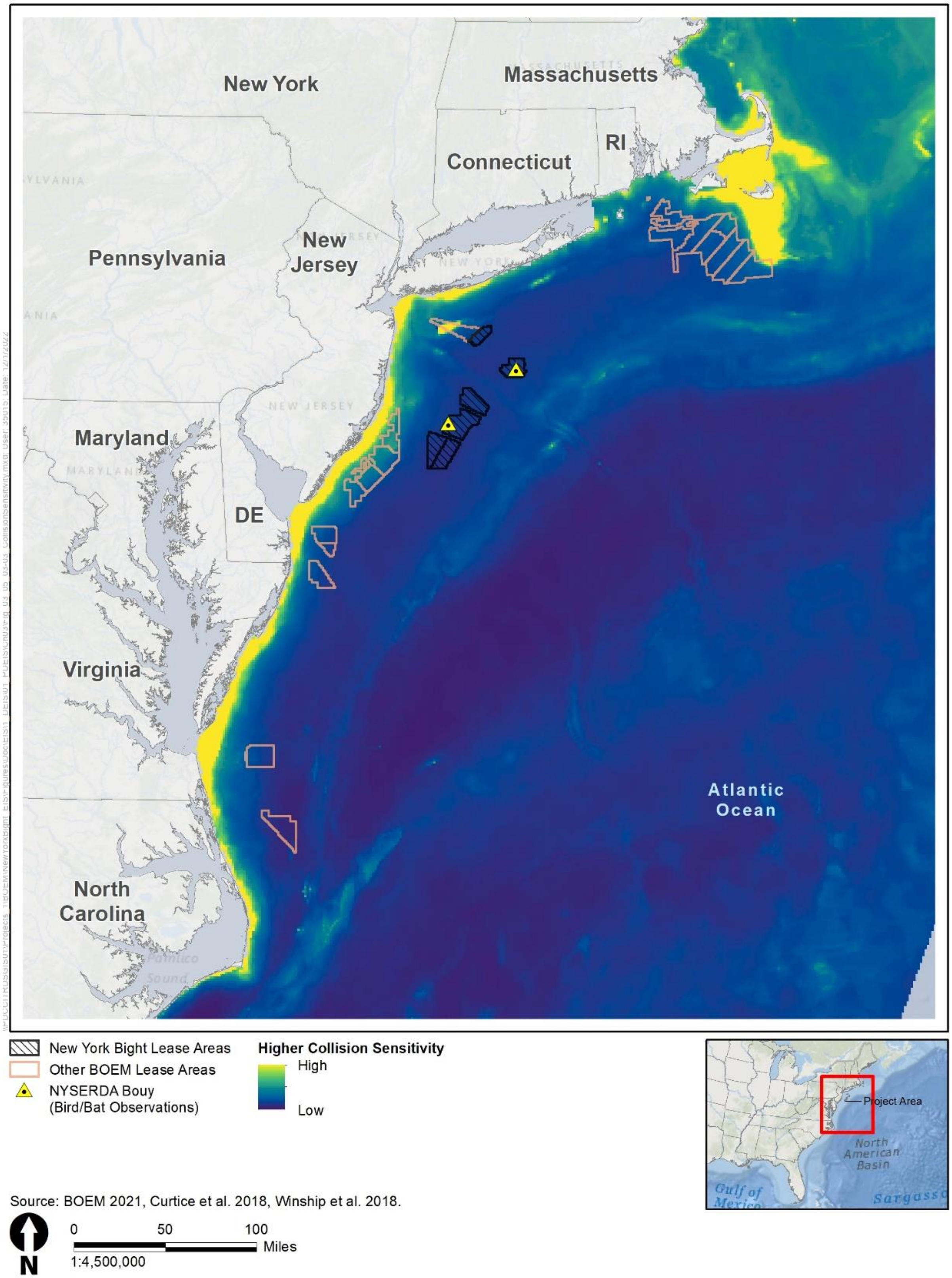


Figure 3.5.3-6.Total avian relative abundance distribution map for the higher collision sensitivity species group

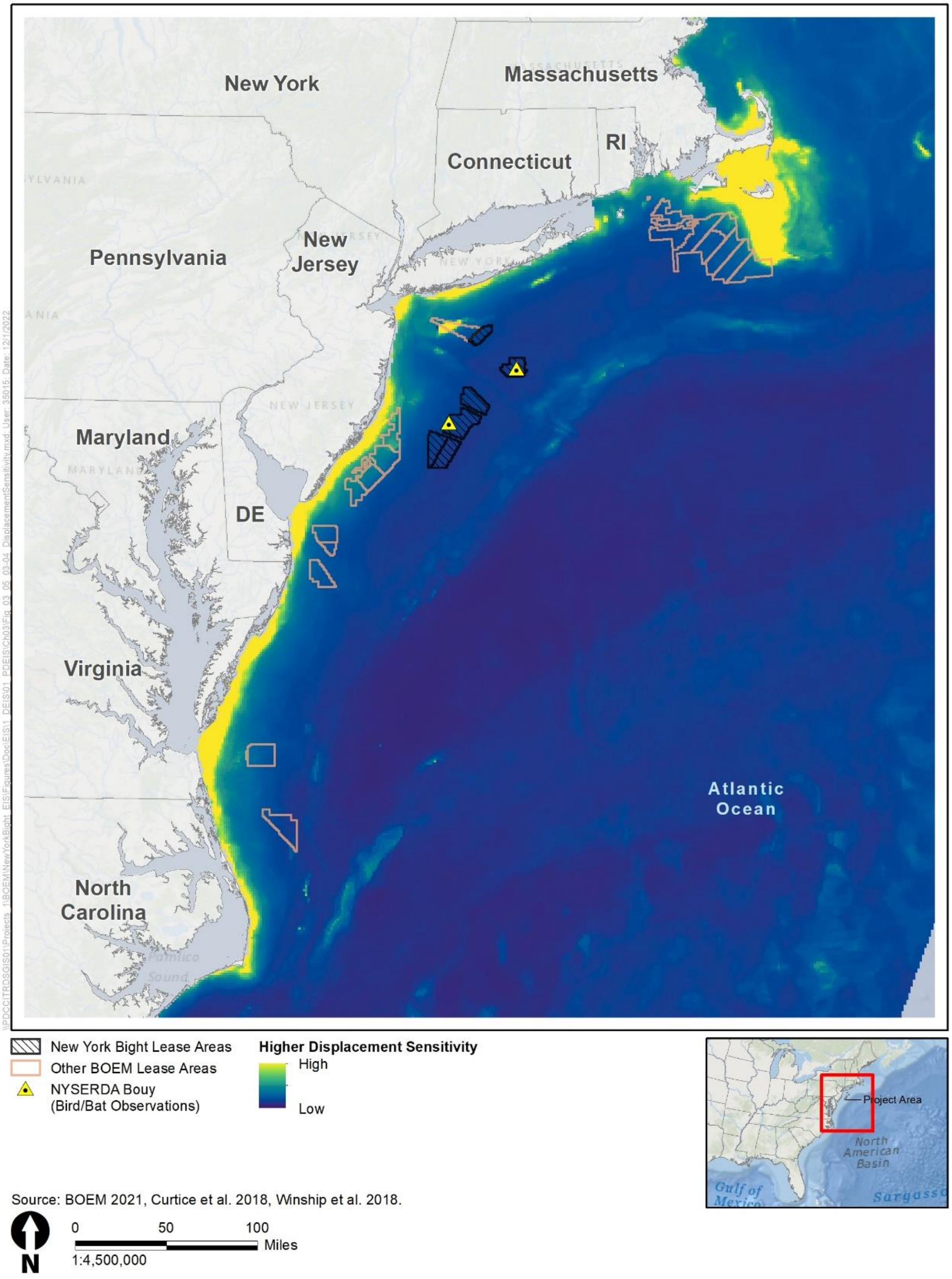


Figure 3.5.3-7. Total avian relative abundance distribution map for the higher displacement sensitivity species group

Traffic (Aircraft): The expected impacts of aircraft traffic associated with a single NY Bight project would not increase beyond the negligible impacts described for the No Action Alternative.

Land disturbance: Impacts associated with construction of onshore elements of one NY Bight project are anticipated to be localized and short term. There would be some potential for habitat impacts on birds as a result of the loss of potentially suitable nesting or foraging habitat. However, BOEM anticipates that impacts on bird habitat from onshore construction activities would be limited because, based on other recent offshore wind projects, whenever possible, facilities (including overhead transmission lines) would be co-located with existing developed areas (i.e., roads and existing transmission lines) to limit disturbance. Any habitat that may be present within permanent substation sites or other permanent facilities would be converted to developed land with landscaping for the duration of the NY Bight project's operational lifetime, which would be considered a long-term effect. While BOEM anticipates habitat clearing to be minimal due to the likely placement of onshore project components in previously disturbed areas, it is possible that larger areas of habitat could be temporarily and permanently cleared. Disturbance to the land surface or terrestrial habitat during the course of conceptual decommissioning would be minimal if onshore components are left in place and abandoned or if minimal disturbance would be required for conceptual decommissioning, such as disconnecting and cutting buried cables at the fence site below ground. If conceptual decommissioning required complete removal of onshore cable, the impacts would be similar to installation impacts. Overall, BOEM anticipates habitat loss would be limited and minor, and any potential effects would be indirect and unlikely to affect individual or population levels of bird species. However, the area of suitable bird habitat removed could vary, depending on the specific siting of the onshore project components, and could result in moderate impacts.

3.5.3.4.2 Impacts of Six Projects

There would be greater potential for impacts under six NY Bight projects due to the greater amount of offshore and onshore development as compared to a single NY Bight project. However, noise impacts are still anticipated to be minimal because noise has limited effects on local birds (see *Impacts of One Project*). The intensity of the impacts from the IPFs related to the offshore environment from a greater number of offshore structures and cables is unlikely to substantially change because bird presence on the OCS is generally low. Therefore, impacts on birds in the offshore environment under six NY Bight projects are anticipated to be negligible to moderate.

The same land disturbance IPF impact types and mechanisms described under one NY Bight project apply to six NY Bight projects. Similar to a single NY Bight project, the level of impact on birds from land disturbance depends on the amount of habitat affected from the onshore project components. While BOEM anticipates that impacts on bird habitat from onshore construction activities under six NY Bight projects would be limited, it is possible that larger areas of habitat could be temporarily and permanently cleared. Under six NY Bight projects, the potential for this possibility would be greater compared to one NY Bight project due to the increased amount of offshore wind development that would occur but would still likely result in a potential negligible to moderate range of impacts.

3.5.3.4.3 Impacts of Alternative B on ESA-Listed Species

The presence of federally protected bird species in the offshore environment would generally be limited. On June 20, 2024, BOEM initiated consultation with the USFWS on a Programmatic Framework ESA Section 7 consultation.

3.5.3.4.4 Cumulative Impacts of Alternative B

The construction and installation, O&M, and conceptual decommissioning of both onshore and offshore infrastructure for offshore wind activities across the geographic analysis area would also contribute to the primary IPFs of accidental releases, air emissions, lighting, cable emplacement and maintenance, noise, presence of structures, traffic (aircraft), and land disturbance. Given that the abundance of bird species that overlap with wind energy facilities on the Atlantic OCS is relatively small, offshore wind activities would not appreciably contribute to impacts on bird populations. Temporary disturbance and permanent loss of habitat onshore may occur as a result of offshore wind development. However, habitat removal is anticipated to be minimal, and any impacts resulting from habitat loss or disturbance would not be expected to result in individual fitness or population-level effects within the geographic analysis area.

The cumulative impacts on birds would likely be moderate because, although bird abundance on the OCS is low, there could be unavoidable impacts offshore and onshore; however, BOEM does not anticipate the impacts to result in population-level effects or threaten overall habitat function. This conclusion would not change even if the six NY Bight projects are constructed at the same time or staggered. In context of reasonably foreseeable environmental trends, the impact of Alternative B to the cumulative accidental releases, air emissions, lighting, cable emplacement and maintenance, presence of structures, traffic (aircraft), and land disturbance impacts on birds would be undetectable.

3.5.3.4.5 Conclusions

Impacts of Alternative B. In summary, construction, installation, and conceptual decommissioning of Alternative B, whether one NY Bight project or six NY Bight projects, would likely have **negligible** to **moderate** impacts on birds, depending on the offshore lighting scheme, amount and quality of habitat removed and the duration of construction activities, as well as the timing and species affected by an activity. The main significant risk would be from operation of the offshore WTGs (including lighting) and potential onshore removal of habitat, which could lead to long-term impacts in the form of mortality, although BOEM anticipates this to be rare. Alternative B would likely also potentially result in **minor beneficial** impacts associated with offshore foraging opportunities for some marine birds, and **minor** to **moderate beneficial** impacts on populations of small land birds due to the reduction in ozone from displacement of fossil fuels in the generation of electricity by offshore wind.

Cumulative Impacts of Alternative B. BOEM anticipates that the cumulative impacts on birds in the geographic analysis area would likely be **negligible** to **moderate** and **minor** to **moderate beneficial** under six NY Bight projects. In context of other reasonably foreseeable environmental trends, the impacts contributed by Alternative B to the cumulative impacts on birds would be undetectable.

Alternative B would contribute to the cumulative impacts primarily through the permanent impacts from the presence of structures and long-term impacts from habitat loss from onshore project components.

3.5.3.5 Impacts of Alternative C (Proposed Action) – Identification of AMMM Measures at the Programmatic Stage – Birds

Alternative C, the Proposed Action, considers the potential impacts of future offshore wind development for the NY Bight area with the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts. Alternative C consists of two sub-alternatives – Sub-alternative C1: Previously Applied AMMM Measures, and Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures. The analysis for Sub-alternative C1 is presented as the change in impacts from those impacts discussed under Alternative B, and the analysis for Sub-alternative C2 is presented as the change from those impacts discussed in Sub-alternative C1. Refer to Table G-1 in Appendix G, *Mitigation and Monitoring*, for a complete description of AMMM measures that make up the Proposed Action.

3.5.3.5.1 Sub-alternative C1 (Preferred Alternative): Previously Applied AMMM Measures

Sub-alternative C1 analyzes the AMMM measures that BOEM has required as conditions of approval for previous activities proposed by lessees in COPs submitted for the Atlantic OCS or through related consultations (Table 3.5.3-6).

Table 3.5.3-6. Summary of previously applied avoidance, minimization, mitigation, and monitoring measures for birds

Measure ID	Measure Summary
BB-1	This measure proposes requiring that any occurrence of dead or injured ESA-listed birds or bats (as well as eagles protected under the Bald and Golden Eagle Protection Act) be reported as soon as practicable, which would improve the understanding of ESA-listed bird interactions with wind farms.
BB-2	This measure proposes annual reporting requirements for dead or injured birds or bats, which would improve the overall understanding of bird interactions with wind farms.
BB-3	This measure proposes lessees prepare and implement a *Bird and Bat Post-Construction Monitoring Plan*, which would include monitoring, reporting requirements, and adaptive management to reduce impacts on birds from offshore wind farms.
BIR-1	This measure proposes preparation of a bird perching deterrent plan subject to agency review and implementation of bird perching-deterrents on WTGs and OSSs to reduce potential bird collisions with WTGs.
BIR-2	This measure proposes use of lighting technology that minimizes impacts on avian species to the extent practicable, including lighting designed to minimize upward illumination.
BIR-3	This measure proposes preparation of a *Compensatory Mitigation Plan* and implementation of compensatory mitigation actions to offset take of the ESA-listed piping plover and red knot.
MUL-37	This measure proposes use of an ADLS system on offshore structures to minimize light pollution and species impacts, while ensuring the structures are visible to aircraft.

Impacts of One Project

The identification of AMMM measures under Sub-alternative C1 could potentially reduce impacts on birds compared to those under Alternative B for the lighting and presence of structures IPFs. Impacts for other IPFs would remain the same as described under Alternative B.

Lighting: Implementation of an ADLS system on WTGs (MUL-37) could reduce potential collisions with WTGs. Because WTG lighting can attract some birds and has the potential to pose an increased collision or predation risk to migrating birds, an ADLS system would reduce this risk by significantly reducing the amount of time lights on WTGs would be illuminated. For comparison, the nearby Empire Wind (OCS-A 0512) ADLS-controlled obstruction lights are estimated to be activated for 357 hours, 46 minutes, and 45 seconds over a 1-year period, 7.5 percent of the normal operating time that would occur without ADLS. Using lighting technology on offshore structures that is designed to minimize upward illumination (BIR-2) could also minimize the potential for these lights to be an attractant to migratory birds and reduce the potential for collision with WTGs. While this measure could further minimize potential collisions in addition to implementing an ADLS system (MUL-37), it is unlikely that there would be a substantial additive effect. However, implementing MUL-37 and BIR-2 could reduce the overall potential lighting impacts on birds from moderate to minor.

Presence of structures: The implementation of a *Bird and Bat Post-Construction Monitoring Plan* (BB-3) would support improvement of the overall understanding of bird interactions with offshore wind farms through monitoring, reporting requirements, and adaptive management. Depending on the results of the post-construction monitoring, new mitigation and monitoring measures may be required by BOEM if impacts on birds in the offshore environment are considerably different from the impact analysis. The immediate reporting of dead or injured ESA-listed birds and annual reporting of any dead or injured birds would improve overall understanding of bird interactions with offshore wind and may reduce overall impacts on birds over time (BB-1, BB-2). Dead bird reporting could also lead to new mitigation or monitoring methods to reduce impacts on birds.

In addition to monitoring and reporting measures, Sub-alternative C1 includes measures to avoid direct impacts on birds in the offshore environment. Implementation of bird deterrent devices on WTGs and OSSs (BIR-1), along with adaptive management to modify deterrent design based on ongoing monitoring, would minimize the attraction of birds to WTGs and the potential for collisions.

To mitigate impacts on ESA-listed birds, lessees would be required to develop and implement a Compensatory Mitigation Plan that would include compensatory mitigation actions to offset take of ESA-listed piping plover and red knot (BIR-3). This measure would ensure that impacts on piping plover and red knot are compensated for, which would reduce impacts on ESA-listed species but impacts on other bird species would not be affected.

Overall, while the identification of the AMMM measures under Sub-alternative C1 for this IPF could reduce impacts on birds, BOEM anticipates the bird impacts from presence of structures from one project in the NY Bight lease areas would be similar to Alternative B and remain minor. This impact determination is primarily based on the low presence of birds in the offshore environment and the avian risk analyses conducted by nearby lease areas indicating low risk.

Impacts of Six Projects

Even with the identification of the AMMM measures under Sub-alternative C1, potential impacts on birds within the NY Bight lease areas under six projects is not anticipated to be different compared to a single NY Bight project due to the low presence of birds on the OCS and the unknown bird habitat impacts that could occur in the onshore environment. For the same reasons, the potential impacts on birds for six NY Bight projects under Sub-alternative C1 compared to six NY Bight projects under Alternative B are not anticipated to be substantially different.

Impacts of Sub-Alternative C1 (Preferred Alternative) on ESA-Listed Species

The identification of AMMM measures would result in similar reductions in impacts for ESA-listed birds as described for all birds for one NY Bight project and six NY Bight projects, with the exception of AMMM measures BB-1 and BIR-3, which are designed specifically to mitigate impacts on ESA-listed species. BB-1 and BIR-3 would improve understanding of ESA-listed bird interactions with WTGs through immediate reporting requirements and use compensatory mitigation actions to offset take of piping plover and red knot, respectively. As stated previously, the presence of ESA-listed bird species in the offshore environment would generally be limited, with more potential effects occurring from onshore activities.

Cumulative Impacts of Sub-Alternative C1 (Preferred Alternative)

Under Sub-alternative C1, the cumulative impacts on birds would likely be moderate because, although bird abundance on the OCS is low, there could be unavoidable impacts offshore and onshore. However, BOEM does not anticipate the impacts to result in population-level effects or threaten overall habitat function. In addition, the AMMM measures may not substantially change the potential effect on bird populations. Onshore habitat loss may be reduced if lessees design the onshore project components to avoid sensitive onshore bird habitat, but there is still the possibility of larger habitat areas being removed, which could still result in potential moderate impacts from land disturbance. In the context of other reasonably foreseeable environmental trends, BOEM anticipates the impact of Sub-alternative C1 to the cumulative accidental releases, lighting, cable emplacement and maintenance, noise, presence of structures, traffic (aircraft), and land disturbance impacts on birds would be undetectable.

3.5.3.5.2 Sub-Alternative C2: Previously Applied and Not Previously Applied AMMM Measures

Sub-alternative C2 analyzes the AMMM measures under Sub-alternative C1 plus the AMMM measures that have not been previously applied. However, BOEM has not identified any AMMM measures that have not been previously applied for birds, and, therefore, the impacts on birds under Sub-alternative C2 are the same as Sub-alternative C1 and Alternative B.

3.5.3.5.3 Conclusions

Impacts of Alternative C. Construction, installation, and conceptual decommissioning of one NY Bight project or six NY Bight projects under Sub-alternative C1 or Sub-alternative C2 would likely have **negligible** to **moderate** impacts on birds, depending on the duration of activities performed and how much onshore habitat would be removed. The AMMM measures under Sub-alternative C1 and Sub-alternative C2 would provide some certainty in reducing impacts on birds in the offshore environment and, therefore, could reduce potential impacts on birds compared to those under Alternative B. However, bird presence in the offshore environment is anticipated to be low and the AMMM measures may not significantly reduce impacts. Like Alternative B, onshore habitat impacts under Sub-alternatives C1 and C2 could be reduced by lessees designing the projects to avoid onshore bird habitat. However, because the location of onshore infrastructure is not known, there could still be a range of potential impacts on habitat regardless of the AMMM measures, resulting in negligible to moderate impacts. Noise effects from construction are expected to be limited to temporary and localized behavioral avoidance that would cease once construction is complete. Sub-alternatives C1 and C2 could also result in **minor beneficial** impacts associated with foraging opportunities for some marine birds, and **minor** to **moderate beneficial** impacts on populations of small land birds due to the reduction in ozone from displacement of fossil fuels in the generation of electricity by offshore wind.

Cumulative Impacts of Alternative C. BOEM expects that the cumulative impacts on birds under Sub-alternative C1 and Sub-alternative C2 in the geographic analysis area would likely be **negligible** to **moderate** and **minor** to **moderate beneficial** for six NY Bight projects. In context of reasonably foreseeable environmental trends, the impact of Sub-alternative C1 and Sub-alternative C2 to the cumulative impacts on birds would be undetectable. Because the occurrence of most local bird species offshore is low, Sub-alternative C1 and Sub-alternative C2 would contribute to the cumulative impacts primarily through the long-term impacts from onshore habitat loss related to onshore substations and cables. The extent of onshore habitat impacts is not known at this time because the location of onshore infrastructure is not known, regardless of the absence of land disturbance AMMM measures.

3.5.3.6 Recommended Practices for Consideration at the Project-Specific Stage

In addition to the AMMM measures identified under Alternative C, BOEM is recommending lessees consider analyzing the RPs in Table 3.5.3-7 to further reduce potential bird impacts. Refer to Table G-2 in Appendix G for a complete description of the RPs.

Table 3.5.3-7. Recommended Practices for bird impacts and related benefits

Recommended Practice	Potential Benefit
BB-4: Prepare a framework for a *Bird and Bat Post-Construction Monitoring Plan* to be submitted with the COP.	Developing a framework for a *Bird and Bat Post-Construction Monitoring Plan* would provide the public and agencies an opportunity to provide early feedback on the plan.
MUL-5: Use equipment, technology, and best practices to produce the least amount of noise possible to reduce noise impacts.	Using noise reduction measures to produce the least amount of noise practicable would likely minimize disturbance/displacement impacts.

Recommended Practice	Potential Benefit
MUL-21: Use the best available technology, including new and emerging technology, when possible, to reduce impacts, such as the use of MERLIN radar systems.	Assessing and monitoring bird mortality risk through radar sensors and bird-detection software (e.g., MERLIN) would provide information on avian occurrence in a wind farm area and could be used to inform post-construction operational mitigation.
MUL-23: Consider how to avoid or reduce potential impacts on important environmental resources by adjusting project design as part of COP submittal, which may minimize impacts on birds associated with onshore activities.	Adjusting project design to minimize impacts, such as routing cable in previously disturbed areas, has the potential to reduce impacts on individual birds and their habitats from onshore activities.
MUL-25: Use consistent turbine grid layouts, markings, and lighting in lease areas. Turbines should have one of the two lines of orientation in the grid layout spaced at least 1 nm apart.	Providing more structure-free areas in the lease area and reducing the total number of structures would potentially reduce interactions between birds and WTGs.
MUL-26: Coordinate for regional monitoring and surveys.	Coordinating monitoring and survey efforts across lease areas in the NY Bight to standardize approaches would contribute to understanding potential impacts on birds at a regional scale.
VIS-6: Ensure lighting at onshore and offshore facilities follows night lighting principles and artificial lighting BMPs to avoid light pollution.	Minimizing lighting onshore and offshore would reduce bird attraction to lighting, which would reduce potential collision risk.

3.5 Biological Resources

3.5.4 Coastal Habitat and Fauna

This section discusses potential impacts on coastal habitat and fauna from the Proposed Action, alternatives, and ongoing and planned activities in the geographic analysis area. The coastal habitat and fauna geographic analysis area, as shown on Figure 3.5.4-1, extends from the shoreline inland 1 mile (1.6 kilometers) where onshore infrastructure may be located (e.g., cable landfalls, onshore cable laying, substations/converter stations) and includes the foreshore, backshore, dunes, and interdunal areas as well as vegetation communities. BOEM expects the resources in this area to have small home ranges, and they are unlikely to be affected by impacts outside these home ranges. The 1-mile (1.6-kilometer) inland buffer was used for the analysis area although it is most likely that the onshore infrastructure for future projects would be farther inland. However, because the location of onshore components is unknown, and the existing land use farther inland includes a diverse mix of land use types and previously disturbed areas (see Section 3.6.5, *Land Use and Coastal Infrastructure*), the 1-mile (1.6-kilometer) buffer is used for the geographic analysis area for coastal habitat and fauna. Future project-specific impacts would predominantly be in these already disturbed areas; therefore, at the programmatic level, this 1-mile (1.6-kilometer) buffer is an appropriate geographic analysis area for coastal habitat and fauna.

The affected environment and environmental consequences of project activities that extend into inshore waters (e.g., HDD for cable landfalls) are presented in Section 3.4.2, *Water Quality*; Section 3.5.2, *Benthic Resources* (e.g., soft and hardbottom habitat, mollusk reef biota, submerged aquatic vegetation [SAV]); Section 3.5.5, *Finfish*, *Invertebrates*, *and Essential Fish Habitat*; Section 3.5.6, *Marine Mammals*; and Section 3.5.7, *Sea Turtles*. Additional information on birds, bats, and wetlands is presented in Section 3.5.1, *Bats*; Section 3.5.3, *Birds*; and Section 3.5.8, *Wetlands,* respectively.

The coastal habitat and fauna impact analysis in this PEIS is intended to be incorporated by reference into the project-specific environmental analyses for individual COPs expected for each of the NY Bight lease areas. Because the locations of onshore components for the NY Bight projects are not known at this time, the analysis of onshore coastal habitat and fauna impacts is dependent on a hypothetical project analysis, and impact conclusions consider a maximum-case scenario for onshore development. Additional detailed site-specific analysis will be required for individual COPs. Refer to Appendix C, *Tiering Guidance*, which identifies additional analyses anticipated to be required for the project-specific environmental analysis of individual COPs.

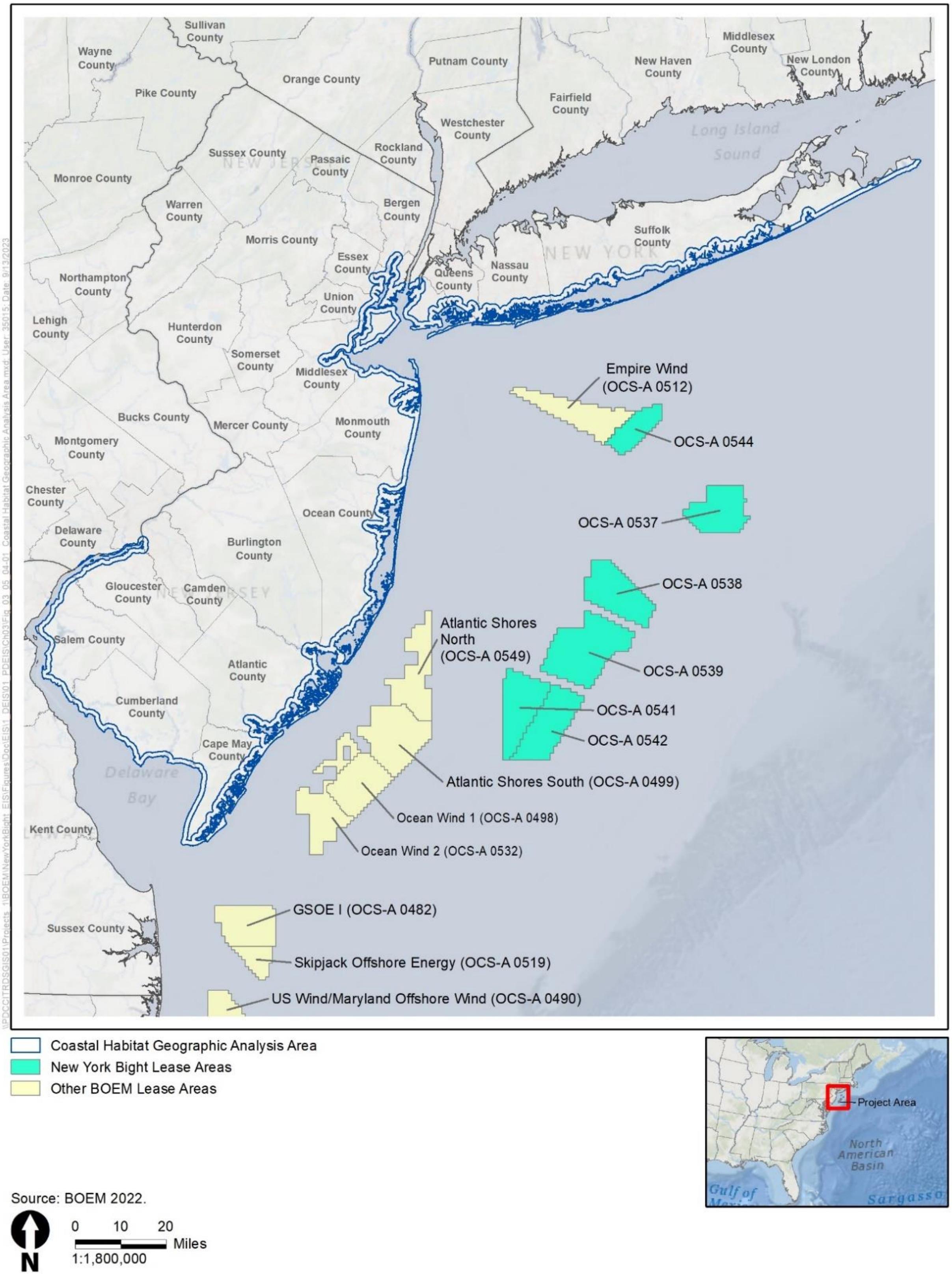


Figure 3.5.4-1. Coastal habitat and fauna geographic analysis area

3.5.4.1 Description of the Affected Environment and Future Baseline Conditions

3.5.4.1.1 Coastal Habitat

This section describes vegetation communities under existing conditions in upland portions of the geographic analysis area and includes information about species and habitats within the onshore area. The *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf* (MMS 2007) includes a general description of the affected environment for coastal habitats along the entire Atlantic coast and is hereby incorporated by reference and summarized here. The NY Bight lease areas are located offshore of the Atlantic coastal plain. This plain is a flat stretch of land that borders the Atlantic Ocean for approximately 2,200 miles (3,541 kilometers) from Cape Cod through the southeast United States. The coastal resources of the New York and New Jersey shorelines include sandy beaches, coarse-grained beaches, cliffs, coastal dune systems, and barrier island forests. These habitats and the species present within them are described in detail in the aforementioned PEIS (MMS 2007). Descriptions of site-specific coastal habitats present in the NY Bight are included below.

New York has 120 miles (193 kilometers) of coastline bordering the Atlantic Ocean between Coney Island and Montauk (Tanski 2012). Most of the ocean-facing barrier islands along the south shore of Long Island consist of fine- to medium-grained sand beaches, solid human-made structures (e.g., docks, marinas, jetties, seawalls), and rip-rap (ESI 2009). North-facing shores of the barrier islands border the Great South Bay. Farther west and deeper into the New York-New Jersey harbor, the shoreline is composed of rocky, exposed cliffs, human-made structures, and coarse-grained sand and gravel beaches and eroding scarps (ESI 2001).

New Jersey has 127 miles (204 kilometers) of oceanfront shoreline, much of which is densely populated; however, about 31 miles (50 kilometers) of non-contiguous shoreline between Sandy Hook and Cape May Point has no human-made barriers between land and water (Stockton University 2015). In northern New Jersey, much of the shoreline around Raritan Bay is composed of coarse-grained beaches, mixed-sand and gravel, and rip-rap (NJDEP 2002). Common onshore habitats include forested areas, New Jersey pinelands, Atlantic White Cedar swamp, and beaches and dunes.

Forested Areas

The forested areas of the onshore project area consist of lowland forest and upland forest. Lowland forests are characterized by Atlantic white-cedar (*Chamaecyparis thyoides*) and other broadleaf species. Along the edges of the lowlands are occasional gray birch (*Betula populifolia*), willow oak (*Quercus phellos*), sweet gum (*Liquidambar styraciflua*), and several other water-tolerant lowland species. Lowland forest communities include cedar swamps, hardwood swamps, and pine lowlands. Upland forests are characterized by pines, especially the pitch pine (*Pinus rigida*) and shortleaf pine (*P. echinata*). As compared to the lowlands, the canopy is more varied in composition. Pitch pine is the most abundant, and its associations include shortleaf pine and oaks. Communities within the upland association include pine-black oak (*Q. velutina*), pine-black oak-scrub oak (*Q. berberidifolia*), and oak-pine.

New Jersey Pinelands

Outside of the coastal zone, portions of the onshore geographic analysis area may overlap with mapped New Jersey Pinelands National Reserve. The pinelands ecosystem is an expansive area in southern New Jersey characterized by unconsolidated sand and gravel with a shallow, but characteristically acidic and nutrient-poor aquifer where the plant and animal species have adapted to challenging conditions, particularly wildland fire. Many plant and animal species known to occur in the pinelands require occasional wildfires to maintain habitat conditions and provide opportunities for reproduction. The Pinelands National Reserve area is managed by the Pinelands Commission and is defined by three separate zones: protected areas, managed use areas, and zones of cooperation. The onshore geographic analysis area may overlap with the Pinelands National Reserve areas that are designated as a "Regional Growth Area" which are managed use areas, or Pinelands National Reserve areas designated "protected areas" (State of New Jersey 2021a, 2021b; Pinelands Preservation Alliance 2021).

Atlantic White Cedar Swamp

Atlantic white cedar swamps are prevalent in coastal New Jersey along riverine areas. This community is typically dominated by Atlantic white cedar surrounded by hummocks of sphagnum mosses (*Sphagnum spp*.) with wildflowers, grasses, sedges, rushes, and other species also present (Pinelands Reserve Alliance 2018). Wetlands are further discussed in Section 3.5.8.

Beaches and Dunes

There are many beaches along the New Jersey and New York coastlines. Beach and dune communities are found within the onshore geographic analysis area. These features are generally located along the barrier beach system of the Atlantic shoreline. Dune communities are protected under both New Jersey's and New York's Coastal Zone Management Programs as they provide special protection from coastal storms. Additionally, many beach and dune communities are protected from development if they are located within state parks or wildlife refuges, or if they are federally managed land such as Fire Island National Seashore. In general, while these communities are typically sparsely populated primarily with dune grasses that protect the dunes and assist in sand accretion (USEPA 2012), these habitats are used by many species, including federally and state-listed species such as migratory birds, butterflies, and bats.

Coastal Barrier Resources System

The Coastal Barrier Resources Act (CBRA) protects coastal areas that serve as barriers against wind and tidal forces caused by coastal storms and serve as habitat for aquatic species. The CBRA designated relatively undeveloped coastal barriers along the Atlantic and Gulf coasts as part of the John H. Chafee Coastal Barrier Resources System (BOEM and NOAA 2018). The CBRA encourages the conservation of hurricane-prone, biologically rich coastal barriers by restricting federal expenditures that encourage development (BOEM and NOAA 2018). Several Coastal Barrier Resources Systems are found within the geographic analysis area along coastal New Jersey.

3.5.4.1.2 Coastal Flora

The Atlantic Coast of the United States supports a great diversity of terrestrial biota. This diversity is a function of the combinations of geology, topography, and climate that occur along the coast from the Florida Keys to the Canadian border in Maine and the ecoregions that encompass these areas. The eastern Atlantic Coast falls into six ecoregions, each with a relatively unique ecosystem and biota; three occur in the geographic analysis area and include the Middle Atlantic Coastal Plain, Atlantic Coastal Pine Barrens, and Northeastern Coastal Zone.

Middle Atlantic Coastal Plain (Southern New Jersey)

This ecoregion consists of low elevation flat plains, with many swamps, marshes, and estuaries. Forest cover in the region is mostly loblolly and some shortleaf pine, with patches of oak, gum, and cypress near major streams. Its low terraces, marshes, dunes, barrier islands, and beaches are underlain by unconsolidated sediments (MMS 2007).

Atlantic Coastal Pine Barrens (New Jersey, New York)

This ecoregion is distinguished from the Middle Atlantic Coastal Ecoregion to the south by its coarser-grained soils, cooler climate, and oak-pine potential natural vegetation. The climate is milder than the Northeastern Coastal Ecoregion to the north, which contains Appalachian Oak forests and some Northern hardwood forests. The physiography of this ecoregion is not as flat as that of the Middle Atlantic Coastal Plain, but it is not as irregular as that of the Northeastern Coastal Zone (MMS 2007).

Northeastern Coastal Zone (New York)

This ecoregion contains relatively nutrient-poor soils and concentrations of continental glacial lakes, some of which are sensitive to acidification; however, this ecoregion contains considerably less surface irregularity and much greater concentrations of human population (MMS 2007). Land use now mainly consists of forests and residential development. Land cover and use is further discussed in Section 3.6.5.

3.5.4.1.3 Coastal Fauna

Coastal areas, including beaches and dunes, provide habitat for many different types of fauna. Beaches and dunes are important habitats for migrating and nesting shorebirds and songbirds. The beaches, dunes, and scrub-shrub habitats along the shoreline may support commonly found species such as the double-crested cormorant (*Phalacrocorax auritus*), ring-billed gull (*Larus delawarensis*), great blue heron (*Ardea herodias*), sanderling (*Calidris alba*), and brown pelican (*Pelecanus occidentalis*); see Section 3.5.3, *Birds,* for additional information.

Wildlife expected to be present along the onshore export cable corridor or at the onshore substation construction area include species known to inhabit forested wetlands, forested lowlands, and upland habitats and pinelands, while wildlife expected to be present along the cable landfall sites includes species known to inhabit coastal wetlands, barrier beaches, and bay island habitats.

Typical species found in coastal areas of New Jersey and New York are shown in Table 3.5.4-1, and typical species known to inhabit forested wetland, forested lowland, and upland habitats and pinelands of New Jersey and New York are provided in Table 3.5.4-2.

Table 3.5.4-1. Species typically found in coastal areas of New Jersey and New York

Common Name	Scientific Name	Common Name	Scientific Name
Black Snake	*Pantherophis obsoletus*	Garter Snake	*Thamnophis sirtalis*
Meadow Vole	*Microtus pennsylvanicus*	Porcupine	*Erethizon dorsatum*
Bobcat	*Felis refus*	Deer Mouse	*Peromyscus maniculatus*
Mink	*Neovison vison*	Raccoon	*Procyon lotor*
Bog Lemming	*Synaptomys cooperi*	Northern Diamondback Terrapin	*Malaclemys terrapin*
Eastern Mole	*Scalopus aquaticus*	Red Fox	*Vulpes vulpes*
Bog Turtle	*Glyptemys muhlenbergii*	Eastern Spiny Softshell Turtle	*Apalone spinifera*
Muskrat	*Ondatra zibethicus*	Red Squirrel	*Tamiasciurus hudsonicus*
Box Turtle	*Terrapene carolina carolina*	Eastern Tiger Salamander	*Ambystoma tigrinum*
Northern Scarlet Snake	*Cemophora coccinea copei*	Rice Rat	*Oryzomys palustris*
Brown Bat	*Myotis lucifugus*	Flying Squirrel	*Glaucomys volans*
Norway Rat	*Rattus norvegicus*	River Otter	*Lontra canadensis*
Eastern Chipmunk	*Tamias striatus*	Fowler's Toad	*Anaxyrus fowleri*
Virginia Opossum	*Didelphis virginiana*	Shrew	*Blarina brevicauda*
Corn Snake	*Pantherophis guttatus*	Skunk	*Mephitis mephitis*
Pine Barrens Tree Frog	*Hyla andersonii*	Gray Tree Frog	*Hyla chrysoscelis*
Cottontail Rabbit	*Sylvilagus floridanus*	Spring Peeper	*Pseudacris crucifer*
Gray Fox	*Urocyon cinereoargenteus*	Gray Squirrel	*Sciurus carolinensis*
Timber Rattlesnake	*Crotalus horridus*	Weasel	*Mustela frenata*
Ground Skink	*Scincella lateralis*	House Mouse	*Mus musculus*
White-footed Mouse	*Peromyscus leucopus*	White-tailed Deer	*Odocoileus virginianus*
Meadow Mouse	*Microtus pennsylvanicus*		

Table 3.5.4-2. Species known to inhabit forested wetland, forested lowland, and upland habitats and pinelands of New Jersey and New York

Common Name	Scientific Name	Common Name	Scientific Name
American Bittern	*Botaurus lentiginosus*	Northern Diamondback Terrapin	*Malaclemys terrapin*
Eastern Chipmunk	*Tamias striatus*	White-tailed Deer	*Odocoileus virginianus*
Red Fox	*Vulpes vulpes*	Virginia Opossum	*Didelphis virginiana*
Gray Fox	*Urocyon cinereoargenteus*	Raccoon	*Procyon lotor*
Red Squirrel	*Tamiasciurus hudsonicus*	Eastern Mole	Scalopus aquaticus
Gray Squirrel	*Sciurus carolinensis*	Northern Harrier	*Circus hudsonius*
Eastern Cottontail	*Sylvilagus floridanus*	Northern Pine Snake	*Pituophis melanoleucus*
Eastern Hognose Snake	*Heterodon platirhinos*	Osprey	*Pandion haliaetus*
Eastern Meadowlark	*Sturnella magna*	Pine Siskins	*Spinus pinus*
Finches	*Fringillidae sp.*	Red Bat	*Lasiurus borealis*
Grasshopper Sparrow	*Ammodramus savannarum*	Red-backed Salamander	*Plethodon cinereus*
Horned Lark	*Eremophila alpestris*	Savannah Sparrow	*Passerculus sandwichensis*

Common Name	Scientific Name	Common Name	Scientific Name
Kinglets	*Regulus spp.*	Little Blue Heron	*Egretta caerulea*
Masked Shrew	*Sorex cinereus*	Woodchuck	*Marmota monax*
Northern Black Racer	*Coluber constrictor*		

For any onshore project components located predominantly within developed lands, the project area would be generally most suitable for species common to urban environments, comprising sparsely vegetated and highly fragmented habitats, including mammals such as Virginia opossum, eastern cottontail, gray squirrel, meadow vole, Norway rat, house mouse, raccoon, and striped skunk. Bird species likely to utilize these urban habitats include house sparrow (*Passer domesticus*), European starling (*Sturnus vulgaris*), gulls, and rock pigeon (*Columba livia*) (see Section 3.5.3 for further discussion of avian species).

3.5.4.1.4 Federal and State-Listed Coastal Species

Under the ESA, the New Jersey Endangered and Nongame Species Program, and the New York Endangered Species Program, species and their habitats potentially impacted by construction and operation of offshore wind projects would require further evaluation to determine presence of habitat and individuals in the geographic analysis area and its immediate vicinity. These evaluations would be required to support federal and state permit requirements.

Special concern species that could potentially occur in these areas include but are not limited to the spotted turtle (*Clemmys guttata*) and the eastern box turtle (*Terrapene carolina carolina*). Seaside sandplant (*Honckenya peploides* var. *robusta*), sea-beach knotweed (*Polygonum glaucum*), seabeach sedge (*Carex silicea*), and sickle-leaf golden-aster (*Pityopsis falcate*) are plant species of concern known to occur in the barrier islands of the geographic analysis area. Federal and state listed threatened and endangered species found in or in the vicinity of the geographic analysis area for coastal habitat and fauna are presented in Table 3.5.4-3. Additional information on other Threatened and Endangered species that may occur in or near the coastal habitat areas can be found in Section 3.5.1, *Bats*; Section 3.5.3, *Birds;* Section 3.5.5, *Finfish*, *Invertebrates*, *and Essential Fish Habitat*; Section 3.5.6, *Marine Mammals*; and Section 3.5.7, *Sea Turtles*.

Table 3.5.4-3. Summary of potential threatened and endangered species in or in the vicinity of the geographic analysis area for coastal habitat and fauna

Common Name	Scientific Name	Taxonomic Group	Federal Status	State Status
Flora				
American Chaffseed	*Schwalbea americana*	Plant	Endangered	Unlisted
Knieskern's Beaked-rush	*Rhynchospora knieskernii*	Plant	Threatened	Unlisted
Sandplain Gerardia	*Agalinis acuta*	Plant	Endangered	NY Endangered
Seabeach Amaranth	*Amaranthus pumilus*	Plant	Threatened	NY Threatened
Sensitive Joint-vetch	*Aeschynomene virginica*	Plant	Threatened	Unlisted
Small whorled pogonia	*Isotria medeoloides*	Plant	Threatened	NY, NJ Endangered
Swamp Pink	*Helonias bullata*	Plant	Threatened	NJ Endangered

Common Name	Scientific Name	Taxonomic Group	Federal Status	State Status
Fauna				
Bobcat	*Lynx rufus*	Mammal	Unlisted	NJ Endangered
Harlequin Duck	*Histrionicus*	Bird	Unlisted	Unlisted
Common Tern	*Sterna hirundo*	Bird	Unlisted	NY Threatened
Forster's Tern	*Sterna forsteri*	Bird	Unlisted	Unlisted
Gull-Billed Tern[1]	*Gelochelidon nilotica*	Bird	Unlisted	Unlisted
Least Tern[1]	*Sterna antillarum*	Bird	Threatened	Unlisted
Black Skimmer[1]	*Rynchops niger*	Bird	Unlisted	Unlisted
Piping Plover	*Charadrius melodus*	Bird	Threatened	NY Endangered
Rufa Red Knot	*Calidris canutus rufa*	Bird	Threatened	NY Threatened
Roseate Tern	*Sterna dougallii*	Bird	Endangered	NY Endangered
Bog Turtle	*Clemys muhlenbergii*	Reptile	Threatened	NJ Endangered
Corn Snake	*Pantherophis guttatus*	Reptile	Unlisted	NJ Endangered
Northern Pine Snake	*Pituophis melanoleucus melanoleucus*	Reptile	Unlisted	NJ Threatened
Timber Rattlesnake	*Crotalus horridus horridus*	Reptile	Unlisted	NJ Endangered
Wood Turtle	*Glyptemus insculpta*	Reptile	Unlisted	NJ Threatened
Cope's Gray Treefrog (southern gray treefrog)	*Hyla chrysoscelis*	Amphibian	Unlisted	NJ Endangered
Pine Barrens Treefrog	*Hyla andersonii*	Amphibian	Unlisted	NJ Threatened
American burying beetle	*Nicrophorus americanus*	Insect	Threatened	NJ Endangered
Monarch Butterfly	*Danaus plexippus plexippus*	Insect	Candidate	Unlisted
Northeastern beach tiger beetle	*Habroscelimorpha dorsalis dorsalis*	Insect	Threatened	NJ Endangered
Rusty patched bumble bee	*Bombus affiniss*	Insect	Endangered	Unlisted

[1] Species considered Birds of Conservation Concern by USFWS (USFWS 2021).

3.5.4.2 Impact Level Definitions for Coastal Habitat and Fauna

Definitions of potential impact levels are provided in Table 3.5.4-4. Beneficial impacts on coastal habitat and fauna are described using the definitions described in Section 3.3.2 (see Table 3.3-1).

Table 3.5.4-4. Adverse impact level definitions for coastal habitat and fauna

Impact Level	Definition
Negligible	There would be no measurable impacts on species or habitat, or impacts would be so small that they would be extremely difficult or impossible to discern or measure.
Minor	Most impacts on species would be avoided; if impacts occur, they may result in the loss of a few individuals. Impacts on sensitive habitats would be avoided; impacts that do occur are temporary or short term in nature.
Moderate	Impacts on species would be unavoidable but would not result in population-level effects. Impacts on habitat may be short term, long term, or permanent and may include impacts on sensitive habitats but would not result in population-level effects on species that rely on them.
Major	Impacts would affect the viability of the population and would not be fully recoverable. Impacts on habitats would result in population-level impacts on species that rely on them.

BOEM expects that planned offshore wind projects in the NY Bight lease area would be designed to avoid important coastal habitat (e.g., wetlands) to the extent feasible, and would be required to comply with federal, state, and local regulations related to the protection of sensitive habitats and species by avoiding or minimizing impacts. Given the extent of sensitive coastal habitats, complete avoidance is often not possible; however, AMMM measures are proposed in Alternative C to minimize and mitigate impacts.

Accidental releases, land disturbance, noise, and traffic are contributing IPFs to impacts on coastal habitat and fauna. However, these IPFs may not necessarily contribute to each individual issue outlined in Table 3.5.4-5.

Table 3.5.4-5. Issues and indicators to assess impacts on coastal habitats and fauna

Issue	Impact Indicator
Habitat loss/ modification	Area of impacted habitat
Disturbance/ displacement	Changes to noise levels Projected traffic patterns/volume changes Qualitative assessment of potential ingestion or ensnarement from trash/debris
Collision/injury	Qualitative estimate of collision risk

3.5.4.3 Impacts of Alternative A – No Action – Coastal Habitat and Fauna

When analyzing the impacts of the No Action Alternative on coastal habitat and fauna, BOEM considered the impacts of ongoing activities, including ongoing non-offshore-wind and ongoing offshore wind activities on the baseline conditions for coastal habitat and fauna. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with the other planned non-offshore-wind and offshore wind activities, which are described in Appendix D, *Planned Activities Scenario*.

3.5.4.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for coastal habitat and fauna would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities. Ongoing activities within the geographic analysis area that contribute to impacts on coastal habitat and fauna are generally associated with onshore impacts, including onshore residential, commercial, and industrial development (see Section D.2 in Appendix D for a description of ongoing activities), and climate change. Mainland coastal habitat in the geographic analysis area for coastal habitat and fauna mostly consists of sandy beach and dune vegetation; much of this is developed for the public beach and private residences. Any new structures along the coast, including developments, roads, utilities, marinas and ports, and shoreline protection measures, are anticipated to increase gradually, altering coastal habitat. Development is likely to continue as resident and vacationer populations expand. However, it is important to note that New York and New Jersey State agencies have regulations on coastal development to protect and preserve existing natural resources; while development is likely to continue, much of it will be done in accordance with state regulations to protect the natural environment, including coastal habitat and fauna. Onshore construction activities have the potential to affect coastal habitat and fauna through temporary and permanent habitat removal or conversion and temporary noise impacts during construction, which could cause avoidance behavior and displacement of animals, as well as injury or mortality to individual animals or loss and alteration of vegetation and individual plants. However, population-level effects would not be anticipated. Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on coastal habitat and fauna include ongoing construction of Ocean Wind 1 (OCS-A 0498), South Fork Wind (OCS-A 0517), Sunrise Wind (OCS-A 0487), and Empire Wind (OCS-A 0512) 1 and 2. Ongoing construction of Ocean Wind 1, South Fork Wind, Sunrise Wind, and Empire Wind 1 and 2 would have the same types of impacts on coastal habitat and fauna that are described in Section 3.5.4.3.3, *Cumulative Impacts of the No Action Alternative,* for all ongoing and planned offshore wind activities in the geographic analysis area, but would be of lower intensity.

Climate change and associated sea level rise results in dieback of coastal habitats caused by rising groundwater tables and increased saltwater inundation from storm surges and exceptionally high tides (Sacatelli et al. 2020). Sandy beaches in the geographic analysis area are subject to erosion and vulnerable to the effects of projected climate change and relative sea level rise (Roberts et al. 2015) including ocean acidification and ocean warming. Climate change may also affect coastal habitats through increases in instances and severity of droughts and range expansion of invasive species. Warmer temperatures will cause plants to flower earlier, will not provide needed periods of cold weather, and will likely result in declines in reproductive success of plant and pollinator species (Cassota et al. 2019). Reptile and amphibian populations may experience shifts in distribution, range, reproductive ecology, and habitat availability. Increased temperatures could lead to changes in mating, nesting, reproductive, and foraging behaviors of species, including a change in the sex ratios in reptiles with temperature-dependent sex determination (Cassota et al. 2019).

Climate change factors have accounted for the loss of approximately 3.4 million acres (1.4 million hectares) of forested coastal wetlands across the north Atlantic coastal plain between 1996 and 2016 (White et al. 2021). If sea levels rise approximately 2 feet (0.6 meter) by the end of the century, over 167,000 acres (67,582 hectares) of undeveloped dry land and approximately 161,000 acres (65,154 hectares) of brackish marsh would be lost, replaced in part by over 266,000 acres (107,646 hectares) of newly open water and 50,000 acres (20,234 hectares) of salt marsh (Glick et al. 2008).

3.5.4.3.2 Impacts of the No Action Alternative on ESA-Listed Species

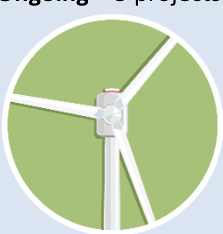
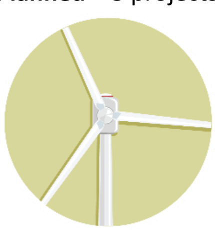
The species discussed in Table 3.5.4-3 may be affected by offshore wind activities. The IPFs described previously for coastal habitat and fauna would also apply to ESA-listed species. Any future federal activities that could affect ESA-listed species would need to comply with ESA Section 7 to ensure that the proposed activities do not jeopardize the continued existence of the species. Future non-federal activities would be addressed under ESA Section 10 to ensure that the proposed activities do not jeopardize the continued existence of individual species.

3.5.4.3.3 *Cumulative Impacts of the No Action Alternative*

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore-wind activities and planned offshore wind activities (without the development of the NY Bight projects).

Planned non-offshore-wind activities that may affect coastal habitat and fauna primarily include increasing onshore development activities (see Section D.2 in Appendix D for a description of ongoing and planned activities). Other planned non-offshore-wind activities that may affect coastal habitat and fauna include new submarine cables, transmission systems (e.g., PBI), and pipelines, oil and gas activities, marine minerals extraction, port expansions, and installation of new structures on the OCS (see Appendix D for a description of planned activities). Planned transmission infrastructure, such as PBI, would likely be primarily co-located with existing roads and rights-of way. These activities may result in temporary or permanent landscape alteration or displacement and injury or mortality to individual plants and animals, but population-level effects would not be expected for flora and fauna. Habitat and plant degradation and loss as well as habitat conversion may also occur. Ongoing and planned offshore wind activities that could potentially overlap the coastal habitat and fauna geographic analysis area are listed in Table 3.5.4-6.

Table 3.5.4-6. Ongoing and planned offshore wind in the geographic analysis area for coastal habitat and fauna

Ongoing/Planned	Projects by Region
Ongoing – 5 projects[1] 	**MA/RI** • South Fork Wind (OCS-A 0517) • Sunrise Wind (OCS-A 0487) **NY/NJ** • Ocean Wind 1 (OCS-A 0498) • Empire Wind 1 (OCS-A 0512) • Empire Wind 2 (OCS-A 0512)
Planned – 3 projects[2] 	**NY/NJ** • Ocean Wind 2 (OCS-A 0532) • Atlantic Shores North (OCS-A 0549) • Atlantic Shores South (OCS-A 0499)

MA = Massachusetts; NJ = New Jersey; NY = New York; RI= Rhode Island

[1] Refer to footnotes 9 and 10 in PEIS Chapter 1 for additional information on the status of Ocean Wind 1, Empire Wind 1, and Empire Wind 2.

[2] Status as of September 20, 2024.

BOEM expects ongoing and planned offshore wind activities to affect coastal habitat and fauna through the following primary IPFs.

Accidental releases: Accidental releases of fuels, lubricating oils, and other petroleum compounds may increase as a result of offshore wind activities. The risk of any type of accidental release would increase primarily during construction, but also could occur during operations and conceptual decommissioning of offshore wind facilities. Onshore, the use of heavy construction equipment could result in releases of fuel and lubricating and hydraulic oils during equipment use or refueling. Accidental releases may cause onshore habitat contamination from releases, cleanup activities, or both, although the volume of spilled material is anticipated to be low. Proper waste handling and cleanup procedures would minimize the potential for accidental releases and ensure spills are cleaned up promptly. There is no evidence that the anticipated volumes of accidental releases combined with cleanup measures would have measurable impacts on coastal habitat and fauna; therefore, impacts would be negligible. See Section 3.4.2.1, *Description of the Affected Environment and Future Baseline Conditions* for water quality, for quantities and details. As described in Section 2.3, *Non-Routine Activities and Events*, accidental releases of chemicals, gases, or man-made debris may occur as a result of a structural failure and could result in impacts on coastal habitat and fauna.

Land disturbance: Ground-disturbing activities from construction of onshore components could contribute to elevated levels of erosion and sedimentation, but usually not to a degree that affects coastal fauna, assuming that industry standard BMPs are implemented. Land disturbance from erosion and sedimentation associated with planned offshore wind activities, including export cables, landfalls, onshore substations/converter stations, and transmission facilities, would likely result in negligible impacts on coastal habitat and fauna in the geographic analysis area.

Land disturbances related to the onshore construction of facilities associated with offshore wind projects could cause removal of vegetation and conversion of natural coastal habitat to developed space. These land use changes are a frequent occurrence in coastal habitat. Land disturbance that results in onshore land use changes associated with planned offshore wind activities may produce minor impacts on coastal habitat and fauna as BOEM expects that most impacts on species would be avoided and, if impacts occur, they may result in the loss of a few individuals.

Some amount of habitat conversion may also result from port expansion activities required to meet the demands for fabrication, construction, transportation, and installation of wind energy structures. The general trend along the coastal region from Virginia to Maine is that port activity will increase modestly and require some conversion of undeveloped land to meet port demand (Lauriat 2022). This conversion will result in permanent habitat loss for local fauna populations. The increase of port facilities from development of planned offshore wind projects would be a minimal contribution of port expansion required to meet increased commercial, industrial, and recreational demand. See Section, 3.5.2, *Benthic Resources,* for more information on port expansion.

Noise: Onshore noise associated with intermittent construction of planned offshore wind development infrastructure (e.g., export cables, landfalls, onshore substations/converter stations, and transmission facilities) may result in highly localized and short-term impacts, including avoidance and displacement of species, as the land-based construction noise is likely sufficient to temporarily drive away local motile fauna, such as wading birds, from the immediate area during construction. No individual fitness or population-level effects would be anticipated to occur. The noise generated from onshore cable installation and trenching would be temporary and localized, and they would extend only a short distance beyond the cable emplacement corridor, therefore, impacts from noise on coastal habitat and fauna would likely be negligible.

Traffic: Impacts on wildlife and their habitat from vehicle traffic associated with planned offshore wind activities are anticipated to be limited as the onshore geographic analysis area is highly developed and experiences regular traffic. Risks of impacts on wildlife from offshore wind-related vehicle traffic may increase in areas that do not currently experience consistent vehicular traffic (e.g., electric utility and pedestrian/bike lanes ROWs). Vehicle traffic associated with the construction and operation of onshore facilities would represent increases in traffic volume mainly during construction and would be concentrated along the onshore cable routes and at the substations. During construction, mechanized equipment traffic could disturb or displace local wildlife, but these impacts would be similar to those caused by human presence, land disturbance, and noise/vibration that already occur. Any vehicle-related impacts on wildlife are expected to be localized and limited to the duration of construction. Limited mobility species, such as snakes and turtles, have a low probability of directly encountering vehicles because of the limited populations of these types of species proximate to the current high traffic use areas within the onshore areas associated with the planned offshore wind activities. Use of standard erosion and sedimentation control BMPs such as silt fences along the limits of construction would prevent these species from entering the construction work areas. Additionally, vehicle-related impacts on wildlife during routine O&M and conceptual decommissioning activities would be accidental and rare. All other species are expected to temporarily avoid areas of higher vehicle traffic but return once activities have ceased. Any impacts are expected to be highly localized, short-term, and not result in any population-level impacts. As there would likely be no measurable impacts on species or habitat, impacts are expected to be negligible.

3.5.4.3.4 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, coastal habitat and fauna would continue to be affected by existing environmental trends and ongoing activities. BOEM expects ongoing activities to have continuing temporary, long-term, and permanent impacts (disturbance, displacement, injury, mortality, and habitat conversion) on coastal habitat and fauna primarily through onshore construction impacts, noise, traffic, and climate change. Habitat removal from ongoing activities is anticipated to be minimal, and any impacts resulting from habitat loss or disturbance would not be expected to result in individual fitness or population-level effects within the geographic analysis area. The No Action Alternative would likely result in **negligible** to **moderate** impacts, as climate change is predicted to cause notable impacts on coastal habitat and fauna.

Cumulative Impacts of the No Action Alternative. Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and coastal habitat and fauna would continue to be affected by land disturbance and climate change. In addition to ongoing activities, planned activities may also contribute to impacts on coastal habitat and fauna. Planned activities primarily include increasing onshore construction. BOEM anticipates that the overall impacts associated with the No Action Alternative, when combined with all other planned activities (including offshore wind) in the geographic analysis area, would likely be **negligible** to **moderate** given that any activity would be required to comply with federal, state, and local regulations related to the protection of sensitive habitats and mitigation of impacts, and given the continued impacts of land disturbance and climate change.

3.5.4.4 Impacts of Alternative B – No Identification of AMMM Measures at the Programmatic Stage – Coastal Habitat and Fauna

3.5.4.4.1 Impacts of One Project

Alternative B considers the potential impacts of future offshore wind development for the NY Bight area without the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts.

Accidental releases: One NY Bight project would increase the risk of accidental releases of fuels, lubricating oils, and other petroleum compounds, primarily during construction but also during operations and conceptual decommissioning. Onshore, the use of heavy construction equipment could result in releases of fuel and lubricating and hydraulic oils during equipment use or refueling. These potential accidental releases would be of low risk and small quantity, and combined with the cleanup measures in place, the impacts of accidental releases of fuel, fluids, and hazardous materials on coastal habitat and fauna are expected to be minor; the duration of effects from accidental releases would be short- to long term in nature, and most impacts on species are expected to be avoided.

Land disturbance: Land disturbance associated with onshore construction (clearing, grading and excavations) could cause removal of vegetation, temporary disturbance to adjacent land uses (light, noise, and traffic), and disruption of shoreline access. A single NY Bight project could include land disturbance from onshore construction associated with installation of export cables, landfalls, onshore substations and converter stations, and transmission facilities. Impacts on habitat from onshore construction activities is expected to be limited because, based on BOEM’s experience with other offshore wind projects along the Atlantic coast, facilities would most likely be located in existing developed areas, such as roads, parking lots, and utility ROWs. Lighting associated with new onshore substations or converter stations would increase, but the extent of impacts would likely be limited to the immediate vicinity of the lights, and the intensity of impacts on coastal fauna would likely be unmeasurable at a distance. It is anticipated that direct effects on sensitive environmental resources, such as wetlands and forests, would be avoided or minimized to the maximum extent practicable during the design and construction of the project. Once onshore project details are determined during the project-specific COP NEPA stage, the lessees will obtain the proper permits for land disturbance.

Temporary construction impacts on coastal fauna would be limited (see noise and traffic IPFs), as most individuals would avoid the construction areas (Goodwin and Shriver 2010). Land disturbance that does occur, especially on shoreline parcels, could cause short-term erosion and sedimentation impacts in coastal habitat. Altering dune and beach habitat could increase erosion and sedimentation because dune habitat serves as a crucial buffer zone against flooding. Federal and state agencies work with Atlantic coastal towns and other land managers to develop site-specific beach management plans for the protection of federally and state-listed threatened and endangered species. The project-specific COP NEPA analysis will coordinate with local town and/or beach managers once the landing locations are identified to ensure concurrence with local management plans. Overall impacts from land disturbance on coastal habitat and fauna are expected to be minor.

Noise: One NY Bight project would generate noise during construction of onshore infrastructure. Onshore construction noise levels would primarily be limited to daytime hours. This would include noise associated with the construction of cable landfalls, onshore cable installation, and construction of onshore substations or converter stations. While noise from pile driving will not impact nearshore environments, there is the potential for developers to install cofferdams at HDD exit pit sites. Driving of sheet piles for HDD pit cofferdams, if used, could create noise in the nearshore environment. Onshore construction noise and vibration could lead to the disturbance and temporary displacement of mobile species including insects, birds, reptiles, amphibians, and mammals. The noise generated by construction activities, as well as the physical changes to the space, could render an area temporarily unsuitable for fauna or result in masking effects on communication for fauna that remain in the area (Dooling et al. 2019). Because impacts from onshore construction noise would be short term and primarily only occur in the daytime and since most fauna are able to temporarily leave the area where noise is occurring, BOEM expects that no individual fitness or population-level impacts would occur. Therefore, minor impacts on coastal habitat and fauna from one NY Bight project are expected; lasting impacts on local breeding populations are not anticipated.

Normal operation of onshore substations/converter stations would generate localized continuous noise; however, BOEM expects negligible impacts when considered in the context of the other commercial and industrial noises in the geographic analysis area. No measurable impacts on coastal fauna are expected.

Traffic: Impacts on wildlife and their habitat from vehicle traffic associated with a single NY Bight project are anticipated to be similar to the No Action Alternative. Risks of impacts on wildlife from project-related vehicle traffic may increase along the portions of the onshore project area that occur within areas that do not currently experience consistent vehicular traffic (e.g., electric utility and pedestrian/bike lanes ROWs). During construction, mechanized equipment traffic could disturb or displace local wildlife, but these impacts would be similar to those caused by human presence, land disturbance, and noise/vibration that already occur. Any vehicle-related impacts on wildlife are expected to be localized and limited to the duration of construction. Limited mobility species, such as snakes and turtles, have a low probability of directly encountering vehicles because of the limited populations of these types of species proximate to the current high traffic use areas within the onshore geographic analysis area. Collisions between highly mobile fauna and vehicles or construction equipment have some limited potential to cause mortality. Additionally, vehicle-related impacts on wildlife during routine O&M and conceptual decommissioning activities would be accidental and rare. Any impacts are expected to be highly localized and short-term, would not result in any population-level impacts, and therefore would likely be minor.

3.5.4.4.2 Impacts of Six Projects

The same IPF impact types and mechanisms described under one NY Bight project apply to six NY Bight projects. There would be more potential for impacts for these IPFs due to the greater amount of onshore development under six NY Bight projects. However, accidental releases, land disturbance, noise, and traffic impacts are still expected to be minimal. Therefore, impacts under six NY Bight projects are anticipated to have negligible to minor and short-term impacts on coastal habitat and fauna.

The same land disturbance IPF impact types and mechanisms described under one NY Bight project apply to six NY Bight projects. Similar to one NY Bight project, the level of impact on coastal habitat and fauna depends on the amount, function, impact type, and duration of land disturbance. While BOEM anticipates that impacts on coastal habitat and fauna from onshore construction activities under six NY Bight projects would be minimized to the extent practicable (similar to one NY Bight project), it is reasonable to assume that with six NY Bight projects, larger areas of coastal habitat could be temporarily and permanently impacted. Under six NY Bight projects, the potential for this possibility would be greater compared to one NY Bight project due to the increased amount of onshore development that would occur; however, impacts would likely remain minor.

3.5.4.4.3 Impacts of Alternative B on ESA-Listed Species

On June 20, 2024, BOEM initiated consultation with the USFWS on a Programmatic Framework ESA Section 7 consultation. The species discussed in Table 3.5.4-3 may be affected by Alternative B. The IPFs described previously for all coastal habitat and fauna would also apply to ESA-listed species. Any future federal activities that could affect ESA-listed species would need to comply with ESA Section 7 to ensure that the proposed activities do not jeopardize the continued existence of the species. Future non-federal activities would be addressed under ESA Section 10 to ensure that proposed activities do not jeopardize the continued existence of individual species.

3.5.4.4.4 Cumulative Impacts of Alternative B

The construction and installation, O&M, and conceptual decommissioning of offshore wind projects across the geographic analysis area would contribute to the primary IPFs of accidental releases, land disturbance, noise, and traffic. Temporary disturbance and permanent loss of coastal habitat may occur as a result of constructing onshore infrastructure such as substations. However, the area of coastal habitat altered or removed could vary widely depending on the specific siting of project components.

The cumulative impacts on coastal habitat and fauna would likely be negligible to moderate because coastal habitat is anticipated to be lost or modified and fauna are anticipated to be disturbed or displaced by onshore construction; however, the level of impact would depend on the area of coastal habitat altered or removed. Impacts on species would be unavoidable; impacts on habitat may be short term, long term, or permanent and may include impacts on sensitive habitats. Impacts on habitat would not result in population-level effects on species that rely on them and therefore would range from negligible to moderate. The cumulative coastal habitat loss from ongoing and planned activities, including the six NY Bight projects, is expected to be moderate but would depend on specific construction activities and their proximity to sensitive habitats and species. If construction of project components of the six NY Bight projects is staggered, there could be less of an effect on coastal habitat and fauna in the short term than if all six projects were constructed at once. In context of reasonably foreseeable environmental trends, BOEM anticipates six NY Bight projects would contribute an undetectable increase to cumulative impacts on coastal habitat and fauna.

3.5.4.4.5 Conclusions

Impacts of Alternative B. Construction and installation, O&M, and conceptual decommissioning of Alternative B, whether one NY Bight project or six NY Bight projects, would likely have **negligible** to **minor** impacts on coastal habitat and fauna, depending on the IPF and the amount and quality of coastal habitat altered or removed. No beneficial impacts would occur. The most significant risk would be from potential onshore removal of habitat, which could lead to fauna mortality and habitat alteration, although BOEM anticipates fauna mortality to be rare and the duration of activities resulting in habitat alteration to be short-term. Impacts are expected to be limited because, based on BOEM's experience with other offshore wind projects along the Atlantic coast, facilities would most likely be located in existing developed areas, such as roads, parking lots, and utility ROWs.

Cumulative Impacts of Alternative B. BOEM anticipates that the cumulative impacts on coastal habitat and fauna in the geographic analysis area would likely be **negligible** to **moderate** for six NY Bight projects. In the context of reasonably foreseeable environmental trends, the impacts contributed by six NY Bight projects to the cumulative impacts on coastal habitat and fauna are likely undetectable. Six NY Bight projects would contribute to the cumulative impacts primarily through the short-term to permanent impacts from onshore habitat loss related to onshore substations/converter stations and cables. Existing environmental trends and ongoing activities would continue, and coastal habitat and fauna would continue to be affected by land disturbance unrelated to the six NY Bight projects and climate change.

3.5.4.5 Impacts of Alternative C (Proposed Action) – Identification of AMMM Measures at the Programmatic Stage – Coastal Habitat and Fauna

Alternative C, the Proposed Action, considers the potential impacts of future offshore wind development for the NY Bight area with the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts. Alternative C consists of two sub-alternatives – Sub-alternative C1: Previously Applied AMMM Measures, and Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures. The analysis for Sub-alternative C1 is presented as the change in impacts from those impacts discussed under Alternative B, and the analysis for Sub-alternative C2 is presented as the change from Sub-alternative C1. Refer to Table G-1 in Appendix G, *Mitigation and Monitoring*, for a complete description of AMMM measures that make up the Proposed Action.

3.5.4.5.1 Sub-Alternative C1 (Preferred Alternative): Previously Applied AMMM Measures

Sub-alternative C1 analyzes the AMMM measures that BOEM has required as conditions of approval for previous activities proposed by lessees in COPs submitted for the Atlantic OCS and through related consultations. However, BOEM has not identified any AMMM measures for the coastal habitat and fauna; and therefore, the impacts on coastal habitat and fauna under Sub-alternative C1 would be the same as described in Alternative B.

3.5.4.5.2 Sub-Alternative C2: Previously Applied and Not Previously Applied AMMM Measures

Sub-alternative C2 analyzes the AMMM measures under Sub-alternative C1 plus the AMMM measures that have not been previously applied. However, BOEM has not identified any not previously applied AMMM measures for coastal habitat and fauna; therefore, the impacts on coastal habitat and fauna under Sub-alternative C2 are the same as under Sub-alternative C1 (comparable to Alternative B).

3.5.4.5.3 Conclusions

Impacts of Alternative C. BOEM has not identified any AMMM measures for coastal habitat and fauna; therefore, impacts on coastal habitat and fauna under both Sub-alternative C1 and C2 are the same as under Alternative B. Therefore, construction and installation, O&M, and conceptual decommissioning of one NY Bight project or six NY Bight projects under both Sub-alternative C1 and C2 would likely have **negligible** to **minor** impacts.

Cumulative Impacts of Alternative C. BOEM has not identified any AMMM measures for coastal habitat and fauna; therefore, the cumulative impacts on coastal habitat and fauna under both Sub-alternative C1 and C2 are the same as under Alternative B. BOEM anticipates that the cumulative impacts on coastal habitat and fauna in the geographic analysis area would likely be **negligible** to **moderate** for six NY Bight projects.

3.5.4.6 Recommended Practices for Consideration at the Project-Specific Stage

BOEM has not identified any AMMM measures for the coastal habitat and fauna; however, BOEM is recommending lessees consider analyzing the RPs in Table 3.5.4-7 to further reduce potential coastal habitat and fauna impacts. Refer to Table G-2 in Appendix G for a complete description of the RPs.

Table 3.5.4-7. Recommended Practices for coastal habitat and fauna impacts and related benefits

Recommended Practice	Potential Benefit
MUL-5: Use equipment, technology, and best practices to produce the least amount of noise possible to reduce noise impacts.	Minimizing the amount of noise from onshore activities may reduce disturbance and displacement of some coastal fauna species.
MUL-12: Incorporate ecological design elements where practicable. Examples include nature-inclusive design products as an alternative to traditional concrete, which could enhance and encourage the growth of marine flora and fauna (e.g. oyster beds or other artificial reefs).	Ecological design elements could reduce the amount or type of land disturbance.
MUL-18: Coordinate transmission infrastructure among projects by using shared intra- and interregional connections, meshed infrastructure, or parallel routing.	Fewer landfalls and a reduction of onshore cables may reduce land disturbance, noise, and traffic impacts on coastal habitat and fauna because there may be less disturbance of beach, dune, and onshore habitats.
MUL-21: Use best available technology, including new and emerging technology, when possible and consider upgrading/retrofitting equipment.	Using best available technology for onshore construction methods may result in lower noise from onshore activities that could disturb and displace some coastal fauna species and decrease overall impacts on coastal habitats and fauna.
MUL-23: Avoid or reduce potential impacts on important environmental resources by adjusting project design.	The use of HDD for cable installation could help to avoid and minimize impacts on benthic habitats and difficult-to-replace resources by minimizing the amount of land disturbance compared to cable installation methods that use trenching. Adjustments by developers could also include siting onshore cables and substations in developed ROWs, thereby avoiding undisturbed habitat.
MUL-26: Coordinate regional monitoring and survey efforts to standardize approaches, understand potential impacts to resources at a regional scale, and maximize efficiencies in monitoring and survey efforts. Develop monitoring and survey plans that meet regional data requirements and standards.	Coordinating regional monitoring and survey efforts would maximize the monitoring efficiency. The data gathered would be evaluated and considered for future mitigation and monitoring needs, which will serve to reduce impacts.

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3.5 Biological Resources

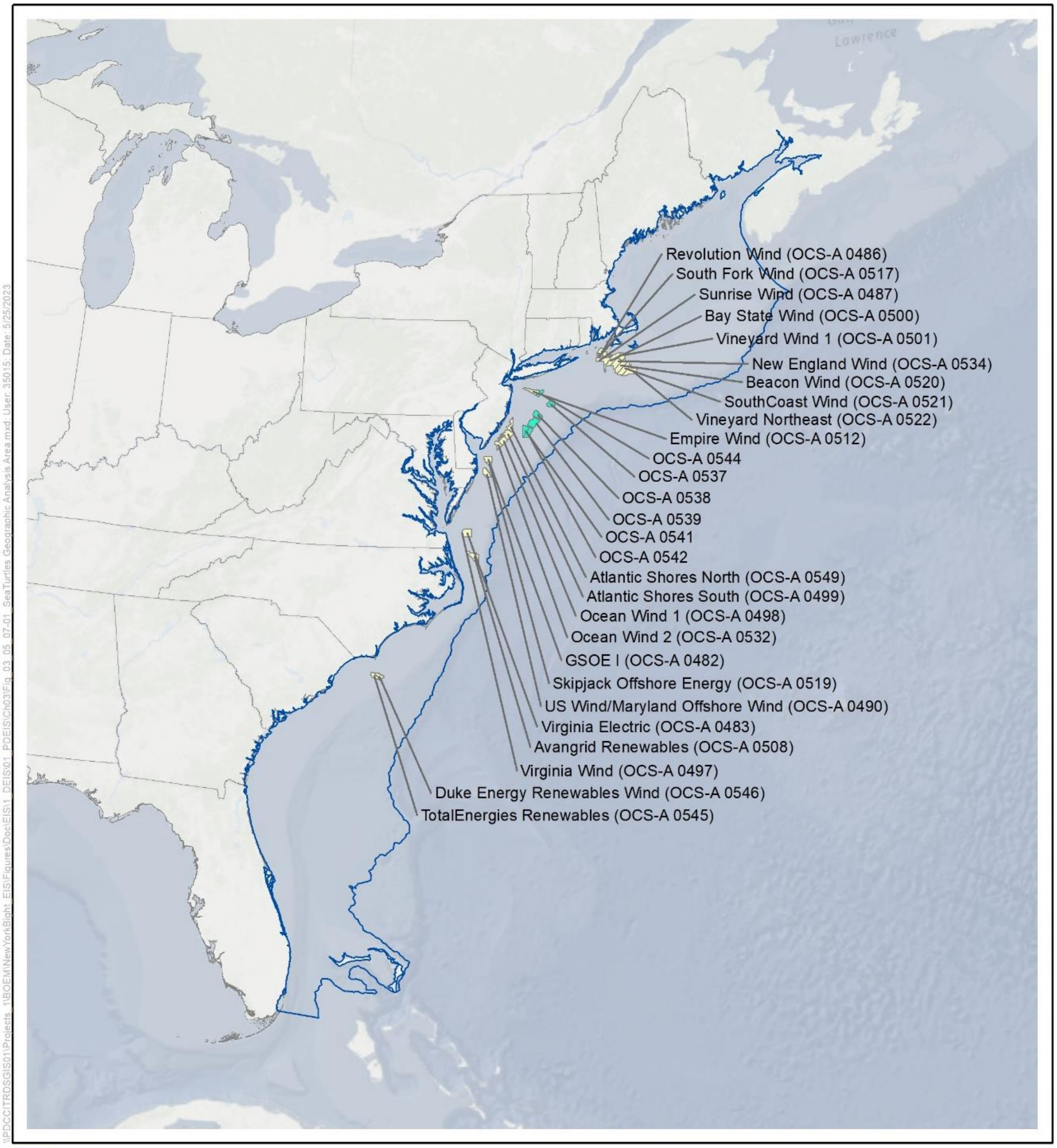
3.5.7 Sea Turtles

This section discusses potential impacts on sea turtles from the Proposed Action, alternatives, and ongoing and planned activities in the sea turtle geographic analysis area. The geographic analysis area for sea turtles, as shown on Figure 3.5.7-1, includes the U.S. Northeast Continental Shelf and Southeast Continental Shelf LMEs to capture the movement range of sea turtles. Due to the size of the geographic analysis area, for analysis purposes in this PEIS, the focus is on sea turtle species likely to occur in the NY Bight area and be affected by NY Bight project activities.

The sea turtles impact analysis in this PEIS is intended to be incorporated by reference into the project-specific environmental analyses for individual COPs expected for each of the NY Bight lease areas. Refer to Appendix C, *Tiering Guidance*, which identifies additional analyses anticipated to be required for the project-specific environmental analysis of individual COPs.

3.5.7.1 Description of the Affected Environment and Future Baseline Conditions

Five species of sea turtles have been documented in U.S. waters of the northwest Atlantic Ocean in the vicinity of the NY Bight area: green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and loggerhead (*Caretta caretta*). All five species are listed under the ESA; hawksbill, Kemp's ridley, and leatherback sea turtles are listed as endangered, and green and loggerhead sea turtles are listed as threatened. Critical habitat has been designated for green, hawksbill, leatherback, and loggerhead sea turtles but is not within or in the vicinity of the NY Bight area. Although hawksbill sea turtles have been documented in OCS waters of the northwest Atlantic Ocean, they are rare in this region and have not been documented within New Jersey or New York waters within the last 10 years (Conserve Wildlife Foundation of New Jersey 2022; NMFS 2022a). Therefore, hawksbill sea turtles are considered unlikely to occur within the NY Bight area and thus will not be evaluated further in this PEIS. Three of the four species expected to occur in the NY Bight area are broken out into DPSs, which include the North Atlantic DPS of green sea turtles, the leatherback sea turtle Northwest Atlantic subpopulation, and the Northwest Atlantic DPS of loggerhead sea turtles. A DPS has not been designated for leatherback sea turtles because this species is listed as endangered throughout its global range (85 Fed. Reg. 48332).



Sea Turtles Geographic Analysis Area
New York Bight Lease Areas
Other BOEM Lease Areas

Source: BOEM 2021.

N

0 100 200 Miles

1:15,000,000

Figure 3.5.7-1. Sea turtles geographic analysis area

Sea turtles generally migrate into or through the NY Bight area as they travel between their northern-latitude feeding grounds and their nesting grounds in the southern United States, Gulf of Mexico, and Caribbean. As ocean waters warm in the spring, sea turtles migrate northward to their feeding grounds in the Mid-Atlantic, typically arriving in the spring or summer and remaining through the fall. As water temperatures cool, most sea turtles begin their return migration to the south. Historically, this southward migration begins in October, and most turtles are gone by the first week in November. Based on this seasonal migration pattern, sea turtles are generally expected to occur in the NY Bight area between late spring and fall (NMFS 2021a). Some individuals may remain in the Mid-Atlantic into the winter when they could experience cold stunning as temperatures drop below 50°F (10°C) (NMFS 2021b), but occurrence is less likely when water temperatures are low (i.e., winter and spring) (BOEM 2012; Greene et al. 2010).

The best available information on the occurrence and distribution of sea turtles in the NY Bight area is provided by a combination of sighting data, technical reports, and academic publications, including:

- Aerial and shipboard survey data collected by the Northwest Atlantic Marine Ecoregional Assessment (Greene et al. 2010);
- Aerial data collected by the NYSERDA (Normandeau Associates Inc. and APEM Inc. 2021a, 2021b);
- PSO monitoring data collected during survey activities for offshore wind projects within or adjacent to the NY Bight area (Gardline 2018, 2021, 2022; RPS 2019, 2020; Smultea 2020);
- Sighting data retrieved from the Ocean Biodiversity Information System (OBIS 2022); and
- Data from the AMAPPS (Palka et al. 2021; NMFS 2021a; NMFS 2022a; NMFS 2022b).

Species occurrence is summarized in Table 3.5.7-1 and described in the following paragraphs. Seasonal density estimates derived from NYSERDA annual reports for their offshore project area (Normandeau Associates Inc. and APEM Inc. 2021a,b) are provided in Table 3.5.7-2. Population estimates are not provided in this section for individual species as sea turtles are wide-ranging and long-lived, making population estimates difficult. Also, survey methods vary depending on species (NMFS and USFWS 2015).

Table 3.5.7-1. Sea turtles likely to occur in the NY Bight area

Common Name	Scientific Name	Distinct Population Segment/ Population[1]	ESA Status	Relative Occurrence in the NY Bight area[2]	Seasonal Occurrence in the NY Bight area
Green sea turtle	*Chelonia mydas*	North Atlantic	Threatened	Regular	Summer through Fall
Kemp's ridley sea turtle	*Lepidochelys kempii*	--	Endangered	Common	Late Spring through Fall
Leatherback sea turtle	*Dermochelys coriacea*	Northwest Atlantic (subpopulation)	Endangered	Common	Late Spring through Fall
Loggerhead sea turtle	*Caretta caretta*	Northwest Atlantic	Threatened	Common	Late Spring through Fall

[1] NMFS 2021a. As a note, the leatherback sea turtle does not have designated Distinct Population Segment because the population is listed as endangered throughout its global range (85 Fed. Reg. 48332).
[2] Regular = occurring in low to moderate numbers on a regular basis or seasonally; Common = occurring consistently in moderate to large numbers.

Table 3.5.7-2. Seasonal sea turtle density estimates in the New York offshore project area[1] derived from NYSERDA annual reports

Species	Density (animals/100 square kilometers)[2]			
	Spring	Summer	Fall	Winter
Green sea turtle	0.0000	0.0003	0.0000	0.0000
Kemp's ridley sea turtle	0.0003	0.0057	0.0016	0.0000
Leatherback sea turtle	0.0000	0.0010	0.0006	0.0000
Loggerhead sea turtle	0.0010	0.1079	0.0016	0.0003

Source: Normandeau Associates Inc. and APEM Inc. 2021b.
[1] The New York offshore project area encompasses the waters of the NY Bight from Long Island southeast to the continental shelf break.
[2] Density estimates are derived from the final NYSERDA report for all surveys between Summer 2016 and Spring 2019 in the New York offshore project area using the most recent year for which data were available for each season or species for which identification was confirmed.

Green sea turtle: Green sea turtles found in the NY Bight area belong to the North Atlantic DPS. This species inhabits tropical and subtropical waters around the globe. In the United States, green sea turtles occur from Texas to Maine, as well as the Caribbean. Late juveniles and adults are typically found in nearshore waters of shallow coastal habitats (NMFS 2022b). In the pelagic environment, green sea turtles are often found in convergence zones (NMFS and USFWS 1991).

No green sea turtle nesting events have been documented on the New Jersey or New York coasts in the NY Bight area. Their diet is largely herbivorous, composed primarily of algae and seagrasses with occasional sponges and invertebrates (NMFS 2022b). Green sea turtles primarily occur offshore within the NY Bight area in summer and fall (Table 3.5.7-2; NMFS 2022b). During the NYSERDA aerial surveys in the New York OPA, only one green sea turtle was observed during the 2016 summer survey (Normandeau Associates Inc. and APEM Inc. 2021b), and results of the AMAPPS visual survey data from 2010 to 2017 indicate green sea turtles are only present in the NY Bight area in the summer and fall (Palka et al. 2017). Data from the sea turtle stranding and salvage network show 73 strandings of green sea turtles in New Jersey and 150 strandings of sea turtles in New York between 2012 and November

2022, largely the result of cold stunning and traditional stranding reasons. Traditional stranding, as defined, occurs when a dead, sick, or injured sea turtle is found washed ashore, floating, or underwater, and when it is not an incidental capture, a post-hatchling, or a cold-stunning event. It specifically excludes healthy, uninjured sea turtles. Out of the recorded strandings, 10 were marked as incidental capture (NMFS 2022a).

PSO monitoring data showed one green sea turtle observed in the Ocean Wind 2 lease area (OCS-A 0532) during surveys between May 2021 and May 2022 (Gardline 2022); one green sea turtle observed nearshore Long Beach, New York in the NY Bight area during surveys between April 2019 and July 2019 (RPS 2019); one green sea turtle observed in the Atlantic Shores South lease area (OCS-A 0499) during surveys from May 2020 to October 2020 (RPS 2020); and two green sea turtles observed offshore Long Island, New York near Montauk during surveys between September 2019 and September 2020 (Smultea Environmental Sciences 2020). There is no population estimate for the North Atlantic DPS of green sea turtles, but the nester abundance for this DPS is estimated to be 167,424, (Seminoff et al. 2015). All major nesting populations in the North Atlantic DPS have shown long-term increases in abundance, but data are lacking to evaluate trends for the South Atlantic DPS (Seminoff et al. 2015).

Kemp's ridley sea turtle: All Kemp's ridley sea turtles, including those found in the NY Bight area, belong to a single population. This species primarily inhabits the Gulf of Mexico, although large juveniles and adults travel along the U.S. Atlantic coast. At these life stages, Kemp's ridley sea turtles occupy nearshore habitats in subtropical to warm temperate waters, including sounds, bays, estuaries, tidal passes, shipping channels, and beachfront waters.

A single Kemp's ridley nest was documented on Queens County's West Beach, New York, in 2018 (Yun 2018). However, this nest was outside the primary nesting range for the species, which is essentially limited to the beaches of the western Gulf of Mexico (NMFS and USFWS 2015). The diet of Kemp's ridley sea turtles is composed primarily of crabs (NMFS 2022c). Kemp's ridley sea turtles primarily occur in the NY Bight area during the spring, summer, and fall (Table 3.5.7-2; NMFS 2022c). Results of the NYSERDA aerial surveys show a total of 64 Kemp's ridley sea turtles were observed in the New York OPA between 2016 and 2018, most of which (57 observations) occurred during the summer surveys (Normandeau Associates Inc. and APEM Inc. 2021b). AMAPPS survey results show similar distributions with a few individuals observed around the NY Bight area in spring which increases in the summer and begins to decrease again in the fall (Palka et al. 2021). Additionally, aerial surveys conducted for the New York Bight Whale Monitoring Program show one observation of Kemp's ridley sea turtles during the summer of 2018 (Tetra Tech and LGL 2020). However, it is noted that visual sighting data may be limited because this small species is difficult to observe using typical aerial survey methods (Kraus et al. 2016). Stranding data from 2012 to 2022 show 102 Kemp's ridley sea turtle strandings in New Jersey and 285 in New York, primarily due to cold stunning or traditional stranding causes (dead, sick, or injured sea turtle), but 51 of these strandings were marked as incidental capture (NMFS 2022a). PSO monitoring data show only one confirmed observation of Kemp's ridley sea turtles in the Ørsted Lease Areas OCS-A 0486, 0487, and 0500 (Smultea Environmental Sciences 2020), which are outside of the NY Bight area. In 2012, the population of individuals aged two and up was estimated at

248,307 turtles (Gallaway et al. 2013). Since 2009, there has been a decline in nest abundance for this population (NMFS and USFWS 2015).

Leatherback sea turtle: Leatherback sea turtles that occur in the NY Bight area belong to the Northwest Atlantic population identified in the 2020 status review for the species (NMFS and USFWS 2020). However, this population has not been identified as a DPS or listed separately under the ESA at this time because the species is considered endangered throughout its global range. This species is found in the Atlantic, Pacific, and Indian Oceans (NMFS 2022d). Leatherback sea turtles can be found throughout the western North Atlantic Ocean as far north as Nova Scotia, Newfoundland, and Labrador. While early life stages prefer oceanic waters, adult leatherback sea turtles are generally found in mid-ocean, continental shelf, and nearshore waters (NMFS and USFWS 1992). Leatherback sea turtle diets are composed primarily of jellyfish and other gelatinous prey, but they may also incidentally consume sea urchins, squid, crustaceans, fish, and vegetation (Eckert et al. 2012). Leatherback sea turtles are known to dive deeper than other sea turtle species while feeding and are therefore more tolerant of cooler oceanic temperatures. Additionally, Bailey et al. (2012) found that mesoscale eddies, convergence zones, and areas of upwelling attract foraging leatherbacks due to the aggregation of jellyfish, their preferred prey, within these features.

There have not been any documented nesting events along the New Jersey or New York coasts within the NY Bight area. Leatherback sea turtles in the NY Bight area primarily occur in the late spring through fall (Table 3.5.7-2; BOEM 2012; Geo-Marine 2010; Palka et al. 2021). During aerial and shipboard surveys for marine mammals and sea turtles off the coast of New Jersey in 2008 and 2009, 12 leatherback sea turtles were sighted during the summer in waters ranging from 59 to 98 feet (18 to 30 meters) deep, located 6.2 to 22.3 miles (10 to 36 kilometers) from shore (Geo-Marine 2010). Leatherback sea turtles were observed 47 times within the New York OPA, which encompasses the waters of the NY Bight from Long Island southeast to the continental shelf break, during the NYSERDA surveys, predominantly in the fall (30 sightings) followed by summer (17 sightings) with no observations in the spring or winter (Normandeau Associates Inc. and APEM Inc. 2021b). AMAPPS and the New York Bight Whale Monitoring Program sightings show a similar trend with higher observations of leatherback sea turtles in the NY Bight area in summer and fall, a few in spring, and none in winter (Tetra Tech and LGL 2020; Palka et al. 2021). Stranding data reported 42 stranded leatherbacks in New Jersey and 109 in New York between 2012 and 2022, primarily due to traditional stranding causes (dead, sick, or injured sea turtle), but 23 of these strandings were marked as incidental capture (NMFS 2022a). PSO monitoring data show one observation of a leatherback sea turtle offshore Block Island, Rhode Island (which is outside the NY Bight area) during surveys between September 2020 and September 2021 (Gardline 2021); 40 leatherbacks observed along the New Jersey coast during surveys between May 2021 and May 2022 (Gardline 2022); 25 leatherback sea turtles observed along the New Jersey coast during surveys between May 2020 to October 2020 (RPS 2020); and 14 leatherback sea turtles observed between the eastern extent of Long Island, New York and Rhode Island during surveys between September 2019 and September 2020 (Smultea Environmental Sciences 2020). The best available estimate of nesting female abundance for the Northwest Atlantic population is 20,659 females. This population is currently exhibiting an overall decreasing trend in annual nesting activity, likely attributed to the destruction or modification of their nesting habitats due to coastal development or erosion (NMFS and USFWS 2020).

Loggerhead sea turtle: Loggerhead sea turtles found in the NY Bight area belong to the Northwest Atlantic DPS. This species inhabits nearshore and offshore habitats throughout the globe. Loggerhead sea turtles occur throughout the Northwest Atlantic as far north as Newfoundland (NMFS 2022e). Coastal waters of the western Atlantic have been identified as foraging habitat for juveniles (USFWS 2020), and the Mid-Atlantic Bight of the Atlantic OCS is an important seasonal foraging ground for approximately 40,000 to 60,000 juvenile and adult loggerheads during summer months (NEFSC and SEFSC 2011). Juvenile loggerhead sea turtles have omnivorous diets, consuming crabs, mollusks, jellyfish, and vegetation. Adults are carnivores, consuming primarily benthic invertebrates (NMFS 2022e).

A single loggerhead nest was documented at Island Beach State Park, New Jersey, in 1979 (Brandner 1983). This nesting event was outside the primary nesting range for the species, which stretches from Texas to Virginia, so no nesting is likely to occur in the NY Bight area (NMFS and USFWS 2008). Loggerhead sea turtles occur in the NY Bight area throughout the year but are more common in the summer and fall (Table 3.5.7-2; BOEM 2012; Geo-Marine 2010; Tetra Tech and LGL 2020; Palka et al. 2021). During aerial and shipboard surveys for marine mammals and sea turtles off the coast of New Jersey in 2008 and 2009, 69 loggerhead sea turtles were sighted between June and October in waters ranging from 30 to 112 feet (9 to 34 meters) deep, located 0.9 to 23.6 miles (1.5 to 38 kilometers) from shore (Geo-Marine 2010). The mean sea surface temperature associated with loggerhead sea turtle sightings was 65.3 degrees Fahrenheit (18.5 degree Celsius). Loggerheads were the most common reported species during NYSERDA aerial surveys in the New York OPA, which reported 1,397 observations (Normandeau Associates Inc. and APEM Inc. 2021b). Most of these sightings were in the summer (1,377) followed by the fall (11), spring (8), and winter (1) (Normandeau Associates Inc. and APEM Inc. 2021b). AMAPPS survey data show loggerheads are most common in the NY Bight area in the summer and fall, with scattered sightings possible further offshore in the spring and winter (Palka et al. 2021). NMFS (2022) reported 397 strandings of loggerhead sea turtles in New Jersey and 339 in New York primarily due to traditional stranding reasons (dead, sick, or injured sea turtle) and cold stunning, but 16 of these were marked as incidental capture. PSO monitoring data show 14 observations of loggerhead turtles along the New Jersey coast during surveys between May 2021 and May 2022 (Gardline 2022); 35 sightings along the New Jersey coast during surveys between May 2020 to October 2020 (RPS 2020); and 14 sightings between the eastern extent of Long Island, New York and Rhode Island during surveys between September 2019 and September 2020 (Smultea Environmental Sciences 2020). The most recent population estimate for the northwest Atlantic continental shelf, calculated in 2010, is 588,000 juvenile and adult loggerhead sea turtles (NEFSC and SEFSC 2011). The Northern recovery unit for the Northwest Atlantic DPS, which is the only recovery unit likely to occur in the NY Bight area, is below the recovery criteria for the number of nests, which required a 2 percent annual increase in the number of nests over a generation time of 50 years; however, the number of nests does correspond to the number of nesting females, which meets the requirement for that recovery criteria (Bolten et al. 2019). All other recovery criteria for this recovery unit—such as abundance on foraging grounds, trends in strandings, and threats to species habitat — have either not been accomplished or there are insufficient data to assess potential recovery (Bolten et al. 2019).

All four sea turtle species likely to occur in the geographic analysis area are subject to regional, ongoing threats. These threats include fisheries bycatch, loss or degradation of nesting and foraging habitat, entanglement in fishing gear, vessel strikes, predation and harvest, disease, and climate change. Green, Kemp's ridley, and loggerhead sea turtles are also susceptible to cold stunning.

3.5.7.1.1 Importance of Sound to Sea Turtles

There are few studies reporting sound production in sea turtles, despite their ability to hear sounds in both air and water. While the general importance of sound to the ecology of sea turtles is not well understood, there is a growing body of knowledge suggesting that sea turtles may use sound in a multitude of ways. Cook and Forest (2005) found that nesting leatherback sea turtles produce sound when breathing in air, but this work suggested the sound was a byproduct of labored breaking rather than a communication signal. Sea turtle embryos and hatchlings have been reported to make airborne sounds, thought to be produced for synchronizing hatching and nest emergence (Montiero et al. 2019, Ferrara et al. 2019, Ferrara et al. 2014a and 2014b, and McKenna et al. 2019). Charrier et al. (2022) noted the production of 10 different underwater sounds in juvenile green sea turtles including those within and above the frequency range of hearing reported for this species. A more comprehensive understanding of sound production, and hearing is needed in sea turtles. However, the limited but growing information available suggests sound may be important to these animals.

Hearing Anatomy of Sea Turtles

The outermost part of the sea turtle ear, or tympanum, is covered by a thick layer of skin covering a fatty layer that conducts sound in water to the middle and inner ear. This is a distinguishing feature from terrestrial and semi-aquatic turtles. This thick outer layer makes it difficult for turtles to hear well in air but it facilitates the transfer of sound from the aqueous environment into the ear (Ketten et al. 1999). The middle ear has two components that are encased by bone, the columella and extracolumella, which provides the pathway for sound from the tympanum on the surface of the turtle head to the inner ear. The middle ear is also connected to the throat by the Eustachian tube. The inner ear consists of the cochlea and basilar membrane. Because there is air in the middle ear, it is generally believed that sea turtles detect sound pressure rather than particle motion. Sea turtle ears are described as being similar to a reptilian ear, but due to the historically limited data in sea turtles and reptiles, fish hearing is often used as an analog when considering potential impacts of underwater sound.

Hearing in sea turtles has been measured through electrophysiological and behavioral studies both in air and in water on a limited number of life stages for each of the five species. In general, sea turtles hear best in water between 200 to 750 Hz and do not hear well above 1 kHz. It is worth noting that there are species-specific and life-stage specific differences in sea turtle hearing (Table 3.5.7-3). Sea turtles are also generally less sensitive to sound than marine mammals, with the most sensitive hearing thresholds underwater measured at or above 75 dB re 1 µPa (Reese et al. 2023; Papale et al. 2020). Loggerhead sea turtles have been studied most thoroughly with respect to other species, including post-hatchlings

(Lavender et al. 2012, 2014), juveniles (Bartol et al. 1999; Lavender et al. 2012, 2014), and adults (Martin et al. 2012).

Table 3.5.7-3. Hearing capabilities, including hearing frequency range and peak sensitivity in sea turtles, by species

Species	Life Stages Tested	Hearing Frequency Range (Hz)	Maximum Sensitivity (Hz)	References
Loggerhead	Post-hatchling, juvenile	100–900 (in air)	500–700	Ketten & Bartol 2006
	Post-hatchling, juvenile, adult	50–1,100 (underwater)	100–400	Bartol & Bartol 2012, Lavender et al. 2014, Martin et al. 2012, Lenhardt 2002, Bartol et al. 1999
Green	Juvenile, sub-adult	50–2,000 (in air)	200–700	Ridgway et al. 1969; Ketten & Bartol 2006; Piniak et al. 2016
	Juvenile	50–1,600 (underwater)	200–400	Piniak et al. 2016
Leatherback	Hatchling	50–1,600 (in air)	300	Piniak 2012, Piniak et al. 2012
	Hatchling	50–1,200 (underwater)	300	Piniak 2012, Piniak et al. 2012
Kemps ridley	Juvenile	100–500 (in air)	100–200	Ketten & Bartol 2006

Source: Summarized from Table 3 in Reese et al. 2023, which was adapted from Papale et al. 2020.
Note: hearing frequency range indicates the widest range of hearing based on the aggregation of results from the references listed, while max sensitivity represents the range of sounds that they can hear best.

Potential Impacts of Underwater Sound

As with marine mammals, sea turtles may experience a range of impacts from underwater sound including non-auditory injury, PTS or TTS, behavioral changes, acoustic masking, or increases in physiological stress. The potential impacts will depend on the physical qualities of the sound source and the environment, as well as the physiological characteristics and the behavioral context of the species of interest. Sound from activities such as pile-driving, seismic surveys, and drilling could have impacts on sea turtles given the overlap between sea turtles' hearing range and the frequency range of these sound sources - yet there is extremely limited data on how their behavior and physiology are impacted. A comprehensive review of the potential impacts of noise on sea turtles can be found in Reese et al. 2023.

While there is no direct evidence of PTS occurring in sea turtles, evidence of underwater noise-induced TTSs in a freshwater turtle species recently have been recorded and suggest turtles may be more sensitive to sound than previously understood (Salas et al. 2023; Mannes et al. 2023). In red eared sliders, Salas et al. (2023) reported the mean predicted TTS onset was 160 dB re 1 μPa^2 s. There was individual variation in susceptibility to TTS, threshold shift magnitude, and recovery rate, which was non-monotonic and occurred on time scales ranging from less than 1 hour to more than 2 days post-exposure (Salas et al. 2023). TTS also has been demonstrated in red eared sliders based on a 24-hour exposure that resulted in a sound exposure level of 160 dB re 1 μPa^2 s, where all animals showed a depression in sensitivity immediately after exposure and a full recovery 3–5 hours after exposure (Mannes et al. 2023). Prolonged or repeated exposure to sound levels sufficient to induce TTS without recovery time can lead to PTS in marine mammals (Southall et al. 2007). Few studies have looked at hair cell damage in reptiles, and do not indicate precisely if sea turtles are able to regenerate injured sensory hair cells (Warchol 2011). While several studies have examined physiological responses of sea turtles to physically stressful events (e.g., incidental or directed capture in fishing nets, cold stunning, handling, transport, etc.), to date, no research has been published on potential stress responses in sea turtles to elevated environmental noise (Reese et al. 2023). Stress response studies characterizing physiological (stress/hormone) responses to sound are ongoing to estimate potential acoustic impacts on sea turtles from industry sound sources. Elevated levels of corticosterone have been observed in Kemp's ridley sea turtles and green sea turtles in response to stressful stimuli such as ground transport for rehabilitation and disease (Aguirre et al. 1995; Hunt et al. 2016). Other physiological impacts due to chronic stress include immunosuppression (Milton and Lutz 2003). Samuel et al. (2005) demonstrated that anthropogenic sound levels from boating and recreational activity near Long Island, New York were over two orders of magnitude greater than when compared with the periods of lowest human activity, and suggested exposure to such levels could affect sea turtle behavior. Chronic exposure to anthropogenic noise may result in increased stress responses in sea turtles, which could have direct consequences on individual fitness (Reese et al. 2023).

The soundscapes and subsequent noise impacts presently experienced by sea turtles in biologically important habitats, and their behavioral and physiological responses may be variable and in general are still not well understood.

Regulation of Underwater Sound for Sea Turtles

There are few empirical data available to form regulatory thresholds for sea turtle sound exposure. For several years, the regulatory community accepted the recommendations of Popper et al. (2014) and used their thresholds for fishes without swim bladders as a proxy for sea turtles. NMFS has adopted the U.S. Navy PTS and TTS thresholds from Finneran et al. (2017) as their own (NMFS 2023). These thresholds include dual criteria (Lpk and SEL) for PTS and TTS, along with auditory weighting functions published by Finneran et al. (2017) used in conjunction with SEL thresholds for PTS and TTS. The behavioral threshold recommended in the GARFO acoustic tool (2020) is an SPL of 175 dB re 1 µPa (Finneran et al. 2017; McCauley et al. 2000) (Table 3.5.7-4). These thresholds apply to all life stages.

Table 3.5.7-4. Acoustic thresholds for sea turtles currently used by NMFS GARFO and BOEM for auditory effects from impulsive and non-impulsive signals, as well as thresholds for behavioral disturbance

Impulsive Signals				Non-impulsive Signals		All
PTS		TTS		PTS	TTS	Behavior
Lp,pk	LE, 24hr	Lp,pk	LE, 24hr	LE, 24hr		Lp,rms
232	204	226	189	220	200	175

Lp,pk = peak sound pressure (dB re 1 µPa); LE =sound exposure level accumulated over 24 hours (dB re 1 µPa2s); Lp =root-mean-square sound pressure (dB re 1 µPa).
PTS = permanent threshold shift; TTS = temporary threshold shift, which is a recoverable hearing effect.
Sources: Finneran et al. 2017; McCauley et al. 2000.

Thresholds for Auditory Injury

As a conservative approach, Popper et al. (2014) recommended using thresholds developed for fishes without swim bladders for sea turtles in response to impulsive sounds. Finneran et al. (2017) agree, that while still unsatisfactory, data from fish provide a better analogy currently due to similar hearing range and that the functioning basilar papilla in the turtle ear is dissimilar to the functioning cochlea in mammals. When exposed to acoustic signals representative of low- and mid-frequency active sonar, Halvorsen et al. (2013); Halvorsen et al. (2012), reported TTS in some species of fish exposed to cumulative SELs of approximately 220 dB re 1 µPa2s between 2 and 3 kHz, and 210 to 215 dB re 1 µPa2s between 170 and 320 Hz, respectively (Finneran et al. 2017). Based on these data the U.S. Navy uses an estimated SEL of 200 dB re 1 µPa2s for TTS onset in sea turtles. An 11 dB difference, on average, was found between SEL-based impulsive and non-impulsive TTS thresholds for marine mammals. By applying the same rule to turtles, (Finneran et al. 2017) derived a weighted SEL-based impulsive TTS threshold of 189 dB re 1 µPa2s which is 3 dB higher than the previously recommended unweighted threshold by Popper et al. (2014) of 186 dB re 1 µPa2s (Finneran et al. 2017). Based on the relatively high SEL-based TTS threshold derived for sea turtles, Finneran et al. (2017) hypothesized that the Lpk based threshold for sea turtles would be higher than that for marine mammals. Consequently, the sea turtle Lpk based TTS threshold for impulsive noise is set to 226 dB re 1 µPa, to match the highest marine mammal value. Sea turtle PTS data from impulsive noise exposures do not exist, therefore PTS onset was estimated by adding 15 dB to the derived SEL-based TTS thresholds and adding 6 dB to the Lpk thresholds (Finneran et al. 2017; Southall et al. 2007). The SEL-based non-impulsive PTS threshold is set to 220 dB re 1 µPa2s in sea turtles (Finneran et al. 2017).

Thresholds for Behavioral Disturbance

There are limited data pertaining to behavioral responses of sea turtles to anthropogenic noise, and none specifically to sounds generated by offshore wind activities. Several publications have attempted to examine sea turtles' immediate behavioral responses mostly focusing on seismic airgun noise. McCauley et al. (2000) observed that one green turtle and one loggerhead sea turtle in an open water pen increased swimming behaviors in response to a single seismic airgun at received levels of 166 dB re 1 µPa and exhibited erratic behavior at received levels greater than 175 dB re 1 µPa. Other empirical work has shown a range of responses, but NMFS developed sea turtle behavioral criteria based on these studies by McCauley et al. (2000). The sound level at which sea turtles are expected to exhibit a behavioral response to both impulsive and non-impulsive sound is a received SPL of 175 dB re 1 µPa.

Thresholds for Non-Auditory Injury

For both turtles and mammals, NMFS has adopted criteria used by the U.S. Navy to assess the potential for non-auditory injury from underwater explosive sources as presented in Finneran et al. (2017). The criteria include thresholds for the following non-auditory effects: mortality, lung injury, and gastrointestinal injury. Unlike auditory thresholds, these depend upon an animal's mass and depth.

The U.S. Navy has published two sets of equations for these thresholds. The first set of equations (Table 3.5.6-6) is usually intended for estimating numbers of animals that may be affected, while the second set of equations (Table 3.5.6-7) is more conservative and normally used for defining mitigation zones. The approach requires choosing a set of representative animal masses to assess.

3.5.7.2 Impact Level Definitions for Sea Turtles

Definitions of potential impact levels are provided in Table 3.5.7-5. Beneficial impacts on sea turtles are described using the definitions described in Section 3.3.2 (see Table 3.3-1).

Table 3.5.7-5. Definitions of potential adverse impact levels for sea turtles

Impact Level	Definition
Negligible	There would be no measurable impacts on individuals or populations of sea turtles, or impacts would be so small that they would be extremely difficult or impossible to discern or measure.
Minor	Impacts on sea turtles are detectable and measurable, but are low intensity, highly localized, and temporary or short term in duration. Impacts would not result in population-level effects.
Moderate	Impacts on sea turtles are detectable and measurable. These impacts could result in loss of individuals, but those effects would likely be recoverable and would not affect population viability.
Major	Impacts on sea turtles are significant and extensive, long term in duration, and could have population-level effects that are not recoverable, even with mitigation.

Contributing IPFs to impacts on sea turtles include accidental releases, cable emplacement and maintenance, discharges/intakes, electric and magnetic fields and cable heat, survey gear utilization, noise, port utilization, presence of structures, and vessel traffic. However, these IPFs may not necessarily contribute to each individual issue outlined in Table 3.5.7-6.

Table 3.5.7-6. Issues and indicators to assess impacts on sea turtles

Issue	Impact Indicator
Underwater noise from construction, operation, and conceptual decommissioning	Extent, frequency, and duration of impacts resulting from noise above established effects thresholds as noted in Section 2.5 (Tables 3–4) in the Construction and Operations Plan Modeling Guidelines.[1]
Vessel collisions	Qualitative estimate of potential collision risk.
Water quality impacts	Quantitative estimate of intensity and duration of suspended sediment effects. Qualitative analysis of impacts from potential discharges (fuel spills, trash, and debris) relative to baseline.
Artificial light	Intensity, frequency, and duration of impacts relative to baseline.
Power transmission	Theoretical extent of detectable electric and magnetic field effects.
Seabed and water column disturbance/alteration	Water column volume and acres of seabed disturbance, loss, or conversion by structure presence.
Habitat alteration	Acres of land disturbance (e.g., nesting habitat), loss, or conversion due to onshore construction or cable landfall.
Prey impacts	Extent, frequency, and duration of impacts resulting from activities associated with offshore wind development on prey species for sea turtles.
Entanglement risk from gear/wind equipment	Qualitative estimate of potential entanglement risk.

[1] Source: https://www.boem.gov/renewable-energy/boemoffshorewindpiledrivingsoundmodelingguidance.

3.5.7.3 Impacts of Alternative A – No Action – Sea Turtles

When analyzing the impacts of the No Action Alternative on sea turtles, BOEM considered the impacts of ongoing activities, including ongoing non-offshore-wind and ongoing offshore wind activities on the baseline conditions for sea turtles. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with the other planned non-offshore-wind and offshore wind activities, which are described in Appendix D, *Planned Activities Scenario*.

3.5.7.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for sea turtles described in Section 3.5.7.1, *Description of the Affected Environment and Future Baseline Conditions,* would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore-wind and offshore wind activities. Ongoing non-offshore-wind activities in the geographic analysis area that contribute to impacts on sea turtles include undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); ongoing vessel traffic; installation of new structures on the U.S. Continental Shelf; onshore development activities; and global climate change (see Appendix D for a description of ongoing activities). These activities contribute to numerous IPFs including:

- Accidental releases, which can have physiological effects on sea turtles;
- Discharges/intakes, which can result in altered micro-climates of warm water surrounding outfalls and entrainment risk;
- Cable emplacement and maintenance and port utilization, which can disturb benthic habitats, affect water quality, and present an entrainment risk for sea turtles;
- EMFs and heat, which can result in behavioral changes in sea turtles;
- Underwater noise, which can have physiological and behavioral effects on sea turtles;
- Port utilization, which can disturb benthic habitats, affect water quality, and present an entrainment risk for sea turtles during dredging and could introduce additional noise;
- The presence of structures, which can result in behavioral changes in sea turtles and effects on prey species, which can affect prey availability for, and distribution of, sea turtles, and increased risk of interactions with fishing gear;
- Vessel traffic, which increases risk of vessel collision;
- Survey gear utilization, which can result in interactions of gear with sea turtles; and
- Lighting, which has a limited potential to attract sea turtles offshore and to result in disorientation of nesting females and hatchling turtles from artificial lighting on nesting beaches or in nearshore habitats.

Because sea turtles have large ranges and highly migratory behaviors, these IPFs can have impacts on individuals over broad geographical scales. Therefore, in addition to the current conditions and trend of sea turtles in the geographic analysis area, these populations are also affected by factors beyond the geographic analysis area. However, the assessment in this PEIS focuses on those stressors currently present within the geographic analysis area; any effect on the populations outside this region are considered as part of the species' ongoing vulnerability, which affects its risk of impact.

The main known contributors to mortality events include collisions with vessels (ship strikes), entanglement with fishing gear, and fisheries bycatch. Many sea turtle migrations can cover long distances within the geographic analysis area, and these factors can have impacts on individuals over broad geographic and temporal scales.

Global climate change is an ongoing potential risk to sea turtles, although the associated impact mechanisms are complex, not fully understood, and difficult to predict with certainty. Possible impacts on sea turtles due to climate change include increased storm severity and frequency; increased erosion and sediment deposition; increased disease frequency; ocean acidification; and altered habitat, prey availability, ecology, and migration patterns. Over time, climate change, in combination with coastal development, would alter existing habitats and render some areas unsuitable for some species and more suitable for others. Available data also suggests that changing temperatures and sea level rise may lead to changes in the sex ratio of sea turtle populations (e.g., green sea turtle population feminization predicted under IPCC scenarios by 2120), loss of nesting area, and a decline in population growth due to nest incubation temperature reaching lethal levels (Patrício et al. 2019; Varela et al. 2019). In addition to affecting nesting activity, increased sea surface temperatures could have physiological effects on sea turtles during migration (Marn et al. 2017). Higher temperatures in migratory corridors would be especially risky for metabolic rates of female sea turtles post-nesting, as they do not generally forage during breeding periods and their body condition would not be expected to be optimal to withstand unexpected changes in water temperature in their migratory habitat (Hays et al. 2014).

Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on sea turtles are listed in Table 3.5.7-7. Ongoing O&M of the Block Island and CVOW-Pilot (OCS-A 0497) projects and ongoing construction of the Vineyard Wind 1 (OCS-A 0501), South Fork Wind (OCS-A 0517), Ocean Wind 1 (OCS-A 0498), Revolution Wind (OCS-A 0486), Sunrise Wind (OCS-A 0487), Empire Wind 1 and 2 (OCS-A 0512), New England Wind Phase 1 and 2 (OCS-A 0534), and CVOW-C (OCS-A 0483) projects would affect sea turtles primarily through the IPFs of noise, presence of structures, and vessel traffic. Ongoing offshore wind activities would have the same type of impacts from these IPFs that are described in detail in Section 3.5.7.3.3, *Cumulative Impacts of the No Action Alternative* for ongoing and planned offshore wind activities, but the impacts would be of lower intensity.

3.5.7.3.2 Impacts of Alternative A – No Action on ESA-Listed Species

As noted in Section 3.5.7.1, *Description of the Affected Environment and Future Baseline Conditions*, all sea turtle species that are expected to occur regularly in the NY Bight area are listed as either threatened or endangered under the ESA. Therefore, the impacts of the No Action Alternative described in Section 3.5.7.3.1 apply to the ESA-listed sea turtle species in the NY Bight area.

3.5.7.3.3 Cumulative Impacts of the No Action Alternative

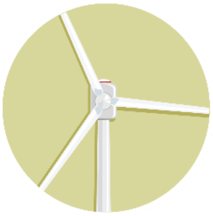
The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore-wind activities and planned offshore wind activities (without the NY Bight projects).

Planned non-offshore-wind activities within the geographic analysis area that contribute to impacts on sea turtles include undersea transmission lines, transmission systems (e.g., PBI), gas pipelines, and other submarine cables; tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; oil and gas activities; and onshore development activities. BOEM expects planned activities other than offshore wind to affect sea turtles through several primary IPFs, including accidental releases, EMFs, new cable emplacement and maintenance, port utilization, noise, and the presence of structures. See Appendix D for a summary of potential impacts associated with planned non-offshore-wind activities by IPF for sea turtles.

Ongoing and planned offshore wind activities in the geographic analysis area for sea turtles are listed in Table 3.5.7-7.

Table 3.5.7-7. Ongoing and planned offshore wind in the geographic analysis area for sea turtles

Ongoing/Planned	Projects by Region
Ongoing – 12 projects[1] 	**MA/RI** • Block Island (State waters) • Vineyard Wind 1 (OCS-A 0501) • South Fork Wind (OCS-A 0517) • Revolution Wind (OCS-A 0486) • Sunrise Wind (OCS-A 0487) • New England Wind (OCS-A 0534) Phase 1 • New England Wind (OCS-A 0534) Phase 2 **NY/NJ** • Ocean Wind 1 (OCS-A 0498) • Empire Wind 1 (OCS-A 0512) • Empire Wind 2 (OCS-A 0512) **VA/NC** • CVOW-Pilot (OCS-A 0497) • CVOW-Commercial (OCS-A 0483)

Ongoing/Planned	Projects by Region
Planned – 18 projects[2] 	**MA/RI** • SouthCoast Wind (OCS-A 0521) • Beacon Wind 1 (OCS-A 0520) • Beacon Wind 2 (OCS-A 0520) • Bay State Wind (OCS-A 0500) • OCS-A 0500 remainder • OCS-A 0487 remainder • Vineyard Wind Northeast (OCS-A 0522) **NY/NJ** • Ocean Wind 2 (OCS-A 0532) • Atlantic Shores North (OCS-A 0549) • Atlantic Shores South (OCS-A 0499) **DE/MD** • Skipjack (OCS-A 0519) • US Wind/Maryland Offshore Wind (OCS-A 0490) • GSOE I (OCS-A 0482) • OCS-A 0519 remainder **VA/NC** • Kitty Hawk North (OCS-A 0508) • Kitty Hawk South (OCS-A 0508) **SC** • Duke Energy Renewables Wind (OCS-A 0546) • TotalEnergies Renewables (OCS-A 0545)

CVOW = Coastal Virginia Offshore Wind; DE = Delaware; GSOE = Garden State Offshore Energy; MA = Massachusetts; MD = Maryland; NC = North Carolina; NJ = New Jersey; NY = New York; RI = Rhode Island; SC = South Carolina; VA = Virginia

[1] Refer to footnotes 9 and 10 in PEIS Chapter 1 for additional information on the status of Ocean Wind 1, Empire Wind 1, and Empire Wind 2.

[2] Status as of September 20, 2024.

The following sections summarize the potential impacts of ongoing and planned offshore wind activities on sea turtles during construction and installation, O&M, and conceptual decommissioning of the projects by IPF.

Accidental releases: Ongoing and planned offshore wind activities may increase accidental releases of fuels, fluids, hazardous materials, and trash and debris due to increased vessel traffic and installation of WTGs and other offshore structures. The risk of accidental releases is expected to be highest during construction, but accidental releases could also occur during operation and conceptual decommissioning. As described in Section 2.3, *Non-Routine Activities and Events*, accidental releases of chemicals, gases, or man-made debris may occur as a result of a structural failure and could result in impacts on sea turtles.

In the planned activities scenario (see Appendix D, Table D2-3), there would be a low risk of a leak of fuel, fluids, or hazardous materials from any one of approximately 2,525 WTGs and OSS installed in the geographic analysis area, which would store a total of 10,368,997 gallons (39,250,923 liters) of oils and lubricants in the WTG; 7,493,000 gallons (28,364,090 liters) of oils and lubricants in the OSS; 1,437,208 gallons (5,440,424 liters) of diesel fuel in the WTGs; and 1,519,420 gallons (5,751,630 liters) of diesel fuel in the OSS. According to BOEM's modeling (Bejarano et al. 2013), a release of 128,000 gallons

(20,350,374 liters), which represents all available oils and fluids from 130 WTGs and an OSS, is likely to occur no more often than once per 1,000 years, and a release of 2,000 gallons (317,975 liters) or less is likely to occur every 5 to 20 years. The likelihood of a spill occurring from multiple WTGs and OSS at the same time is very low and, therefore, the potential impacts from a spill larger than 2,000 gallons (317,975 liters) are largely discountable. Based on the volumes potentially involved, the additional risk posed by offshore wind development would fall within the range of accidental releases that already occur on an ongoing basis from non-offshore-wind activities.

Impacts resulting from accidental releases may pose a long-term risk to sea turtles and could potentially lead to mortality and sublethal impacts on individuals present in the vicinity of the spill, 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, although the analysis provided in Appendix D, Table D1-10 suggests localized, temporary effects that would not impact any invertebrate or finfish populations. Oil and fuels from accidental spills may also be transported away from the initial spill site or undergo weathering processes wherein the chemical composition of the oil is altered, which can have unforeseen effects on marine life following a spill (Passow and Overton 2021). However, the potential for exposure would be minor given the isolated nature of these accidental releases when following available regulations such as those set forth by the International Convention for the Prevention of Pollution from Ships (MARPOL) (IMO 2019) and the variable distribution of sea turtles in the geographic analysis area. Fuel spills from vessels have lesser potential impacts on sea turtles due to their low probability of occurrence and relatively limited spatial extent, although impacts of large spills can be significant. 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.

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 from all ongoing and planned non-offshore-wind and offshore wind activities (Appendix D). 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 between ingestion of marine debris and sublethal effects are difficult to identify (Nelms et al. 2016).

Impacts from accidental releases and discharges from ongoing and planned non-offshore-wind activities would likely be minor for sea turtles. Impacts from accidental releases and discharges from offshore wind activities would also be minor as offshore wind projects would be expected to follow all BOEM BMPs and MARPOL guidance for accidental releases. Though long-term consequences to individuals that are detectable and measurable could occur, it would not lead to population-level effects.

Discharges/intakes: Planned offshore wind projects in the geographic analysis area may use HVDC substations that would convert AC to DC before transmission to onshore project components. As described in a BOEM white paper (Middleton and Barnhart 2022), these HVDC systems are cooled by an open loop system that intakes cool sea water and discharges warmer water back into the ocean. Potential effects resulting from intake and discharge use on sea turtles include altered micro-climates of warm water surrounding outfalls, altered hydrodynamics around intakes/discharges, prey entrainment, and sea turtles scavenging intake screens if prey aggregate on them (Wilcox 1985; Martin and Ernest 2000; Villalba-Guerra 2017). Sea turtles may be attracted to the warm water surrounding the outflow area, especially in fall or early winter when the surrounding water temperatures are cooling and the risk for cold-stunning is heightened. However, the warm water discharged is absorbed by the surrounding water and quickly returned to ambient temperatures, thereby minimizing the extent of a warm water plume. Entrainment of potential prey resources would be minimal given the small number of proposed OSSs per project. Entrainment of sea turtles that may depredate on aggregated prey is unlikely due to physical impedance by intake safety screens. Although it is possible for a sea turtle to be impinged and pulled against an intake screen, which could lead to suffocation and drowning, the likelihood of this is considered small given the small number of HVDC converter stations. Sea turtle attraction to warm-water outflows and entrapment by cooling intake systems is documented for nuclear power plants (Wilcox 1985; Martin and Ernest 2000; Villalba-Guerra 2017). However, HVDC converter substation discharges and intakes are expected to be orders of magnitude smaller than those for nuclear power plants. Additionally, the cooling systems for nuclear power plants often use the nearshore ocean water to cool their reactors, which is taken in using a human-made canal from the ocean to the reactor (Martin and Ernest 2000; Villalba-Guerra 2017). The presence of this canal can contribute to the risk of entrainment in nuclear power plant cooling systems, but they would not be present for HVDC converter substations because they are located offshore and would pull directly from surrounding waters. Given this, and the small number of HVDC converter substations planned for the geographic analysis area, impacts on sea turtles are largely discounted. Impacts from intakes and discharges from ongoing and planned offshore wind activities would therefore be long term, low in intensity, localized, and negligible for sea turtles; measurable effects are not anticipated.

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 is 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 some sea turtle prey species such as benthic fish and invertebrates, as well as any SAV present along potential cable routes. 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 therefore any impacts would likely be short term and temporary. Turbidity associated with increased sedimentation may result in short-term, temporary impacts on some sea turtle prey species. Long-term changes in benthic habitat due to the presence of hard protection on top of cables may also affect the presence of sea turtle prey species (Janßen et al. 2013; Hutchison et al. 2020), potentially yielding varying effects on sea turtles' foraging abilities around the cables.

Dredging for sand wave clearance may be necessary in places to ensure cable burial below mobile seabed sediments, which could result in additional impacts on sea turtles related to impingement, entrainment, and capture associated with mechanical and hydraulic dredging techniques. Sea turtles have been known to become entrained in trailing suction hopper dredges or trapped beneath the draghead as it moves across the seabed. Direct impacts, especially for entrainment, typically result in severe injury or mortality (Dickerson et al. 2004; NMFS 2020). About 69 dredging projects using trailing suction hopper dredgers have recorded sea turtle takes within channels in New Jersey, Delaware, and Virginia and there have likely been numerous other instances not officially recorded (Ramirez et al. 2017). However, the risk of interactions between hopper dredges and individual sea turtles is expected to be lower in the open ocean areas where dredging may occur compared to nearshore navigational channels where sea turtles are more concentrated in a constrained operating environment (Michel et al. 2013; NMFS 2020). This may be due to the lower density of sea turtles in these areas as well as differences in behavior and other risk factors. Dredging within nearshore areas could affect green sea turtle habitat by directly removing SAV or creating suspended sediments that may be deposited on top of seagrass (see Section 3.5.2, *Benthic Resources*). Changes in turbidity and suspended sediments could temporarily disrupt normal sea turtle behaviors, especially if turtles rely on vision to forage. Sea turtles may experience behavioral effects upon exposure to turbidity or suspended sediments and become more susceptible to other threats like vessel collision, but this has not been studied or measured. There are also no studies that evaluate the behavioral effects of suspended sediments on mobile prey species. Johnson (2018) suggested that any effects on sea turtle prey species from suspended sediments, sediment deposition, or turbidity may cause turtles to move to other areas and then return to the affected areas at some time in the future. It is not believed that dredging would permanently change the sea turtle prey base (Michel et al. 2013) and wind projects would implement turbidity reduction measures to contain the silt and sediment stirred up by dredging.

Given the available information, sediment disturbances associated with both ongoing and planned non-offshore-wind and offshore wind activities are not likely to result in any discernible effects on sea turtles, and the risk of injury or mortality of individual sea turtles resulting from dredging necessary to support offshore wind projects would be low. Cable emplacement and maintenance would therefore result in minor impacts on sea turtles and population-level effects are unlikely to occur.

Electric and magnetic fields and cable heat: EMFs emanate constantly from installed telecommunication and electrical power transmission cables. During operations of ongoing and planned offshore wind projects (Appendix D), cables would produce EMFs. 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 EMFs to low levels (BOEM 2007). Although the EMF would exist as long as a cable was in operation, impacts would likely be difficult to detect, if they occur at all. Recent reviews by Bilinski (2021) of the effects of EMFs on marine organisms concluded that though sea turtle species can detect electromagnetic fields and use the earth's magnetic field for migration and navigation, no observed effects from subsea cable EMFs have been reported for any sea turtle species. Additionally, transmission cables using HVAC, emit ten times less magnetic field than HVDC (Taormina et al. 2018), and cable shielding, and burial would further reduce the level of EMF produced.

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).

Heat transfer into surrounding sediment associated with buried submarine high-voltage cables is possible (Emeana et al. 2016). However, heat transfer is not expected to extend to any appreciable effect into the water column due to the use of thermal shielding, the cable's burial depth, and additional cable protection such as scour protection or concrete mattresses for cables unable to achieve adequate burial depth. As a result, heat from submarine high-voltage cables is not expected to affect sea turtles.

Impacts from EMFs from ongoing and planned non-offshore-wind activities would likely be negligible for sea turtles as it would be of the lowest level of detection and no perceptible consequences to individuals or populations are expected. Impacts from EMFs from ongoing and planned offshore wind activities would similarly be negligible for sea turtles.

Noise: The siting, construction and installation, O&M, and conceptual decommissioning of ongoing and planned offshore wind farms is expected to introduce several types of underwater sound into the marine environment. Physical descriptions of sounds associated with these activities can be found in Appendix J, *Introduction to Sound and Acoustic Assessment*. As discussed in Section 3.5.7.1, hearing sensitivity of sea turtles is restricted to a range of low frequencies. The expected impacts of each of these sources on sea turtles is discussed below.

Geophysical and Geotechnical Surveys

The active acoustic sources used in site characterization surveys introduce noise into the water in areas around sites of investigation. See Appendix J for a physical description of these sounds. Only a subset of geophysical sources (e.g., boomers, sparkers) are likely to be audible by sea turtles given the frequency range of the sounds and the hearing range of turtles, but they may cause short-term behavioral disturbance, avoidance, or stress (NSF and USGS 2011). Recently, BOEM and USGS characterized underwater sounds produced by high-resolution geophysical sources and their potential to affect marine animals, including sea turtles (Ruppel et al. 2022). In addition to frequency range, other characteristics of the sources—like the source level, duty cycle, and beamwidth—make it very unlikely that these sources would result in behavioral disturbance of sea turtles, even without mitigation (Ruppel et al. 2022). Given the intensity of noise generated by this equipment (Crocker and Frantantonio 2016; Crocker et al. 2019) and short duration of proposed surveys, it is unlikely to result in PTS for any turtle species. Although temporary displacement or behavioral responses may occur, they would not result in biologically notable consequences and impacts on sea turtles would be minor and would have no stock or population-level effects. Likewise, geotechnical surveys may introduce low-level, intermittent, broadband noise into the marine environment, though these sounds are unlikely to result in behavioral disturbance given their low source levels and intermittent use.

Unexploded Ordnance Detonations

There are several options for UXO removal that include stabilizing the UXO for safe relocation without detonation, low-order detonation designed to reduce the net explosive yield of a UXO compared to conventional “blow-in-place” techniques, and high-order detonation in which the full explosive weight is detonated in the place where the object is found. The appropriate method of removal for each project will depend on the condition of the UXO (i.e., how stable it is for potential relocation) and surrounding environmental conditions. For a physical description of the sounds produced by underwater explosions, see Appendix J. Underwater explosions of this type generate shock waves, or a nearly instantaneous wave characterized by extreme changes in pressure, both positive and negative. This shock wave can cause injury and mortality to a sea turtle, depending on how close an animal is to the blast. Similar to effects seen in mammals, the physical range at which injury or mortality could occur will vary based on the amount of explosive material in the UXO, size of the turtle, and the location of the turtle relative to the explosive. Injuries may include hemorrhages or damage to the lungs, liver, brain, or ears, as well as auditory impairment such as PTS and TTS (Ketten 2004; Finneran et al. 2017). Potential impacts from *in-situ* UXO detonation would result from both low- and high-order detonation methods, with less intense pressures and noise produced from the low-order detonations. However, though low-order detonation methods would generally be preferred by projects, they may not always fully eliminate the risk of high-order detonation, so potential impacts from *in-situ* UXO disposal need to be assessed assuming high-order detonations would occur. Noise generated during detonation is dependent on the size and type of UXO, amount of charge used, location, water depth, soil conditions, and burial depth of the UXO. Higher order detonation methods, if they were to occur, would present the greatest risk of impact on sea turtles, as this could result in mortality, non-auditory injuries (e.g., hemorrhages, lung damage, ear damage), and auditory injuries such as PTS or TTS and would present moderate impacts on sea turtles. UXO detonations may result in the loss of individuals but would not be expected to result in population-level effects given the irregular occurrence of high-order detonations expected.

Impact and Vibratory Pile-Driving

The construction of WTG and OSS foundations in the geographic analysis area is expected to occur intermittently over an approximate 9-year period between 2023 and 2030. During the installation of foundations, underwater sound related to pile-driving would likely occur for less than 12 hours per day per project. The sound generated during pile-driving will vary depending on the piling method (impact or vibratory), pile material, size, hammer energy, water depth, and substrate type. A description of the physical qualities of pile-driving noise can be found in Appendix J. These sounds may affect sea turtle species in the area. The impacts would vary in extent and intensity based on the scale and design of each project, as well as the schedule of project activities.

Impulsive noise from impact pile-driving during offshore wind development, due to the anticipated frequency and spatial extent of effect, represents the highest risk of exposure and potential for adverse effects on sea turtles in the geographic analysis area. While these potential effects are acknowledged, their significance is unclear because sea turtle sensitivity and behavioral responses to pile-driving noise are not well known and are subjects of ongoing study. However, several studies conducted on responses to seismic airguns, an impulsive signal that can serve as a proxy, have shown that a range of behavioral effects are possible. In these studies, caged and free-swimming sea turtles are reported as reacting to the sounds by initiating a startle dive (Weir 2007; DeRuiter and Doukara 2012), rising to the surface (Lenhardt 1994), and altering swimming patterns (McCauley et al. 2000). In other studies, sea turtles avoided the airgun source initially, but authors suggested that animals likely habituated to the source over time (Moein et al. 1994; Lenhardt 2002; Hazel et al 2007). This type of noise habituation has been demonstrated even when the repeated exposures were separated by several days (Bartol and Bartol 2012; U.S. Department of the Navy 2018). The accumulated stress and energetic costs of avoiding repeated exposures to pile-driving noise over a season or life stage could have long-term effects on survival and fitness (U.S. Department of the Navy 2018).

Vibratory pile-driving may be used prior to impact pile-driving to reduce the risk of pile run for some offshore wind projects and during export cable installation and port facility construction. The term *pile run* refers to the quick penetration of a pile into the seabed as a result of its high self-weight and low resistance from the seabed. A more detailed description of vibratory pile-driving noise can be found in Appendix J. Vibratory pile-driving is expected to create nearly continuous, non-impulsive, low-frequency noise. Compared to impact pile-driving, this means the most damaging elements of sound exposure (the rapid rise time) would not pose a risk to sea turtles like they would for impulsive noise sources. However, like with any continuous source, if animals remain within the area for long enough, they could still experience auditory fatigue. At larger ranges, acoustic masking is possible. However, vibratory pile-driving activities would be relatively short term, occurring over approximately 4 hours per pile for the foundations, and over several days for export cable installation.

Sea turtles that are exposed to pile-driving have the potential to experience acoustic injury such as TTS or PTS. In theory, reduced hearing sensitivity could limit the ability to detect predators, prey, or potential mates and reduce the survival and fitness of affected individuals. However, the role and importance of sound in these biological functions for sea turtles remains poorly understood (Lavender et al. 2014).

Based on the available information provided above and in Appendix J, impacts on sea turtles from construction-related pile-driving noise would be limited to effects on a small number of individuals. However, given the number of projects anticipated within the geographic analysis area through 2030 (Appendix D), impact pile-driving would have moderate impacts on sea turtles due to the potential for severe effects on individuals but no effects on population viability for any species. Vibratory pile-driving is expected to be less impactful for sea turtles and would result in detectable impacts that are minor and would not result in population-level effects.

Foundation Drilling

Drilling activities for the WTG and OSS foundations used prior to pile-driving activities to remove soil or boulders from inside the piles in cases of pile refusal may produce SPL of 140 dB re µPa at 3,280 feet (975 meters) (Austin et al. 2018). This would exceed the continuous noise threshold of 120 dB re 1 µPa (Table 3.7-3) beyond 3,000 feet (914 meters), but these events are expected to be short term, which limits the sea turtles potentially present during construction. While behavioral responses may occur from drilling, they are not expected to be long lasting or biologically significant to sea turtle populations and are therefore minor.

Vessels

Vessel noise associated with non-offshore-wind activities is likely to be present throughout the sea turtle geographic analysis area at a nearly continuous rate due to the prevalence of commercial shipping, fishing, and recreational boating activities which are ongoing and would be expected to continue in the geographic analysis area. During both the construction and operational phases of ongoing and planned offshore wind projects, several types of vessels would be used to transport crew and supplies, and during construction, dynamic positioning systems may be used to keep the pile-driving vessel in place. A description of the physical qualities of vessel noise can be found in Appendix J. Construction and operational vessel noises are the most broadly distributed source of non-impulsive noise associated with offshore wind projects. Sea turtle exposure to underwater vessel noise would increase as a result of ongoing and planned offshore wind projects, especially during construction periods (Appendix D, Table D1-21). Sea turtles are less sensitive to sound compared to faunal groups like marine mammals and no injury or behavioral effects from vessel noise are anticipated for ongoing and planned offshore wind projects. It is unlikely that received levels of underwater noise from vessel activities would exceed PTS thresholds for sea turtles, as the PTS threshold for non-impulsive sources is an SEL_{24h} of 200 dB re 1 µPa^2 s (NMFS 2023), which is comparable to the maximum source level reported for large shipping vessels (Appendix J). Hazel et al. (2007) demonstrated that sea turtles only appear to respond behaviorally to vessels at approximately 33 feet (10 meters) or closer.

Vessel noise effects for ongoing and planned offshore wind projects are expected to be broadly similar to noise levels from existing vessel traffic in the region. Nonetheless, periodic localized, short-term behavioral impacts on sea turtles could occur, but sea turtle behavioral disturbances are anticipated only to occur within a relatively small area around the vessels and are expected to return to normal when the vessel moves away. Therefore, the effects of vessel noise from offshore wind activities would be minor. No population-level effects are expected to occur.

Dredging, Trenching, and Cable-Laying

Preparing a lease area for turbine installation and cable-laying may require jetting, plowing, or removal of soft sediments, as well as the excavation of rock and other material through various dredging methods. Cable installation vessels are likely to use dynamic positioning systems while laying the cables. The sound associated with dynamic positioning generally dominates over other sound sources present, especially in relation to dredging, trenching, and cable-laying activities. A description of the physical qualities of these sound sources can be found in Appendix J. Given the estimated source levels (Appendix J) and transitory nature of these sources, exceedance of PTS and TTS sound levels are not likely for sea turtles (Heinis et al. 2013), and behavioral disturbances would likely be low-intensity and localized, and result in negligible impacts on sea turtles.

Aircraft

Rotary wing aircraft (helicopters) may be used during initial site surveys, protected species monitoring prior to and during construction, facility monitoring, and crew transfers during construction. Sea turtle sensitivity to airborne noise is not well studied, but available information indicates potential disturbances would likely be minimal. Bevan et al. (2018) observed no evident behavioral responses from sea turtles exposed to drones flown directly overhead at altitudes ranging from 50 to 102 feet (18 to 31 meters). When aircraft travel at relatively low altitude, aircraft noise has the potential to elicit stress or behavioral responses (e.g., diving or swimming away or altered dive patterns) (BOEM 2017; NSF and USGS 2011; Samuel et al. 2005). Aircraft would operate through the NY Bight area at altitudes of 1,000 feet (305 meters) or more except when landing or departing from service vessels. NMFS (2016) determined that noise and disturbance effects on sea turtles from aircraft operations for a single offshore wind project would be negligible, and effects from aircraft use during multiple projects within the geographic analysis area would similarly be expected to be negligible as these noises are not expected to overlap in time or space.

WTG Operations

No biologically notable effects on sea turtles are anticipated from noise produced by WTG operation. Noise associated with operational WTGs would be expected to attenuate below ambient levels at a relatively short distance from WTG foundations (Miller and Potty 2017; Thomsen et al. 2015; Tougaard et al. 2009). Maximum anticipated noise levels produced by operational WTGs are estimated to be between 125 and 130 dB re 1 µPa m (Lindeboom et al. 2011; Tougaard et al. 2009). HDR (2019) measured SPL below 120 dB re 1 µPa at 164 feet (50 meters) from operating turbines at the Block Island Wind Farm, which are below the sound level thresholds expected to cause sea turtle PTS, TTS, and behavioral disturbance (NMFS 2023). Additionally, current generation WTGs use direct drive motors that could result in a sound decrease of approximately 10 dB from WTGs using gear boxes that were considered in prior studies (Stöber and Thomsen 2021). However, a review of published literature also identified an increase in underwater source levels (up to 177 dB re 1 µPa) with increasing power size with a nominal 10 MW WTG (Stöber and Thomsen 2021), and given the number of foundations expected within the sea turtle geographic analysis area through 2030 (Appendix D), the presence of WTG operational noise would be a persistent presence throughout the sea turtle geographic analysis area. Impacts on sea turtles would therefore be minor as the behavioral responses would be detectable but would not be expected to result in any population-level effects.

Port utilization: The development of an offshore wind industry in the sea turtle geographic analysis area may incentivize the expansion or improvement of regional ports to support planned projects. As discussed in Section D.2.5 of Appendix D, a number of dredging and port improvement projects at ports within the NY Bight area have either been proposed or are considered reasonably foreseeable including Port Ivory, the Port of Albany, the Port of Coeymans, the Southern Brooklyn Marine Terminal, the Brooklyn Navy Yard, and Arthur Kill Terminal in New York; the Paulsboro Marine Terminal, Lower Alloways Creek, High Bar Harbor, and Barnegat Light Stake channels in New Jersey; and Barnegat Bay, New Jersey. Further details of each of these proposed or foreseeable projects are provided in Appendix D.

Any port expansion could increase the total amount of disturbed (modified or lost) benthic habitat and result in impacts on some sea turtle prey species. However, given that port expansions would likely occur in subprime areas for foraging and the disturbance would be relatively small in comparison to the overall sea turtle foraging areas in the geographic analysis area, port expansions are not expected to affect sea turtles. Dredging for port facility improvement could lead to additional impacts on turtles from incidental entrainment, impingement, or capture. Most observed injury and mortality events in the United States due to dredging activities were associated with hopper dredging in and around core habitat areas in the southern portion of the geographic analysis area and in the Gulf of Mexico outside the geographic analysis area (Michel et al. 2013; NMFS 2020). Ongoing maintenance dredging of these facilities may increase related risks to individual turtles over the lifetime of the facilities; however, typical mitigation measures such as timing restrictions should minimize this potential. Additionally, the size, scope, and location of the dredging activities conducted for ongoing and planned offshore wind projects would be less than that identified for other projects such as beach nourishment or port deepening, and the type of equipment used reduces the risk of entrainment or impingement. Compared to the dredging activities for ongoing and planned offshore wind projects, navigation dredging projects, which occur primarily in channels close to shore, generally pose a greater risk of entrainment of sea turtles because of their tendency to concentrate in channels (Ramirez et al. 2017). For example, the number of sea turtles entrained by hopper dredging in BOEM offshore borrow areas has historically been relatively low when compared to navigation channel dredging (Ramirez et al. 2017). Between 1995 and 2015, there were 69 reported sea turtle takes in the North Atlantic (i.e., north of North Carolina) by trailing suction hopper dredges, versus approximately 260 taken in hopper dredges operating in the South Atlantic. The takes per project across the entire South Atlantic were estimated to be 0.96 (the North Atlantic was not analyzed). Therefore, given the limited extent and location of offshore wind project dredging in comparison to navigation projects, offshore wind projects are not expected to result in population effects as few to no takes of sea turtles would reasonably be expected. The risk of injury or mortality to individual sea turtles resulting from dredging associated with ongoing and planned offshore wind projects is low.

Port utilization of ongoing and planned non-offshore-wind and offshore wind activities would affect sea turtles through disturbances to benthic habitat, vessel traffic (discussed further in the *Vessel Traffic* IPF), and entrainment risk in dredging equipment. Based on the available information, this would be expected to result in minor impacts on sea turtles; although impacts on individuals would be detectable and measurable, no population-levels effects are expected.

Presence of structures: The Mid-Atlantic region currently 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 CVOW-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.

The addition of WTGs offshore in the geographic analysis area could increase sea turtle prey availability through the creation of new hard-bottom habitat, increasing pelagic productivity in local areas, or promoting fish aggregations at foundations (Bailey et al. 2014). Section 3.5.5, *Finfish, Invertebrates, and Essential Fish Habitat*, discusses reef creation and the potential for anthropogenic structures to attract benthic fauna and fish. The enhancement of these resources around new wind farm structures can provide additional foraging opportunities for sea turtles that may result in beneficial effects given the broad geographic range of species during their annual foraging migrations. These beneficial effects could be reversed following project decommissioning, as all project structures could be removed and any artificial reef creation would be reversed. The decision to remove structures or to leave them in place would be a part of the decommissioning application submitted to BSEE and approved or disapproved by BOEM at the project-specific stage.

Additionally, potential beneficial effects may be offset given the increased risk of entanglement due to derelict fishing gear on the structures. The presence of structures during offshore wind project operations has the potential to concentrate recreational fishing around foundations, potentially increasing the risk of sea turtle entanglement in both vertical and horizontal fishing lines and increasing the risk of injury and mortality due to infection, starvation, or drowning. While sea turtles are capable of remaining submerged for long periods, they appear to rapidly consume oxygen stores when entangled and forcibly submerged in fishing gear (Lutcavage and Lutz 1997). If there is an increase in recreational fishing in a wind farm area, it is likely that this will represent a shift in fishing effort from areas outside a wind farm area to within a wind farm area or an increase in overall effort. These structures could also result in fishing vessel displacement or gear shift. The potential impact on sea turtles from these changes is uncertain; however, if a shift from mobile gear (trolling) to fixed gear (hook and line) occurs due to inability of the fishermen to maneuver mobile gear, there would be a potential increase in the number of vertical lines, resulting in an increased risk of sea turtle interactions with fishing gear. Given vessel safety concerns regarding being too close to foundations and other vessels, the likelihood of recreational fishermen aggregating around the same turbine foundation at the same time is low. Due to foraging strategies, leatherback and loggerhead sea turtles are more likely to be exposed to recreational fishing lines in the pelagic WTG area. Conversely, Kemp's ridley and green sea turtles are less likely to be exposed to recreational fishing lines in the pelagic WTG area and are in the geographic analysis area at much lower densities than loggerhead and leatherback sea turtles. Human-made structures, especially tall vertical structures like WTG and OSS foundations, alter local water flow at a fine scale and could result in localized impacts on sea turtle prey distribution and abundance. A discussion of the effects of altered water flow can be found in Section 3.5.6, *Marine Mammals*. The presence of many WTG structures could affect oceanographic and atmospheric conditions in ways that alter local environments and potentially increase primary productivity in the vicinity of these structures (Carpenter et al. 2016; Schultze et al. 2020). However, this may not translate to a beneficial increase in sea turtle prey abundance if the increase in primary productivity is consumed by filter feeders (e.g., mussels) that colonize the surface of the structures (Slavik et al. 2019).

The long-term effects of offshore structure development on ocean productivity and sea turtle prey species, and therefore on sea turtles, are difficult to predict with certainty because they are expected to vary by location, season, and year depending on broader ecosystem dynamics. For example, the presence of new hard surfaces could increase the abundance of associated organisms (e.g., mollusks, crustaceans) on and around the structures, providing a prey resource for sea turtles. Increased primary and secondary productivity in proximity to hard-bottom structures could increase the abundance of prey species like jellyfish (English et al. 2017). Additionally, hard-bottom (scour control, cable protection) and vertical structures (WTG and OSS foundations) in a soft-bottom habitat can create a three-dimensional artificial reef structure, thus inducing the "reef effect" and resulting in higher densities and biomass of mollusks, fish, and decapod crustaceans (Causon and Gill 2018; Taormina et al. 2018). Recent studies have found increased biomass for benthic fish and invertebrates, and possibly for pelagic fish, sea turtles, and birds as well (Raoux et al. 2017; Pezy et al. 2018; Wang et al. 2019), indicating that offshore wind facilities can generate beneficial long-term impacts on local ecosystems, translating to increased foraging opportunities for sea turtle species. Sea turtles may also use vertical structures for shelter from strong currents to conserve energy and for cleaning their carapace (Barnette 2017). In contrast, increased fish biomass around the structures could attract commercial and recreational fishing activity, creating an increased risk of injury or mortality from gear entanglement and ingestion of debris (Berreiros and Raykov 2014; Gregory 2009; Vegter et al. 2014; Shigenaka et al. 2021).

Some level of displacement of sea turtles from ongoing and planned offshore wind lease areas into areas with a greater potential for interactions with ships or fishing gear could occur, particularly during construction phases. However, the addition of structures could locally increase pelagic productivity and prey availability for sea turtles and decrease the likelihood of long-term displacement from the ongoing and planned offshore wind lease areas. While the effect would be present long-term throughout the life of ongoing and planned offshore wind projects, the overall impact is minor and would not be expected to affect the viability of any sea turtle populations.

Traffic: Current activities contributing to traffic in the geographic analysis area include port traffic levels, fairways, TSS, commercial vessel traffic, recreational and fishing activity, and scientific research and surveys. 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 (NMFS and USFWS 2007; Hazel et al. 2007; Barco et al. 2016; Foley et al. 2019). In the United States, the percentage of strandings of loggerhead sea turtles attributed to vessel strikes increased from approximately 10 percent in the 1980s to a record high of 20.5 percent 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). Sea turtle strandings reported to have vessel strike injuries have been reported to be as high as 25 percent in the Chesapeake Bay in Virginia (Barco et al. 2016), and Foley et al. (2019) reported that roughly one-third of stranded sea turtles in Florida had injuries indicative of a vessel strike. Increased vessel traffic associated with ongoing and planned offshore wind activities could result in a higher number of vessel strikes, resulting in sea turtle injury or mortality. However, despite the potential for individual fatalities, no population-level impacts on sea turtles are expected. It is anticipated that projects will adhere to vessel speed restrictions and visual monitoring requirements set forth by NMFS (87 *Federal Register* 46921) which, while geared primarily towards marine mammals, will help reduce the risk of a strike occurring that could result in a serious injury or mortality. PSO sightings data indicate sighting rates for sea turtles during vessel operations were approximately 13 sea turtle detections per 100 hours of vessel effort (Marine Ventures International, Inc. 2022; RPS 2021). These detection rates are relatively high, and even with these high detection rates there were only 18 vessel strike mitigation actions required (2.8 percent of all sea turtle detections) and no strikes were reported.

Therefore, given the risk of impact of vessel strikes on sea turtles and the level of traffic expected from ongoing and planned non-offshore-wind and offshore wind activities, impacts on sea turtles are expected to be moderate as vessel strikes may result in long-term impacts on individuals, but the populations would be expected to recover, and the viability of these populations would not be affected.

Survey gear utilization (biological/fisheries monitoring surveys): A primary threat to sea turtles is their unintended capture in fishing gear, which can result in drowning or cause injuries that lead to mortality (e.g., swallowing hooks). For example, trawl fishing is among the greatest continuing primary threats to the loggerhead turtle (NMFS and USFWS 2019) and sea turtles are also caught as bycatch in other fishing gear including longlines, gillnets, hook and line, pound nets, pot/traps, and dredge fisheries.

A substantial impact of commercial fishing on sea turtles is the entrapment or entanglement that occurs with a variety of fishing gear. Although the requirement for the use of bycatch mitigation measures, such as "turtle excluder devices" in trawl fishing gear, has reduced sea turtle bycatch, Finkbeiner et al. (2011) compiled data on sea turtle bycatch in U.S. fisheries and found that in the Atlantic, a mean estimate of 137,700 interactions, 4,500 of which were lethal, occurred annually since implementation of bycatch mitigation measures. Stationary gear poses a risk of entanglement for ESA-listed sea turtle species due to buoy and anchor lines. Of all the Atlantic sea turtles, the leatherback seems to be the most vulnerable to entanglement in trap/pot fishing gear, possibly due to its physical characteristics, diving and foraging behaviors; distributional overlap with the gear; and the potential attraction to prey items that collect on buoys and buoy lines at or near the surface (NMFS 2016). Individuals entangled in pot gear generally have a reduced ability to forage, dive, surface, breathe, or perform other behaviors essential for survival (Balazs 1985). In addition to mortality, gear entanglement can restrict blood flow to extremities and result in tissue necrosis and death from infection. Individuals that survive may lose limbs or limb function, decreasing their ability to avoid predators and vessel strikes (NMFS 2016). A reduction of sea turtle interactions with fisheries is a priority for sea turtle recovery. The impacts of survey gear utilization associated with biological and fisheries surveys monitoring for ongoing and planned offshore wind activities on sea turtles are expected to be minor given the relatively limited extent and duration of these surveys; impacts on individuals would be detectable and measurable but would not lead to population-level effects.

Lighting: Artificial lighting from ongoing and planned offshore wind and non-offshore-wind projects may be produced by vessel traffic or project structures. Ocean vessels such as ongoing commercial vessel traffic, recreational and fishing activity, and scientific research and survey vessels 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. 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 such 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). Based on the available information, artificial lighting from ongoing and planned offshore wind and non-offshore-wind projects would be expected to result in negligible impacts on sea turtles; although impacts on individuals would be detectable and measurable, no population-levels effects are expected.

3.5.7.3.4 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, sea turtles would continue to be affected by existing environmental trends and ongoing activities. In addition to ongoing climate change, BOEM expects a range of temporary to long-term impacts (disturbance, displacement, injury, mortality, and reduced foraging success) on sea turtles, primarily from exposure to construction-related underwater noise (specifically UXO detonations and impact pile-driving), vessel traffic (i.e., vessel strike), entanglement, seabed disturbance, and changes in habitat from presence of new structures acting as artificial reefs, altering hydrodynamics, and introducing secondary entanglement risk. Ongoing activities are expected to continue to result in **negligible** to **moderate** impacts on sea turtles. Although impacts on individual sea turtles and their habitat are anticipated from pile-driving, vessel traffic, UXO detonation, and other IPFs, they are recoverable and likely would not affect the population viability of any sea turtle species.

Cumulative Impacts of the No Action Alternative. BOEM anticipates that planned offshore wind and non-offshore-wind activities would result in moderate impacts on sea turtles. These impacts are primarily driven by ongoing underwater noise impacts (UXO detonations, impact pile-driving), traffic (i.e., vessel strike), entanglement, and seabed disturbance. Although impacts on individual sea turtles and their habitat are anticipated, populations are expected to recover sufficiently.

Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and sea turtles would continue to be affected by natural and human-caused IPFs. BOEM anticipates that the overall impacts associated with the No Action Alternative, when combined with all other planned activities (including offshore wind without the development of six NY Bight projects), in the geographic analysis area would likely result in **negligible** to **moderate** impacts on sea turtles because the anticipated impact would likely be notable and measurable, but populations are expected to recover and no effects on population viability are anticipated. **Minor beneficial** impacts for sea turtles are expected to result from the presence of structures primarily due to an increase in foraging opportunity as a result of the artificial reef effect, which may be offset given the increased risk of entanglement due to derelict fishing gear on the structures.

3.5.7.4 Impacts of Alternative B – No Identification of AMMM Measures at the Programmatic Stage – Sea Turtles

3.5.7.4.1 Impacts of One Project

Alternative B considers the potential impacts of future offshore wind development for the NY Bight area without the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts.

Accidental releases: Accidental releases of fuel, fluids, hazardous materials, trash, and debris may increase as a result of one project developed in the NY Bight area. The risk of any type of accidental release would be increased primarily during construction when additional vessels are present and during the refueling of primary construction vessels at sea. BOEM prohibits the discharge or disposal of solid debris into offshore waters during any activity associated with construction and operation of offshore energy facilities (30 CFR 250.300). USCG also prohibits dumping of trash or debris capable of posing entanglement or ingestion risk (International Convention for the Prevention of Pollution from Ships, Annex V, Public Law 100–200 [101 Stat. 1458]). Project activities would comply with the federal requirements for the prevention and control of oil and fuel spills, reducing the likelihood of an accidental release. Further, implementation of an OSRP, which is required information with any future project COP submitted for the NY Bight area (30 CFR 585.627(c)), would decrease potential impacts from spills and informational training on proper storage and disposal practices would reduce the likelihood of accidental discharges and spills from occurring. The impacts of one NY Bight project from accidental releases of hazardous materials and trash/debris would, therefore, not increase the risk beyond that described under the No Action Alternative. In the unlikely event of an accidental oil spill, impacts would be sublethal due to quick dispersion, evaporation, and weathering, all of which would limit the amount and duration of exposure of sea turtles to hydrocarbons. The combined regulatory requirements and any additional directives from BOEM and other applicable federal agencies would effectively avoid accidental debris releases and avoid and minimize the impacts from accidental spills such that impacts on sea turtles are unlikely to occur. Therefore, though the consequence to individuals resulting from ingestion of debris could be fatal, the likelihood of this occurring is so low that impacts of accidental releases as a result of one NY Bight project would be of low intensity, short term, and localized. Therefore, the effects on sea turtles from accidental releases and discharges would likely be minor during construction and installation.

The impacts of one NY Bight project during O&M from accidental releases of hazardous materials and trash/debris would be the same, though slightly reduced, as that described above for construction and installation. During O&M, at-sea refueling for construction vessels would not likely occur, thereby reducing overall risk for an accidental spill. All other impacts of accidental releases during O&M would be the same as during construction and installation and would therefore remain minor for sea turtles.

Discharges/intakes: The use of HVDC cables is possible for one NY Bight project, which would require HVDC converter intakes on the up to five OSSs. Therefore, intakes and discharges related to cooling offshore wind converter stations are possible for one NY Bight project. Potential effects resulting from intake and discharge use include altered micro-climates of warm water surrounding outfalls, altered hydrodynamics around intakes/discharges, prey entrainment, association with intakes if prey aggregates on intake screens from which sea turtles scavenge, and direct entrainment or impingement. As discussed in Section 3.5.7.3.3, these impacts on sea turtles are largely discountable given the small number of OSSs. Therefore, the impact as a result of one NY Bight project from discharges and intakes, though long term, would be low in intensity, highly localized, non-measurable, and negligible for sea turtles.

Cable emplacement and maintenance: One NY Bight project would result in seafloor disturbance from installation of up to 280 WTGs, up to 5 OSSs, up to 550 miles (885 kilometers) of interarray cable, and up to 929 miles (1,495 kilometers) of export cable (Section 2.1.2, *Alternative B – No Identification of AMMM Measures at the Programmatic Stage*), which would result in turbidity effects with the potential to have temporary impacts on some sea turtle prey species (see Section 3.5.5, *Finfish, Invertebrates, and Essential Fish Habitat*). Jack-up vessels and vessel anchoring will include additional seafloor disturbance. These effects would be increased primarily during construction and installation activities as cable installation for the offshore export cables and interarray cables are gradually added. As provided in Table 2-2 in Chapter 2 of this PEIS, the most common methods expected for cable emplacement are mechanical or jet plowing. Additional options include jet trencher, precision installation (using a remotely operated vehicle/diver), mechanical cutter, controlled flow excavator, and vertical injection. In general, plumes generated during trenching of offshore areas would likely be limited to within a few feet vertically and a few hundred feet horizontally, and would be expected to settle out of the water column entirely within 24 hours after the completion of jetting operations. The jet plow embedment process for cable installation will, therefore, result in short-term and localized heightened turbidity. Trenching with a jet plow in areas of shallower water depths could cause plumes to nearly reach the surface of the water, and alternate cable emplacement methods may be required for some areas, such as dredging to install cable along sand waves. Dredging using mechanical dredging techniques would also contribute additional impacts on sea turtles due to the risk of impingement and entrainment.

Sea turtles in or near the one NY Bight project area would likely be foraging or migrating between foraging and nesting habitats. Prey species within the one NY Bight project area could include benthic species that could be affected by seabed disturbance associated with installation of the offshore export cables and interarray cables. This disturbance would be short term, and prey species would be expected to return to the area once the cables are installed. Similar levels of impact would be realized during cable maintenance. Because impacts during cable installation or maintenance would be temporary and localized, the impact of project activities on sea turtles would be negligible.

Only intermittent, localized cable maintenance is predicted during the O&M phase of one NY Bight project which would only disturb the seafloor if maintenance required exposing the cables. In case of insufficient burial or cable exposure, whether attributable to natural or human caused issues, appropriate remedial measures will be taken including reburial or placement of additional protective measures. If a cable failure occurs, an appropriate cable repair spread will be mobilized. During these remedial activities, if they occur, sediment plumes would be limited to directly above the seabed and not extend into the water column. Suspended sediments due to jet plowing are expected to remain localized to the area of disturbance and settle quickly to the seafloor. Elevated turbidity levels would be short term, highly localized, and temporary. Therefore, effects to sea turtles would be similar to those described for the construction and installation phase and impacts would be non-measurable and negligible.

Electric and magnetic fields and cable heat: As discussed in Section 3.5.7.3.3, Normandeau et al. (2011) and Bilinski (2021) reviewed the potential effects of EMFs from offshore wind energy projects on sea turtles and other species and concluded that sea turtles would be insensitive to EMF effects from subsea electrical cables. One NY Bight project-related EMFs are likely to be below the threshold detectable to sea turtles and, therefore, indistinguishable from natural variability in the analysis area. Export and interarray cables may be either HVAC or HVDC; potential effects to sea turtles from HVAC cables are considerably reduced compared to HVDC cables. However, Taormina et al. (2018) found that, though EMF from HVDC cables is higher than from HVAC cables, there were no significant differences in resettlement of benthic species over the cable a few years after installation compared to baseline regions, so sea turtles foraging on benthic prey species would not be expected to experience long-term changes in prey availability. Hutchison et al. (2018) found notable behavioral responses of American lobster and little skate in response to EMF from HVDC cables; however, it did not constitute a barrier to movement across the cable for either species, also indicating that long-term changes to sea turtle prey distribution are unlikely to occur. Additionally, export and interarray cables would be buried at a depth ranging from 3 to 19.6 feet (0.9 to 6 meters) and 3 to 9.8 feet (0.9 to 3 meters), respectively, and installed with appropriate cable shielding and scour protection (where needed). These factors will effectively limit sea turtle exposure to both EMFs and heat originating from the project cables. Areas where cable lie exposed on the seafloor could potentially result in EMFs that are detectable by sea turtles, but this area would be small, limited to extending only a few feet from the cable.

These factors indicate that the likelihood of sea turtles encountering detectable EMF and heat effects is low, and any exposure would be below levels associated with measurable biological effects. Therefore, EMF effects on sea turtles would be negligible.

Noise: Activities associated with one NY Bight project that could cause underwater noise effects on sea turtles are UXO detonations, impact and vibratory pile driving (during installation of WTG and OSS foundations), geophysical (i.e., HRG) and geotechnical surveys, vessel traffic, aircraft, cable laying or trenching and dredging, and potential drilling during construction. Project construction activities could generate underwater noise and result in non-auditory injury, auditory injury (i.e., PTS), behavioral disturbance, and masking effects on sea turtles.

Geophysical and Geotechnical Surveys

HRG survey equipment would likely be used during preconstruction surveys to support design finalization. This equipment produces noise in the 1.1 to 200 kilohertz frequency range at sound levels that may exceed sea turtle behavioral thresholds. No injurious impacts are expected for sea turtles from any HRG survey equipment (Baker and Howsen 2021). Behavioral disturbances may occur up to 295 feet (90 meters) from impulsive sources and up to 6.6 feet (2 meters) from non-impulsive sources assuming equipment are operating at the highest power settings (Baker and Howsen 2021). Some low-level behavioral disturbances could potentially occur during project-related HRG surveys; however, due to the relatively short duration of these surveys, risk of exposure to sea turtles is considered minimal. Likewise, geotechnical surveys, which may introduce low-level, intermittent, broadband noise into the marine environment, are unlikely to result in behavioral disturbance given their low source levels and intermittent use. Impacts from G&G surveys from one NY Bight project on sea turtles are therefore expected to be minor, with effects that are of low intensity and detectable but that do not lead to population-level impacts.

G&G surveys may occur irregularly throughout the O&M phase of one NY Bight project to check the integrity of the scour protection around the foundations and ensure the interarray and export cables have not become exposed. The scope of G&G surveys during O&M would be similar to that described for one NY Bight project construction and impacts on all sea turtles would similarly be detectable and minor, with no population-level effects.

Unexploded Ordnance Detonations

As discussed in Section 3.5.7.3.3 and Appendix J, underwater explosions of this type generate high pressure levels that could cause disturbance and both non-auditory and auditory injury to sea turtles. Five UXO locations (shown in Section 3.6.7, *Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research and Surveys*, on Figure 3.6.7-6) and two UXO areas are located within the NY Bight area (Ecology and Environment 2017). While avoidance and non-explosive methods would be preferred and may be employed to lift and move these objects, it may not be possible to avoid all UXOs and some may need to be removed by explosive detonation. Based on acoustic modeling conducted for a nearby wind farm (Ocean Wind 1 OCS-A 0498), the physical range in which detonation of a UXO may exceed the mortality threshold for sea turtles resulting from a UXO at 39-, 66-, 98-, 148-foot (12-, 20-, 30-, and 45-meter) water depths may extend up to 1,903 feet (580 meters) from the source depending on the sea turtle size and location of the detonation (Hannay and Zykov 2022). Modeling included a range of UXO masses from 5 to 1,000 pounds (2.3 to 454 kilograms) based on charge weight "bins" defined by the U.S. Navy (Hannay and Zykov 2022). Modeled distances to non-auditory injury (e.g., gastrointestinal injury, lung injury) thresholds for these UXO masses and depths may extend up to 3,451 feet (1,052 meters) and distances to the PTS threshold may exceed 4,134 feet (1,260 meters) (Hannay and Zykov 2022). Modeled distances to the TTS threshold (which is used to determine potential behavioral disturbances for single detonations) for these UXO masses and depths may extend up to 15,997 feet (4,870 meters) (Hannay and Zykov 2022). The physical range at which injury or mortality could occur will vary based on the amount of explosive material in the UXO, size of the animal, the location of the animal relative to the explosive, whether the UXO is buried, the water depth of the blast, and local seafloor conditions, among other factors. Although acoustic modeling was not conducted for one NY Bight project, the ranges presented above from Hannay and Zykov (2022) are used to approximate the potential risk in this PEIS as the model was conducted for a comparable region in the northeastern United States, which is also likely to encounter similar types of UXO. UXO detonation is anticipated to be infrequent, localized, and temporary as detonation is not the preferred method of removal for any anticipated project. However, given the large ranges to auditory and non-auditory injury, the risk for mortality, and the severity of consequences to an exposed individual, impacts due to an unmitigated UXO detonation would be moderate for sea turtles because this could result in the loss of individuals, but populations would be expected to recover after construction of one NY Bight project.

Impact and Vibratory Pile-Driving

Noise from impact and vibratory pile-driving for the installation of WTG and OSS monopile or jacket foundations would occur intermittently during the installation of offshore structures. Impact pile-driving is anticipated to be used for monopiles and piled jacket foundations; vibratory impact pile-driving would likely only be used for piled jacket foundations. Maximum hammer energy for impact pile-driving is assumed to be less than 5,000 kJ with an estimated duration of up to 4 hours per day. Vibratory pile-driving is predicted to occur over a 1-hour period. If suction bucket or gravity-based foundations are used, no pile-driving would be required; therefore, no impact or vibratory pile-driving noise impacts would occur.

Noise produced by impact pile-driving during installation of WTG and OSS foundations have the potential to result in PTS and behavioral disturbances for all sea turtle species. Although acoustic modeling is not available for one NY Bight project activities, unmitigated ranges to the PTS thresholds for impact pile-driving may exceed 12,139 feet (3,700 meters) for the installation of one monopile per day based on acoustic modeling conducted for similar offshore wind project construction (Empire 2022; Küsel et al. 2022a,b; Tetra Tech 2022). Ranges to the behavioral disturbance threshold for sea turtles may extend to distances from 6,562 to 16,404 feet (2,000 to 5,000 meters) for large-diameter monopile foundations measuring between 30 and 49 feet (9 and 15 meters), which are the foundation type likely to result in the greatest potential for acoustic impacts, depending on the location (Empire 2022; Küsel et al. 2022a,b; Tetra Tech 2022). Vibratory pile-driving is not likely to result in PTS or behavioral disturbance for any species considering threshold ranges are predicted to be very small, extending <164 feet (<50 meters) for PTS thresholds and <656 feet (<200 meters) for behavioral thresholds (Tetra Tech 2022).

Glauconite sands may be present in the NY Bight lease areas. Depending on the classification of the glauconite sands present, there can be challenges associated with potential offshore wind development in these areas. Specifically, some glauconite sands are difficult, or even impossible, to drill through and cause high friction and increased noise during pile-driving. If developers discover glauconite sands during construction and installation, noise levels will likely increase as they determine if the glauconite is passable.

Behavioral and masking effects are more difficult to mitigate with large threshold ranges and are considered likely during impact pile-driving. One NY Bight project includes installation of up to 280 WTG and up to 5 OSS, which would equate to up to 285 days of impact pile-driving (assuming one monopile installation per day). Avoidance of impulsive noise sources by sea turtles has also been inferred from field observations of sea turtle behavior during seismic surveys (DeRuiter and Doukara 2012; Holst et al. 2006; Weir 2007), and other responses include short-term displacement of feeding or migratory activity (NSF and USGS 2011; Samuel et al. 2005). Though sea turtles may temporarily avoid the area, behaviors would be expected to return to normal after construction, and no long-term impacts that would affect stock or population viability are expected.

Impacts from impact pile-driving would be moderate, with effects that are measurable and detectable, but any potential injuries would only affect individuals and would not affect population viability. Impact from vibratory pile-driving would be minor for sea turtles as effects are anticipated to be low intensity, short term, and localized.

Vessels

As discussed in Section 3.5.7.3.3, underwater noise levels produced by construction and maintenance vessels throughout the life of the project are not expected to exceed PTS thresholds for sea turtles given the relatively low noise levels produced. However, sea turtles would be able to detect construction and support vessels associated with one NY Bight project, which could elicit behavioral changes in individual sea turtles present in the project area during vessel operations, but these changes would be limited to evasive maneuvers such as diving, changes in swimming direction, or changes in swimming speed. These changes are not expected to be biologically notable, and impacts on sea turtles from one NY Bight project vessel noise would therefore be minor as population-level effects are not anticipated.

Vessel traffic during the O&M phase of one NY Bight project is expected to be infrequent and limited to the use of smaller vessels which would limit the level of noise produced during maintenance trips and G&G surveys. Given the lower volume of vessel traffic expected during O&M and the smaller size of the vessels expected, impacts on all sea turtles are expected to be barely measurable and, therefore, negligible.

Dredging, Trenching, and Cable-Laying

During one NY Bight project construction, jetting, plowing, or removal of soft sediments may be required prior to installation of the WTGs and OSSs and installation of the interarray cable and export cable. As described in Section 3.5.7.3, these activities may result in behavioral disturbances for some sea turtles, though these are expected to be low-intensity and localized (Heinis et al. 2013). Additionally, because activities associated with one NY Bight project are expected to be short term and localized, impacts on all sea turtles from dredging or trenching noise during cable-laying would be expected to be negligible, with no perceptible consequences to populations.

Drilling

Drilling activities may be used during installation of the WTG foundations in the unlikely event that a pile has been "driven to refusal," which occurs when five or more blows of an adequate hammer will not budge the pile. Drilling would be used for removal of soils, boulders, or other obstructions from the pile to ensure the foundation is safely and securely installed in the seabed. Drilling activities may produce SPL of 140 dB re μPa at 3,280 feet (1,000 meters) (Austin et al. 2018). This would exceed the continuous noise threshold of 120 dB re 1 μPa beyond 3,280 feet (1,000 meters), but these events are expected to be short term and would not be required for every foundation installed for one NY Bight project, which limits the risk of sea turtles potentially present during construction. While behavioral responses may occur from drilling, they are expected to be short term and of low intensity. Impacts from potential drilling activities on all sea turtles would therefore be minor, as the potential behavioral responses may be detectable, but population-level effects are not anticipated.

Aircraft

Aircraft used during one NY Bight project construction would follow established guidance (BOEM 2019) and would maintain altitudes of 1,000 feet (305 meters) or more above the water surface during normal flight operations, exclusive of takeoffs and landings. As discussed in Section 3.5.7.3.3, there is limited information regarding sea turtle responses to airborne aircraft noise. Based on available information, it is expected that short-term, non-biologically notable behavioral responses may occur (BOEM 2017; NSF and USCG 2011; Samuel et al. 2005). These changes in behavior are expected to end when the aircraft has left the area. Consequently, potential effects on sea turtles from aircraft noise for one NY Bight project are expected to be negligible, with no perceptible consequences to populations.

WTG Operations

As discussed in Section 3.5.7.3.3, operations of the WTG would result in long-term, low-level, continuous noise in the one NY Bight project area, which could result in behavioral disturbances and auditory masking at close distances (Lucke et al. 2007; Tougaard et al. 2009, 2020; Thomsen and Stober 2022). Noise produced by operational WTGs is within the auditory hearing range for all sea turtles, but the potential for impacts is not likely to occur outside a relatively small radius surrounding the project foundations and the audibility of the WTGs may be further limited by the ambient noise conditions of the one NY Bight project area (Jansen and Jong 2016, as an example). Impacts on sea turtles would therefore be minor as the behavioral responses would be detectable but would not be expected to result in any population-level effects.

Port utilization: Use of the port facilities located in New York and New Jersey would increase vessel traffic in the area and potentially require expansion or increased maintenance of port facilities within the sea turtle geographic analysis area. Expansion could result in impacts on coastal and estuarine habitats from shoreline noise during construction and disturbance or loss of habitat for prey species. As discussed in Section 3.5.7.3.3, there are a number of dredging and port improvement activities either planned or considered reasonably foreseeable at the representative ports identified for potential use by any of the NY Bight projects (Section D.2.5, Appendix D). Representative ports in New York and New Jersey include the Port of Albany, Port of Coeymans, Brooklyn Navy Yard, South Brooklyn Marine Terminal, Howland Hook/Port Ivory, Arthur Kill Terminal, Paulsboro Marine Terminal, and New Jersey Wind Port (Section D.2.5, Appendix D).

Increased maintenance such as dredging could expose sea turtles to increased levels of underwater noise, increased turbidity, and entrainment risk, affecting individual sea turtles or their prey. Increased activities associated with port expansion and port maintenance would likely be intermittent but long term. Increased noise associated with dredging was discussed previously under the *Noise* IPF, and vessel traffic associated with the above specified ports is covered in the *Traffic* IPF section. However, as discussed in Section 3.5.7.3.3, most dredging impacts on sea turtles were associated with hopper dredging in the southeastern United States and Gulf of Mexico (Michel et al. 2013; USACE 2020) used for dredging projects that have a much larger scope than what would be associated with one NY Bight project, so any port expansion activities associated with offshore wind projects would have a lower risk of effect on sea turtles. Additionally, most sea turtles occurring in the area would be migrating or foraging offshore, and while one species has been documented nesting in New York, this is considered a rare occurrence and is not common within the NY Bight area (Section 3.5.7.1). Therefore, dredging impacts on sea turtles from port utilization during one NY Bight project construction would be negligible as no perceptible consequences to populations are anticipated.

Port activities beyond routine maintenance of the facilities are not predicted at this time. Therefore, port utilization during the construction and O&M phase of one NY Bight project is likely to have negligible impacts on sea turtles as there would be no perceptible consequences to individuals or populations. Vessel traffic in and out of the ports is considered in the *Traffic* IPF.

Presence of structures: Under one NY Bight project, up to 280 WTGs, up to five OSSs, and new hard scour/cable protection would be installed. The structures and scour/cable protection, and the potential consequential impacts, would remain at least until conceptual decommissioning of the facility is complete. The foundations would be placed in a grid-like pattern with a minimum spacing of 0.6 by 0.6 nautical mile (1.1 by 1.1 kilometers) between WTGs. Based on the space between turbines, one NY Bight project would not present a barrier to movement to sea turtles, and the presence of WTG foundations would pose a negligible risk of displacement effects on sea turtles.

Long-term reef and hydrodynamic effects resulting from one NY Bight project could result in beneficial effects on sea turtles that benefit from increased prey abundance around the structures. However, these beneficial impacts would be reversed following project decommissioning when all project structures would be removed. The decision to remove structures or to leave them in place would be a part of the decommissioning application submitted to BSEE and approved or disapproved by BOEM at the project-specific stage. Conversely, minor impacts due to disruption in hydrodynamics from one NY Bight project could result in impacts on sea turtles that forage on planktonic species such as jellyfish. Sea turtles may also use vertical structures from one NY Bight project for shelter from strong currents to conserve energy and for cleaning their carapace (Barnette 2017). Long-term impacts could occur as a result of increased interaction with active or abandoned fishing gear. This impact is considered minor for sea turtles.

The presence of structures may concentrate recreational fishing around foundations and would also increase the risk of gear loss or damage. This could cause entanglement, especially with monofilament line, and increase the potential for entanglement in both lines and nets leading to injury and mortality due to abrasions, loss of limbs, and increased drag, resulting in reduced foraging efficiency and ability to avoid predators (Barnette 2017; Berreiros and Raykov 2014; Foley et al. 2008). The reef effect may attract recreational fishing effort from inshore areas and attract sea turtles for foraging opportunities, resulting in a small increased risk of sea turtle entanglement and hooking or ingestion of marine debris where fishing activity and turtles are concentrated around the same foundations. Therefore, though the increase in prey availability around the structures may result in long-term benefit for sea turtles, the risk of increased interactions with active or abandoned fishing gear would result in moderate impacts on sea turtles, as impacts on or loss of individuals may occur, but populations are expected to sufficiently recover.

Traffic: A number of vessels will be required to support activities carried out during the construction and installation, O&M, and conceptual decommissioning phases of one NY Bight project. Vessel traffic would be present for surveying activities; foundation, OSS, cable, and WTG installation; and support activities. The majority of the vessels are expected to have conventional propeller- or thruster-based propulsion systems. Smaller vessels designed primarily for crew transfer applications are expected to employ conventional propeller-propulsion systems or water jet-drive-based systems.

It is estimated that one NY Bight project would generate approximately 51 vessels operating in the one NY Bight project area at any one time during the construction and installation phase and approximately the same number of vessel trips per year during conceptual decommissioning as during construction and installation; the O&M phase would result in 8 trips per day primarily from ports identified in the *Port utilization* IPF to the project area (Section 3.6.6, *Navigation and Vessel Traffic*). Crew transfer vessels would account for a majority of vessel types used during O&M followed by supply vessels and jack-up vessels.

The potential effect of a vessel strike on sea turtle populations is considered severe in intensity because potential receptors include listed species and because the NY Bight area and potential vessel transit routes seasonally or annually support sea turtles. The geographic extent is considered localized to the vessel transit routes and the project area. Vessel traffic may also occur after dark or in daylight during periods of poor visibility (e.g., fog) or inclement weather conditions, during which risk of collisions with sea turtles would be higher because both turbid water and darkness would impede turtles' visual detection of approaching boats. Additionally, sea turtles spend time near the surface while resting, feeding, or periodically surfacing to breathe, during which time they would be more susceptible to vessel strikes. Data from Watwood and Buonantony (2012) and Borcuk et al. (2017) suggest loggerhead and green sea turtles spend 60 to 75 percent of the time within 32 feet (10 meters) of the surface and leatherback sea turtles spend about 20 percent of the time within 32 feet (10 meters) of the water surface; there are insufficient data to quantify Kemp's ridley sea turtle activity.

As one NY Bight project vessels would operate throughout the construction and installation, O&M, and conceptual decommissioning phases, the potential for a vessel to strike a sea turtle is considered continuous (life of one NY Bight project). Effects from vessel strikes range from short term in duration for minor injuries to permanent in the case of death of an animal. This impact is considered minor for sea turtles as there is potential for mortality or serious injury to occur to individuals, but it would not affect the viability of any sea turtle populations.

Survey gear utilization: There is currently no specific information regarding biological or fisheries monitoring surveys for one NY Bight project to quantitatively assess in this PEIS. However, unintended capture in fishing gear is a primary threat to sea turtles and is therefore included in this analysis. Sea turtles have the potential to be caught in trawl gear, longlines, gillnets, hook and line, pound nets, pot/traps, and dredge fishing gear. As discussed in Sections 3.5.7.1 and 3.5.7.3.3, impacts of entanglement from fishing gear could occur to all species in the NY Bight area. However, given the relatively limited extent and duration of these surveys, impacts on individuals would be detectable and measurable, but would not lead to population-level effects. The impact of survey gear utilization on sea turtles as a result of one NY Bight project, therefore, is expected to be minor.

Lighting: One NY Bight project would introduce mobile and stationary artificial light sources to the lease area that would persist from dusk to dawn. Artificial light in coastal environments is an established stressor for juvenile sea turtles, which use light to aid in navigation and dispersal and can become disoriented when exposed to artificial lighting sources, but the significance of artificial light in offshore environments is less clear (Gless et al. 2008). Available data suggests that there is the potential for effects on sea turtle species as a result of artificial lighting. While these effects would be localized and limited to the area exposed to operational lights, the effects would persist over the lifetime of the project. Orr et al. (2013) indicate that lights on wind generators flash intermittently for navigation or safety purposes and do not present a continuous light source. Limpus (2006) suggested that intermittent flashing lights with a very short “on” pulse and long “off” interval are non-disruptive to sea turtle behavior, irrespective of the color. Similarly, navigation/anchor lights on top of vessel masts are unlikely to adversely affect sea turtles (Limpus 2006). Orr et al. (2013) summarized available research on potential operational lighting effects from offshore wind energy facilities and concluded that the operational lighting effects on sea turtle distribution, behavior, and habitat use were unknown but likely negligible when recommended design and operating practices are implemented. Therefore, the impact of artificial lighting on sea turtles as a result of one NY Bight project is expected to be negligible.

3.5.7.4.2 Impacts of Six Projects

The same IPF impact types and mechanisms described under one project apply to six projects developed for the NY Bight. There would be more potential for impacts for these IPFs due to the greater amount of offshore and onshore development under six NY Bight projects. Impacts for accidental releases, discharges/intakes, EMFs and cable heat, survey gear utilization, and lighting are expected to be the same as those discussed above for one NY Bight project. These IPFs from six projects would not result in combined effects due to the highly localized nature of the individual IPFs, the low probability of any effects for even one project, and no population-level consequences for sea turtles. While individual projects vary in size and individual IPFs for each project may vary, the overall likelihood of impacts resulting from these IPFs for any one project remains the same as described in Section 3.5.7.4.1 regardless of the number of NY Bight projects considered. IPFs that will have a greater potential for impact under six NY Bight projects include cable emplacement and maintenance, noise, port utilization, presence of structures, and traffic.

Cable emplacement and maintenance: Under six NY Bight projects, the total area of seafloor disturbance would increase due to the substantial increase in the number of cables installed and maintained in the NY Bight area. Additionally, construction of six NY Bight projects would increase the amount of dredging equipment and activities used during installation of the cables. As discussed in Sections 3.5.7.3.3 and 3.5.7.4.1, direct impacts from dredging, particularly entrainment, typically result in severe injury or mortality for sea turtles (Dickerson et al. 2004; NMFS 2020). However, the risk of interactions between hopper dredges and individual sea turtles is expected to be lower in the open ocean areas where six NY Bight project cables would likely be installed compared to nearshore navigational channels where sea turtles are more concentrated in a constrained operating environment (Michel et al. 2013; NMFS 2020). The risk of entrainment in dredging associated with cable emplacement for six NY Bight projects would be measurable but impacts would be localized and minor for sea turtles as no population-level effects would occur.

Noise: Under six NY Bight projects, noise generated from impact pile-driving will increase due to the substantial increase in the number of foundations to be installed in the NY Bight area. If the construction of six NY Bight projects does not occur simultaneously, the total sound entering the water column at any given time would approximate that described for one NY Bight project (see *Noise* IPF). However, if construction occurs simultaneously on all six NY Bight projects, this would greatly increase the ensonified region. The impact on sea turtles, however, would remain moderate as PTS cannot be ruled out. The risk to sea turtles from UXO detonations will also increase under six NY Bight projects given the increased area over which UXOs may be encountered that cannot be avoided; the impact, however, will remain the same as for one NY Bight project and is expected to be moderate for sea turtles given the high-consequence severity of this IPF regardless of the number of detonations anticipated. Given the expected substantial increase in vessels operating under six NY Bight projects, impacts on sea turtles due to vessel noise would be elevated to minor for all phases (construction and installation, O&M, conceptual decommissioning), with effects that are detectable and measurable under full buildout of six NY Bight projects but would not lead to population-level effects. The impact on sea turtles from WTG operations under six NY Bight projects would elevate to minor for sea turtles due to potential long-term, localized presence in low-frequency noise that would be restricted to a small radius around each WTG. The impact of six NY Bight projects from all other noise sources (G&G surveys, aircraft, cable laying/trenching, and drilling) would increase marginally, but because the area of effect would also be limited to a relatively small area around the activity for six NY Bight projects, the full build out of projects is not expected to result in prolonged behavioral disturbances that would affect foraging or reproduction for any species, and would not elevate to higher impact levels as compared to one NY Bight project.

Within a concurrent exposure scenario of multiple wind farms under construction, an individual sea turtle in the area has the potential to be exposed to the sounds from more than one pile-driving event within a given season if traveling through more than one lease area during impact pile-driving. However, results from a previous risk assessment for marine mammals conducted for three projects offshore New England showed that concurrent construction of multiple wind farms could in fact minimize the overall risk to sea turtles by reducing the overall duration of impact pile-driving noise present within the NY Bight area (Southall et al. 2021). Therefore, the risk of noise effects on sea turtles is not expected to significantly increase from the construction of six NY Bight projects compared to one project, but the risk of effects of exposure to noise above acoustic thresholds during impact pile-driving cannot be ruled out. This would result in a moderate impact rating for pile-driving for all sea turtles.

Port utilization: Similar to the discussion for cable emplacement and maintenance under six NY Bight projects scenario, port utilization under six NY Bight projects would also increase. This would increase the likelihood of dredging projects occurring that could present the risk of entrainment for sea turtles. With the increase in the number and spatial extent of ports needed to support six NY Bight projects, impacts from potential dredging would be elevated to minor for sea turtles as impacts on individuals would be detectable and measurable, but would not lead to population-level consequences.

Presence of structures: Under six projects, the number of structures in the NY Bight area would be substantially higher than that for one NY Bight project. As a result, the presence of structures IPF has the potential to be more impactful to sea turtles under six NY Bight projects, mainly due to the increased risk of entanglement associated with additional vertical structures in the water column. Sea turtles would be at an increased risk of entanglement and may experience long-term consequences; impacts, however, are expected to remain moderate as effects would be detectable and measurable, though the viability of the species is likely to remain functional or are able to sufficiently recover. Minor beneficial impacts will likely still result due to the reef effect and potential increase in foraging opportunity, which would be measurable, though localized, and may be offset given the increased risk of entanglement due to derelict fishing gear on the structures.

Traffic: The construction of six NY Bight projects will substantially increase the number of vessels operating in the NY Bight area throughout all six NY Bight project phases. This increase in vessel traffic will increase the impact on all sea turtles from minor under one NY Bight project to moderate under six NY Bight projects because the consequences would be detectable and long-term for individuals, but populations are expected to remain viable.

3.5.7.4.3 Impacts of Alternative B on ESA-Listed Species

General impacts of Alternative B on sea turtles were described in the previous subsection. Because all sea turtle species present in the NY Bight area are listed under the ESA, the impact determinations provided in the previous subsections would apply here.

3.5.7.4.4 Cumulative Impacts of Alternative B

The construction and installation, O&M, and conceptual decommissioning of infrastructure for planned non-offshore-wind and planned offshore wind activities across the geographic analysis area would contribute to the primary IPFs of accidental releases, discharges/intakes, cable emplacement and maintenance, electric and magnetic fields and cable heat, noise, port utilization, presence of structures, traffic, and survey gear utilization.

Accidental releases: In the context of ongoing and planned non-offshore-wind and offshore wind activities, the impact contributed by accidental releases from six NY Bight projects would be undetectable. Impacts, therefore, are expected to be temporary and highly localized due to the likely limited extent and duration of a release, resulting in minor impacts for sea turtles, largely driven by ongoing and planned non-offshore-wind activities.

Cable emplacement and maintenance: In the context of reasonably foreseeable environmental trends, the contributions of six NY Bight projects to the combined cable emplacement impacts associated with planned non-offshore-wind and planned offshore wind activities would be undetectable on sea turtles. Impacts are expected to be minor, with short-term, localized consequences to individuals that are detectable and measurable but do not lead to population-level effects.

Discharges/intakes: In the context of reasonably foreseeable environmental trends, the contributions of six NY Bight projects to the combined discharge and intake impacts associated with planned non-offshore-wind and planned offshore wind activities would be undetectable. Impacts, therefore, are expected to be low in intensity, highly localized, and non-measurable, resulting in negligible impacts for sea turtles.

Electric and magnetic fields and cable heat: In the context of reasonably foreseeable environmental trends, the impact contributed by six NY Bight projects, while difficult to detect, would result in a cumulative increase in EMFs in the geographic analysis area beyond that described under the No Action Alternative. However, the combined impacts from EMFs and cable heat on sea turtles would likely still be negligible, localized, and long-term though with no perceptible consequences to individuals or populations.

Noise: In the context of reasonably foreseeable environmental trends, the contributions of six NY Bight projects to the combined noise impacts associated with planned non-offshore-wind and planned offshore wind activities described for Alternative A in Section 3.5.7.3.3 would be noticeable. The most significant sources of noise are expected to be pile-driving and UXO detonation. Impacts from impact pile-driving and UXO detonation would be moderate for all sea turtles due to the potential for severe-intensity effects such as non-auditory injury, but populations would be expected to fully recover. Impacts from vibratory pile-driving, G&G surveys, vessel noise, foundation drilling, and WTG operations would be minor for all sea turtles as impacts would be detectable and measurable but would not lead to population-level effects. Impacts from aircrafts and dredging, trenching, and cable-laying would be negligible for all sea turtles as impacts on individuals would be barely perceptible, short term, and highly localized.

Port utilization: In the context of ongoing and planned non-offshore-wind and offshore wind activities, the impact contributed by six NY Bight projects would result in a noticeable increase in port utilization in the geographic analysis area beyond that described under the No Action Alternative. The cumulative impacts of port utilization would therefore be minor, as impacts on sea turtles are expected to be detectable, but highly localized and intermittent; population-level impacts would not be expected.

Presence of structures: In the context of ongoing and planned non-offshore-wind and offshore wind activities, the impact contributed by six NY Bight projects would result in a noticeable increase in the presence of structures in the geographic analysis area beyond that described under the No Action Alternative. However, the combined impacts from the presence of structures would likely still be moderate for sea turtles, largely due to the risk of secondary entanglement in lost fishing gear, but population-level impacts are not expected. Minor beneficial impacts may result for sea turtles as well due to the reef effect and potential increase in foraging opportunity.

Traffic: In the context of ongoing and planned non-offshore-wind and offshore wind activities, the impact contributed by six NY Bight projects would result in a noticeable increase in vessel traffic in the geographic analysis area. The combined impact would be moderate for sea turtles because vessel strike would result in long-term consequences to individuals that are detectable and measurable but would not affect the viability of any sea turtle populations.

Survey gear utilization: In the context of ongoing and planned non-offshore-wind and offshore wind activities, the impact contributed by six NY Bight projects would be undetectable. Impacts, therefore, are expected to be minor, with short-term, localized consequences to individuals that are detectable and measurable but do not lead to population-level effects.

Lighting: In the context of ongoing and planned non-offshore-wind and offshore wind activities, the impact contributed by six NY Bight projects would result in a noticeable increase in artificial lighting in the geographic analysis area beyond that described under the No Action Alternative. However, the combined impacts from lighting would likely remain negligible for sea turtles, largely due to the limited potential for impacts, if any, and the localized and temporary impacts; although impacts on individuals would be detectable and measurable, no population-levels effects are expected.

3.5.7.4.5 Conclusions

Impacts of Alternative B. Construction and installation, O&M, and conceptual decommissioning of either one or six NY Bight projects, would result in habitat disturbance (presence of structures and new cable emplacement), habitat conversion (presence of structures), underwater and airborne noise, vessel traffic (strikes and noise), and potential discharges/spills and trash under Alternative B. For both one and six NY Bight projects, BOEM expects individual impacts ranging from **negligible** to **moderate** for sea turtles because impacts from most IPFs would likely be noticeable and measurable but would not affect the continued viability of any sea turtle populations. Impacts are expected to result mainly from pile-driving noise, UXO detonations, increased vessel traffic, and the presence of structures related to fishing gear entanglement. **Minor beneficial** impacts for sea turtles are expected to result from the presence of structures primarily due to an increase in foraging opportunity as a result of the artificial reef effect for both one and six NY Bight projects, which may be offset given the increased risk of entanglement due to derelict fishing gear on the structures.

Cumulative Impacts of Alternative B. BOEM anticipates that the cumulative impacts on sea turtles in the geographic analysis area under six NY Bight projects would likely be **negligible** to **moderate** for sea turtles and could include **minor beneficial** impacts. Long-term effects may occur for individual sea turtles, primarily due to UXO detonations, pile-driving noise, vessel traffic, and entanglement risk associated with the presence of structures, but impacts would be recoverable and would not affect the viability of the populations. In the context of other reasonably foreseeable environmental trends, impacts contributed by six NY Bight projects to the cumulative impact on sea turtles would range from undetectable to appreciable. Six NY Bight projects would contribute to the cumulative impacts primarily through pile-driving noise, increased vessel traffic, and the presence of structures as related to fishing gear entanglement.

3.5.7.5 Impacts of Alternative C (Proposed Action) – Identification of AMMM Measures at the Programmatic Stage – Sea Turtles

Alternative C, the Proposed Action, considers the potential impacts of future offshore wind development for the NY Bight Area with the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts. Alternative C consists of two sub-alternatives—Sub-alternative C1: Previously Applied AMMM Measures, and Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures. The analysis for Sub-alternative C1 is presented as the change in impacts from those impacts discussed under Alternative B, and the analysis for Sub-alternative C2 is presented as the change from Sub-alternative C1. Refer to Table G-1 in Appendix G, *Mitigation and Monitoring*, for a complete description of AMMM measures that make up the Proposed Action.

3.5.7.5.1 Sub-Alternative C1 (Preferred Alternative): Previously Applied AMMM Measures

Sub-alternative C1 analyzes the AMMM measures that BOEM has previously required as conditions of approval for previous activities proposed by lessees in COPs submitted for the Atlantic OCS and through related consultations (Table 3.5.7-8).

Table 3.5.7-8. Summary of previously applied avoidance, minimization, mitigation, and monitoring measures for sea turtles

Measure ID	Measure Summary
MMST-1	This measure proposes requiring submittal and approval of a Reduced Visibility Monitoring (RVMP)/Nighttime Pile Driving Monitoring Plan to ensure visual monitoring can be achieved.
MMST-2	This measure proposes requiring the submittal and approval of a final pile-driving Marine Mammal and Sea Turtle monitoring plan with PAM and PSO requirements.
MMST-3	This measure proposes adjusting pile-driving clearance zones, shutdown zones, and monitoring and mitigation measures for pile driving based on sound field verification measurements.
MMST-4	This measure proposes requiring time of day restrictions, PSOs, clearance, and shutdown zones for pile-driving activities to reduce impacts from noise.
MMST-5	This measure proposes requiring additional PSO coverage to reliably monitor expanded pile driving clearance or shutdown zones to reduce noise impacts on marine mammals and sea turtles.
MMST-6	This measure proposes requiring that PSOs have effective viewing conditions (e.g., rain, fog, darkness) for visual monitoring during pile-driving to ensure unobstructed visual monitoring.
MMST-7	This measure proposes requiring that PSO coverage and training requirements for pile driving are sufficient to detect protected species.
MMST-9	This measure proposes requiring vessel crew and PSO training for protected species identification to reduce vessel strike risk.
MMST-10	This measure proposes requiring PSO reporting of all protected species in the shutdown zone during active pile driving.
MMST-12	This measure proposes requiring clearance and shutdown zones and related mitigations for marine mammals and sea turtles during geophysical surveys.
MMST-14	This measure proposes requiring that vessel operators and crews maintain a watch for protected species and take mitigative action if sighted to reduce vessel strike risk.
MUL-1	This measure proposes requiring training, recovery, prevention, and reporting to reduce and eliminate trash and debris in order to reduce impacts from entanglement, ingestion, smothering of protected species (including marine mammals, sea turtles, and benthic species), and pollutants in the water column. This measure also proposes requiring surveys to monitor and adaptively mitigate for lost fishing gear accumulated at WTG foundations.
MUL-8	This measure proposes requiring that all trap/pot gear used in fishery surveys would be uniquely marked to distinguish it from commercial or recreational gear and to facilitate identification of gear on any entangled marine mammals, sea turtles, or ESA-listed fish.
MUL-9	This measure proposes requiring recovery and reporting of any lost fishery and benthic monitoring survey gear to reduce entanglement impacts on marine mammals, sea turtles, and ESA-listed fish.
MUL-10d	This measure proposes requiring qualified third-party PSOs to observe Clearance and Shutdown Zones and implement mitigation measures during data collection and site survey activities.
MUL-10e	This measure proposes PSO reporting requirements during site-characterization and site assessment/data collection activities
MUL-13	This measure proposes requiring use of trained observers onboard trawl and trap surveys to mitigate impacts on protected species, including marine mammals, sea turtles, and fish.
MUL-14a	This measure proposes developing and implementing standard protocols for addressing UXOs. Avoidance to the maximum extent practicable is required; a plan must be submitted if avoidance is not possible.
MUL-16	This measure proposes development and implementation of a plan for post-storm event monitoring of facility infrastructure, foundation scour protection, and cables. BSEE reserves the

Measure ID	Measure Summary
	right to require post-storm mitigations to address conditions that could result in safety risks and/or impacts to the environment.
MUL-19	This measure proposes requiring inspecting the cables after installation to determine location, burial, and conditions of the cable and surrounding areas and implementing remedial actions if needed.
MUL-20	This measure proposes requiring implementation of soft start techniques during impact pile-driving to reduce noise impacts on marine mammals, sea turtles, and finfish.
MUL-29	This measure proposes requiring pile-driving sound field verification, a written plan to inform the size of the isopleths for potential injury and harassment, and reporting requirements.
MUL-31	This measure proposes that all fisheries sampling gear is hauled out every 30 days and between seasons to minimize entanglement risk.
MUL-32	This measure outlines PSO reporting requirements (including foundation pile driving).
MUL-33	This measure proposes requiring communication of protected species sightings and detections amongst all project vessels.
MUL-34	This measure proposes requiring reporting of any observations or collections of injured or dead protected species.
MUL-37	This measure proposes requiring use of FAA-approved lighting that will only become active if an aircraft is present in the vicinity of the wind farm to reduce visual impacts at night.
ST-3	This measure proposes requiring vessels deploying fixed fisheries survey gear be equipped with disentanglement equipment and follow Northeast Atlantic Coast STDN Disentanglement Guidelines to reduce impacts on sea turtles from entanglement.
STF-2	This measure proposes requiring identification, data collection, handling, and resuscitation measures for sea turtles and Atlantic sturgeon caught and retrieved in fisheries survey gear to minimize impacts from entanglement.
STF-4	This measure proposes requiring reporting of any potential takes of sea turtles and Atlantic sturgeon during fisheries surveys.

Impacts of One Project

As compared to under Alternative B, implementation of previously applied AMMM measures would reduce impacts on sea turtles for IPFs, including accidental releases, cable emplacement and maintenance, EMF and cable heat, noise, presence of structures, traffic, survey gear utilization, and lighting. Impacts for other IPFs would remain the same as described under Alternative B.

BOEM-proposed mitigation, monitoring, and reporting measures derived from BOEM's *Data Collection and Site Survey Activities for Renewable Energy on the Atlantic OCS* Biological Assessment (Baker and Howsen 2021) and presented in BOEM's *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection* notice (last revised on November 22, 2021) (BOEM 2021) are required under Lease issuance, and are therefore considered standard for preconstruction activities. These measures are primarily related to reducing impacts on sea turtles from G&G survey equipment and vessel traffic during site assessment surveys. Measures that are or will soon be required by federal law, such as USCG discharge rules and the pending NMFS NARW speed rule, are requirements for all vessel operators and not limited to offshore wind or project-specific activities; these measures are accounted for in both Alternative B and Sub-alternative C1 analyses. AMMM measures that are specific to a given IPF or IPFs from Table 3.5.7-8 are discussed further below, except those that are limited to required reporting procedures, which are not expected to reduce expected impacts on sea turtles and therefore are not considered further in this analysis.

Accidental releases: Potential impacts on sea turtles from accidental releases may decrease under Sub-alternative C1 compared to Alternative B. AMMM measure MUL-1 would require standardized marine debris awareness training for project personnel, proper marking and stowage of all materials, equipment, tools and containers, and recovery for all discarded or lost items to the extent practicable. MUL-1 would also require marine debris monitoring around WTG foundations. Additionally, MUL-9, which requires the recovery of lost survey gear, would reduce the amount of marine debris that is in the water as a result of project activities and infrastructure. Implementation of these waste management and mitigation measures, as well as marine debris awareness training, would reduce the likelihood of an accidental release. The impact of accidental releases and discharges under Sub-alternative C1 would be reduced from minor as in Alternative B, to negligible for sea turtles and would be low intensity, short term, and localized and not lead to population-level consequences.

Cable emplacement and maintenance: Potential impacts on sea turtles from cable emplacement and maintenance activities, primarily through increased turbidity in the water column, may be decreased under Sub-alternative C1 compared to Alternative B. AMMM measure MUL-19, which proposes inspection of the cables during operations and implementing remedial actions if needed, could help reduce the potential effects of cable maintenance during operations if additional mitigation measures are deemed necessary. Overall, these measures would only be expected to provide a nominal reduction in potential turbidity effects on sea turtles, and potential impacts are, therefore, not expected to differ under Sub-alternative C1 compared to Alternative B (i.e., negligible).

Electric and magnetic fields and cable heat: AMMM measure MUL-19 would require periodic post-installation cable monitoring. While this measure may identify areas where project HVAC or HVDC cables are exposed on the seabed, it is not anticipated to reduce the level of impact of this IPF on sea turtles compared to Alternative B. The G&G survey efforts and vessel traffic needed to satisfy this AMMM measure could increase risk to sea turtles through both noise and traffic IPFs. However, this potential increase in risk is not anticipated to increase any IPF impact rating; thus, the impact expected on sea turtles remains negligible.

Noise: As discussed in Section 3.5.7.4.1, unmitigated noise has the potential to be highly impactful to sea turtles, especially that originating from UXO detonations and impact pile-driving. As a result, BOEM has developed several AMMM measures that are designed specifically to mitigate the sound exposure levels from impact pile-driving on sea turtles, thereby reducing the potential impact of this IPF.

PSO training, visual monitoring coverage, shutdown procedures, and monitoring equipment effectiveness, procedures, and protocols are critical to monitoring the defined clearance and shutdown zones during noise-generating activities (AMMM measures MMST-3, MMST-4, MMST-5, MMST-6, MMST-7, MMST-10, and MMST-12). These measures—namely those that establish clearance and exclusion zones—establish protocols to effectively monitor them by trained PSOs. Furthermore, the measures require shutdowns for sea turtles detected within these zones that will reduce the overall impact on sea turtles by reducing exposure to sound levels that can cause PTS. Reduction in PTS exposure would reduce the likelihood that a sea turtle is within range to experience these sound levels and would reduce the duration the sea turtle may be exposed to these sound levels.

An RVMP/Nighttime Pile Driving Monitoring Plan (MMST-1) must be prepared and submitted for agency review and approval. Additionally, MMST-2 requires the submittal of a pile-driving monitoring plan, which will need to be consistent with all monitoring and mitigation requirements.

Additionally, the pile-driving sound field measurement requirements proposed under AMMM measures MMST-2, MMST-3, and MUL-29 would confirm the predicted clearance and shutdown zones, adjust these zones or implement additional sound attenuation as needed, and require a pile-driving sound field verification plan to inform the size of the isopleths for potential injury and harassment, respectively. The clearance and exclusion zones will be based on the modeled threshold ranges, and the sound field measurements proposed under these AMMM measures will help ensure the proposed mitigation zones established in the AMMM measures listed previously effectively minimize the risk of PTS, if not eliminating it altogether.

Under Sub-alternative C1, AMMM measure MUL-29 would require the lessee to perform sound field verification of impact pile-driving noise levels during foundation installation. Pile-driving sound field measurement requirements proposed under AMMM measures MMST-3, MUL-22, and MUL-29 would confirm the predicted clearance and shutdown zones in the approved permits, enable adjustment of these zones (MMST-3), and require the lessee to implement additional sound attenuation as needed. Under this AMMM measure, the lessee would be required to prepare and submit for agency review and approval a sound field verification plan before commencement of pile-driving activities. This plan will identify key project parameters, the predicted clearance and shutdown zones, and the lessee’s approach for obtaining the sound field data. The clearance and exclusion zones will be based on the modeled threshold ranges, and the sound field measurements proposed under these AMMM measures will help ensure the proposed mitigation zones established in the AMMM measures effectively minimize the risk of PTS, if not eliminate it altogether.

Preparing and approving an RVMP/Nighttime Pile Driving Monitoring Plan (MMST-1) prior to construction for activities occurring at night or in low-visibility conditions will also ensure sufficient visual PSO coverage for monitoring the clearance and exclusion zones is achieved and implemented for all pile-driving activities. Seasonal restrictions (MMST-4) are primarily designed to avoid pile-driving activities during the period when NARW abundance in the project area is likely to be heightened, which, per this AMMM measure, occurs between January 1 and April 30. However, available data suggests that sea turtles present in the NY Bight area are most likely to occur between spring and fall (Section 3.5.7.1), which largely overlaps with the seasons of low NARW abundances. Therefore, sea turtles are less likely to benefit from this AMMM measure as increased abundances of these species are likely to occur during seasons when impact pile-driving would also occur. Finally, the greatest protections for sea turtles under MMST-4 would be through the implementation of clearance and exclusion zones to be monitored by trained PSOs as described above.

Soft-start procedures (MUL-20) can also be an effective mechanism to reduce the potential for PTS exposures in certain species during impact pile driving by deterring individuals from the ensonified area before the maximum hammer energy, and therefore the maximum sound levels, are reached. However, the efficacy of deterring sea turtle species through pile-driving soft-start procedures is unknown.

Consideration of all AMMM measures for impact pile driving of OSS and WTG foundations under Sub-alternative C1 is expected to reduce the potential impact of pile-driving noise on all sea turtles from the impacts under Alternative B. This would substantially reduce the impact of impact pile-driving to minor for all sea turtles. Impacts would be detectable and measurable, but will be of low intensity, highly localized, and short term in duration; population-level impacts are not anticipated under Sub-alternative C1.

AMMM measure MUL-14a is specifically designed for UXO detonations and proposes avoidance of underwater detonations to the maximum extent practicable and use of the best available technology to avoid or minimize exposure of protected resources to UXO detonations. Additionally, this measure requires consultation with all appropriate state and federal agencies to develop a plan for removal or detonation of a UXO if detonation is demonstrated to be necessary for the project.

The intensity of the effects from UXO detonation is expected to be reduced from severe to medium with the implementation of mitigation and monitoring measures that are applied to pile driving. These measures (PSOs, clearance and shutdown zones, and noise mitigation devices) are expected to limit impacts from extending beyond the immediate project area to a more localized extent that includes just the immediate project area. However, even with monitoring and mitigative measures, there could still be loss of individuals so the impact of UXO detonation would remain as moderate for all sea turtles, but no population-level impacts are anticipated under Sub-alternative C1.

AMMM measures for G&G surveys would include similar measures to those described for impact pile driving such as PSO training, visual monitoring coverage, shutdown procedures, and monitoring equipment effectiveness, procedures, and protocols (AMMM measures MMST-10 and MMST-12). However, under Alternative B (Section 3.5.7.4.1), the main impact from these surveys would be temporary behavioral disturbances, given the acoustic characteristics of these sources and extent of these surveys; the AMMM measures under Sub-alternative C1 would not reduce the impacts to the extent that they are not measurable. Therefore, impacts of G&G surveys would remain detectable and measurable but of low intensity, highly localized, and short-term and therefore minor for all sea turtles.

For noise-producing activities such as vessel operations, aircraft, cable laying or trenching, drilling, and WTG operations, there are no vessel noise-specific AMMM measures for these activities, and impacts under Sub-alternative C1 are unlikely to differ substantially from those under Alternative B (Section 3.5.7.4.1).

Additional discussion of the noise-related AMMM measures and how they may reduce noise impacts can be found in Appendix J.

Presence of structures: The primary impact on sea turtles associated with the presence of structures is due to entanglement risk resulting from an increased interaction with active or abandoned fishing gear. AMMM measures MUL-1, MUL-8, MUL-9, MUL-16, MUL-31, ST-3, ST-2, and STF-4 address this risk by providing guidance for gear use, and monitoring and adaptively mitigating recreational and commercial fishing gear that might be lost at sea. Monitoring and removing lost or derelict fishing gear will reduce exposure to such gear, therefore reducing the risk of entanglement to sea turtles. AMMM measure MUL-31 specifically requires all project-related sampling gear to be hauled at least once every 30 days and removed from the water between sampling seasons and MUL-9 requires the recovery of lost project-related survey gear which would help reduce the amount of gear caught on WTG foundations during O&M. Both measures are expected to reduce entanglement risk to sea turtles by minimizing exposure to and monitoring all survey gear periodically. While required gear marking (MUL-8) would not reduce entanglement risk directly, it would facilitate understanding which sampling gear is highest risk to sea turtles if multiple entanglements were to occur, which could be used to inform future deployments, ideally with minimized risk. BOEM would also require a monitoring plan be developed for post-storm events (MUL-16). While monitoring of cables (and cable protection) and WTG/OSS scour protection would not directly reduce effects on sea turtles, a monitoring plan would provide information about conditions that pose increased entanglement hazards from fishing gear (e.g., unburied cables), and BSEE would retain the ability to require post-storm mitigation to address safety risks and environmental impacts caused by the storm event. Based on these proposed AMMM measures, the impact from the presence of structures due to entanglement risk would be reduced from moderate, as in Alternative B, to minor for sea turtles as impacts would be detectable and measurable but not expected to lead to population-level effects.

Traffic: As discussed in Section 3.5.7.3.3, vessel strikes are a significant concern for all sea turtles. AMMM measures MMST-9, MMST-14, and MUL-33, include vessel strike avoidance procedures such as the use of trained observers, reduced vessel speeds, minimum separation distances, and project-specific training for all vessel crew, and are considered effective at reducing the risk of vessel strike to sea turtles, though they would not completely eliminate it. Speed restrictions designed specifically to reduce strike risk for NARWs (MMST-14), will also be beneficial for sea turtles by reducing the risk of collision as well as serious injury or mortality occurring. Additionally, AMMM measure MMST-14 would specifically require lessees to follow vessel strike avoidance conditions for any construction, operations, or decommissioning vessel transits associated with the project—including trained lookouts searching specifically for sea turtles—and report any sightings. The proposed mitigation outlined above is expected to reduce the risk of vessel strikes occurring or resulting in severe injury or mortality. Therefore, impacts on sea turtles would remain as minor as effects would be detectable and measurable, though would not be expected to lead to population-level consequences.

Survey gear utilization: AMMM measure ST-3 is the primary measure that would reduce the risk of sea turtle entanglement in fisheries monitoring survey gear as it requires projects to have adequate disentanglement equipment onboard when deploying any fixed gear. STF-2 also provides guidelines for safe handling and resuscitation of sea turtles caught in gear which would reduce the risk of long-term impacts or injuries occurring for entangled individuals. AMMM measure MUL-13 would implement a requirement that at least one survey staff onboard trawl and ventless trap surveys be trained in protected species identification and safe handling, and disentanglement procedures would be available onboard. AMMM measure MUL-9 would require that all reasonable efforts are undertaken to recover any survey gear that is lost during any phase of the NY Bight project, including G&G surveys, biological monitoring surveys, and fisheries monitoring surveys. Fast recovery of the lost gear would benefit sea turtles by reducing the amount of time lost gear is in the water and thereby reducing the likelihood of a sea turtle becoming entangled. Additional AMMM measures related to survey gear utilization (MUL-8, STF-2, STF-4) are more focused on tracking gear types and origins and reporting any incidents of entanglement or injury to the proper agencies. While this information is beneficial for tracking take and realized impacts on sea turtle populations, it does not reduce the risk of entanglement occurring and would not lower the impact level.

With the measures laid out in AMMM measures ST-3 and STF-2, the risk of a serious injury or mortality occurring for any sea turtle species during biological or fisheries monitoring surveys under one NY Bight project would be reduced. However, the potential impacts of entanglement would still be detectable and measurable for sea turtles, so impacts under Sub-alternative C1 would remain minor.

Lighting: AMMM measure MUL-37 would propose the use of an FAA-approved vendor for the ADLS, which will activate the FAA hazard lighting only when an aircraft is in the vicinity of the wind farm to reduce visual impacts at night. While this measure is primarily geared towards birds, cultural, and scenic and visual resources, it will indirectly benefit sea turtles by reducing the overall amount of time the safety lights are active on the project turbines. However, as discussed in Section 3.5.7.4.1, the overall effects of artificial lighting from offshore wind projects would be negligible given available data on sea turtle responses to artificial lighting, and the addition of this AMMM measure would result in a nominal reduction in the lighting produced by one NY Bight project. Therefore, the potential impacts of lighting under Sub-alternative C1 would remain negligible.

Impacts of Six Projects

The same IPF impact types and mechanisms described under one NY Bight project also apply to six NY Bight projects. There would be more potential for impacts for these IPFs due to the greater amount of offshore and onshore development under six NY Bight projects. However, with the AMMM measures described in Section 3.5.7.5.1 and Appendix G, impacts under six NY Bight projects are not expected to differ substantially from one NY Bight project. Therefore, impacts from all IPFs are expected to be the same as that discussed in Section 3.5.7.5.1 for one NY Bight project, though over the broader geographic and temporal scale covered by the six NY Bight projects.

Under a concurrent exposure scenario in which multiple NY Bight lease areas are under construction simultaneously, the overall proportion of the NY Bight ensonified by impact pile-driving noise would increase compared to the proportion ensonified by just one project, which could increase the risk of sea turtles in the NY Bight being exposed to above-threshold noise. However, as discussed for one project above, with the AMMM measures identified under Sub-alternative C1 for all six projects—which include monitoring by trained PSOs of designated clearance and exclusion zones and soft-start procedures—the risk of PTS occurring in sea turtles would be minimized by reducing the likelihood and duration of sea turtles being within range of a given pile driving event to encounter sound levels sufficient to result in PTS. Even with concurrent construction of six NY Bight projects, the area over which PTS effects may occur and the risk of sea turtles experiencing above-threshold sound levels would still be limited to a localized area around each pile installation event that would be sufficiently monitored by trained PSOs. Therefore, no additive risk of effects is expected with construction of six projects such that loss of individuals would occur, and impacts would remain minor for impact pile driving of OSS and WTG foundations under Sub-alternative C1.

Similarly with all other IPFs, either the timing or extent of the potential impacts is small enough such that consideration of six projects would not have any additive effects, and no substantial difference in these impacts on sea turtles is expected between one and six projects.

Impacts of Sub-Alternative C1 (Preferred Alternative) on ESA-Listed Species

General impacts of the Sub-alternative C1 on sea turtles were described in the previous subsection. Because all sea turtle species present in the NY Bight area are listed under the ESA, the impact determinations provided in the previous subsections would apply here.

Cumulative Impacts of Sub-Alternative C1 (Preferred Alternative)

Under Sub-alternative C1, the same ongoing and planned non-offshore-wind and offshore wind activities described for Alternative A in Section 3.5.7.3 would continue to contribute to the potential for impacts on sea turtles. In context of reasonably foreseeable environmental trends and planned actions, the cumulative impacts of Sub-alternative C1 (for six NY Bight projects)—when combined with ongoing and planned actions—would be negligible to moderate. Sub-alternative C1 would contribute to the cumulative impacts primarily through impact pile-driving noise, increased vessel traffic, and the presence of structures as related to fishing gear entanglement. Minor beneficial impacts would result from the presence of structures, though this benefit may be offset given the increased risk of entanglement due to derelict fishing gear on the structures.

3.5.7.5.2 Sub-Alternative C2: Previously Applied and Not Previously AMMM Measures

Sub-alternative C2 analyzes the AMMM measures under Sub-alternative C1 plus the AMMM measures that have not been previously applied (Table 3.5.7-9).

Table 3.5.7-9. Summary of not previously applied avoidance, minimization, mitigation, and monitoring measures for sea turtles

Measure ID	Measure Summary
MUL-22	This measure would reduce noise impacts on marine mammals, sea turtles, and finfish by establishing received sound level limits (RSLL) that will require non exceedance of an acoustic threshold at 1,000 or 1,500 meters, depending on the year of pile installation.
STF-5	This measure proposes requiring disengaging trailing suction hopper dredge pumps when dragheads are not in use to prevent impingement or entrainment of sea turtle species.

Impacts of One Project

AMMM measures MUL-22 and STF-5 could reduce impacts on sea turtles compared to those under Sub-alternative C1 for impact pile-driving and cable emplacement. Impacts for other IPFs would remain the same as described under Sub-alternative C1 (Section 3.5.7.5.1).

Cable emplacement and maintenance: AMMM measure STF-5 proposes disengaging dredge pumps when dragheads are not in use for offshore activities requiring the use of a trailing suction hopper dredge to prevent impingement or entrainment of sea turtle species. This would work to keep the dragheads firmly on the bottom to prevent impingement or entrainment of sea turtle species. Pumps would be disengaged when lowering dragheads to the bottom to start dredging, turning, or lifting dragheads off the bottom at the completion of dredging. However, the use of trailing suction hopper dredges for one NY Bight project is not definite, and—given the lower risk of encounters between dredgers and sea turtles in open ocean areas—the risk of entrainment in dredgers is low.

The implementation of this measure would be expected to contribute to the reduction of turbidity and provide an additional measure to reduce entrainment/impingement of sea turtles when added to the previously applied mitigation measures under Sub-alternative C1. The potential effects on sea turtles are therefore unlikely to differ substantially from Sub-alternative C1 (Section 3.5.7.4.1). Therefore, effects from cable emplacement and maintenance would remain negligible under Sub-alternative C2.

Noise: AMMM measure MUL-22 would establish a RSLL such that sound fields generated during impact pile-driving would not exceed thresholds defined by NOAA Fisheries for marine mammal hearing groups. As detailed in Appendix G, the RSLL requirements are specific to a frequency weighted SEL of 183 dB re 1 μPa^2 s (the PTS-onset threshold for low-frequency cetacean species) and an unweighted Lpk of 202 dB re 1 µPa (the PTS-onset threshold for high-frequency cetacean species). In comparison, the PTS-onset threshold for sea turtles is an unweighted SEL of 204 μPa^2 s and an unweighted Lpk of 232 dB re 1 µPa (Table 3.5.7-4). While MUL-22 uses marine mammal acoustic thresholds as the target limit, the area ensonified above the sea turtle PTS-onset thresholds would be expected to fall within the area ensonified above the marine mammal thresholds (since the sea turtles thresholds are higher), so reducing the range over which the marine mammal RSLL may be exceeded to a maximum of 1,500 meters would benefit sea turtles by reducing the range over which their PTS threshold would be exceeded. Additionally, minimizing the PTS ranges would reduce the range to TTS and behavioral disturbance thresholds. Reduction in the size of the PTS ranges in turn reduces the size of clearance and shutdown zones, which improves the ability for trained PSOs or other monitoring technologies to successfully detect sea turtles in and near those zones and reduces the risk of sea turtles being within these zones to experience above-threshold noise. MUL-22 could also minimize noise impacts if developers discover glauconite sands during construction and installation, which may result in increased noise levels as developers determine if the glauconite is passable. Developers would need to use different methodology, technology, or infrastructure, or apply other quieting techniques to reduce their RSLL if glauconite sands are discovered. Therefore, this AMMM measure, though designed specifically for marine mammals, would benefit sea turtles.

The potential reduction in the noise level as a result of these not previously applied AMMM measures would be beneficial for all sea turtles; however, impacts from impact pile-driving under Sub-alternative C2 are unlikely to differ substantially from those under Sub-alternative C1 (Section 3.5.7.4.1). The AMMM measures under Sub-alternative C2 would not reduce potential impacts on sea turtles from impact pile-driving such that impacts are not measurable or are difficult to measure; therefore, they would continue to be detectable and measurable but of low intensity, localized, and short-term like described under Sub-alternative C1. Effects from impact pile-driving would remain minor under Sub-alternative C2.

Impacts of Six Projects

The same IPF impact types and mechanisms described under a single NY Bight project also apply to six NY Bight projects. However, there would be more potential for impacts for these IPFs due to the greater amount of offshore and onshore development under six NY Bight projects, although these impacts could be reduced with the not previously applied AMMM measures under Sub-alternative C2. However, the not previously applied AMMM measures would not change the impact determinations under six projects compared to Sub-alternative C1 (Section 3.5.7.5.1). The only not previously applied AMMM measures under Sub-alternative C2 apply to impact pile-driving noise, so there is no change from Sub-alternative C1 for all other IPFs.

For impact pile-driving, though construction of six NY Bight projects increases the geographic and temporal scale over which pile-driving activities would occur, the implementation of the additional AMMM measures would reduce the likelihood and extent over which sea turtles may be exposed to above-threshold noise. Particularly with MUL-22, the range over which the sea turtle acoustic thresholds may be exceeded would be localized to an immediate area around each pile-driving event such that risk of exposure from six projects would not be additive and would remain the same as that described for one project. Therefore, impact pile-driving impacts associated with six projects under Sub-alternative C2 would remain detectable and measurable but low intensity, localized, and short-term. Because no population-level effects would occur, impacts would remain minor, as assessed under Alternative B and Sub-alternative C1.

Impacts of Sub-Alternative C2 on ESA-Listed Sea Turtles

General impacts of Sub-alternative C2 on sea turtles were described in the previous subsection. All sea turtle species present in the NY Bight area are listed under the ESA; therefore, the impact determinations provided in the previous subsections would apply here.

Cumulative Impacts of Sub-Alternative C2

Under Sub-alternative C2, the same ongoing and planned non-offshore-wind and offshore wind activities described for Alternative A (Section 3.5.7.3) would continue to contribute to the potential impacts on sea turtles. Impacts on sea turtles are anticipated to be similar to those described under Alternative B. While the not previously applied AMMM measures for six NY Bight projects can reduce potential adverse impacts, the impact level determination is not expected to change under Sub-alternative C2. In context of reasonably foreseeable environmental trends and planned actions, the cumulative impacts of Sub-alternative C2 (for six NY Bight projects)—when combined with ongoing and planned actions—would be negligible to moderate. Sub-alternative C2 would contribute to the cumulative impacts primarily through impact pile-driving noise, increased vessel traffic, and the presence of structures as related to fishing gear entanglement. Minor beneficial impacts would result from the presence of structures, though this benefit may be offset given the increased risk of entanglement due to derelict fishing gear on the structures.

3.5.7.5.3 Conclusions

Impacts of Alternative C. Project construction and installation, O&M, and conceptual decommissioning either from one or six NY Bight projects, would result in habitat disturbance (presence of structures and new cable emplacement), habitat conversion (presence of structures), underwater and airborne noise, vessel traffic (strikes and noise), and potential discharges/spills and trash under Sub-alternatives C1 and C2. For both one and six NY Bight projects and Sub-alternatives C1 and C2, BOEM expects individual impacts ranging from **negligible** to **moderate** for sea turtles because impacts from most IPFs would be noticeable and measurable, but likely would not affect the viability of any sea turtle populations; previously applied AMMM measures would reduce some impacts on sea turtles compared to Alternative B for accidental releases, pile driving, and presence of structures. Moderate impact levels would mainly result from UXO detonations. **Minor beneficial** impacts for sea turtles are expected to result from the presence of structures for both one and six NY Bight projects and under Sub-alternatives C1 and C2. AMMM measures that have not been previously applied would further reduce impacts on sea turtles from new cable emplacement and noise, but these reductions would not be sufficient to lower the impact determination from Sub-alternative C1.

Cumulative Impacts of Alternative C. The cumulative impacts of Sub-alternatives C1 and C2 consider the impacts of implementing AMMM measures identified in Appendix G and in combination with other ongoing and planned non-offshore-wind and offshore wind activities described for Alternative A in Section 3.5.6.3. BOEM anticipates that the cumulative impacts on sea turtles in the geographic analysis area under six NY Bight projects would likely be **negligible** to **moderate**. Moderate impact levels would mainly result from impact pile driving and construction noise, UXO detonation, risk of vessel strikes due to non-offshore-wind vessel traffic described under Alternative A, and the presence of structures as related to fishing gear entanglement. **Minor beneficial** impacts for sea turtles are expected to result from the presence of structures, though these beneficial impacts may be offset given the increased risk of entanglement due to derelict fishing gear on the structures. Impacts may be measurable and detectable but would not be expected to affect the viability of any sea turtle populations. In the context of other reasonably foreseeable environmental trends, the impacts contributed by Sub-alternatives C1 and C2 to the cumulative impact on sea turtles would range from undetectable to appreciable for pile-driving noise, increased vessel traffic, and the presence of structures as related to fishing gear entanglement. Implementation of AMMM measures that would have otherwise not been implemented under Alternative B would reduce impact levels to sea turtles for some IPFs.

3.5.7.6 Recommended Practices for Consideration at the Project-Specific Stage

BOEM is recommending that lessees consider analyzing the RPs in Table 3.5.7-10 to further reduce potential sea turtle impacts. Refer to Table G-2 in Appendix G for a complete description of the RPs.

Table 3.5.7-10. Recommended practices for sea turtles impacts and related benefits

Recommended Practice	Potential Benefit
MUL-5: Use equipment, technology, and best practices to produce the least amount of noise possible and reduce noise impacts.	Using noise reduction measures to produce the least amount of noise practicable would likely minimize disturbance/displacement impacts.
MUL-6: Use low noise practices or quieting technology to install foundations, when possible, to limit noise impacts.	The consideration of non-pile-driving foundation types (e.g., suction buckets, gravity-based foundations) first, and the use of the best available quieting technology should be applied to reach the received sound level limit (MUL-22). Using quieting technology (e.g., noise attenuation system [NAS]) reduces the risk of noise impacts on sea turtles by reducing the sound levels that propagate from the pile source. Available studies suggest that when a single or combined NAS is applied to monopile installation, noise reductions ranging from 3 to 17 dB can be achieved, depending on the NAS combination, with some frequency-dependent reductions of over 20 dB (Bellmann et al. 2020).
MUL-7: Use the most current International Maritime Organization's (IMO) Guidelines for the reduction of underwater radiated noise, including propulsion noise, machinery noise, and dynamic positioning systems for project vessels.	Following IMO guidelines would reduce underwater vessel noise.
MUL-10c: Minimize survey vessel interactions with protected species during the use of a moon pool.	Following protocols for moon pool use and monitoring for protected species would minimize vessel interactions with protected species.
MUL-12: Incorporate ecological design elements where practicable.	Using ecological designs elements such as those that could encourage growth of flora or fauna could enhance potential benefits to sea turtles due to the reef effect.
MUL-14b: When MEC avoidance is not possible, submitted UXO/MEC avoidance plans should follow, when finalized, the US Committee on the Marine Transportation System general guidance on MEC.	Following the US Committee on the Marine Transportation System general guidance on MEC would minimize effects from MEC detonation on sea turtles.
MUL-18: Coordinate transmission infrastructure among projects such as by using shared intra- and interregional connections, meshed infrastructure, or parallel routing.	Using a shared infrastructure would consolidate the extent of transmission cables, which could reduce the geographic extent of impacts, from cable emplacement and maintenance and EMF and cable heat. This RP may minimize potential impacts from offshore export cables on sea turtles.
MUL-21: Use the best available technology, including new and emerging technology, when possible and consider upgrading or retrofitting equipment. It may include technology such as jet plows, closed-loop	The use of jet plows would minimize the extent of turbidity plumes associated with cable emplacement as compared to other installation methods. As described in Section 3.4.2, *Water Quality*, a closed-loop subsea cooler system is an emerging technology,

Recommended Practice	Potential Benefit
cooling systems and new foundations designs that do not rely on pile driving.	that, if applied, would eliminate entrainment risks to sea turtles and may minimize localized hydrodynamic and thermal plume impacts because intake and discharge of seawater would not occur. Using foundation designs that do not rely on pile-driving would, if employed, reduce noise exposure to sea turtles.
MUL-23: Avoid or reduce potential impacts on important environmental resources by adjusting project design.	Adjusting project design could include analysis of the turbine layout in order to reduce potential impacts from the presence of structures. MUL-23 could include use of BOEM's risk assessment tool to model potential encounter rates between sea turtles and vessel traffic from offshore wind energy development (i.e., the "vessel strike model"). Use of this tool will serve to identify potential encounter rates between ESA-listed sea turtle species and project vessels; speed and routing variables can be incorporated to assess when and where high strike risk may occur and identify where additional mitigation measures should be focused and reduce the risk of vessel strikes.
MUL-26: Coordinate regional monitoring and survey efforts across lease areas in the NY Bight to standardize approaches, understand potential impacts to resources at a regional scale, and maximize efficiencies in monitoring and survey efforts. Develop monitoring and survey plans that meet regional data requirements and standards.	Coordinating regional monitoring and survey efforts would maximize the monitoring efficiency. The data gathered would be evaluated and considered for future mitigation and monitoring needs, which will serve to reduce impacts.
MUL-27: Employ methods to minimize sediment disturbance such as use of midline buoys to prevent cable sweep and not side-casting materials.	Minimizing sediment disturbance could reduce impacts during cable emplacement and maintenance.
MUL-39: Use of standard underwater cables designs that mitigate the intensity of EMF at the seafloor.	Shielding of cables could reduce the intensity of EMFs, cable heat, and exposure to sea turtles.
STF-1: Monitor tagged sea turtles using technology strategically placed on WTGs to monitor the effect of the presence of structures on sea turtle habitat use and residency around NY Bight project foundations.	Incorporating technologies for detecting tagged sea turtles and monitoring the effect of increases in habitat use and residency around WTG foundations would provide additional information about impacts on sea turtles and could lead to additional mitigation.

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3.5 Biological Resources

3.5.8 Wetlands

This section discusses potential impacts on wetlands from the Proposed Action, alternatives, and ongoing and planned activities in the wetlands geographic analysis area. The wetlands geographic analysis area, as shown on Figure 3.5.8-1, includes all 10-digit hydrologic unit code watersheds that could be intersected by the NY Bight projects' onshore infrastructure components. This includes locations along the New Jersey and New York coastline where BOEM anticipates wetland impacts associated with the potential construction of the NY Bight projects' onshore components. A broad geographic analysis area was defined due to the uncertainty of the landfall locations and locations of onshore project components.

The wetlands impact analysis in this PEIS is intended to be incorporated by reference into the project-specific environmental analyses for individual COPs expected for each of the NY Bight lease areas. Because the locations of onshore components for the NY Bight projects are not known at this time, the analysis of onshore wetland impacts is dependent on a hypothetical project analysis, and impact conclusions consider a maximum-case scenario for onshore development. Additional detailed site-specific analysis will be required for individual COPs. Refer to Appendix C, *Tiering Guidance*, which identifies additional analyses anticipated to be required for the project-specific environmental analysis of individual COPs.

3.5.8.1 Description of the Affected Environment and Future Baseline Conditions

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3(c)(16)). Wetlands are important features in the landscape that provide numerous beneficial services or functions. Some of these include protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters, providing aesthetic value, ensuring biological productivity, filtering pollutant loads, and maintaining surface water flow during dry periods. The majority of the wetlands in the geographic analysis area are tidally influenced salt marshes, which provide shelter, food, and nursery grounds for coastal fisheries species, including shrimp, crab, and many finfish. Wetlands also protect shorelines from erosion by creating a buffer against wave action and by trapping soils. In flood-prone areas, wetlands reduce the flow of flood water and absorb rainwater. Tidal wetlands also serve as carbon sinks, holding carbon that would otherwise be released into the atmosphere and contribute to climate change. New Jersey and New York's coastal wetlands, including those in the geographic analysis area, protect coastal water quality by acting as a sink for land-derived nutrients and contaminants, constitute an important component of coastal food webs, provide valuable wildlife habitat, and protect upland and shoreline areas from flooding and erosion.

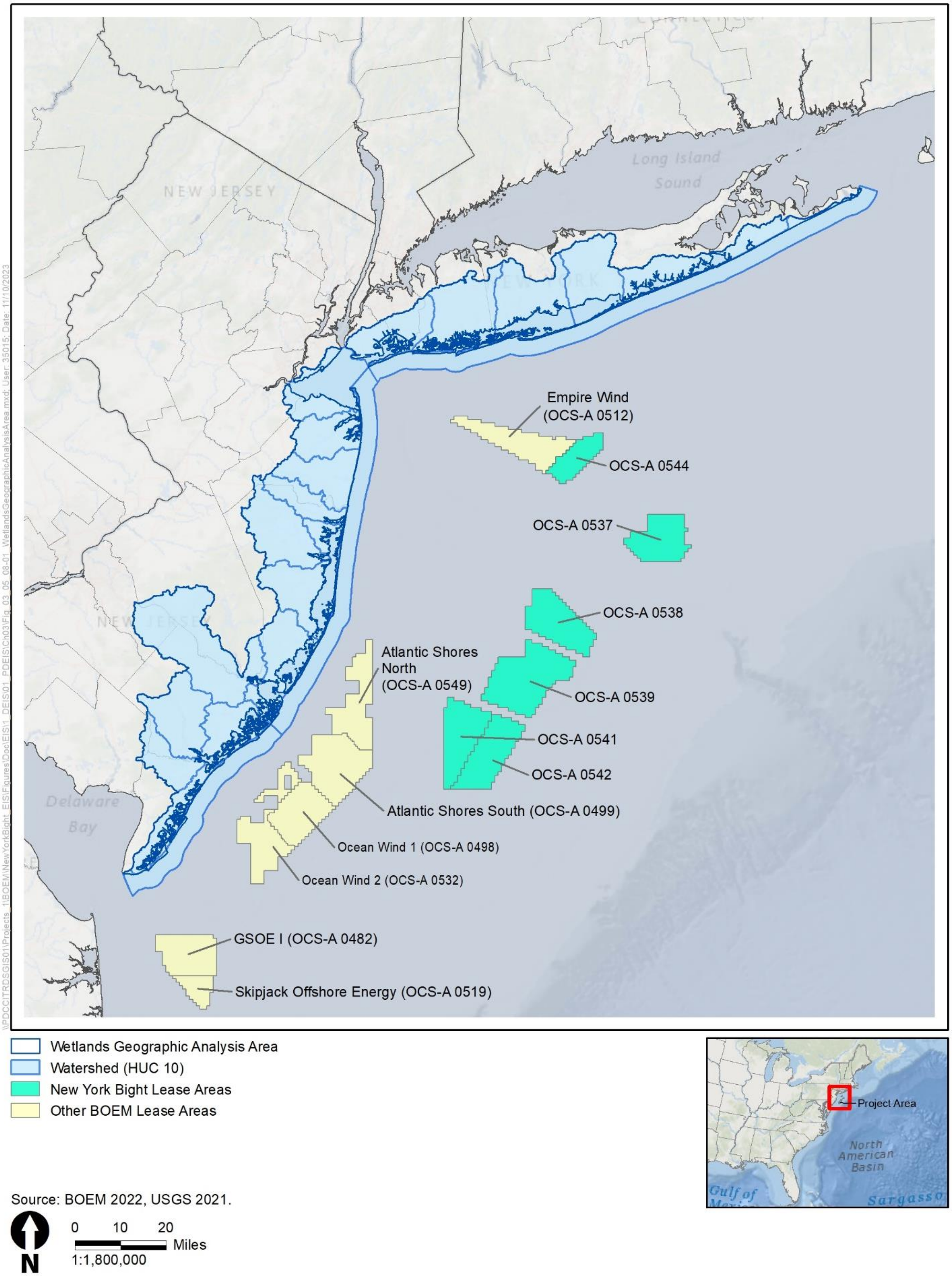


Figure 3.5.8-1. Wetlands geographic analysis area

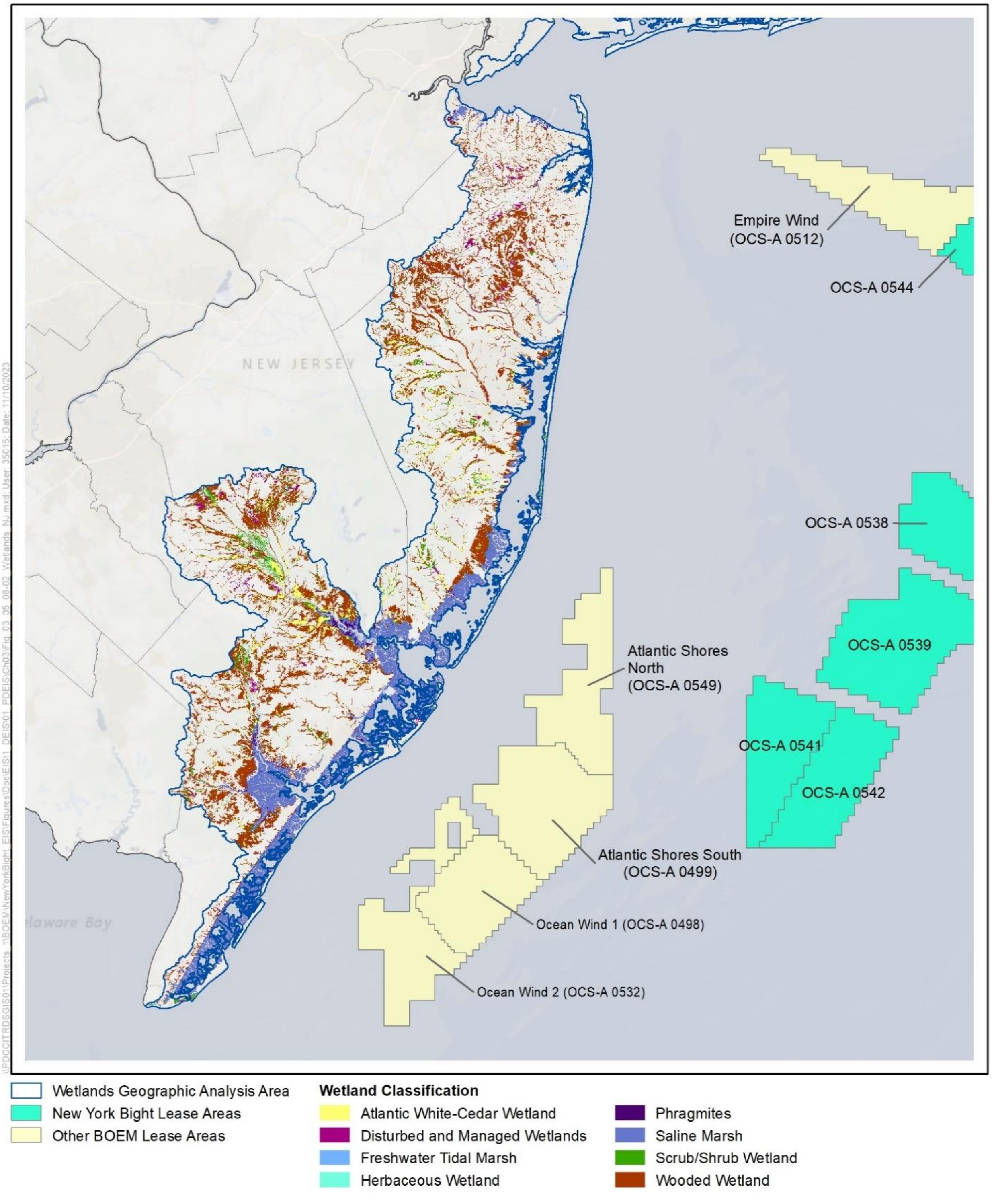
The NWI, State of NJDEP, and NYSDEC wetland GIS data sets were used to determine the potential presence of wetlands in the geographic analysis area. NWI information is provided in Appendix B, *Supplemental Information and Additional Figures and Tables*, and the NJDEP and NYSDEC information is provided in this section. These datasets map both tidal and non-tidal wetlands. Tidal wetlands in the geographic analysis area are areas where the Atlantic Ocean and estuaries meet land, are found below the spring high tide line, and are subject to regular flooding by the tides. Tidal wetlands are typically categorized into two zones: high marsh and low marsh. Non-tidal wetlands, otherwise referred to as freshwater wetlands, are not influenced directly by tides and are typically categorized based on their hydrology and predominant vegetation. To confirm the extent and presence of regulated wetlands within the onshore project area of the NY Bight projects, a wetland delineation must be conducted to identify the wetlands under jurisdiction of USACE, NJDEP, and NYSDEC. This is expected to occur for each NY Bight project prior to BOEM's decision approving, approving with modifications, or disapproving the COPs.

The New Jersey geographic analysis area contains 332,424 acres of wetlands (Table 3.5.8-1 and Figure 3.5.8-2) (NJDEP 2021). Threats to the state's wetlands include land reclamation, development, dredging, nutrient overload, and sea level rise due to climate change. Sea level rise is considered the largest climate-related threat to salt marshes along the New Jersey shore. New Jersey's climate has warmed by about 3 degrees (F) in the last century, heavy rainstorms are more frequent, and the sea is rising about 1 inch every 6 years. Higher water levels are eroding beaches, submerging lowlands, exacerbating coastal flooding, and increasing the salinity of estuaries and aquifers. Sea level is rising more rapidly along the New Jersey shore than in most coastal areas because the land is sinking (USEPA 2016a).

Table 3.5.8-1. Wetlands in the New Jersey geographic analysis area

Wetland Community	Acres	Percent of Total
Atlantic White-Cedar Wetland	23,842	7.2
Disturbed and Managed Wetlands	12,153	3.7
Freshwater Tidal Marsh	65	0.0
Herbaceous Wetland	3,907	1.2
Phragmites	7,053	2.1
Saline Marsh	100,727	30.3
Scrub/Shrub Wetland	20,078	6.0
Wooded Wetland	164,600	49.5
Total	**332,424**	**100.0**

Source: NJDEP 2021.



Source: BOEM 2022, NJDEP 2021.

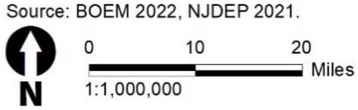


Figure 3.5.8-2. Wetlands in the New Jersey geographic analysis area

In New York, the NYSDEC identifies and maps two general types of wetlands: tidal wetlands and freshwater wetlands. In the geographic analysis area, tidal wetlands occur around the Long Island coastline, and freshwater wetlands occur inland on Long Island typically on river and lake floodplains (i.e., outside the influence of tidal waters). Both tidal and freshwater wetlands habitats are protected under the state's Tidal Wetland Act (1973) and the Freshwater Wetlands Act (1975). Freshwater wetlands are identified on the basis of vegetation and must be at least 12.4 acres (5 hectares) to be protected under the Freshwater Wetlands Act. Freshwater wetlands smaller than 12.4 acres (5 hectares) would be protected under the CWA (Section 404) if they are determined to be jurisdictional under the CWA by the USACE. Freshwater wetlands are also classified as Class I, II, III, or IV wetlands, which correspond to the benefits the wetland may provide (Class I provides the greatest benefits, Class IV the least benefits). NYSDEC has mapped all tidal and freshwater wetlands in New York, and these wetlands in the geographic analysis area are shown in Figure 3.5.8-3.

New York's climate is changing: most of the state has warmed 1 to 3 degrees (F) in the last century, heavy rainstorms are more frequent, and the sea is rising about 1 inch every decade. Higher sea levels are eroding beaches, submerging lowlands, exacerbating coastal flooding, and threatening coastal wetlands and estuaries. Sea level is rising more rapidly along New York's coast than in most coastal areas because the land surface is sinking (USEPA 2016b).

The New York geographic analysis area contains 36,225 acres (14,659 hectares) of wetlands, according to Cornell University Geospatial Information Repository (2013) and the NYSDEC wetland data (NYSDEC 2005). Table 3.5.8-2 displays the wetlands within the geographic analysis area based on NYSDEC wetland data.

Table 3.5.8-2. Wetlands in the New York geographic analysis area

Wetland Community	Acres	Percent of Total
Freshwater Wetlands		
Freshwater Wetland Class I	8,817	24
Freshwater Wetland Class II	1,327	4
Freshwater Wetland Class III	181	<1
Tidal Wetlands		
Coastal Shoals, Bars and Mudflats	2,136	6
Formerly Connected	542	1
Fresh Marsh	471	1
High Marsh	5,637	16
Intertidal Marsh	11,374	31
Littoral Zone	5,740	16
Total	**36,225**	**100.0**

Source: CUGIR 2013; NYSDEC 2005.

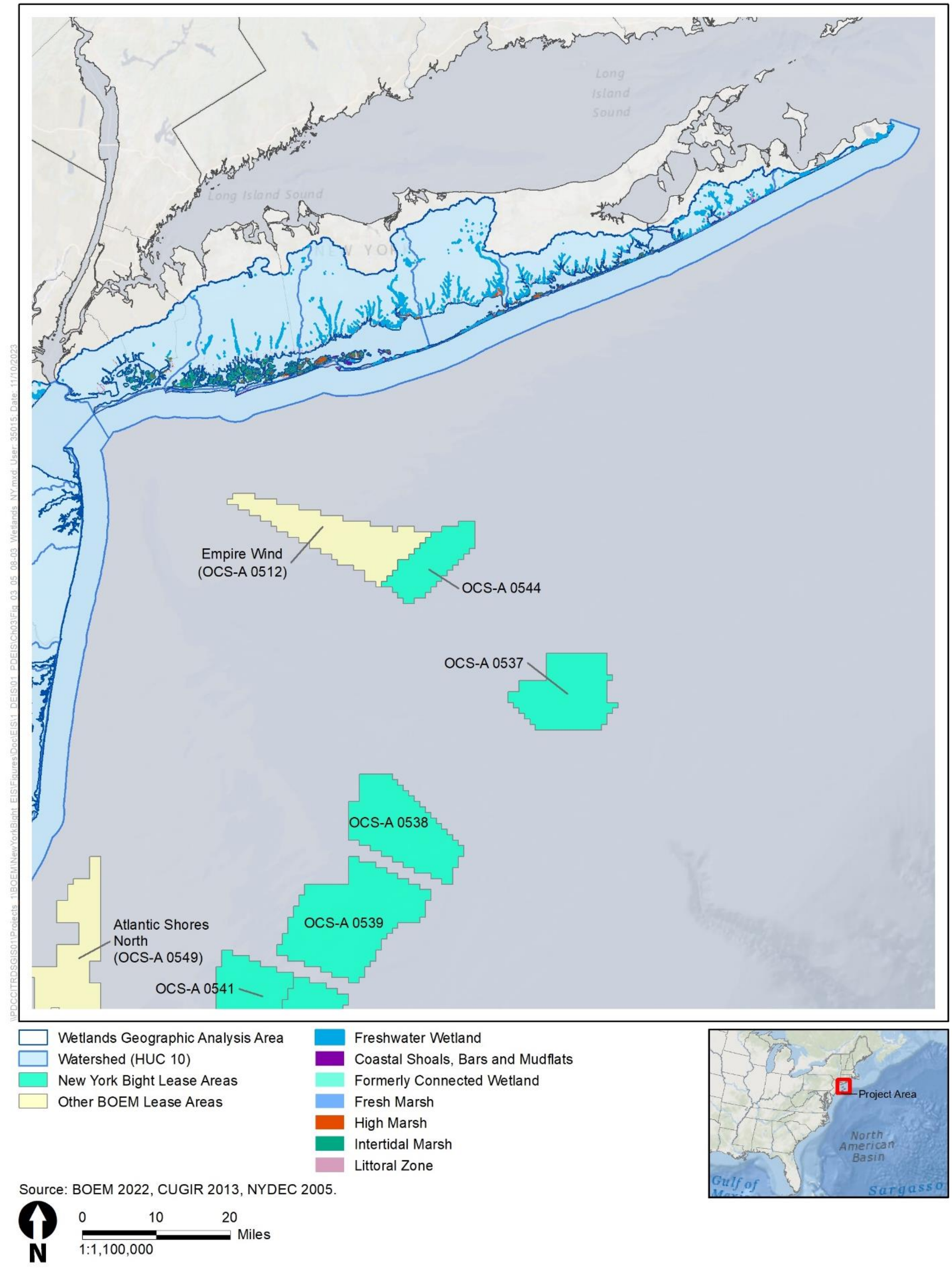


Figure 3.5.8-3. Tidal and freshwater wetlands in the New York geographic analysis area

3.5.8.2 Impact Level Definitions for Wetlands

BOEM's general impact definitions of potential adverse impact levels for wetlands are provided in Table 3.5.8-3. USACE, NJDEP, and NYSDEC define wetland impacts differently than BOEM due to requirements under CWA Section 404, the New Jersey Freshwater Wetlands Protection Act (1987), and the New York State Tidal Wetlands Act (1973) and Freshwater Wetlands Act (1975).

Table 3.5.8-3. Adverse impact level definitions for wetlands

Impact Level	Definition
Negligible	Impacts on wetlands would be so small as to be unmeasurable, and impacts would not result in a detectable change in wetland quality and function.
Minor	Impacts on wetlands would be minimized; and would be relatively small and localized. If impacts occur, wetland functions and values would completely recover.
Moderate	Impacts on wetlands would be minimized; however, permanent impacts would be unavoidable. Compensatory mitigation would be required to offset impacts on wetland functions and values, and mitigation measures would have a high probability of success.
Major	Impacts on wetlands would be minimized; however, permanent impacts would be regionally detectable. Extensive compensatory mitigation would be required to offset impacts on wetland functions and values, and mitigation measures would have a marginal or unknown probability of success.

The New Jersey Freshwater Wetlands Protection Act defines temporary disturbance as a regulated activity that occupies, persists, or occurs on a site for no more than 6 months. Impacts on wetlands that persist longer than 6 months are considered permanent.

USACE defines temporary impacts as those that occur when fill or cut impacts occur in wetlands that are restored to preconstruction contours when construction activities are complete (e.g., stockpile, temporary access). Conversion of a wetland type is also considered a permanent impact.

BOEM expects offshore wind projects in the NY Bight lease areas would be designed to avoid wetlands to the extent feasible, and would be required to comply with federal, state, and local regulations related to the protection of wetlands by avoiding or minimizing impacts. This would include compliance with the New York or New Jersey State Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Construction Activities and implementation of sediment controls and a SWPPP to avoid and minimize water quality impacts during onshore construction. Projects would also need to comply with both tidal and non-tidal wetlands enforceable policies of New Jersey and New York Coastal Management Programs. Any work in wetlands in New Jersey would require a CWA Section 404 permit from USACE or NJDEP (or both) and a Section 401 Water Quality Certification from NJDEP; any wetlands permanently lost would require compensatory mitigation. Any work in wetlands in New York State would require a CWA Section 404 permit from USACE and a Section 401 Water Quality Certification from NYSDEC, as well as authorization from NYSDEC under the Tidal Wetlands Act. If impacts could not be avoided or minimized, mitigation would be anticipated to compensate for lost wetland functions.

Accidental releases and land disturbance are contributing IPFs to impacts on wetlands. However, these IPFs may not necessarily contribute to each individual issue outlined in Table 3.5.8-4.

Table 3.5.8-4. Issues and indicators to assess impacts on wetlands

Issue	Impact Indicator
Wetland fill and disturbance	Areal extent of tidal and non-tidal wetlands impacted and further characterized using the National Wetlands Inventory mapper
Hydrology	Reduced or increased hydrology changes in hydrological regime
Soil erosion and sedimentation	Qualitative assessment of potential impacts resulting from increased sedimentation into wetlands
Discharges/releases	Qualitative assessment of potential impacts from changes in water quality from stormwater runoff or discharges, HDD activity, and spills

3.5.8.3 Impacts of Alternative A – No Action – Wetlands

When analyzing the impacts of the No Action Alternative on wetlands, BOEM considered the impacts of ongoing activities, including ongoing non-offshore-wind and ongoing offshore wind activities on the baseline conditions for wetlands. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore-wind and offshore wind activities, as described in Appendix D, *Planned Activities Scenario*.

3.5.8.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for wetlands described in Section 3.5.8.1, *Description of the Affected Environment and Future Baseline Conditions*, would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore-wind and offshore wind activities. Ongoing non-offshore-wind activities within the geographic analysis area that may contribute to impacts on wetlands are associated with onshore development activities and climate change.

Ongoing onshore development activities within the geographic analysis area may contribute to impacts by permanently (e.g., fill placement) or temporarily (e.g., stockpile, temporary access) affecting wetlands or areas near wetlands. All projects would be required to comply with existing federal, state, and local regulations related to the protection of wetlands by avoiding or minimizing impacts. If unavoidable permanent wetland impacts (i.e., permanent fill placement) cannot be entirely avoided, then compensatory mitigation would be required to replace lost wetland functions. Climate change–induced sea level rise in the geographic analysis area is also anticipated to continue to affect wetlands. Inundation and rising water levels would result in the conversion of vegetated areas into areas of open water, with a consequent loss of wetland functions associated with the loss of vegetated wetlands. Wetlands have very specific water elevation tolerances and, if water is not deep enough, it is no longer a wetland. Slowly rising waters on a gentle, continuously rising surface can result in wetlands migrating landward. In areas where slopes are not gradual or where there are other features blocking flow (e.g., bulkhead or surrounding developed landscape), wetland migration would be slowed or impeded. Rising coastal waters would also continue to cause saltwater intrusion, which occurs when saltwater starts to move farther inland and creeps into freshwater/non-tidal areas. Saltwater intrusion would continue to change wetland plant communities and habitat (i.e., freshwater species to saltwater species) and overall wetland functions.

As sea level rises along the New Jersey shore, many wetlands will be submerged. Most salt marshes between Cape May and the Meadowlands are unlikely to keep pace if sea level rises 3 feet. Tidal flats are also likely to become open water (USEPA 2016a).

If the oceans and atmosphere continue to warm, tidal waters in New York are likely to rise 1 to 4 feet in the next century. As sea level rises, the lowest dry lands will be submerged and become either tidal wetland or open water. Wetlands can create their own land and keep pace with a slowly rising sea, but if sea level rises 3 feet or more during the next century, most existing wetlands along the south shore of Long Island are likely to be submerged (USEPA 2016b).

There are five ongoing offshore wind projects within the geographic analysis area that could contribute to impacts on wetlands from onshore components (Table 3.5.8-5): South Fork Wind Farm (OCS-A 0517), Ocean Wind 1 (OCS-A 0498), Sunrise Wind (OCS-A 0487), and Empire Wind 1 and 2 (OCS-A 0512). The South Fork Wind Farm includes offshore export cables landing on Long Island, and Ocean Wind 1 includes two offshore export cable routes making landfall in Ocean County, New Jersey and Cape May County, New Jersey. The export cables for Sunrise Wind and Empire Wind would both make landfall on Long Island, New York. These projects' export cable landfall sites are within the geographic analysis area and ongoing construction of the projects could affect wetlands through the primary IPFs of accidental releases and land disturbance; these are described in detail in the following section.

3.5.8.3.2 Cumulative Impacts of the No Action Alternative

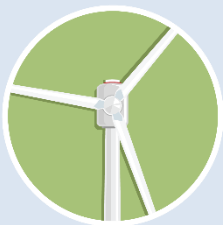
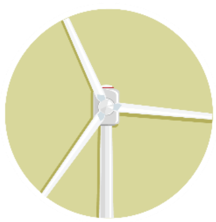
The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore-wind activities and planned offshore wind activities (without the NY Bight projects). Other planned non-offshore-wind activities that may affect wetlands would primarily include increasing onshore construction (see Appendix D for a description of planned activities in the onshore environment). These activities may permanently (e.g., fill placement) and temporarily (e.g., vegetation removal) affect wetland habitat, water quality, and hydrologic functions. All activities would be required to comply with federal, state, and local regulations related to the protection of wetlands by avoiding or minimizing impacts. If impacts would not be entirely avoided, mitigation would be anticipated to compensate for wetland loss.

Planned construction of an offshore wind PBI by the NJBPU could result in impacts on approximately 4 acres of wetlands. Areas with potential impacts include disturbance along the PBI route, HDD entry and exit locations, laydown areas, access roads, and other appurtenant facilities. Because the PBI route would occur mostly within roadways and existing rights-of-way, the footprint of potentially disturbed habitats is relatively small. Through a review of NJDEP's vernal habitat mapping, several areas that are mapped as potential vernal habitat are within the PBI route area (NJDEP 2023). These areas would need to be field-verified to confirm presence and potential impacts. All routes from Sea Girt National Guard Training Center (NGTC) to the Larabee Collector Station must cross the Manasquan River. The furthest upstream potential crossing of the Manasquan River would be along the north side of Hospital Road, and the furthest downstream potential crossing would be along the south side of Lakewood-Allenwood Road. Other stream crossings may include a subset of the following Category 1 waterways: Tarkiln

Brook, Woodcock Brook, Haystack Brook, Dicks Brook, Muddy Ford Brook, Sandyhill Brook, and Judas Creek.

Impacts on wetlands from planned offshore wind projects may occur if onshore activity from these planned offshore wind projects overlaps with the geographic analysis area. Ongoing and planned offshore wind activities that could potentially overlap the wetlands geographic analysis area are listed in Table 3.5.8-5.

Table 3.5.8-5. Ongoing and planned offshore wind in the geographic analysis area for wetlands

Ongoing/Planned	Projects by Region
Ongoing – 5 projects[1] 	**MA/RI** • South Fork Wind (OCS-A 0517) • Sunrise Wind (OCS-A 0487) **NY/NJ** • Ocean Wind 1 (OCS-A 0498) • Empire Wind 1 (OCS-A 0512) • Empire Wind 2 (OCS-A 0512)
Planned – 3 projects[2] 	**NY/NJ** • Ocean Wind 2 (OCS-A 0532) • Atlantic Shores North (OCS-A 0549) • Atlantic Shores South (OCS-A 0499)

MA = Massachusetts; NJ = New Jersey; NY = New York; RI = Rhode Island
[1] Refer to footnotes 9 and 10 in PEIS Chapter 1 for additional information on the status of Ocean Wind 1, Empire Wind 1, and Empire Wind 2.
[2] Status as of September 20, 2024.

Accidental releases: During onshore construction of offshore wind projects in the geographic analysis area, oil leaks and accidental spills from construction equipment are potential sources of wetland water contamination. While many wetlands act to filter out contaminants, any significant increase in contaminant loading could exceed the capacity of a wetland to perform its normal water quality functions. Degradation of water quality in wetlands could occur during construction, conceptual decommissioning, and to a lesser extent O&M. However, due to the small volumes of spilled material anticipated, these impacts would all be short term until the source of the contamination is removed. Compliance with applicable state and federal regulations related to oil spills and waste handling would minimize potential impacts from accidental releases. These include the Resource Conservation and Recovery Act, Department of Transportation Hazardous Material regulations, and implementation of a Spill Prevention, Control, and Countermeasure Plan. Impacts from accidental releases on wetlands would likely be minor because accidental releases would likely be small and localized, and compliance with state and federal regulations would avoid or minimize potential impacts on wetland quality or functions. As described in Section 2.3, *Non-Routine Activities and Events*, accidental releases of chemicals, gases, or man-made debris may occur as a result of a structural failure and could result in impacts on wetlands.

Land disturbance: Construction of onshore components in the geographic analysis area is anticipated to require clearing, excavating, trenching, fill, and grading, which could result in the loss or alteration of wetlands. This may cause adverse effects on wetland habitat, water quality, and flood and storage capacity functions. Table 3.5.8-6 describes impacts on wetlands from other offshore wind projects in the geographic analysis area.

Table 3.5.8-6. Other offshore wind projects' impacts on wetlands in the geographic analysis area

Offshore Wind Project	Wetland Impacts
Ongoing Offshore Wind Project	
South Fork Wind (OCS-A 0517)	One onshore project component for the South Fork Wind Farm (OCS-A 0517) (Hither Hills onshore cable route) could affect up to 2.02 acres (0.89 hectare) of wetland on Long Island (BOEM 2021).
Ocean Wind 1 (OCS-A 0498)	Ocean Wind 1 (OCS-A 0498) has estimated that up to 1 acre (0.4 hectare) of permanent disturbance would occur within wooded wetlands and approximately 0.53 and 11.92 acres (0.21 and 4.82 hectares) of temporary wetland impacts could potentially occur as a result of interconnection cable burial at BL England and Oyster Creek, respectively (BOEM 2022a).
Sunrise Wind (OCS-A 0487)	The landfall and onshore transmission cable route for Sunrise Wind (OCS-A 0487) is anticipated to result in 0.02 acre (0.08 hectare) of wetland impact on Long Island, New York.
Empire Wind (OCS-A 0512)	Based on NWI-mapped wetlands, 13.64 acres (5.51 hectares) of wetlands within the cable corridor could be susceptible to potential impacts as a result of cable installation associated with the Empire Wind lease area (OCS-A 0512). However, this will not necessarily be the area of wetland that would be affected during construction and operations. Empire Wind is evaluating several methods (trenchless, cable bridge) to avoid and minimize wetland impacts at the Reynolds and Barnums Channel crossings. These two channel crossings account for approximately 12.4 acres (5.01 hectares) or 91 percent of the mapped wetland in the cable corridor.
Planned Offshore Wind Projects	
Ocean Wind 2 (OCS-A 0532)	Ørsted is currently planning the Ocean Wind 2 (OCS-A 0532) project, which will develop the remaining portion of its Ocean Wind federal lease area, located adjacent to Ocean Wind 1 (OCS-A 0498). Potential wetland impact information is unavailable at this time.
Atlantic Shores South (OCS-A 0499)	Atlantic Shores South (OCS-A 0499) has estimated that approximately 0.65 acre (0.26 hectare) of temporary and 0.1 acre (0.04 hectare) of permanent disturbance in wetlands may occur as a result of interconnection cable installation (Atlantic Shores Offshore Wind 2022). Approximately 87 percent of the proposed wetland impacts are temporary and would occur in both emergent and forested wetlands.
Atlantic Shores North (OCS-A 0549)	Atlantic Shores North (OCS-A 0549) has estimated approximately 0.8 acre of permanent disturbance and 1.2 acres of temporary disturbance in wetlands (Atlantic Shores Offshore Wind 2024).

Fill material permanently placed in wetlands during construction would result in the permanent loss of wetlands, including any associated habitat, flood and storage capacity, and water quality functions that the wetlands may provide. If a wetland were partially filled and fragmented or if wetland vegetation were trimmed, cleared, or converted to a different vegetation type (e.g., forest to herbaceous), habitat would then be altered and degraded (affecting wildlife use). Additionally, water quality and flood/storage capacity functions would be reduced by changing natural hydrologic flows and reducing the wetland's ability to impede and retain stormwater and floodwater. On a watershed level, any permanent wetland loss or alteration could reduce the capacity of regional wetlands to provide wetland functions.

Temporary wetland impacts, such as rutting, compaction, and mixing of topsoil and subsoil, may occur from a construction activity that crosses or is adjacent to wetlands. Where construction leads to unvegetated or otherwise unstable soils, precipitation events could erode soils, resulting in sedimentation that could affect water quality in nearby wetlands. The extent of wetland impacts would depend on specific construction activities and their proximity to wetlands. These impacts would occur primarily during construction and conceptual decommissioning; impacts during O&M would only occur if new ground disturbance was required, such as to repair a buried component.

Given that the geographic analysis areas for the planned offshore wind projects are within urbanized landscapes in New Jersey and New York and onshore project components would likely be sited in previously disturbed areas (e.g., along existing roadways and ROW), BOEM anticipates wetland impacts would be minimal. In addition, BOEM expects the offshore wind projects would be designed to avoid wetlands to the extent feasible. However, depending on project-specific details and locations of onshore components, wetland impacts could range from negligible to moderate. All offshore wind projects would be required to comply with federal, state, and local regulations related to the protection of wetlands by avoiding or minimizing impacts. Mitigation would be anticipated for projects to compensate for unavoidable wetland impacts.

3.5.8.3.3 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, wetlands would continue to follow current regional trends and respond to IPFs introduced by ongoing activities. Land disturbance from onshore construction would cause temporary and permanent loss of wetlands. All activities would be required to comply with federal, state, and local regulations related to the protection of wetlands by avoiding or minimizing impacts. If impacts would not be entirely avoided or minimized, mitigation would be anticipated for projects to compensate for lost wetlands. BOEM anticipates that the No Action Alternative would likely result in **negligible** to **moderate** impacts on wetlands. Impacts would likely be **negligible** to **moderate** because permanent wetland impacts would likely occur, and compensatory mitigation would be required.

Cumulative Impacts of the No Action Alternative. Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and wetlands would continue to be affected by natural and human-caused IPFs. Planned activities would contribute to temporary and permanent impacts on wetlands due to accidental releases and land disturbance. BOEM anticipates that the cumulative impacts associated with the No Action Alternative, when combined with all other planned activities (including offshore wind) in the geographic analysis area would likely be **negligible** to

moderate given that permanent wetland impacts could occur, and any activity would be required to comply with federal, state, and local regulations related to the protection of wetlands and mitigation of impacts.

3.5.8.4 Impacts of Alternative B – No Identification of AMMM Measures at the Programmatic Stage – Wetlands

3.5.8.4.1 Impacts of One Project

Alternative B considers the potential impacts of future offshore wind development for the NY Bight area without the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts.

Accidental releases: Onshore construction activities would require heavy equipment use and HDD activities, and potential spills could occur as a result of an inadvertent release from the machinery or during refueling activities. Applicants would develop and implement a Spill Prevention, Control, and Countermeasure Plan to minimize impacts on water quality (prepared in accordance with applicable NJDEP and NYSDEC regulations). In addition, all waste generated onshore would comply with applicable federal regulations, including the Resource Conservation and Recovery Act and the Department of Transportation Hazardous Material regulations. Therefore, BOEM anticipates a single NY Bight project would result in minor and short-term impacts on wetlands as a result of releases from heavy equipment during construction and other cable installation activities.

Land disturbance: Construction impacts on wetlands and related functions would be similar to those described for the No Action Alternative. The primary wetland impacts would be filling, excavation, rutting, compaction, mixing of topsoil and subsoil, and potential alteration due to clearing. These impacts would be temporary in those locations where onshore project components do not require permanent fill, as restoration would be conducted in accordance with applicable CWA permit requirements. Following installation of interconnection cables within wetlands, topography would be restored, and soils would be de-compacted to avoid long-term impacts on soils and hydrology. Long-term changes from wooded to herbaceous wetlands could occur if clearing is required in wooded wetlands. Placement of fill within a wetland would result in loss of wetlands, and permanent conversion of wooded wetlands to herbaceous or shrub/scrub wetlands would constitute a permanent impact on wetlands because of the conversion to a different vegetation type. Other long-term impacts on wetlands could include clearing wooded wetlands within a temporary workspace. While these would be allowed to revert to forested wetland conditions, after construction, the recovery could take decades or longer and is therefore not considered a temporary impact. Following construction, temporary disturbed areas (e.g., temporary wetland fill, non-forest vegetation clearing) would be restored to pre-existing conditions and revegetated.

Where applicable, onshore interconnection cables would be installed using trenchless technology (e.g., jack-and-bore, pipe jacking, or HDD) beneath wetlands to minimize direct impacts on these resources. Entry/exit work areas would be in disturbed upland areas to further avoid impacts on wetlands. Water quality within wetlands could be affected by sedimentation from nearby exposed soils. To prevent indirect impacts, such as soil erosion and sedimentation from land-disturbing construction activities, on wetlands and waterbodies applicants would need to comply with an approved Soil Erosion and Sediment Control Plan, obtain coverage under a National Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Construction Activities, and prepare a SWPPP for the project. In accordance with these plans, BMPs—including, but not limited to, dust abatement and installation of silt fencing, filter socks, and inlet filters—would be implemented to minimize or avoid potential effects. Additionally, once construction is completed, areas of temporary disturbance would be returned to preconstruction conditions, and at the onshore substations land would be appropriately graded, graveled, or revegetated to prevent future erosion.

Based on recent offshore wind projects under BOEM review, BOEM anticipates that impacts on wetlands from a single NY Bight project would be mostly avoided or minimized by adhering to the requirements of federal, state, and local wetland permitting. However, the area of wetland impacted could vary widely, depending on the specific siting of the onshore project components. Therefore, wetland impacts could range from none to potential permanent filling or clearing of wetlands. Mitigation, if required under federal and state wetland regulations, would likely include a combination of restoration, enhancement, creation, or in-lieu fee (credit purchase). In summary, potential adverse impacts on wetlands from one NY Bight project, should any occur, would be temporary and permanent, and long term and shorter term; this impact would range from negligible to moderate depending on the siting of project components.

3.5.8.4.2 Impacts of Six Projects

The same accidental releases and land disturbance IPF impact types and mechanisms described for one NY Bight project would apply to six NY Bight projects. There would be more potential for impacts from these IPFs due to the greater amount of onshore development under six NY Bight projects. However, accidental release impacts are still expected to be minimal as all six NY Bight projects would develop and implement a Spill Prevention, Control, and Countermeasure Plan to minimize impacts on water quality. Similar to one NY Bight project, the level of impact on wetlands from land disturbance depends on the amount, function, impact type, and duration. While BOEM anticipates that impacts on wetland habitat from onshore construction activities of six NY Bight projects would be minimized to the extent practicable, it is reasonable to assume that larger areas of wetland could be temporarily and permanently affected, resulting in negligible to moderate impacts. The impact of six NY Bight projects would not change the impact conclusion compared to one NY Bight project due to each project requiring federal and state wetland permits.

3.5.8.4.3 Cumulative Impacts of Alternative B

The construction and installation, O&M, and conceptual decommissioning of onshore infrastructure for offshore wind activities across the geographic analysis area would also contribute to the primary IPFs of accidental releases and land disturbance. Temporary disturbance and permanent loss of wetland may occur as a result of constructing infrastructure such as substations and onshore export cables for offshore wind development. Any wetland impact is anticipated to be minimal due to federal, local, and state wetland requirements to avoid and minimize wetland impacts. However, the area of wetland impact could vary widely depending on the specific siting of the onshore project components.

Six NY Bight projects would contribute to the combined accidental release impacts on wetlands from ongoing and planned activities including offshore wind. Impacts would likely be short term and minor due to the low risk and localized nature of the most likely spills, the use of an Oil Spill Response Plan for projects, and regulatory requirements for the protection of wetlands. The development of six NY Bight projects could contribute to the impacts on the land disturbance impacts from ongoing and planned activities including offshore wind. Impacts would likely be temporary to permanent and moderate because permanent wetland impacts would likely occur, and compensatory mitigation would be required. BOEM would not expect normal O&M activities to involve further wetland alteration. Onshore cable routes and associated substation/converter station facilities and POIs generally have no maintenance needs unless a fault or failure occurs; therefore, O&M is not expected to have any notable effects on wetlands.

Although impacts on wetlands would be avoided and minimized, compensatory mitigation would likely be necessary due to unavoidable permanent impacts, and actual wetland impacts could vary widely depending on the locations of specific project components. This conclusion would not change even if six NY Bight projects are constructed all at once or staggered. Therefore, onshore wetland habitat impacts are expected to range from negligible to moderate and would depend on specific construction activities, project component siting, and their proximity to wetlands. If construction of the onshore project components of six NY Bight projects are staggered, then there could be less of an effect on wetlands in the short term than if all six NY Bight projects were constructed at once. In context of reasonably foreseeable environmental trends, BOEM anticipates the impact of six NY Bight projects to the cumulative accidental release impacts would be undetectable; the contribution to cumulative land disturbance impacts would be noticeable on wetlands if greater impacts are incurred based on project-specific siting.

3.5.8.4.4 Conclusions

Impacts of Alternative B. In summary, construction and installation, O&M, and conceptual decommissioning of either one NY Bight project or six NY Bight projects under Alternative B, would likely have **negligible** to **moderate** impacts on wetlands, depending on the area of wetland affected, the types of wetlands affected, and duration of impact. For projects that would incur wetland impacts, the requirements set forth in the CWA Section 404(b)(1) Guidelines of avoidance, minimization, and compensatory mitigation would likely reduce project impacts on wetlands.

Cumulative Impacts of Alternative B. BOEM anticipates that the cumulative impacts on wetlands in the geographic analysis area would likely be **negligible** to **moderate** under six NY Bight projects. In context of other reasonably foreseeable environmental trends, the impacts contributed by six NY Bight projects to the overall impacts on wetlands could be noticeable, depending on site-specific project component siting relative to wetland locations.

3.5.8.5 Impacts of Alternative C (Proposed Action) – Identification of AMMM Measures at the Programmatic Stage – Wetlands

Alternative C, the Proposed Action, considers the potential impacts of future offshore wind development for the NY Bight Area with the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts. Alternative C consists of two sub-alternatives – Sub-alternative C1: Previously Applied AMMM Measures, and Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures. The analysis for Sub-alternative C1 is presented as the change in impacts from those impacts discussed under Alternative B, and the analysis for Sub-alternative C2 is presented as the change from those impacts discussed in Sub-alternative C1. Refer to Table G-1 in Appendix G, *Mitigation and Monitoring*, for a complete description of AMMM measures that make up the Proposed Action. BOEM notes that federal, state, and local wetland permitting that would apply to any of the alternatives would contain mitigation measures and permit terms and conditions that would avoid and minimize wetlands impacts and, if needed, compensate for any permanent wetland function loss.

3.5.8.5.1 Sub-alternative C1 (Preferred Alternative): Previously Applied AMMM Measures

Sub-alternative C1 analyzes the AMMM measures that BOEM has required as conditions of approval for previous activities proposed by lessees in COPs submitted for the Atlantic OCS or through related consultations. However, BOEM has not identified any previously applied AMMM measures for wetlands; therefore, the impacts on wetlands under Sub-alternative C1 are the same as for Alternative B.

3.5.8.5.2 Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures

Sub-alternative C2 analyzes the AMMM measures under Sub-alternative C1 plus the AMMM measures that have not been previously applied. However, BOEM has not identified any AMMM measures that have not been previously applied for wetlands; therefore, the impacts on wetlands under Sub-alternative C2 are the same as for Sub-alternative C1 and Alternative B.

3.5.8.5.3 Conclusions

Impacts of Alternative C. No AMMM measures are identified for wetlands under Sub-alternative C1 or Sub-alternative C2. Therefore construction and installation, O&M, and conceptual decommissioning activities from either one NY Bight project or six NY Bight projects would be the same as for Alternative B. Impacts on wetlands would likely be **negligible** to **moderate**, depending on the area of wetland affected, the types of wetlands affected, and duration of impact. For projects that would incur wetland impacts, the mitigation requirements set forth in the CWA Section 404(b)(1) guidelines of avoidance, minimization, and compensatory mitigation would likely reduce project impacts on wetlands.

Cumulative Impacts of Alternative C. BOEM anticipates that the cumulative impacts on wetlands in the geographic analysis area would likely be **negligible** to **moderate** under Sub-alternative C1 and Sub-alternative C2. In context of other reasonably foreseeable environmental trends, the impacts contributed by one NY Bight project or six NY Bight projects to the overall impacts on wetlands could be noticeable, depending on site-specific project component siting relative to wetland locations.

3.5.8.6 Recommended Practices for Consideration at the Project-Specific Stage

In addition to the AMMM measures identified under Alternative C, BOEM is recommending lessees consider analyzing the RPs in Table 3.5.8-7 to further reduce potential wetlands impacts. Refer to Table G-2 in Appendix G for a complete description of the RPs.

Table 3.5.8-7. Recommended practices for wetlands impacts and related benefits

Recommended Practice	Potential Benefit
MUL-18: Coordinate transmission infrastructure among projects such as by using shared intra- and interregional connections, meshed infrastructure, or parallel routing.	Using shared transmission infrastructure or following parallel routing with existing and proposed infrastructure could result in the consolidation of export cables from the six NY Bight projects into a reduced number of cable corridors, which could reduce the potential for wetland habitat loss. BOEM also acknowledges that easements and ROWs continue onshore and encourages the use of shared onshore infrastructure where practicable to minimize potential impacts on wetlands.
MUL-23: Avoid or reduce potential impacts on important environmental resources by adjusting project design.	Adjusting project design to minimize impacts on environmental resources, such as by siting onshore infrastructure to avoid wetlands or using HDD to pass underneath wetlands, could reduce overall wetland impacts. The site selection of onshore landfalls and substation locations and the onshore cable routes would have the highest influence on the magnitude of impacts on wetlands.

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3.6 Socioeconomic Conditions and Cultural Resources

3.6.3 Demographics, Employment, and Economics

This section discusses the demographics, employment, and economic characteristics in the geographic analysis area and the potential impacts from the Proposed Action, alternatives, and ongoing and planned activities. The geographic analysis area, as shown on Figure 3.6.3-1, includes the counties where onshore infrastructure and potential port cities would be located, as well as the counties closest to the NY Bight lease areas. These counties are the most likely to experience beneficial or adverse economic impacts from the NY Bight projects. Potentially affected counties in New Jersey include Atlantic, Burlington, Camden, Cape May, Cumberland, Essex, Gloucester, Hudson, Middlesex, Monmouth, Ocean, Salem, and Union Counties. Potentially affected counties in New York include Albany, Kings, Nassau, New York, Queens, Rensselaer, Richmond, and Suffolk Counties. This analysis also considers counties that may be affected by visual impacts or impacts on recreation and tourism that may have economic consequences (e.g., on property values, tourism, or recreation), which are discussed in separate sections of this Final PEIS. Refer to Appendix B, *Supplemental Information and Additional Figures and Tables,* for detailed demographic, housing, and employment information for the counties within the geographic analysis area.

The demographics, employment, and economic impact analysis in this PEIS is intended to be incorporated by reference into the project-specific environmental analyses for individual COPs expected for each of the NY Bight lease areas. Refer to Appendix C, *Tiering Guidance*, which identifies additional analyses anticipated to be required for the project-specific environmental analysis of individual COPs.

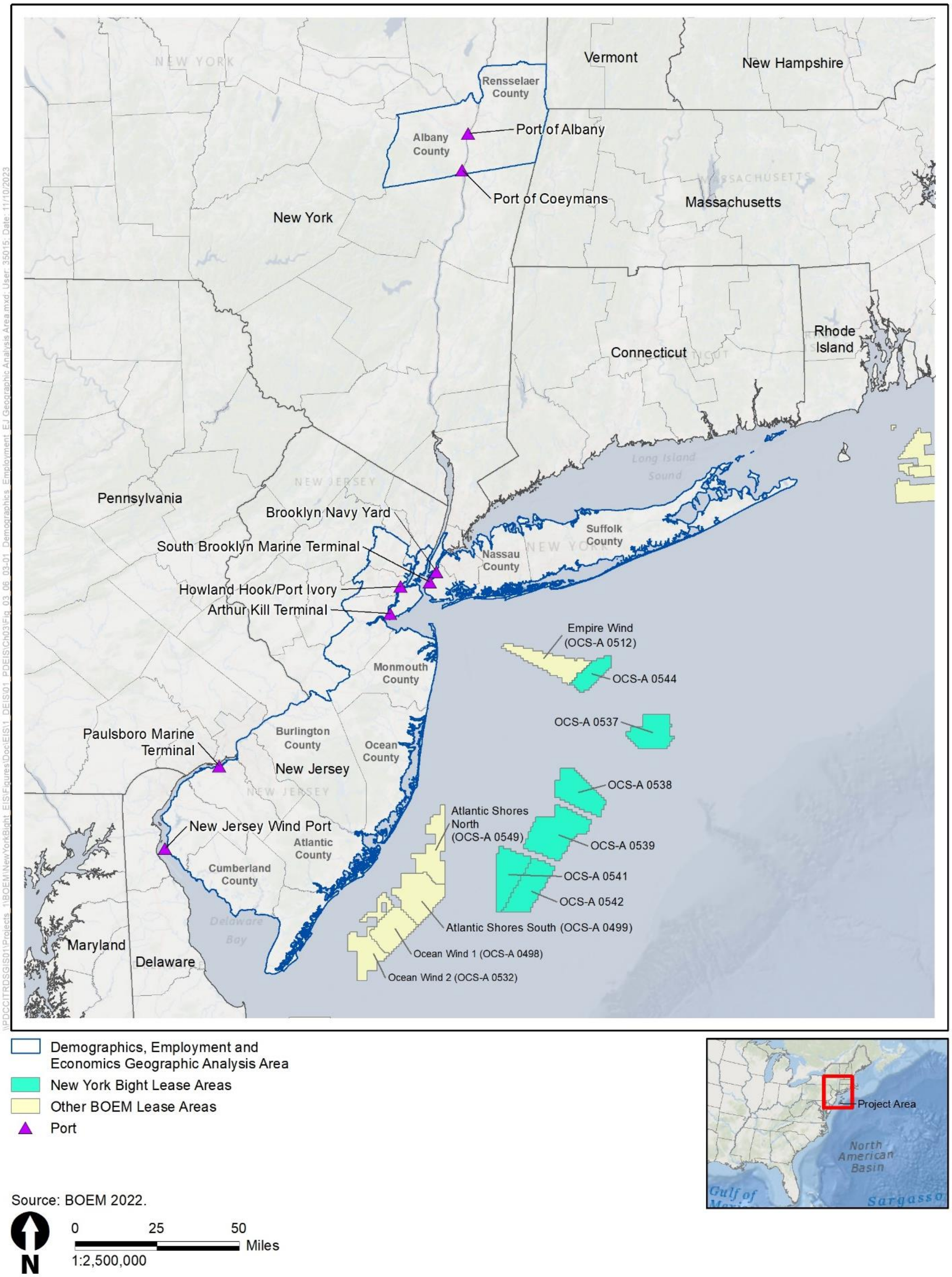


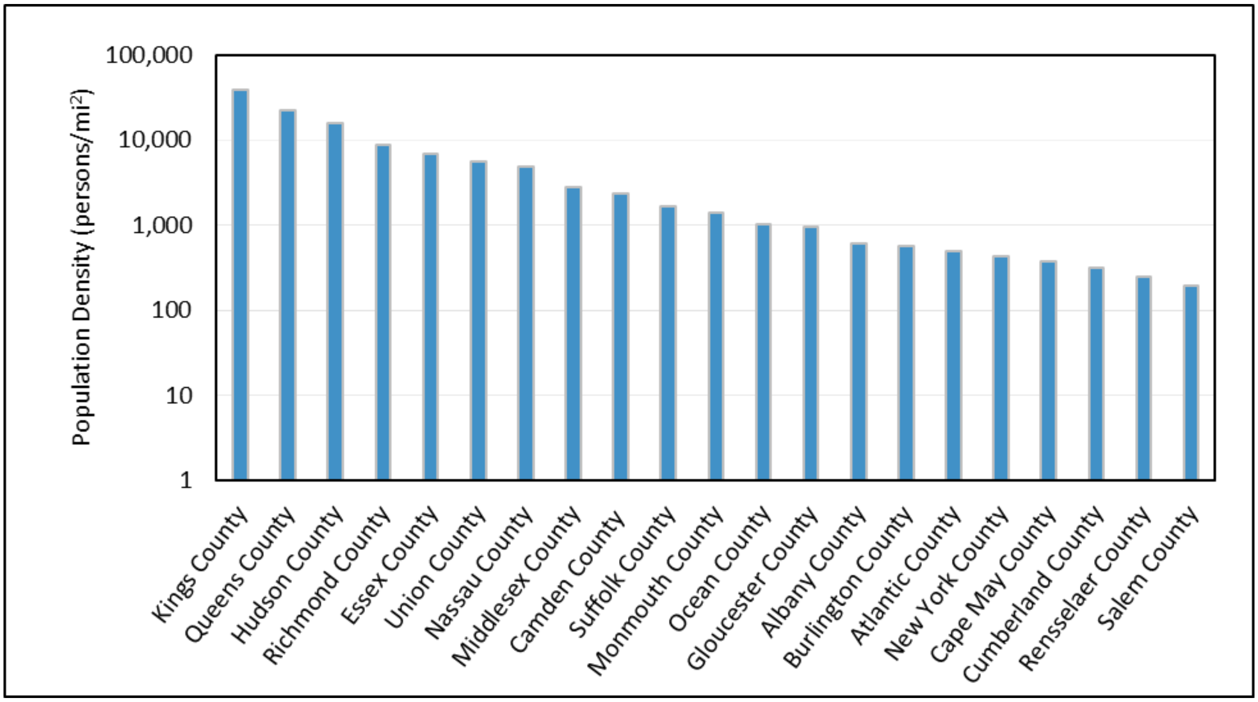
Figure 3.6.3-1. Demographics, employment, and economics geographic analysis area

3.6.3.1 Description of the Affected Environment and Future Baseline Conditions

3.6.3.1.1 Demographics

Population

The total population within the geographic analysis area is approximately 15.6 million, with the 8 potentially affected New York counties comprising approximately 9.5 million and the 13 New Jersey counties comprising about 6.1 million. The population within each county varies widely, ranging from 160,000 to 2.7 million in New York and 65,000 to 863,000 in New Jersey (U.S. Census Bureau 2020; Appendix B, Table B.4-1). Population densities are more comparable. The three most densely populated New York counties (Kings, Queens, and Richmond) range from 8,618 to 39,438 persons per square mile; the top three New Jersey counties (Hudson, Essex, Union) range from 5,569 to 15,692 persons per square mile. The two least densely populated counties were inland counties: Rensselaer in New York and Salem in New Jersey, respectively at 247 and 195 persons per square mile (Figure 3.6.3-2).



Source: U.S. Census Bureau 2020.

Figure 3.6.3-2. Population density in New York and New Jersey counties (2020)

Populations trended upwards from 2000 to 2020 for all New York and nearly all New Jersey counties (Appendix B, Table B.4-1). In New Jersey, two counties showed a loss in population: Cape May County between 2000 and 2020, and Cumberland County between 2010 and 2020. Overall, from 2010 to 2020 the population growth of New York and New Jersey counties averaged 4.8 percent and 4.2 percent, respectively; from 2000 to 2020 population growth respectively averaged 7.8 percent and 8.9 percent (U.S. Census Bureau 2000, 2010, 2020).

Population Age Distribution

The age profiles for 2019 for both New York and New Jersey counties show fair consistency across age groups, with the exception of the median age (Appendix B, Table B.4-2). The 0–17 age group is an important demographic as it reflects the opportunity to train and educate the next generation of workers. This age group ranges from 14 percent to 24 percent of the population across all counties in the geographic analysis area, averaging 21 percent. The 18–34 age group ranged from 18 percent to 31 percent, averaging 23 percent. The 35–64 age group ranged from 35 percent to 42 percent, averaging 40 percent. The combined 18–64 age group, which represents the available prime working age population, ranged from 54 percent to 69 percent of the population, averaging 62 percent. The 65+ age group are generally considered retirement age population and ranged from 12 percent to 18 percent, with one outlier at 26 percent, and averaging 23 percent (U.S. Census Bureau 2019).

3.6.3.1.2 Housing

The number of housing units for New York counties in 2019 ranged from 73,011 units to 1,044,493 units, with a median of 524,266 units. The number of housing units for New Jersey counties in 2019 ranged from 27,595 units to 317,314 units, with a median of 202,267 units. The median owner-occupied value per unit for New York counties ranged from $188,700 to $987,700, with a median value of $493,500. The median owner-occupied value per unit for New Jersey counties ranged from $162,500 to $421,900, with a median value of $279,000 (U.S. Census Bureau 2019; Appendix B, Table B.4-4).

Occupancy in 2019 was comparably high for both New York (85 percent to 95 percent, averaging 90 percent) and New Jersey (78 percent to 94 percent, averaging 89 percent) counties (U.S. Census Bureau 2019; Appendix B, Table B.4-4). The figures for New Jersey omit data from Cape May County because of its seasonal population dynamics: some 95,000 year-long residents lived in Cape May County in 2020 (U.S. Census Bureau 2020), but during summer, the population increases to at least eight times that of the permanent winter population due to tourism (Cape May County Planning Board 2022).

The percentages of housing units that are seasonally occupied vary widely between counties. One factor is that tourism and recreation are key economic drivers of coastal counties, whereas the inland counties included in the geographic analysis area (where potential ports are located) are not as dependent on seasonal industries. Thus, Gloucester County and Salem County have seasonally occupied housing unit percentages of 0.3 percent and 0.7 percent, while Atlantic, Ocean, and Cape May Counties have seasonally occupied housing unit percentages of 13.4 percent, 13.8 percent, and 50.8 percent, respectively (U.S. Census Bureau 2019; Appendix B, Table B.4-4).

In 2019, average rents in New Jersey counties in the geographic analysis area ranged from $836 per month to $1,349 per month, with a statewide median rent of $1,087 per month for renter-occupied housing units. Average rents in New York counties in the geographic analysis area in 2019 (with the exception of Queens County, for which no data were available) ranged from $822 per month to $1,651 per month, with a statewide median rent of $1,303 per month (U.S. Census Bureau 2019).

3.6.3.1.3 Employment

Regional Employment

The New York metropolitan area is a major hub of the Nation's commerce. In 2019 total employment in the geographic analysis area counties of New York amounted to approximately 4.25 million jobs and in New Jersey amounted to 3.10 million jobs (U.S. Census Bureau 2019). The number of jobs varied widely by county, ranging from 85,822 to 1,851,947 jobs in New York counties and 31,221 to 429,146 jobs in New Jersey counties. Per capita income in 2019 ranged from $60,231 to $116,100 for counties in New York in the geographic analysis area, compared to a statewide average of $83,134. Per capita income in 2019 ranged from $54,149 to $99,733 for counties in New Jersey in the geographic analysis area, compared to a statewide average of $74,492 (Table 3.6.3-1).

Table 3.6.3-1. New York and New Jersey employment, unemployment, per capita income, and population living below poverty level (2019)

Jurisdiction	Total Employment	Per Capita Income	Unemployment Rate (%)	Population Living Below Poverty Level (%)
New York Counties				
Albany County	168,609	$66,252	4.5	7.1
Kings County	1,308,399	$60,231	6.2	15.9
Nassau County	716,106	$116,100	3.9	3.8
New York County	955,427	$86,553	5.2	11.8
Queens County	1,851,947	$96,631	3.6	12.2
Rensselaer County	85,822	$68,991	4.7	7.8
Richmond County	225,088	$82,783	4.6	9.4
Suffolk County	785,803	$101,031	4.2	4.5
New Jersey Counties				
Atlantic County	139,427	$62,110	8.4	9.9
Burlington County	241,940	$87,416	5.6	4.1
Camden County	267,725	$70,451	6.6	9.1
Cape May County	45,904	$67,074	6.6	6.9
Cumberland County	66,521	$54,149	7.3	11.9
Essex County	411,493	$61,510	8.1	12.8
Gloucester County	158,168	$87,283	5.5	4.4
Hudson County	377,168	$71,189	5.2	11.8
Middlesex County	429,146	$89,533	5.2	6.2
Monmouth County	335,725	$99,733	4.9	4.7
Ocean County	275,104	$70,909	5.1	6.5
Salem County	31,221	$66,842	6	8.6
Union County	299,082	$80,198	5.7	6.9

Source: U.S. Census Bureau 2019.

The New York metropolitan area has a highly diversified economic base. Data on the contribution to the New York and New Jersey GDP for 16 commercial sectors show the breadth of the region's employment summarized at the county level in Table 3.6.3-2. Education/Health Care/Social Assistance is the top commercial sector. Professional/Scientific/Technical Services, Retail Trade, and Finance/Insurance/Real

Estate rounded out the top four positions, which in total accounted for some 60 percent of the total ocean economy employment of the counties.

Table 3.6.3-2. New York and New Jersey employment contribution by commercial sector (2019)

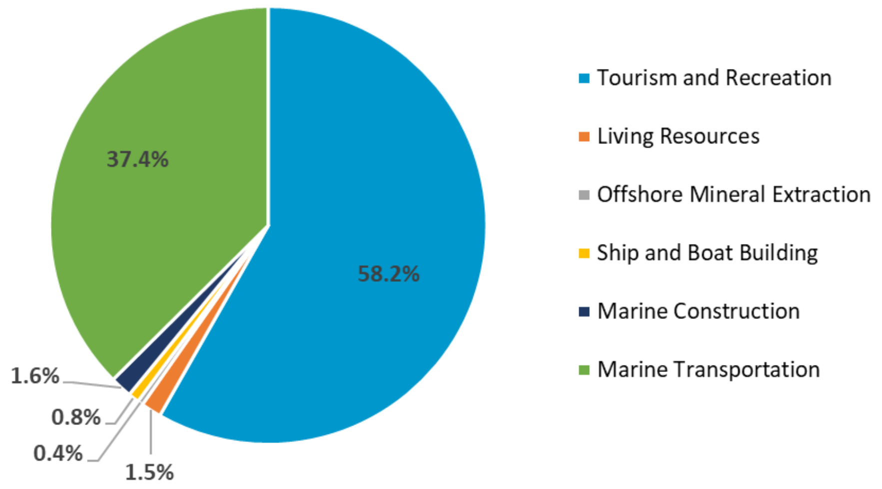
Commercial Sector	New York	New Jersey
Education, Health Care, Social Assistance	29.2%	26.4%
Professional, Scientific, Technical	11.4%	9.6%
Finance, Insurance, Real Estate	10.8%	9.0%
Retail Trade	10.0%	12.1%
Accommodations and Food	7.1%	6.9%
Construction	6.1%	6.8%
Transportation and Warehouse	6.0%	6.5%
Manufacturing	4.5%	7.9%
Information	4.2%	2.8%
Administration, Support, Waste Management	4.0%	4.7%
Arts/Entertainment /Recreation	3.0%	2.5%
Wholesale Trade	2.7%	3.5%
Utilities	0.6%	0.9%
Agriculture, Forestry, Fishing, Hunting	0.2%	0.3%
Management of Companies	0.1%	0.2%
Mining, Quarrying, Oil & Gas	0.0%	0.0%

Source: U.S. Census 2019.

As shown in Table 3.6.3-1, the lowest unemployment levels for New York counties were for Queens County (3.6 percent) and Nassau County (3.9 percent); the highest unemployment levels were in New York County (5.2 percent) and Kings County (6.2 percent) (U.S. Census Bureau 2019). The populations living below poverty levels were lowest for Nassau (3.8 percent) and Suffolk (4.5 percent) Counties and were highest in Queens (12.2 percent) and Kings (15.9 percent) Counties. The lowest unemployment levels for New Jersey counties were in Monmouth, Middlesex, Ocean, and Hudson Counties and ranged from 4.9 percent to 5.2 percent; the highest unemployment levels were in Atlantic (8.4 percent), Essex (8.1 percent), and Cumberland (7.3 percent) Counties. The populations living below poverty levels were lowest for Burlington (4.1 percent) and Gloucester (4.4 percent) Counties and were highest in Hudson (11.8 percent), Cumberland (11.9 percent), and Essex (12.8 percent) Counties (U.S. Census Bureau 2019).

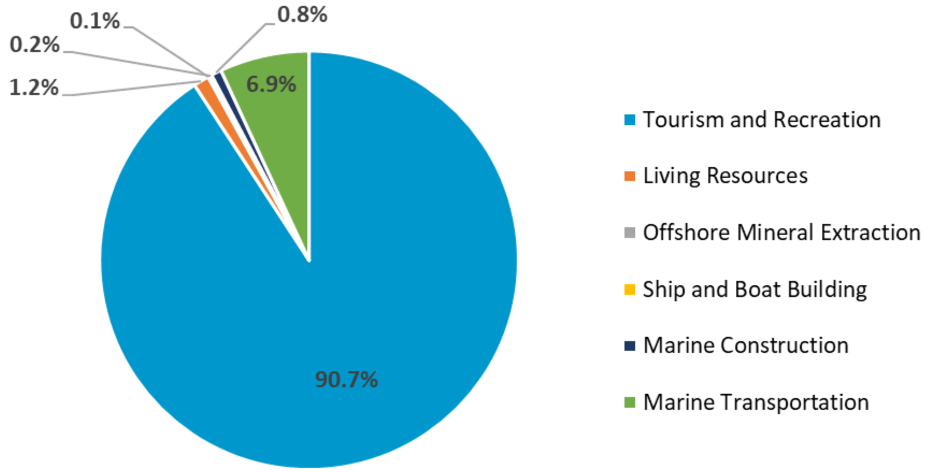
Ocean Industry Employment

Figure 3.6.3-3 presents the contribution of six ocean industry sectors (marine construction, living resources, offshore mineral extraction, ship and boat building, tourism and recreation, and marine transportation) to the ocean industry employment in 2019 for the New Jersey counties within the geographic analysis area. Figure 3.6.3-4 presents the same data for New York counties. Total ocean industry employment for New York counties was 342,047; for New Jersey it was 149,649 (NOEP 2022; Appendix B, Table B.4-8). Considering data for both states within the geographic analysis area, tourism and recreation accounts for 81 percent of the ocean industry economy, marine transportation accounts for 16 percent, and the remaining 3 percent is composed of the other four ocean industry sectors.



Source: NOEP 2022.

Figure 3.6.3-3. Ocean economy employment, New Jersey counties



Source: NOEP 2022.

Figure 3.6.3-4. Ocean economy employment, New York counties

3.6.3.1.4 Economics

Table 3.6.3-3 presents the data on number of establishments, employment, wages, and GDP attributed to the ocean industry sector for the counties in the geographic analysis area of New York (NOAA 2022). Similar to ocean industry-related employment for New York counties, the number of establishments, wages, and GDP are driven by two ocean industry sectors—tourism and recreation, and marine transportation.

Table 3.6.3-3. Total number of establishments, wages, and GDP for ocean industry economy of New York (2019)

Ocean Sector	Establishments	Employment	Wages, $M	GDP, $M	% NY Coastal Ocean Sector	
					Wages	GDP
Marine Construction	142	2,593	$198	$479	1.9%	1.5%
Living Resources	623	4,264	$8	$497	1.4%	1.6%
Offshore Mineral Extraction	35	90	$16	$14	0.1%	0.0%
Ship and Boat Building	4	190	$12,857	$30	0.1%	0.1%
Tourism and Recreation	20,195	330,693	$696	$29,194	92%	93%
Marine Transportation	397	11,847	$14,047	$1,116	5.0%	3.6%
All Ocean Sectors, Geographic Analysis Area Counties	21,445	349,677	$16,111	$31,330	100%	100%
All Ocean Sectors, State	24,019	398,514	$273	$35,109	87%	89%

Source: NOAA 2022.

Table 3.6.3-4 presents the data on number of establishments, employment, wages, and GDP attributed to the ocean industry sector for the counties in the geographic analysis area of New Jersey for the same six ocean industry sectors (NOAA 2022). Again, two ocean industry sectors—tourism and recreation and marine transportation—drive the ocean industry-related employment, number of establishments, wages, and GDP in New Jersey.

Table 3.6.3-4. Total number of establishments, wages, and GDP for ocean industry economy of New Jersey (2019)

Ocean Sector	Establishments	Employment	Wages, $M	GDP, $M	% NJ Coastal Ocean Sector	
					Wages	GDP
Marine Construction	81	1,869	$183	$369	4.9%	5.6%
Living Resources	152	890	$40	$101	1.1%	1.5%
Offshore Mineral Extraction	0	Not applicable	$0	$0	0.0%	0.0%
Ship and Boat Building	0	Not applicable	$0	$0	0.0%	0.0%
Tourism and Recreation	6,501	81,694	$1,951	$3,813	53%	58%
Marine Transportation	486	31,320	$1,537	$2,299	41%	35%
All Ocean Sectors, Geographic Analysis Area Counties	7,220	115,773	$3,711	$6,582	100%	100%
All Ocean Sectors, State	9,349	169,654	$6,689	$11,857	55%	56%

Source: NOAA 2022.

3.6.3.2 Impact Level Definitions for Demographics, Employment, and Economics

Definitions of adverse impact levels are provided in Table 3.6.3-5. Beneficial impacts on demographics, employment, and economics are described using the definitions described in Section 3.3.2 (see Table 3.3-1).

Table 3.6.3-5. Adverse impact level definitions for demographics, employment, and economics

Impact Level	Definition
Negligible	There would be no measurable impacts, or impacts would be so small that they would be extremely difficult or impossible to discern or measure.
Minor	Adverse impacts would not disrupt the normal or routine functions of the affected activity or geographic place.
Moderate	The affected activity or geographic place would have to adjust somewhat to account for disruptions due to impacts of the project.
Major	The affected activity or geographic place would experience disruptions to a degree beyond what is normally acceptable.

Cable emplacement and maintenance, land disturbance, lighting, noise, port utilization, presence of structures, and traffic are contributing IPFs to impacts on demographics, employment, and economics. However, these IPFs may not necessarily contribute to each individual issue outlined in Table 3.6.3-6.

Table 3.6.3-6. Issues and indicators to assess impacts on demographics, employment, and economics

Issue	Impact Indicator
Impacts on particular demographic and employment sectors of the economy	Qualitative assessment that considers the context and intensity of impacts resulting from the particular IPF on the functioning of the economy (e.g., decrease in full-time equivalent jobs, labor income, gross domestic product, and gross output)

3.6.3.3 Impacts of Alternative A – No Action – Demographics, Employment, and Economics

When analyzing the impacts of the No Action Alternative, BOEM considered the impacts of ongoing activities, including ongoing non-offshore-wind and ongoing offshore wind activities as the baseline conditions for demographics, employment, and economics. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore-wind and offshore wind activities as described in Appendix D, *Planned Activities Scenario*.

3.6.3.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for demographics, employment, and economics would continue to follow current regional levels and trends and respond to IPFs introduced by other ongoing activities. Tourism, recreation, and marine industries (e.g., fishing) would continue to be important components of the regional economy. Ongoing non-offshore-wind activities in the geographic analysis area that contribute to impacts on demographics, employment, and economics include growth in onshore development; ongoing installation of submarine cables and pipelines; periodic channel dredging; maintenance of piers, pilings, seawalls, and buoys; ongoing commercial shipping; continued port upgrades and maintenance; and ongoing effects from climate change (e.g., damage to property and coastal infrastructure) (see Appendix D for a description of ongoing activities). These ongoing activities contribute to numerous IPFs including cable emplacement and maintenance, which could disrupt fishing; land disturbance, which supports local population growth, employment, and economies; lighting and noise, which can affect residential and other sensitive populations; port utilization, which can affect jobs, populations, and economies; presence of structures, which can affect fishing, navigation, and coastal views; and marine traffic, which can affect commercial fishing/shipping and recreation and tourism economies.

The socioeconomic impact of ongoing activities varies depending on each activity. Activities that generate economic activity, such as port maintenance and channel dredging, would generally benefit the local economy by providing job opportunities and generating indirect economic activity from suppliers and other businesses that support activity along coastal areas. Conversely, ongoing activities that disrupt economic activity, such as climate change, may adversely affect businesses, resulting in impacts on employment and wages. Coasts are sensitive to sea level rise, changes in the frequency and intensity of storms, increases in precipitation, and warmer ocean temperatures. Sea level rise and increased storm frequency and severity could result in property or infrastructure damage, increased insurance cost, and reduction in the economic viability of coastal communities. Impacts on marine life due to ocean acidification, altered habitats and migration patterns, and disease frequency would affect industries that rely on these species. The impacts of climate change are likely over time to worsen problems that coastal areas already face.

Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on demographics, employment, and economics include ongoing construction of Ocean Wind 1 (OCS-A 0498) and Empire Wind 1 and 2 (OCS-A 0512). Ongoing construction of Ocean Wind 1 and Empire Wind 1 and 2 would have the same type of impacts on demographics, employment, and economics that are described in Section 3.6.3.3.2, *Cumulative Impacts of the No Action Alternative* for all ongoing and planned offshore wind activities in the geographic analysis area.

3.6.3.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impact of the No Action Alternative in combination with other planned non-offshore-wind activities and planned offshore wind activities (without the NY Bight projects). Offshore wind is a new industry for the Atlantic states and the nation. Although most offshore wind component manufacturing and installation capacity exists outside of the U.S., some studies acknowledge that domestic capacity is poised to increase (BVG 2017; NREL 2023).

A BVG Associates Limited study (BVG 2017) estimated that the percentage of associated jobs that would be sourced in the United States during the initial implementation of offshore wind projects along the U.S. northeast coast would range from 35 to 55 percent. The proportion of jobs projected to be associated with offshore wind within the United States is approximately 65 to 75 percent from 2030 through 2056. Overseas manufacturers of components and specialized ships based overseas would comprise the rest of the offshore wind–related jobs, located outside the United States (BVG 2017).

The American Wind Energy Association (AWEA; now known as American Clean Power) estimates that the offshore wind industry will invest between $80 and $106 billion in U.S. offshore wind development by 2030, of which $28 to $57 billion will be invested within the United States. While most economic and employment impacts would be concentrated in Atlantic coastal states where offshore wind development will occur, there would be nationwide effects as well (AWEA 2020). The AWEA base scenario assumes 20 GW of offshore wind power by 2030, domestic content of 30 percent in 2025, and of 50 percent in 2030; the high scenario assumes 30 GW of offshore wind power by 2030 and domestic content of 40 percent in 2025 and of 60 percent in 2030. Offshore wind energy development will support $14.2 billion in economic output and $7 billion in value added by 2030 under the base scenario and support $25.4 billion in economic output and $12.5 billion in value added under the high scenario.

Compared to the $14.2 to $25.4 billion in offshore wind economic output (AWEA 2020), the 2020 annual GDP for Atlantic states with planned offshore wind projects (Connecticut, Massachusetts, Rhode Island, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina) ranged from $60.8 billion in Rhode Island to $1.74 trillion in New York (U.S. Bureau of Economic Analysis 2021) and totaled just over $5 trillion. The $14.2 to $25.4 billion in offshore wind industry output would represent 0.3 to 0.5 percent of the combined GDP of these states.

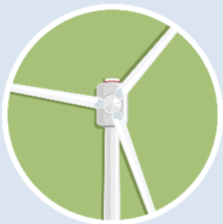
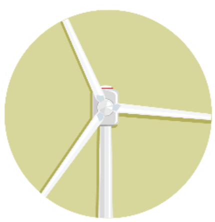
The AWEA estimates that in 2030, offshore wind would support 45,500 (base scenario) to 82,500 (high scenario) full-time equivalent (FTE) jobs nationwide. The Responsible Offshore Development Alliance (RODA) in 2020 estimated that offshore wind projects would create 55,989 to 86,138 job-years through 2030 in construction and 5,003 to 6,994 long-term jobs in O&M (Georgetown Economic Services 2020).

In 2019, employment for New Jersey and New York counties within the geographic analysis area was approximately 3.0 million and 6.1 million jobs, respectively (Table B.4-5 in Appendix B). While the extent to which there will be impacts on the geographic analysis area is unclear due to the geographic versatility of offshore wind jobs, a substantial portion of the jobs supporting planned offshore wind projects in New Jersey and New York would likely be within commuting distance of ports.

Some local economic activity has already begun for the anticipated offshore wind industry. The establishment of a New York State Advisory Council on Offshore Wind Training Institute was launched to develop a plan for deploying public funds and has issued the first solicitation for $3 million to support early training and skills development for disadvantaged communities. The developers of the Sunrise Wind project (OCS-A 0487) have invested $10 million in a National Offshore Wind Training Center at Suffolk County Community College on Long Island to train and certify workers. The Center of Excellence for Offshore Energy at State University of New York’s Maritime College was launched with a grant from New York State to develop classroom and online training programs (NYSERDA 2021).

Ongoing and planned offshore wind activities that may contribute to impacts on demographics, employment, and economics in the geographic analysis area are listed in Table 3.6.3-7.

Table 3.6.3-7. Ongoing and planned offshore wind that may contribute to impacts on demographics, employment, and economics

Ongoing/Planned	Projects by Region
Ongoing – 3 projects[1] 	**NY/NJ** • Ocean Wind 1 (OCS-A 0498) • Empire Wind 1 (OCS-A 0512) • Empire Wind 2 (OCS-A 0512)
Planned – 3 projects[2] 	**NY/NJ** • Ocean Wind 2 (OCS-A 0532) • Atlantic Shores North (OCS-A 0549) • Atlantic Shores South (OCS-A 0499)

NJ = New Jersey; NY = New York

[1] Refer to footnotes 9 and 10 in PEIS Chapter 1 for additional information on the status of Ocean Wind 1, Empire Wind 1, and Empire Wind 2.

[2] Status as of September 20, 2024.

In addition to the regional economic impact of a growing offshore wind industry, BOEM expects ongoing and planned offshore wind activities to affect demographics, employment, and economics through the following primary IPFs.

Cable emplacement and maintenance: Offshore cable emplacement for offshore wind activities could impact commercial fishing and for-hire recreational fishing during cable installation and maintenance, temporarily causing commercial and recreational fishing vessels to relocate away from work areas, disrupting fish stocks, and reducing income or increasing catch per unit effort costs. (See Section 3.6.1.3.2 for additional details.) The economic impact on commercial/for-hire recreational fishing would likely be short term and minor.

Land disturbance: Land disturbance could result in localized, short-term, adverse revenue losses for businesses near construction sites due to construction impacts (e.g., increased noise, traffic, and access disturbances) and beneficial impacts for businesses supporting construction activities. Conceptual decommissioning would create an increased economic activity compared to the O&M phase but is unlikely to cause additional land disturbance. Adverse and beneficial impacts on employment, wages, and GDP would be localized, short term, and minor.

Lighting: Offshore WTGs require aviation warning lighting that could have economic impacts if the lighting influences visitors and residents in selecting coastal locations in which to reside or to visit. No readily available studies characterize the impacts of nighttime offshore lighting on economic activity. Studies cited in Section 3.6.8, *Recreation and Tourism*, suggest that WTGs visible from more than 15 miles (24.1 kilometers) away would have negligible effects on businesses dependent on recreation and tourism activity (Parsons and Firestone 2018).[1] At this distance, the percentage of respondents who indicated that their experience would be improved by the presence of WTGs was the same as the percentage of respondents who indicated that their experience would be worsened by the WTGs. While some WTGs associated with ongoing and planned offshore wind projects in the geographic analysis area would be within 10 miles of shore, the majority of WTGs would be more than 15 miles from coastal locations. The implementation of ADLS would activate a hazard lighting system in response to detecting nearby aircraft and, if ADLS is implemented, would result in shorter-duration night sky impacts. Due to the distance of the WTGs from shore and the expected implementation of ADLS, ongoing and planned offshore wind projects would result in overall negligible impacts. Nighttime transit or construction lighting may be visible from some coastal residences and businesses. Conceptual decommissioning may increase nighttime lighting from vessels in transit but would result in reduced lighting impacts from WTG removals. However, the contribution from offshore wind to existing activity is small and there would likely be a negligible impact on demographics, employment, and economics.

Noise: Noise from vessel traffic during the maintenance and construction phases could affect species important to commercial/for-hire fishing, recreational fishing, and whale watching. Offshore wind-related construction noise from pile-driving, cable laying and trenching, and vessels could drive away species important to tour boat or for-hire recreational fishing businesses. Noise from pile-driving could also affect fish populations important to commercial fishing and marine recreational businesses. These impacts would be greater if multiple construction activities occur in close spatial or temporal proximity. Impacts would likely be temporary, mainly occurring during surveying and construction and, therefore, are expected to be minor. Impacts during O&M would likely be negligible. Onshore construction noise could temporarily inconvenience visitors, workers, and residents, resulting in reduction of economic activity for businesses near cable landfall or substation sites or port improvements. During conceptual decommissioning vessel traffic noise would occur as well as offshore activity-related noise from WTG removal. The location of onshore activities is unknown, so noise impacts from onshore construction currently cannot be determined reliably. Impacts on demographics, employment, and economics from noise is expected to be intermittent, short term, and negligible to minor, like those of typical onshore utility construction activities.

Port utilization: Offshore wind development would require support from nearby port facilities and may need port expansion and improvements. Development activities would bolster port investment and employment, jobs and revenue in port-supporting industries, and port construction/improvement businesses. Port utilization would require a trained workforce for the offshore wind industry, providing local and regional employment and economic activity for onshore and offshore workers. Improvements to existing ports and channels would be beneficial to other port activity. In the O&M phase, the level of port activity would likely be lower but more consistent. Offshore wind development could result in increased demand for port service and result in port expansions. Port construction activities could result in minor short- to long-term adverse impacts on marine transportation and commercial/for-hire/recreational fishing. Overall, however, port utilization from offshore wind is anticipated to result in

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[1] This study was based on 100 WTGs using a 0.75-mile grid spacing and a maximum rotor height of 574 feet. The study used visual simulations under clear, hazy, and nighttime (lighted) conditions.

minor beneficial impacts on demographics, employment, and economics both from short-term creation of construction jobs (a few years to a decade, particularly between 2023 and 2030) that likely can be supported by the existing workforce, from minor long-term (decades) job creation during the O&M phase, and from short-term job creation during conceptual decommissioning (a few years to a decade).

Presence of structures: Up to 697 WTGs are projected for the New York/New Jersey region, without any NY Bight development (Appendix D). Businesses that are most likely to be affected by presence of structures include commercial fishing, for-hire recreational fishing, recreational fishing (and for all three, particularly the fisheries using bottom gear) and marine recreation and tourism businesses. Marine transportation could also be affected. Impacts will include both short-term impacts during construction from noise and vessel traffic and long-term impacts from the physical presence of structures by creating areas that fishing vessels may avoid due to safety concerns or potential for gear damage. The areal extent of these areas will increase directly with the number of WTGs installed but will also depend on their location, spacing, and orientation. These potential adverse impacts can be temporary over a timescale of years and minor (e.g., those associated with structure installation) or can be long-term over a timescale of multiple decades and moderate (e.g., resulting from space-use conflicts for fishing or marine transportation). The presence of structures could produce beneficial fish aggregation and reef effect impacts around marine structures for businesses that cater to migratory species and offshore recreational fishing. Damage to gear is a concern and could be worsened if fish aggregate around offshore infrastructure and fishermen engage in higher risk fishing patterns near WTGs. Given the distances from shore, the attraction of recreational anglers to offshore wind structures is more likely to change recreational fishing patterns than to result in an overall increase in recreational fishing. Another beneficial impact could be new business opportunities, e.g., windfarm tourism for those interested in a close-up experience with offshore wind structures, as has occurred for the Block Island Wind Farm. Both adverse and beneficial impacts would be reversed following conceptual decommissioning and WTG removal.

Impacts on commercial fisheries and for-hire recreational fishing are of most concern, with impacts anticipated to range from negligible to major for commercial fisheries and moderate impacts with potential minor beneficial impacts on for-hire recreational fishing (see Section 3.6.1, *Commercial Fisheries and For-Hire Recreational Fishing*). These industries represent only a part of the ocean economy that would be affected by offshore wind, and overall impacts on employment and economics would be minor.

Traffic: Offshore wind construction and conceptual decommissioning and, to a lesser extent, offshore wind operations would generate increased vessel traffic. The magnitude of increased vessel traffic will depend on vessel traffic volumes generated by each offshore wind project and number of WTGs; the extent of concurrent or sequential construction of wind energy projects; and the ports selected for each project. Increased vessel traffic will occur to, from, and in supporting ports and in offshore construction areas. Vessel traffic could adversely affect marine transportation, commercial fishing, and recreational traffic. Impacts of short-term, increased vessel traffic during construction could include increased vessel traffic congestion, delays at ports, and a risk for collisions between vessels. Increased vessel traffic would be localized near affected ports and offshore construction areas. Congestion and delays could increase fuel costs (i.e., for vessels forced to wait for port traffic to pass) and decrease productivity for commercial shipping, fishing, and recreational vessel businesses, whose income depends on the ability to spend time out of port. Collisions could lead to vessel damage and spills, which could have direct costs (i.e., vessel repairs and spill cleanup), as well as indirect costs from damage caused by spills. Beneficially, this increased traffic would support increased employment and economic activity for marine transportation related to offshore wind and supporting businesses and investment in ports.

Beneficial and adverse impacts will be greatest during construction and installation and cover a span of a few years to a decade. The far longer phase of O&M will produce lower and more consistent vessel traffic. Conceptual decommissioning would create a short-term increase in vessel traffic but would be at a lower level of activity than during the construction phase. The increase in vessel trips from offshore wind activity is anticipated to be largely indiscernible from existing levels of vessel traffic. Offshore wind traffic would likely result in short-term, negligible to minor impacts and long-term minor beneficial impacts on employment, wages, and the economy.

3.6.3.3.3 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, the demographic and economic trends from ongoing non-offshore-wind activities and ongoing offshore wind construction in the geographic analysis area would continue. Tourism and recreation and marine industries such as marine transportation would continue to be important components of the regional economy. BOEM anticipates that the No Action Alternative would likely have a **negligible** to **minor** impact on the demographics, employment, and economy of the geographic analysis area.

Cumulative Impacts of the No Action Alternative. Under the No Action Alternative, ongoing and planned offshore wind and non-offshore-wind activities would affect ocean-based employment and economics, driven primarily by the continued operation of existing marine industries, especially recreation/tourism and marine shipping. The influence of planned offshore wind development, representing a significant investment in energy production, still presents a small impact in the geographic analysis area whose combined annual state GDPs runs to $2.6 trillion and supports nearly 7.5 million jobs. Although there may be adverse impacts associated with planned offshore wind activities on the region's demographics, employment, and economics, there are also beneficial impacts resulting from these same activities. BOEM concludes the cumulative impact of planned offshore wind development, in combination with ongoing activities, would likely have a **negligible** to **minor** impact and **minor beneficial** impacts on demographics, employment, and economics.

3.6.3.4 Impacts of Alternative B – No Identification of AMMM Measures at the Programmatic Stage – Demographics, Employment, and Economics

3.6.3.4.1 Impacts of One Project

Alternative B considers the potential impacts of future offshore wind development for the NY Bight area without the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts. The development of a single project within the NY Bight lease areas without AMMM measures would result in impacts similar to those described in Section 3.6.3.3.2, *Cumulative Impacts of the No Action Alternative*. Accordingly, the discussion below does not repeat the analyses supplied in Section 3.6.3.3.2 but describes where impacts may differ and reiterates the conclusions of those analyses.

Cable emplacement and maintenance: The development of a single NY Bight project would result in seafloor disturbance due to the installation of interarray and export cables. Cable emplacement could prevent deployment of fixed and mobile fishing gear in limited parts of the NY Bight area from one day up to several months (if simultaneous lay and burial techniques are not used), which may result in the loss of access if alternative fishing locations are not available. The demographic, employment, and economic impact on commercial/for-hire fishing would be localized, short term, and minor.

Land disturbance: Land disturbance could result in localized, short-term, adverse revenue losses for businesses near construction sites and beneficial impacts for businesses supporting construction. During peak tourist season, construction-related impacts associated with land disturbance, including road construction along the offshore export cable routes, could cause traffic delays and inconveniences to local businesses and residents. Temporary blockage of some roads during installation activities may restrict access to some local areas, although it is unlikely that access to specific establishments would be completely inhibited. Conceptual decommissioning is not anticipated to create additional land disturbance. Adverse and beneficial impacts on employment and wages would likely be localized, short term, and minor.

Lighting: One offshore wind project would add new sources of light to onshore and offshore areas, including from nighttime vessel lighting during construction and conceptual decommissioning and fixed lighting at onshore substations/converter stations, and on up to 280 WTGs and up to 5 OSSs. Because of the distance from shore (the NY Bight lease area nearest to shore is 20 nautical miles [37 kilometers] offshore), lighting on the WTGs and OSSs is not anticipated to have a substantial effect on views. However, as described in Section 3.6.9, *Scenic and Visual Resources*, in the absence of an ADLS system, there would be new, constant sources of nighttime lighting in view of the coastline for one NY Bight project. Nighttime lighting could have long-term impacts on demographics, employment, and economics if the lighting influences resident and visitor decisions in selecting coastal locations to visit or reside in. The addition of a single project in the NY Bight area would result in long-term, minor impacts, primarily as a result of offshore lighting on WTGs and OSSs.

Noise: Adverse offshore noise impacts on demographics, employment, and economics during construction/installation and conceptual decommissioning would likely be short term and minor; and impacts during O&M would be negligible. Adverse impacts of onshore noise would likely be intermittent, short term, and minor.

Port utilization: A single NY Bight project's activities at ports would support port investment and employment and would also support jobs and businesses in supporting industries and commerce. Several ports may support a single NY Bight project construction and O&M: Howland Hook/Port Ivory, Port of Albany, Port of Coeymans, South Brooklyn Marine Terminal, Brooklyn Navy Yard, Arthur Kill

Terminal in New York, and New Jersey Wind Port and Paulsboro Marine Terminal in New Jersey. These ports would require a trained workforce for the offshore wind industry including additional shore-based and marine workers that would contribute to local and regional economic activity.

The economic benefits would be greatest during construction and conceptual decommissioning when the most jobs and economic activity at ports supporting the NY Bight project would occur. During operations, activities would be concentrated where the single NY Bight project's onshore O&M facility would be located, and in other ports that may support one NY Bight project-related vessel traffic. Port utilization during construction/installation and conceptual decommissioning is expected to result in short-term minor beneficial impacts on demographics, employment, and economics, and minor beneficial long-term impacts during O&M.

Presence of structures: One NY Bight project would add up to 285 offshore wind structures with foundation scour protection and offshore export cable hard protection, which could affect marine-based businesses (i.e., commercial and for-hire recreational fishing businesses, offshore recreational businesses, and related businesses) through entanglement and gear loss/damage, navigational hazard and risk of allisions, fish aggregation, habitat alteration, and space use conflicts. Adverse impacts could include both short-term minor impacts during construction and long-term minor impacts from the creation of areas that fishing vessels would likely avoid due to the physical presence of structures. The presence of structures could produce long-term beneficial fish aggregation/reef effect impacts that are expected to be negligible to minor. Conceptual decommissioning and WTG removals would reverse both adverse and beneficial impacts from the presence of structures.

Stakeholders have raised questions regarding whether a NY Bight project could affect property values; any impacts on property values could also affect local property tax receipts. Hoen et al. (2013) analyzed housing prices from home sales occurring within 10 miles (16 kilometers) of onshore wind facilities in nine U.S. states and found no statistical evidence that home values were affected in the post-announcement/preconstruction or post-construction periods. The MassCEC also commissioned a report—Relationship between Wind Turbines and Residential Property Values in Massachusetts (Atkinson Palombo & Hoen 2014)—to study if home values were affected by their proximity to onshore WTGs. The study analyzed 122,198 home sales occurring between 1998 and 2012 of homes located within 5 miles (8 kilometers) of 41 Massachusetts wind turbines. Results of this study indicated that there were no effects on nearby home prices resulting from the development of a wind farm in a community. Brunner et al. (2024) found that onshore wind farms in the U.S. had temporary adverse impacts on property values within a limited distance (1–2 miles) and that wind farms further away did not adversely affect property values. A 2017 study found that when placed more than 8 miles (7 nautical miles; 13 kilometers) from shore, there is a minimal effect on vacation rental values associated with offshore wind farms (Lutzeyer et al. 2017). A 2018 study also found that there was no impact on property values when the wind farm is located 5.6 miles (9 kilometers) offshore (Jensen et al. 2018). Dong and Lang (2022) found that the Block Island Wind Farm did not adversely affect property values on Block Island or on the Rhode Island mainland. Since any NY Bight project will be located a substantial distance from shore—with the closest lease area 20 nautical miles from shore and the farthest lease area 35 nautical miles (40 miles) from shore—any impacts on property values are expected to be negligible.

Traffic: Vessel traffic from a single NY Bight project could adversely affect marine transportation, commercial/for-hire fishing, and recreational traffic due to associated increased vessel traffic congestion, delays at ports, and a risk for collisions between vessels. Increased traffic would support increased employment and economic activity for marine transportation and supporting businesses and investment in ports. The highest activity level would occur during the construction phase; lower activity would occur during the conceptual decommissioning phase; and the lowest activity would be during the much longer O&M phase. Offshore wind traffic would likely result in short-term negligible to minor adverse impacts and long-term minor beneficial impacts.

3.6.3.4.2 Impacts of Six Projects

The types of IPFs, impacts, and mechanisms that affect the demographics, employment, and economics of the geographic analysis area as described for one NY Bight project would be the same for six NY Bight projects, but would be of greater intensity or extent because more projects would be constructed and decommissioned. Impacts would be greater due to the higher level of activity and onshore development for six NY Bight projects. The impacts from some IPFs may increase directly proportionally to the amount of construction; for example, seabed disturbance associated with cable emplacement relates directly to the total miles of cable installed for each of the six NY Bight projects. The impacts from other IPFs may be highly dependent on the specific details of how each of the six NY Bight projects would be constructed; for example, the impacts from port utilization for the six NY Bight projects would be highly dependent on the specific ports proposed to be used, their need for improvements, and whether a specific port may be used to serve multiple projects. In addition, if multiple projects are being constructed at the same time, temporary impacts for certain IPFs, such as those associated with traffic and port utilization, could be greater than those identified for a single project. If projects are staggered over a longer period, the intensity of the impacts could be less than if multiple projects were constructed at the same time, but the overall duration of the impacts could be longer. The impacts and benefits for IPFs may increase, but the magnitude change of specific impacts are not known until COPs are developed for each project. Based on the type, nature, and magnitude of impacts expected under one NY Bight project, although impacts from six NY Bight projects would undoubtedly be larger, the overall impact magnitude is not expected to change.

3.6.3.4.3 Cumulative Impacts of Alternative B

The construction and installation, O&M, and conceptual decommissioning of six NY Bight projects would contribute to the impacts on demographics, employment, and economics from ongoing and planned activities in the geographic analysis area. Construction and conceptual decommissioning of six NY Bight projects that overlap with construction and conceptual decommissioning of other ongoing and planned projects would result in temporary impacts from increased vessel traffic and offshore construction that may disrupt maritime businesses. It is not likely that onshore export cables, onshore substations/converter stations, and other project-specific onshore facilities associated with the six NY

Bight projects would overlap spatially with other projects. However, the six NY Bight projects and other ongoing and planned projects may rely on the same ports and construction staging areas, because it is possible that a given port or staging area capacity has sufficient flexibility to accommodate more than one project's requirements. Cumulative impacts would occur if the six NY Bight projects overlap in the use of ports with other offshore wind projects, leading to greater port congestion and greater economic use and employment opportunities.

The presence of structures from the six NY Bight projects combined with the structures from other ongoing and planned offshore wind projects in the region (Ocean Wind 1 [OCS-A 0498], Ocean Wind 2 [OCS-A 0532], Atlantic Shores South [OCS-A 0499], Atlantic Shores North [OCS-A 0549], and Empire Wind 1 and 2 [OCS-A 0512]) would create permanent space-use conflicts that may have negligible to major adverse impacts on commercial fishing and moderate adverse impacts with minor beneficial impacts on for-hire recreational fishing industries. Commercial fishing GDP for New York ranges from approximately $40 million to $69 million, while for New Jersey ranges from approximately $166 million to $191 million (see Section 3.6.1, *Commercial Fisheries and For-Hire Recreational Fishing*). Compared to the ocean sector GDPs of $31 billion for New York and $6.6 billion for New Jersey, although impacts on commercial fishing may be major, such impacts would be negligible to minor on the ocean economies of either state. While the presence of structures would also affect other commercial vessel traffic by requiring most large vessels to navigate around the lease areas, because the lease areas are sited outside of current and proposed vessel traffic lanes (refer to Section 3.6.6, *Navigation and Vessel Traffic*), disruptions to marine transportation and related economic activity would be limited and impacts would be minor. Adverse effects could be counterbalanced by the beneficial effects on the regional economy from increased economic activity and employment associated with the establishment of the New York-New Jersey region as an offshore wind hub, resulting in moderate beneficial impacts on employment and economics. Zhang et al. (2020) estimates that the jobs supported by all development in the New York Bight area are 100 annual development jobs (from 2022 to 2029) and 32,200 annual construction jobs (from 2025 to 2030).

3.6.3.4.4 Conclusions

Impacts of Alternative B. One NY Bight project and six NY Bight projects would likely have **negligible** to **minor** impacts on demographics, employment, and economics. One NY Bight project and six NY Bight projects would affect employment and economics through job creation and increased local business revenue and would likely have **minor beneficial** impacts. The geographic analysis area may experience substantial temporary increased economic activity associated with offshore wind development during the construction and installation phases, a lower and shorter-term increase during conceptual decommissioning, and a low level of increased economic activity over the long-term (35+ years) O&M phase of offshore wind energy production.

While the NY Bight projects' investments in wind energy would largely benefit the local and regional economies through job creation, workforce development, and income and tax revenue, adverse impacts on individual businesses and communities would also occur. Short-term increases in noise during construction, cable emplacement, and conceptual decommissioning; land disturbance; and the long-term presence of offshore lighting and structures would have negligible to minor adverse impacts on demographics, employment, and economics. The commercial fishing industry and other businesses that depend on local seafood production would experience impacts during construction. Overall, the impacts on commercial fishing and onshore seafood businesses would have minor impacts on demographics, employment, and economics for this component of the geographic analysis area's economy. Although commercial fishing is a small component of the regional economy, it is important to the identity of local communities within the region. The IPFs associated with one and six NY Bight projects would also result in impacts on certain recreation and tourism businesses, with an overall minor impact on employment and economic activity for this component of the analysis area's economy.

Cumulative Impacts of Alternative B. In context of reasonably foreseeable environmental trends, the impacts contributed by Alternative B to cumulative impacts on demographics, employment, and economics would be noticeable. BOEM anticipates that cumulative impacts on demographics, employment, and economics from six NY Bight projects when combined with other ongoing and planned activities would likely be **negligible** to **minor** and **moderate beneficial**. The moderate beneficial impacts primarily would be associated with the investment in offshore wind, job creation and workforce development, income and tax revenue, and infrastructure improvements generated from the development of six NY Bight projects plus six ongoing and planned offshore wind projects in the geographic analysis area. The minor adverse effects would result from aviation hazard lighting on WTGs; new cable emplacement and maintenance; the presence of structures; noise and vessel traffic and collisions during construction and conceptual decommissioning; and land disturbance. Impacts on commercial fishing could rise to a major level; however, such impacts would be negligible to minor on the ocean economies of New York and New Jersey because commercial fishing is only one component of the overall ocean economy.

3.6.3.5 Impacts of Alternative C (Proposed Action) – Identification of AMMM Measures at the Programmatic Stage – Demographics, Employment, and Economics

Alternative C, the Proposed Action, considers the potential impacts of future offshore wind development for the NY Bight area with the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts. Alternative C consists of two sub-alternatives – Sub-alternative C1: Previously Applied AMMM Measures, and Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures. The analysis for Sub-alternative C1 is presented as the change in impacts from those impacts discussed under Alternative B, and the analysis for Sub-alternative C2 is presented as the change from those impacts discussed in Sub-alternative C1. Refer to Table G-1 in Appendix G, *Mitigation and Monitoring*, for a complete description of AMMM measures that make up the Proposed Action.

3.6.3.5.1 Sub-alternative C1 (Preferred Alternative): Previously Applied AMMM Measures

Sub-alternative C1 analyzes the AMMM measures that BOEM has required as conditions of approval for previous activities proposed by lessees in COPs submitted for the Atlantic OCS or through related consultations.

Although there are no previously applied AMMM measures specific to demographics, employment, and economics, there are many identified for other resources that may indirectly affect demographics, employment, and economics, such as those measures that reduce onshore noise and traffic associated with construction of onshore support facilities or the presence of structure impacts. However, the dynamics of such interactions are complex and not easily quantifiable absent project-specific data. For example, onshore construction can have negative impacts on a local community (e.g., from noise and traffic), but at the same time may use local labor, supplies, or services that positively affect the same community. Thus, the net impact of any AMMM measure on demographics, employment, and economic needs to be assessed when project-specific data are available. Impacts associated with noise, lighting, traffic, and presence of structures would likely be reduced, while impacts for all other IPFs would remain the same as described under Alternative B.

Impacts of One Project

AMMM measures under Sub-alternative C1 that reduce impacts on commercial fisheries and for-hire recreational fishing and recreation and tourism are those most likely to affect employment and economics from a single NY Bight project. As described in Section 3.6.1, *Commercial Fisheries and For-Hire Recreational Fishing*, and Section 3.6.8, *Recreation and Tourism*, AMMM measures may slightly reduce impacts on commercial fishing, for-hire recreational fishing, and recreation and tourism, which would benefit regional employment and economics, but the impact levels would remain the same as projected for Alternative B—negligible to minor adverse impacts and minor beneficial impacts.

Impacts of Six Projects

Impacts of six NY Bight projects under Sub-alternative C1 would be the same as described for one NY Bight project under Sub-alternative C1. AMMM measures may slightly reduce impacts on commercial fisheries and for-hire recreational fishing and on recreation and tourism, but the impact levels would remain the same as projected for Alternative B—negligible to minor adverse impacts and minor beneficial impacts.

Cumulative Impacts of Sub-alternative C1 (Preferred Alternative)

Under Sub-alternative C1, cumulative impacts on demographics, employment, and economics are anticipated to be the same as described under Alternative B.

3.6.3.5.2 Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures

Sub-alternative C2 analyzes the AMMM measures under Sub-alternative C1 plus the AMMM measures that have not been previously applied. However, BOEM has not identified any AMMM measures that have not been previously applied for demographics, employment, and economics; therefore, the impacts under Sub-alternative C2 are the same as for Sub-alternative C1.

3.6.3.5.3 Conclusions

Impacts of Alternative C. Impacts on demographics, employment, and economics would be slightly reduced from the AMMM measures that would lessen impacts on other resources like commercial fisheries and for-hire recreational fishing and recreation and tourism. However, under Sub-alternatives C1 and C2, the overall evaluation of impacts would likely remain the same as Alternative B—**negligible** to **minor** impacts and **minor beneficial** impacts from one NY Bight project and six NY Bight projects.

Cumulative Impacts of Alternative C. In context of reasonably foreseeable environmental trends, the impacts contributed by Sub-alternatives C1 and C2 to cumulative impacts on demographics, employment, and economics would be noticeable. The combination of Sub-alternatives C1 and C2 of six NY Bight projects and other ongoing and planned activities would likely result in the same **negligible** to **minor** impacts and **moderate beneficial** impacts on demographics, employment, and economics as Alternative B.

3.6.3.6 Recommended Practices for Consideration at the Project-Specific Stage

BOEM has not identified any RPs for demographics, employment, and economics. However, RPs for other resources that minimize disruptions to businesses—especially those that reduce impacts on commercial fisheries and for-hire recreational fishing and recreation and tourism, while supporting the offshore wind industry—may also benefit demographics, employment, and economics.

3.6 Socioeconomic Conditions and Cultural Resources

3.6.5 Land Use and Coastal Infrastructure

This section discusses potential impacts on land use and coastal infrastructure from the Proposed Action, alternatives, and ongoing and planned activities in the geographic analysis area. The land use and coastal infrastructure geographic analysis area, as shown on Figure 3.6.5-1, includes the counties where onshore infrastructure may be located, the counties with representative ports that may be used by the NY Bight projects, as well as the counties closest to the NY Bight lease areas that may be affected by construction and installation, O&M, and conceptual decommissioning of the NY Bight projects.

The land use and coastal infrastructure impact analysis in this PEIS is intended to be incorporated by reference into the project-specific environmental analyses for individual COPs expected for each of the NY Bight lease areas. Because the locations of onshore components for the NY Bight projects are not known at this time, the analysis of land use impacts is dependent on a hypothetical project analysis and impact conclusions consider a maximum-case scenario for onshore development. Additional detailed site-specific analysis will be required for individual COPs. Refer to Appendix C, *Tiering Guidance*, which identifies additional analyses anticipated to be required for the project-specific environmental analysis of individual COPs.

3.6.5.1 Description of the Affected Environment and Future Baseline Conditions

The geographic analysis area includes a diverse mix of land use types. In New Jersey, land uses in the geographic analysis area include agricultural, barren, urban, riparian lands, forest, and waterbodies (NJDEP 2015). In New York, land uses include agricultural, commercial, industrial, urban, and recreational lands (Long Island Index 2020; NYC Planning 2021). Figure 3.6.5-2 illustrates the diversity of land uses across the geographic analysis area, and Table 3.6.5-1 provides the acreage of each land use type.

New Jersey and New York both have statewide land use laws and regulations in place that regulate land uses and development, particularly along the coast. The Waterfront Development Law authorizes the NJDEP to regulate the construction or alteration of dock, wharf, pier, bulkhead, bridge, pipeline, cable, or other similar development on or adjacent to tidal waterways throughout the state (NJDEP 2022). The Coastal Area Facility Review Act (CAFRA) authorizes NJDEP to regulate residential, commercial, public, or industrial development (such as construction, relocation, and enlargement of buildings and structures; and associated work such as excavation, grading, site preparation, and the installation of shore protection structures) within the CAFRA area, which includes coastal New Jersey along the Delaware Bay (NJDEP 2022).

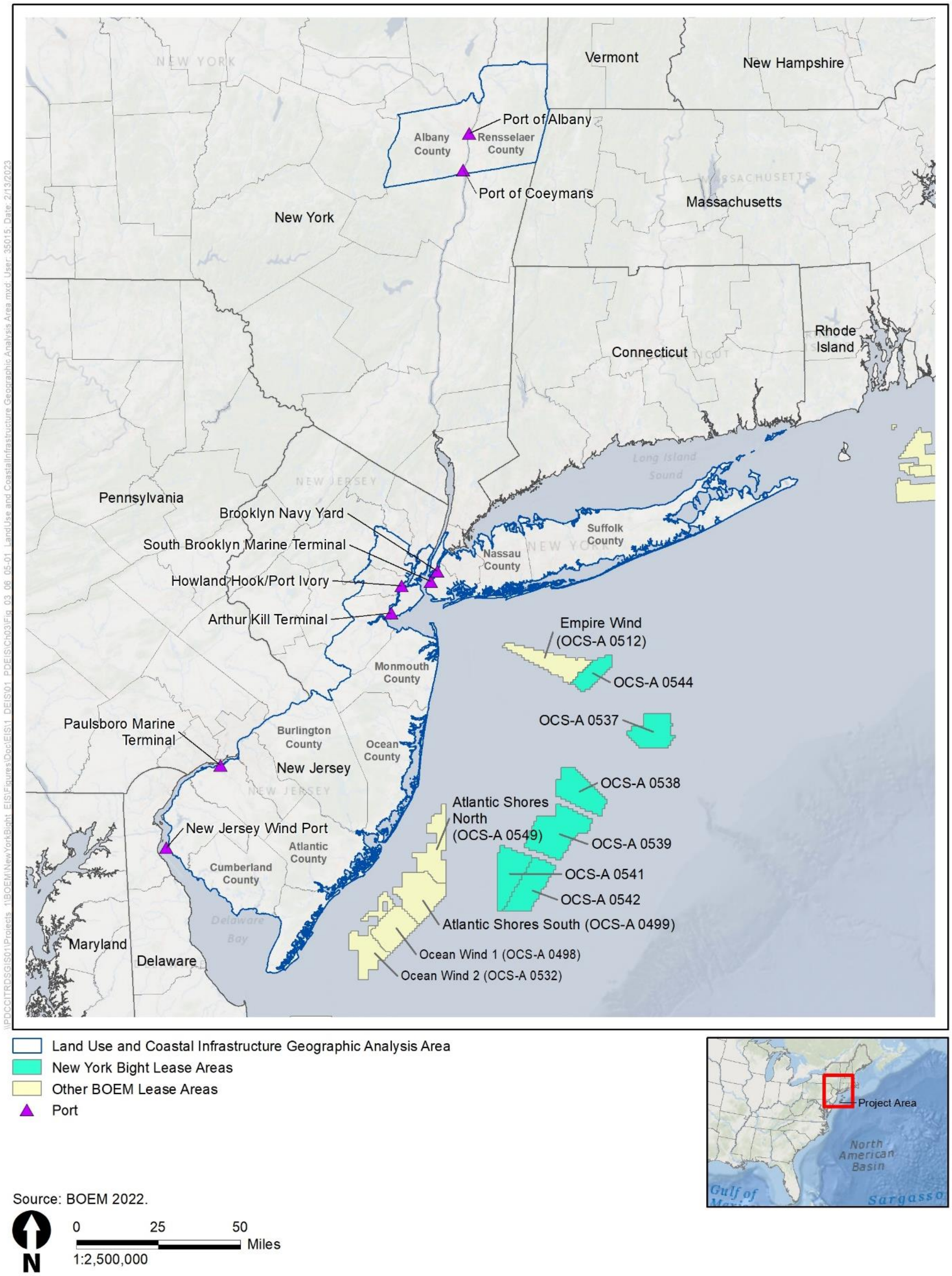


Figure 3.6.5-1. Land use and coastal infrastructure geographic analysis area

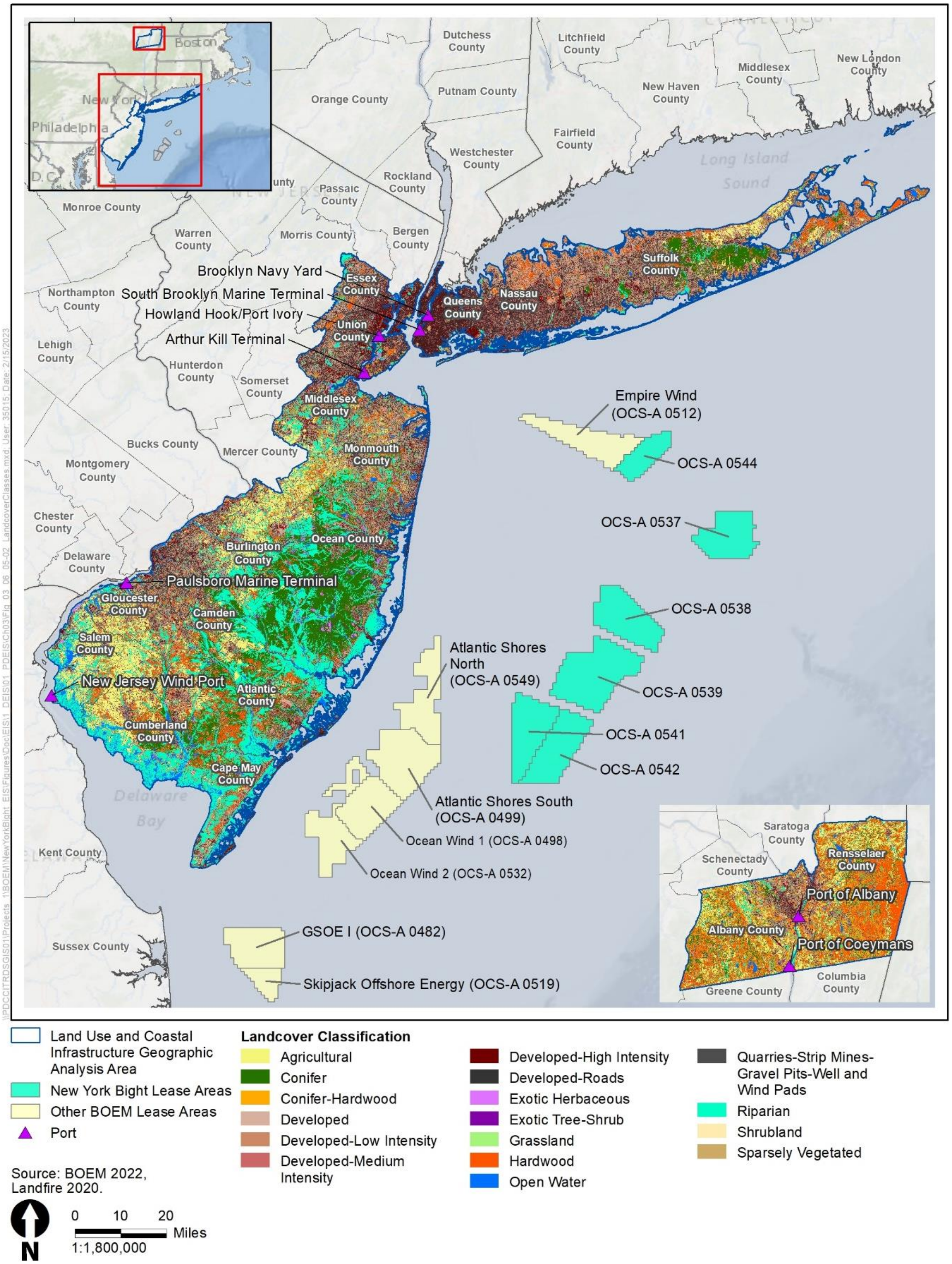


Figure 3.6.5-2. Land uses in geographic analysis area

Table 3.6.5-1. Land use by type

Type of Land Use	Acres	Percent (%)
Agricultural	365,529	9.2%
Conifer	468,544	11.7%
Conifer-Hardwood	70,312	1.8%
Developed	438,403	11.0%
Developed – High Intensity	143,220	3.6%
Developed – Low Intensity	296,394	7.4%
Developed – Medium Intensity	217,279	5.4%
Developed-Roads	652,543	16.4%
Exotic Herbaceous	48,389	1.2%
Exotic Tree-Shrub	8,046	0.2%
Grassland	11,528	0.3%
Hardwood	343,746	8.6%
Open Water	147,372	3.7%
Quarries – Strip Mines – Gravel Pits – Well and Wind Pads	5,908	0.1%
Riparian	758,105	19.0%
Shrubland	1,883	0.0%
Sparsely Vegetated	11,977	0.3%
Total	**3,989,178**	**100.0%**

Source: Landfire 2020.

New York has a Coastal Management Program, which provides a framework for federal, state, and local decision-making that affects coastal land and water areas and uses for actions occurring within the state's coastal boundary. The Coastal Management Program also includes Local Waterfront Revitalization Programs, which allows communities to develop state and federally approved refinements to the state coastal policies to ensure actions are consistent with local planning efforts and special management areas. Related to the federal Coastal Zone Management Act Consistency Review, New York has adopted an approved Renewable Energy Geographic Location Description, which will help make offshore wind project reviews more effective by establishing criteria for automatic review for certain offshore wind projects in the Atlantic Ocean (NYSDOS 2022).

Individual counties and municipalities in New Jersey and New York have individual land use plans and zoning regulations that dictate and govern land uses in the geographic analysis area. Land use is typically regulated through zoning, which is the process local governments use to regulate the use of real property and guide urban growth and development.

Representative ports analyzed in this PEIS that may potentially be used by the NY Bight projects are the New Jersey Wind Port and Paulsboro Marine Terminal in New Jersey and the Port of Albany, Port of Coeymans, Howland Hook/Port Ivory, Arthur Kill Terminal, Brooklyn Navy Yard, and South Brooklyn Marine Terminal in New York. The New Jersey Wind Port is currently being developed as an offshore wind marshalling and assembly port; land use is industrial and undeveloped (NJEDA 2020). The Port of Paulsboro is surrounded by land zoned as marina industrial business (Borough of Paulsboro 2010).

In New York, land use surrounding the Port of Albany is characterized by high-intensity developed land along the Hudson River (NYSERDA 2019a). Land use surrounding the Port of Coeymans is characterized by high-intensity developed land as well as undeveloped land (NYSERDA 2019b). The land use surrounding the Howland Hook/Port of Ivory is primarily industrial (NYSERDA 2019d). The Arthur Kill Terminal, an undeveloped 32-acre parcel on the western shoreline of Staten Island, New York, received federal grants in 2022 to be redeveloped for offshore wind staging and assembly (Empire State Development 2022). The Brooklyn Navy Yard is zoned for industrial uses and is surrounded by commercial, industrial, residential, and open and recreational space (NYSERDA 2022). The land use surrounding the South Brooklyn Marine Terminal is mostly undeveloped (NYSERDA 2019c).

3.6.5.2 Impact Level Definitions for Land Use and Coastal Infrastructure

Definitions of adverse impact levels are provided in Table 3.6.5-2. Beneficial impacts on land use and coastal infrastructure are described using the definitions described in Section 3.3.2, *Impact Terminology,* (Table 3.3-1).

Table 3.6.5-2. Adverse impact level definitions for land use and coastal infrastructure

Impact Level	Definition
Negligible	There would be no measurable impacts on land use, or impacts would be so small that they would be extremely difficult or impossible to discern or measure.
Minor	Impacts would be detectable but would be short term and localized.
Moderate	Impacts would be detectable and broad-based, affecting a variety of land uses, but would be short term and would not result in long-term change.
Major	Impacts would be detectable, long term, and extensive, and result in permanent land use change.

Accidental releases, lighting, port utilization, presence of structures, land disturbance, and traffic are contributing IPFs to impacts on land use and coastal infrastructure. However, these IPFs may not necessarily contribute to each individual issue outlined in Table 3.6.5-3.

Table 3.6.5-3. Issues and indicators to assess impacts on land use and coastal infrastructure

Issue	Impact Indicator
Public health and safety	Construction- or operation-related volume increases, traffic delays, traffic re-routes, and noise
Port improvements and operations	Changes to vehicle, vessel traffic volumes, and working waterfront infrastructure demands
Land use code and zoning	Qualitative assessment of impacts on compliance with local land use regulations

3.6.5.3 Impacts of Alternative A – No Action – Land Use and Coastal Infrastructure

When analyzing the impacts of the No Action Alternative on land use and coastal infrastructure, BOEM considered the impacts of ongoing activities, including ongoing non-offshore-wind and ongoing offshore wind activities on the baseline conditions for land use and coastal infrastructure. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore and offshore wind activities, which are described in Appendix D, *Planned Activities Scenario*.

3.6.5.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for land use and coastal infrastructure described in Section 3.6.5.1, *Description of the Affected Environment and Future Baseline Conditions*, would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore-wind and offshore wind activities. Ongoing non-offshore-wind activities include onshore development activities. The geographic analysis area lies within developed communities that are likely to continue experiencing commerce and development activity in accordance with established land use patterns and zoning regulations. The geographic analysis area is highly developed, and most construction projects would likely affect land that has already been disturbed from past development, although some development of undeveloped land may also occur. The geographic analysis area is a coastal area that may experience long lasting impacts from climate change such as sea level rise, more frequent and intense storms, and flooding (USEPA 2023). The impact of climate change may require storm hardening and resilience measures to overcome impacts on land use and coastal infrastructure.

Ongoing offshore wind activities that may contribute to impacts on land use and coastal infrastructure include construction of Ocean Wind 1 (OCS-A 0498), South Fork Wind (OCS-A 0517), Sunrise Wind (OCS-A 0487), and Empire Wind 1 and 2 (OCS-A 0512). These projects have landfalls in the geographic analysis area. Ongoing offshore wind activities would have the same types of impacts that are described in detail in Section 3.6.5.3.2, *Cumulative Impacts of the No Action Alternative,* for ongoing and planned offshore wind activities.

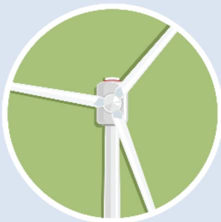
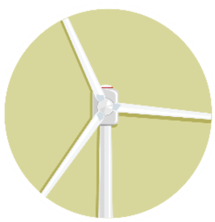
3.6.5.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore-wind activities and planned offshore wind activities (without the NY Bight projects). Planned non-offshore-wind activity that may contribute to land use impacts includes port improvement, dredging projects, transmission systems (e.g., PBI), and onshore development activities; more information regarding these projects can be found in Appendix D, Section D.2.5 and Section D.2.12. Ports in the geographic analysis area would continue to serve marine traffic and industries and experience periodic dredging and improvement projects to meet ongoing needs. Dredging and port improvements would allow larger vessels to use the ports and may result in increased port use and conversion of surrounding land use if the ports are expanded. Planned onshore development, such as commercial/industrial development, would contribute to ongoing construction activities and development in the region. Planned onshore infrastructure would be developed in conformance with existing land use regulations.

Ongoing and planned offshore wind activities that may contribute to impacts on land use and coastal infrastructure in the geographic analysis area are listed in Table 3.6.5-4. The location of known onshore infrastructure from ongoing and planned offshore wind projects in the geographic analysis area includes Long Island, New York, for Empire Wind (OCS-A 0512); Monmouth, New Jersey, and Atlantic City, New

Jersey, for Atlantic Shores South (OCS-A 0499); Upper Township, New Jersey, and Lacey Township, New Jersey, for Ocean Wind 1 (OCS-A 0498); East Hampton, New York for South Fork Wind (OCS-A 0517); and Brookhaven, New York for Sunrise Wind (OCS-A 0487). The locations of onshore infrastructure for other offshore wind projects in the geographic analysis area are not known at this time.

Table 3.6.5-4. Ongoing and planned offshore wind that may contribute to impacts on land use and coastal infrastructure

Ongoing/Planned	Projects by Region
Ongoing – 5 projects[1] 	**MA/RI** • South Fork Wind (OCS-A 0517) • Sunrise Wind (OCS-A 0487) **NY/NJ** • Ocean Wind 1 (OCS-A 0498) • Empire Wind 1 (OCS-A 0512) • Empire Wind 2 (OCS-A 0512)
Planned – 3 projects[2] 	**NY/NJ** • Ocean Wind 2 (OCS-A 0532) • Atlantic Shores North (OCS-A 0549) • Atlantic Shores South (OCS-A 0499)

NJ = New Jersey; NY = New York
[1] Refer to footnotes 9 and 10 in PEIS Chapter 1 for additional information on the status of Ocean Wind 1, Empire Wind 1, and Empire Wind 2.
[2] Status as of September 20, 2024.

Accidental releases: Accidental releases of fuel, fluids, or hazardous materials may increase due to construction of onshore components associated with other offshore wind projects, such as landfalls and onshore export cable routes. Accidental release risks would be highest during construction, but still pose a risk during O&M and decommissioning of offshore wind facilities. BOEM assumes all projects and activities would comply with laws and regulations to minimize releases. Accidental releases could result in temporary restrictions on use of adjacent properties and coastal infrastructure during the cleanup process; however, the impacts would be localized and short term. The exact extent of impacts would depend on the locations of landfall, substations, and cable routes, as well as the ports that support offshore wind energy projects. The impacts of accidental releases on land use and coastal infrastructure would be minor (except in the case of very large spills that affect a large land or coastal area).

Lighting: Aviation obstruction lights on offshore WTGs would be visible from beaches and coastlines within the geographic analysis area. Nighttime lighting for construction and decommissioning of onshore project components could disrupt existing uses on adjacent properties. These impacts would be localized and short term. Nighttime lighting from operation of onshore substations, O&M facilities, and port facilities could disrupt existing or planned uses on adjacent properties in the long term, depending on the specific location of these facilities, the land use and zoning of adjacent properties, and the extent of visual screening incorporated into the design of offshore wind facilities. Given the existing level of development in the geographic analysis area and that facilities would be sited consistent with local zoning regulations, BOEM anticipates the impact of facility lighting would be negligible.

Port utilization: Ports in the geographic analysis area would be improved to support offshore wind projects and other uses (see Appendix D). These improvements would occur within the boundaries of existing port facilities, within areas planned for expansion, or within repurposed industrial facilities, would be similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for the development of waterfront infrastructure. BOEM expects that ports would experience long-term beneficial impacts from greater economic activity and increased employment due to demand for vessel maintenance services and related supplies, vessel berthing, loading and unloading, warehousing and fabrication facilities for offshore wind components, and other business activity related to offshore wind. For example, the Port of Albany estimates that development of a new offshore wind tower manufacturing facility would create approximately 500 construction jobs, 355 direct and full-time new manufacturing jobs, and $350 million in new private investment (Port of Albany 2021). Federal, state, and local agencies would be responsible for minimizing the potential adverse impacts of these future port expansions through zoning regulations and permitting planned improvements and in-water work.

If multiple offshore wind energy projects are constructed at the same time and rely on the same ports, this use could stress port resources and could potentially temporarily increase the marine and road traffic, noise, and air pollution in the area during construction activities. Overall, offshore wind projects would have constant, long-term, minor beneficial impacts on port utilization due to the productive use of ports designated for offshore wind activity, as well as localized, short-term, minor impacts in cases where individual ports are stressed due to project activity.

Presence of structures: Planned and ongoing offshore wind projects would add onshore substations, O&M facilities, and overhead or underground transmission connections to the regional power grid. Improvements to coastal infrastructure such as bulkheads or marinas could also be made to support offshore wind activities. BOEM expects that onshore export cables would generally be buried and would not introduce aboveground structures to the geographic analysis area for land use and coastal infrastructure. Onshore substations, O&M facilities, and overhead electric power transmission lines would be sited consistent with local zoning regulations and ordinances or would be required to obtain a zoning change or other relief.

Non-offshore-wind activities, including transmission systems, could have an impact on existing land use and coastal infrastructure. The Sea Girt NGTC and the adjacent area in Manasquan, New Jersey is one of three major landfall locations in the state of New Jersey for transatlantic and subsea fiber optic and telecommunications cables. The sand replenishment of the beach at the Sea Girt NGTC is a federal civil works project. Construction methods such as HDD may be used to avoid or minimize conflicts between existing and planned coastal infrastructure.

Given the existing level of development in the geographic analysis area and that facilities would be sited consistent with local zoning regulations, BOEM anticipates the addition of onshore infrastructure for offshore wind would have negligible impacts on land use. Improvements made to coastal infrastructure such as bulkheads or marinas to support offshore wind activities would have beneficial impacts on land use and coastal infrastructure.

As described in Section 3.6.9, *Scenic and Visual Resources*, visibility of offshore WTGs would vary with distance from shore, topography, and atmospheric conditions. The presence of WTGs would have negligible impacts on land use because, while WTGs could be visible from some shoreline locations in the geographic analysis area, the presence of WTGs would not be expected to change existing land use patterns.

Land disturbance: Construction and installation of onshore substations, O&M facilities, landfalls, buried onshore export cables, and overhead or underground transmission connections to the regional power grid for offshore wind projects would cause land disturbance and associated impacts (e.g., noise) in the geographic analysis area. Land disturbance for installation of landfalls and buried export cables would be temporary, with areas restored to preexisting conditions following construction. BOEM expects that disturbed areas not occupied by new facilities would be revegetated or otherwise stabilized for erosion control in compliance with stormwater permits for general construction. While the impacts from each individual ongoing and planned offshore wind project would be localized, the combined land disturbance from onshore facilities associated with all ongoing and planned offshore wind projects would affect a variety of land uses across the geographic analysis area, resulting in the potential for moderate impacts.

EMF: Onshore export cables in the geographic analysis area would generate EMF during operation of wind farms. Residents and visitors may be exposed to EMF where cables are installed near businesses, residences, or in public areas. Common household items—including television sets, hair dryers, and electric drills—can emit magnetic fields similar to or higher in intensity than those emitted by power cables (CSA Ocean Sciences, Inc. and Exponent 2019). Based on typical EMF values from submarine cables buried at a depth of 3 feet (1 meter), maximum emissions directly above the onshore export cable would not exceed 165 milliGauss. From 10 to 25 feet (3 to 7.5 meters) away from the onshore export cable, emissions values drop to less than 0.1 to 12 milligauss (Ocean Wind 2023). These values are well below the reported human health reference levels of 2,000 milliGauss for the general population (International Commission on Non-ionizing Radiation Protection 2010). Even if other offshore wind export cables were of higher voltage or buried closer to the surface, EMF levels are still anticipated to be well below the human health reference levels; therefore, EMF impacts on land use would be long-term but negligible.

Traffic: Offshore wind projects could result in increased road traffic and congestion that may affect land use and coastal infrastructure because traffic volumes may dictate where residents and businesses choose to locate. Onshore construction of cables for offshore wind projects would likely disrupt road traffic for a short period of time. The exact extent of impacts would depend on the locations of landfall and onshore transmission cable routes for offshore wind energy projects and traffic management plans developed with local governments. Traffic impacts on land use and coastal infrastructure are anticipated to be negligible.

3.6.5.3.3 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, land use and coastal infrastructure would continue to be affected by existing environmental trends and ongoing activities, as well as climate change. BOEM expects ongoing activities under the No Action Alternative to have continuing temporary and permanent **minor** impacts on land use and coastal infrastructure.

Cumulative Impacts of the No Action Alternative. BOEM anticipates that the cumulative impacts associated with the No Action Alternative, when combined with all other planned activities (including offshore wind) in the geographic analysis area, would likely be **moderate** and **minor beneficial**. Offshore wind projects would adversely affect land use through land disturbance (during installation of onshore cable and substations), accidental releases during onshore construction, and traffic (depending on landfall locations, onshore routes, and time of year), as well as through the presence of offshore lighting on wind energy structures and views of the structures themselves that could affect the use and value of onshore properties. Beneficial impacts on land use and coastal infrastructure would result from the productive use of ports and related infrastructure designed or appropriate for offshore wind activity.

3.6.5.4 Impacts of Alternative B – No Identification of AMMM Measures at the Programmatic Stage – Land Use and Coastal Infrastructure

3.6.5.4.1 Impacts of One Project

Alternative B considers the potential impacts of future offshore wind development for the NY Bight area without the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts.

Accidental releases: Accidental releases of fuel, fluids, or hazardous materials could occur during construction and installation, O&M, and conceptual decommissioning of one NY Bight project. The representative NY Bight project's SPCC and OSRP would provide for rapid spill response, cleanup, and other measures to minimize any potential impacts from spills and accidental releases. SPCC is required under the Clean Water Act of 1974 and 40 CFR part 112. OSRP is required under the Oil Pollution Act of 1990 and Executive Order 12777. Should accidental releases occur, there could be temporary restrictions placed on the use of affected properties during the cleanup process. Accordingly, BOEM anticipates that accidental releases from one NY Bight project would have localized, short-term, minor impacts on land use.

Lighting: The types of impacts from lighting from one NY Bight project would be the same as described for the No Action Alternative. The construction and O&M lighting from one individual project is not expected to have a substantial impact on land use and coastal infrastructure. Given the existing level of development in the geographic analysis area and that facilities would be sited consistent with local zoning regulations, BOEM anticipates the impact of facility lighting from one NY Bight project would be negligible.

Port utilization: The Brooklyn Navy Yard, South Brooklyn Marine Terminal, Howland Hook Port Ivory, Arthur Kill Terminal, Paulsboro Marine Terminal, New Jersey Wind Port, Port of Albany, and Port of Coeymans have been identified as representative ports that may be used by the NY Bight projects. While one NY Bight project is not anticipated to require port upgrades, some ports have planned improvements to accommodate offshore wind activities across the region, which are described in Appendix D.

Similar to the No Action Alternative, use of ports by one NY Bight project would result in minor beneficial impacts through greater economic activity and increased employment opportunities. The increase in vessel activity during the construction and installation stage for one NY Bight project would be small and would decrease during operations and decommissioning stages. Therefore, construction and installation, O&M, and conceptual decommissioning would have negligible impacts from port utilization on land use and coastal infrastructure.

Presence of structures: BOEM expects that onshore export cables would generally be buried and would not introduce aboveground structures to the geographic analysis area for land use and coastal infrastructure. Onshore substations, O&M facilities, and overhead electric power transmission lines would be sited consistent with local zoning regulations and ordinances or would be required to obtain a zoning change or other relief. Depending on where the facilities are sited, new aboveground infrastructure could result in the long-term conversion of land from existing conditions to a new use for electric power generation and transmission. Due to the scarcity of waterfront properties in the geographic analysis area, especially in the New York City and Long Island region, electrical facilities that are constructed shoreside could be sited on parcels currently within the public trust (e.g., shorelines, parks), which could pose conflicts with public land uses, such as recreation and coastal resilience projects. Based on BOEM's experience with other offshore wind projects in the region, larger electrical facilities (e.g., substations, O&M facilities) are typically sited on previously disturbed areas and industrial locations, and therefore would not result in long-term changes in land use. Given the existing level of development in the geographic analysis area and that facilities would be sited consistent with local zoning regulations, BOEM anticipates the addition of onshore infrastructure for one NY Bight project would have minor, localized impacts on land use. The presence of one individual project's WTGs would have the same impact as under the No Action Alternative and would likely be negligible.

Land disturbance: Onshore components associated with one NY Bight project are anticipated to include a specific transmission POI in New York or New Jersey and an interconnection point to a regional offshore grid substation. Proper erosion and sedimentation controls would be maintained to avoid and minimize unstable soils that could potentially be moved by wind and runoff. HDD is expected to be used at landfall sites to minimize land disturbance near the shoreline. Land disturbance from onshore construction would produce noise that could affect nearby residential or commercial areas, depending on the location of the facilities, but all noise emissions would be required to comply with local or state noise requirements. Given that the geographic analysis area is highly developed, it is unlikely that one NY Bight project would result in substantial development in previously undisturbed areas. As such, impacts on land use and coastal infrastructure from land disturbance of one NY Bight project would be minor.

EMF: The types of impacts from EMF from one NY Bight project would be the same as described for the No Action Alternative. Onshore export cables in the geographic analysis area would generate EMF during operation of one NY Bight project, but EMF values are anticipated to be well below the reported human health reference levels of 2,000 milliGauss for the general population (International Commission on Non-ionizing Radiation Protection 2010). EMF impacts from onshore cable routes on land use and coastal infrastructure would be long term but negligible.

Traffic: Road traffic associated with one NY Bight project is not anticipated to noticeably add to traffic on the local road system and is therefore anticipated to have the same negligible impact as under the No Action Alternative.

3.6.5.4.2 Impacts of Six Projects

The same IPFs described under one NY Bight project apply to six NY Bight projects. There would be the potential for greater impacts from these IPFs due to the greater amount of onshore development. If multiple projects are being constructed at the same time, temporary impacts associated with land disturbance, traffic, and port utilization could be greater than those identified for one NY Bight project. The development of electric infrastructure for six projects could affect a variety of land uses across the geographic analysis area, reducing the availability of land for other uses. Impacts from six NY Bight projects are anticipated to be moderate, but specific impacts will not be known until COPs are developed for each project, where there will be more detailed project information and analysis.

3.6.5.4.3 Cumulative Impacts of Alternative B

The construction and installation, O&M, and conceptual decommissioning of six NY Bight projects would contribute to the land use impacts from ongoing and planned activities in the geographic analysis area. The greatest cumulative impacts would occur if the landfalls and other electrical infrastructure from six NY Bight projects occur in the same location as other offshore wind projects in the geographic analysis area, including in Long Island, New York, for Empire Wind (OCS-A 0512); Monmouth, New Jersey, and Atlantic City, New Jersey, for Atlantic Shores South (OCS-A 0499); Upper Township, New Jersey, and Lacey Township, New Jersey, for Ocean Wind 1 (OCS-A 0498); East Hampton, New York for South Fork Wind (OCS-A 0517); and Brookhaven, New York for Sunrise Wind (OCS-A 0487). The locations of onshore infrastructure for other offshore wind projects in the geographic analysis area are not known at this time. Cumulative impacts would also occur if six NY Bight projects overlap in the use of ports with other offshore wind projects, leading to greater port congestion but also greater economic use and opportunities. In context of reasonably foreseeable environmental trends, BOEM anticipates that the cumulative impacts associated with six NY Bight projects under Alternative B when combined with past, present, and future activities would be moderate and minor beneficial for land use and coastal infrastructure in the geographic analysis area.

3.6.5.4.4 Conclusions

Impacts of Alternative B. Construction and installation, O&M, and conceptual decommissioning of one NY Bight project under Alternative B would likely have **minor** impacts and **minor beneficial** impacts on land use and coastal infrastructure. Six NY Bight projects would likely have **moderate** impacts because of the increased onshore land disturbance and infrastructure as well as **minor beneficial** impacts from port utilization.

Cumulative Impacts of Alternative B. BOEM anticipates that the impacts associated with Alternative B in the geographic analysis area, combined with ongoing and planned activities, would likely result in **moderate** cumulative impacts and **minor beneficial** cumulative impacts on land use and coastal infrastructure. In context of reasonably foreseeable environmental trends, the impacts contributed by Alternative B to cumulative impacts on land use and coastal infrastructure would likely be noticeable, depending on site-specific project component locations relative to coastal infrastructure locations.

3.6.5.5 Impacts of Alternative C (Proposed Action) – Identification of AMMM measures at the Programmatic Stage – Land Use and Coastal Infrastructure

Alternative C, the Proposed Action, considers the potential impacts of future offshore wind development for the NY Bight area with the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts. Alternative C consists of two sub-alternatives: Sub-alternative C1: Previously Applied AMMM Measures, and Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures. The analysis for Sub-alternative C1 is presented as the change in impacts from those impacts discussed under Alternative B, and the analysis for Sub-alternative C2 is presented as the change from those impacts discussed in Sub-alternative C1. Refer to Table G-1 in Appendix G, *Mitigation and Monitoring*, for a complete description of AMMM measures that make up the Proposed Action.

3.6.5.5.1 Sub-alternative C1 (Preferred Alternative): Previously Applied AMMM Measures

Sub-alternative C1 analyzes the AMMM measures that BOEM has required as conditions of approval for previous activities proposed by lessees in COPs submitted for the Atlantic OCS or through related consultations. However, BOEM has not identified any previously applied AMMM measures for land use and coastal infrastructure; therefore, the impacts on land use and coastal infrastructure under Sub-alternative C1 are the same as for Alternative B.

3.6.5.5.2 Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures

Sub-alternative C2 analyzes the AMMM measures under Sub-alternative C1 plus the application of AMMM measures that have not been previously applied. Under this sub-alternative, these AMMM measures (Table 3.6.5-5) are analyzed in addition to the AMMM measures applied under Sub-alternative C1. However, as BOEM has not identified any previously applied AMMM measures for land use and coastal infrastructure in Sub-alternative C1, analysis in Sub-alternative C2 is presented as the change in impacts from those discussed under Alternative B.

Table 3.6.5-5. Summary of not previously applied avoidance, minimization, mitigation, and monitoring measures for land use and coastal infrastructure

Measure ID	Measure Summary
EJ-1a	This measure proposes requiring a lessee to create an Environmental Justice Communications Plan that will guide a lessee throughout the project life on meaningful engagement, and will propose a process for what, how, and to whom the lessee plans to communicate during activities described in the COP that may affect populations with environmental justice concerns, including construction, operations, and decommissioning. The Environmental Justice Communications Plan must be specifically designed for populations with environmental justice concerns and be created in coordination with, at minimum, organizations that serve these populations. Residents of these populations should be involved in the creation of the plan and will have the opportunity to review the plan and provide feedback.

Impacts of One Project

AMMM measure EJ-1a could minimize some impacts on land use and coastal infrastructure specifically relating to the land disturbance and traffic IPFs. Impacts for other IPFs would remain the same as described under Alternative B. EJ-1a would require lessees to develop an Environmental Justice Communications Plan that describes how the lessee intends to communicate with environmental justice communities during activities including construction, operations, and decommissioning. The Environmental Justice Communications Plan would allow communities to prepare for construction activities and minimize impacts on sensitive land uses, such as residences, near the onshore construction sites.

While some impacts on land use may be minimized with EJ-1a, the extent of the impacts cannot be determined without project-specific information. BOEM does not anticipate this measure would substantively reduce the overall impact for one NY Bight project compared to Alternative B, which is minor, or increase the overall beneficial impact, which is minor.

Impacts of Six Projects

For six NY Bight projects, the AMMM measure EJ-1a would implemented be the same as described for one NY Bight project but would cover a larger geographic area and affect more land uses. AMMM measure EJ-1a would minimize impacts on the land disturbance and traffic IPFs by limiting some construction impacts. Residents would be notified of upcoming construction activities, but they would not avoid the development activities that could temporarily and permanently affect land use patterns in the geographic analysis area. Therefore, the overall impact magnitude is not anticipated to change.

Cumulative Impacts of Sub-alternative C2

Under Sub-alternative C2, the same ongoing and planned activities (including offshore wind) as those under Alternative B would contribute to impacts on land use and coastal infrastructure. The construction and installation, O&M, and conceptual decommissioning for six NY Bight projects with the AMMM measure that has not been previously applied would still cumulatively affect land use across the geographic analysis area, although at a slightly reduced level.

3.6.5.5.3 Conclusions

Impacts of Alternative C. The construction, installation, and decommissioning of one NY Bight project under Sub-alternative C1 and Sub-alternative C2 would likely have **minor** impacts and **minor beneficial** impacts on land use and coastal infrastructure. Six NY Bight projects would likely have **moderate** impacts and **minor beneficial** impacts. AMMM measure EJ-1a may slightly reduce overall impacts (but not change the impact level) on land uses under Sub-alternative C2 by minimizing temporary construction impacts in communities with environmental justice concerns.

Cumulative Impacts of Alternative C. BOEM anticipates that the cumulative impacts on land use and coastal infrastructure under Sub-alternatives C1 and C2 in the geographic analysis area from six NY Bight projects combined with ongoing and planned activities would likely be **moderate** and **minor beneficial**. AMMM measure EJ-1a would reduce overall impacts under Sub-alternative C2, but it would not change the impact level. In context of reasonably foreseeable environmental trends, the impacts contributed by Sub-alternatives C1 and C2 to cumulative impacts on land use and coastal infrastructure would be noticeable.

3.6.5.6 Recommended Practices for Consideration at the Project-Specific Stage

In addition to the AMMM measure identified under Sub-alternative C2, BOEM is recommending lessees consider analyzing the RPs in Table 3.6.5-6 to further reduce potential land use and coastal infrastructure impacts. Refer to Table G-2 in Appendix G for a complete description of the RPs.

Table 3.6.5-6. Recommended Practices for land use and coastal infrastructure impacts and related benefits

Recommended Practice	Potential Benefit
MUL-5: For onshore and offshore project activities and across all phases of construction and operations, use equipment, technology, and best practices that produce the least amount of noise practicable to avoid and minimize noise impacts on the environment.	Using equipment or technology to reduce noise may help prevent noise impacts on certain land uses that may be sensitive to noise, such as residential land use.
REC-1: Prioritize scheduling of nearshore construction activities for outside the summer tourist season, which is generally between Memorial Day and Labor Day.	Scheduling nearshore construction activities outside of the summer tourist season may reduce traffic and noise impacts that would otherwise contribute to the additional tourist traffic and noise.

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3.6 Socioeconomic Conditions and Cultural Resources

3.6.8 Recreation and Tourism

This section discusses potential impacts on recreation and tourism resources and activities from the Proposed Action, alternatives, and ongoing and planned activities in the geographic analysis area. The geographic analysis area, as shown on Figure 3.6.8-1, includes a 47.4-mile (76.2-kilometer) buffer around the NY Bight lease areas in the open ocean (corresponding to the maximum potential visibility of the turbine tips), the ocean-facing coastal counties from which the NY Bight projects would be visible, and counties that may be affected by onshore construction activity. Section 3.6.3, *Demographics, Employment, and Economics*, discusses the economic aspects of recreation and tourism in the geographic analysis area.

The recreation and tourism impact analysis in this PEIS is intended to be incorporated by reference into the project-specific environmental analyses for individual COPs expected for each of the NY Bight lease areas. Refer to Appendix C, *Tiering Guidance*, which identifies additional analyses anticipated to be required for the project-specific environmental analysis of individual COPs.

3.6.8.1 Description of the Affected Environment and Future Baseline Conditions

Recreation and tourism play a major role in New York and New Jersey's environment and economy. Visitors from all over the world travel to the area to partake in a variety of onshore and marine recreational activities. Marine recreational activities include wildlife viewing tours, scuba diving, and recreational fishing and boating. Popular onshore recreational activities include beach going, surfing, golfing, and scenic viewing. In 2016, the economic value of recreation and tourism for New York State in Nassau and Suffolk County accounted for $2.7 billion (gross domestic product [GDP]), and $1.3 billion in wages; while New Jersey's Ocean County alone resulted in $569 million (GDP), and $288 million in wages within the state (Center for Blue Economy 2016).

3.6.8.1.1 Project Area and Regional Setting

Coastal areas of New York and New Jersey support ocean-based and onshore recreation and tourism activities, such as recreational and for-hire boating and fishing, guided tours, day use of parks and beaches, outdoor sports, and scenic or wildlife viewing. A 2012 BOEM study identified that the counties within the geographic analysis area are susceptible to impacts on their recreation and tourism economies from offshore wind development (BOEM 2012).

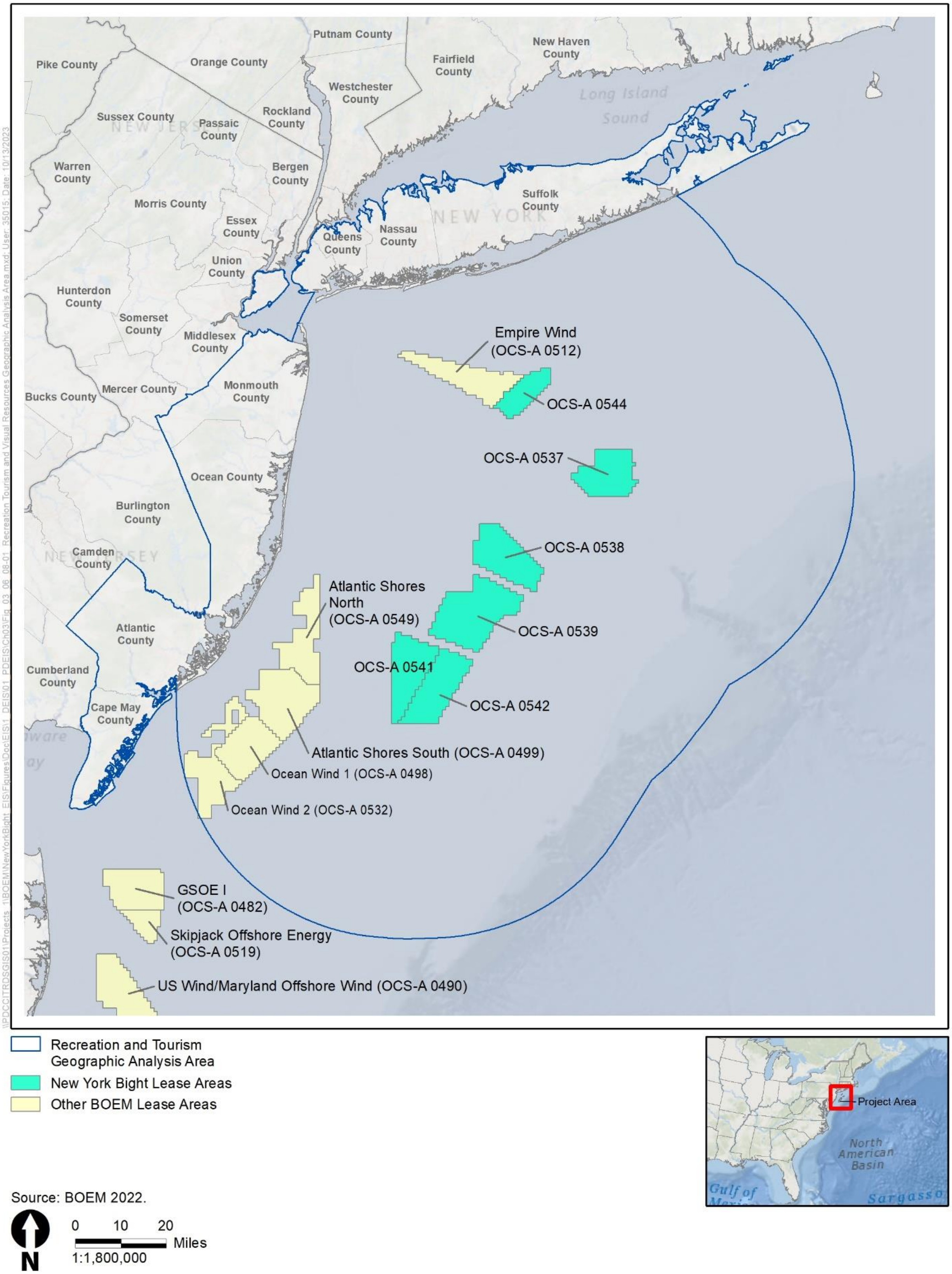


Figure 3.6.8-1. Recreation and tourism geographic analysis area

There are many recreation areas within the geographic analysis area. Though many recreation and tourism opportunities exist in inland portions of coastal counties in New Jersey and New York, this PEIS focuses on areas along the shoreline that have shown a greater dependency on coastal resources. The coastal areas support ocean-based and onshore activities, entertainment, and accommodation, as well as food services related to recreation and tourism. Given the proximity to the Atlantic Ocean, the geographic analysis area has a wide range of characteristics, with communities and landscapes ranging from large cities to small towns, suburbs, rural areas, and wildlife preserves. These coastal areas and shore communities have been extensively developed for water-based recreation and tourism.

The scenic quality of the coastal environment is important to the identity, attraction, and economic health of many coastal communities. Additionally, the recreational and entertainment aspect of outdoor activity on these beaches, within parks, and new and historic coastal towns are important community characteristics. The coastal and ocean amenities, such as beaches, birdwatching, connected trails, and onshore and offshore recreational fishing, are accessible to residents and tourists (whether free or for fee) and function as key drivers for recreation and tourism businesses. Recreational by-product businesses include food, security, water safety, housing, and entertainment.

Given the regional importance and unique attributes of recreational fishing compared to the other types of recreation and tourism, the following discussion is separated into two categories: recreation and tourism, and recreational fishing. Refer to Section 3.6.1, *Commercial Fisheries and For-Hire Recreational Fishing*, for analysis of commercial fisheries and for-hire recreational fishing.

3.6.8.1.2 Recreation and Tourism

Recreation and tourism contribute substantially to the economies of New York and New Jersey's coastal counties. Counties within the geographic analysis area accounted for $29 billion and $4 billion in GDP, respectively, for New York and New Jersey, which represented 89 percent and 56 percent of their entire state's ocean industry economy (NOAA 2022c). In 2019, 265.5 million people visited New York and spent about $73.6 billion, leading to a $117.6 billion total economic impact through tourism (Empire State Development n.d.). Appendix B, *Supplemental Information and Additional Figures and Tables,* Section B.6 describes recreational resources for each county in the geographic analysis area.

There are numerous federal, state, and local recreational areas and recreational trails within the geographic analysis area. Otis Pike Fire Island High Dune Wilderness, a 7-mile stretch of undeveloped barrier island on Fire Island, is the only federally designated wilderness area within the state of New York. Recreation features within the wilderness area include hiking trails, backcountry camping opportunities, fishing, and scenic views and abundant wildlife that attract bird watchers and wildlife viewers. The Gateway National Recreation Area includes three units: the Jamaica Bay Unit (Jamaica Bay and surrounding properties in Brooklyn and Queens including the western end of the Rockaway Peninsula), the Staten Island Unit (Fort Wadsworth, Miller Field, and Great Kills), and the Sandy Hook Unit (the Sandy Hook peninsula). The Gateway National Recreation Area provides visitors green spaces and beaches alongside historic structures and cultural landscapes and provides space for recreation activities such as boating, bicycling, bird watching, archery, camping, fishing, and guided tours.

Recreational trails for biking, birding, dog walking, fishing, inline skating, and walking (with wheelchair accessibility) also exist within the geographic analysis area. Some of these align with beaches, marinas, and national recreational areas, such as the Ocean Parkway Coastal Greenway in New York and the Sandy Hook Multi-Use Pathway in New Jersey.

Beaches are valuable assets for recreation and tourism. Those beaches regarded as undeveloped are important tourist destinations and are often valued for their remoteness (Peregrine Energy Group 2008) and as such may be sensitive to the visual impacts of offshore wind facilities. The National Park Service Atlantic and Gulf Coast Recreation Area Survey reported that in 2007 there were only two undeveloped beaches in the geographic analysis area of New Jersey: Brigantine Inlet North and Absecon Inlet, which are both in Atlantic County (NPS 2007). Of the three New York State Park Beaches (Hoboken, Wildwood, and Jones Beach), only Jones Beach State Park has a direct line of sight to the NY Bight lease areas (NYSERDA 2021). Further, within the last 10 years storms have ravaged areas in and outside of the geographic analysis area, where coastal restoration is ongoing (NY DEC 2022; NJ DEP 2022). Coastal ecosystem and habitat restoration activity, including beach and dune nourishment projects, support recreational opportunities along the New Jersey and New York coastline. In the geographic analysis area, the relatively few remaining undeveloped beaches, combined with a predominantly developed coast, indicates a tolerance or acceptance of coastal development in most coastal communities. Where wetlands plantings are in place to preserve open spaces and improve environmental quality, project-specific NEPA analyses will address potential impacts and ensure compliance with rigorous local controls. Development will likely avoid disturbances in those areas.

Ocean water-oriented recreational activities include boating, jet skiing, beach going, hiking, fishing, shell fishing, and bird and wildlife viewing. New York and New Jersey are identified as within the top five states with the largest contributions to marine-based recreation and tourism employment, and New York is within the top five states contributing to GDP related to marine-based recreation and tourism (NOAA n.d.). Recreation and tourism contribute approximately 90 percent of employment in the ocean sector economy for New York counties in the geographic analysis area and 58 percent in New Jersey counties analyzed (NOAA 2022c) (see Figures 3.6.3-4 and 3.6.3-5 in Section 3.6.3).

Many water-oriented recreational activities in the geographic analysis area include boating. Boating covers a wide range of activities, from the use of ocean-going vessels to small boats used by residents and tourists in sheltered waters, and includes sailing, fishing, shell fishing, kayaking, canoeing, and paddleboarding. Commercial businesses offer rentals of canoes and kayaks, and private charter boats for recreation, fishing, and wildlife viewing. Many of the activities make use of coastal and ocean amenities that are free for public access. Nonetheless, these features function as key drivers for many coastal businesses, particularly those within the recreation and tourism sectors.

Offshore wildlife viewing in charter boats, such as bird and whale watching, is particularly popular off the New York and New Jersey coasts and in the New York Harbor between spring and fall due to migrations. Chartered bird-watching tours occur at New York Harbor during the winter months, while whale watching occurs at New York Harbor and throughout the NY Bight area, especially during the summer months (NYSERDA 2017). Year-round bird watching occurs in areas off the coast of Long Island near Jones Inlet, the waters off Fire Island Inlet, and Moriches Inlet. Another wildlife viewing area stretches over 60 nautical miles from Jones Inlet to Hudson Canyon and is used by charter vessels specifically for pelagic bird watching during the winter (NYSDOS 2022). New York's whale watching operations are concentrated in three general use areas: outside of New York Harbor, south of Long Island, and east of Montauk. Tours are primarily scheduled from spring through fall, typically peaking in June, July, and August, with some New York-based tour companies offering cruises year-round (NYSDOS 2022). The New York State Department of Environmental Conservation has instituted a New York Bight Whale Monitoring Program that extends south from Long Island to the Outer Continental Shelf, within which this tourism activity occurs (NYSDEC n.d.).

Surface-based marine recreational activities popular along the New York coastline, particularly during the summer, include swimming, surfing, kayaking, paddle boarding, windsurfing, and kite boarding. Surfing usually occurs all along Long Island in New York down the Jersey Shore to Cape May (NJ Beaches 2023). Surfing can occur year-round, with the prime season in the fall. Surfers frequent several towns and cities along the coastline, including Ocean City and Atlantic City. Swimming is popular during the summer months along the miles of white sand beaches (New Jersey Department of State 2021a). Underwater recreation happens throughout the year in New York and New Jersey, but it is most popular between May and October. These activities take place from Long Island to Cape May at sites that include shipwrecks, artificial reefs, beach dives, and various inland sites. The sailing season typically runs from May to October in New Jersey (New Jersey Department of State 2021b) and primarily occurs in relatively small areas within the bays and inlets and just along the coastline (NJ DEP 2021; Ocean Wind 2022).

3.6.8.1.3 Recreational Fishing

There is a large and robust recreational fishing industry in New York and New Jersey. Figure 3.6.1-22 in Section 3.6.1, *Commercial Fisheries and For-Hire Recreational Fishing,* depicts popular for-hire recreational fishing areas offshore New York and New Jersey relative to the six NY Bight lease areas. The *Fisheries Economics of the United States Report of 2019* estimates that recreational fishing had a $309 million impact on New York's economy and a $388 million impact on New Jersey's economy in 2019 (NOAA 2022a). In 2019, there were a reported 13.4 million recreational fishing trips in New York and 13.3 million in New Jersey (NOAA 2022a). BOEM estimates approximately 8.6 million recreational fishing trips are made from New York and New Jersey into the NY Bight area (BOEM 2018). Popular recreational saltwater species in the waters off the NY Bight area are primarily caught from May to October, with seasonal extensions from April to November. Annually, national and regional saltwater fishing tournaments in New York and New Jersey target a variety of fish including stripers, fluke, bluefish, black drum, weakfish, northern kingfish, sea bass, tautog, tuna, and shark (NJDEP 2018a). According to NOAA Fisheries One Stop Shop database, recreational anglers off the coast of New York and New Jersey caught 33,322,544 and 21,344,901 pounds of fish, respectively, in 2019 (NOAA n.d.).

NMFS provides statewide annual marine fishing trip (effort) data for New York for 2022. The shore fishing mode accounted for 1,487,534 trips, the party boat mode for 117,214 trips, the charter boat mode for 73,782 trips, and the private/rental boat mode for 1,647,971 trips, for a total of 3,326,501 recreational fishing trips (NMFS 2023). For New Jersey's annual marine fishing trips for 2022, shore fishing mode accounted for 4,265,032 trips, the party boat mode for 101,309 trips, the charter boat mode for 105,540 trips, and the private/rental boat mode for 2,122,013 trips, for a total of 6,593,894 recreational fishing trips (NMFS 2023). For comparison, NMFS reports inland recreational fishing trips in New York totaled nearly 13 million (80 percent of total trips) while inland fishing trips in New Jersey totaled less than 8 million (54% of total trips).

NOAA's social indicator mapping identifies the importance or level of dependence of recreational fishing to coastal communities (NOAA 2022b). Several communities in the geographic analysis area have a high recreational fishing reliance, which measures the presence of recreational fishing in relation to the population size of a community, and high recreational fishing engagement, which measures the presence of recreational fishing through fishing activity estimates. The communities with the highest recreational fishing reliance and recreational fishing engagement would be most affected by impacts on recreational fishing from offshore wind development.

Recreational crabbing is also important to the region and occurs primarily along the bays and creeks on the Jersey Shore, especially in the upper portions of Barnegat Bay, Little Egg Harbor, and the Maurice River estuary, which contribute 65 to 86 percent of the total recreational harvest (NJDEP 2018b). The peak crabbing season occurs from mid-June until early October and is especially good in August.

3.6.8.2 Impact Level Definitions for Recreation and Tourism

Definitions of adverse impact levels are provided in Table 3.6.8-1. Beneficial impacts on recreation and tourism are described using the definitions described in Section 3.3.2 (see Table 3.3-1).

Table 3.6.8-1. Adverse impact level definitions for recreation and tourism

Impact Level	Definition
Negligible	There would be no measurable impacts, or impacts would be so small that they would be extremely difficult or impossible to discern or measure.
Minor	Impacts would not disrupt the normal functions of the affected activities and communities.
Moderate	The affected activity or community would have to adjust somewhat to account for disruptions due to the project.
Major	The affected activity or community would experience unavoidable disruptions due to large local or notable regional adverse impacts of offshore wind development.

Anchoring, cable emplacement and maintenance, land disturbance, lighting, noise, presence of structures, and traffic are contributing IPFs to impacts on recreation and tourism. However, the IPFs described may not necessarily contribute to each individual issue outlined in Table 3.6.8-2.

Table 3.6.8-2. Issues and indicators to assess impacts on recreation and tourism

Issue	Impact Indicator
Changes to recreation and tourism access and opportunity	Qualitative assessment of changes to the following: • Vehicle/vessel traffic volume • Viewshed • Navigation hazards • Access restrictions
Changes to recreational fishing	Qualitative assessment of impacts on the following: • Loss or damage to fishing gear • Change in distribution and catch of target species • Loss of recreational fishing access sites • Impacts on recreational fishing businesses and expenditures

3.6.8.3 Impacts of Alternative A – No Action – Recreation and Tourism

When analyzing the impacts of the No Action Alternative on recreation and tourism, BOEM considered the impacts of ongoing activities, including ongoing non-offshore-wind and ongoing offshore wind activities on the baseline conditions for recreation and tourism. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore and offshore wind activities, which are described in Appendix D, *Planned Activities Scenario*.

3.6.8.3.1 Impacts of the No Action Alternative

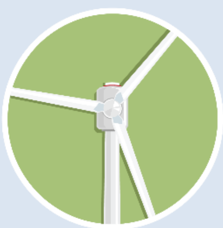
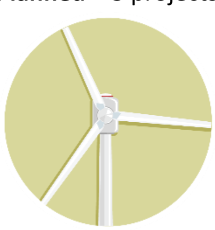
Under the No Action Alternative, baseline conditions for recreation and tourism described in Section 3.6.8.1, *Description of the Affected Environment and Future Baseline Conditions*, would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore-wind activities. Ongoing non-offshore-wind activities within the geographic analysis area include ongoing vessel traffic; recreational and commercial fishing; noise and trenching from periodic maintenance or installation of piers, pilings, seawalls, and offshore cables; and onshore development activities. Ongoing activities would contribute to impacts on recreation and tourism through the primary IPFs of anchoring, land disturbance, lighting, cable emplacement and maintenance, noise, presence of structures, and vessel traffic. These activities would contribute to periodic disruptions to recreation and tourism activities but are a typical part of daily life along the New York and New Jersey coastlines and would not substantially affect recreational enjoyment in the geographic analysis area. Visitors would continue to pursue activities that rely on the area's coastal and ocean environment, scenic qualities, natural resources, and establishments that provide services for recreation and tourism. Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on recreation and tourism include ongoing construction of Ocean Wind 1 (OCS-A 0498) and Empire Wind 1 and 2 (OCS-A 0512). Ongoing construction of Ocean Wind 1 and Empire Wind 1 and 2 would have the same type of impacts on recreation and tourism that are described in Section 3.6.8.3.2, *Cumulative Impacts of the No Action Alternative*, for all ongoing and planned offshore wind activities in the geographic analysis area.

3.6.8.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore-wind activities and planned offshore wind activities (without the NY Bight projects). Planned non-offshore-wind activities that would contribute to periodic disruptions to recreation and tourism activities include tidal energy projects, military use, dredge material disposal, and sand borrowing operations; increased vessel congestion that can pose a risk for collisions or allisions; dredging and port improvements, marine transportation, and oil and gas activities; or activities that pose a risk for gear entanglement such as undersea transmission lines, gas pipelines, and other submarine cables. See Appendix D for a description of planned activities. Like ongoing activities, other planned non-offshore-wind activities may result in periodic disruptions to recreation and tourism activities along the coast. However, visitors are expected to be able to continue to pursue activities that rely on other coastal and ocean environments, scenic qualities, natural resources, and establishments that provide services to recreation and tourism.

Ongoing and planned offshore wind projects in the geographic analysis area are listed in Table 3.6.8-3.

Table 3.6.8-3. Ongoing and planned offshore wind projects in the geographic analysis area for recreation and tourism

Ongoing/Planned	Projects by Region
Ongoing – 3 projects[1] 	**NY/NJ** • Ocean Wind 1 (OCS-A 0498) • Empire Wind 1 (OCS-A 0512) • Empire Wind 2 (OCS-A 0512)
Planned – 3 projects[2] 	**NY/NJ** • Ocean Wind 2 (OCS-A 0532) • Atlantic Shores North (OCS-A 0549) • Atlantic Shores South (OCS-A 0499)

NJ = New Jersey; NY = New York
[1] Refer to footnotes 9 and 10 in PEIS Chapter 1 for additional information on the status of Ocean Wind 1, Empire Wind 1, and Empire Wind 2.
[2] Status as of September 20, 2024.

BOEM expects ongoing and planned offshore wind activities to affect recreation and tourism through the following IPFs.

Anchoring: Anchoring could potentially affect recreational boating in the geographic analysis area both through the presence of an increased number of anchored vessels during offshore wind construction and installation, O&M, and conceptual decommissioning and through the creation of offshore areas with cable or scour protection where anchors of smaller recreational vessels may fail to hold.

Development of offshore wind projects would increase the number of vessels anchored offshore, particularly in offshore work areas during construction and installation. Vessel anchoring would also occur during O&M but at a reduced frequency. Anchored vessels for offshore wind projects would have localized, intermittent, long-term impacts on recreational boating.

Ongoing and planned offshore wind projects would add scour protection for WTGs and would create offshore areas with cable hardcover, which could create resistance to anchoring for recreational boats. Scour and cable protection would have localized, long-term impacts on anchoring for recreational boats. BOEM expects that recreational boaters could navigate around anchored vessels and adjust their locations to avoid cable and scour protection issues with brief inconveniences; therefore, impacts would likely be minor.

Land disturbance: Ongoing and planned offshore wind development would require installation of landfalls, onshore export cable and interconnection cable, and onshore substations, which could result in localized, temporary disturbance to recreational activity or tourism-based businesses near construction sites. BOEM expects these impacts would be localized and temporary during construction and installation, and O&M and conceptual decommissioning impacts would be reduced. The exact extent of impacts would depend on the specific locations chosen for offshore wind projects; however, the impacts would generally be localized, temporary, and minor.

Lighting: Offshore wind projects would add new sources of light to onshore and offshore areas including from nighttime vessel lighting and fixed lighting at onshore substations. BOEM expects that lighting at onshore substations would have negligible impacts on recreation and tourism as onshore lighting is a prevalent feature along the New York and New Jersey coast. Impacts of vessel lighting would be temporary for the duration that the vessel is engaged in construction and installation, O&M, or conceptual decommissioning activities. WTGs would be lit and marked in accordance with FAA and USCG requirements for aviation and navigation obstruction lighting, respectively. The lighting on WTGs would be visible from beaches and coastlines within the geographic analysis area and could have long-term impacts on recreation and tourism in certain locations if the lighting influences visitor decisions in selecting coastal locations to visit. The implementation of ADLS would activate a hazard lighting system in response to detecting nearby aircraft and, if ADLS is implemented, would result in shorter-duration night sky impacts on the seascape, landscape, and viewers relative to the WTG lighting.

The New York and New Jersey shores within the viewshed of ongoing and planned offshore wind projects have been extensively developed, and existing nighttime lighting is prevalent. Elevated boardwalks, jetties, and seawalls afford greater visibility of offshore elements for viewers in tidal beach areas. Nighttime views toward the ocean from the beach and adjacent inland areas are diminished by ambient light levels and glare of shorefront developments. Visible aviation warning lighting would add a developed/industrial visual element to views that were previously characterized by dark, open ocean, broken only by transient lighted vessels and aircraft passing through the view. As a result, although lighting on WTGs would have a continuous, long-term, adverse impact on recreation and tourism, the impact in the geographic analysis area is likely to be limited to individual decisions by visitors to the New York and New Jersey coastline and elevated areas, with less impact on the recreation and tourism industry as a whole. Lighting impacts on recreation and tourism are anticipated to be negligible due to the distance of the offshore wind development projects from shore and the use of ADLS.

Cable emplacement and maintenance: An estimated 3,094 miles (4,979 kilometers) of submarine export cable and interarray cable would be installed in the geographic analysis area between 2023 and 2030 for ongoing and planned offshore wind projects. Offshore cable emplacement for offshore wind development projects would have temporary, localized, adverse impacts on recreational boating while cables are being installed, because vessels would need to navigate around work areas and recreational boaters would likely prefer to avoid the noise and disruption caused by installation. Cable installation could also have temporary impacts on fish and invertebrates of interest for recreational fishing, due to the required dredging, turbulence, and disturbance; however, species would recover upon completion. The degree of temporal and geographic overlap of each cable is unknown, although cables for some projects could be installed simultaneously. Active work would only occur over the cable segment being emplaced at a given time. Once installed, cables would affect recreational boating only during maintenance operations, except that the mattresses covering cables in hard-bottom areas could hinder anchoring and result in gear entanglement or loss. Impacts of cable emplacement and maintenance on recreational boating and tourism would be short term, continuous, adverse, and localized. Disruptions from cable emplacement and maintenance are anticipated to have a minor impact on recreation and tourism.

Noise: Noise during construction (e.g., from pile-driving) or vehicle/vessel traffic could result in adverse impacts on recreation and tourism. Onshore construction noise near beaches, parkland, recreation areas, or other areas of public interest would temporarily disturb the public's quiet enjoyment. Offshore construction noise could cause boaters to avoid construction areas, although safety zones that USCG may establish for construction areas would be off-limits to boaters. Noise from operational WTGs would be expected to have little effect on finfish, invertebrates, and marine mammals, and consequently little effect on recreational fishing or sightseeing.

Adverse impacts of noise, especially from pile-driving, would also affect recreation and tourism due to impacts on species important to recreational fishing and sightseeing. Using information from the Ocean Wind 1 COP, noise from pile-driving, the noisiest aspect of WTG installation, is estimated to be 101 A-weighted decibels (dBA) at 50 feet (COP Volume III, Appendix R-1, Section 2.5; Ocean Wind 2022). Most recreational fishing takes place closer to shore, so construction of WTGs or OSSs would affect only a small proportion of recreational fishing. Temporary impacts from offshore construction noise will more likely affect recreational fishing for offshore species (e.g., tuna, shark, and marlin). Offshore construction noise also could contribute to temporary impacts on marine mammals, with resulting impacts on chartered tours for whale watching or other wildlife viewing. BOEM qualitatively analyzed impacts on recreational fisheries in the Atlantic OCS region during the offshore construction phase and found slightly negative to neutral impacts on recreational fisheries from both direct exclusion of fishing activities and displacement of mobile target species by construction noise (Tougaard 2008).

BOEM expects that offshore wind construction would result in localized, temporary impacts on recreational fishing and marine sightseeing related to fish and marine mammal populations. If multiple offshore wind construction projects are constructed concurrently, this would increase the spatial extent of temporary disturbances to marine species but would also decrease the temporal extent of these impacts. No long-term, adverse impacts are anticipated, provided that mitigation measures are implemented to prevent population-level harm to fish and marine mammal populations.

Presence of structures: The construction and installation of 697 WTGs within the recreation and tourism geographic analysis area would have long-term, adverse impacts on recreational boating and fishing through the risk of allision; risk of gear entanglement, damage, or loss; navigational hazards; space use conflicts; presence of cable infrastructure; and visual impacts. However, ongoing and planned offshore wind structures could potentially increase the number of trips and revenue by creating new locations for recreational or for-hire fishing through fish and sea turtle attraction and reef effects by creating hard-bottom habitat known to attract numerous species of algae, shellfish, finfish, and sea turtles and result in increased recreational boaters traveling farther from shore.

The presence of offshore wind structures would increase the risk of allision and the complexity of navigation within the geographic analysis area. Generally, smaller vessels moving within and near wind farm installations, such as recreational vessels, are at a greater risk of allisions with WTGs or OSSs. Offshore wind development could require recreational boaters, anglers, sailboat races, and sightseeing boats to adjust their routes. Recreational boating routes in the NY Bight area mainly occur within 3 nautical miles (5.5 kilometers) of the coastline (NY State Parks n.d.). Thus, the impact of these offshore structures would be limited by their farther distances from shore.

As it relates to the visual impacts of structures, the vertical presence of WTGs on the offshore horizon may affect recreational experience and tourism in the geographic analysis area. Section 3.6.9, *Scenic and Visual Resources*, describes the visual impacts from offshore wind infrastructure. A study conducted by Parsons and Firestone (2018) suggests that WTGs visible from more than 15 miles (24.1 kilometers) away would have negligible effects on businesses dependent on recreation and tourism activity. At this distance, the percentage of respondents who indicated that their experience would be improved by the presence of WTGs was the same as the percentage of respondents who indicated that their experience would be worsened by the WTGs. The study found proximity of WTGs to shore is correlated to the number of respondents who would expect a worsened coastal experience (Parsons and Firestone 2018). However, the majority of respondents (68 percent) indicated that the visibility of WTGs would neither improve nor worsen their experience. Respondents were shown a visual simulation for this survey, and it should be noted that the turbines depicted were smaller than those proposed for the NY Bight area. Reported trip loss (respondents who stated that they would visit a different beach without offshore wind) averaged 8 percent when wind projects were 12.5 miles (20 kilometers) offshore and 6 percent when 15 miles (24.1 kilometers) offshore. Within the geographic analysis area, while some WTGs associated with ongoing and planned offshore wind projects would be within 10 miles (16 kilometers) of shore, the majority of WTGs would be more than 15 miles (24.1 kilometers) from coastal locations.

Carr-Harris and Lang (2019) assessed the potential impacts of offshore wind energy development on tourism by examining how the Block Island Wind Farm has impacted the vacation rental market. Using data from Airbnb, they compared three nearby tourist destinations in Southern New England before and after construction. The results suggest that construction of the Block Island Wind Farm caused a significant increase in nightly reservations, occupancy rates, and monthly revenues for Airbnb properties during the peak tourism months of July and August but had no effect in other months. The findings indicate that offshore wind farms can act as an attractive feature of a location, rather than a deterrent.

In a 2020 survey-based study, 11.4 percent of participants indicated that they would tour offshore wind facilities 12.5 miles (20 kilometers) offshore (Parsons et al. 2020), but the number of participants decreases as structures move farther offshore. A majority of respondents who would make the trip expect it to be a one-time trip. Although the likelihood of recreational vessels visiting offshore structures decreases with distance from shore, increasing numbers of offshore structures may create increased recreational vessel traffic to these structures. Additional vessel traffic from these fishing and tourism activities would increase the chance of allisions and collisions among recreational, sightseeing, or commercial vessels.

A 2019 survey of over 500 New Hampshire coastal recreation users found 77 percent support for offshore wind development, 12 percent opposition, and 11 percent neutral. Regarding the impact on their outdoor recreation experience, 43 percent anticipated a beneficial impact, 31 percent anticipated a neutral impact, and 26 percent anticipated an adverse impact (Tourism Economics 2019; BOEM 2021).

Additionally, a 2020 survey-based preference study to determine attitude toward offshore wind and if the presence of offshore wind turbines affects the number of trips a beachgoer makes to the beach found that developed beaches with boardwalks and beaches that were designated as local, state, or national parks had the lowest amount of reported trip cancellation (Parsons et al. 2020). Because many of New Jersey's and New York's most visited beaches are quite developed, long-term impacts on recreation and tourism are not expected. The beachgoers at local, state, or national park beaches self-reported as more favorable toward wind power and correspondingly appeared less inclined to cancel a trip due to the presence of wind turbines.

Based on currently available studies and the distance of ongoing and planned offshore wind projects from shore, BOEM anticipates that the WTGs associated with ongoing and planned offshore wind projects in the geographic analysis area could have a minor adverse impact on recreation and tourism when discernible in previously undeveloped views. The impact of visible WTGs on recreation would be long term and continuous. However, Parsons and Firestone (2018) found that beyond 15 miles (24.1 kilometers) from shore, the percentage of people who responded negatively vs. positively to seeing offshore wind infrastructure was nearly equal. In addition, beneficial impacts due to the presence of offshore structures could provide opportunities for fishing and sightseeing due to a reef effect.

Traffic: Offshore wind project construction and conceptual decommissioning and, to a lesser extent, offshore wind project operation would generate increased vessel traffic that could inconvenience recreational vessel traffic. The impacts would occur primarily during construction, along routes between ports and offshore wind construction areas. Vessel traffic for each project is not known but is anticipated to result in a small increase in current vessel traffic for the NY Bight area. BOEM expects that vessel traffic would have minor impacts on recreation and tourism.

3.6.8.3.3 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, recreation and tourism would continue to be affected by existing environmental trends and ongoing activities. The impacts of ongoing activities, including ongoing construction of offshore wind, ongoing vessel traffic, presence of structures, and the noise and trenching from periodic maintenance or installation of piers, pilings, seawalls, or offshore cables, would be **negligible** to **minor**.

Cumulative Impacts of the No Action Alternative. Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and recreation and tourism would continue to be affected by the primary IPFs of anchoring, land disturbance, lighting, cable emplacement and maintenance, noise, presence of structures, and vessel traffic. The impacts of planned non-offshore-wind activities would be similar to the impacts of ongoing, non-offshore-wind activities. Impacts on recreation and tourism from planned offshore wind activities would be long term, localized, and negligible for lighting; long term, localized, and minor from anchoring and from presence of structures; and short term, localized, and minor due to land disturbance, noise, traffic, and cable emplacement and maintenance. Planned offshore wind activities in the analysis area would likely also result in minor beneficial impacts due to the presence of offshore structures, which could provide opportunities for fishing and sightseeing due to a reef effect. Overall, the No Action Alternative combined with all planned activities in the geographic analysis area would likely result in **negligible** to **minor** impacts and **minor beneficial** impacts on recreation and tourism.

3.6.8.4 Impacts of Alternative B – No Identification of AMMM Measures at the Programmatic Stage – Recreation and Tourism

Alternative B considers the potential impacts of future offshore wind development for the NY Bight area without the AMMM measures identified in Appendix G, *Mitigation and Monitoring,* that could avoid, minimize, mitigate, and monitor those impacts.

3.6.8.4.1 Impacts of One Project

Anchoring: Construction and installation, O&M, and conceptual decommissioning of a single NY Bight project would increase the number of vessels anchored offshore and would require the addition of scour protection for WTG foundations and cable protections. Anchored vessels for construction and installation, O&M, and conceptual decommissioning of one NY Bight project would have localized, intermittent, temporary impacts on recreational boating. The addition of scour and cable protection would have localized, long-term impacts on anchoring for recreational boats. BOEM expects that recreational boaters could navigate around anchored vessels and adjust the locations for dropping anchor to avoid cable and scour protection with only brief inconvenience. The anticipated impacts from anchoring on recreation, tourism, or recreational fishing in the geographic analysis area for one NY Bight project would be minor.

Land disturbance: One NY Bight project would require one or more cable landfall(s), onshore export cabling, possible substation and converter station construction, and support service facilities, resulting in vehicle traffic, noise, and construction sites that could reduce visitor enjoyment and temporarily restrict access to recreational sites. Impacts associated with construction of onshore elements would be most likely to occur if construction activities take place during the tourism high season (generally May through September) and disrupt access to recreation areas or create disruptive noise. The disruption would likely be localized and temporary so impacts would be minor. While direct disturbance to recreational sites (e.g., beaches, parks) is possible, BOEM anticipates popular recreational areas would likely be avoided and any impacts, if they did occur, would be temporary. Site-specific project information is needed to fully analyze the extent of impacts on recreational sites.

Lighting: One NY Bight project would add new sources of onshore and offshore light, including nighttime vessel lighting, fixed lighting at onshore substation/converter station sites, and at up to 280 WTGs and up to 5 OSSs. As described for the No Action Alternative, lighting at onshore substations/converter stations is anticipated to have a negligible impact on recreation and tourism because onshore lighting is already a prevalent feature along the New York and New Jersey coast.

Because of the distance from shore (the NY Bight lease area nearest to shore is 20 nautical miles [37 kilometers] offshore, lighting on the WTGs and OSS is not anticipated to have a substantial effect on views. However, as described in Section 3.6.9, *Scenic and Visual Resources*, in the absence of an ADLS system, there would be new, constant sources of nighttime lighting in view of the coastline for the NY Bight project. Nighttime lighting could have long-term impacts on recreation and tourism if the lighting influences visitor decisions in selecting coastal locations to visit. The addition of a single project in the NY Bight area would result in long-term, minor impacts on recreation and tourism, primarily as a result of offshore lighting on WTGs and OSS.

Cable emplacement and maintenance: The development of one NY Bight project would result in seafloor disturbance due to the installation of interarray and export cables. Cable emplacement could prevent deployment of fixed and mobile fishing gear in limited parts of the NY Bight area from one day up to several months (if simultaneous lay and burial techniques are not used), which may result in the loss of access if alternative fishing locations are not available. Impacts would be greatest if cables are installed in areas of high recreational fishing activity, as shown on Figure 3.6.1-22. Activities from support vessels, cable emplacement, and routine or emergency maintenance repairs would temporarily impact access to some areas. Overall, cable emplacement and maintenance would not restrict large areas, and navigational impacts on recreational fishing grounds would be on the scale of hours to days. Cable emplacement and maintenance as a result of a single NY Bight project would likely result in localized and temporary minor adverse impacts on recreation and tourism.

Dredging and turbulence during cable installation could also affect fish and marine mammals of interest for recreational fishing and sightseeing, although species would recover upon completion (Section 3.5.7, *Sea Turtles*, and Section 3.5.6, *Marine Mammals*), resulting in localized, short-term, minor impacts on recreation and tourism. Cable emplacement and maintenance that occur near beaches, fishing sites, or nearshore recreational activities could contribute to recreational impacts related to temporary water quality impacts during construction and maintenance. As discussed in Section 3.4.2, *Water Quality*, impacts on water quality from cable installation and maintenance would be short term and minor and are therefore not anticipated to result in substantive impacts on recreation and tourism.

Noise: Noise from operation of construction equipment, pile-driving, HRG surveys, and vehicle or vessel traffic associated with a single NY Bight project could result in adverse impacts on recreation and tourism. Onshore construction noise near beaches, parkland, recreation areas, or other areas of public interest would temporarily disturb the quiet enjoyment of the sites (in locations where such quiet is an expected or typical condition).

Similarly, offshore construction noise would intrude upon the natural sounds of the marine environment, adversely affecting recreational enjoyment of the marine and coastal environments. Using Ocean Wind 1 as representative of pile-driving for a single NY Bight project, noise from pile-driving—the noisiest aspect of WTG installation—is estimated to be 101 dBA at a distance of 50 feet (Ocean Wind 2022). Over water, the piling noise would be barely audible at 7 miles downwind (Ocean Wind 2022). Accordingly, even where areas within or near the offshore export cable route and lease area are available for recreational boating during construction, increased noise from construction would be limited to a small area in the larger NY Bight and would represent only a temporary inconvenience to recreational boaters. The temporary disruptions to or changes in offshore fish, shellfish, and whale populations (see Section 3.5.5, *Finfish, Invertebrates, and Essential Fish Habitat*, and Section 3.5.6, *Marine Mammals*) as a result of construction noise would have a minor impact on recreational fishing or marine sightseeing. The overall impact from one NY Bight project is expected to be minor.

Presence of structures: The construction and installation of between 50 and 280 WTGs and between 1 and 5 OSSs associated with one NY Bight project within the recreation and tourism geographic analysis area would contribute to impacts on recreational fishing and boating. The offshore structures would have long-term, adverse impacts on recreational boating and fishing through the risk of allision; risk of gear entanglement, damage, or loss; navigational hazards; space use conflicts; presence of cable infrastructure; and visual impacts. However, offshore wind structures could have beneficial impacts on recreation through fish aggregation and reef effects. The impact from one NY Bight project would likely be negligible to minor.

As described in Section 3.6.8.3.2, *Cumulative Impacts of the No Action Alternative*, recreation and tourism may benefit from the presence of operational WTGs. Parsons (Parsons et al. 2020) documented large increases in the number of trips to the shoreline to view offshore wind projects in parts of Europe. New studies of the Block Island Wind Farm corroborate positive effects on tourism. In a study relying on trends in summer vacation property rentals, researchers at the University of Rhode Island observed a 19 percent increase in summer monthly revenue for Block Island vacation property landlords compared to other regional summer vacation rental destinations such as Narragansett and Westerly, Rhode Island, and Nantucket, Massachusetts. The factors that may be driving the increase in rental volume are not defined in the study, but the researchers hypothesized that tourists may be curious to see the wind farm or that the recreational fishing near the wind farm has improved significantly, thereby increasing interest in visiting the wind farm itself (Atlantic Shores 2021; Carr-Harris and Lang 2019). Based on a study prepared by Parsons and Firestone (2018), beaches with views of WTGs could gain trips from the estimated 2.6 percent of beach visitors for whom viewing the WTGs would be a positive result, offsetting some lost trips from visitors who consider views of WTGs to be negative and the 8 percent of respondents who stated they would visit a different beach (without offshore wind development).

Recreational anglers may avoid fishing in the NY Bight lease area due to concerns about their ability to safely fish within or navigate through the area. As noted in Section 3.6.1, *Commercial Fisheries and For-Hire Recreational Fishing*, navigational hazards and scour/cable protection due to the presence of structures from one NY Bight project would result in substantial adverse impacts on commercial fisheries and for-hire recreational fishing. Similar impacts would also result for recreational anglers who would travel the minimum of 20 nautical miles (37 kilometers) to the nearest NY Bight lease area (or over 35 nautical miles [65 kilometers] to the farthest NY Bight lease area). However, because most recreational anglers fish much closer to shore (Figure 3.6.1-22), BOEM anticipates impacts on recreational fishing from presence of structures would be minor.

As described more fully in Section 3.5.5, *Finfish, Invertebrates, and Essential Fish Habitat*, the presence of structures and cable protection can create a “reef effect,” providing ecological benefits and habitat diversity. The offshore foundations, scour protection, and cable protection provide habitat for developing new ecosystems and attract species seeking prey or refuge from predators. For example, the creation of structured habitat is expected to benefit species such as striped bass, black sea bass, and Atlantic cod by potentially increasing their habitat. Similarly, the presence of foundations may increase habitat and provide forage and refuge for some migratory finfish targeted by recreational fishermen. Increasing potential habitat for fish and their prey may positively affect recreational fishing within a NY Bight lease area. Additionally, interest in visiting a single NY Bight project lease area may result in an increased number of fishing trips originating from New Jersey and New York ports. These additional vessel trips could support an increase in angler expenditures at shoreside facilities servicing recreational fishermen (Atlantic Shores 2021; Kirkpatrick et al. 2017).

Traffic: A single NY Bight project would generate a small increase in vessel traffic compared to baseline conditions, with a peak during construction and conceptual decommissioning and reduced traffic during O&M. As described in Section 3.6.6, *Navigation and Vessel Traffic*, based on vessel trip estimates from nearby ongoing and planned offshore wind projects (Ocean Wind 1 [OCS-A 0498], Atlantic Shore South [OCS-A 0499], and Empire Wind [OCS-A 0512]), one NY Bight project is anticipated to generate up to 51 vessels at any given time during construction and 8 vessel trips per day during O&M. Construction support vessels, including vessels carrying assembled WTGs or WTG and OSS components, would be present in the waterways between the NY Bight project area and the ports used during construction and installation and during conceptual decommissioning. Recreational vessels may experience delays within the ports serving construction, but most recreational boaters in the geographic analysis area would experience only minor inconvenience from construction-related vessel traffic. Vessel travel requiring a specific route that crosses or approaches the offshore export cable routes could experience minor impacts. Recreational boating and fishing activities would be required to avoid project vessels and restricted safety zones through routine adjustments to navigation. Although tourists may experience increased transit times in some situations, these situations are spatially and temporally limited. O&M activities would only periodically be present in the NY Bight lease areas.

Section 2.3, *Non-Routine Activities and Events*, describes the non-routine activities associated with a NY Bight project. Activities requiring repair of WTGs, equipment, or cables, or spills from maintenance or repair vessels, which could affect water quality, would generally require intense, temporary activity to address emergency conditions or respond to an oil spill. Additionally, accidental releases of chemicals, gases, or man-made debris may occur as a result of a structural failure. Non-routine activities could temporarily prevent or deter recreation or tourist activities near the site of a given non-routine event, but these impacts would be temporary. Overall, BOEM expects vessel activities in the open waters between the project area and ports and along the cable corridor to result in a small increase in current levels of vessel traffic and have only minor impacts on recreation and tourism.

3.6.8.4.2 Impacts of Six Projects

The same impact types and mechanisms described for a single NY Bight project apply to six NY Bight projects for anchoring, land disturbance, cable emplacement and maintenance, noise, presence of structures, and vessel traffic. However, there would be more potential for impacts due to the larger number of projects occurring and the subsequent greater amount of offshore and onshore development. Impacts from anchoring are still expected to remain minor because anchoring is not expected to substantially affect or disrupt recreational fishing. Land disturbance from six NY Bight projects would increase compared to one NY Bight project, but the impact would remain minor as impacts are anticipated to be temporary during construction.

The amount of nighttime lighting that would be visible from WTGs and OSSs would increase with six NY Bight projects without the use of ADLS. However, because of the distance from shore from any of the NY Bight leases (the closest lease area is 20 nautical miles [37 kilometers] offshore) and the pervasive light sources already present along the New York and New Jersey coastline, impacts from lighting would likely remain minor. Noise impacts would increase in duration and geographic extent and therefore would affect more recreational boaters and anglers. However, because most recreational boating activity occurs closer to shore than the NY Bight lease areas, impacts would remain minor. Disruptions to fish and whale populations as a result of construction noise could also increase impacts on recreational fishing or marine sightseeing, but impacts would be temporary and remain minor.

Impacts from cable emplacement and maintenance under six NY Bight projects would range from minor to moderate, an increase from minor impacts under a single NY Bight project. The increased impacts would be due to multiple areas of cable installation potentially occurring simultaneously, increasing the potential for temporary access limitations on recreational fishing vessels. However, the area used by installation vessels would still be small relative to the size of available access to other fishing grounds, and recreational fishing vessels would be able to make temporary adjustments during construction and O&M.

Because of the increased number of WTGs and OSSs across the six NY Bight lease areas, the impact from the presence of structures would increase to moderate. The increased impacts would be due to the larger area where recreational boating and fishing would be at risk of allision, gear entanglement, increased navigational hazards, and space use conflicts, requiring recreational boaters to make adjustments when traveling to or nearby the NY Bight lease areas. In addition, a greater number of structures would be visible from the coastline and to recreational boaters with six NY Bight projects, potentially affecting recreational experience. Beneficial impacts from fish aggregation and reef effect would remain minor.

Impacts from vessel traffic would increase under six NY Bight projects due to the higher number of vessels that would be required as compared to one NY Bight project during installation, O&M, and conceptual decommissioning. The number of vessels would increase the likelihood that tourism charters and recreational fishing vessels would change their travel routes, times, or other routines, which could negatively impact their catch or result in increased expenses. However, given the incremental increase in vessel traffic from wind energy development compared to regional vessel traffic, the impact would remain minor**.**

3.6.8.4.3 Cumulative Impacts of Alternative B

The construction and installation, O&M, and conceptual decommissioning of six NY Bight projects would contribute to the impacts on recreation and tourism from ongoing and planned activities in the geographic analysis area. BOEM anticipates that the cumulative impacts associated with six NY Bight projects when combined with past, present, and planned activities would be temporarily disruptive during the construction and conceptual decommissioning phases and would result in some long-term impacts associated with the presence of structures. The cumulative impacts would be similar to the impacts discussed for six NY Bight projects above. If construction of the six NY Bight projects is staggered or geographically dispersed onshore, impacts would be further minimized. The six NY Bight projects would contribute a noticeable increase to the minor to moderate and minor beneficial impacts on recreation and tourism from the combination of the six NY Bight projects and other ongoing and planned activities.

3.6.8.4.4 Conclusions

Impacts of Alternative B. Construction and installation, O&M, and conceptual decommissioning of one NY Bight project under Alternative B would likely have **negligible** to **minor** impacts and **minor beneficial** impacts on recreation and tourism. Short-term impacts would occur during construction related to noise, anchored vessels, and hindrances to navigation from the installation of the export cable and WTGs. The long-term presence of cable hardcover and structures in the lease area during operations would also result in impacts on recreational vessel navigation and visual quality. Six NY Bight projects would likely have increased **minor** to **moderate** impacts, as result of the increased number of WTGs and increased construction impacts, and **minor beneficial** impacts.

Cumulative Impacts of Alternative B: In context of reasonably foreseeable environmental trends, the impacts contributed by six NY Bight projects to the cumulative impacts on recreation and tourism would be noticeable and would likely contribute to the **minor** to **moderate** impacts and **minor beneficial** impacts. The main drivers for this impact rating are the impacts on fishing and other recreational activity from noise, vessel traffic, and cable emplacement during construction; visual impacts associated with the presence of structures and lighting; and beneficial impacts on fishing from the reef effect.

3.6.8.5 Impacts of Alternative C (Proposed Action) – Identification of AMMM Measures at the Programmatic Stage – Recreation and Tourism

Alternative C, the Proposed Action, considers the potential impacts of future offshore wind development for the NY Bight Area with the AMMM measures identified in Appendix G, *Mitigation and Monitoring*, that could avoid, minimize, mitigate, and monitor those impacts. Alternative C consists of two sub-alternatives – Sub-alternative C1: Previously Applied AMMM Measures, and Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures. The analysis for Sub-alternative C1 is presented as the change in impacts from those impacts discussed under Alternative B, and the analysis for Sub-alternative C2 is presented as the change from those impacts discussed in Sub-alternative C1. Refer to Table G-1 in Appendix G, *Mitigation and Monitoring*, for a complete description of AMMM measures that make up the Proposed Action.

3.6.8.5.1 Sub-alternative C1 (Preferred Alternative): Previously Applied AMMM Measures

Sub-alternative C1 analyzes AMMM measures that BOEM has required as conditions of approval for previous activities proposed by lessees in COPs submitted for the Atlantic OCS and through related consultations (Table 3.6.8-4).

Table 3.6.8-4. Summary of previously applied avoidance, minimization, mitigation, and monitoring measures for recreation and tourism

Measure ID	Measure Summary
MUL-37	This measure requires implementation of ADLS to turn aviation obstruction lights on and off in response to detection of nearby aircraft, which would reduce total nighttime lighting on WTGs and OSSs.

Impacts of One Project

The implementation of MUL-37 could reduce some of the impacts from lighting associated with Alternative B on recreation and tourism. Impacts for other IPFs would remain the same as described under Alternative B. An ADLS system (MUL-37) would activate a hazard lighting system in response to detecting nearby aircraft and would result in shorter-duration night sky impacts. For comparison, the nearby Empire Wind (OCS-A 0512) ADLS-controlled obstruction lights are estimated to be activated for 357 hours, 46 minutes, and 45 seconds over a 1-year period, 7.5 percent of the normal operating time that would occur without ADLS. This would likely reduce the potential impacts from nighttime lighting on recreational viewer experience from minor to negligible.

Impacts of Six Projects

For six NY Bight projects, MUL-37 would be implemented the same as described for one NY Bight project but would cover a larger geographic area and potentially affect more tourism-based businesses and recreational activities. ADLS on WTGs/OSSs of all six NY Bight leases (MUL-37) would substantially reduce the amount of nighttime lighting compared to Alternative B, reducing the impact from lighting to negligible.

Cumulative Impacts of Sub-alternative C1 (Preferred Alternative)

Under Sub-alternative C1, cumulative impacts on recreation and tourism are anticipated to be similar as described under Alternative B, except that implementation of ADLS on six NY Bight projects (MUL-37) in combination with ongoing and planned projects would reduce offshore lighting impacts to negligible.

3.6.8.5.2 Sub-alternative C2: Previously Applied and Not Previously Applied AMMM Measures

Sub-alternative C2 analyzes the AMMM measures under Sub-alternative C1 plus the AMMM measures that have not been previously applied. However, BOEM has not identified any AMMM measures under Sub-alternative C2 that were not previously applied. Therefore, the impacts on recreation and tourism under Sub-alternative C2 are the same as for Sub-alternative C1.

3.6.8.5.3 Conclusions

Impacts of Alternative C. The construction, installation, and conceptual decommissioning for one NY Bight project under Sub-alternative C1 and Sub-alternative C2 would likely have **negligible** to **minor** impacts and **minor beneficial** impacts on recreation and tourism, while impacts on recreation and tourism for six NY Bight projects would be **minor** to **moderate** and **minor beneficial** under Sub-alternative C1 and Sub-alternative C2. The AMMM measure that would be implemented under Sub-alternative C1 and Sub-alternative C2 would reduce lighting impacts but would not reduce the overall impact level.

Cumulative Impacts of Alternative C. In context of reasonably foreseeable environmental trends, the impacts contributed by Sub-alternative C1 and Sub-alternative C2 to cumulative impacts on recreation and tourism would be noticeable. The AMMM measure that would be implemented under Sub-alternative C1 and Sub-alternative C2 would minimize impacts from lighting. BOEM anticipates that the cumulative impacts on recreation and tourism in the geographic analysis area from six NY Bight projects under Sub-alternative C1 and Sub-alternative C2 combined with ongoing and planned activities would likely be **negligible** to **moderate** and **minor beneficial**.

3.6.8.6 Recommended Practices for Consideration at the Project-Specific Stage

BOEM is recommending that lessees consider analyzing RPs in Table 3.6.8-5 to further reduce potential recreation and tourism impacts. Refer to Table G-2 in Appendix G for a complete description of the RPs.

Table 3.6.8-5. Recommended practices for recreation and tourism impacts and related benefits

Recommended Practice	Potential Benefit
MUL-5: Use equipment, technology, and best practices to produce the least amount of noise possible to reduce noise impacts.	Using equipment and technology to limit noise levels could reduce interference with recreational activity near onshore construction sites as a result of construction noise. The NY Bight projects would also have to comply with applicable state or local noise regulations, which would ensure noise levels are within appropriate limits.
REC-1: Schedule nearshore construction activities outside of the summer months to avoid tourist season.	Scheduling onshore and nearshore construction outside of the busy summer tourist season would minimize effects on recreational activities and tourism-based businesses. Increased vehicle traffic, road closures, and potential limitations on recreational access would still occur, but they would affect fewer visitors and summertime recreational activities.

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