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Draft Environmental Impact Statement for the Sunrise Wind Project

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COVER SHEET

Environmental Impact Statement

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ABSTRACT

This Draft Environmental Impact Statement (EIS) assesses the reasonably foreseeable impacts on physical, biological, socioeconomic, and cultural resources that could result from the construction and installation, operations and maintenance, and conceptual decommissioning of the Sunrise Wind Farm (Project) proposed by Sunrise Wind, LLC (Sunrise Wind), in its Construction and Operations Plan (COP). The proposed Project described in the COP and this Draft EIS would be up to approximately 1,034 megawatts in scale and sited 18.5 statute miles (mi) (16.1 nautical miles [nm], 29.8 kilometers [km]) south of Martha's Vineyard, Massachusetts, and approximately 30 mi (26.1 nm, 48.2 km) east of Montauk, New York (NY), within the area of Renewable Energy Lease Number OCS-A 0487 (Lease Area). The Project would serve demand for renewable energy in New York. This Draft EIS was prepared in accordance with the requirements of the National Environmental Policy Act (42 United States Code 4321–4370f) and implementing regulations of the Council on Environmental Quality and the Department of the Interior. This Draft EIS will inform the Bureau of Ocean Energy Management's decision on whether to approve, approve with modifications, or disapprove the Project's COP. Publication of the Draft EIS initiates a 60-day public comment period, after which all the comments received will be assessed and considered by BOEM in preparation of a Final EIS.

Additional copies of this draft environmental impact statement may be obtained by writing the Bureau of Ocean Energy Management, Attn: Paige Foley (address above); by telephone at (703)-787-1584; or by downloading from the BOEM website at Sunrise Wind Activities | Bureau of Ocean Energy Management (boem.gov).

EXECUTIVE SUMMARY

Introduction

This Draft Environmental Impact Statement (EIS) assesses the potential biological, socioeconomic, physical, and cultural impacts that could result from the construction and installation, operations and maintenance (O&M), and conceptual decommissioning of the Sunrise Wind Farm (SRWF) and Sunrise Wind Export Cable (SRWEC) Project (the Project), as proposed by Sunrise Wind, LLC (Sunrise Wind, the Applicant) in its construction and operations plan (COP). The Bureau of Ocean Energy Management (BOEM) has prepared the Draft EIS following the requirements of the National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321 et seq.) and implementing regulations (40 Code of Federal Regulations [CFR] 1500-1508). Additionally, this Draft EIS was prepared consistent with the U.S. Department of the Interior's NEPA regulations (43 CFR 46), longstanding federal judicial and regulatory interpretations, and U.S. Administration priorities and policies including the Secretary of the Interior's Order NO. 3399 requiring bureaus and offices to not apply any of the provisions of the 2020 changes to Council on Environmental Quality (CEQ) regulations (the "2020 rule")(Council on Environmental Quality 2020) in a manner that would change the application or level of NEPA that would have been applied to a project action before the 2020 rule went into effect.

Cooperating agencies may rely on this Draft EIS to support their decision-making. Sunrise Wind applied to the National Marine Fisheries Service (NMFS) for an incidental take authorization in the form of a Letter of Authorization for Incidental Take Regulations under the Marine Mammal Protection Act (MMPA) of 1972, as amended (16 USC 1361 et seq.), for take of marine mammals incidental to specified activities associated with the Project. NMFS needs to render a decision regarding the request for authorization due to NMFS' responsibilities under the MMPA (16 USC 1371 (a)(5)(A and D)) and its implementing regulations. NMFS intends to adopt the Final EIS if, after independent review and analysis, NMFS determines the Final EIS to be sufficient to support NMFS' separate proposed action and decision to issue the authorization, if appropriate. The U.S. Army Corps of Engineers (USACE) intends to adopt BOEM's EIS to support its decision on any permits requested under Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act of 1899 (RHA). Additionally, Sunrise Wind has also applied to the National Park Service (NPS) for a construction permit and right-of-way to place a transmission cable through federally held and controlled property within Fire Island National Seashore. The cable can be so located only if the NPS grants a right-of way (54 USC § 100902; 36 C.F.R. Part 14) and special use permit for construction (36 C.F.R. § 5.7). The NPS intends to adopt BOEM's Final EIS if the NPS determines that the EIS is sufficient to supports its permitting decisions.

Purpose and Need for the Proposed Action

In Executive Order 14008, Tackling the Climate Crisis at Home and Abroad, issued January 27, 2021, President Biden stated that it is the policy of the United States "to organize and deploy the full capacity of its agencies to combat the climate crisis to implement a Government-wide approach that reduces climate pollution in every sector of the economy; increases resilience to the impacts of climate change;

protects public health; conserves our lands, waters, and biodiversity; delivers EJ; and spurs well-paying union jobs and economic growth, especially through innovation, commercialization, and deployment of clean energy technologies and infrastructure. Through a competitive leasing process under 30 CFR 585.211, Sunrise Wind was awarded commercial Renewable Energy Lease OCS-A 0487[1] (Lease Area) covering an area offshore of Massachusetts, Rhode Island, and New York (Figure ES-1). Under the terms of the lease, Sunrise Wind has the exclusive right to submit a COP for activities within the Lease Area, and it has submitted a COP to BOEM proposing the construction and installation, O&M, and conceptual decommissioning of up to a 1,034-megawatt (MW) offshore wind energy facility in accordance with BOEM's COP regulations under 30 CFR 585.626, et seq. (Figure ES-1). Sunrise Wind's goal is to develop a commercial-scale offshore wind energy facility in the Lease Area with wind turbine generators; a network of inter-array cables; an offshore converter station; an export cable making landfall in the Town of Brookhaven, NY; and an onshore converter station. The Project, as described here, is the Proposed Action considered by BOEM in this Draft EIS. The need for the Project is to contribute to New York State's goal of 2,400 megawatts (MW) of offshore energy generation by 2030. The Project would have the capacity to generate up to 1,034 MW of power to the New York grid and satisfy Sunrise Wind's obligation to the New York State Energy Research and Development Authority for providing 924 MW of offshore wind energy for purchase by New York load-serving entities.

[1] A portion of the area covered by Renewable Energy Lease OCS-A 0500 and the entirety of the area covered by Renewable Energy Lease OCS-A 0487 were merged and included in a revised Lease OCS-A 0487 issued to Sunrise Wind on March 15, 2021.

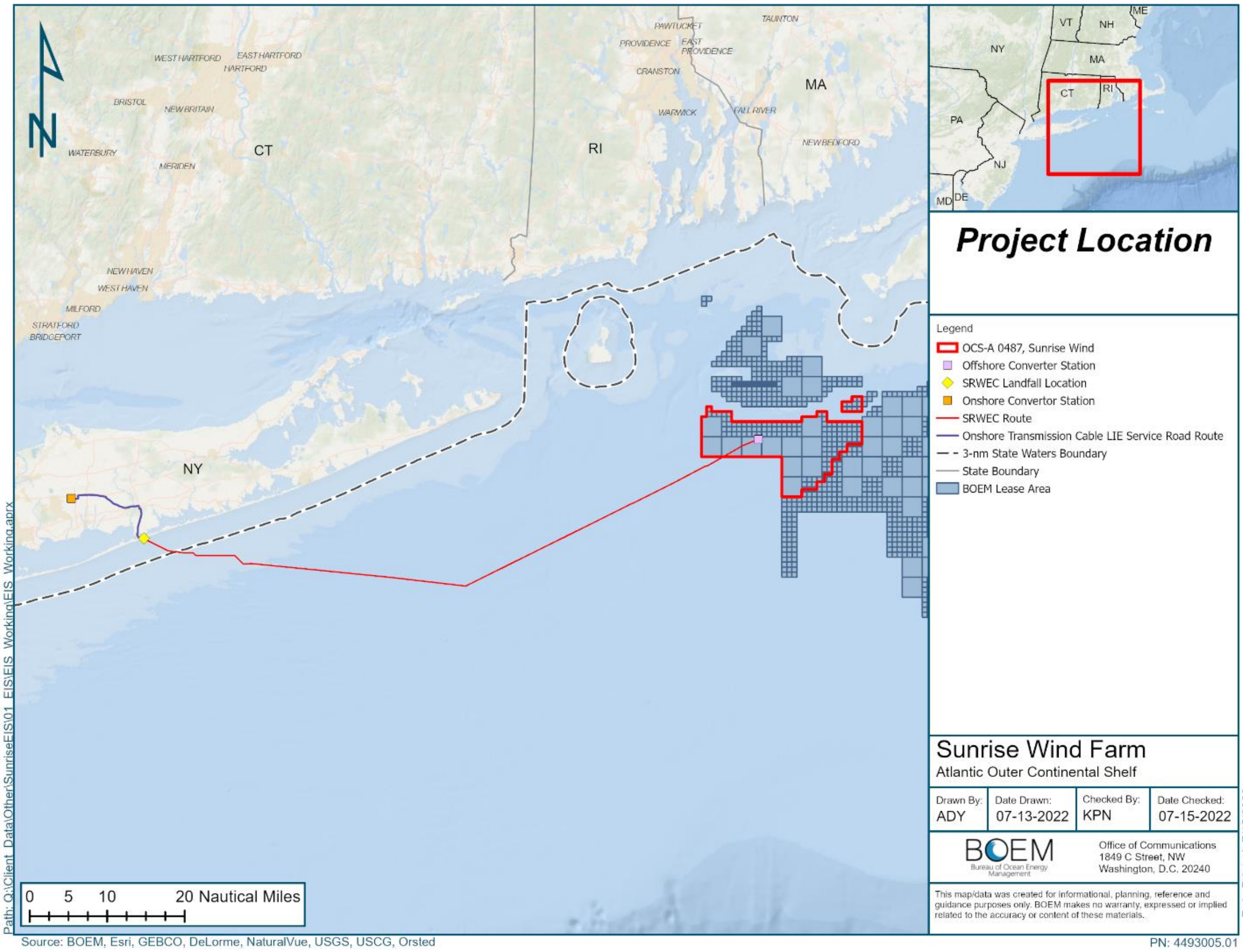

Figure ES-1. Sunrise Wind Farm Project Location

Based on BOEM's authority under the Outer Continental Shelf Lands Act (OCSLA) to authorize renewable energy activities on the Outer Continental Shelf (OCS), and Executive Order 14008; the goal is to deploy 30 GW of offshore wind energy capacity in the United States by 2030, while protecting biodiversity and promoting ocean co-use; and in consideration of the goals of the Applicant, the purpose of BOEM's action is to determine whether to approve, approve with modifications, or disapprove Sunrise Wind's COP. BOEM will make this determination after weighing the factors in subsection 8(p)(4) of the OCSLA that are applicable to plan decisions and in consideration of the above goals. BOEM's action is needed to fulfill its duties under the lease, which require BOEM to decide on the lessee's plans to construct and operate a commercial-scale offshore wind energy facility within the Lease Area (the Proposed Action).

Public Involvement

On August 31, 2021, BOEM issued a Notice of Intent (NOI) to prepare an EIS, initiating a 30-day public scoping period (86 Federal Register 48763). A revision to the NOI was published in the *Federal Register* on September 3, 2021, to extend the comment period to October 4, 2021, and to make technical corrections. The NOI solicited public input on the significant resources and issues, impact-producing factors, reasonable alternatives, and potential mitigation measures to analyze in the EIS. BOEM also used the NEPA scoping process to initiate the Section 106 consultation process under the National Historic Preservation Act (54 USC 300101 et seq.), as permitted by 36 CFR 800.2(d)(3), and sought public comment and input through the NOI regarding the identification of historic properties or potential effects on historic properties from activities associated with approval of the Sunrise Wind COP. BOEM held three virtual public scoping meetings on September 16, 20, and 22, 2021, to present information on the Project and NEPA process, answer questions from meeting attendees, and to solicit public comments. Scoping comments were received through Regulations.gov on docket number BOEM-2021-0052, via email to a BOEM representative, and through oral testimony at each of the three public scoping meetings. BOEM received total of 88 comment submissions from federal and state agencies, local governments, non-governmental organizations, and the general public during the scoping period. The topics most referenced in the scoping comments included climate change, NEPA/public involvement process, mitigation and monitoring, commercial fisheries and for-hire recreational fishing, and general support or opposition. BOEM considered all scoping comments while preparing this Draft EIS. Publication of this Draft EIS initiates a 60-day public comment period open to all, after which BOEM will assess and consider all of the comments received on the Draft EIS during preparation of the Final EIS. See Appendix A for additional information on public involvement.

Alternatives

BOEM considered a reasonable range of alternatives during the EIS development process that emerged from scoping, interagency coordination, and internal BOEM deliberations. The Draft EIS evaluates the No Action Alternative and two action alternatives (one of which has sub-alternatives). The action alternatives are not mutually exclusive; BOEM may select a combination of alternatives that meet the purpose and need of the proposed Project. Cooperating agencies will be considered when selecting the priority alternative. The alternatives are as follows:

- Alternative A - No Action Alternative
- Alternative B - Proposed Action
- Alternative C - Fisheries Habitat Impact Minimization

Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

Alternatives considered but dismissed from detailed analysis and the rationale for their dismissal are described in Section 2.2 herein.

Alternative A - No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP. Project construction and installation, O&M, and decommissioning would not occur, and no additional permits or authorizations for the Project would be required. Any potential environmental and socioeconomic impacts, including benefits, associated with the Project as described under the Proposed Action would not occur. However, all other past and ongoing impact-producing activities would continue. The current resource condition, trends, and impacts from ongoing activities under the No Action Alternative serve as the existing baseline against which the direct and indirect impacts of all action alternatives are evaluated.

Over the life of the proposed Project, other reasonably foreseeable future impact-producing offshore wind and non-offshore wind activities would be implemented, which would cause changes to the existing baseline conditions even in the absence of the Proposed Action. The continuation of all other existing and reasonably foreseeable future activities described in Appendix E (Planned Activities Scenario) without the Proposed Action serves as the baseline for the evaluation of cumulative impacts of all alternatives.

Alternative B – Proposed Action

The Proposed Action would construct, operate, maintain, and decommission an approximately 1,034-MW wind energy facility on the OCS offshore of Massachusetts, Rhode Island, and New York within the range of design parameters described in the Sunrise Wind COP (Sunrise Wind 2022) and summarized in Table ES-1 and Appendix C, Project Design Envelope and Maximum-Case Scenario. Refer to the Sunrise Wind COP (Sunrise Wind 2022) for additional details on Project design.

Table ES-1. Summary of Project Design Envelop Parameters

SRWF	**Foundations**
	• Monopile foundations for the WTGs and a piled jacket foundation for the OCS–DC • Up to 95 foundations for the WTGs and OCS–DC within 103 potential positions • Maximum embedment depth of up to 164 ft (50 m) for WTG monopile foundations, and 295 ft (90 m) for OCS–DC piled jacket foundation • Maximum area of seafloor footprint per foundation, inclusive of scour protection and CPS stabilization: 1.06 ac (4,290 m^2) for WTG monopile foundations and 2.64 ac (10,684 m^2) for the OCS–DC foundation structure
	WTGs
	• Up to 94 WTGs within 102 potential positions • Nameplate capacity of 11 MW • Rotor diameter of 656 ft (200 m) • Hub height of 459 ft (140 m) above mean sea level (AMSL) • Upper blade tip height of 787 ft (240 m) AMSL
	IAC
	• Maximum 161 kilovolt AC cables buried up to a target depth of 3 to 7 ft (1 to 2 m) • Maximum total length of up to 180 mi (290 km) • Maximum cable diameter of 8 inches (in; 200 millimeters [mm]) • Maximum disturbance corridor width of 98 ft (30 m) per circuit
	OCS-DC
	• One OCS-DC

	• Up to 361 ft (110.0 m) total structure height from lowest astronomical tide (LAT) (including lightning protection and ancillary structures)
SRWEC-OCS and SRWEC-NYS	**SRWEC**
	• One 320-kV DC export cable bundle buried to a target depth of 3 to 7 ft (1 to 2 m) • Maximum total corridor length of up to 105 mi (169 km) • Maximum individual cable diameter of 7.8 in (200 mm) • Maximum bundled cable diameter of 15.8 (400mm) • Maximum disturbance corridor width of 98 ft (30 m) • Maximum seafloor disturbance for horizontal directional drilling (HDD) exit pits of 61.8 ac (25 ha) • Maximum disturbance for Landfall Work Area (onshore) of up to 6.5 ac (2.6 ha)
Onshore Facilities	**Onshore Transmission Cable and Onshore Interconnection Cable**
	• Onshore Transmission Cable, including associated TJB and fiber optic cable, up to 17.5 mi (28.2 km) long, with a temporary disturbance corridor of 30 ft (9.1 m) and maximum duct bank target burial depth of 6 ft (1.8 m) • Maximum cable diameter of 6 in (152 mm) • Onshore Interconnection Cable to connect to Holbrook Substation
	OnCS-DC
	• An OnCS-DC with operational footprint of up to 6 ac (2.4 ha)

Alternative C – Fisheries Habitat Impact Minimization

Under Alternative C, the construction, O&M, and eventual decommissioning of up to a 1,034-MW wind energy facility on the OCS offshore of Massachusetts, Rhode Island, and New York would occur within the range of the design parameters outlined in the COP, subject to applicable mitigation measures. However, Alternative C is proposed with the intent to minimize impacts to fisheries habitats in the proposed project area that are the most vulnerable to long-term impacts. This alternative considered and prioritized contiguous areas of complex bottom habitat to be excluded from development to potentially avoid and/or minimize impacts to complex fisheries habitats, while still meeting BOEM's purpose and need for the project.

Areas for prioritization were identified by NMFS on May 2, 2022, based upon historical detections of Atlantic cod spawning activity in the vicinity of the Project Area, assumed hard bottom complex substrate, and the presence of large boulders (Figure 2.1.3-2). Priority Area 1 was deemed the higher priority by NMFS due to the close proximity to Cox Ledge, and documented cod spawning activity based upon recent acoustic and telemetry data. Priority Area 1 includes 16 WTG positions as well as the OCS-DC. Priority Area 2 includes 18 WTG positions and contains areas of high reflectance (indicative of hard substrates), large boulders, and is adjacent to detected cod spawning activity. Priority Area 3 includes 14 WTG positions and areas of high reflectance but fewer large boulders. Priority Area 4 includes 4 WTG positions and mid to high reflectance with large boulders.

Each of the sub-alternatives below may be individually selected or combined with any or all other alternatives or sub-alternatives, subject to the combination meeting the purpose and need.

Alternative C-1: Sunrise Wind's proposed layout includes 102 WTG positions; however, only 94 11-MW WTGs would be needed to meet the Project's maximum capacity of up to 1,034 MW. Under Alternative C-1, the construction and installation, O&M, and eventual decommissioning of a wind energy facility, and an OSS would occur within the design parameters outlined in the Sunrise Wind Farm COP (Sunrise Wind 2022) subject to applicable mitigation measures. However, certain WTG positions would be excluded from the identified priority areas in order to reduce impacts to sensitive benthic habitat and areas where cod spawning has been detected. Under this alternative the Project would maintain a uniform east-west and north-south grid of 1 x 1 nm spacing between WTGs. Alternative C-1 would result in the exclusion of up to 8 WTG positions from the identified priority areas. The specific 8 WTG positions that would be excluded from the identified priority areas are informed through the impacts analysis described in Chapter 3.

Alternative C-2: Under Alternative C-2, the 8 WTG positions identified for exclusion from development in Alternative C-1 would remain the same, and an additional 12 WTG positions would be removed from the Priority Areas and relocated to the eastern side of the lease area. The construction and installation, O&M, and eventual decommissioning of a wind energy facility, and an OSS would occur within the design parameters outlined in the Sunrise Wind Farm COP (Sunrise Wind 2022) subject to applicable mitigation measures. The Project would maintain a uniform east-west and north-south grid of 1 x 1 nm spacing between WTGs. Alternative C-2 assumes that habitat on the eastern side of the lease area is suitable for development. Geotechnical and geophysical surveys conducted in 2022 will help inform the feasibility of Alternative C-2. The specific 20 WTG positions that would be excluded from the identified Priority Areas are informed through the impacts analysis described in Chapter 3.

Environmental Impacts

This EIS uses a four-level classification scheme to characterize the potential beneficial impacts and adverse impacts of alternatives as either negligible, minor, moderate, or major. Resource-specific adverse and beneficial impact level definitions are presented in each Chapter 3 resource section.

BOEM analyzes the impacts of past and ongoing activities in the absence of the Project as the No Action Alternative. The No Action Alternative serves as the existing baseline against which all action alternatives are evaluated. BOEM also separately analyzes cumulative impacts of the No Action Alternative, which considers all other ongoing and reasonably foreseeable future activities described in Appendix E, *Planned Activities Scenario*. In this analysis, the cumulative impacts of the No Action Alternative serve as the baseline against which the cumulative impacts of all action alternatives are evaluated. Table ES-2 summarizes the impacts of each alternative and the cumulative impacts of each alternative. Under the No Action Alternative, the environmental and socioeconomic impacts and benefits of the action alternatives would not occur.

NEPA implementing regulations (40 CFR 1502.16) require that an EIS evaluate the potential unavoidable adverse impacts associated with a proposed action. Adverse impacts that can be reduced by mitigation measures but not eliminated are considered unavoidable. The same regulations also require that an EIS review the potential impacts of irreversible or irretrievable commitments of resources resulting from implementation of a proposed action. Irreversible commitments occur when the primary or secondary impacts from the use of a resource either destroy the resource or preclude it from other uses. Irretrievable commitments occur when a resource is consumed to the extent that it cannot recover or be replaced.

Chapter 4, Other Required Impact Analyses, describes potential unavoidable adverse impacts. Most potential unavoidable adverse impacts associated with the Proposed Action would occur during the construction phase and would be short-term. Chapter 4 also describes irreversible and irretrievable commitment of resources by resource area. The most notable such commitments could include effects on habitat or individual members of protected species, as well as potential loss of use of commercial fishing areas.

Table ES-2. Summary and Comparison of Impacts among Alternatives with No Mitigation Measures

Resource	Alternative A – No Action	Alternative B – Proposed Action	Alternative C-1 – Fisheries Habitat Impact Minimization (exclude 8 WTG positions)	Alternative C-2 – Fisheries Habitat Impact Minimization (exclude 8 WTG positions and relocate 12 WTG positions)
3.4.1 Air Quality				
Alternative Impacts	Minor to moderate	Minor to moderate; minor to moderate beneficial	Minor to moderate; minor to moderate beneficial	Minor to moderate; minor to moderate beneficial
Cumulative Impacts	Minor to moderate; minor to moderate beneficial	Minor to moderate; minor to moderate beneficial	Minor to moderate; Minor to moderate beneficial	Minor to moderate; minor to moderate beneficial
3.4.2 Water Quality				
Alternative Impacts	Negligible to moderate	Negligible to moderate	Negligible to moderate	Negligible to moderate
Cumulative Impacts	Minor to moderate	Negligible to moderate	Negligible to moderate	Negligible to moderate
3.5.1 Bats				
Alternative Impacts	Minor	Minor	Minor	Minor
Cumulative Impacts	Minor	Minor	Minor	Minor
3.5.2 Benthic Resources				
Alternative Impacts	Moderate; moderate beneficial	Moderate; minor beneficial	Moderate; minor beneficial	Moderate; minor beneficial
Cumulative Impacts	Moderate; moderate beneficial	Moderate; moderate beneficial	Moderate; moderate beneficial	Moderate; moderate beneficial

Resource	Alternative A – No Action	Alternative B – Proposed Action	Alternative C-1 – Fisheries Habitat Impact Minimization (exclude 8 WTG positions)	Alternative C-2 – Fisheries Habitat Impact Minimization (exclude 8 WTG positions and relocate 12 WTG positions)
3.5.3 Birds				
Alternative Impacts	Minor, minor beneficial	Negligible to minor; minor beneficial	Negligible to minor; minor beneficial	Negligible to minor; minor beneficial
Cumulative Impacts	Moderate; minor beneficial	Moderate; minor beneficial	Moderate; minor beneficial	Moderate; minor beneficial
3.5.4 Coastal Habitat and Fauna				
Alternative Impacts	Moderate	Negligible to minor	Negligible to minor	Negligible to minor
Cumulative Impacts	Minor to moderate	Minor to moderate	Minor to moderate	Minor to moderate
3.5.5 Finfish, Invertebrates, and Essential Fish Habitat				
Alternative Impacts	Minor to moderate	Negligible to moderate	Negligible to minor	Negligible to minor
Cumulative Impacts	Minor to moderate	Negligible to moderate	Negligible to minor	Negligible to minor
3.5.6 Marine Mammals				
Alternative Impacts	Negligible to moderate, Minor beneficial	Negligible to moderate, Minor beneficial	Negligible to moderate, Minor beneficial	Negligible to moderate, Minor beneficial
Cumulative Impacts	Moderate	Moderate	Moderate	Moderate

Resource	Alternative A – No Action	Alternative B – Proposed Action	Alternative C-1 – Fisheries Habitat Impact Minimization (exclude 8 WTG positions)	Alternative C-2 – Fisheries Habitat Impact Minimization (exclude 8 WTG positions and relocate 12 WTG positions)
3.5.7 Sea Turtles				
Alternative Impacts	Negligible to moderate, minor beneficial	Negligible to minor; minor beneficial	Negligible to minor; minor beneficial	Negligible to minor; minor beneficial
Cumulative Impacts	Moderate; minor beneficial	Moderate; minor beneficial	Moderate; minor beneficial	Moderate; minor beneficial
3.5.8 Wetlands and Other Waters of the United States				
Alternative Impacts	Moderate	Negligible to minor	Negligible to minor	Negligible to minor
Cumulative Impacts	Moderate	Moderate	Moderate	Moderate
3.6.1 Commercial Fisheries and For-Hire Recreational Fishing				
Alternative Impacts	Minor to major	Minor to major, depending on the fishery; minor beneficial	Minor to major, depending on the fishery; minor beneficial	Minor to major, depending on the fishery; minor beneficial
Cumulative Impacts	Moderate to major for commercial fisheries; minor to moderate for for-hire recreational fishing	Major	Major	Major
3.6.2 Cultural Resources				
Alternative Impacts	Negligible to major	Negligible to major	Negligible to major	Negligible to major
Cumulative Impacts	Negligible to major, negligible to minor beneficial	Negligible to major, negligible to minor beneficial	Negligible to major, negligible to minor beneficial	Negligible to major, negligible to minor beneficial
3.6.3 Demographics, Employment, and Economics				
Alternative Impacts	Minor; minor beneficial	Negligible to minor; negligible to minor beneficial	Negligible to minor; negligible to minor beneficial	Negligible to minor; negligible to minor beneficial

Resource	Alternative A – No Action	Alternative B – Proposed Action	Alternative C-1 – Fisheries Habitat Impact Minimization (exclude 8 WTG positions)	Alternative C-2 – Fisheries Habitat Impact Minimization (exclude 8 WTG positions and relocate 12 WTG positions)
Cumulative Impacts	Minor; moderate beneficial	Minor; moderate beneficial	Minor; moderate beneficial	Minor; moderate beneficial
3.6.4 Environmental Justice				
Alternative Impacts	Minor to moderate; minor beneficial	Negligible to moderate, negligible to minor beneficial	Negligible to moderate, negligible to minor beneficial	Negligible to moderate, negligible to minor beneficial
Cumulative Impacts	Minor to moderate, minor beneficial	Moderate; negligible to minor beneficial	Minor to moderate; negligible to minor beneficial	Minor to moderate; negligible to minor beneficial
3.6.5 Land Use and Coastal Infrastructure				
Alternative Impacts	Minor; minor beneficial	Negligible to moderate; minor beneficial	Negligible to moderate; minor beneficial	Negligible to moderate; minor beneficial
Cumulative Impacts	Minor; minor beneficial	Negligible to moderate; minor beneficial	Negligible to moderate; minor beneficial	Negligible to moderate; minor beneficial
3.6.6 Navigation and Vessel Traffic				
Alternative Impacts	Negligible to moderate	Negligible to moderate	Negligible to moderate	Negligible to moderate
Cumulative Impacts	Moderate	Moderate	Moderate	Moderate
3.6.7 Other Uses				
Alternative Impacts	Negligible for marine mineral extraction, marine and national security uses, aviation and air traffic, cables and pipelines, and radar systems; major for scientific research and surveys	Negligible for marine mineral extraction, cables and pipelines; minor for aviation and air traffic, most military and national security uses, and radar systems; moderate for USCS SAR operations; and major for scientific research and surveys	Negligible for marine mineral extraction, cables and pipelines; minor for aviation and air traffic, most military and national security uses, and radar systems; moderate for USCS SAR operations; and major for scientific research and surveys	Negligible for marine mineral extraction, cables and pipelines; minor for aviation and air traffic, most military and national security uses, and radar systems; moderate for USCS SAR operations; and major for scientific research and surveys

Resource	Alternative A – No Action	Alternative B – Proposed Action	Alternative C-1 – Fisheries Habitat Impact Minimization (exclude 8 WTG positions)	Alternative C-2 – Fisheries Habitat Impact Minimization (exclude 8 WTG positions and relocate 12 WTG positions)
Cumulative Impacts	Negligible to minor for marine mineral extraction, aviation and air traffic, cables and pipelines; moderate for radar systems; minor for military and national security; moderate for search and rescue activities; and major for scientific research and surveys	Negligible to minor for aviation and air traffic, cables and pipelines, marine mineral extraction, radar systems, and most military and national security uses; moderate for radar systems; and major for USCG SAR operations and scientific research and surveys	Negligible to minor for aviation and air traffic, cables and pipelines, marine mineral extraction, radar systems, and most military and national security uses; moderate for radar systems; and major for USCG SAR operations and scientific research and surveys	Negligible to minor for aviation and air traffic, cables and pipelines, marine mineral extraction, radar systems, and most military and national security uses; moderate for radar systems; and major for USCG SAR operations and scientific research and surveys
3.6.8 Recreation and Tourism				
Alternative Impacts	Negligible to moderate; minor beneficial	Negligible to moderate; minor beneficial	Negligible to moderate; minor beneficial	Negligible to moderate; minor beneficial
Cumulative Impacts	Negligible to moderate; minor beneficial	Negligible to moderate; minor beneficial	Negligible to moderate; minor beneficial	Negligible to moderate; minor beneficial
3.6.9 Scenic and Visual Resources				
Alternative Impacts	Minor to moderate	Negligible to major	Negligible to major	Negligible to major
Cumulative Impacts	Major	Negligible to major	Negligible to major	Negligible to major

Impact rating colors are as follows: orange = major; yellow = moderate; green = minor; light green = negligible or beneficial to any degree. All impact levels are assumed to be adverse unless otherwise specified as beneficial. Where impacts are presented as multiple levels, the color representing the most adverse level of impact has been applied.

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ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
L_{pk}	peak sound pressure level
µg/L	micrograms per liter
µT	microteslas
AADT	Annual Average Daily Traffic
ac	acre(s)
AC	alternating current
ACCSP	Atlantic Coastal Cooperative Statistics Program
ACPARS	Atlantic Coast Port Access Route Study
ACS	American Community Survey
ADCP	Acoustic Doppler Current Profiler
ADLS	Aircraft Detection Lighting System
AIF	actual intake flow
AIS	automatic identification system
ALARP	As Low As Reasonably Practicable
AMAPPS	Atlantic Marine Assessment Program for Protected Species
AMCS	Atlantic Marine Conservation Society
AMI	Area of Mutual Interest
AMAPPS	Atlantic Marine Assessment Program for Protected Species
AMSL	above mean sea level
AOWL	aviation obstruction warning light
APE	Area of Potential Effect
API	American Petroleum Institute
APM	Applicant Proposed Measures
ASCE	American Society of Civil Engineers
ASMFC	Atlantic States Marine Fisheries Commission
ATON	aids to navigation
AWEA	American Wind Energy Association
BACT	Best Available Control Technology
BEA	Bureau of Economic Analysis
BGEPA	Bald and Golden Eagle Protection Act
bgs	below ground surface
BLS	Basic Life Support
BIA	biologically important area

BIWF	Block Island Wind Farm
BMP	best management practice
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CAA	Clean Air Act
Call	Call for Information and Nominations
CEA	Critical Environmental Area
CECPN	Certificate of Environmental Compatibility and Public Need
cm	centimeter
CEQ	Council on Environmental Quality
CES	Order Clean Energy Standards
CFCS	Center for Coastal Studies
CFE	controlled flow excavation
CFR	Code of Federal Regulations
CFSR	Climate Forecast System Reanalysis
CH_4	methane
CIRP	Coastal Inlets Research Program
CLCPA	Climate Leadership and Community Protection Act
cm	centimeter
cm/s	centimeter(s) per second
CMECS	Coastal and Marine Ecological Classification Standard
CMR	Code of Massachusetts Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
COA	Corresponding Onshore Area
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
COP	Construction and Operations Plan
CPS	cable protection system
CR	Commercial Recreation
CRESLI	Coastal Research and Education Society of Long Island
CRIS	Cultural Resource Information System
CT	Connecticut
CTV	crew transfer vessel
CVA	Certified Verification Agent
CWA	Clean Water Act

CWIS	cooling water intake system
cy	cubic yard(s)
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
dB	decibel
dBA	decibels on the A-weighted scale
DC	direct current
DDT	dichlorodiphenyltrichloroethane
DECD	Department of Economic and Community Development
DEEP	Department of Energy and Environmental Protection
DEP	Department of Environmental Protection
DFE	design flood elevation
DIF	design intake flow
DMA	Dynamic Management Area
DO	dissolved oxygen
DoD	[United States] Department of Defense
DOE	Department of Energy
DOER	Dredging Operations and Environmental Research Program
DoT	Department of Transportation
DP	dynamic positioning
DPS	distinct population segments
DPW	Suffolk County DPW
DSM	digital surface map
DTM	digital terrain model
EA	Environmental Assessment
EC4	Executive Climate Change Coordinating Council
EEA	Energy and Environmental Affairs
EEZ	exclusive economic zone
EFH	essential fish habitat
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EJ	Environmental Justice
EJSCREEN	Environmental Justice Screening and Mapping Tool
EM&CP	Environmental Management and Construction Plan
EMF	electric and magnetic fields
EMS	emergency medical services

EMT	emergency medical technician
eNGOs	environmental non-governmental organizations
EO	Executive Order
EPA	United States Environmental Protection Agency
EPM	environmental protection measure
EPR	ethylene propylene rubber
ERP/OSRP	emergency response plan/oil spill response plan
ESA	Endangered Species Act
Eversource	Eversource Investment LLC
FAA	Federal Aviation Administration
FDNY	New York City Fire Department
FDR/FIR	facility design report/fabrication and installation report
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FINS	Fire Island National Seashore
FIR	Fishing Industry Representative
FIRM	Flood Insurance Rate Maps
FLIDAR	floating light detection and ranging
FMP	Fishery Management Plan
FONSI	finding of no significant impact
FPL	federal poverty level
FPM	flashes per minute
FR	Federal Register
FR	Fisheries Representative
ft	foot/feet
FTE	full-time equivalent
F-TWG	Fisheries Technical Working Group of NYSERDA
G&G	geophysical and geotechnical
GAA	geographic analysis area
gal	gallon
GARFO	Greater Atlantic Regional Fisheries Office
GDP	gross domestic product
GEIS	Generic Environmental Impact Statement
GHG	greenhouse gas
GIS	Geographic Information System
GSFC	Goddard Space Flight Center

GW	gigawatt(s)
GWSA	Global Warming Solutions Act
ha	hectare(s)
HAB	harmful algal bloom
HAB	horizontal auger boring
HAP	Hazardous Air Pollutants
HAPC	Habitat Areas of Particular Concern
HDD	horizontal directional drilling
HF	high frequency
HRG	high-resolution geophysical
HRVEA	Historic Resources Visual Effects Analysis
HURDAT2	Atlantic Hurricane Database (
HVDC	high voltage direct current
HYCOM	Hybrid Coordinate Ocean Model
Hz	hertz
IAC	Inter-Array Cables
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IBTrACS	International Best Track Archive for Climate Stewardship
ICNIRP	International Commission for Non-Ionizing Radiation Protection
ICPC	International Cable Protection Committee
ICW	intracoastal waterway
iE	Induced electric
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IMO	International Maritime Organization
in	inch(es)
in/s	inches per second
iPaC	Information for Planning and Consultation
IPF	impact-producing factor
ISMP	Invasive Species Management Plan
ITA	incidental take authorization
IVM	Integrated Vegetation Management
JASMINE	JASCO Animal Simulation Model Including Noise Exposure
kHz	kilohertz
km	kilometer(s)

km^2	square kilometers
KOP	key observation point
kV	kilovolt(s)
kW	kilowatt(s)
L	liter(s)
LAeq	A-weighted, equivalent continuous sound level
LAER	Lowest Achievable Emission Rate
LAT	lowest astronomical tide
Lease Area	Lease Area OCS-A 0487
LF	low frequency
LGM	Last Glacial Maximum
LICAP	Long Island Commission for Aquifer Protection
lidar	light detection and ranging
LIE	Long Island Expressway
LIPA	Long Island Power Authority
LIRR	Long Island Rail Road
LME	Large Marine Ecosystem
LNM	Local Notice to Mariners
LOA	Letter of Authorization
LSZ	Landscape Similarity Zone
m/s	meters per second
m	meter(s)
M.G.L	Massachusetts General Law
m/s	meters per second
MA	Massachusetts
MA	Massachusetts Wind Energy Area
MA/RI	Massachusetts / Rhode Island
MACRIS	Massachusetts Cultural Resource Information System
MACZM	Massachusetts Coastal Zone Management
MADMF	Massachusetts Department of Marine Fisheries
MAFMC	Mid-Atlantic Fishery Management Council
MAR	marine archaeological resource
MARCS	Marine Accident Risk Calculation System
MARIPAR	Massachusetts and Rhode Island Port Access Routes
MARPOL	International Convention for the Prevention of Pollution from Ships
MARS	Monterey Accelerated Research System

MassCEC	Massachusetts Clean Energy Center
MassDEP	Massachusetts Department of Environmental Protection
MBES	Multibeam Echo Sounding
MBTA	Migratory Bird Treaty Act
MCC	Marine Coordination Center
MCS	management classification system
MDAT	Marine-life Data and Analysis Team
MDE	Maryland Department of the Environment
MDS	map-documented structures
MEC	munitions and explosives of concern
MEPA	Massachusetts Environmental Policy Act
MF	mid-frequency
mG	milligauss
mg	milligram
MHC	Massachusetts Historical Commission
MHWL	Mean High Water Line
mi	statute mile(s)
MLLW	mean lower low water
mm	millimeter(s)
MMPA	Marine Mammal Protection Act
mph	mile(s) per hour
MPN	most probable number
MPRSA	Marine Protection, Research, and Sanctuaries Act
MPT	Maintenance and Protection of Traffic
MRIP	Marine Recreational Information Program
MS4	Municipal Separate Storm Sewers System
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSIR	Marine Site Investigation Report
MSL	mean sea level
mT	metric ton(s)
mV/m	Millivolts per meter
MVR	Monitor Values Report
MW	megawatt
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration

NAVD88	North American Vertical Datum of 1988
NCA	National Coastal Assessment
NCCR	National Coastal Condition Reports
NCDC	National Climate Data Center
NCEI	National Centers for Environmental Information
NDBC	National Data Buoy Center
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NREL	National Renewable Energy Laboratory
NESC	National Electric Safety Code
NESEC	Northeast States Emergency Consortium
ng/L	nanograms per liter
NHESP	Natural Heritage and Endangered Species Program
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NJDEP	New Jersey Department of Environmental Protection
NLPSC	Northeast Large Pelagic Survey Collaborative
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NNSR	Nonattainment New Source Review
NO_2	nitrogen dioxide
NOA	nearest onshore area
NOAA	National Oceanic and Atmospheric Administration
NOI	notice of intent
NOS	National Ocean Service
NO_X	nitrogen oxides
NPCC	Northeast Power Coordinating Council, Inc.
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NREL	National Renewable Energy
NRHP	National Register of Historic Places
NSR	New Source Review
NSRA	Navigation Safety Risk Assessment
NSRs	noise sensitive receptors
NTL	Notice to Lessee

NTSC	National Transportation Safety Council
NVIC	Navigation and Vessel Inspection Circular 3.6
NVIC 01-19	Navigation and Vessel Inspection Circular 01-19
NWI	National Wetlands Inventory
NWS	National Weather Service
NY	New York
NYAC	New York Archaeological Council
NYB	New York Bight
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSERDA	New York State Energy Research and Development Authority
NYECL	New York Environmental Conservation Law
NYISO	New York Independent System Operator
NYNHP	New York Natural Heritage Program
NYPD	New York Police Department
NYS	New York State
NYSCMP	New York State Coastal Management Program
NYSDAM	New York State Department of Agriculture and Markets
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOS	New York State Department of State
NYSDOT	New York State Department of Transportation
NYSEP	New York State Energy Plan
NYSERDA	New York State Energy Research and Development Authority
NYSHPO	New York State Historic Preservation Office
NYSOGS	New York State Office of General Services
NYSOPRHP	New York State Office of Parks, Recreation and Historic Preservation
NYSPSC	New York State Public Service Commission
O&M	operations and maintenance
OBC	Overburdened Community
O_3	ozone
OCS	outer continental shelf
OCS–DC	Offshore Converter Station
OCSLA	Outer Continental Shelf Lands Act
OnCS–DC	Onshore Converter Station
OPA	[New York] Offshore Planning Area

Options	Offshore Wind Policy Options paper
OREC	Offshore Wind Renewable Energy Certificate
Orsted	Orsted North America Inc.
OSAMP	Ocean Special Area Management Plan
OSRP	Oil Spill Response Plan
OSS	Offshore substation
OSS–AC	Offshore Substation – alternating current
OW	otariid pinnipeds in water
PAPE	Preliminary Area of Potential Effect
PATON(s)	Private Aids to Navigation Permits
Pb	lead
PCA	phocid carnivores in air
PCBs	polychlorinated biphenyls
PCW	phocid carnivores in water
PDE	project design envelope
PEIS	Programmatic Environmental Impact Statement
PEJA	Potential Environmental Justice Area
PK	zero-to-peak sound pressure levels
PLGR	pre-lay grapnel run
PM	PM particulate matter
PM_{10}	particulate matter less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 micrometers in aerodynamic diameter
POI	point of interconnection
PPW	phocid pinnipeds in water
Project	Sunrise Wind Farm Project
PSD	Prevention of Significant Deterioration
PSL	Public Service Law
PSMMP	Protected Species Mitigation and Monitoring Plan
PSN	Proposed Sale Notice
PSO	Protected Species Observer
PTM	Particle Tracking Model
PTS	permanent threshold shift
RARMS	Risk Assessment with Risk Mitigation Strategy
RCNM	Roadway Construction Noise Model
REV	Reforming the Energy Vision
RFI	Request for Interest

RHA	Rivers and Harbors Appropriation Act of 1899
RI	Rhode Island
RI	Rhode Island Coastal Resources Management Council
RI	Rhode Island Coastal Resources Management Program
RICR	Rhode Island Code of Regulations
RIDEM	Rhode Island Department of Environmental Management
RIHCC	Rhode Island Historical Cemetery Commission
RIHPHC	Rhode Island Historical Preservation & Heritage Commission
RI-MA	Rhode Island/Massachusetts Wind Energy Area
ROD	Record of Decision
ROI	region of influence
ROW	right-of-way
RSZ	rotor-swept zone
RTE	rare, threatened, and endangered
S/NRHP	State and/or National Register of Historic Places
SAMP	Special Area Management Plan
SAP	Site Assessment Plan
SAR	Search and Rescue
SAV	submerged aquatic vegetation
SCADA	supervisory control and data acquisition
SCDHS	Suffolk County Department of Health Services
SCFWH	Significant Coastal Fish and Wildlife Habitats
SEFSC	Southeast Fisheries Science Center
SEL	sound exposure levels
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SMA	seasonal management area
SNE	southern New England
SO_2	sulfur dioxide
SOV	service operating vessel
SPCC	spill prevention, control, and countermeasure
SPDES	State Pollutant Discharge Elimination System
SPI/PV	Sediment Profile and Plan View Imaging
SPL	sound pressure level
SPLrms	sound pressure levels, root mean square

SRWEC	Sunrise Wind Export Cable
SRWF	Sunrise Wind Farm
SSS	Side-Scan Sonar
Sunrise Wind	Sunrise Wind LLC
SWLP	seawater lift pump
SWPPP	Stormwater Pollution Prevention Plan
TCP	Traditional cultural properties
THPO	Tribal Historic Preservation Office
TJB	transition joint bay
TP	transition piece
tpy	tons per year
TSS	total suspended solids
TTS	temporary threshold shift
UME	Unusual Mortality Event
UPS	uninterrupted power supply
US	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USCB	United States Census Bureau
USCG	United States Coast Guard
USDOI	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
VADEQ	Virginia Department of Environmental Quality
VCEJ	Virginia Council on Environmental Justice
VHF	very high frequency
VMS	vessel monitoring system
VOC	volatile organic compound
VRAP	Visual Resource Assessment Procedure
VSA	Visual Study Area
VSR	visually sensitive resource
VTL	Visibility Threshold Level
VTR	vessel trip report
WEA	Wind Energy Area
WOTUS	Waters of the United States

WTG	Wind Turbine Generator
yBP	years before present
ZVI	Zone of Visual Influence
μPa	micropascals

Chapter 1

Introduction

1.0 INTRODUCTION

This Draft Environmental Impact Statement (EIS) assesses the potential reasonably foreseeable environmental, social, economic, historic, and cultural impacts that could result from the construction, operations and maintenance (O&M), and conceptual decommissioning of the Sunrise Wind Farm (Project) proposed by Sunrise Wind, LCC (Sunrise Wind), in its Construction and Operations Plan (COP) (Sunrise Wind 2022)[2]. The proposed Project described in the COP and this Draft EIS would have a nameplate capacity of up to 1,034 megawatts (MW) and sited within Lease Area OCS-A 0487 (Lease Area), approximately 18.5 statute miles (mi) (16.1 nautical miles [nm], 29.8 kilometers [km]) south of Martha's Vineyard, Massachusetts, and approximately 30 mi (26.1 nm, 48.2 km) east of Montauk, New York (NY). The Project would provide clean, reliable offshore wind energy to the state of New York[3] and could potentially offer additional offtake agreements or sell additional electricity on a merchant basis. This Draft EIS will inform the Bureau of Ocean Energy Management (BOEM) in deciding whether to approve, approve with modifications, or disapprove the COP (30 Code of Federal Regulations [CFR] 585.628). Publication of this Draft EIS initiates a 60-day public comment period. BOEM will use the comments received during the public review period to inform preparation of the Final EIS.

This Draft EIS was prepared following the requirements of the National Environmental Policy Act (NEPA) (42 United States Code [U.S.C.] 4321 et seq.) and implementing regulations (40 CFR Parts 1500-1508). The Council on Environmental Quality's (CEQ) current regulations contain a presumptive time limit of 2 years for completing EISs, and a presumptive page limit of 150 pages or fewer or 300 pages for proposals of unusual scope or complexity. BOEM followed those limits in preparing this Draft EIS in accordance with the new regulations. Additionally, this Draft EIS was prepared consistent with the U.S. Department of the Interior's (USDOI) NEPA regulations (43 CFR Part 46); longstanding federal judicial and regulatory interpretations; and Administration priorities and policies, including Secretary's Order No. 3399 entitled *Department-Wide Approach to the Climate Crisis and Restoring Transparency and Integrity to the Decision-Making Process*, dated April 16, 2021, requiring bureaus and offices to not apply any of the provisions of the 2020 changes to CEQ Regulations (85 Federal Register 43304-43376) "in a manner that would change the application or level of NEPA that would have been applied to a proposed action before the 2020 Rule went into effect."[4]

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[2] The Sunrise Wind COP is available on BOEM's website: https://www.boem.gov/renewable-energy/state-activities/sunrise-wind.

[3] Sunrise Wind executed a contract with the New York State Energy Research and Development Authority (NYSERDA) for a 25-year Offshore Wind Renewable Energy Certificate (OREC) Agreement in October 2019. Under the OREC Agreement, NYSERDA will purchase ORECs for 880 MW of offshore wind energy, with the ability to increase by 5 percent without requiring an amendment (totaling up to 924 MW), generated by the operational Project and make them available for purchase by New York load-serving entities. The Project is being developed to fulfill its obligations to New York in accordance with its OREC Agreement.

[4] Secretarial Order 3399 is available on the Department of Interior's website: https://www.doi.gov/sites/doi.gov/files/elips/documents/so-3399-508_0.pdf

1.1 Background

In 2009, the USDOI announced final regulations for the Outer Continental Shelf (OCS) Renewable Energy Program, which was authorized by the Energy Policy Act of 2005. The Energy Policy Act provisions implemented by BOEM provide a framework for issuing renewable energy leases, easements, and rights-of-way for OCS activities (Section 1.3, Regulatory Framework). BOEM's renewable energy program occurs in four distinct phases: (1) planning and analysis, (2) lease issuance, (3) site assessment, and (4) construction and operations. The history of BOEM's planning and leasing activities offshore for the Lease Area is summarized in Table 1.1-1.

Table 1.1-1. History of BOEM Planning and Leasing for Offshore Wind Lease Areas OCS-A 0487 and OCS-A 0500

Year	OCS-A 0487 Milestone	OCS-A 0500 Milestone
2010	N/A	On Dec. 29, 2010, BOEM published a Request for Interest (RFI) in the Federal Register to gauge commercial interest in wind energy development offshore Massachusetts. BOEM invited the public to comment and provide information-including information on environmental issues and data-for consideration of the RFI area for commercial wind energy leases.
2011	On August 18, 2011, BOEM published a Call for Information and Nominations (Call) for Commercial Leasing for Wind Power on the OCS Offshore Rhode Island and Massachusetts in the Federal Register. The public comment period for the Call closed on October 3, 2011. In conjunction with the Call, BOEM published a Notice of Intent (NOI) to prepare an environmental assessment on the proposed leasing, site characterization and assessment activities in the offshore area under consideration in the Call. BOEM received eight indications of interest to obtain a commercial lease for a wind energy project and 81 comments on the Call; as well as 24 comments in response to the NOI.	The Massachusetts RFI area was delineated based on deliberation and consultation with the Massachusetts Renewable Energy Task Force. The subsequent selection of a Wind Energy Area (WEA) was based on input received on this RFI area. Responding to requests received from the public and the Commonwealth of Massachusetts, BOEM reopened the comment period for the RFI on March 17, 2011. The comment period ended on April 18, 2011.
2012	On February 24, 2012, BOEM announced the Rhode Island and Massachusetts WEA was comprised of approximately 164,750 acres within an Area of Mutual Interest identified by Rhode Island and Massachusetts in a Memorandum of Understanding between the two states in 2010. BOEM published a Proposed Sale Notice in the Federal Register on	After careful consideration of the public comments, as well as input from BOEM's intergovernmental Massachusetts Renewable Energy Task Force, BOEM modified the planning area offshore Massachusetts and proceeded to publish a Call in the Federal Register on February 6, 2012 to identify locations within the offshore Call Area in which there was industry interest to seek commercial leases for

Year	OCS-A 0487 Milestone	OCS-A 0500 Milestone
	December 3, 2012, for a 60-day public comment period.	developing wind projects. BOEM published a NOI to prepare an Environmental Assessment (EA) of the Call Area. The comment period for the Call closed March 22, 2012. On February 6, 2012 under Docket ID: BOEM-2011-0116 BOEM published a "Notice of Intent to Prepare an Environmental Assessment (EA) for Commercial Wind Leasing and Site Assessment Activities on the Atlantic OCS Offshore Massachusetts". On November 2, 2012, BOEM announced the availability of the EA for public review and comment.
2013	June 4, 2013, BOEM made available a revised EA for the WEA offshore Rhode Island and Massachusetts. As a result of the analysis in the revised EA, BOEM issued a Finding of No Significant Impact (FONSI), which concluded that reasonably foreseeable environmental effects associated with the commercial wind lease issuance and related activities would not significantly impact the environment. On June 5, 2013, BOEM published the Final Sale Notice to auction two leases offshore Rhode Island and Massachusetts for commercial wind energy development. On July 31, 2013, BOEM auctioned the two lease areas announcing Deepwater Wind New England LLC as the winner of both. The competitive auction received $3,838,288 in high bids and consisted of 11 rounds of bidding between three participants. BOEM issued Renewable Energy Lease Area OCS-A 0487 (Lease Area) to the Applicant on October 1, 2013.	The Department of Energy's (DOE) National Renewable Energy Laboratory (NREL), under an interagency agreement with BOEM, provided technical assistance to identify and delineate leasing areas for offshore wind energy development within WEAs the Atlantic Coast. In December 2013, NREL submitted a report to BOEM that focuses on the Massachusetts WEA.
2014	N/A	On June 17, 2014, Secretary of the Interior, Sally Jewell and BOEM Acting Director, Walter Cruickshank joined Massachusetts Governor Deval Patrick to announce that more than 742,000 acres offshore Massachusetts would be available for commercial wind energy leasing. The proposed area is the largest in federal waters and would nearly double the federal offshore acreage available for commercial-scale wind energy projects. The Massachusetts Proposed Sale Notice (PSN) was made available for a 60-day public comment period, which closed on August 18, 2014.

Year	OCS-A 0487 Milestone	OCS-A 0500 Milestone
2015	N/A	On Jan. 29, 2015, BOEM held a competitive lease sale (i.e., auction) for the WEA offshore Massachusetts. The auction lasted two rounds. RES America Developments, Inc. was the winner of Lease Area OCS-A 0500 (187,523 acres) and Offshore MW LLC was the winner of Lease Area OCS-A 0501 (166,886 acres). The commercial wind energy leases were signed by BOEM on March 23, 2015 and went into effect on April 1, 2015.
2017	N/A	On June 29, 2017, BOEM approved the Site Assessment Plan (SAP) for Lease OCS-A 0500 (Bay State Wind). The SAP approval allows for the installation of two floating light and detection ranging buoys (FLIDARs) and one metocean/current buoy.
2018	On September 18, 2018, Deepwater Wind New England, LLC requested an extension of the site assessment term for commercial lease OCS-A 0487 pursuant to 30 CFR 585.235(b). On October 23, 2018, BOEM approved a 3.5-year extension of the site assessment term, from July 1, 2019, to January 1, 2023.	N/A
2020	Sunrise Wind submitted its initial COP to BOEM on September 1, 2020. On September 3, 2020, Bay State Wind, LLC assigned 100 percent of its record title interest in a portion of lease OCS-A 0500, which BOEM designated OCS-A 0530, to Sunrise Wind, LLC. The effective date of lease OCS-A 0487 remains as October 1, 2013.	
2021	BOEM completed the consolidation of lease OCS-A 0530 into Lease OCS-A 0487.	
2021	Sunrise Wind submitted their updated COP dated August 23, 2021. On August 31, 2021, BOEM published in the Federal Register a NOI to Prepare an EIS for Sunrise Wind's Proposed Wind Energy Facility Offshore New York. A revision to the NOI was published in the Federal Register on September 3, 2021 to extend the comment period to October 4, 2021, and to make technical corrections. The resulting OCS-A 0487 lease area is 109,952 acres (mint green). Sunrise Wind proposes to develop entire lease area EXCEPT for the isolated aliquot cluster in OCS block 3959 (**Error! Reference source not found.**)	

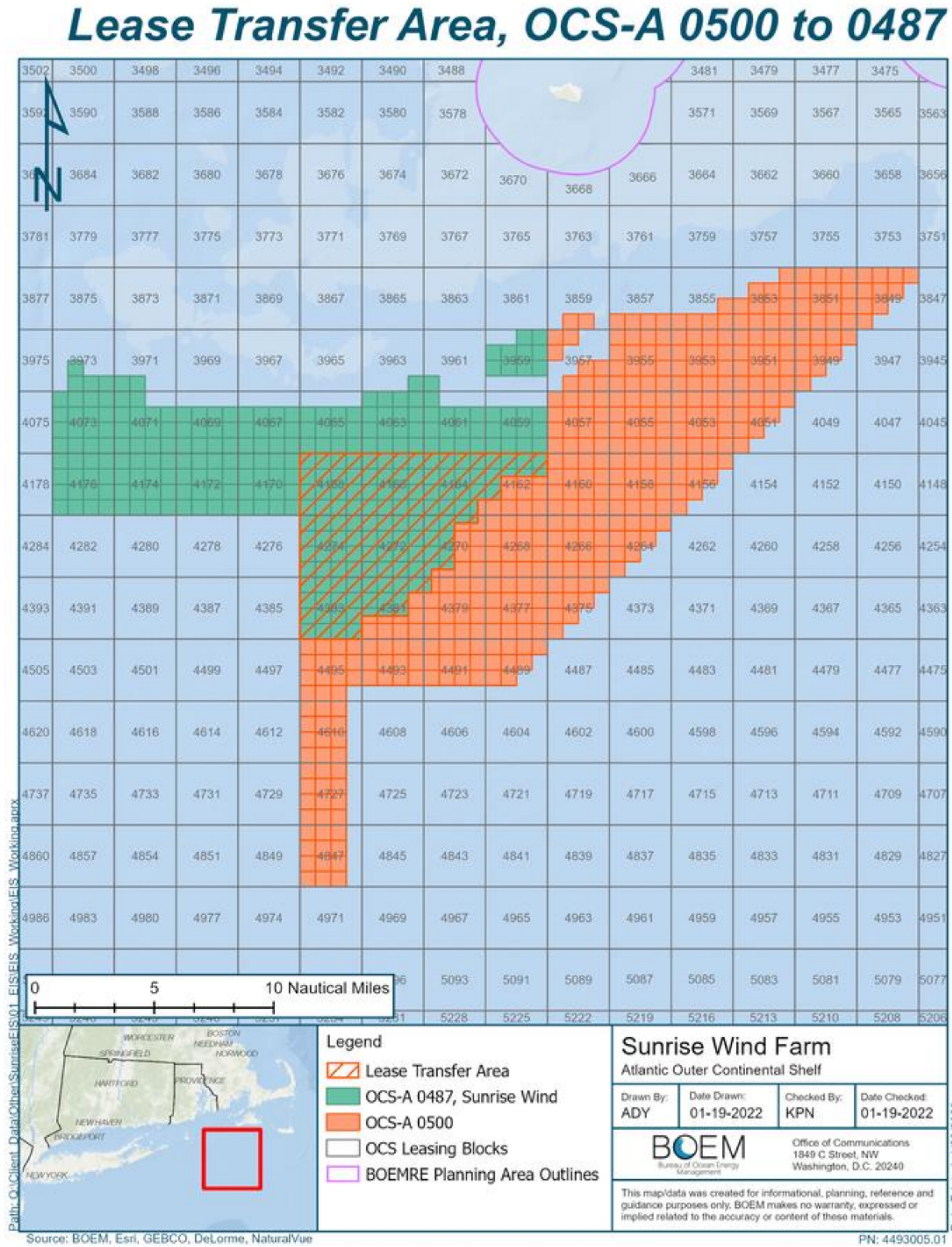

Figure 2.1.1-1 Sunrise Wind Lease Area OCS-A 0487 and OCS-A 0500 Transfer

1.2 Purpose of and Need for the Proposed Action

In Executive Order 14008, *Tackling the Climate Crisis at Home and Abroad,* issued January 27, 2021, President Biden stated that it is the policy of the United States "to organize and deploy the full capacity of its agencies to combat the climate crisis to implement a government-wide approach that reduces climate pollution in every sector of the economy; increases resilience to the impacts of climate change; protects public health; conserves our lands, waters, and biodiversity; delivers EJ; and spurs well-paying union jobs and economic growth, especially through innovation, commercialization, and deployment of clean energy technologies and infrastructure."

Through a competitive leasing process under 30 Code of Federal Regulations (CFR) 585.211, Sunrise Wind was awarded commercial Renewable Energy Lease OCS-A 0487 covering an area offshore of Massachusetts, Rhode Island, and New York (Lease Area). Under the terms of the lease, Sunrise Wind has the exclusive right to submit a COP for activities within the Lease Area, and it has submitted a COP to BOEM proposing the construction and installation, O&M, and conceptual decommissioning of up to a 1,034-megawatt (MW) offshore wind energy facility in accordance with BOEM's COP regulations under 30 CFR 585.626, et seq. (Figure ES-1).

Sunrise Wind's goal is to develop a commercial-scale, offshore wind energy facility in the Lease Area, with up to 94 wind turbine generators (WTGs) in 102 potential positions, an offshore converter station (OCS-DC), inter-array cables, an onshore converter station (OnCS-DC), an offshore transmission cable making landfall on Long Island, New York, and an onshore interconnection cable to the Long Island Power Authority (LIPA) Holbrook Substation. The Project would generate up to approximately 1,034 MW of renewable energy.

This Project would help the state of New York achieve the aggressive clean energy goals set forth in the Clean Energy Standards Order and the Climate Leadership and Community Protection Act through an Offshore Wind Renewable Energy Certificate Purchase and Sale Agreement (OREC) with the New York State Energy Research and Development Authority (NYSERDA) to deliver 880 MW of offshore wind energy. Sunrise Wind has the ability under the OREC to deliver a maximum capacity of 924 MW of offshore wind energy (NYSERDA 2019).

Based on BOEM's authority under the Outer Continental Shelf Lands Act (OCSLA) to authorize renewable energy activities on the OCS, and Executive Order 14008; the shared goals of the federal agencies to deploy 30 gigawatts (GW) of offshore wind energy capacity in the United States by 2030, while protecting biodiversity and promoting ocean co-use[5]; and in consideration of the goals of the Applicant, the purpose of BOEM's action is to determine whether to approve, approve with modifications, or disapprove Sunrise Wind's COP. BOEM will make this determination after weighing the factors in subsection 8(p)(4) of the OCSLA that are applicable to plan decisions and in consideration of the above

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[5] Fact Sheet: Biden Administration Jumpstarts Offshore Wind Energy Projects to Create Jobs | The White House: https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/29/fact-sheet-biden-administration-jumpstarts-offshore-wind-energy-projects-to-create-jobs/.

goals. BOEM's action is needed to fulfill its duties under the lease, which require BOEM to make a decision on the lessee's plans to construct and operate a commercial-scale offshore wind energy facility within the Lease Area (the Proposed Action).

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) received a request for authorization to take marine mammals incidental to construction activities related to the Project, which NMFS may authorize under the Marine Mammal Protection Act (MMPA). NMFS's issuance of an MMPA incidental take authorization is a major federal action and, in relation to BOEM's action, is considered a connected action (40 CFR 1501.9(e)(1)). The purpose of the NMFS action—which is a direct outcome of Sunrise Wind's request for authorization to take marine mammals incidental to specified activities associated with the Project (e.g., pile-driving)—is to evaluate Sunrise Wind's request under requirements of the MMPA (16 U.S.C. 1371(a)(5)(D)) and its implementing regulations administered by NMFS and to decide whether to issue the authorization. If NMFS makes the findings necessary to issue the requested authorization, NMFS intends to adopt, after independent review, BOEM's Final EIS to support that decision and to fulfill its NEPA requirements.

The U.S. Army Corps of Engineers (USACE) New York District anticipates a permit action to be undertaken through authority delegated to the District Engineer by 33 CFR 325.8, under Section 10 of the Rivers and Harbors Act of 1899 (RHA) (33 U.S.C. 403) and Section 404 of the Clean Water Act (CWA) (33 U.S.C. 1344). It is anticipated that Section 408 permission would be required pursuant to Section 14 of the RHA of 1899 (33 U.S.C. 408) for any proposed alterations that have the potential to alter, occupy or use any USACE federally authorized Civil Works projects. The USACE considers issuance of a permit under these three delegated authorities a major federal action connected to BOEM's action (40 CFR 1501.9(e)(1)). Sunrise Wind's stated purpose and need for the Project, as indicated above, is to provide a commercially viable offshore wind energy project within the Lease Area to help New York achieve its renewable energy goals. The basic Project purpose, as determined by USACE for Section 404(b)(1) guidelines evaluation, is offshore wind energy generation. The overall Project purpose for Section 404(b)(1) guidelines evaluation, as determined by USACE, is the construction and operation of a commercial-scale offshore wind energy project for renewable energy generation and distribution to the New York energy grids.

The purpose of USACE Section 408 action as determined by Engineer Circular 1165-2-220 is to evaluate the applicant's request and determine whether the proposed alterations are injurious to the public interest or impair the usefulness of the USACE project. USACE Section 408 permission is needed to ensure that congressionally authorized projects continue to provide their intended benefits to the public. USACE intends to adopt BOEM's EIS to support its decision on any permits and permissions requested under Section 10 of the RHA, Section 404 of the CWA, and Section 14 of the RHA. The USACE would adopt the EIS per 40 CFR 1506.3 if, after its independent review of the document, it concludes that the EIS satisfies the USACE's comments and recommendations. Based on its participation as a cooperating agency and its consideration of the final EIS, the USACE would issue a Record of Decision to formally document its decision on the Proposed Action.

The National Parks Service (NPS) received an application from Sunrise Wind for Right-of-Way and Special Use permits at the Fire Island National Seashore. This application was submitted for authorization to construct and install the transmission cable under the sea floor within the Fire Island National Seashore. The United States holds an easement for the use and occupation of lands for the purposes of the Fire Island National Seafloor, and therefore the transmission cable may only be located as proposed if the NPS grants a Right-of-Way (54 USC § 100902; 36 C.F.R. Part 14) and Special Use permit for construction (36 C.F.R. § 5.7).

1.3 Regulatory Overview

The Energy Policy Act of 2005, Public Law 109-58, amended the OCSLA (43 U.S.C. 1331 et seq.)[6] by adding a new subsection 8(p) that authorizes the Secretary of the Interior to issue leases, easements, and rights-of-way in the OCS for activities that "produce or support production, transportation, or transmission of energy from sources other than oil and gas," which include wind energy projects.

The Secretary of the Interior delegated this authority to the former Minerals Management Service, and later to BOEM. Final regulations implementing the authority for renewable energy leasing under the OCSLA (30 CFR Part 585) were promulgated on April 22, 2009[7]. These regulations prescribe BOEM's responsibility for determining whether to approve, approve with modifications, or disapprove Sunrise Wind's COP (30 CFR 585.628).

Subsection 8(p)(4) of the OCSLA states: "[t]he Secretary shall ensure that any activity under [subsection 8(p)] is conducted in a manner that provides for –

- (A) safety;
- (B) protection of the environment;
- (C) prevention of waste;
- (D) conservation of the natural resources of the outer Continental Shelf;
- (E) coordination with relevant federal agencies;
- (F) protection of national security interests of the United States;
- (G) protection of correlative rights in the outer Continental Shelf;
- (H) a fair return to the United States for any lease, easement, or right-of-way under this subsection;
- (I) prevention of interference with reasonable uses (as determined by the Secretary) of the exclusive economic zone, the high seas, and the territorial seas;
- (J) consideration of—

[6] Public Law No. 109-58, § 119 Stat. 594 (2005).

[7] Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf, 74 Federal Register 19638–19871 (April 29, 2009).

- (i) the location of, and any schedule relating to, a lease, easement, or right-of-way for an area of the outer Continental Shelf; and
- (ii) any other use of the sea or seabed, including use for a fishery, a sealane, a potential site of a deepwater port, or navigation;
- (K) public notice and comment on any proposal submitted for a lease, easement, or right of-way under this subsection; and
- (L) oversight, inspection, research, monitoring, and enforcement relating to a lease, easement, or right-of-way under this subsection."

As stated in M-Opinion 37067, ". . . subsection 8(p)(4) of OCSLA imposes a general duty on the Secretary to act in a manner providing for the subsection's enumerated goals. The subsection does not require the Secretary to ensure that the goals are achieved to a particular degree, and she retains wide discretion to determine the appropriate balance between two or more goals that conflict or are otherwise in tension."[8]

Section 2 of commercial Renewable Energy Lease OCS-A 0498 provides the lessee with an exclusive right to submit a COP to BOEM for approval. Section 3 provides that BOEM will decide whether to approve a COP in accordance with applicable regulations in 30 CFR Part 585, noting that BOEM retains the right to disapprove a COP based on its determination that the proposed activities would have unacceptable environmental consequences, would conflict with one or more of the requirements set forth in 43 U.S.C. 1337(p)(4), or for other reasons provided by BOEM under 30 CFR 585.613(e)(2) or 585.628(f); BOEM reserves the right to approve a COP with modifications; and BOEM reserves the right to authorize other uses within the leased area that would not unreasonably interfere with activities described in Addendum A, Description of Leased Area and Lease Activities.

BOEM's evaluation and decision on the COP are also governed by other applicable federal statutes and implementing regulations such as NEPA and the Endangered Species Act (ESA) (16 U.S.C. 1531–1544). The analyses in this Draft EIS will inform BOEM's decision under 30 CFR 585.628 for the COP that was initially submitted in September 2020 and later updated with current information on June 7, 2021, October 29, 2021, and April 8, 2022. BOEM is required to coordinate with federal agencies and state and local governments and ensure that renewable energy development occurs in a safe and environmentally responsible manner. In addition, BOEM's authority to approve activities under the OCSLA only extends to approval of activities on the OCS. Appendix A outlines the federal, state, regional, and local permits and authorizations that are required for the Project and the status of each permit and authorization. Appendix A provides a description of BOEM's consultation efforts during development of the Draft EIS.

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[8] M-Opinion 37067 at page 5, http://doi.gov/sites/doi.gov/files/m-37067.pdf.

1.4 Relevant Existing NEPA and Consulting Documents

Consistent with the CEQ directive "Incorporation by reference" (40 CFR 1501.12), BOEM used the following NEPA, non-NEPA, and consulting documents to inform the Draft EIS:

Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement, October 2007 (OCS EIS/EA MMS 2007-046) https://www.boem.gov/renewable-energy/guide-ocs-alternative-energy-final-programmatic-environmental-impact-statement-eis

The Energy Policy Act of 2005 (EPAct) amended Section 8 of the Outer Continental Shelf Lands Act (OCSLA) (43 USC 1337) to authorize the Secretary of the Interior to issue a lease, easement, or right-of-way on the OCS for activities that are not otherwise authorized by the OCSLA, or other applicable law, if those activities:

1. Produce or support production, transportation, or transmission of energy from sources other than oil and gas; or
2. Use, for energy-related purposes or other authorized marine-related purposes, facilities currently or previously used for activities authorized under the OCSLA, except that any oil and gas energy-related uses shall not be authorized in areas in which oil and gas preleasing, leasing, and related activities are prohibited by a moratorium.

Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York, 2016 (BOEM 2016) https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/NY/NY-Public-EA-June-2016.pdf

BOEM has prepared this Environmental Assessment (EA), Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York, to determine whether the issuance of a lease and approval of a Site Assessment Plan (SAP) within the Wind Energy Area (WEA) offshore New York would lead to reasonably foreseeable significant impacts on the environment and, thus, whether an EIS should be prepared before a lease is issued. BOEM identified the WEA for the purposes of conducting this environmental analysis and considering the area for leasing.

Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts 2014 (BOEM 2014) https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/MA/Revised-MA-EA-2014.pdf

BOEM prepared an EA to determine whether issuance of leases and approval of SAPs within an area identified offshore Massachusetts would have a significant effect on the environment and whether an EIS must be prepared. BOEM conducted its analysis to comply with the NEPA, 42 United States Code (U.S.C.) §§ 4321-4370f, the CEQ regulations at 40 Code of Federal Regulations (CFR) 1501.3(b) and 1508.9, USDOI regulations implementing NEPA at 43 CFR 46, and USDOI Manual (DM) Chapter 15 (516 DM 15).

BOEM conducted its environmental analysis after BOEM identified an area potentially suitable for commercial wind development, or a WEA. BOEM identified the WEA through input from the BOEM-lead Massachusetts Intergovernmental Task Force (Task Force), comments on the Notice of Intent to Prepare an Environmental Assessment (77 FR 5830), comments on the Commercial Leasing for Wind Power on the OCS Offshore Massachusetts - Call for Information and Nominations (77 FR 5820), comments on the Commercial Leasing for Wind Power on the OCS Offshore Massachusetts – Request for Interest (RFI) (75 FR 82055), and input received during public outreach efforts. The environmental analysis was limited to the effects of lease issuance: site characterization activities (i.e., surveys of the lease area and potential cable routes), and site assessment activities (i.e., construction and operation of meteorological towers and/or buoys on the leases to be issued) within the WEA.

On November 2, 2012, BOEM published a Notice of Availability for the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Environmental Assessment (2012 EA) (77 FR 66185) for a 30-day comment period. Public information meetings were held in Massachusetts on November 13, 14, and 15, 2012, to provide stakeholders an additional opportunity to offer comments on the 2012 EA. To address comments received during the public comment period, public information meetings, stakeholder outreach, required consultations, and the Task Force meetings, BOEM has revised the 2012 EA. The revised EA includes a summary of the comments and questions received. This finding is accompanied by and cites the revised EA.

Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts, Revised Environmental Assessment, May 2013 (BOEM 2013) https://www.boem.gov/sites/default/files/uploadedFiles/BOEM/Renewable_Energy_Program/State_Activities/BOEM%20RI_MA_Revised%20EA_22May2013.pdf

BOEM prepared an EA to determine whether issuance of leases and approval of SAPs within an area identified offshore Rhode Island and Massachusetts would have a significant effect on the environment and whether an EIS must be prepared. BOEM conducted its analysis to comply with NEPA 42 U.S.C. §§ 4321-4370f, the CEQ) regulations at 40 CFR 1501.3(b) and 1508.9, USDOI regulations implementing NEPA at 43 CFR 46, and USDOI DM Chapter 15 (516 DM 15).

BOEM conducted its environmental analysis after the identification of an area potentially suitable for commercial wind development, or a WEA, was completed. BOEM identified the WEA through input from the BOEM-lead joint Task Force, comments on the Notice of Intent to Prepare an Environmental Assessment (76 Federal Register [FR] 51391), comments on the Call for Information and Nominations for Commercial Leasing for Wind Power on the OCS Offshore Rhode Island and Massachusetts (76 FR 51383), and input received during public outreach efforts. The environmental analysis was limited to the effects of lease issuance, site characterization activities (i.e., surveys of the lease area and potential cable routes), and site assessment activities (i.e., construction and operation of meteorological towers and/or buoys on the leases to be issued) within the WEA offshore of Rhode Island and Massachusetts (referred to herein as the Rhode Island and Massachusetts WEA).

On July 2, 2012, BOEM published a Notice of Availability for the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts Environmental Assessment (2012 EA) (77 FR 39508) for a 30-day comment period. Public information meetings were held in Rhode Island and Massachusetts on July 16 and 17, 2012, to provide stakeholders an additional opportunity to offer comments on the 2012 EA. To address comments received during the public comment period, public information meetings, stakeholder outreach, required consultations, and the Task Force meetings, BOEM has revised the 2012 EA. The revised EA includes a summary of the comments and questions received. This finding of no significant impact is accompanied by the revised EA and sections and figures in the EA.

1.5 Methodology for Assessing the Project Design Envelope

The Project is being developed based on a Project Design Envelope (PDE) concept, consistent with BOEM's *Draft Guidance Regarding the Use of a Project Design Envelope in a Construction and Operations Plan* (BOEM 2018 [9]). This concept allows Sunrise Wind to define and bracket proposed Project characteristics for environmental review and permitting while maintaining a reasonable degree of flexibility for selection and purchase of Project components, such as WTGs, foundations, submarine cables, and OSSs.

This Draft EIS assesses the impacts of the PDE that are described in the Sunrise Wind COP and presented in Appendix C, Project Design Envelope and Maximum-Case Scenario, by using the "maximum-case scenario" process. The maximum-case scenario analyzes the aspects of each design parameter that would result in the greatest impact for each physical, biological, and socioeconomic resource. This Draft EIS evaluates potential impacts of the Proposed Action and each alternative using the maximum-case scenario to assess the design parameters or combination of parameters for each environmental resource and considers the interrelationship between aspects of the PDE rather than simply viewing each design parameter independently. Certain resources may have multiple maximum-case scenarios, and the most impactful design parameters may not be the same for all resources. Appendix E explains the PDE approach in more detail and presents a detailed table outlining the design parameters with the highest potential for impacts by resource area.

1.6 Methodology for Assessing Impacts

This EIS also assesses past, present (ongoing), and reasonably foreseeable future (planned) actions that could occur during the life of the Project. Ongoing and planned actions occurring within the geographic analysis area include (1) other offshore wind energy development activities; (2) undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); (3) tidal energy projects; (4) marine minerals use and ocean-dredged material disposal; (5) military use; (6) marine transportation (commercial, recreational, and research-related); (7) fisheries use, management, and monitoring

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[9] BOEM's draft guidance on the use of design envelopes in a COP is available at https://www.boem.gov/sites/default/files/renewable-energy-program/Draft-Design-Envelope-Guidance.pdf.

surveys; (8) global climate change; (9) oil and gas activities; and (10) onshore development activities. Appendix E (*Planned Activities Scenario*) describes the past and ongoing actions that BOEM has identified as potentially contributing to the existing baseline, and the planned actions potentially contributing to cumulative impacts when combined with impacts from the alternatives over the specified spatial and temporal scales.

1.6.1 Past and Ongoing Activities and Trends (Existing Baseline)

Each resource-specific *Environmental Consequences* section in Chapter 3 of this Final EIS includes a description of the baseline conditions of the affected environment. The existing baseline considers past and present activities in the geographic analysis area, including those related to offshore wind projects with an approved construction and operations plan (e.g., Vineyard Wind 1 and South Fork) and approved past and ongoing site assessment surveys, as well as other non-wind activities (e.g., Navy military training, existing vessel traffic, climate change). The existing condition of resources as influenced by past and ongoing activities and trends comprises the existing baseline condition for impact analysis. Other factors currently impacting the resource, including climate change, are also acknowledged for that resource and are included in the impact-level conclusion.

1.6.2 Planned Activities

It is reasonable to predict that future activities may occur over time, and that cumulatively, those activities would impact the existing baseline conditions discussed in Section 1.6.1. Cumulative impacts are analyzed and concluded separately in each resource-specific *Environmental Consequences* section in Chapter 3 of this Final EIS. The existing baseline condition as influenced by future planned activities evaluated in Appendix E (*Planned Activities Scenario*) comprises the baseline condition for cumulative impact analysis. The impacts of future planned offshore wind projects are predicted using information from and assumptions based on COPs submitted to BOEM that are currently undergoing independent review.

Chapter 2

Alternatives

2.0 ALTERNATIVES

2.1 Alternatives Analyzed in Detail

BOEM considered a reasonable range of alternatives during the EIS development process that emerged from scoping, interagency coordination, and internal BOEM deliberations. Alternatives were reviewed using BOEM's screening criteria ("screening criteria") (BOEM, June 2022). Alternatives that did not meet the screening criteria (i.e., were found to be infeasible or did not meet the purpose and need) were dismissed from detailed analysis in this Draft EIS. Alternatives considered but dismissed from detailed analysis and the rationale for their dismissal are described in Table 2.1-1. The alternatives listed in Table 2.1-1 are not mutually exclusive. BOEM may "mix and match" multiple listed Draft EIS alternatives to result in a preferred alternative that will be identified in the Final EIS provided that (1) the design parameters are compatible; and (2) the preferred alternative still meets the purpose and need.

Although BOEM's authority under the OCSLA only extends to the activities on the OCS, alternatives related to addressing nearshore and onshore elements as well as offshore elements of the Proposed Action are analyzed in the EIS. BOEM's regulations (30 CFR 585.620) require that the COP describes all planned facilities that the lessee would construct and use for the Project, including onshore and support facilities and all anticipated Project easements. As a result, those federal, state, and local agencies with jurisdiction over nearshore and onshore impacts are able to adopt, at their discretion, those portions of BOEM's EIS that support their own permitting decisions.

NMFS and USACE are serving as cooperating agencies and intend to adopt the Final EIS after independent review and analysis to meet their NEPA compliance requirements. Under the Proposed Action and other action alternatives NMFS' action alternative is to issue the requested Letter of Authorization to the Applicant to authorize incidental take for the activities specified in its application as well as mandatory conservation measures as necessary. USACE is required to analyze alternatives to the proposed Project that are reasonable and practicable pursuant to NEPA and the CWA 404(b)(1) Guidelines. The range of alternatives analyzed in the Draft EIS, including cable route options within the PDE and alternatives considered but dismissed, represents a reasonable range of alternatives for this analysis.

NPS is serving as a cooperating agency and intends to adopt the final EIS after independent review and analysis to meet their NEPA compliance requirements. A construction permit and right-of-way for the transmission cable, are required if Sunrise Wind intends to locate the transmission cable under the seafloor within Fire Island National Seashore in an area where the United States holds an easement for the use and occupation of lands for the purposes of Fire Island National Seashore. Under the Proposed Action and other action alternatives, the transmission cable may only be located there if the NPS grants a right-of way (54 USC § 100902; 36 C.F.R. Part 14) and special use permit for construction (36 C.F.R. § 5.7).

BOEM decided to use the NEPA substitution process for National Historic Preservation Act (NHPA) Section 106 purposes, pursuant to 36 CFR 800.8(c), during its review of the Project. Section 106 of the NHPA regulations, "Protection of Historic Properties" (36 CFR 800), provides for use of the NEPA substitution process to fulfill a federal agency's NHPA Section 106 review obligations in lieu of the procedures set forth in 36 CFR 800.3 through 800.6. Draft avoidance, minimization, and mitigation measures to resolve adverse effects on historic properties are presented in Appendix H, *Mitigation and Monitoring*. Ongoing consultation with consulting parties and government-to-government consultation with tribal nations may result in additional measures or changes to these measures.

Table 2.1-1. Alternatives Considered for Analysis

Alternative	Description
Alternative A: No Action Alternative	Under the No Action Alternative, BOEM would not approve the COP; the Project construction and installation, O&M, and conceptual decommissioning would not occur; and no additional permits or authorizations for the Project would be required. Any potential environmental and socioeconomic impacts, including benefits, associated with the Project as described under the Proposed Action would not occur. However, all other past and ongoing impact-producing activities would continue. The current resource condition, trends, and impacts from ongoing activities under the No Action Alternative serve as the existing baseline against which the direct and indirect impacts of all action alternatives are evaluated. Over the life of the proposed Project, other reasonably foreseeable future impact-producing offshore wind and non-offshore wind activities would be implemented, which would cause changes to the existing baseline conditions even in the absence of the Proposed Action. The continuation of all other existing and reasonably foreseeable future activities described in Appendix E (*Planned Activities Scenario*) without the Proposed Action serves as the baseline for the evaluation of cumulative impacts.
Alternative B: Proposed Action	Under Alternative B, the construction, O&M, and conceptual decommissioning of up to a 1,034-MW wind energy facility consisting of up to 94 WTGs within 102 potential positions, one OCS–DC, and inter-array cables linking the individual WTGs to the OCS-DC would be developed in the lease area. The lease area is approximately 16.4 nm (18.9 miles, 30.4 km) south of Marth's Vineyard, Massachusetts; approximately 26.5 nm (30.5 miles, 48.1 km) east of Montauk, New York; and approximately 14.5 nm (16.7 miles, 26.8 km) from Block Island, Rhode Island. One export cable would connect to the onshore export cable systems which would connect to the onshore converter station in the Town of Brookhaven, Long Island, New York at the Union Avenue Site. Development of the wind energy facility would occur within the range of design parameters outlined in the COP (Sunrise Wind 2022), subject to applicable mitigation measures.
Alternative C: Fisheries Habitat Impact Minimization	Under Alternative C, the construction, O&M, and eventual decommissioning of up to a 1,034-MW wind energy facility consisting of up to 94 WTGs within 102 potential positions, one OCS–DC, and inter-array cables linking the individual WTGs to the OCS-DC would be developed in the Lease Area. The wind energy area would occur within the range of the design parameters outlined in the COP, subject to applicable mitigation measures. However, this alternative considered and prioritized contiguous areas of complex bottom habitat to be excluded from development to potentially avoid and/or minimize impacts to complex fisheries habitats, while still meeting BOEM's purpose and need for the project. Each of the sub-alternatives outlines

Alternative	Description
	below may be individually selected or combined with any or all other alternatives or sub-alternatives, subject to the combination meeting the purpose and need. **Alternative C-1:** A total of 94 WTGs would be developed under this alternative that prioritizes relocating WTGs out of the priority areas identified by NMFS. This alternative would result in the exclusion of up to 8 WTG positions from development within the identified priority areas. The specific 8 WTG positions that would be excluded from the identified priority areas are informed through the impacts analysis described in Chapter 3. **Alternative C-2:** A total of 94 WTGs would be developed under this alternative that prioritizes relocating WTGs out of the priority areas identified by NMFS. This alternative would exclude the 8 WTG positions identified in Alternative C-1 from development, and an additional 12 WTG positions would be removed from the Priority Areas and relocated to the eastern side of the lease area. The specific 20 WTG positions that would be excluded from the identified priority areas are informed through the impacts analysis described in Chapter 3.

2.1.1 Alternative A – No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP. Project construction and installation, O&M, and decommissioning would not occur, and no additional permits or authorizations for the Project would be required. Any potential environmental and socioeconomic impacts, including benefits, associated with the Project as described under the Proposed Action would not occur. However, all other past and ongoing impact-producing activities would continue. The current resource condition, trends, and impacts from ongoing activities under the No Action Alternative serve as the existing baseline against which the direct and indirect impacts of all action alternatives are evaluated.

Over the life of the proposed Project, other reasonably foreseeable future impact-producing offshore wind and non-offshore wind activities would be implemented, which would cause changes to the existing baseline conditions even in the absence of the Proposed Action. The continuation of all other existing and reasonably foreseeable future activities described in Appendix E (*Planned Activities Scenario*) without the Proposed Action serves as the baseline for the evaluation of cumulative impacts. Table 2.4-1 includes an impact assessment of the No Action alternative for each resource, including an assessment for cumulative effects.

2.1.2 Alternative B – Proposed Action

The SRWF and SRWEC are the two primary components of the Project (Figure 2.1.2-1). The Project uses a design envelope (PDE) approach, consistent with BOEM's Draft Guidance Regarding the Use of a Project Design Envelope in a Construction and Operations Plan (BOEM 2018). This approach results in a range of characteristics and locations for some components of the Proposed Action. Chapter 1, Section 1.6 and Appendix C provide additional information on the PDE approach.

SRWF would be located within federal waters (Atlantic Ocean) on the OCS, specifically in the Lease Area, approximately 16.4 nm (18.9 miles, 30.4 km) south of Marth's Vineyard, Massachusetts; approximately 26.5 nm (30.5 miles, 48.1 km) east of Montauk, New York; and approximately 14.5 nm (16.7 miles, 26.8 km) from Block Island, Rhode Island (Figure 2.1.2-1);

Table 2.1.2-1 summarizes the SRWF components. The sections that follow, Section 3.1 of the COP, and Appendix C provide additional details. A detailed map showing the locations of all proposed Project components, including WTG positions, inter-array cables (IAC), the offshore substation (OSS), transmission cables, and onshore facilities is provided in Figure 2.1.2-1, Figure 2.1.2-2, and Figure 2.1.2-3. For the purposes of this Draft EIS, the Project Area refers to the potential maximum footprint of the proposed facilities including the SRWF, SRWEC, and the onshore facilities (OnSC-DC, onshore transmission cable, and onshore interconnection cable).

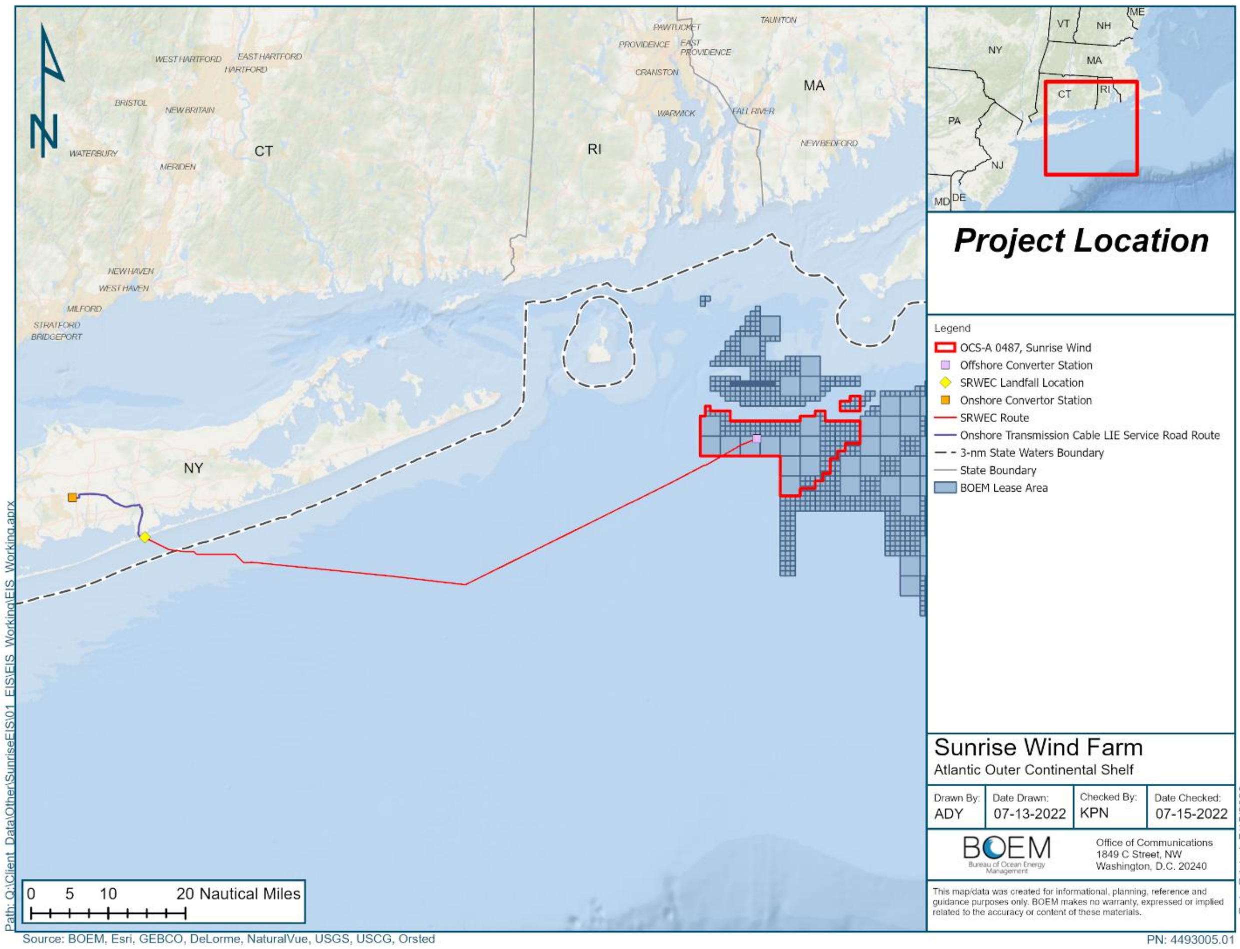


Figure 2.1.2-1. Overview of Project Components and Locations

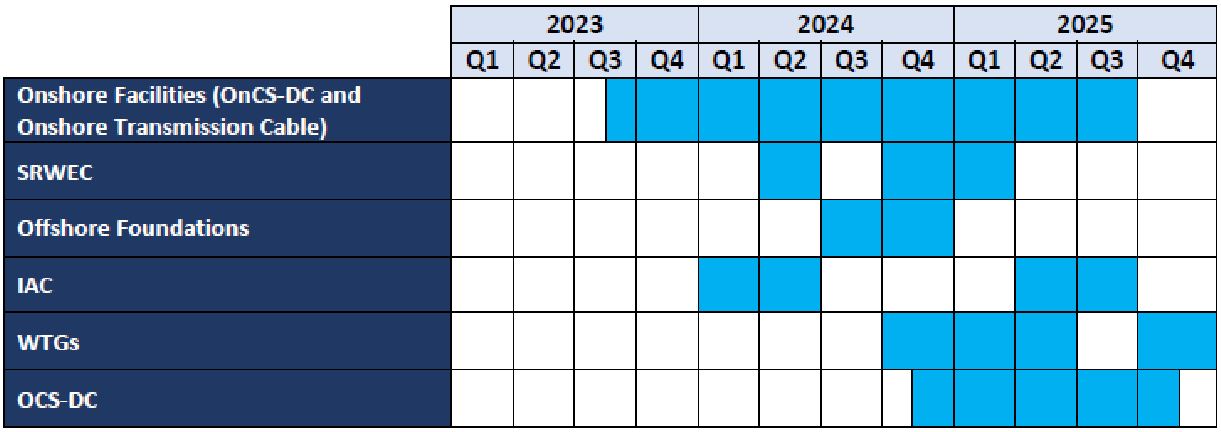
Table 2.1.2-1. Summary of SRWF Project Components

SRWF	**Foundations**	
		• Monopile foundations for the WTGs and a piled jacket foundation for the OCS–DC • Up to 95 foundations for the WTGs and OCS–DC within 102 potential positions • Maximum embedment depth of up to 164 ft (50 m) for WTG monopile foundations, and 295 ft (90 m) for OCS–DC piled jacket foundation • Maximum area of seafloor footprint per foundation, inclusive of scour protection and CPS stabilization: 1.06 ac (4,290 m^2) for WTG monopile foundations and 1.39 ac (5,625 m^2) for the OCS–DC foundation structure
	WTGs	
		• Up to 94 WTGs within 102 potential positions • Nameplate capacity of 11 MW • Rotor diameter of 656 ft (200 m) • Hub height of 459 ft (140 m) above mean sea level (AMSL) • Upper blade tip height of 787 ft (240 m) AMSL
	IAC	
		• Maximum 161 kilovolt AC cables buried up to a target depth of 3 to 7 ft (1 to 2 m) • Maximum total length of up to 180 mi (290 km) • Maximum cable diameter of 8 inches (in; 200 millimeters [mm]) • Maximum disturbance corridor width of 98 ft (30 m) per circuit
	OCS-DC	
		• One OCS-DC • Up to 295 ft (90.0 m) total structure height from lowest astronomical tide (LAT) (including lightning protection and ancillary structures)
SRWEC-OCS and SRWEC-NYS	**SRWEC**	
		• One 320-kV DC export cable bundle buried to a target depth of 3 to 7 ft (1 to 2 m) • Maximum total corridor length of up to 104.6 mi (168.4 km) • Maximum individual cable diameter of 7.8 in (200 mm) • Maximum bundled cable diameter of 15.8 (400mm) • Maximum disturbance corridor width of 98 ft (30 m) • Maximum seafloor disturbance for horizontal directional drilling (HDD) exit pits of 61.8 ac (25 ha) • Maximum disturbance for Landfall Work Area (onshore) of up to 6.5 ac (2.6 ha)
Onshore Facilities	**Onshore Transmission Cable and Onshore Interconnection Cable**	
		• Onshore Transmission Cable, including associated TJB and fiber optic cable, up to 17.5 mi (28.2 km) long, with a temporary disturbance corridor of 30 ft (9.1 m) and maximum duct bank target burial depth of 6 ft (1.8 m) • Maximum cable diameter of 6 in (152 mm) • Onshore Interconnection Cable to connect to Holbrook Substation
	OnCS-DC	
		• An OnCS-DC with operational footprint of up to 6 ac (2.4 ha)

2.1.2.1 Construction and Installation

Construction and installation of the proposed SRWF and SRWEC would occur over several years within applicable seasonal work windows and within a uniform east–west and north–south grid with 1 × 1–nm spacing between WTGs. Construction and installation would include transportation and installation of foundations, installation of cable systems, installation of WTGs, and installation of the Offshore Converter Station (OCS-DC). Table 2.1.2-2 provides the anticipated construction schedule for all Project components.

Table 2.1.2-2. Indicate Project Construction Schedule



2.1.2.1.1 Onshore Activities and Facilities

2.1.2.1.1.1 Onshore Converter Station

Power from the Project would be delivered to the electric grid via an Onshore Converter Station (OnCS-DC), which would be constructed in the Town of Brookhaven, Long Island, New York at the Union Avenue Site. The OnCS–DC would support the Project's interconnection to the existing electrical grid by transforming the Project voltage to 138 kV AC. Interconnection to the electric grid would occur at the existing Holbrook Substation also located in the Town of Brookhaven, New York.

The Union Avenue Site, an approximately 7-acre (2.8-ha) area (Figure 2.1.2-2), is located on two parcels to be improved jointly as a common development. The entire station footprint area would be graveled and surrounded by a 7-ft (2.1-m)-high fence topped with a 1-ft (0.3-m) tall, barbed wire extension for a total height of 8 ft (2.4 m). Access would be provided through a minimum of one drive-through gate and one walk-through gate. Vegetative screening of the site would be provided as needed subject to New York State permitting requirements. General yard lighting would be provided within the site for assessment of equipment. In general, yard lighting would be minimal at night and subject to state and local requirements unless there is work in progress on site or lights are required for safety and security purposes.

Equipment and structures for the OnCS-DC would be supported on foundations expected to be of concrete and would be of a design suitable for existing soil conditions. The majority of the site equipment would require shallow foundations, 4 to 5 ft (1.2 to 1.5 m) in depth based on the expected equipment size. Larger structures may require drilled shaft equipment foundations of 12 to 30 ft (4 to 9 m) in depth. The final foundation design and equipment layout may vary based on site-specific geotechnical evaluations and subsequent engineering design.

Onshore facilities would be designed in accordance with the National Electric Safety Code (NESC), American National Standards Institute (ANSI)/ Institute of Electrical and Electronics Engineers (IEEE) Standards and New York Independent System Operator (NYISO) requirements. Grading at the OnCS–DC would ensure adequate drainage and that the site is graded appropriately to reduce impacts from water accumulation. The design would consider the potential effects of erosion, high winds, and ice. The OnCS–DC would be located in the Town of Brookhaven and would be well inland of the 100-year and 500-year floodplain; the minimum equipment elevations at the OnCS–DC site exceed both the present day and future worst-case Design Flood Elevation, as recommended in American Society of Civil Engineers (ASCE) 24-14.

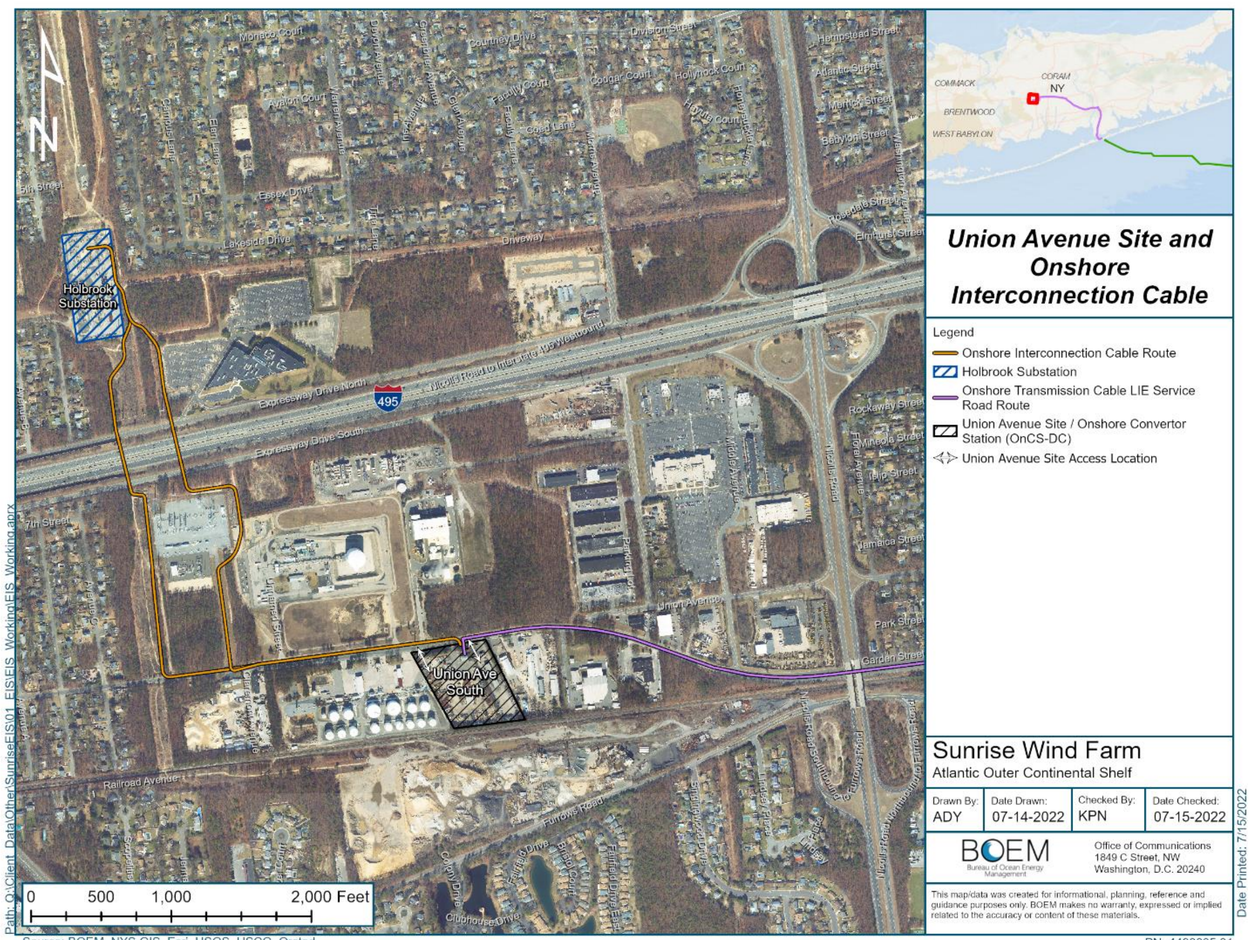


Figure 2.1.2-2. Overview of Onshore Components and Locations

2.1.2.1.1.2 Construction

Construction of the proposed OnCS–DC would involve surveys and protection of sensitive areas, clearing and grading, foundation and equipment installation, site restoration, and commissioning, as described in Table 3.3.1-3 of the COP (Sunrise Wind 2022). Sunrise Wind may utilize temporary laydown yards to support the staging of necessary equipment and materials for development of the OnCS–DC. Locations selected for the use of temporary laydown yards would be approved by the applicable permitting agencies prior to utilization. These areas would be generally confined to locations containing open land or previously disturbed commercial/industrial sites with existing roadway access, such that no or minimal site improvements would be required. Sunrise Wind would use mechanical clearing methods for the construction of the Project and does not intend to use any pesticides/herbicides during construction and installation. Following the completion of the proposed Project, locations used for temporary laydown yards would be restored to pre-existing conditions in accordance with landowner requests and permit requirements.

The maximum areas of land disturbance associated with the construction of the OnCS–DC are provided in Table 3.3.1-4 of the COP (Sunrise Wind 2022). Site grading could be between 7 to 10 ft (2.1 to 3.0 m) deep in areas that require excavation but would be further refined as geotechnical work is completed.

2.1.2.1.1.3 Onshore Transmission Facilities

Electrical transmission facilities for the Project would be comprised of both onshore and offshore cable systems. Specifically, power from the SRWF would be delivered to the electric grid via distinct transmission cable segments: the SRWEC would carry the power from the SRWF to the transition joint bay (TJB), the Onshore Transmission Cable would carry the power from the TJB to the new OnCS–DC location, and the Onshore Interconnection Cable would carry the power from the new OnCS–DC location to the existing grid at the Holbrook Substation. The SRWEC and Onshore Transmission Cable would be spliced together at co-located TJB and link boxes located at Smith Point County Park on Fire Island in the Town of Brookhaven, New York. The SRWEC and Onshore Transmission Cable have different design and construction parameters; therefore, these transmission components are described separately below.

The proposed Onshore Transmission Cable route has been sited within existing disturbed ROW to the extent practicable. The Onshore Transmission Cable would originate at the TJB on the eastern portion of Smith Point County Park, as described below. The Onshore Transmission Cable would then follow the LIE Service Road Route to the OnCS–DC at the Union Avenue Site.

The LIE Service Road Route (hereinafter the Onshore Transmission Cable route) would travel up to 17.5 mi (28.2 km) in length to the OnCS–DC as described below and depicted in Figure 2.1.2-3. From the Landfall Work Area, the Onshore Transmission Cable would run parallel to Fire Island Beach Road within the paved Smith Point County Park parking lot, crossing under the William Floyd Parkway to a recreational area located to the west of William Floyd Parkway. The Onshore Transmission Cable would be routed across the ICW via the ICW HDD to a paved parking lot within the Smith Point Marina along East Concourse Drive. From the ICW Work Area, the Onshore Transmission Cable would turn north along

East Concourse and north along William Floyd Parkway to the intersection with Surrey Circle. The Onshore Transmission Cable would be routed along Surrey Circle and would continue north along Church Road then turn west along Mastic Boulevard, north along Francine Place, to the intersection with Montauk Highway. It would cross Montauk Highway to Revilo Avenue and would continue north along Revilo Avenue to the work area for the Sunrise Highway crossing. The Onshore Transmission Cable would then cross Sunrise Highway via trenchless methods to Revilo Avenue, continuing north to the intersection with Victory Avenue and then continue west on Victory Avenue to Horseblock Road, crossing the Carmans River via HDD. The Onshore Transmission Cable would continue northwest along Horseblock Road to Manor Road, then turn north onto Manor Road and cross the LIRR to Long Island Avenue via trenchless methods. The Onshore Transmission Cable would then turn west along the LIE Service Road, then turn south on Waverly Avenue to Long Island Avenue. The Onshore Transmission Cable would then turn west on Long Island Avenue to Union Avenue and reach the Union Avenue Site.

The Onshore Interconnection Cable would begin at a set of termination structures located at the OnCS-DC and would be routed entirely underground along Union Avenue to an existing utility-owned or controlled property for connection to the Holbrook Substation (Figure 2.1.2-3).

Figure 2.1.2-3. Proposed Onshore Transmission Cable Route for the Sunrise Wind Offshore Wind Project

The design of the Onshore Transmission Facilities considered geologic and local climatic conditions. The underground design avoids overhead weather-related disturbances such as from wind, ice, and lightning. The HDD would also provide some amount of protection from storm surges, flooding, sea level rise, wave runup, and overland wave propagation. Additionally, the proposed route is almost entirely within existing roadways that are designed for adequate drainage to handle such events, and there would be no change to grading or drainage of those facilities as a result of the Project construction. At the landfall location at Smith Point County Park, storm surge levels are up to 13.9 ft (4.2 m), which is inclusive of both the Stillwater elevation and wave setup, an increase in water levels caused by wave breaking, along the Atlantic-facing coast (Federal Emergency Management Agency [FEMA] 2009). Within Bellport Bay, storm surge decreases due to the protection of offshore barrier islands.

2.1.2.1.1.4 Onshore Interconnection Cable

The Onshore Interconnection Cable would convey AC power from the OnCS–DC to the existing Holbrook Substation. A cross section of a typical onshore AC transmission cable is provided in Figure 3.3.2-2 of the COP (Sunrise Wind 2022). The maximum design scenario for the AC Onshore Interconnection Cable is provided in Table 3.3.2-1 of the COP (Sunrise Wind 2022).

2.1.2.1.1.5 Onshore Transmission Cable

The Onshore Transmission Cable would convey the energy produced by the SRWF to the OnCS–DC. The SRWEC would connect to the Onshore Transmission Cable within the TJB and link boxes located within the Landfall Work Area. From this location, the two monopole DC cables would be spliced into two DC Onshore Transmission Cables (each comprising a single-phase cable) and two fiber optic cables. A cross section of a typical onshore DC transmission cable is provided in Figure 3.3.2-3 of the COP and the maximum design scenario for the Onshore Transmission Cable is provided in Table 3.3.2-2 of the COP (Sunrise Wind 2022).

2.1.2.1.1.6 Construction

Construction of the Onshore Transmission Cable and Onshore Interconnection Cable would involve site preparation, trench excavation, duct bank and vault installation, cable installation, cable jointing, and final testing, and restoration with additional steps associated with HDD and other trenchless crossing methods. The typical underground transmission cable construction sequence is provided in Table 3.3.2-3 of the COP (Sunrise Wind 2022). Temporary laydown yards would be required to support the staging of necessary equipment and materials for the installation of the Onshore Transmission Cable and Onshore Interconnection Cable. Locations selected for the use of temporary laydown yards may require additional assessments prior to use and would be approved by the applicable permitting agencies prior to utilization. These areas would be generally confined to locations containing open land or previously disturbed commercial/industrial sites with existing roadway access, such that no or minimal site improvements are required. Following the completion of the proposed Project, locations used for temporary laydown yards would be restored to pre-existing conditions in accordance with landowner requests and permit requirements.

Installation of the Onshore Transmission Cable would generally require excavation of a trench within a temporary disturbance corridor. The Onshore Transmission Cable would be installed within a concrete or thermal equivalent duct bank buried to a depth consistent with local utility standards. From the OnCS–DC, the Onshore Interconnection Cable would be installed underground within a duct bank to the Holbrook Substation. A typical configuration of an underground onshore transmission circuit is shown in Figure 3.3.2-4 of the COP (Sunrise Wind 2022). A typical configuration of the installation of an underground onshore transmission circuit within a road ROW is shown in Figure 3.3.2-5 of the COP (Sunrise Wind 2022). A typical configuration of an underground onshore interconnection circuit is shown in Figure 3.3.2-6 of the COP (Sunrise Wind 2022).

Due to the length of the proposed Onshore Transmission Cable, sections of cable would need to be spliced together with joints for each circuit. Splicing would occur along the entirety of the route approximately every 1,800 to 2,200 ft (549 to 671 m). At each splice location, a splice vault/pit would be required. Once a detailed below grade utility survey is completed, more refined distances between splice vaults/pits would be determined based upon site specifics. In these locations, the temporary disturbance area required would be larger than for the duct bank installation. The splice vaults would be buried to a depth consistent with local utility standards. The entire temporary disturbance corridor would be restored to pre-construction conditions following installation of the proposed Onshore Transmission Cable. The maximum design scenario for the construction of the Onshore Transmission and Onshore Interconnection Cable is provided in Table 3.3.2-4 of the COP (Sunrise Wind 2022).

Installation of the proposed Onshore Transmission Cable would result in the crossing of multiple waterways, major roadways, and rail roads, which would require additional temporary disturbance areas to support the setup of equipment necessary to perform each crossing. The maximum design scenario, identifying the associated crossing method, overall crossing distance, approximate area of short-term and/or permanent impact, along with a description of the workspace locations that would be impacted to facilitate the various major crossings are provided in Table 3.3.2-5 of the COP (Sunrise Wind 2022).

2.1.2.1.1.7 SWREC – Onshore Portion

The onshore termination of the SRWEC would be spliced together with the Onshore Transmission Cable at the co-located TJB and link boxes located at the landfall location at Smith Point County Park, in the Town of Brookhaven, New York. The onshore portion of the SRWEC (up to 1,152 ft [351 m]) would be buried underground (i.e., above the MHWL) up to the TJB and the remaining, offshore portion would traverse both federal and New York state waters (Figure 2.1.2-2).

2.1.2.1.1.8 TJB and Link Box Design

The proposed TJB would be comprised of a pit dug in the soil and lined with concrete. The purpose of the TJB is to provide a clean, dry environment for the jointing of the SRWEC and Onshore Transmission Cable as well as protecting the joint once the jointing is completed and allowing for inspections if necessary. In the TJB, each SRWEC would be spliced into one single-phase conductor onshore cable. The sheaths from the SRWEC and the Onshore Transmission Cable would be terminated into the link box via the cable joints. The fiber optic cable from the SRWEC and Onshore Transmission Cable would be joined inside the fiber optic joint box. There would be one TJB, two link boxes, and two fiber optic cable joint boxes.

A conceptual schematic of the TJB is provided in Figure 3.3.3-1 of the COP and Section 3.3.3.1 in the COP (Sunrise Wind 2022) provides a detailed description of the TJB and link box design.

2.1.2.1.1.9 SRWEC Design and Landfall Construction

The SRWEC would be comprised of one distinct cable bundle and would transfer the electricity from the OCS–DC to the TJB located within the Landfall Work Area at Smith Point County Park. The SRWEC would be joined with the Onshore Transmission Cable at the TJB.

The SRWEC would consist of one cable bundle comprised of two cables. Each cable within the single bundle would consist of one copper or aluminum conductor core surrounded by layers of cross-linked polyethylene insulation and various protective armoring and sheathing to protect the cable from external damage and keep it watertight. A fiber optic cable would be bundled together with the two main conductors. The maximum design scenario for the proposed SRWEC is provided in Table 3.3.3-1 of the COP and Section 3.3.3.2 in the COP (Sunrise Wind 2022) provides a detailed description of SRWEC design.

The SRWEC–NYS would enter NYS territorial waters at a point 3 nm (5.6 km) offshore and would be located up to 5.2 mi (8.4 km) in NYS territorial waters and 1,152 ft (351 m) located onshore. The SRWEC–NYS would span 4.8 mi (7.7 km) until a point approximately 2,225 ft (678 m) offshore from the MHWL where it would connect utilizing HDD methodology. Two segments of the SRWEC–NYS would be installed via the Landfall HDD, including a segment that would be installed offshore (approximately 2,225 ft [678 m] seaward from the MHWL) and a segment that would be installed onshore (approximately 1,054 ft [321 m] landward from the MHWL). In addition, approximately 98 ft (30 m) would be installed underground from the Landfall HDD entry point to the TJB in Smith Point County Park.

2.1.2.1.1.10 Ports for Construction

The Project would use existing port facilities located in New York, Rhode Island, Connecticut, Massachusetts, Maryland, New Jersey, and/or Virginia for offshore construction, staging and fabrication, crew transfer, and logistics support. Modifications of these ports specifically for the Project are not anticipated. Final port selection has not been determined at this time; Table 3.3.10-1 and Figure 3.3.10-1 in the COP (Sunrise Wind 2022) provide a summary and depiction of potential ports that could be used to support construction of the Project.

2.1.2.2 Offshore Activities and Facilities

2.1.2.2.1 SRWEC – Offshore Portion

Offshore, the SRWEC would be installed within a survey corridor ranging in width from 1,312 to 2,625 ft (400 to 800 m), depending on water depth. The total width of the disturbance corridor for installation of the SRWEC would be up to 98 ft (30 m), inclusive of any required sand wave leveling and boulder clearance. Dynamic Positioning (DP) vessels would generally be used for cable burial activities. If anchoring (or a pull ahead anchor) is necessary during cable installation, it would occur within the survey corridor (see Section 3.3.10 of the COP for additional information on vessel anchoring).

Burial of the proposed SRWEC would typically target a depth of 3 to 7 ft (1 to 2 m). BOEM guidance is that all static cables be buried at the depth of 6 ft below the seabed where technically feasible. Technical feasibility constraints include seabed conditions that preclude burial, such as telecommunication cable crossings. BOEM also recommends avoiding installation techniques that raise the profile of the seabed, such as the ejection of large, previously buried rocks or boulders onto the surface. The ejection of this material may damage fishing gear. The target burial depth for the SRWEC would be determined based on an assessment of seafloor conditions, seafloor mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment. The Cable Burial Risk Assessment would be prepared for the FDR to be reviewed by the CVA and submitted to BOEM prior to construction. The Cable Burial Feasibility Assessment, which provides an assessment of cable burial based on review of site-specific survey data, is provided with the MSIR as Appendix G4, under confidential cover. Where burial cannot occur, sufficient burial depth cannot be achieved, or protection is required due to cables crossing other existing cables, additional cable protection methods may be used (cable protection is discussed further below). The location of the SRWEC and associated cable protection would be provided to NOAA's Office of Coast Survey after installation is completed so that they may be marked on nautical charts. Burial depths at specific locations would be formalized in the FDR/FIR.

Installation of the proposed SRWEC consists of a sequence of events, including pre-lay cable surveys, seafloor preparation, offshore cable installation, beginning with cable pull into the landfall, joint construction, cable installation surveys, cable protection, and connection to the OCS–DC, as summarized in Table 3.3.3-4 of the COP (Sunrise Wind 2022). Additional details for seafloor preparation, cable installation methodologies and cable protection strategies are described in the COP, including information on Munitions and Explosives of Concern (MEC)/Unexploded Ordinance (UXO) risk mitigation, boulder removal, sand wave leveling, and pre-lay grapnel run (PLGR).

Based on the identified range of installation methods and requirements, Sunrise Wind has established a design envelope for installation of the proposed SRWEC that reflects the maximum seafloor disturbance associated with construction (see Table 3.3.3-5 of the COP; Sunrise Wind 2022). short-term seafloor disturbance during installation includes the construction disturbance corridor where seafloor preparation would occur prior to cable installation, as well as the installation of the cable. Vessel anchoring occurring within the surveyed corridor during cable installation would also result in short-term seafloor disturbance. Permanent seafloor disturbance includes areas where additional cable protection may be required post-installation.

2.1.2.2.1.1 Offshore Cable Installation Methodology

Selection of cable installation methodologies would be dependent on sediment conditions. As sediment conditions range along the SRWEC and within the SRWF, several different cable installation methodologies may be required during installation. Sunrise Wind has completed geophysical surveys of the SRWEC to inform preliminary cable routing and selection of the most appropriate tools for installation of the SRWEC to the target burial depths. The cable bundle would be laid on the seafloor and then trenched post-lay. Alternatively, a trench may be pre-cut prior to cable installation. Based on current understanding of site-specific conditions between landfall at Smith Point, Long Island, and the SRWF, Sunrise Wind is considering mechanical plowing, jet plowing, and mechanical cutting as described is Section 3.3.3 of the COP (Sunrise Wind 2022).

During cable installation, there may be scenarios where installation to the target burial depth is not achievable using the primary installation methodologies due to mechanical problems with the trencher, adverse weather conditions, and/or unforeseen soil conditions. Therefore, alternative installation methodologies would be utilized, including CFE, pre-cut mechanical plowing, and pre-cut dredging as described in Section 3.3.3 in the COP (Sunrise Wind 2022).

Secondary cable protection may be applied where burial cannot occur, sufficient burial depth cannot be achieved due to seafloor conditions, or to avoid risk of interaction with external hazards. The need for secondary cable protection in specific locations would be based on factors such as the as-built burial depths, cable burial risk, and suitability to perform remedial works. The area of impact for secondary cable protection is accounted for in Table 3.3.3-5 of the COP and cable protection solutions can be found in Section 3.3.3 (page 46) of the COP (Sunrise Wind 2022).

2.1.2.2.1.2 Cable Crossing

The Project’s network of submarine cable (inclusive of the SRWEC and IAC) would cross existing submarine assets. There are up to eight known telecommunications cables that would be crossed by the SRWEC, two of which may also be crossed by the IAC (Table 3.3.3-6 and Figure 3.3.3-10 of the COP; Sunrise Wind 2022).

Cable protection at these crossings would be applied for both in-service assets as well as out-of-service assets that cannot be safely removed and pose a risk to the SRWEC or IAC. Where appropriate, inactive cable systems would be cut and cleared from the burial route for a short distance on each side. Any cut and cleared cables would typically have the exposed ends weighted with clump weights or short-section chain so that the cable cannot be snagged by other seafloor users, such as fishermen.

Rock berm or concrete mattress separation layers would be installed prior to cable installation, while the rock berm or concrete mattress cover layers would be installed after cable installation. Any rock berm separation and cover layers would be installed using suitably approved rock material. The rock berm separation and cover layers are defined by minimum geometry and vertical and horizontal tolerances. The amount of cable protection would be as required for suitable coverage and technical agreements with respective asset owners. It is assumed up to 1.48 acres (0.6 ha) of cable protection would be required per crossing. The cable protection required for cable crossings is in addition to the secondary cable protection requirements previously described.

2.1.2.2.1.3 Foundations

Up to 94 WTG monopile foundations (located at 102 potential positions) with a maximum diameter tapering from 7 m above the waterline to 12 m (39 ft) below the waterline (7/12 m monopile) would be installed in the Sunrise Wind Farm. Monopiles would be installed using an impact pile driver with a maximum hammer energy of 4,000 kJ to a maximum penetration depth of 50 m (164 ft). A monopile foundation typically consists of a single steel tubular section, with several sections of rolled steel plate welded together. For a WTG monopile foundation, a Transition Piece (TP) may be fitted over the top of the monopile and secured via a bolted connection. Secondary structures on each WTG monopile foundation would include a boat landing or alternative means of safe access (e.g., Get Up Safe – a motion compensated hoist system allowing vessel to foundation personnel transfers without a boat landing), ladders, a crane, and other ancillary components. The TP may either be installed separately following the monopile installation or the monopile and TP may be fabricated and installed as an integrated single component. If the monopile and TP are fabricated and installed as an integrated component, the secondary structures would be installed on the TP subsequently and in separate smaller operations. The TP portion would be painted yellow and marked according to USCG requirements. A monopile foundation would only be used for the WTGs. Scour protection would have a radial extension of approximately five times the monopile radius and a height of approximately 6.5 ft (2 m) from original seabed level around selected monopile foundations. Additional cable protection system (CPS) stabilization may be used where the IAC would be pulled into the foundation, which would require additional rock cover on top of the scour protection. This additional rock cover would have a height of approximately 6.5 ft (2 m), for a total of up to 13.1 ft (4 m) height from the original seabed level, inclusive of the scour protection and CPS stabilization.

An up to four-legged piled jacket foundation would be used for the proposed OCS–DC. The piled jacket foundation would have four legs with 2 pin piles per leg. The platform height would be up to 26.8 m (88 ft) with a leg diameter of up to 4.6 m (15 ft) and a pile diameter of up to 4 m (13 ft). Installation of OCS-DC jacket foundation pin piles (2 per leg, 8 total) would be performed using an impact pile driver with a maximum hammer energy of 4,000-kJ to a maximum penetration depth of 90 m (295 ft). A piled jacket foundation would be formed of a steel lattice construction (comprising tubular steel members and welded joints) secured to the seafloor by means of hollow steel pin piles attached to the jacket. Unlike monopiles, there is no separate TP; the TP and ancillary components are fabricated as an integrated part of the jacket. Rock may be used to provide a level seafloor around the base of the structure. Scour protection, if required, would cover the entire jacket footprint, extending an additional 33 to 66 ft (10 to 20 m) beyond the base of the structure and reaching a height of approximately 6.5 ft (2 m) from original seabed level. Additional CPS stabilization may be used where the IAC and SRWEC would be pulled into the foundation, which would require additional rock cover on top of the scour protection. This additional rock cover would have a height of approximately 6.5 ft (2 m), for a total of up to 13.1 ft (4 m) height from the original seabed level, inclusive of the scour protection and CPS stabilization.

An up to four-legged piled jacket foundation would be used for the proposed OCS–DC. A piled jacket foundation would be formed of a steel lattice construction (comprising tubular steel members and welded joints) secured to the seafloor by means of hollow steel pin piles attached to the jacket. Unlike monopiles, there is no separate TP; the TP and ancillary components are fabricated as an integrated part of the jacket. Rock may be used to provide a level seafloor around the base of the structure. Scour protection, if required, would cover the entire jacket footprint, extending an additional 33 to 66 ft (10 to 20 m) beyond the base of the structure and reaching a height of approximately 6.5 ft (2 m) from original seabed level. Additional CPS stabilization may be used where the IAC and SRWEC would be pulled into the foundation, which would require additional rock cover on top of the scour protection. This additional rock cover would have a height of approximately 6.5 ft (2 m), for a total of up to 13.1 ft (4 m) height from the original seabed level, inclusive of the scour protection and CPS stabilization.

Offshore platform piled jacket substructures such as those that would be used for the OCS–DC are typically designed with mudmats to ensure on-bottom stability of the jacket during installation. The permanent anchoring of the jacket is provided by the piles once installation is complete. Mudmats are typically made up of horizontal plates with vertical stiffeners. Mudmats are designed to distribute the load from the piled jacket into the seafloor, from initial set down of the foundation by the installation vessel, through pile installation and grouting, until the piled jacket is sufficiently supported by piles. The design accounts for environmental loads and the static weight of the piled jacket, as well as bearing capacity of the upper soil layers.

The final foundation design specifications would be determined by the final engineering design process, informed by factors including soil conditions, wave and tidal conditions, Project economics, and procurement approach. Detailed information on the foundations would be included in the FDR/FIR, to be reviewed by the CVA and submitted to BOEM prior to construction.

To promote safety while the foundations are awaiting installation of the TPs (if used) and WTGs, each foundation would be marked and lit in accordance with USCG requirements. In addition, without the TPs or ancillary structures with the equivalent features, there would be no means for unauthorized access to the foundation.

2.1.2.2.2 Offshore Converter Station

2.1.2.2.2.1 Design

An OCS–DC would be required to support the proposed Project's maximum design capacity. The water depth at the OCS–DC location would be approximately 164 ft (50 m) MSL based on NOAA Coastal Relief Model data (166 ft [51 m] mean lower low water [MLLW] based on site-specific geophysical surveys). The OCS–DC would convert the medium voltage AC generated by WTGs and transported to the OCS–DC via the IAC to DC for transmission to the onshore electrical infrastructure to reduce the energy losses incurred while transmitting energy over a long distance. Onshore, the OnCS–DC would convert the DC power back to AC for interconnection to the electrical grid.

The OCS would house DC equipment. The DC equipment on the OCS–DC is expected to be rated up to ±320 kV DC. The OCS–DC would house equipment for high-voltage transmission and conversion of electric power from AC to DC. The main equipment would include medium voltage AC (66-kV) gas-insulated switchgear, one or more converter transformers, and converter reactors. The OCS–DC would also include AC and DC gas- or air-insulated switchgears at voltages to be defined during detailed design, converter valves based on state-of-art voltage-source converter technology, DC smoothing reactors, and SCADA and protection systems.

In addition to the power transmission system above, the OCS–DC would be equipped with the necessary low voltage (LV) and utility systems. These systems include emergency power generation and uninterrupted power supply (UPS) seawater cooling, offshore crane, fire and safety, small power and lighting, and communications, sanitary facilities, and lifesaving and rescue. A helideck may also be located on the OCS–DC.

The AC to DC conversion process at the OCS–DC requires a CWIS. Raw seawater for the OCS–DC would be withdrawn through three individual vertical pipes attached to a leg of the steel foundation jacket. The openings of each of the three intake pipes would be located at a height 30 ft (10 m) above the seafloor. A seawater lift pump (SWLP) equipped with a variable frequency drive would be dedicated to each of the three vertical intake pipes. The three SWLPs would pump water into a single manifold that leads into a coarse filtering element designed to remove suspended particles larger than 500 microns. The filtered cooling water would then be exposed to heat exchange equipment and ultimately discharged to the receiving water through a dump caisson. The dump caisson is a single vertical pipe whose terminus is located 40 ft (12 m) below MSL. Additional design details are included in the National Pollutant Discharge Elimination System (NPDES) permit application, which was submitted to EPA in December 2021. The maximum topside design scenario for the OCS–DC is provided in Table 3.3.6-1 of the COP (Sunrise Wind 2022).

2.1.2.2.2.2 Construction

The typical sequence for the proposed OCS–DC installation is summarized in Table 3.3.6-3 of the COP (Sunrise Wind 2022). The proposed schedule for installation and commissioning of the OCS–DC is provided in Section 3.2 of the COP (Sunrise Wind 2022), not including cable pull-in. Seafloor disturbance associated with installation of the proposed OCS–DC is accounted for in Table 3.3.5-2 of the COP (Sunrise Wind 2022), which summarizes disturbances associated with foundations.

2.1.2.2.3 Inter-Array Cables

The IAC would carry the electrical current produced by the WTGs to the OCS–DC. The length of the entire network of IAC would be up to 180 mi (290 km). Figure 3.3.4-1 of the COP (Sunrise Wind 2022) presents the indicative IAC layout for the Project. The following subsections describe the design and construction of the proposed IAC.

2.1.2.2.3.1 Design

The network of AC IAC would be comprised of a series of cable “strings” that interconnect a small grouping of WTGs to the OCS–DC. The IAC would be installed within surveyed corridors ranging approximately 328 ft to 1,608 ft (100 m to 490 m) in width. The IAC would consist of three bundled copper or aluminum conductor cores surrounded by layers of cross-linked polyethylene or ethylene propylene rubber (EPR) insulation and various protective armoring and sheathing to protect the cable from external damage and keep it watertight. A fiber optic cable would also be included in the interstitial space between the three conductors and would be used to transmit data from each of the WTGs to the SCADA system. Table 3.3.7-1 of the COP (Sunrise Wind 2022) provides a summary of the proposed IAC maximum design scenario.

2.1.2.2.3.2 Construction

The IAC would be installed within a 90-ft (30-m)-wide corridor. Burial of the IAC would typically target a depth of 3 to 7 ft (1 to 2 m). The target burial depth for the IAC would be determined based on an assessment of seafloor conditions, seafloor mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment. Installation of the IAC would follow a similar sequence as described for the SRWEC in Table 3.3.3-4 of the COP (Sunrise Wind 2022), with two exceptions:

- After pre-lay cable surveys and seafloor preparation activities are completed, a cable-laying vessel would be pre-loaded with the IAC. Prior to the first end-pull, the cable would be fitted with a cable protection system and the cable would be pulled into the WTG or OCS–DC. The vessel would then move towards the second WTG (or the OCS–DC). Cable may be laid on the seafloor and then trenched post-lay or, alternatively, cable laying and burial may occur simultaneously using a lay and bury tool. Alternatively, a trench may be pre-cut prior to cable installation. The pull and lay operation, inclusive of fitting the cable with a cable protection system, is then repeated for the remaining IAC lengths, connecting the WTGs and the OCS–DC together.
- The IAC would typically not require in-field joints; thus, “Joint Construction,” as described for the SRWEC, would generally not be required. However, joints may be required in case of a cable repair.

Installation methods for the IAC would be similar to those described for the SRWEC (see Section 3.3.3.4 of the COP; Sunrise Wind 2022). As described for the installation of the SRWEC, seafloor preparation (specifically boulder clearance and sand wave leveling) would be required; boulder clearance trials, as previously described for the SRWEC, may also be implemented prior to wide-scale seafloor preparation activities. Sunrise Wind assumes up to 10 percent of the total IAC network would require boulder clearance and up to 5 percent of the total IAC network would require sand wave leveling prior to installation of the cables. As with the SRWEC, boulder clearance would involve the use of a boulder grab or towed plow to relocate boulders along the IAC routes. The installation and commissioning of the IAC system is presented in the anticipated construction schedule provided in Section 3.2 of the COP (Sunrise Wind 2022).

Cable protection strategies would be required for the IAC. Sunrise Wind assumes up to 15 percent of the entire IAC network may require secondary cable protection in areas where burial cannot occur, sufficient burial depth cannot be achieved due to seafloor conditions, or to avoid risk of interaction with external hazards. As previously described, additional CPS stabilization may be used where the IACs would be pulled into the foundations. The SRWEC and IAC would also need to cross existing cables, which would require cable protection. The anticipated locations where IAC would cross existing cables is provided in Table 3.3.3-6 of the COP (Sunrise Wind 2022). Rock berm or concrete mattress separation layers would be installed over the previously installed cable prior to installing a crossing cable, while the rock berm or concrete mattress cover layers would be installed after cable installation. The location of the IAC and associated cable protection would be provided to NOAA’s Office of Coast Survey after installation is completed so that they may be marked on nautical charts.

The installation methods and burial depths would be determined by the engineering design process, informed by detailed geotechnical data, discussion with the chosen installation contractor, and coordination with regulatory agencies and stakeholders. Detailed information on the technique(s) selected, burial requirements, and the Cable Burial Risk Assessment would be included in the FDR/FIR, to be reviewed by the CVA and submitted to BOEM prior to construction. The Cable Burial Feasibility Assessment, based on review of site-specific survey data, is provided with the MSIR as Appendix G4 of the COP. Maximum seafloor disturbance associated with construction and operation of the IAC is summarized in Table 3.3.7-2 of the COP (Sunrise Wind 2022).

2.1.2.2.4 Wind Turbine Generators

The proposed Project would consist of up to 94 WTGs (within 102 potential positions), sited in a uniform east-west/north-south grid with 1.15 by 1.15-mi (1 by 1-nm; 1.85 by 1.85-km) spacing (Figure 2.1.2-4). The water depths where the WTGs would be located range from 135 to 184 ft (41 to 56 m) MSL, based on NOAA Coastal Relief Model data (127 to 181 ft [39 to 55 m] MLLW based on site-specific geophysical surveys). As previously noted, a final layout of the Project would be provided as part of the FDR/FIR, to be reviewed by the CVA and submitted to BOEM prior to construction.

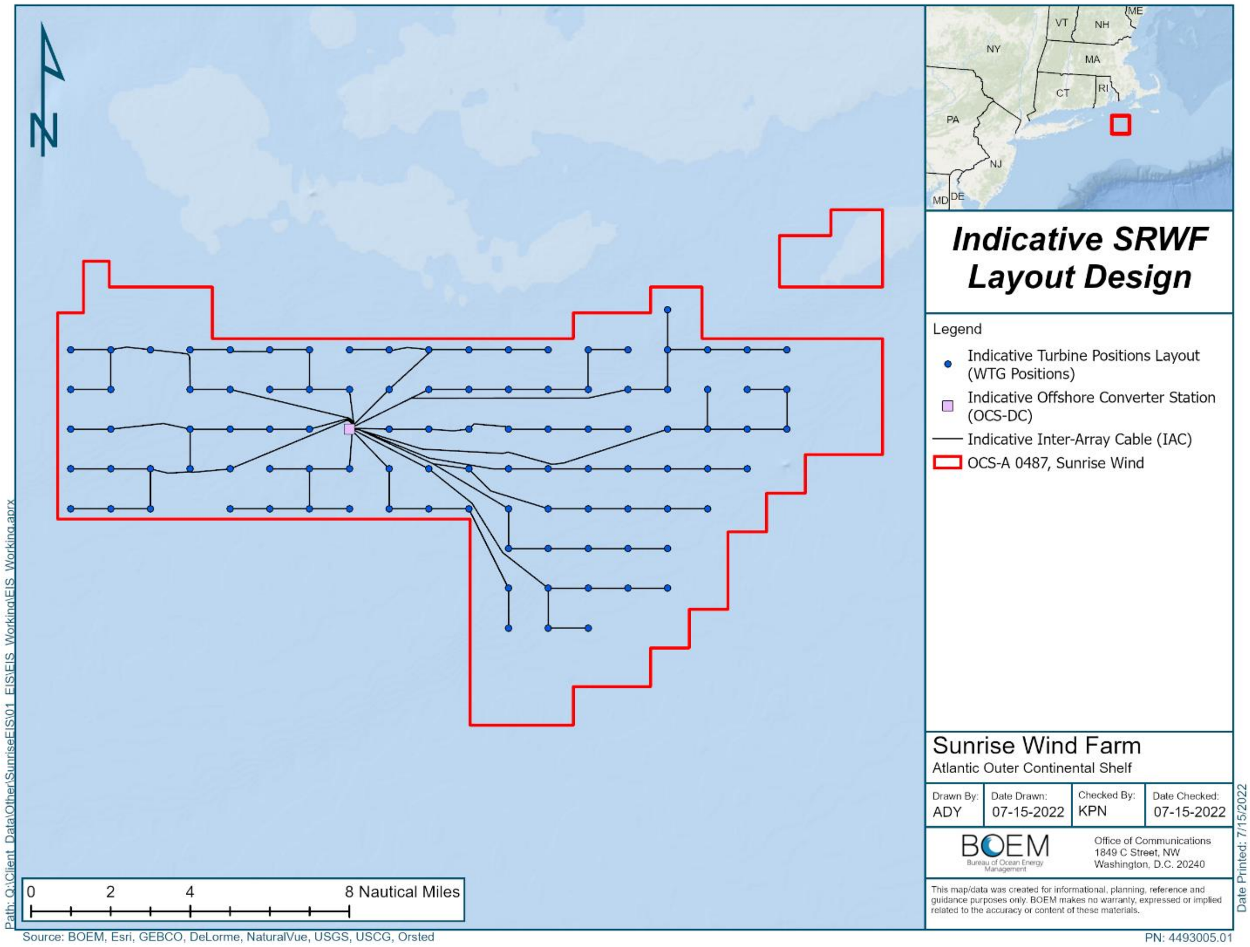


Figure 2.1.2-4. Indicative Layout of the SRWF

2.1.2.2.4.1 Design

Sunrise Wind has selected the Siemens Gamesa Renewable Energy SG DD-200 11-MW turbine as the machine that would be installed for the Project. The 11-MW turbine is considered to be the WTG model that would be best suited for the Project and is commercially available to support the Project schedule. With selection of the 11-MW turbine, Sunrise Wind has determined that up to 94 11-MW WTGs (within 102 potential positions) would be sufficient to meet the Project purpose.

The Siemens 11-MW turbine follows the traditional offshore WTG design with three blades and a horizontal rotor axis. Specifically, the blades would be connected to a central hub, forming a rotor that turns a shaft connected to the generator. The generator would be located within a containing structure known as the nacelle situated adjacent to the rotor hub. The nacelle would be supported by a tower structure affixed to the foundation. The nacelle would be able to rotate or “yaw” on the vertical axis to face the oncoming wind direction. Figure 3.3.8-1 of the COP (Sunrise Wind 2022) shows a conceptual rendering of the 11-MW WTG dimensions.

Table 2.1.2-3 provides a summary of the physical parameters of the 11-MW turbine selected for the proposed Project. The WTGs would be designed following Class S based on the IEC1 with turbulence classes B and C specifications of the standards IEC-61400-1/IEC-61400-3. The design is specifically suited for offshore wind sites with referenced wind speeds of 121 miles per hour (mph) (54 meters per second [m/s] over a 10-minute average) and 50-year extreme gusts of 145 mph (65 m/s over a 3-second average) as well as air temperatures greater than -4 degrees Fahrenheit (°F) (-20 degrees Celsius [°C]) and less than 122° F (50°C). However, standard environmental operating conditions for the proposed WTGs include cut-in wind speeds of 7 to 11 mph (3 to 5 m/s) and cut-out wind speeds of 56 to 63 mph (25 to 28 m/s), and air temperatures between 14°F and 104° F (-20°C and +40°C). The WTGs would automatically shut down outside of the operational criterial for the WTG design.

Table 2.1.2-3. WTG Design Specifications (from Sunrise Wind 2022, Table 3.3.8-1)

WTG Component/Parameter	Selected Turbine (11-MW)
Turbine Height (from MSL) [a]	787 ft (240 m)
Hub Height (from MSL) [a]	459 ft (140 m)
Air Gap (from MSL) to the Bottom of the Blade Tip [a]	131.2 ft (40 m)
Base Height (foundation height – top of TP) (from MSL) [a]	89 ft (27 m)
Base (tower) Width (at the bottom)	23 ft (7 m)
Base (tower) Width (at the top)	16 ft (5 m)
Nacelle Dimensions (length x width x height)	69 ft x 33 ft x 36 ft (21 m x 10 m x 11 m)
Blade Length	318 ft (97 m)

Note: [a]MSL = Mean Sea Level

2.1.2.2.4.2 Construction

The proposed sequence for WTG installation is summarized in Table 3.3.8-3 of the COP (Sunrise Wind 2022). It is currently estimated that the construction of each WTG may take up to 36 hours allowing for vessel positioning and completion of all lifts; however, to allow time for vessel maneuvering between WTG locations as well as weather downtime, the total duration of the installation campaign for the WTGs is presented in Section 3.2 of the COP (Sunrise Wind 2022). Monopiles would be installed using an impact pile driver with a maximum hammer energy of 4,000 kJ to a maximum penetration depth of 50 m (164 ft).

Vessel activity during installation of WTGs would occur within area cleared during seafloor preparations as described in Section 3.3.6 of the COP (Sunrise Wind 2022). Seafloor disturbance associated with installation of WTGs would result from jack-up vessel spudcans. Seafloor disturbance associated with WTG foundations is summarized in Table 3.3.5-2 of the COP (Sunrise Wind 2022).

2.1.2.2.5 Measurement Equipment

Sunrise Wind plans to install a series of monitoring instrumentation to monitor metocean conditions as part of the Project's construction and operation activities. The monitoring instrumentation may consist of a floating light detection and ranging (flidar), wave buoys, Acoustic Doppler Current Profiler (ADCP), ground-based lidar, wave radar sensor, and weather stations measuring air temperature, air pressure, humidity, wind speed and direction, and visibility readings. Each type of measurement equipment is described below in further detail.

2.1.2.2.5.1 Flidar

A single flidar may be installed in the Lease Area prior to or during the construction to measure blockage and wake effects from the South Fork Wind Farm and Revolution Wind Farm. The flidar would be maintained through construction and would provide real time data for the vessels operating offshore to support lifting operation, cargo transfer, and overall weather monitoring for logistics decisions. The position where the flidar may be located in the Lease Area would be identified at a later date and a Site Assessment Plan (SAP) would be submitted to BOEM at that time.

The flidar would consist of a floating platform with sensors and equipment that measure ocean parameters and atmospheric conditions, including wind velocity. The flidar would be anchored to the seabed with an anchor or weight block and chain and the buoy would weather vane with the waves, wind and tides. The anchoring and mooring system would be designed to withstand the loads and site conditions for the 10-year return period storm. The flidar would be powered using a set of external wind turbines, solar panels, internal batteries, and diesel generators or fuel cells that work as per a hierarchy order. The flidar is generally equipped with satellite data transmission options that transmit data to an onshore server. Deployment of the flidar would occur from a vessel and would be conducted in accordance with manufacturer specifications by trained personnel. Additional details on the flidar would be provided in the SAP to be submitted to BOEM.

2.1.2.2.5.2 Wave Bouys

Up to two wave buoys would be deployed to support the SRWF installation stage with one wave buoy within the SRWF proximate to the WTGs in the eastern region of the windfarm and one wave buoy deployed nearshore along the SRWEC–NYS near the HDD exit pit location. The wave buoys would collect information about the wave and current information to be transmitted in real time to the installation vessel(s) for monitoring the safety of operations and also to feed into a forecasting system for real time calibration and accuracy improvement of the local forecast. The number and exact coordinates of the wave buoys would be determined at a later date. The wave buoys would be installed during the construction phase. The nearshore wave buoy would only remain deployed during the cable installation process. The wave buoy in the SRWF would remain in place during the installation works and may remain deployed in the water after windfarm commissioning, until Sunrise Wind has reviewed and confirmed calibration of the data. During the operations phase, the wave radar sensor, together with the weather and wave forecast service, would support asset management, structural monitoring, and marine transfer operations. Data collected would be stored locally and transmitted via telemetry to a satellite gateway to an onshore server.

The wave buoys would measure wave heights, periods, and directions and may also be equipped with a downward facing current profiler, which measures water velocity and direction through the water column. The top side of the wave buoy is comprised of a tall mast (7 feet above sea level approx.) where a set of equipment is fixed: navigational light, navigation radar, solar panels, antenna, visibility sensors and ultra-sonic anemometer. Generally, wave buoy diameters range from 1.6 to over 5 ft (0.5 to over 1.5 m) and range in weight from 440 to 1,320 lbs (200 to 600 kg). The mooring configuration will be dependent on buoy type, water depth, and environmental considerations, but generally consists of an anchor weight (approximately 11 ft2 [1 m2] and 1,765 lbs [800 kg]), mooring line, and are equipped with navigational lighting. The wave buoys would be powered by lead acid and lithium batteries that are charged through solar panels but would operate using only solar power when available. Deployment of the wave buoys would occur from vessels equipped with a crane or A-Frame and winch and would be conducted in accordance with manufacturer specifications by trained personnel.

2.1.2.2.5.3 Acoustic Doppler Current Profiler

Up to three near-shore ADCPs would be deployed during construction in the nearshore area in the vicinity of the HDD exit pit and along the cable route to support cable installation activities. Any ADCPs deployed would only be used during the installation period and recovery of the ADCPs would occur within a few months of installation completion. ADCPs collect current measurements, including direction and velocity through the water column by sending pulses through the water column at varying frequencies. This data may be stored internally and transferred upon equipment recovery or, for real-time monitoring, the data may be transmitted via telemetry to a satellite gateway to an onshore server using a transmission buoy. The number and locations of ADCPs will be determined as the cable route, seabed conditions, and ocean dynamics are further defined and in coordination with stakeholders.

The adopted ADCP configuration could consist of two solutions:

- An upward facing ADCP mounted on a seabed frame, a groundline connecting the frame to the ground weight, and a data storage/recovery system. The groundline would be relatively taut, with generally no sweep occurring throughout the tides. The seabed frame has an approximately 11 ft2 (1 m2) footprint. It is 1.6 to 3.3 ft (0.5 to 1 m) in height and weighs 220 to 1,100 lbs (100 to 500 kg). The frame may consist of simple tripod designs with gimbal and/or trawl resistant features such as low profile and protected sides. ADCPs are powered by alkaline or lithium batteries. There are two standard mooring configurations that may be used. One includes a surface marker buoy that can be used for telemetry in real time and navigation and acts as the primary recovery method. If used, the marker buoy may be affixed to the ground weight by chain or rope mooring. The second configuration does not have a surface marker and relies on an acoustic system to release floats, which are attached to the ADCP frame. ADCP deployment would be conducted in accordance with manufacturer specifications by trained personnel. Deployment and recovery of ADCP frames and moorings can generally be conducted on a small workboat or cat equipped with on-deck crane, winch, and bow roller.

- An alternative setup is using a standard wave buoy (as described the section above), and installing a bottom-mounted ADCP to the lower part of the submerged hull of the buoy.

2.1.2.2.5.4 Ground Based Lidar

The lidar wind measurements would be taken using ground-based lidars and anemometers. During construction, ground-based lidar includes LiDAR installation at some ports, on decks of installation of work vessels, or on the OCS–DC.

The lidars used for some port facilities and installation or work vessels are aimed at supporting lifting operations to ensure safety and to minimize risk to equipment, vessels, and crew.

There will be:

- 3 lidars at different ports (specific locations to be confirmed)
- 2 lidars on two installation vessels (foundation vessel and WTG vessel)

The OCS–DC lidar is not yet confirmed. The design for the OCS–DC may include a lidar mount and connection point to support potential installation of a sensor.

2.1.2.2.5.5 Wave Radar System

Weather stations with anemometers would be installed on the OCS–DC and selected WTG(s) as per NYISO requirements. The units to be placed on the OCS–DC shall be part of a single weather station installed in the roof of the upper level of the converter station. The weather station would include measurements of air temperature; air pressure; humidity; visibility; and wind speed and direction.

2.1.2.2.6 Unexploded Ordnance/Munitions, Explosives of Concern (UXO/MEC)

Within the SRWF there is potential for construction activities to encounter unexploded ordnances/ munitions and explosives of concern and/or (UXO/MEC) on the seabed. These include explosive munitions such as bombs, shells, mines, torpedoes, etc. that did not explode when they were originally deployed or were intentionally discarded in offshore munitions dump sites to avoid land-based detonations. The risk of incidental detonation associated with conducting seabed-altering activities such as cable laying and foundation installation in proximity to UXO/MECs jeopardizes the health and safety of project participants. Sunrise Wind follows an industry standard As Low as Reasonably Practical (ALARP) process that minimizes the number of potential detonations (COP Appendix G2; Sunrise-Wind 2022).

For UXO/MECs that are positively identified in proximity to planned activities on the seabed, several alternative strategies would be considered prior to in-situ UXO/MEC in place. These may include relocating the activity away from the (avoidance), moving the UXO/MEC away from the activity (lift and shift), cutting the UXO/MEC open to apportion large ammunition or deactivate fused munitions, using shaped charges to reduce the net explosive yield of a UXO/MEC (low-order detonation), or using shaped charges to ignite the explosive materials and allow them to burn at a slow rate rather than detonate instantaneously (deflagration). Only after these alternatives are considered would a decision to utilize in-situ UXO/MEC disposal. To detonate a UXO/MEC, a small charge would be placed on the UXO/MEC and detonated causing the UXO/MEC to then detonate.

While many of the munitions dump sites are mapped and can be avoided, some UXO/MECs may have migrated from those sites or are unrecorded elsewhere in the region. To better assess the potential UXO/MEC encounter risk, geophysical surveys have been and continue to be conducted to identify potential UXO/MECs that have not been previously mapped. The current estimate of the number of UXO/MECs that may need to be detonated is based on preliminary findings of historical information on UXO/MECs in the region and HRG survey data. However, potential UXO/MECs identified by HRG surveys have not yet been investigated to determine if they truly are UXO/MECs. Some that are determined to be UXO/MECs may be able to be avoided without the need for detonation, but other UXO/MECs may be encountered that have not yet been identified by the HRG surveys. As these surveys and analysis of data from them are still underway, the exact number and type of UXO/MECs in the Project Area are not yet known. Based on prior experience in other regions, the total number of potential UXO/MECs that have thus far been identified was reduced to the existing estimates using conservative assumptions of how many may actually be UXO/MECs, and how many of those may not be possible to avoid, and thus would have to be detonated. It is currently assumed that up to 3 UXO/MECs in the SRWF may have to be detonated in place and none along the SRWEC route. If all potential UXO/MECs (up to 3) require detonation, these detonations would occur on 3 different days (1 detonation per day).

2.1.2.3 Operations and Maintenance

Per the Lease, the operations term of the proposed Project is 25 years but could be extended to 30 or 35 years. The operations term would commence on the date of COP approval. It is anticipated that Sunrise Wind would request to extend the operations term in accordance with applicable regulations in 30 CFR § 585.235.

The O&M Plan for both the Project's onshore and offshore infrastructure would be finalized as a component of the FDR/FIR review process; however, a preliminary O&M plan for the onshore facilities, offshore transmission facilities (e.g., the SRWEC, IAC, and the OCS–DC electrical components) and WTGs is provided in the following sections. As noted previously, various existing ports are under consideration to support offshore construction, assembly and fabrication, crew transfer and logistics (including for O&M activities) (see Section 3.5.5 and Table 3.3.10-3 in the COP; Sunrise Wind 2022).

To support O&M, the Project would be controlled 24/7 via a remote surveillance system (i.e., SCADA).

2.1.2.3.1 Onshore Activities and Facilities

Sunrise Wind would monitor the OnCS–DC remotely on a continuous basis. The equipment in the OnCS–DC would be configured with a condition monitoring system that would sound an alarm upon detecting equipment faults, unintended shutdowns, or other issues. In addition, the OnCS–DC would be inspected for anomalies with the equipment operation in accordance with manufacturers' recommendations.

Sunrise Wind would put in place an established and documented program for the maintenance of all equipment critical to reliable operation. Maintenance programs would conform to the equipment manufacturer's recommendations.

Sunrise would implement a reliability maintenance program which would include preventative maintenance on the OnCS-DC, Onshore Transmission Cable, and Onshore Interconnection Cable, and planned outages would be conducted in accordance with the North American Electric Reliability Corporation (NERC)/Northeast Power Coordinating Council, Inc. (NPCC) Standard-TOP-003-1, and protective system maintenance would be performed in accordance with the NPCC PRC 005-2 standard.

Vegetation surrounding the Onshore Transmission Cable and Onshore Interconnection Cable would be managed to ensure safe operation and access. A 60-ft wide Project Easement for Operation ROW center on the cables would be required. An Integrated Vegetation Management (IVM) program would be developed to address vegetation removal and control. The plan would include manual cutting, mowing, and the prescriptive use of federally approved and state-registered herbicides to eliminate targeted species within the ROW. Specific details on the IVM program would be provided within the Project EM&CP.

2.1.2.4 Offshore Activities and Facilities

2.1.2.4.1 Offshore Transmission Facilities

A summary of the proposed offshore transmission facility routine maintenance activities and the anticipated frequency at which they may occur is provided in Table 3.5.2-1 of the COP (Sunrise Wind 2022). Routine maintenance requirements (including frequencies) referenced in this table are subject to change based on final design specifications and manufacturer requirements. Detailed information regarding maintenance and required frequencies would be included in the FDR/FIR, to be reviewed by the CVA and submitted to BOEM prior to construction.

Sunrise Wind would employ a proprietary state-of-the-art asset management system to inspect offshore transmission assets including the OCS–DC (electrical components), SRWEC, and IAC. This system provides a data-driven assessment of the asset condition and allows for prediction and assessment of whether inspections and/or maintenance activities should be accelerated or postponed. This approach would allow the Project to maximize O&M efficiencies.

The SRWEC and IAC would typically have no maintenance requirements unless a fault or failure was to occur. To evaluate integrity of the assets, Sunrise Wind intends to conduct a bathymetry survey along the entirety of the cable routes immediately following installation (scope of installation contractor), and at 1 year after commissioning, 2–3 years after commissioning, and 5–8 years after commissioning. Survey frequency thereafter would depend on the findings of the initial surveys (i.e., site seabed dynamics and soil conditions). A survey may also be conducted after a major storm event (i.e., greater than 10-year event). Surveys of the cables may be conducted in coordination with scour surveys at the foundations.

Should the periodic bathymetry surveys completed during the operational lifetime of the Project indicate that the cables no longer meet an acceptable burial depth (as determined by the Cable Burial Risk Assessment), the following actions may be taken:

- Alert the necessary regulatory authorities, as appropriate;
- Undertake an updated Cable Burial Risk Assessment to establish whether cable is at risk from external threats (i.e., anchors, fishing, dredging);
- Survey monitoring campaign for the specific zone around the shallow buried cable; and
- Assess the risk to cable integrity.

Based on the outcome of these assessments, several options may be undertaken, as feasible, permitted and practical, such as remedial burial, addition of secondary protection (rock protection, rock bags or mattresses), and increased frequency of bathymetric surveys to assess reburial.

It is possible submarine cables may need to be repaired or replaced due to fault or failure. Also, it is expected that a maximum of 10 percent of the cable protection placed during installation may require replacement/remediation over the lifetime of the Project. These maintenance activities are considered non-routine. If cable repair/replacement or remedial cable protection are required, the Project would complete any necessary surveys of the seafloor in areas where O&M activities would occur and obtain necessary approvals. These activities would result in a short-term disturbance of the seafloor similar to or less than what is anticipated during construction.

2.1.2.4.2 Foundations

A summary of WTG and OCS–DC foundation maintenance activities and the anticipated frequency at which they may occur is provided in Table 3.5.3-1 of the COP (Sunrise Wind 2022). Maintenance requirements (including frequencies) referenced in this table are subject to change based on final design specifications and manufacturer requirements. Detailed information regarding maintenance and required frequencies would be included in the FDR/FIR, to be reviewed by the CVA and submitted to BOEM prior to construction.

2.1.2.4.3 WTGs

A summary of WTG maintenance activities and the anticipated frequency at which they may occur is provided in Table 3.5.4-1 of the COP (Sunrise Wind 2022). Maintenance requirements (including frequencies) referenced in this table are subject to change based on final design specifications and manufacturer requirements. Detailed information regarding maintenance and required frequencies would be included in the FDR/FIR, to be reviewed by the CVA and submitted to BOEM prior to construction. As discussed previously, WTGs would be continuously remotely monitored via the SCADA systems from shore. Preventative maintenance activities would be planned for periods of low wind and good weather (typically corresponding to the spring and summer seasons). The WTGs would remain operational between work periods of the maintenance crews. Certain O&M activities may require presence of either a jack-up vessel or anchored barge vessel. These activities would result in a short-term disturbance of the seafloor similar to or less than what is anticipated.

The WTGs would also be designed to minimize the effects of potential icing conditions in the SRWF. The SCADA monitoring system and turbine control management system would be designed to detect the buildup of ice and/or snow on the WTG and shut down operations, as necessary. The WTGs would be type certified according to IEC standards. The WTGs would comply with EC machinery directive (CE marked). Sunrise Wind would seek compliance with BOEM and BSEE regulations that directly govern operations and in-service inspections for offshore wind facilities in the US.

Each of the WTGs would require various oils, fuels, and lubricants to support the operation of the WTGs. Table 3.3.8-2 of the COP (Sunrise Wind 2022) provides a summary of the maximum potential quantities of oils, fuels, lubricants per WTG. The spill containment strategy for each WTG would be comprised of preventive, detective, and containment measures. These measures include 100 percent leakage-free joints to prevent leaks at the connectors; high pressure and oil level sensors that can detect both water and oil leakage; and appropriate integrated retention reservoirs capable of containing 110 percent of the volume of potential leakages at each WTG.

Each WTG would have its own control system to carry out functions like yaw control and ramp down in high wind speeds. Each turbine would also connect to a central SCADA system for control of the wind farm remotely. This would allow functions such as remote turbine shutdown if faults occur. The Project would be able to shut down a WTG within two minutes of initiating a shutdown signal. The SCADA system would communicate with the wind farm via fiber optic cable(s), microwave, or satellite links. Individual WTGs can also be controlled manually from within the nacelle or tower base to control and/or lock out the WTG during commissioning or maintenance activities. In case of a power outage or during commissioning, the turbine would be powered by a permanent battery back-up power solution with integrated energy harvest from the rotor or by a diesel generator located temporarily on each WTG.

The WTGs would also be protected both externally and internally by a lightning protection system. The external lightning protection system is comprised of lightning receptors located within both the nacelle and blade tips, which are designed to handle direct lightning strikes and would conduct the lightning's peak current through a conductive cabling system that leads through the tower into the WTG grounding/earthing system. To avoid and/or minimize internal damage from the secondary effects of lightning (e.g., power surges), the internal electrical systems would be protected by equipotential bonding, overvoltage protection, and electromagnetic coordination.

WTGs would be accessed either from a vessel via a boat landing or alternative means of safe access (e.g., Get Up Safe). The WTGs would be lit and marked in accordance with FAA, BOEM, and USCG requirements for aviation and navigation obstruction lighting, respectively. The lights would be equipped with back-up battery power to maintain operation should a power outage occur on a WTG. Additional operational safety systems on each WTG would include fire suppression, first aid, and survival equipment.

2.1.2.4.4 Offshore Converter Station

The OCS–DC would require various oils, fuels, and lubricants to support its operation. Table 3.3.6-2 of the COP (Sunrise Wind 2022) provides a summary of the maximum potential volumes of oils, fuels, and lubricants for the OCS–DC. The spill containment strategy for the OCS–DC would be comprised of preventive, detective, and containment measures. The OCS–DC would be designed with a minimum of 110 percent of secondary containment of all identified oils, grease, and lubricants. These measures are discussed in more detail in Appendix E-1 of the COP (Sunrise Wind 2022). OCS–DC gas insulated switchgears containing SF6 would be equipped with gas density monitoring devices to detect SF6 gas leakages should they occur. Any chemicals used in the auxiliary systems would be brought onto and taken off the platform during O&M and are not anticipated to be stored on the platform.

2.1.2.5 Conceptual Decommissioning

Pursuant to 30 CFR 585 and other BOEM requirements, Sunrise Wind would be required to remove or decommission all facilities, projects, cables, pipelines, and obstructions and clear the seabed of all obstructions created by the Project. In accordance with applicable regulations and a BOEM-approved conceptual decommissioning plan, Sunrise Wind would have up to 2 years to decommission the Project after the 25-year lease ends, unless the lease is extended, which would return the area to pre-construction conditions, as feasible.

Sunrise Wind would need to obtain separate and subsequent approval from BOEM to retire any portion of the Project in place. Sunrise Wind would submit a conceptual decommissioning application prior to any conceptual decommissioning activities. BOEM would conduct a NEPA review at that time, which could result in the preparation of a NEPA document. If the COP is approved or approved with modifications, Sunrise Wind would have to submit a bond that would be held by the United States government to cover the cost of conceptually decommissioning the entire facility.

Conceptual decommissioning may not occur for all Project components. However, for the purposes of the final EIS, all analyses assume that conceptual decommissioning would occur as described in this section.

2.1.2.5.1 Onshore Activities and Facilities

Depending on the needs of the host town, SRW may leave onshore facilities in place for future use. Cable removal, if required, would probably proceed using truck-mounted winches and handling equipment. There are no plans to disrupt streets or onshore public utility ROWs by excavating or deconstructing buried facilities.

2.1.2.5.2 Offshore Activities and Facilities

WTGs and foundations (along with their associated transition pieces), now have an expected operating life of at least 25 years, and substantially longer with prudent inspection and maintenance practices. This timeframe is applicable to offshore wind facilities worldwide, including for SRWF. At the end of the proposed Project’s operational life, it would be decommissioned in accordance with a detailed Project decommissioning plan that would be developed in compliance with applicable laws, regulations, and BMPs at that time. All facilities would need to be removed to a depth of 15 ft (4.6 m) below the mudline, unless otherwise authorized by BOEM (30 CFR § 585.910(a)). Care would be taken to handle waste in a hierarchy that prefers re-use or recycling and leaves waste disposal as the last option. Absent permission from BOEM, Sunrise Wind would complete decommissioning within 2 years of termination of the Lease.

Sunrise Wind would develop a final decommissioning and removal plan for the facility that complies with all relevant permitting requirements. This plan would account for changing circumstances during the operational phase of the Project and would reflect new discoveries particularly in the areas of marine environment, technological change, and any relevant amended legislation.

2.1.3 Alternative C – Fisheries Habitat Impact Minimization Alternative

Through a competitive leasing process under 30 Code of Federal Regulations (CFR) 585.211, Sunrise Wind was awarded commercial Renewable Energy Lease OCS-A 0487 covering an area offshore of Massachusetts, Rhode Island, and New York (Lease Area). Under the terms of the lease, Sunrise Wind has the exclusive right to submit a COP for activities within the Lease Area, and it has submitted a COP to BOEM proposing the construction and installation, O&M, and conceptual decommissioning of up to a 1,034-megawatt (MW) offshore wind energy facility in accordance with BOEM's COP regulations under 30 CFR 585.626, et seq. (Figure ES 1). Alternative C is proposed with the intent to minimize impacts to fisheries habitats in the proposed Project Area that are the most vulnerable to long-term impacts. This alternative considered and prioritized contiguous areas of complex bottom habitat to be excluded from development to potentially avoid and/or minimize impacts to complex fisheries habitats, while still meeting BOEM's purpose and need for the project. Areas for prioritization were identified by NMFS on May 2, 2022, based upon recent, preliminary data of Atlantic cod spawning activity in the vicinity of the Project Area, assumed hard bottom complex substrate, and the presence of large boulders (Figure 2.1.3-2). Priority Area 1 was deemed the higher priority by NMFS due to close proximity to Cox Ledge, and documented cod spawning activity based upon recent acoustic and telemetry data. Cox ledge is approximately 5 to 10 kilometers (3.1 to 6.2 miles) north of Priority Area 1 (Figure 2.1.3-1) (U.S. Geological Survey 2022). Priority Area 1 includes 16 WTG positions as well as the OCS-DC. Priority Area 2 includes 18 WTG positions and contains areas of high reflectance (indicative of hard substrates), large boulders, and is adjacent to detected cod spawning activity. Priority Area 3 includes 14 WTG positions and areas of high reflectance but fewer large boulders. Priority Area 4 includes 4 WTG positions and mid to high reflectance with large boulders.

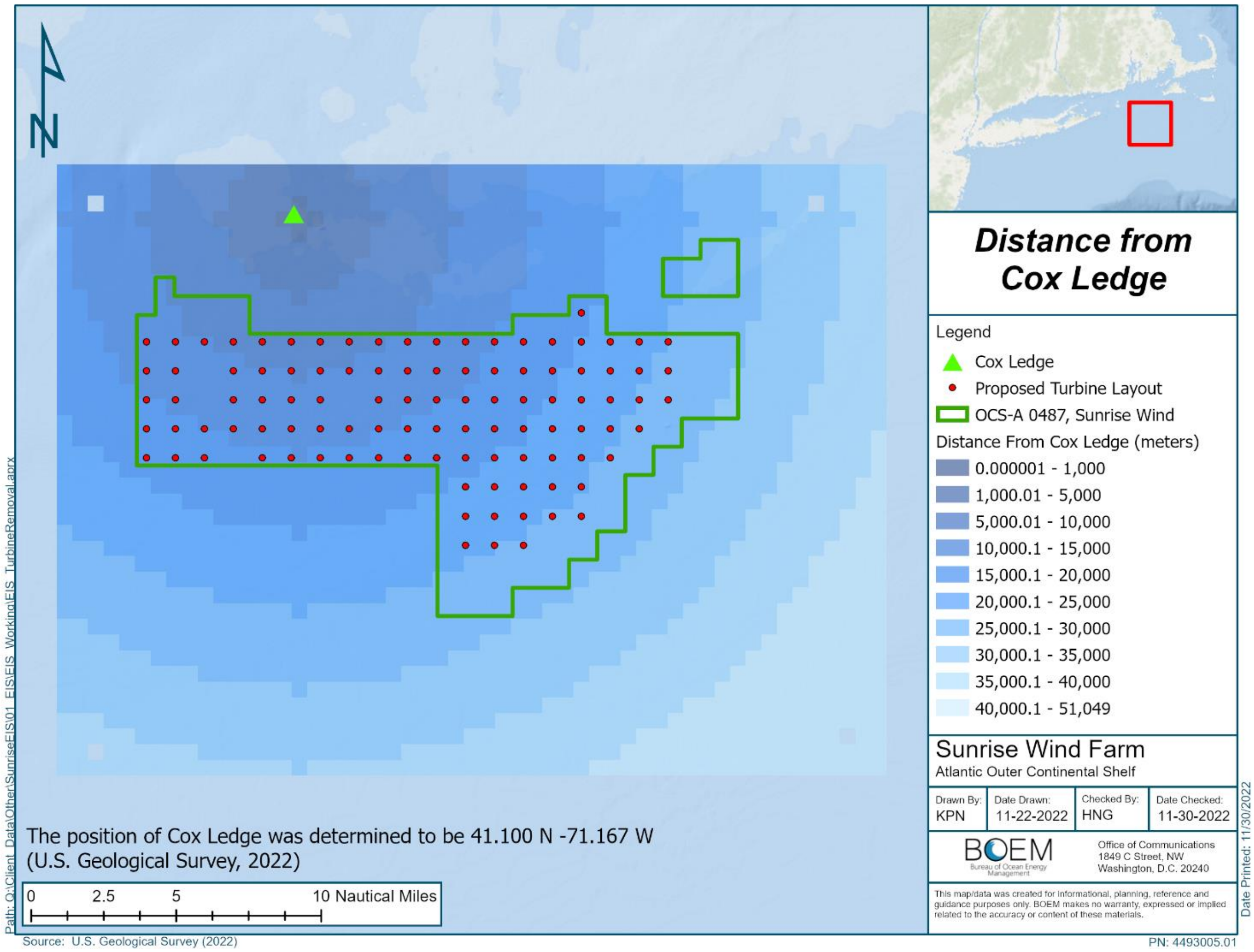


Figure 2.1.3-1 Distance of the Sunrise Wind Farm from Cox Ledge

2.1.3.1 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Sunrise Wind's proposed layout includes up-to 102 WTG positions; however, only 94 11-MW WTGs would be needed to meet the Project's maximum capacity of up to 1,034 MW. Under Alternative C-1, the construction and installation, O&M, and eventual decommissioning of a wind energy facility, and an OSS would occur within the design parameters outlined in the Sunrise Wind Farm COP (Sunrise Wind 2022) subject to applicable mitigation measures. However, certain WTG positions would be excluded from the identified priority areas in order to reduce impacts to sensitive benthic habitat and areas where cod spawning has been detected. Under this alternative the Project would maintain a uniform east-west and north-south grid of 1 x 1 nm spacing between WTGs (as shown in Figure 2.1.3-2). Alternative C-1 would result in the exclusion of up to 8 WTG positions from development within the identified priority areas. The specific 8 WTG positions that would be excluded from the identified priority areas are informed through the impacts analysis described in Chapter 3.

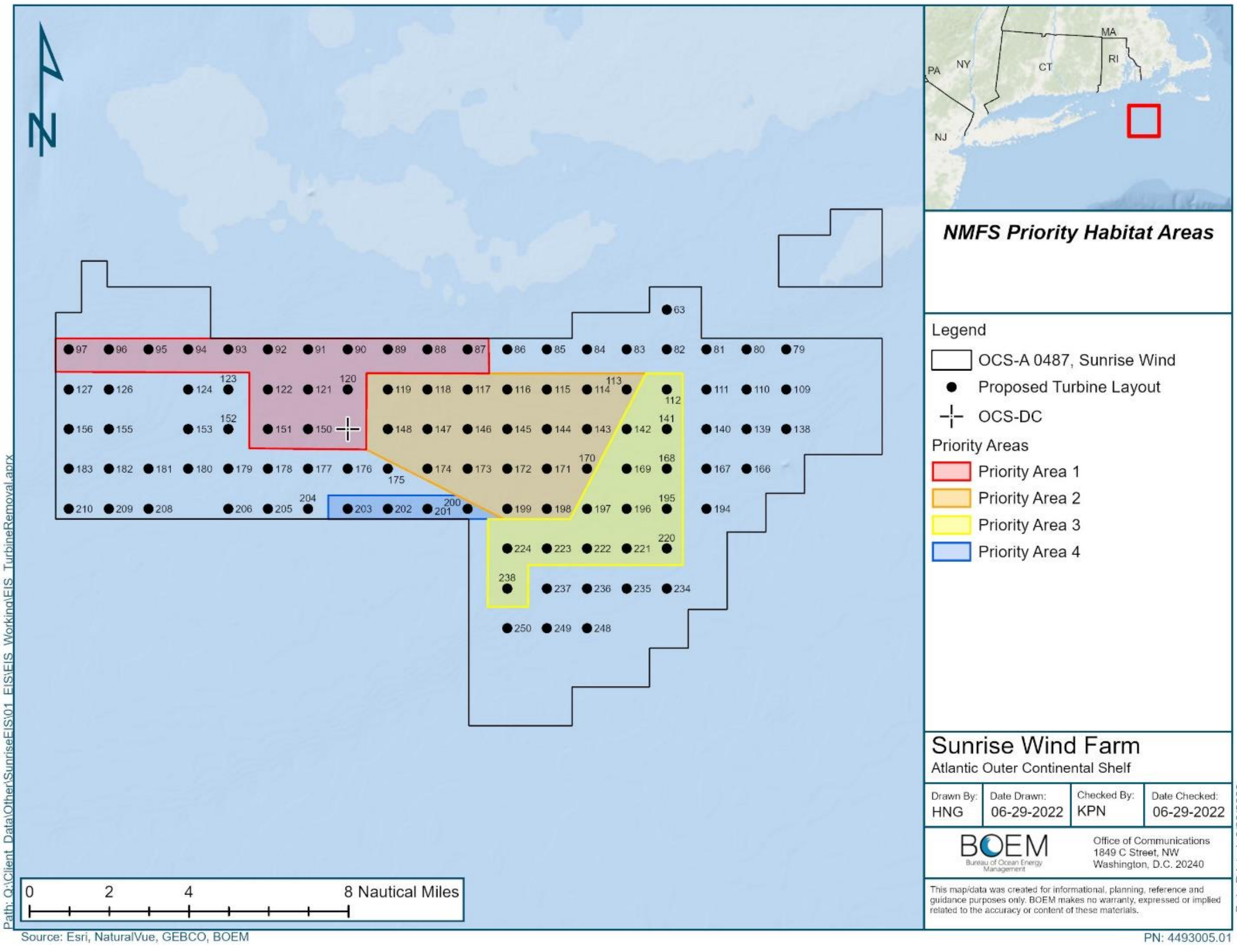


Figure 2.1.3-2. Priority Areas Identified by NMFS for WTG Exclusion

2.1.3.2 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

Under Alternative C-2, the 8 WTG positions identified for exclusion from development in Alternative C-1 would remain the same, and an additional 12 WTG positions would be removed from the Priority Areas and relocated to the eastern side of the lease area. The construction and installation, O&M, and eventual decommissioning of a wind energy facility, and an OSS would occur within the design parameters outlined in the Sunrise Wind Farm COP (Sunrise Wind 2022) subject to applicable mitigation measures. The Project would maintain a uniform east-west and north-south grid of 1 x 1 nm spacing between WTGs (as shown in Figure 2.1.3-2). Alternative C-2 assumes that habitat on the eastern side of the lease area is suitable for development. Geotechnical and geophysical surveys that are currently underway will help inform the feasibility of Alternative C-2. The specific 20 WTG positions that would be excluded from the identified Priority Areas are informed through the impacts analysis described in Chapter 3.

2.2 Alternatives Considered but Not Analyzed in Detail

Under NEPA, a reasonable range of alternatives framed by the purpose and need must be developed for analysis for any major federal action. The alternatives should be "reasonable," which the Department of the Interior has defined as those that are "technically and economically practical or feasible and meet the purpose and need of the proposed action."[10] There should also be evidence that each alternative would avoid or substantially lessen one or more potential, specific, and significant socioeconomic or environmental effects of the project.[11] Alternatives that could not be implemented if they were chosen (for legal, economic, or technical reasons), or do not resolve the need for action and fulfill the stated purpose in taking action to a large degree, are therefore not considered reasonable.

BOEM considered alternatives to the Proposed Action that were identified through coordination with cooperating and participating agencies and through public comments received during the public scoping period for the EIS. BOEM then evaluated the alternatives and dismissed from further consideration alternatives that did not meet the purpose and need, did not meet the screening criteria, or both.

Table 2.2-1 lists the alternatives and the rationale for their dismissal. These alternatives are presented below with a brief discussion of the reasons for their elimination as prescribed in CEQ regulations at 40 CFR 1502.14(a) and Department of the Interior regulations at 43 CFR 46.420(b–c).

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[10] 43 CFR 46.420(b). The terms "practical" and "feasible" are not intended to be synonymous (73 Federal Register 61331, October 15, 2008).

[11] 43 CFR 46.415(b).

Table 2.2-1. Alternatives that were Considered for Analysis in this Draft EIS but Not Analyzed

Alternative	Objective	Rational for Dismissal
Consider air cooling or evaluation of emergent technologies to cool the OCS-DC.	Reduce impacts to marine resources	Air cooling is technically infeasible because of ambient air temperatures at the Project location. One technology suggested was the "EU-funded COOLWIND Project"; this technology does not require seawater pumps, filters, heat exchangers or expensive saltwater piping, nor chlorination of seawater. Instead of pumping cold seawater to the transformer platform, heated water from the converters is circulated and chilled in a subsea mounted cooler with less environmental pollution, less power consumption, and less emissions. However, this subsea mounted cooler is technically infeasible as it is still an experimental/emerging technology still under development and is not proven at a commercial windfarm scale.
Alternative foundation types to monopiles including: • Gravity foundations • Suction bucket foundations • 100% jackets or tripods Floating foundation as an experimental part of the Project	Reduce sound impacts to marine mammals from impact pile-driving; Reduce impacts to benthic resources (floating only)	The COP, which BOEM has found to be technically sufficient, thoroughly analyzes different design parameters and technologies and includes rationale for what is proposed in the PDE and why the parameters outside of the PDE were not considered further. Specifically, during Project development, Sunrise Wind considered multiple design alternatives for *WTG foundations* that were ultimately not selected for inclusion in the PDE for the COP (see COP Vol. 1 Section 2.2.2.3). Alternative foundations considered but not carried forward included monopod suction caisson foundations, suction bucket jacket foundations, gravity-based turbines. These alternative foundation types are not technically feasible because they are more difficult to site due to the requirement for a large level areas with no boulders which are not present in a sufficient quantity throughout the lease area; the supply chain for these alternative foundations is not mature; and these alternative foundations have not been used at a commercial scale for a project the size of Sunrise Wind and are therefore still an emerging technology. Notably, while these alternative foundation types would eliminate the sounds associated with impact pile-driving, they would all have a larger footprint on the seabed and consequently result in increased impacts to benthic resources. In addition, floating foundations were considered as an alternative to jacket foundations or pile foundations in the Sunrise Wind COP. Floating platforms are a much less proven technology than jacket foundations or pile foundations for a commercial project at the scale of Sunrise Wind. Additionally, the water depth at the Sunrise Wind Project is not deep enough to justify the additional costs to the developer for floating technologies (it is cost prohibitive). Floating foundations are dismissed as an alternative for the EIS because they are technically and economically infeasible at this stage of technology development, particularly for shallower waters suitable for fixed bottom foundations. Finally, jacket foundations require a custom-made jacket to match the seabed and water depth at the siting location; thus, the logistics for construction and transportation of jacket foundations were cost-

Alternative	Objective	Rational for Dismissal
		prohibitive for this project, therefore the COP includes only the monopile foundation design for the WTGs. Sunrise Wind has eliminated the monopile foundation from further consideration for the OCS–DC due to the topside size and weight, water depth, and equipment sensitivity, which require a stiffness of the support structure that can only be achieved by means of a jacket foundation (a monopile foundation would be technically infeasible).
Alternative to consider onshore substation locations other than Holbrook.	Reduce socioeconomic impacts	According to the COP, the Long Island Power Authority (LIPA) Holbrook Substation was specifically designated as the interconnection point in the Offshore Wind Renewable Energy Certificate (OREC) that SRF signed with NYSERDA for the Sunrise Wind Project. Thus, a change to the onshore substation would constitute a potential breach of the agreement, which would be economically infeasible and impracticable because the competitive nature of the NYSERDA award process and the importance of the award as the primary revenue generator for the Sunrise Wind Farm.
Alternative to consider transit lanes that are at least 4 nm wide.	Reduce impacts to navigation	The 1x1-nm grid is consistent with the findings in MA/RI Port Access Study (MARIPAS) and maximizes safety and navigation consistency. U.S. Coast Guard (USCG) also asserted that 1x1nm spacing provides ample maneuvering space for typical fishing vessels expected in the Project Area. Additionally, the Northeast leaseholders' agreement was reached to align Project layouts and avoid irregular transit corridors. Adding transit corridors could erode Project economics and logistics and potentially lead the lessee to retract from the agreement, which it committed to assuming that no additional transit lanes would be required.
Alternative to consider using AC technology for OSSs (vs HVDC).	Reduce impacts to marine resources	This proposed alternative would require additional infrastructure in comparison to the HVDC technology in the Proposed Action: • Requires a second offshore export cable to be installed spaced approximately 112.5 to 220.5 m apart, which would double the seafloor disturbance and double the required cable crossings from eight to sixteen. • Requires a booster station, of a similar size as an OSS, located approximately midway between the OSSs and onshore substation, to provide reactive compensation to stabilize the voltage and minimize electrical loses along the export cables. Use of HVDC does not require this additional booster station. • Requires two OSSs (platforms) (instead of a single offshore converter substation platform within Lease OCS-A 0487), and the two OSSs would require a 9 mi (15 km) interlink cable to be installed between them using the same installation and burial methods as an export cable. Use of HVDC does not require this additional cable.

Alternative	Objective	Rational for Dismissal
		Due to the length of the Project's transmission system, a DC option provides a more efficient electrical design that would reduce losses – providing a more effective transmission system for the Project. The DC system is also expected to result in greater overall grid stability when compared to an AC system due to the way a DC system is able to decouple any electrical disturbances present from the onshore grid to the WTGs and vice versa. Therefore, an HVDC system is more technically and economically feasible and practical, and within the applicant's PDE, which eliminated HVAC transmission due to environmental and technical concerns.
Alternative to consider a closed loop cooling system for the OCS-DC.	Reduce impacts to marine resources	Closed loop systems, while technically feasible for some applications, are not market ready with a proven historical use in offshore applications. Use of prefabricated commercially available chillers with 1 MGD nominal flow rate (not designed for offshore use) were even considered. However, application of these for offshore converter station design would require 8 units in parallel, with spacing requirements of 20'x 20'. This would result in less energy efficient offshore converter station, larger and more robust offshore converter station topside and support structure, and significant increases in capital expenditures (CAPEX) and operational expenditures (OPEX). For these reasons, consideration of a closed loop cooling system is not technically and economically feasible or practical.
Alternative to consider shared export cables and/or common cable corridors that can benefit multiple Projects to reduce reducing Project impacts and costs and increase efficiency and predictability.	Reduce impacts to benthic and marine resources	There are currently no shared or regional cable corridors in which BOEM could require the lessee to install its export cable. 30 CFR 585.200(b) states, "A lease issued under this part confers on the lessee the rights to one or more project easements without further competition for the purpose of installing gathering, transmission, and distribution cables; pipelines; and appurtenances on the OCS as necessary for the full enjoyment of the lease." While BOEM could require a lessee to use a previously existing shared cable corridor established by a Right-of-Way grant (30 CFR 585.112) when the use of the shared cable corridor is technically and economically practical and feasible alternative for the project, BOEM cannot limit a lessee's right to a project easement when such a cable corridor does not exist and there is no way of determining if the use of a future shared cable corridor would be a technically and economically practical and feasible alternative for the project. Therefore, BOEM cannot require Sunrise Wind to use a non-existent shared cable corridor for this Project. Furthermore, Sunrise Wind's export cables would connect to the power grid via different onshore substations than any other projects that are sufficiently mature in their permitting processes. Developing a shared export cable corridor would not be technically or economically practicable because the Sunrise Wind and Empire Wind 1 and 2 projects have distinct interconnection points to the electric power grid. At this time, BOEM considers this alternative speculative and economically infeasible and impractical.

Alternative	Objective	Rational for Dismissal
Alternative to consider use of 14-MW WTGs.	Reduce impacts to fisheries habitat	Use of a 14-MW WTG is outside the PDE, as supplied by Sunrise Wind in their October 2021 COP. Sunrise Wind has executed a contract with Siemens Gamesa as the supplier of the WTGs for the Sunrise Wind Offshore Wind Farm. The foundation design is nearing completion to support steel procurement in Q4 2022, and fabrication starts in Q1 2023. Sunrise Wind provided business confidential documentation to BOEM that sufficiently demonstrated that if Sunrise were to procure the 14-MW WTG there would be a multiple year Project delay. Several construction/installation contracts have also been executed or are being negotiated. One key example of a contractual consequence of a Project delay would be related to WTG installation. A project delay would be extremely detrimental as Sunrise Wind would need to find a second WTG installation vessel setup to complete the scope—one that is not U.S.-built and resulting in a significant delay to the Project's COD due to the lack of availability of Jones Act compliant WTG installation vessels. Additionally, system reliability changes caused by changing to a 14-MW WTG would have to be assessed by NYISO. Modifying wind turbine type from 11MW to 14-MW would require Sunrise Wind to submit a modification request to NYISO to redo the System Reliability Impact Studies and Class Year Facilities Studies, which would delay the critical path Large Generator Interconnection Agreement (LGIA) negotiations for Sunrise Wind. Because this alternative is not operationally, technically, and economically feasible and implementable, it was eliminated from further consideration.
Alternative to consider relocation of the offshore converter station (OCS-DC).	Reduce impacts to fisheries habitat	The location of the OCS-DC was selected specifically because of it is centrally located to balance length of the export and collection infrastructure and account for the electrical constraints on the number of WTGs that can be connected to a single IAC. Moving the OCS-DC to another location within the lease area would require a full redesign of the OCS-DC topside and jacket foundation and result in significant delays to the Project that are not compatible with meeting the Project purpose and need. The designs of the topside and jacket foundation are complete/nearing completion and are based specifically on the current location. Fabrication of the topside, in coordination with BOEM and the CVA, started in Q1 2022; orders have been placed for the jacket foundation materials, and fabrication would start in Q4 2022. Additionally, moving the OCS-DC would result in full design of the electrical infrastructure and potentially result in the need for longer and larger cross-section export cables and/or array cables, with associated increased installation footprint and associated seabed impacts. Because this alternative is not operationally, technically, or economically feasible or implementable, it was eliminated from further consideration.

Alternative	Objective	Rational for Dismissal
Alternative to consider other landfall sites	Reduce impacts to benthic resources, sensitive environmental habitat, water quality, and cultural resources	Suitable landfalls sites must consider the proximity to the onshore transmission route, proximity to lease area, technical feasibility, and minimize conflicts with existing environmental and anthropogenic constraints onshore and offshore. These were considerations when SRF evaluated potential landfall sites. Oceanography, geology, potential hazards, archeological and environmental resources and existing/sensitive infrastructure were analyzed to determine the suitable locations for landfall. Landfall on the northern shore of Long Island, entering through Long Island Sound, was dismissed for consideration due to increased offshore distance, presence of natural rocks and reefs, significant habitat designations, and high concentration of shipwrecks. Along the southern shore of Long Island, six sites were evaluated for feasibility for landfall; Smith Point County Park, Town of Brookhaven, NY, Village of Quogue Beach, Town of Southampton, NY, Coopers Beach, Southampton, NY, Rogers Beach, Westhampton, NY, Bellport Bay, Town of Brookhaven, NY, and Bluepoint Marina/Corey Beach, Town of Brookhaven, NY. The Village of Quogue Beach was excluded from further consideration based on limited areas available for temporary work areas; floodplains, significant coastal fish and wildlife habitat; and extended length of Onshore Transmission Cable. Coopers Beach was excluded from further consideration based on potential conflicts with existing sand borrow areas, and recreational boating activity; proximity to cultural and historic resources; and extended length of Onshore Transmission Cable. Rogers Beach was excluded from further consideration based on close proximity to residential areas; limited area available for temporary work areas; and potential conflicts with existing sand borrow areas and recreational boating activity. Both Bellport Bay and Bluepoint Marina/Corey Beach were excluded from further consideration based on being situated within federally designated wilderness area, proximity to federal navigation channels; and potential conflicts with commercial and recreational fishing activities These impacts are evaluated further in Appendix P – USACE Summary Table of Alternatives Analysis Through the extensive survey work conducted during the site assessment phase, BOEM and the operator did not identify cable route alternatives during Project development that would further reduce or avoid benthic impacts (see Section 2.2.1 of the COP). Changes to the proposed landfall site would likely result in substantial cost for the applicant, could be counter to BOEM policy objectives of responsible and orderly development of the OCS under the OCSLA, and have not been determined as necessary based on stakeholder feedback provided to date. In addition, a site-specific cable burial risk assessment would be completed with additional approvals conducted at the facility design report/facility installation report stage prior to installation of any cables. No alternative cable route(s) have been proposed that are meaningfully different from those already evaluated, which also

Alternative	Objective	Rational for Dismissal
		include supporting evidence of significantly reducing impacts when compared to the Proposed Action or that address impacts that could not be addressed in the site-specific cable burial risk assessment.
Alternative to consider other onshore transmission cable routes	Reduce impacts to land use, sensitive environmental habitat, and cultural resources	The Long Island Power Authority (LIPA) Holbrook Substation was specifically designated as the interconnection point in the Offshore Wind Renewable Energy Certificate (OREC) that SRF signed with NYSERDA for the Sunrise Wind Project. Alternative routes to this Substation from the landfall site at Smith Point County Park were evaluated for the most suitable route during the COP phase. Potential routes were considered based on publicly available information and local stakeholder engagement. Factors considered during the evaluation included route length, constructability (e.g., route length, number of roadway and railroad crossings, width of corridor), adjacent land uses (e.g., developed parcels, number of residences, public lands), and proximity to environmental and cultural resources (e.g., streams, wetlands, floodplains, unique habitats, cultural and historic properties). During analysis, five routes were considered (COP Section 2.2.1) but there were several technical, commercial, stakeholder, cultural and environmental constraints with the alternative routes. The Montauk Highway Route was eliminated from consideration due to proximity to sensitive natural and cultural resources, including the Yaphank Creek and the Wertheim National Wildlife Refuge as well as proximity to residences and higher traffic volumes. The Peconic Avenue Route was excluded from further consideration based on the proximity to residences and narrow road ROW. The Woodside Avenue Route was excluded from further consideration based on constructability constraints and length of route; proximity to stream and wetlands; and proximity and quantity of residences in some areas. The Smith Road Route was excluded from further consideration based on proximity to residences; narrow ROW; potential utility conflicts; ownership of underlying land under federal and private control; and proximity to natural resources and historic and cultural resources. The LIE Service Road was designated as the most optimal route for the onshore transmission cable route. This route was selected because of location primarily within existing ROW; minimal presence of sensitive natural resources; limited presence of potential cultural resources; and limited residential impacts. These impacts are evaluated further in Appendix P – USACE Summary Table of Alternatives Analysis BOEM and the operator did not identify onshore transmission cable route alternatives during Project development that would further reduce or avoid impacts to land use, sensitive environmental habitat, and cultural resources. Changes to the proposed cable route would likely result in substantial cost for the applicant and have not been determined as necessary based on stakeholder feedback provided to date. No alternative cable route(s) have been proposed that are meaningfully different from

Alternative	Objective	Rational for Dismissal
		those already evaluated, which also include supporting evidence of significantly reducing impacts when compared to the Proposed Action.
Alternative to consider other offshore transmission cable routes	Reduce impacts to benthic resources	SRF conducted a desktop study between the lease area and Long Island, NY to determine suitable offshore cable routes. Sunrise Wind also evaluated recent AIS and VMS data and navigational features, including identifying high vessel density areas and existing routes where multiple vessels regularly utilize a similar passage and assessed potential future scenarios of vessel traffic based on the establishment of the ACPARS tug and tow lanes. Based on that evaluation, analysis was further refined based on mapped geology, shipwrecks, artificial reefs, sand borrow pits, existing cables, and other mapped resources. These impacts are evaluated further in Appendix P – USACE Summary Table of Alternatives Analysis BOEM and the operator did not identify cable route alternatives during Project development that would further reduce or avoid benthic impacts (see Section 2.2.1.2 of the COP). Changes to the proposed export cable would likely result in substantial cost for the applicant, could be counter to BOEM policy objectives of responsible and orderly development of the OCS under the OCSLA, and have not been determined as necessary based on stakeholder feedback provided to date. In addition, a site-specific cable burial risk assessment would be completed with additional approvals conducted at the facility design report/facility installation report stage prior to installation of any cables. No alternative cable route(s) have been proposed that are meaningfully different from those already evaluated, which also include supporting evidence of significantly reducing impacts when compared to the Proposed Action or that address impacts that could not be addressed in the site-specific cable burial risk assessment.
Alternative to consider co-locating a portion of the export cable on the Smith Point Bridge (BIN 3-30077-0) in the Town of Brookhaven, New York	Minimizing impacts to sensitive environmental resources in Great South Bay, including but not limited to, complex benthic habitats, saltmarshes, SAV, etc.	Co-locating the export cable on the replacement bridge was deemed infeasible due to technical and logistical constraints. As currently designed, the proposed bridge could not support the additional space and load needed to accommodate a required cable utility bay without modifying the spans and substructure support beams nor would there be enough space to safely conduct bridge inspections or maintenance activities in proximity to the high voltage cable. The cable would interfere with the bridge abutments and backwalls, likely requiring modifications to the proposed vehicle entrances and exits. Additionally, logistical constraints proved too great to overcome given that, as currently designed, the bridge would not be completed until 2026, more than two years after the cable is installed. Finally, bridge design revisions to accommodate a suitable utility bay would substantially delay construction of the new bridge beyond the desired operation timeline of the existing bridge.

2.3 Non-Routine Activities and Low-Probability Events

Non-routine activities and low-probability events associated with the Project could occur during construction and installation, O&M, or conceptual decommissioning. Although these activities or events are impossible to predict with certainty, examples of such activities and events and potential for Project impacts are briefly summarized below.

- **Corrective maintenance activities:** These activities could be required as a result of other low-probability events, or as a result of unanticipated equipment wear or malfunctions. Sunrise Wind would stock spare parts and have sufficient workforce available to conduct corrective maintenance activities, if required.
- **Collisions and allisions:** These activities could result in spills (described below) or injuries or fatalities to humans or wildlife (addressed in Chapter 3). Collisions and allisions may be minimized through USCG's requirement for lighting on vessels, temporary safety zones anticipated to be implemented by Sunrise Wind during construction, the implementation of National Oceanic and Atmospheric Administration (NOAA) vessel-strike guidance, proposed spacing between WTGs and other facility components, and inclusion of Project components on nautical charts.
- **Cable displacement or damage by vessel anchors or fishing gear:** This could result in safety concerns and economic damages to vessel operators. However, such incidents would be minimized by inclusion of Project components on nautical charts and the cable burial or other protection measures.
- **Chemical spills or releases:** For offshore activities, these would include inadvertent releases from refueling vessels, spills from routine maintenance activities, and any more significant spills as a result of a catastrophic event. Sunrise Wind would comply with USCG and Bureau of Safety and Environmental Enforcement (BSEE) regulations relating to prevention and control of oil spills. Onshore, releases could occur from construction equipment or HDD activities. Sunrise Wind would prepare a construction spill prevention, control, and countermeasure plan in accordance with applicable requirements, and would outline spill prevention plans and measures to take to contain and clean up spills that may occur.
- **Severe weather (e.g., hurricanes) and natural events:** The design parameters for the WTGs are sufficient based upon historical data, site-specific measurements, and engineering design practices. There have been three Category 3 hurricanes (tropical cyclones) in the historical record in the area, and no Category 4 or 5 hurricanes. The Sunrise Wind Project would be designed in accordance with the International Electrotechnical Commission (IEC) 61400-1 and 61400-3 standards. These standards require designs to withstand forces based on site-specific conditions for a 50-year return interval (2% chance occurrence in a single year) for the WTGs, which corresponds to a Category 3 hurricane in this area. This means that the WTGs are designed not merely for average conditions but for the higher end event that is reasonably likely to occur. The newly revised IEC standard now also recommends a robustness load case for extreme metocean conditions, where the WTG support structures are checked for a 500-year event (0.2% chance occurrence in a single year), which corresponds to wind gusts at the strength of a Category 5 hurricane, to ensure that the appropriate level of safety is maintained in case of a less likely event. The Project would be constructed using a certified verification agent to ensure that all design specifications are met. It is possible that severe weather could cause blades to fail, but because of the construction design, it is highly unlikely that the towers

would topple. However, severe flooding or coastal erosion could require repairs during construction and installation activities of onshore project components. Although highly unlikely, structural failure of a WTG (i.e., loss of a blade or tower collapse) would result in short-term hazards to navigation for all vessels.

- **Terrorist attacks:** Impacts from terrorist attacks could greatly vary in magnitude and extent and, therefore, their analysis would be highly speculative. BOEM also considers terrorist attacks unlikely and therefore does not analyze them further in the EIS.

2.4 Summary and Comparison of Impacts by Alternative

Table 2.4-1 summarizes and compares the impacts from Chapter 3 by environmental resource and alternative. Where directionality (e.g., adverse or beneficial) is not specifically noted, the reader should assume the impact is adverse.

Table 2.4-1. Summary of Impacts on Resources from Proposed Action and Alternatives

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
Air quality	*No Action Alternative*: Continuation of existing environmental trends and activities under the No Action Alternative would result in **minor** to **moderate** impacts on air quality from air emissions, climate change, and accidental releases. *Cumulative Impacts of the No Action Alternative:* The No Action Alternative combined with all other planned activities (including other offshore wind activities) would result in **minor** to **moderate** adverse impacts due to emissions of criteria pollutants, VOCs, HAPs, and GHGs from the continued use of fossil fuel electricity generation. Planned offshore wind activities would have an indirect **minor** to **moderate beneficial** impact on air quality after the offshore wind projects are operational.	*Proposed Action*: The Proposed Action would have a short-term **minor** to **moderate** adverse effect from air emissions, climate change, and accidental releases. While there would be emissions of GHGs and criteria pollutants during the construction, O&M, and decommissioning phases, these emissions would be less than the total avoided emissions possible from the proposed Project and would provide **minor** to **moderate beneficial** impacts. *Cumulative Impacts of the Proposed Action:* The potential emissions from onshore and offshore activities during the construction and installation, O&M, and decommissioning phases would have a **minor** to **moderate** short-term impact on air quality but would be dispersed throughout the construction, O&M, or decommissioning phases. BOEM anticipates that overall emissions from fossil fuel power generation would	*Alternative C-1*: Alternative C-1 would have a **minor** to **moderate** adverse effect from air emissions, climate change, and accidental releases. **Minor** to **moderate beneficial** indirect impact from reduced emissions from fossil-fueled energy sources and associated health benefits. *Cumulative Impacts of Alternative C-1*: The potential emissions from onshore and offshore activities during the construction and installation, O&M, and decommissioning phases would have a **minor** to **moderate** short-term impact on air quality but would be dispersed throughout the construction, O&M, or decommissioning phases. Ongoing and planned activities, including Alternative C-1, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions from fossil-fuel	*Alternative C-2*: Alternative C-2 would have a **minor** to **moderate** adverse effect from air emissions, climate change, and accidental releases. **Minor** to **moderate beneficial** indirect impact from reduced emissions from fossil-fueled energy sources and associated health benefits. *Cumulative Impacts of Alternative C-2*: The potential emissions from onshore and offshore activities during the construction and installation, O&M, and decommissioning phases would have a **minor** to **moderate** short-term impact on air quality but would be dispersed throughout the construction, O&M, or decommissioning phases. Ongoing and planned wind projects, including Alternative C-2, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions from fossil-fuel

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
		decrease and would contribute to a **minor** to **moderate** **beneficial** indirect impact on air quality through avoided emissions and health benefits.	powered electricity generation sources and the associated health benefits.	powered electricity generation sources and the associated health benefits.
Water quality	*No Action Alternative*: The No Action Alternative would result in **negligible** to **moderate** short-term impacts on water quality through sediment suspension and deposition, anchoring, new cable emplacement, accidental releases or discharges, port utilization, presence of structures, or land/seafloor disturbance. *Cumulative Impacts of the No Action Alternative:* Considering all the IPFs together, BOEM anticipates the overall potential impacts on water quality associated with planned offshore wind activity would be **minor** or **moderate**.	*Proposed Action*: Impacts on water quality from the Proposed Action would range from **negligible** to **moderate**. The risk of an accidental discharge or release of chemicals, oils, fuel, lubricants, trash, or debris is low during all phases of the Proposed Action, in the event a release was to occur, the impact on water quality would be **minor** or **moderate** depending on the volume of the spill and the type of material spilled. Impacts from port utilization or the presence of structures would be **negligible** or **minor**. Sediment suspension, deposition, and increased turbidity would have a **minor** impact during anchoring, cable emplacement and maintenance, and seafloor/land disturbance; sediment plumes would be localized and short term.	*Alternative C-1*: Impacts on water quality from onshore and offshore construction, O&M, and decommissioning would be similar to the Proposed Action. Alternative C-1 would have a **negligible** to **moderate** impact on water quality. *Cumulative Impacts of Alternative C-1*: Considering all the IPFs together, BOEM anticipates that the cumulative impacts of Alternative C-1 would have **negligible** to **moderate** impacts on water quality.	*Alternative C-2*: Impacts on water quality from construction, O&M, and decommissioning of the WTGs would be similar to the Proposed Action because the same number of WTGs would be installed. Alternative C-2 would have a **negligible** to **moderate** impact on water quality. *Cumulative Impacts of Alternative C-2*: Considering all the IPFs together, BOEM anticipates that the cumulative impacts of Alternative C-2 would have **negligible** to **moderate** impacts on water quality.

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
		Cumulative Impacts of the Proposed Action: Considering all the IPFs together, BOEM anticipates the overall potential impacts on water quality associated with planned offshore wind activity would be **minor** or **moderate**.		
Bats	*No Action Alternative*: BOEM anticipates that the overall impacts associated Alternative A, the No Action Alternative, when combined with all other ongoing activities (including ongoing offshore wind projects) in the GAA would result in overall **minor** adverse impacts. *Cumulative Impacts of the No Action Alternative:* BOEM anticipates that the overall impacts associated Alternative A, the No Action Alternative, when combined with all on-going and planned activities (including offshore wind) in the GAA would result in overall **minor** adverse impacts.	*Proposed Action*: BOEM anticipates the impacts resulting from the Proposed Action alone would range from negligible to minor adverse impacts and negligible to minor beneficial impacts. Therefore, BOEM expects the overall impact on bats from the Proposed Action alone to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects. *Cumulative Impacts of the Proposed Action:* Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable	*Alternative C-1*: Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for bat compared to the Proposed Action. BOEM expects the overall impact on to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects. *Cumulative Impacts of Alternative C-1*: Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for bat compared to the Proposed Action. The conclusions for cumulative impacts of Alternative C-2 are the same as	*Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for bats. BOEM expects the overall impact on to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects. *Cumulative Impacts of Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for bats. The conclusions for cumulative impacts of Alternative C-2 are the same as described under the Proposed Action. BOEM expects the overall impact on

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
		activities would result in **minor** impacts to bats. Even though the overall effect would be detectable and measurable, the impacts to individuals and their habitats would not lead to population-level effects.	described under the Proposed Action. BOEM expects the overall impact on to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.	to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.
Benthic Resources	*No Action Alternative*: BOEM anticipates that the overall impacts associated with ongoing activities, including permitted offshore wind projects, and environmental trends in the GAA would result in **moderate** adverse impacts and could potentially include **moderate beneficial** impacts on benthic resources due to the artificial reef effect (habitat conversion) *Cumulative Impacts of the No Action Alternative:* BOEM expects the combination of ongoing activities and reasonably foreseeable activities other than offshore wind to result in **moderate** impacts on benthic resources, primarily driven by ongoing dredging and fishing activities. BOEM	*Proposed Action*: BOEM anticipates the impacts resulting from the Proposed Action alone would range from **negligible** to **moderate**. Therefore, BOEM expects the overall impact on benthic resources from the Proposed Action and ongoing activities to be **moderate**, as the overall effect would be notable, but the resource would be expected to recover completely without remedial or mitigating action. Additionally, **minor beneficial** impacts may result due to the artificial reef effect (habitat conversion to hard bottom). *Cumulative Impacts of the Proposed Action:* In the context of other reasonably foreseeable environmental trends and planned actions, the	*Alternative C-1*: Impacts resulting from the relocation of the 8 WTGs would be **minor**, but in the context of the overall offshore wind development planned in this region, incremental decreases in impacts may have **minor beneficial** impacts to the OCS habitat overall. BOEM expects the overall impact on benthic resources to be similar to the Proposed Action, **moderate** adverse. *Cumulative Impacts of Alternative C-1*: Considering all the IPFs together, BOEM anticipates that the overall impacts associated with Alternative C-1 and future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable	*Alternative C-2*: Impacts resulting from the relocation of the 8 WTGs would be **minor**, but in the context of the overall offshore wind development planned in this region, incremental decreases in impacts may have **minor beneficial** impacts to the OCS habitat overall. BOEM expects the overall impact on benthic resources to be similar to the Proposed Action, **moderate** adverse. *Cumulative Impacts of Alternative C-2*: Considering all the IPFs together, BOEM anticipates that the overall impacts associated with Alternative C-2 and future offshore wind activities in the GAA combined with ongoing activities,

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	anticipates that the overall impacts associated with future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in **moderate** adverse impacts and could potentially include **moderate beneficial** impacts on benthic resources due to the artificial reef effect (habitat conversion).	incremental impacts under the Proposed Action resulting from individual IPFs would range from negligible to moderate, depending on the species and habitat component. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action and future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities would result in **moderate** adverse impacts and could potentially include **moderate beneficial** impacts on benthic resources due to the artificial reef effect (habitat conversion).	environmental trends, and reasonably foreseeable activities would result in **moderate** adverse impacts and could potentially include **moderate beneficial** impacts on benthic resources due to the artificial reef effect (habitat conversion).	reasonably foreseeable environmental trends, and reasonably foreseeable activities would result in **moderate** adverse impacts and could potentially include **moderate beneficial** impacts on benthic resources due to the artificial reef effect (habitat conversion).
Birds	*No Action Alternative*: The IPFs associated with existing and ongoing projects are not expected to significantly alter bird populations. BOEM anticipates that impacts to birds due to ongoing activities associated with the No Action Alternative would include **minor** adverse impacts as well as the	*Proposed Action*: BOEM anticipates adverse impacts resulting from the Proposed Action alone would range from **negligible** to **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the presence of structures and underwater armoring. Overall, impacts to individual birds and/or their	*Alternative C-1*: The conclusions for impacts of Alternative C-1 are the same as described under the Proposed Action. BOEM anticipates adverse impacts resulting from Alternative C-1 would range from **negligible** to **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the	*Alternative C-2*: The conclusions for impacts of Alternative C-2 are the same as described under the Proposed Action. BOEM anticipates adverse impacts resulting from Alternative C-2 would range from **negligible** to **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	potential for **minor beneficial** impacts. *Cumulative Impacts of the No Action Alternative:* BOEM anticipates that the overall impacts associated with offshore wind activities in the GAA under the No Action Alternative would result in long-term **moderate** adverse impacts but could potentially include **minor beneficial** impacts because of the presence of structures.	habitat would be detectable and measurable but would not lead to long-term or population-level effects. *Cumulative Impacts of the Proposed Action:* In the context of existing conditions other reasonably foreseeable planned actions, the incremental impacts from the Proposed Action resulting from individual IPFs would range from **negligible** to **moderate** depending on the species depending on habitat or seasonal uses that vary by species. When combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and offshore wind activities would result in **moderate adverse** impacts to birds because those impacts that are detectable and measurable would not lead to long-term or population-level effects. Potential **minor beneficial** impacts may result from the presence of structures.	presence of structures and underwater armoring. *Cumulative Impacts of Alternative C-1*: The conclusions for cumulative impacts of Alternative C-1 are the same as described under the Proposed Action. Combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and offshore wind activities, the Alternative C-1 would result in **moderate** adverse and potential **minor beneficial** impacts to birds.	presence of structures and underwater armoring. *Cumulative Impacts of Alternative C-2*: The conclusions for cumulative impacts of Alternative C-2 are the same as described under the Proposed Action. Combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and offshore wind activities, the Alternative C-2 would result in **moderate** adverse and potential **minor beneficial** impacts to birds.

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
Coastal Habitat and Fauna	*No Action Alternative*: The impacts of ongoing activities, especially land disturbance due to development, would be potentially **moderate**. The combined impacts of ongoing activities and planned actions other than offshore wind are expected to result in **moderate** impacts on coastal habitats. *Cumulative Impacts of the No Action Alternative:* Considering the combined effects of IPFs on coastal habitats and fauna, the overall impacts associated with future offshore wind activities, combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable planned actions other than offshore wind would include both **minor** and **moderate** impacts	*Proposed Action*: Overall impacts to coastal habitats and fauna from the Proposed Action would be **negligible** to **minor** as a result of the loss of individuals and disturbance to habitats for the duration of Project construction but no population level impacts to fauna and no permanent loss of habitat is expected. *Cumulative Impacts of the Proposed Action:* The overall impacts associated with the Proposed Action in combination with future offshore wind activities, ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable planned actions other than offshore wind would include both **minor** and **moderate** impacts. Land disturbance is expected to continue to have the greatest impact on the condition of coastal habitats and fauna in the geographic area of analysis.	*Alternative C-1*: None of the components under Alternative C-1 would alter the proposed onshore activities and facilities, O&M, or conceptual decommissioning described for the Proposed Action. Therefore, impacts to coastal habitats and fauna, including ESA-listed species, from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action, **negligible** to **minor.** *Cumulative Impacts of Alternative C-1*: Cumulative impacts to coastal habitats and fauna under Alternative C-1 would be the same as those described for the cumulative Proposed Action impacts, **minor** and **moderate** impacts.	*Alternative C-2*: None of the components under Alternative C-2 would alter the proposed onshore activities and facilities, O&M, or conceptual decommissioning described for the Proposed Action. Therefore, impacts to coastal habitats and fauna, including ESA-listed species, from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action, **negligible** to **minor.** *Cumulative Impacts of Alternative C-2*: Cumulative impacts to coastal habitats and fauna under Alternative C-2 would be the same as those described for the cumulative Proposed Action impacts, **minor** and **moderate** impacts.

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
Finfish, Invertebrates, and Essential Fish habitat	*No Action Alternative*: Under the No Action alternative, finfish, invertebrates, and EFH would likely continue to be affected by existing environmental trends in the region. Ongoing activities are expected to have continuing short-term and permanent impacts (disturbance, displacement, injury, mortality, and habitat conversion) on finfish, invertebrates, and EFH. Continuation of existing environmental trends and activities under the No Action Alternative would result in **minor** to **moderate** impacts on finfish, invertebrates, and EFH. *Cumulative Impacts of the No Action Alternative:* Aside from renewable energy construction activities, the trend of commercial fishing pressures and climate change would continue to be a **moderate** threat to fish, invertebrates, and EFH. Reasonably foreseeable activities and their impacts on fish, invertebrates and EFH are anticipated to be **minor** to **moderate.** These activities include increased vessel traffic,	*Proposed Action*: BOEM anticipates construction and installation, O&M, and conceptual decommissioning of the Proposed Action would have **negligible** to **moderate** impacts on finfish, invertebrates and EFH. The primary risks would be associated with cable installation, and noise from construction, most prominently associated with pile-driving activities Entrainment estimates for egg and larval species regarding the OCS-DC are anticipated to be **minor** as demonstrated by the calculated equivalent adult losses. *Cumulative Impacts of the Proposed Action:* BOEM anticipates that the cumulative impacts on finfish, invertebrates and EFH in the GAA would be **negligible** to **moderate**. Considering all IPFs together, BOEM anticipates that the overall impacts on finfish, invertebrates, and EFH in the GAA associated with the Proposed Action when combined with the impacts from ongoing and planned activities	*Alternative C-1*: Alternative C-1 could potentially result in reduced overall impacts on finfish, invertebrates, and EFH due to the change in layout aimed to reduce the amount of WTGs located in the presumed Atlantic Cod spawning locations. Overall, the potential impacts associated from the Alternative C-1 are anticipated to be **negligible** to **minor.** *Cumulative Impacts of Alternative C-1*: The cumulative impacts on finfish, invertebrates and EFH from Alternatives C-1 would likely be **negligible** to **minor** due to a reduced impact on finfish, invertebrates and EFH given that the WTGs would be removed from prioritized contiguous areas of complex habitat to be excluded from development to avoid and minimize impacts to complex fisheries habitats, while still meeting BOEM's purpose and need for the Project.	*Alternative C-2*: Alternative C-2 could potentially result in reduced overall impacts on finfish, invertebrates, and EFH due to the change in layout aimed to reduce the number of WTGs located in the presumed Atlantic Cod spawning locations and complex bottom habitat areas. Overall, the potential impacts associated from the Alternative C-2 are anticipated to be **negligible** to **minor.** *Cumulative Impacts of Alternative C-2*: The cumulative impacts on finfish, invertebrates and EFH from Alternatives C-2 would likely be **negligible** to **minor** due to a reduced impact on finfish, invertebrates and EFH given that the WTGs would be removed from prioritized contiguous areas of complex habitat to be excluded from development to avoid and minimize impacts to complex fisheries habitats, while still meeting BOEM's purpose and need for the Project.

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	any new submarine cable installations or pipelines, onshore construction activities, marine survey or explorations, mineral extractions, port expansions, channel dredging activities, and the installation of any new offshore structures, buoys, or piers.	including offshore wind would be **negligible** to **moderate**.		
Marine mammals	*No Action Alternative*: BOEM anticipates that the marine mammal impacts due to ongoing activities associated with the No Action Alternative of ongoing activities would be **negligible** to **moderate** adverse and **minor beneficial**. *Cumulative Impacts of the No Action Alternative:* Under the No Action Alternative, existing environmental trends and ongoing activities, and marine mammals would continue to be affected by natural and human-caused IPFs. Planned activities would also contribute to impacts to marine mammals. BOEM anticipates that the overall impacts associated Alternative A, the No Action Alternative, when combined with	*Proposed Action*: BOEM anticipates the adverse impacts resulting from the Proposed Action alone would range from **negligible** to **moderate,** with long-term **minor beneficial** impacts from increase prey availability. Adverse impacts are expected to result mainly from pile-driving noise and increased vessel traffic. Therefore, BOEM expects the overall impact on marine mammals from the Proposed Action alone to be **moderate**, as the overall Impacts on individuals and/or their habitat could have population-level effects, but the population can sufficiently recover from the impacts or enough habitat still is functional to maintain the viability of the	*Alternative C-1*: Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for marine mammals. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the Proposed Action, **negligible** to **moderate adverse impacts,** with long-term **minor beneficial** impacts from increase prey availability. *Cumulative Impacts of Alternative C-1*: Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for marine mammals. Therefore, the conclusions for impacts and cumulative impacts of	*Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for marine mammals. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the Proposed Action, **negligible** to **moderate adverse impacts,** with long-term **minor beneficial** impacts from increase prey availability. *Cumulative Impacts of Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for marine mammals. Therefore, the conclusions for impacts and cumulative impacts of

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	all other planned activities (including offshore wind) in the GAA would result in overall **moderate** adverse impacts.	species both locally and throughout their range. *Cumulative Impacts of the Proposed Action:* In the context of other reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual IPFs would range from **negligible** to **moderate**, depending on the species, and may potentially include **minor beneficial** impacts. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **moderate** impacts to marine mammals.	Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action.	Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action.
Sea turtles	*No Action Alternative*: BOEM anticipates that the sea turtle impacts due to current environmental trends and ongoing activities associated with the No Action Alternative would be **negligible** to **moderate**	*Proposed Action*: BOEM anticipates the impacts resulting from the Proposed Action alone would range from **negligible** to **minor** adverse impacts and could include potentially **minor beneficial**	*Alternative C-1*: Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and	*Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	adverse with the potential for **minor beneficial** impacts. *Cumulative Impacts of the No Action Alternative:* Under the No Action Alternative, existing environmental trends and ongoing activities, natural and human-caused IPFs would continue to affect sea turtles. BOEM anticipates that the overall impacts associated Alternative A, the No Action Alternative, when combined with all other planned activities (including offshore wind) in the GAA would result in overall **moderate** adverse and **minor beneficial** impacts.	impacts. Adverse impacts are expected to result mainly from pile-driving noise and increased vessel traffic. Beneficial impacts are expected to result from the presence of structures. *Cumulative Impacts of the Proposed Action:* Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **moderate** adverse impacts to sea turtles and could include potentially **minor beneficial** impacts. The main drivers for impact ratings are pile-driving noise and associated potential for auditory injury, the presence of structures, ongoing climate change, and ongoing vessel traffic posing a risk of collision.	cumulative impacts of Alternative C-1 are the same as described under the Proposed Action. *Cumulative Impacts of Alternative C-1*: Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action.	cumulative impacts of Alternative C-2 are the same as described under the Proposed Action. *Cumulative Impacts of Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the cumulative impacts of the Proposed Action.
Wetlands and WOTUS	*No Action Alternative*: BOEM anticipates that the impact on wetlands resulting from ongoing activities associated with the No Action Alternative would be **moderate**.	*Proposed Action*: BOEM expects the impacts resulting for the Proposed Action alone would likely have **negligible** to **minor** impact on wetlands and other WOTUS.	*Alternative C-1*: Because changes in the WTGs arrangement would not impact onshore wetlands and other WOTUS, BOEM expects that the impacts resulting from Alternative C-1 alone would be	*Alternative C-2*: Since changes in the WTGs arrangement would not impact onshore wetlands and other WOTUS, BOEM expects that the impacts resulting from Alternative C-2 alone would be

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	Cumulative Impacts of the No Action Alternative: BOEM anticipates that the overall impacts associated with Alternative A, the No Action Alternative, when combined with all other planned activities (including offshore wind) in the GAA would result in overall **moderate** impacts.	*Cumulative Impacts of the Proposed Action:* Considering all the IPFs together, BOEM expects that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **moderate** impacts to wetlands and other WOTUS..	the same as the Proposed Action: **negligible** to **minor**. *Cumulative Impacts of Alternative C-1*: Considering all the IPFs together, the overall impacts of the alternatives when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action and result in **moderate** impacts to wetlands and other WOTUS.	the same as the Proposed Action: **negligible** to **minor**. *Cumulative Impacts of Alternative C-2*: Considering all the IPFs together, the overall impacts of the alternatives when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action and result in **moderate** impacts to wetlands and other WOTUS.
Commercial fisheries and for-hire recreation fishing	*No Action Alternative*: BOEM anticipates that the impacts of ongoing activities on commercial fisheries and for-hire recreational fishing would be **minor** to **major**. The major impact rating for some fisheries and fishing operations is primarily driven by regulated fishing effort and climate change associated with ongoing activities. *Cumulative Impacts of the No Action Alternative:* BOEM anticipates that the cumulative impact of the No Action Alternative would result in	*Proposed Action*: In the event that these specific fishing operations are unable to find suitable alternative fishing locations, they could experience long-term, **major** disruptions. However, it is estimated that the majority of vessels would only have to adjust somewhat to account for disruptions due to impacts. The impacts of the Proposed Action could include long-term, **minor beneficial** impacts for some for-hire recreational fishing operations due to the artificial reef effect. Therefore, BOEM expects that the impacts resulting from the Proposed Action would be range	*Alternative C-1*: The impacts to commercial fishing and for-hire recreational fishing would be expected to be similar to those discussed under Alternative B; however, slightly less due to the habitat minimization layout. BOEM expects that the impacts resulting from Alternative C-1 would range from **minor** to **major**, depending on the fishery and fishing operation, with the overall impact on commercial fisheries and for-hire recreational fishing being **moderate**.	*Alternative C-2*: The impacts resulting from individual IPFs associated with Alterative C-2 would be similar to, but slightly less adverse than those described under Alternative C-1 (as well as Alternative B). The overall impact magnitudes under Alternative C-2 are anticipated to range from **minor** to **major**, depending on the fishery and fishing operation, with the overall impact on commercial fisheries and for-hire recreational fishing being **moderate**. Although impacts related to Alternative C-2 are anticipated to be slightly less

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	a **moderate** to **major** adverse impact on commercial fisheries and **minor** to **moderate** adverse impacts on for-hire recreational fishing. This impact rating would primarily result from future fisheries use and management, the increased presence of offshore structures and climate change.	from **minor** to **major**, depending on the fishery and fishing operation, with the overall impact on commercial fisheries and for-hire recreational fishing being **moderate**. *Cumulative Impacts of the Proposed Action:* In the context of reasonably foreseeable environmental trends in the area, the contribution of the Proposed Action to the impacts of individual IPFs resulting from ongoing and planned activities would range from **minor** to **moderate**. Considering all the IPFs together, BOEM anticipates that the contribution of the Proposed Action to the impacts from ongoing and planned activities would result in **major** impacts on commercial fisheries and for-hire recreational fishing because some commercial and for-hire recreational fisheries and fishing operations would experience substantial disruptions indefinitely, even with APMs.	*Cumulative Impacts of Alternative C-1*: In context of reasonably foreseeable environmental trends in the area, the contribution of Alternative C-1 to the impacts of individual IPFs resulting from ongoing and planned activities would range from **minor** to **moderate**. Considering all the IPFs together, BOEM anticipates that the contribution of Alternative C-1 to the impacts from ongoing and planned activities would result in **major** impacts on commercial fisheries and for-hire recreational fishing because some commercial and for-hire recreational fisheries and fishing operations would experience substantial disruptions indefinitely, even with APMs.	adverse than Alternative B or C-1. *Cumulative Impacts of Alternative C-2*: Impacts related to Alternative C-2 combined with ongoing and planned activities would result in similar, but slightly less adverse impacts than as described in the Proposed Action (and Alternative C-1), which would range from **minor** to **moderate**. Considering all the IPFs together, BOEM anticipates that the contribution of Alternative C-2 to the impacts from ongoing and planned activities would result in **major** impacts on commercial fisheries and for-hire recreational fishing because some commercial and for-hire recreational fisheries and fishing operations would experience substantial disruptions indefinitely, even with APMs.

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
Cultural resources	*No Action Alternative*: The primary source of onshore impacts from ongoing activities would include ground-disturbing activities and the introduction of intrusive visual elements, while the primary source of offshore impacts or those activities that disturb the seafloor, such as anchoring, new cable emplacement, and installation/presence of structures. BOEM anticipates that the cultural resource impacts as a result of ongoing activities associated with the Alternative A - No Action of ongoing activities would be **negligible** to **major**. *Cumulative Impacts of the No Action Alternative:* BOEM anticipates that the overall impacts associated with the No Action Alternative when combined with all other planned activities (including offshore wind) in the GAA would result in overall **negligible** to **major** impacts on individual onshore and offshore cultural resources depending on the scale and extent of impacts and the unique	*Proposed Action*: Based on the preceding IPF analysis, BOEM has determined that the Proposed Action would likely result in **negligible to major** impacts on cultural resources. The Proposed Action would still result in adverse visual effects on above ground historic properties and adverse physical effects to ancient submerged landform feature historic properties which would require mitigation to resolve those adverse effects. Therefore, the overall impacts on historic properties from the Proposed Action would qualify as **major** as it would result in adverse effects on historic properties, as defined at 36 CFR 800.5(a)(1), that would require mitigation to resolve. Considering all the IPFs together, BOEM anticipates that the cumulative impacts on cultural resources from the Proposed Action and the reasonably foreseeable offshore wind projects would range from **negligible** to **major** due to the long-term or permanent and irreversible impacts on 47	*Alternative C-1*: Alternative C-1 would result in the same **negligible** to **major** impacts on marine and terrestrial cultural resources as the Proposed Action. *Cumulative Impacts of Alternative C-1*: Alternative C-1 would result in the same **negligible** to **major** impacts and **negligible to minor beneficial** impacts on marine and terrestrial cultural resources as the cumulative impacts of the Proposed Action.	*Alternative C-2*: Alternative C-2 would result in the same negligible to major impacts on marine and terrestrial cultural resources as the Proposed Action. *Cumulative Impacts of Alternative C-2*: Alternative C-2 would result in the same **negligible** to **major** impacts and **negligible to minor beneficial** impacts on marine and terrestrial cultural resources as the cumulative impacts of the Proposed Action.

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	characteristics of individual resources. The construction and operation of reasonably foreseeable offshore wind projects would also have **negligible** to **minor beneficial** impacts on individual onshore and offshore cultural resources as these projects would make incremental contributions to arresting the pace of global warming and climate change and associated impacts on cultural resources from sea level rise, increased storm severity/frequency, and increased erosion/deposition of sediments.	NRHP-listed/eligible historic above ground properties *Cumulative Impacts of the Proposed Action:* Construction impacts from the Proposed Action and reasonably foreseeable offshore wind projects could result in cumulative **negligible to major** negative impacts and **negligible to minor beneficial** impacts on cultural resources. Impacts from operations and maintenance activities from the Proposed Action and reasonably foreseeable offshore wind projects could result in cumulative **moderate** to **major** impacts to marine resources.		
Demographics, employment, and economics	*No Action Alternative*: BOEM anticipates that ongoing activities in the GAA (continued commercial shipping and commercial fishing; ongoing port maintenance and upgrades; periodic channel dredging; maintenance of piers, pilings, seawalls, and buoys; and the use of small-scale, onshore renewable energy) would have **minor adverse** and **minor beneficial** impacts on	*Proposed Action*: BOEM anticipates that the Proposed Action would have **negligible** impacts on demographics within the analysis area. Short-term increases in noise during construction, cable emplacement, land disturbance, and the long-term presence of offshore lighting and structures would have **negligible** to **minor** adverse impacts on	*Alternative C-1*: The impacts resulting from individual IPFs associated with Alterative C-1 would result in no change to the overall impact magnitudes to demographics, employment and economics as compared to the Proposed Action. These are anticipated to range from **negligible** to **minor** adverse impacts and **negligible** to **minor beneficial** impacts on	*Alternative C-2*: The impacts resulting from individual IPFs associated with Alterative C-2 would be the same as Alternative C-1. The overall impact magnitudes under Alternative C-2 are anticipated to range from **negligible** to **minor** adverse impacts and **negligible** to **minor beneficial** impacts on

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	demographics, employment, and economics. *Cumulative Impacts of the No Action Alternative:* BOEM anticipates that the No Action Alternative, when combined with all planned activities (including other offshore wind activities), would result in **minor adverse** and **moderate beneficial** impacts due primarily to the impacts on commercial fishing and for-hire recreational fishing businesses and marine recreational businesses (tour boats, marine suppliers) primarily through cable emplacement, noise and vessel traffic during construction, and the presence of offshore structures during operations.	demographics, employment, and economics. The impacts on commercial fishing and onshore seafood businesses would have **minor** impacts on demographics, employment, and economics for this component of the GAA's economy. The IPFs associated with the Proposed Action would also result in impacts on certain recreation and tourism businesses that range from **negligible** to **minor**, with an overall **minor** impact on employment and economic activity for this component of the analysis area's economy. *Cumulative Impacts of the Proposed Action:* Overall, BOEM anticipates that the Proposed Action and ongoing and planned activities would result in **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment, and economics in the GAA. The **moderate beneficial** impacts primarily would be associated with the investment in offshore wind, job creation and workforce development, income	demographics, employment, and economics. *Cumulative Impacts of Alternative C-1*: Overall, Alternative C-1 combined with ongoing and planned activities would result in the same impacts as described in the Proposed Action, which include **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment and economics in the GAA.	demographics, employment, and economics. *Cumulative Impacts of Alternative C-2*: Impacts related to Alternative C-2 combined with ongoing and planned activities would result in the same impacts as described in the Proposed Action (and Alternative C-1), which include **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment and economics in the GAA.

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
		and tax revenue, and infrastructure (i.e., ports, etc.) improvements, while the **minor** adverse effects would result from aviation hazard lighting on WTGs, new cable emplacement and maintenance, the presence of structures, vessel traffic and collisions during construction, and land disturbance.		
Environmental justice	*No Action Alternative*: BOEM anticipates that the EJ impacts as a result of ongoing activities associated with the Alternative A - No Action of these ongoing activities would be **minor** to **moderate** adverse to **minor beneficial**. *Cumulative Impacts of the No Action Alternative:* Considering all the IPFs, BOEM anticipates that the overall impacts associated with future offshore wind activities in the GAA combined with ongoing activities and reasonably foreseeable activities other than offshore wind would result in overall **minor** to **moderate**. BOEM also anticipates that the impacts associated with future offshore wind activities in the	*Proposed Action*: BOEM anticipates that the impacts of individual IPFs from the Proposed Action alone would be **negligible** to **moderate** on EJ populations within the GAA. Considering the combined impacts of all IPFs, BOEM anticipates that the Proposed Action would have overall **negligible** to **moderate** impacts on all EJ populations. In addition, **negligible** to **minor beneficial** effects to EJ populations may result from reductions in air emissions if offshore wind displaces energy generation using fossil fuels, as well as beneficial effects from economic activity and job creation.	*Alternative C-1*: The impacts resulting from individual IPFs associated with Alterative C-1 would be the same for both offshore activities and facilities and onshore activities and facilities. Therefore, the overall impact magnitudes to EJ populations would be impacted to the same degree when compared to the Proposed Action. These are anticipated to range from **negligible** to **moderate** adverse impacts and **negligible** to **minor beneficial** impacts on EJ populations.	*Alternative C-2*: The impacts resulting from individual IPFs associated with Alterative C-2 would be essentially the same the Proposed Action for both offshore activities and facilities and onshore activities and facilities. Therefore, the overall impact magnitudes to EJ populations would be impacted to the same degree when compared to the Proposed Action and Alternative C-1. These are anticipated to range from **negligible** to **moderate** adverse impacts and **negligible** to **minor beneficial** impacts on EJ populations.

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	GAA would result in **minor beneficial** effects on minority and low-income populations through economic activity and job creation.	*Cumulative Impacts of the Proposed Action:* The Proposed Action in combination with other offshore wind energy projects would result in a greater number of offshore structures affecting larger offshore areas, and additional onshore construction and port utilization within the GAA. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined impacts on EJ populations from ongoing and planned activities, which are anticipated to be **moderate** overall. Additionally, **negligible** to **minor beneficial** impacts may result from reductions in air emissions, as well as beneficial effects from economic activity and job creation.	*Cumulative Impacts of Alternative C-1*: Overall, Alternative C-1 combined with ongoing and planned activities would result in the same impacts as described in the Proposed Action, which include **negligible** to **moderate** adverse impacts and **negligible** to **minor beneficial** impacts on EJ populations in the GAA.	*Cumulative Impacts of Alternative C-2*: Overall, Alternative C-2 combined with ongoing and planned activities would result in the same impacts as described in the Proposed Action and Alternative C-1, which include **negligible** to **moderate** adverse impacts and **negligible** to **minor beneficial** impacts on EJ populations in the GAA.
Land use and coastal infrastructure	*No Action Alternative*: The No Action Alternative would result in **minor beneficial** and **minor adverse** impacts on land use and coastal infrastructure. The identified IPFs relevant to land use and coastal	*Proposed Action*: BOEM anticipates that impacts on land use and coastal infrastructure from the Proposed Action would range from **negligible** to **moderate**	*Alternative C-1*: BOEM expects that the impacts from Alternative C-1 to land use and coastal infrastructure would be similar to the Proposed Action, and impacts would range from	*Alternative C-2*: BOEM expects that the impacts from Alternative C-2 to land use and coastal infrastructure would be similar to the Proposed Action, and impacts would range from

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	infrastructure from ongoing non-offshore wind and offshore wind activities include accidental releases and discharges, lighting, land disturbance, presence of structures, noise, traffic, and port utilization. *Cumulative Impacts of the No Action Alternative:* BOEM anticipates that the cumulative impacts of the No Action Alternative would be both **minor beneficial** and **minor adverse** in the GAA. There are potential adverse impacts from future offshore wind to land use and coastal infrastructure through accidental releases and discharges during onshore construction, land disturbance during installation of onshore cables and substations, the presence of WTGs on the viewshed, nighttime lighting on WTGs and from onshore construction, and the presence of other structures. Potential beneficial impacts to land use and coastal infrastructure would result from the expansion and productive utilization of ports and associated infrastructure that would be utilized for future offshore wind activity.	adverse impacts with **minor beneficial** impacts. *Cumulative Impacts of the Proposed Action:* Considering all the IPFs together, BOEM anticipates that the contribution of the Proposed Action to the impacts associated with ongoing and planned activities would result in **negligible** to **moderate** adverse impacts and **minor beneficial** impacts on land use and coastal infrastructure in the GAA.	**negligible** to **moderate** adverse impacts to **minor beneficial** impacts. *Cumulative Impacts of Alternative C-1*: In context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to the cumulative impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the Proposed Action. Impacts are expected to range from **negligible** to **moderate** adverse impacts for onshore land use and coastal infrastructure and **minor beneficial** impacts.	**negligible** to **moderate** adverse impacts to **minor beneficial** impacts. *Cumulative Impacts of Alternative C-2*: In context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the Proposed Action. Impacts are expected to range from **negligible** to **moderate** adverse impacts for onshore land use and infrastructure and **minor beneficial** impacts.

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
Navigation and vessel traffic	*No Action Alternative*: Continuation of existing environmental trends and activities under the No Action Alternative would result in **negligible** to **moderate** impacts on navigation and vessel traffic. *Cumulative Impacts of the No Action Alternative:* Considering all the IPFs together, BOEM anticipates that the impacts associated with future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in **moderate** adverse impacts because the overall effect would be notable but vessels could adjust to account for disruptions and EPMs would reduce impacts	*Proposed Action*: BOEM anticipates that the impacts resulting from the Proposed Action would be **negligible** to **moderate**. Therefore, BOEM expects the overall impact on navigation from the Proposed Action and ongoing activities to be **moderate**, as the change in navigation and safety risk would be small. *Cumulative Impacts of the Proposed Action:* In the context of reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual IPFs would be **moderate**. The main IPF is the presence of structures, which could alter navigation patterns as large vessels would likely navigate around the Project.	*Alternative C-1*: BOEM anticipates that the impacts resulting from the Proposed Action would be **negligible** to **moderate**. Therefore, BOEM expects the overall impact on navigation and vessel traffic from Alternative C-1 to be **negligible** to **moderate**, as the change in navigation and safety risk would be small. *Cumulative Impacts of Alternative C-1*: In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to navigation and vessel traffic impacts from ongoing and future activities would be **moderate** and the same as the Proposed Action.	*Alternative C-2*: BOEM anticipates that the impacts resulting from the Proposed Action would be **negligible** to **moderate**. Therefore, BOEM expects the overall impact on navigation and vessel traffic from Alternative C-2 to be **negligible** to **moderate**, as the change in navigation and safety risk would be small. *Cumulative Impacts of Alternative C-2*: In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to navigation and vessel traffic impacts from ongoing and future activities would be **moderate** and the same as the Proposed Action.
Other marine uses	*No Action Alternative*: BOEM Anticipates the No Action Alternative would be **negligible** for marine mineral extraction, marine and national security uses, aviation and air traffic,	*Proposed Action*: BOEM anticipates that the contribution of the Proposed Action to the impacts of individuals IPFs resulting from	*Alternative C-1*: The overall level of impact would remain similar to the Proposed Action. The impacts of Alternative C-1 resulting from individual IPFs would be **negligible** for marine	*Alternative C-2*: The overall level of impact would remain similar to the Proposed Action, and the impacts of each alternative alone resulting from individual

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	cables and pipelines, and radar systems. Military and national security use, aviation and air traffic, vessel traffic, commercial fishing, and scientific research and surveys are expected to continue in the GAA. Impacts of ongoing non-offshore and offshore wind activities on scientific research surveys are anticipated to be **major** due to the impacts of ongoing offshore wind activities. *Cumulative Impacts of the No Action Alternative:* BOEM anticipates that the overall impacts associated with Alternative A, the no action alternative, when combined with all other planned activities (including offshore wind) in the GAA would result in overall **moderate** adverse impacts. The impacts would be **negligible** to **minor** adverse impacts for most uses, for marine mineral extraction, aviation and air traffic, and cables and pipelines; **moderate** for radar system due to WTG interference; **minor** for military and national security uses except for USCG SAR operations, which would have	ongoing activities would range from **negligible** to **major**. *Cumulative Impacts of the Proposed Action:* Considering all IPFs together, BOEM anticipates that the cumulative impacts associated with the Proposed Action when combined with ongoing and planned activities would range from **negligible** to **minor** for aviation and air traffic, cables and pipelines, marine mineral extraction, radar systems, and most military and national security uses; **moderate** for radar systems; and **major** for USCG SAR operations and scientific research and surveys.	mineral extraction, cables and pipelines; **minor** for aviation and air traffic, most military and national security uses, and radar systems; **moderate** for USCS SAR operations; and **major** for scientific research and surveys. *Cumulative Impacts of Alternative C-1*: In context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to the individual IPFs resulting from ongoing and planned activities would be similar to that of the cumulative impacts of the Proposed Action. The impacts would range from **negligible** to **minor** for aviation and air traffic, cables and pipelines, marine mineral extraction, and most military and national security uses; **moderate** for radar systems; and **major** for USCG SAR operations and scientific research and surveys.	IPFs associated with these alternatives would be **negligible** for marine mineral extraction, cables and pipelines; **minor** for aviation and air traffic, military and national security uses, and radar systems; **moderate** for USCG SAR operations; and **major** for scientific research and surveys. *Cumulative Impacts of Alternative C-2*: In context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to the individual IPFs resulting from ongoing and planned activities would be similar to that of the cumulative impacts of the Proposed Action. The impacts would range from **negligible** to **minor** for aviation and air traffic, cables and pipelines, marine mineral extraction, and most military and national security uses; **moderate** for radar systems; and **major** for USCG SAR operations and scientific research and surveys.

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	major adverse impacts; and **major** for scientific research and surveys.			
Recreation and tourism	*No Action Alternative*: The No Action Alternative would result in **negligible** to **moderate** adverse and **minor beneficial** impacts. Recreation and tourism in the GAA would continue to be affected by ongoing activities, including vessel traffic, noise and trenching from periodic maintenance or installation of coastal and nearshore infrastructure, and onshore development activities. *Cumulative Impacts of the No Action Alternative:* BOEM anticipates that the cumulative impacts of the No Action Alternative would likely be **negligible** to **moderate** adverse and **minor beneficial**. The impacts associated with future offshore wind activities in the analysis area, considered with other reasonably foreseeable activities, current activities, and environmental trends, would be **negligible** to **moderate** adverse effects if no	*Proposed Action*: BOEM anticipates the construction, operation and maintenance, and conceptual decommissioning of the Proposed Action would have **negligible** to **moderate** adverse and **minor beneficial** impacts to recreation and tourism. The impacts of O&M activities associated with the Proposed Alternative would range from **negligible** to **moderate** adverse and **minor** beneficial impacts to recreation and tourism. The overall effect of the Proposed Action on recreation and tourism would be expected to be **negligible** to **moderate** adverse and **minor** beneficial impacts, as recreation and tourism activities are expected to continue with most impacts being avoided with APMs in place.	*Alternative C-1*: BOEM expects that the impacts from Alternative C-1 to recreation and tourism would be similar, but potentially less, to the Proposed Action. All other impacts are anticipated to be similar to those described under the Proposed Action and would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts. *Cumulative Impacts of Alternative C-1*: In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on recreation and tourism would be marginal. BOEM anticipates that the cumulative impacts of Alternative C-1 would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts. This impact	*Alternative C-2*: BOEM expects that the impacts from Alternative C-2 to recreation and tourism would be similar, but potentially less, to the Proposed Action. All other impacts are anticipated to be similar to those described under the Proposed Action and would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts. *Cumulative Impacts of Alternative C-2*: In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on recreation and tourism would be marginal. BOEM anticipates that the cumulative impacts of Alternative C-1 would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts. This impact

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	other offshore wind farms are authorized. Most of the adverse impacts could be avoided with APMs, but some impacts would only be minimized with APMs in place. If other offshore wind farms are authorized, BOEM would anticipate **negligible** to **moderate** adverse impacts to recreation and tourism with **minor** beneficial impacts.	*Cumulative Impacts of the Proposed Action:* BOEM anticipates that the cumulative impacts on recreation and tourism in the GAA would range from **negligible** to **moderate** adverse impacts and **minor** beneficial impacts. In the context of reasonably foreseeable environmental trends, the incremental impacts contributed by the Proposed Action would be marginal.	rating is driven by ongoing and planned activities as well as short-term and permanent disturbance associated with both onshore and offshore construction, O&M and decommissioning of the Alternative.	rating is driven by ongoing and planned activities as well as short-term and permanent disturbance associated with both onshore and offshore construction, O&M and decommissioning of the Alternative.
Scenic and Visual resources	*No Action Alternative*: The No Action Alternative would result in **minor** to **moderate** impacts on scenic and visual resources. Ongoing O&M of the Block Island project and construction of the Vineyard Wind 1 project and South Fork project would have impacts on a viewer's experience, as they change the expected environment and contrasts to the previous seascape, landscape, and open ocean environments.	*Proposed Action*: Under the Proposed Action, impacts of the SRWF to scenic and visual resources would be **negligible** to **major** adverse. The presence of offshore WTGs and OCS-DC would result in **moderate** to **major** adverse impacts to the seascape character and landscape character. Onshore structures would be located either underground or in previously developed areas, which would result in **negligible** impacts during O&M activities.	*Alternative C-1*: Under Alternative C-1, the seascape character units, ocean character unit, landscape character units, and viewer experience would have similar **negligible** to **major** adverse impacts to those of the Proposed Action. The negligible chances in distance of the WTGs would be unnoticeable to the casual viewer at the distance and impacts to scenic and visual resources would be similar.	*Alternative C-2*: Under Alternative C-2, the seascape character units, ocean character unit, landscape character units, and viewer experience would have similar **negligible** to **major** adverse impacts to those of the Proposed Action. The negligible chances in distance of the WTGs would be unnoticeable to the casual viewer at the distance and impacts to scenic and visual resources would be similar.

Resource	No Action	Proposed Action	Alternative C-1	Alternative C-2
	Cumulative Impacts of the No Action Alternative: The cumulative impacts of the No Action Alternative would result in **major** impacts on visual and scenic resources within the GAA due to the presence of new structures, nighttime lighting, land disturbance, and increased traffic.	*Cumulative Impacts of the Proposed Action:* BOEM anticipates that the cumulative impacts on scenic and visual resources in the GAA would be **negligible** to **major** adverse. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a detectable increment to the presence of structures, lighting, traffic, land disturbance, port utilization, and accidental releases. The Proposed Action would contribute to the cumulative impacts through changes in seascape character units, ocean character units, landscape character units, and viewer experience.	*Cumulative Impacts of Alternative C-1*: In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on scenic and visual resources would be detectable. However, the differences in impacts among the Proposed Action and Alternative C-1 would be negligible. BOEM anticipates that the cumulative impacts of Alternative C-1 would be **negligible** to **major** adverse.	*Cumulative Impacts of Alternative C-2*: In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 to the cumulative impacts on scenic and visual resources would be detectable. However, the differences in impacts among the Proposed Action and Alternative C-2 would be negligible. BOEM anticipates that the cumulative impacts of Alternative C-2 would be **negligible** to **major** adverse.

Chapter 3

Affected Environment and Environmental Consequences

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter analyzes the impacts of the proposed action and alternatives by establishing the existing baseline of affected resources; predicting the direct and indirect impacts; and then evaluating those impacts when added to the baseline and considered in the context of the reasonably foreseeable impacts of future planned activities. This chapter thus addresses the affected environment, also known as the existing baseline, for each resource area and the potential environmental consequences to those resources from implementation of the alternatives described in Chapter 2, Alternatives. In addition, this section addresses the impact of the alternatives when combined with other past, present, or reasonably foreseeable planned activities, i.e., cumulative impacts, using the methodology and assumptions outlined in Chapter 1, Introduction, and Appendix E, *Planned Activities Scenario*. Appendix E describes other ongoing and planned activities within the geographic analysis area for each resource. These actions may be occurring on the same time scale as the proposed Project or could occur later in time but are still reasonably foreseeable.

In accordance with Section 1502.21 of the CEQ regulations implementing NEPA, BOEM identified information that was incomplete or unavailable for the evaluation of reasonably foreseeable impacts analyzed in this chapter. The identification and assessment of incomplete or unavailable information is presented in Appendix F, Analysis of Incomplete or Unavailable Information.

Analysis Approach

The No Action Alternative is first analyzed to predict the impacts of the baseline (as described in Section 1.6.1), the status quo. A subsequent analysis is conducted to assess the cumulative impacts to baseline conditions as future planned activities occur (as described in Section 1.6.2). Separate impact conclusions are drawn based on these separate analyses. This Final EIS also conducts separate analyses to evaluate the impacts of the action alternatives when added to the baseline condition of resources (as described in Section 1.6.1) and to evaluate cumulative impacts by analyzing the incremental impacts of the action alternatives when added to both the baseline (as described in Section 1.6.1) and the impacts of future planned activities (as described in Section 1.6.2).

3.1 Impact-Producing Factors

BOEM has completed a study of impact-producing factors (IPF) on the North Atlantic OCS to consider in an offshore wind development planned activities scenario (BOEM 2019). That study is incorporated in this document by reference. The IPF study:

- Identifies cause-and-effect relationships between renewable energy projects and resources potentially affected by such projects.
- Classifies those relationships into IPFs through which renewable energy projects could affect resources.
- Identifies the types of actions and activities to be considered in a cumulative impacts scenario.

- Identifies actions and activities that may affect the same physical, biological, economic, or cultural resources as renewable energy projects and states that such actions and activities may have the same IPFs as offshore wind projects.

The BOEM (2019) study identified the relationships between IPFs associated with specific past, present, and reasonably foreseeable future actions in the North Atlantic OCS. BOEM determined the relevance of each IPF to each resource analyzed in this Draft EIS. If an IPF was not associated with the proposed Project, it was not included in the analysis. Table 3.1-1 provides a brief description of the primary IPFs considered in this analysis, including examples of sources and activities that result in each IPF. The IPFs cover all phases of the Project, including construction, O&M, and decommissioning. Appendix G, Impact-Producing Factor Tables, includes the IPF tables for each resource considered in this Draft EIS.

In addition to adverse effects, beneficial effects may accrue from the development of the proposed Project and renewable energy sources on the OCS in general. The study *Evaluating Benefits of Offshore Wind Energy Projects in NEPA* (BOEM 2017) examines this in depth. Benefits from the development of offshore wind energy projects can accrue in three primary areas: electricity system benefits, environmental benefits, and socioeconomic benefits, which are further examined throughout this chapter.

Table 3.1-1. Primary Impact-Producing Factors Used in this Analysis

IPF	Sources and Activities	Description
Accidental releases	Mobile sources (e.g., vessels) Installation and O&M of onshore or offshore stationary sources (e.g., renewable energy structures, transmission lines, cables)	Unanticipated release or spills into receiving waters of a fluid or other substance such as fuel, hazardous materials, suspended sediment, trash, or debris. Accidental releases are distinct from routine discharges, the latter typically consisting of authorized operational effluents controlled through treatment and monitoring systems and permit limitations.
Discharges	Vessels Structures Onshore point and non-point sources Dredged material ocean disposal Installation and O&M of submarine transmission lines, cables, and infrastructure	Generally, refers to routine permitted operational effluent discharges to receiving waters. There can be numerous types of vessel and structure discharges, such as bilge water, ballast water, deck drainage, gray water, fire suppression system test water, chain locker water, exhaust gas scrubber effluent, condensate, and seawater cooling system effluent, among others. These discharges are generally restricted to uncontaminated or properly treated effluents that may have best management practice or numeric pollutant concentration limitations imposed through U.S. EPA NPDES permits or USCG regulations.
Air emissions	Internal combustion engines (such as generators) aboard stationary sources or structures Internal combustion engines within mobile sources such as vessels, vehicles, or aircraft	Release of gaseous or particulate pollutants into the atmosphere. Releases can occur on- and offshore.
Anchoring	Anchoring of vessels Attachment of a structure to the sea bottom by use of an anchor, mooring, or gravity-based weighted structure	Anchors, anchor chain sweep, mooring, and the installation of bottom-founded structures can alter the seafloor.
Electric and magnetic fields	Substations Power transmission cables Inter-array cables Electricity generation	Power generation facilities and cables produce electric fields (proportional to the voltage) and magnetic fields (proportional to flow of electric current) around the power cables and generators. Three major factors determine levels of the magnetic and induced electric fields from offshore wind energy projects: (1) the amount of electrical current being generated or carried by the cable, (2) the design of the generator or cable, and (3) the distance of organisms from the generator or cable.

IPF	Sources and Activities	Description
Land disturbance	Onshore construction Onshore land use changes Erosion and sedimentation Vegetation clearance	Land disturbances for any onshore construction activities.
Lighting	Vessels or offshore structures above or under water Onshore infrastructure	Light presence above the water onshore and offshore as well as underwater associated with offshore wind development and activities that utilize offshore vessels.
Cable emplacement and maintenance	Dredging or trenching Cable placement Seabed profile alterations Sediment deposition and burial Mattress and rock placement	Disturbances associated with installing new offshore submarine cables on the seafloor, commonly associated with offshore wind energy.
Noise	Aircraft Vessels Turbines Geophysical (HRG surveys) and geotechnical surveys (drilling) O&M Vibratory and impact pile-driving Dredging and trenching UXO detonations	Noise from various sources. Commonly associated with construction activities, geophysical and geotechnical surveys, and vessel traffic. May be impulsive (e.g., pile-driving) or broad spectrum and continuous (e.g., from Project-associated marine transportation vessels). May be noise generated from turbines themselves or interactions of the turbines with wind and waves.
Port utilization	Expansion and construction Maintenance Use Revitalization	Effects associated with port activity, upgrades, or maintenance that occur only because of the Project. Includes activities related to port expansion and construction from increased economic activity and maintenance dredging or dredging to deepen channels for larger vessels.
Presence of structures	Onshore and offshores structures including towers and transmission cable infrastructure	Effects associated with onshore or offshore structures other than construction-related effects, including the following: Space-use conflicts Fish aggregation/dispersion Bird attraction/displacement Marine mammal attraction/displacement Sea turtle attraction/displacement Scour protection Allisions Entanglement Gear loss/damage Fishing effort displacement Habitat alteration (creation and destruction) Migration disturbances Navigation hazard Seabed alterations Turbine strikes (birds, bats)

IPF	Sources and Activities	Description
		Viewshed (physical, light) Microclimate and circulation effects Disruption or displacement of scientific surveys and impacts to radar systems (air traffic control, air space surveillance, weather, high-frequency ocean observation radar)
Traffic	Aircraft Vessels Vehicles	Marine and onshore vessel and vehicle congestion, including vessel strikes of sea turtles and marine mammals, collisions, and allisions.
Energy generation / security	Wind energy production	Generation of electricity and its provision of reliable energy sources as compared with other energy sources (energy security). Associated with renewable energy development operations.
Climate change	Emissions of greenhouse gases	Effects of climate change, such as warming and sea level rise, and increased storm severity or frequency. Ocean acidification refers to the effects associated with the decreasing pH of seawater from rising levels of atmospheric carbon dioxide
Gear utilization	Bottom trawls, bycatch/benthic disruption Ghost fishing, entanglement Midwater trawls, bycatch/overfishing Dredging	Refers to entanglement and benthic disruptions that may affect biota. Primarily associated with commercial and recreational fishing activities, but also may be associated with marine minerals extraction and military uses.

Source: BOEM 2019

3.2 Mitigation Identified for Analysis in the Environmental Impact Statement

During the development of the Draft EIS and in coordination with cooperating agencies, BOEM considered potential additional mitigation measures that could further avoid, minimize, or mitigate impacts on the physical, biological, socioeconomic, and cultural resources assessed in this document. These potential additional mitigation measures are described in Appendix H, *Mitigation and Monitoring*, and analyzed in the relevant resource sections in Chapter 3. BOEM may choose to incorporate one or more of these additional mitigation measures in the preferred alternative. In addition, other mitigation measures may be required through completion of consultations, authorizations, and permits with respect to several environmental statutes such as the MMPA, Section 7 of the ESA, or the Magnuson–Stevens Fishery Conservation and Management Act (MSA). Mitigation imposed through consultations will be included in the Final EIS. Those additional mitigation measures presented in Appendix H may not all be within BOEM's statutory and regulatory authority to require; however, other jurisdictional governmental agencies may potentially require them. BOEM may choose to incorporate one or more additional measures in the ROD and adopt those measures as conditions of COP approval. As previously discussed, all Sunrise Wind-committed measures are part of the Proposed Action (refer to Section 2.1 for details).

3.3 Definition of Impact Levels

This Draft EIS uses a four-level classification scheme to characterize potential beneficial and adverse impacts of alternatives, including the Proposed Action. Tables in each resource section in Chapter 3 identify adverse and beneficial impact levels definitions for all biological, physical, and socioeconomic resources that the proposed Project and alternatives could potentially affect. In addition, impacts are defined in terms of their duration. Short-term effects are effects that may extend beyond construction, potentially lasting for several months, but not several years or longer. An example would be clearing of onshore shrubland vegetation during construction; the area would be revegetated when construction is complete and, after revegetation is successful, this effect would end. Long-term effects are effects that last for a long period of time (e.g., decades or longer). An example would be the loss of habitat where a foundation was installed. Permanent effects have no expected end. An example would be the conversion of land to support new onshore facilities or the placement of scour protection that is not removed as part of decommissioning.

3.4 Physical Resources

3.4.1 Air Quality

This section examines the existing air quality conditions and the potential impacts on air quality from the Proposed Action, the alternatives, and future offshore wind farm development. The GAA (refer to Figure D-1 Appendix D) covers the airshed within 15.5 mi (24.1 km) of the onshore components and ports, the area within 3.45 miles (5.6 km) of state borders, the area within a 25 mi (40.2 km) radius around the Sunrise Wind Farm (SRWF), and the offshore export cable.

3.4.1.1 Description of the Affected Environment and Future Baseline Conditions

The air quality of a region is described in comparison to National Ambient Air Quality Standards (NAAQS) which are standards for criteria air pollutants established by the U.S. Environmental Protection Agency (USEPA) pursuant to the Clean Air Act (CAA) (42 United States Code [USC] 7409). The CAA identifies two types of NAAQS: (1) primary standards protect public health, including sensitive populations such as children, the elderly, and asthmatics; and (2) secondary standards protect public welfare, such as protecting against decreased visibility and damage to crops, animals, or buildings (USEPA 2021a). The criteria pollutants are carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), lead, particulate matter less than 2.5 microns ($PM_{2.5}$), and particulate matter less than 10 microns (PM_{10}). Ozone is a secondary pollutant produced in the atmosphere from reactions involving sunlight, nitrogen oxides (NO_X), and volatile organic compounds (VOCs); thus, ozone does not have direct emission sources. Pollutant emissions from the most recent USEPA National Emissions Inventory are provided in Table 3.4.1-1 (USEPA 2022a). Criteria pollutant emissions in all states in the GAA were lower in 2017 than in previous years.

Hazardous air pollutants (HAPs), or air toxics, are pollutants that are known to cause cancer or other serious health issues (USEPA 2022b). HAPs include pollutants such as VOCs, asbestos, and metals. USEPA regulates 188 HAPs.

Table 3.4.1-1. Statewide Emissions of CO2e (million metric tons of carbon dioxide equivalents [MMT CO2e]) and Criteria Air Pollutants (tpy)

State	CO2e (MMT CO2e) (year reported)	2017 EPA National Emissions Inventory (tpy)[a]					
		CO	NOx	SO2	VOC	PM2.5	PM10
New York	379 (2019)[b]	1,376,430	247,134	25,431	600,513	63,431	196,385
Massachusetts	73 (2017)[c]	620,152	105,234	6,052	209,615	25,322	66,059
Connecticut	42.2 (2018)[d]	322,357	46,903	2,665	125,317	11,867	29,230
Rhode Island	11.7 (2017)[e]	89,837	14,886	797	35,072	3,474	7,187
Maryland	79.1 (2017)[f]	605,124	99,929	20,078	217,512	30,037	92,519
New Jersey	97.7[a](2019)[g]	792,149	136,318	4,313	236,385	24,475	46,911
Virginia	140.6 (2018)[h]	1,285,957	220,035	27,187	956,008	68,551	169,943

Sources: [a]USEPA 2022a; [b]NYSDEC 2021; [c]Commonwealth of Massachusetts 2022a; [d]CT DEEP 2018; [e]RI DEM 2021; [f]MD DE 2019; [g]NJ DEP 2021; [h]VDEQ 2021.

The USEPA classifies individual counties as in attainment, nonattainment, maintenance, or unclassified for each criteria air pollutant (USEPA 2021b). An area is in attainment if it meets the NAAQS for the criteria pollutant. An area is in nonattainment if it does not meet the NAAQS. If a county is in nonattainment, the state must develop a state implementation plan (SIP) to attain and maintain the NAAQS. An area is unclassified if there is not enough available information to determine the attainment status; these areas are typically treated as attainment areas. A maintenance area is one that recently became in attainment and must continue to demonstrate it is maintaining the standard before the county can be redesignated as attainment.

The CAA provides additional air quality and visibility protection to Class I areas which are national parks larger than 6,000 acres (24.3 square kilometers [km^2]) and national wilderness areas larger than 5,000 acres (20.2 km^2) (NPS 2018). There are no Class I areas within the GAA. The closest Class 1 area to the proposed Project Area is the Lye Brook Wilderness in Vermont (USEPA 2022c). The Fire Island National Seashore is a Class II area meaning that some air pollution is permitted as long as the NAAQS or the maximum allowable increases over baseline concentrations are not exceeded (NPS 2020).

GHGs are gases that trap heat in the atmosphere and include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases, such as chlorofluorocarbons, perfluourocarbons, hydrofluorocarbons, and sulfur hexafluoride (SF_6). The largest source of GHGs is fossil fuel combustion (USEPA 2021c). CO_2 is the dominant GHG emitted in the United States from human activities. CO_2 is stable in the atmosphere and remains long enough (decades) to become well-mixed throughout the global atmosphere. SF_6 is an electrical insulator used in high voltage equipment (USEPA 2021d); SF_6 is proposed to be used to insulate switchgears on the OCS-DC and OnCS-DC. GHG emissions are typically reported in carbon dioxide equivalents (CO_2e) which considers the different global warming potentials of the various GHGs (USEPA 2021e).

There are no federal air quality or emission standards for GHGs. Individual states have developed GHG reduction plans to mitigate the impacts of climate change (e.g., Commonwealth of Massachusetts 2022b; NYS 2022; NJ DEP 2022a). These plans include mandates to decrease GHG emissions through various methods, including improving energy efficiency, energy conservation, and increasing renewable energy sources, to reduce GHG emissions to a baseline level (e.g., 1990). Individual states track and report their GHG emissions to measure progress toward the goals. Recent statewide GHG emissions (provided as CO_2e) are provided in Table 3.4.1-1.

The CAA Section 328 directs the USEPA to regulate air pollution from OCS sources located offshore of states along the Pacific, Arctic, and Atlantic coasts. OCS air regulations (40 CFR Part 55) establish air pollution control requirements for permitting, monitoring, fees, compliance, and enforcement for OCS sources subject to the CAA and beyond state seaward boundaries (USEPA 2021f). OCS sources include emissions from construction, installation, O&M, and decommissioning within a 25-mi (40.2-km) radius of the centroid of the wind farm. OCS sources that may produce air emissions include vessels only when they are temporarily or permanently attached to the seabed and used for exploring, developing, or producing resources therefrom or physically attached to an OCS facility (40 CFR Part 55).

If the estimated emissions from construction of the OCS sources exceed the major source permitting thresholds for NO_x, VOCs, or one or more of the criteria pollutants, then the source would require a major source permit under the Nonattainment New Source Review (NNSR) and/or Prevention of Significant Deterioration (PSD) regulations. NNSR regulations require the lowest achievable emission rate, emission offsets, and public involvement (USEPA 2021g). These regulations apply to sources with the potential to emit 50 tons (45.4 metric tons) per year or more of VOCs or 100 tons (90.7 metric tons) per year or more of NO_x (COP Appendix K, Sunrise Wind 2022). PSD regulations require installation of best achievable control technology, an air quality analysis, an additional impacts analysis, and public involvement (USEPA 2021h). PSD regulations apply to sources that may emit 250 tons (226.8 metric tons) per year or more of any pollutant. Sunrise Wind would apply for an OCS air permit in 2022.

Facilities located within 25 nm (28.77 mi; 46.3 km) of a state seaward boundary are required to comply with the air quality controls of the nearest or corresponding onshore area (COA). The permitting authority for the OCS air permit is the COA for an OCS source. The nearest onshore area (NOA) is typically the COA unless the USEPA designates another area (COP Appendix K, Sunrise Wind 2022). The NOA is Dukes County, Massachusetts; emissions that may occur nearest to Dukes County would be included in the OCS air permit.

For emission sources within state boundaries, within state territorial waters (3 nm [3.5mi; 5.6 km] of the shore) that are not included in the OCS air permit, and within a nonattainment area, BOEM must make a general conformity determination (40 CFR §93, Subpart B). It must be demonstrated that the action upholds the SIP, would not cause or contribute to new violations of the NAAQS, increase the frequency or severity of any violation of a NAAQS, or delay timely attainment of a NAAQS or any required interim emission reduction or milestone. The general conformity determination excludes emissions accounted for in the OCS air permit. The general conformity determination includes emissions from construction and O&M of the onshore facilities and construction and O&M vessel transit through state waters outside of the 25-mi (40.2-km) OCS source centroid.

3.4.1.2 Impact Level Definitions for Air Quality

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on air quality from the alternatives, including the Proposed Action. Table 3.4.1-2 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for air quality. Table G-3 in Appendix G identifies potential impact producing factors (IPFs), issues, and indicators to assess impacts to air quality. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration (Table 3.4.1-2). Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a Project.

Table 3.4.1-2. Definition of Potential Adverse and Beneficial Impact Levels for Air Quality

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Project emissions would not be detected.	Project emissions would not be detected.
Minor	Air emissions would be detected but would not exceed NAAQS or general conformity emissions. Air emissions could be avoided with PMEs.	A small and measurable improvement in air quality.
Moderate	Air emissions would be detected but would not exceed NAAQS or general conformity emissions. Air emissions could be minimized with PMEs.	A notable and measurable improvement in air quality.
Major	Exceedance of NAAQS or general conformity emissions would occur even with PMEs.	Regional improvement in air quality.

3.4.1.3 Impacts of Alternative A - No Action on Air Quality

When analyzing the impacts of the No Action Alternative on air quality, BOEM considered the impacts of ongoing 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, as described in Appendix E*, Planned Activities Scenario*.

3.4.1.3.1 Impacts of the No Action Alternative

Under Alternative A, baseline air quality conditions would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities. Ongoing activities that could impact air quality in the GAA are continued operation and development of fossil fuel electricity generation facilities, onshore and offshore development, onshore and marine transportation, other commercial and industrial activities, construction of undersea transmission lines or gas pipelines, marine mineral use and dredged material disposal, and military use. Air or HAP emissions from these activities could cause short-term exceedances of air quality standards.

Ongoing offshore wind activities within the GAA that contribute to impacts on air quality include:

- Continued O&M of the Block Island Project (5 WTGs) installed in State waters;
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and;
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Forks projects would affect air quality through the primary IPFs of air emissions, climate change, and accidental releases. Ongoing offshore wind activities would have the same type of impacts from air emissions, climate change, and accidental releases that are described in the following section for planned offshore wind activities, but the impacts would be of lower intensity.

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 Proposed Action).

Other planned non-offshore wind activities that could impact air quality in the GAA are the continued operation and development of fossil fuel electricity generation facilities, onshore and offshore development, onshore and marine transportation, commercial and industrial activities, construction of undersea transmission lines or gas pipelines, marine mineral use and dredged material disposal, and military use. These activities may result in short-term increases in air, GHG, or HAP emissions which may cause short-term, localized exceedances of air quality standards.

The sections below summarize the potential impacts of planned offshore wind activities on air quality during construction, O&M, and decommissioning of the projects. BOEM anticipates future offshore wind activities to affect air quality through the following primary IPFs.

Air emissions: The potential emission sources from future offshore wind activities would include fossil fuel combustion in main and auxiliary engines on marine vessels, helicopters, on-vessel equipment, construction vehicles and equipment, and fugitive dust emissions. Most emissions would occur during the construction phase of planned projects. Air emission impacts on air quality would be higher if the construction of multiple projects overlapped spatially or temporally. All projects would be required to comply with the CAA.

Future offshore wind activities other than the Proposed Action that may result in air emissions within the MA/RI Lease Area include New England Wind, Mayflower, Beacon Wind, Bay State Wind, Revolution Wind, and Liberty Wind. The total number of wind turbine that may be constructed in the MA/RI Lease

Area (not including the Proposed Action) is 362 WTGs which would produce 5,354 MW of renewable energy. The total construction phase emissions of criteria pollutants from future offshore wind projects through 2030 are estimated to be 4,077 tons CO; 17,881 tons NO_x; 137 tons SO_2, 433 tons VOC; 624 tons PM_{10}; 600 tons $PM_{2.5}$; and 1,169,089 tons of CO_2. Only the New England Wind Project is expected to have an overlapping construction schedule with the Proposed Action in 2024. The magnitude of emissions and resulting impacts would vary spatially and temporally during the construction phase.

Air emissions from O&M activities may overlap temporally, but overall, would be intermittent and dispersed and contribute to localized impacts on air quality; emissions during O&M would be less than during the construction and decommissioning phases. Estimated O&M phase emissions through 2030 are 86 tons CO; 341 tons NO_x; 1.3 tons SO_2; 8.9 tons VOCs; 11.6 tons PM_{10}; 11.4 tons $PM_{2.5}$; and 28,496 tons CO_2. Emissions could result from routine or nonroutine maintenance activities and repairs involving marine vessels carrying crew and materials, on-vessel equipment, and emergency diesel generators. Overall, operation of planned offshore wind projects would produce negligible emissions because wind turbines do not emit pollutants.

Offshore wind energy development could help offset emissions from fossil fuels, potentially improving regional air quality, reducing GHGs, and providing health benefits. An analysis by Katzenstein and Apt (2009), for example, estimates that CO_2 emissions can be reduced by up to 80 percent and NO_X emissions can be reduced up to 50 percent by implementing wind energy projects. 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 predicted increases in global surface temperature by 0.3–0.8 degrees Celsius (°C) (0.5–1.4 degrees Fahrenheit (°F) by 2100.

Climate change: Future offshore wind activities would produce GHG emissions that would minimally impact climate change compared to total global and United States GHG emissions. Fossil fuel combustion during construction and decommissioning (e.g., from marine vessels and on-vessel equipment, construction equipment, construction vehicles) and during O&M (e.g., from marine vessels carrying crew, construction, and passenger vehicles) would produce CO_2 emissions. The estimated CO_2 emissions from the construction and O&M activities of future offshore wind projects in the MA/RI Lease Area through 2030 are 1,169,089 tons and 28,496 tons, respectively. The development of future offshore wind projects would likely result in reduced regional GHG emissions because the emissions from fossil fuel combustion would be displaced. Further, the reduced emissions would likely more than offset the small amount of GHG emissions from the future offshore wind activities. Future offshore wind activities would have an overall beneficial impact on climate change and would be an important component of state climate change mitigation plans.

Accidental releases: Accidental chemical spills during construction, O&M, and decommissioning could cause emission of HAPs; accidental releases would be more likely during the construction phase because of the increased vessel traffic and equipment use. Emissions of hazardous VOCs would occur through evaporation. HAPs are generally short-lived in the atmosphere and would cause short-term, localized air quality impacts. Accidental releases would occur infrequently over the lifetime of future offshore wind projects.

3.4.1.3.3 Conclusions

Impacts of the No Action Alternative

Under Alternative A, the No Action Alternative, air quality would continue to be affected by existing environmental trends and ongoing activities. Air quality patterns would continue to follow the regional trends and respond to societal, economic, technological, and environmental activities. Non-offshore wind activities may have air quality impacts due to the construction and O&M of new energy generation facilities needed to meet future energy needs or from the maintenance of fossil-fuel energy facilities already in service. Ongoing non-offshore and offshore wind activities could cause localized, short-term increases in air, GHG, or HAP emissions, and short-term exceedances of air quality standards. The No Action Alternative would result in **minor** to **moderate** impacts on air quality from air emissions, climate change, and accidental releases.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities would continue. Planned non-offshore wind activities and offshore wind activities would contribute to impacts on air quality through air and GHG emissions and accidental releases, particularly during the construction phase of projects. These impacts would be **minor** to **moderate** depending on the extent and duration of emissions. Planned activities would produce GHG emissions that would have a **minor** impact on climate change compared to fossil fuel powered energy generation. As more offshore wind projects come online, the need for fossil fuel power generation would decrease. This would contribute to improved air quality from the larger amount of renewable energy sources and reduced air emissions. Planned offshore wind activities would have an indirect **minor** to **moderate beneficial** impact on air quality after the offshore wind projects are operational.

3.4.1.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on air quality:

- The number of WTGs and number of foundations;
- Length of IAC, offshore export cables, and onshore export cable;
- The number of marine vessels, helicopters, construction, and passenger vehicles used during construction, O&M, and decommissioning, and number of trips per vessel;
- Engine and fuel types used in marine vessels, equipment, and construction vehicles;
- The travel routes to and from the offshore and onshore components;
- Air emission ratings of marine vessel, construction equipment, and vehicle engines; and
- Soil characteristics at onshore areas.

3.4.1.5 Impacts of Alternative B - Proposed Action on Air Quality

The proposed Project is evaluated in accordance with OCS air regulations and with the General Conformity rule. Emissions that occur within a 25-mile (40.2-km) radius of the OCS source centroids at the SRWF and SRWEC-OCS would be subject to the OCS air regulations (40 CFR Part 55). Emissions that occur outside the OCS area but within state jurisdictional boundaries, including onshore stationary sources and vessels transiting to and from OCS sources in state waters would be subject to the General Conformity rule. Those emissions are apportioned to the state nearest to where the emissions may occur (COP Appendix K, Sunrise Wind 2022).

3.4.1.5.1 Construction and Installation

3.4.1.5.1.1 Onshore Activities and Facilities

Air emissions: Air emissions from the Proposed Action could affect six counties in nonattainment with one or more criteria pollutants. The attainment status of an area is provided in the USEPA Green Book (USEPA 2021i). Albany County, New York[12]; Bristol County, Massachusetts; Providence County and Washington County, Rhode Island; and Norfolk County, Virginia are in attainment for all criteria air pollutants. Kings County, New York is in nonattainment with O_3 and is a maintenance area for CO and $PM_{2.5}$. Suffolk County, New York is in nonattainment with O_3 and maintenance for $PM_{2.5}$. New London County, Connecticut, is in nonattainment of the O_3 standard and is the only port currently planned to be used during the construction phase that is in a non-attainment area (CT DEEP 2016; USEPA 2021i). Dukes County, Massachusetts, is in nonattainment with the 2008 O_3 standard but is in attainment with the 2015 standard (Commonwealth of Massachusetts 2022c; USEPA 2021i). Baltimore County, Maryland, is in nonattainment with the O_3 and SO_2 standards and is a maintenance area for CO. Gloucester County, New Jersey, is in nonattainment with the O_3 standard (NJ DEP 2022b).

Air emissions may occur from fuel combustion in heavy equipment and construction vehicles during construction and installation of the onshore transmission cable (OTC), onshore interconnection cable (OIC), and the OnCS-DC. Construction of the OTC and OIC would involve site preparation, clearing and grading, trench excavation, duct bank and vault installation, cable installation and jointing, testing, and restoration (COP Section 3.3.2.3, Sunrise Wind 2022). Construction of the OnCS-DC would involve clearing and grading, foundation and equipment installation, site restoration, and commissioning (COP Section 3.3.1.2, Sunrise Wind 2022). A variety of on-road and non-road engines would be used during the onshore construction phase including excavators, drills, backhoes, bulldozers, cranes, tractors, cable puller, pumps, compressors, and passenger vehicles (COP Appendix K, Sunrise Wind 2022). The onshore construction and installation phase is expected to last 2 years; emissions would cease when construction is complete.

12 The Port of Albany and the Port of Coeymans are in the former Albany-Schenectady-Troy Area, New York Ozone Nonattainment Area for the 1979 and 1997 NAAQS. However, USEPA has revoked these standards.

Site preparation, clearing, grading, and vehicle use may produce fugitive dust emissions (i.e., PM_{10} or $PM_{2.5}$); the magnitude of emissions would depend on the spatial extent of the activities and on the soil type and moisture content. Fugitive dust emissions would be minimized through the dust control plan (AQ-05).

Onshore construction emissions (COP Appendix K, Sunrise Wind 2022) from the counties in nonattainment or maintenance with one or more NAAQS were compared to the general conformity de minimis thresholds in Table 3.4.1-3. The estimated onshore construction emissions of VOCs, particulate matter, and SO_2 were all below the General Conformity thresholds. Emissions from the Port of New London in Connecticut are below the de minimus thresholds. NO_x emissions from the Port of Paulsboro in New Jersey are below the de minimus threshold; this port is being considered as a back-up or support facility.

The potential NO_x emissions from the construction of onshore facilities in New York (50 tpy [45.4 metric tpy]) or from activities supported by the Port of Coeymans or the Port of Albany (209.5 tpy [190.1 metric tpy) or other ports in New York City (53.5 tpy [48.5 metric tpy]) are estimated to exceed the de minimus threshold of 50 tpy (45.4 metric tpy). These emissions would be short term and would occur throughout the approximate 2-year construction phase window and would have a minor to moderate impact on air quality.

The estimated CO (276.1 tpy [250.5 metric tpy]) and NO_x emissions (664.6 tpy [602.9 metric tpy]) from potential construction activities supported from Sparrows Point in Baltimore County, Maryland exceed the general conformity threshold (100 tpy [90.7 metric tpy]) (Table 3.4.1-3). SO2 emissions would be below the threshold. This port is being considered as a back-up or support facility, and thus, may not be used for the Proposed Action. If the Sparrows Point port is used, emissions would be intermittent, short-term, and short-term and would have a minor to moderate impact on air quality.

Sunrise Wind would implement environmental protection measures (APM AQ-01, AQ-02, AQ-03, AQ-04, AQ-05, AQ-06, AQ-07, COP Section 4.3.4.3, Sunrise Wind 2022) to reduce or avoid air emissions during onshore construction and installation activities. These measures include using engines and equipment that meet applicable air emissions standards (Tier 3, and if applicable, Tier 4); only using diesel generators during commissioning or emergencies; using low sulfur diesel fuel, marine distillate, or marine residual fuels; dust control; and using gas insulated switchgears to detect SF_6 leaks. Onshore air emissions would be greatest during the construction phase and would be offset by the potential reduction in fossil fuel emissions. Air emissions would be intermittent throughout the 2-year construction phase and would have a minor to moderate impact on air quality.

Sunrise Wind would implement environmental protection measures (APM AQ-01, AQ-02, AQ-03, AQ-04, AQ-05, AQ-06, AQ-07, COP Section 4.3.4.3, Sunrise Wind 2022) to reduce or avoid air emissions during onshore construction and installation activities. These measures include using engines and equipment that meet applicable air emissions standards (Tier 3, and if applicable, Tier 4); only using diesel generators during commissioning or emergencies; using low sulfur diesel fuel, marine distillate, or marine residual fuels; dust control; and using gas insulated switchgears to detect SF_6 leaks. Onshore air

emissions would be greatest during the construction phase and would be offset by the potential reduction in fossil fuel emissions. Air emissions would be intermittent throughout the 2-year construction phase and would have a minor to moderate impact on air quality.

Table 3.4.1-3. Applicable General Conformity Emission Thresholds (tpy) Based on Project Counties Attainment Status*, **

State	County	CO	NOx	VOCs	PM2.5	PM10	SO_2
NY	Suffolk		50	50	100	100	
	Kings	100	50	50	100	100	
CT	New London		50	50			
MD	Baltimore	100	100	50			100
NJ	Gloucester		100	50			

Source: USEPA 2021j

* Adapted from Table 4.3.4-6 in COP, Sunrise Wind 2022.

** The Port of Albany and the Port of Coeymans are in the former Albany-Schenectady-Troy Area, New York Ozone Nonattainment Area for the 1979 and 1997 NAAQS. However, USEPA has revoked these standards.

Climate change: GHG emissions would occur throughout the onshore construction phase; however, they would be small compared to total annual statewide emissions. CO_2e emissions were estimated to range from 1,074 tpy (974.3 metric tpy) for emissions within 3 nm (3.45 mi; 5.6 km) of Connecticut to 73,202 tpy (66,407.7 metric tpy) for emissions within 3 nm (3.45 mi; 5.6 km) of Maryland (COP Appendix K, Sunrise Wind 2022). These totals are well below the total CO_2e emissions from fossil fuel combustion in the United States transportation sector (1,817 MMT CO_2e) or the electricity generation sector (1,602 MMT CO_2e) in 2019 (USEPA 2021k) and from the most recently reported statewide CO_2e emissions (Table 3.4.1-1). The GHG emissions from the Proposed Action would be offset by the reduction in emissions from the closure or reduced operations of fossil fueled electricity generating facilities. Overall, it is anticipated that the Proposed Action would have a beneficial impact on GHG emissions and air quality compared to the GHG emissions that would be produced by generation of the same amount of energy from a fossil fueled generation facility. The GHG emissions from the Proposed Action would be offset by the reduction in emissions from the closure or reduced operations of fossil fueled electricity generating facilities. Overall, it is anticipated that the Proposed Action would have a beneficial impact on GHG emissions and air quality compared to the GHG emissions that would be produced by generation of the same amount of energy from a fossil fueled generation facility.

Accidental releases: Evaporative emissions of HAPs from accidental chemical spills or releases could occur during the onshore construction of the proposed Project. Coolants, oils, fuels, solvents, and lubricants would be used at the OnCS-DC; an estimated maximum of mineral oils is 101,333 gallons (383,587 liters [L]) (COP Table 3.3.1-2, Sunrise Wind 2022). These materials, as well as hydraulic fluids, would be used during trenchless and duct bank installation, and installation of the OTC and OIC. There is a higher risk of accidental releases during the construction phase than O&M because of the increased amount of construction vehicles and equipment. Accidental HAP emissions would be short-term and localized to the area at or around the release. Accidental releases would be avoided or reduced through the development and implementation of the SPCC plan, developed as part of Project's EM&CP (APM GEN-11). Any spills would be governed by state of New York regulations and secondary oil containment procedures following industry standards.

3.4.1.5.1.2 Offshore Activities and Facilities

Air emissions: During construction of the SRWF, the main sources of air emissions would be from fossil fuel combustion emissions on helicopters; marine vessels; on-vessel equipment (e.g., compressors); on-board engines including generators; heavy equipment during construction and installation of the foundations, WTG, OCS-DC; construction and cable laying equipment for the IAC, SRWEC-OCS, and SWREC-NYS; generators on the WTGs and OCS-DC; and vessels traveling to and from the OCS sources when within 25 mi (40.2 km). During the construction phase, there would be increased combustion emissions from increased vessel traffic, air traffic, and construction equipment. The air pollutants that could be emitted include criteria pollutants, HAPs, and VOCs. The specific emissions and amounts would vary throughout the construction phase. Diesel generators would be used to provide temporary power during construction and commissioning of the WTGs which is expected to be completed in less than 1 year. The total offshore construction phase is anticipated to last from 1 year to 18-months. The offshore emissions would be short-term and would cease after construction is complete.

During construction of the SRWEC-OCS, air emissions may arise from vessels burning fossil fuels that are used to transport crew and material and to perform or support laying of the SRWEC and HDD installation at landfall. This includes vessels attached to or erected on the seafloor and conducting cable laying within 25 miles (40.2 km) of the OCS source centroid. Air emissions from construction of the SRWEC would be short-term and would stop after construction is complete.

During construction and installation of the SRWEC-NYS, air emissions may come from offshore vessels transiting through state waters, on-vessel equipment, portable diesel generators, or onshore-equipment. The SRWEC construction and installation phase is expected to last approximately 8-months. These emissions would cease when construction of the SRWEC-NYS is complete.

The estimated offshore construction and installation emissions subject to the OCS permit (i.e., within 25 mi [40.2 km] of the SRWF and SRWEC centroids) were compared to emission standards for the COA in Dukes County, Massachusetts. The Massachusetts SIP defines the NO_x and VOC emission threshold as 50 tpy (45.4 metric tpy) (MA DEP 2018). The total estimated VOCs emissions (49.1 tpy [44.5 metric tpy]) from construction emissions of the SRWF (24.2 tpy [22.0 metric tpy]) and SRWEC (9.2 tpy [8.3 metric tpy]) and from crew transport and support (15.7 tpy [14.2 metric tpy]) would be less than the 50 tpy (45.4 metric tpy) threshold. VOC emissions would have a minor impact on air quality. The total NO_x emissions (2,092.8 tpy [1,899 metric tpy]) from construction of the SRWF (1,031.8 tpy [936.0 metric tpy]), SRWEC (391.5 tpy [355.2 metric tpy]) and from crew transport and support (669.6 tpy [607.5 metric tpy]) would exceed the emission threshold but would be much less than the total NO_X emissions in Massachusetts in 2017 (105,234 tons [95,467 metric tons], Table 3.4.1-1). The offshore construction

NO_x emissions would be short-term, vary spatially, would occur throughout the 12-to-18-month construction phase and would have a minor to moderate impact on air quality.

Sunrise Wind would implement environmental protection measures to reduce or avoid air emissions during offshore activities as described in Section 4.3.4.3 of the COP (APM AQ-01, AQ-02, AQ-03, AQ-04, AQ-05, AQ-06, AQ-07, Sunrise Wind 2022) at a minimum. These measures include using low sulfur diesel in generators on the WTGs or OCS-DC; low sulfur fuel, marine distillate, or marine residual fuels on vessels; engines that meet applicable air emissions standards to satisfy Best Available Control Technology and Lowest Achievable Emission Rate requirements; dust control; and obtaining emission reduction credits if required by the OCS permit.

Climate change: GHG emissions would occur during the construction and installation of the offshore components of the proposed Project. The total CO_2e emissions estimated for the OCS air permit is 230,504 tpy (209,110 metric tpy) with 113,639 tpy (103,092 metric tpy) from construction of the SRWF; 43,120 tpy (39,118 metric tpy) due to construction of the SRWEC; and 73,745 tpy (66,900 metric tpy) for crew transport and support (COP Appendix K, Sunrise Wind 2022). These emissions would be much less than the total annual statewide emissions (Table 3.4.1-1) and the total United States GHG emissions in 2019 (5,256 MMT CO_2e) (USEPA 2021k). The proposed Project would use SF_6 insulated switchgears on the OCS-DC. These switchgears are designed to be completely sealed and have a manufacturer-certified leak rate of less than 0.5 percent per year; thus, little to no SF_6 emissions are expected. Low pressure detectors would be installed to detect any SF_6 leaks (APM AQ-07, COP Section 4.3.4.3. Sunrise Wind 2022). SRW performed a Best Available Control Technology assessment for the OCS Air Permit Application that considered the use of SF_6-free equipment. The assessment considered the technology currently available, and its feasibility given the design and high voltage requirement of the OCS-DC, available space on the OCS-DC, how widely available other equipment is, and the cost effectiveness of altering the Project design. It was determined that using SF_6-free switchgears was not technically feasible at this time based on the electrical requirements of the OCS-DC (60 Hz rated components).

Accidental releases: Accidental chemical spills or releases during construction of the offshore components of the proposed Project could result in HAP emissions. Oils, solvents, lubricants, and fuels would be used at the OCS-DC in transformers and reactors, fuel tanks, cranes, rotating equipment, pumps, generators, and chilling/cooling units. HAP emissions from accidental spills would be avoided or reduced through implementation of the OSRP (APM GEN-11). There would be a spill containment system on the OCS-DC designed with at least 110 percent of secondary containment for all oils, fuels, grease, and lubricants.

Each of the WTGs would require oils, fuels, and lubricants for the bearings, yaw pinions, accumulators, pumping unit, actuators, gearbox, transformer, emergency generator, and cooling system. Potential emissions of HAPs would be avoided or minimized through measures to contain accidental releases at the WTGs including 100 percent leakage-free joints, high pressure, and oil level sensors to detect leakages, and retention reservoirs that could contain 110 percent of the volume of any potential leaks (COP Section 3.3.8.1, Sunrise Wind 2022). Accidental HAP emissions would be short-term, intermittent, and localized to the area at or around the spill or leak and result in a minor to moderate impact on air quality.

3.4.1.5.2 Operations and Maintenance

3.4.1.5.2.1 Onshore Activities and Facilities

Air emissions: Air emissions would occur during periodic O&M of the OnCS-DC and cables from vehicle use to transport material and personnel and equipment use. Ports in New York and Rhode Island are being considered to support onshore O&M activities. The estimated onshore emissions and emissions within 3 miles of the New York state boundary and subject to a General Conformity determination are less than the de minimus thresholds. The estimated air emissions during the O&M phase would be less than the potential emissions during the onshore construction and installation phase because there would be less workers, passenger and construction vehicles, and equipment used. Air emissions would be minimized through implementation of measures described in Section 4.3.4.3 of the COP (APM AQ-01, AQ-02, AQ-03, AQ-04, AQ-05, AQ-06, AQ-07, Sunrise Wind 2022) at a minimum. Air quality impacts would be expected to occur close to the emission source and would be dispersed throughout the 25-to-35-year lifetime of the proposed Project. It is anticipated that the potential emissions from maintenance vehicles and equipment would decrease due to increases in fuel efficiency and standards over the Project lifetime. Onshore air emissions during O&M are expected to have a minor to moderate impact on air quality.

Climate change: GHG emissions would occur during routine and non-routine O&M activities at the onshore facilities over the 25-to-35-year lifetime of the proposed Project. The estimated CO_2e emissions from O&M activities in New York are 6,001 tpy (5,444 metric tpy) and from activities in Rhode Island are 3,461 tpy (3,140 metric tpy). These emissions would be small compared to the total New York and Rhode Island statewide emissions. Over the lifetime of the Project, GHG emissions would likely decrease through improved technology and emissions standards.

The OnCS-DC would use SF_6 insulated switchgears for electrical insulation purposes. The maximum potential volume of SF_6 that may be used for the OnCS-DC is 3,500 pounds (COP Section 3.3.1.1). Fugitive SF_6 emissions may occur at a rate of 1 percent annually resulting in up to 0.018 tons/year (COP Section 4.3.4.2). The switchgears are designed to be completely sealed and would be expected to result in little to no SF_6 emissions. All SF_6 insulated switchgears would contain low pressure detectors in case a leak was to occur (APM AQ-07).

Accidental releases: Accidental chemical spills or leaks and subsequent HAP emissions could occur during onshore O&M activities. Operation of the OnCS-DC would require oils, lubricants, and fuels. Vehicles used to transport crew and equipment would use diesel fuel. Repair work on the onshore interconnection cable could require the use of hydraulic fluids. Accidental releases would be prevented through implementation of the SPCC and would be infrequent and dispersed throughout the 25-to 35-year lifetime of the proposed Project. Sunrise Wind would implement measures such as using low sulfur diesel, fueling offsite, and an Inadvertent Return Plan and an SPCC Plan to minimize or eliminate accidental HAP emissions during onshore O&M activities (APM AQ-01, AQ-02, WQ-02, GEN-11, GEN-12).

3.4.1.5.2.2 Offshore Activities and Facilities

Air emissions: During the offshore O&M phase, air emissions could occur during periodic marine vessel or helicopter use to transport material and personnel to the SRWF, OCS-DC, SRWEC, or IAC for regular inspections and maintenance practices and from on-vessel equipment used for repairs or maintenance. Routine inspections of electrical components and minor corrective and preventative maintenance actions are anticipated to occur multiple times per year (COP Section 3.5.2, Sunrise Wind 2022). Annual maintenance activities would include above water and visual inspections, routine service and safety checks, and oil and high-voltage maintenance. Non-routine (e.g., corrective and major repairs) maintenance would occur as needed. It is possible that a WTG installation or cable laying vessel could be used for repairs or maintenance over the operational life of the proposed Project; however, this would be infrequent.

The SRWF, SRWEC-OCS, or SRWEC-NYS would not emit any pollutants during operation. The temporary generators on the WTGs used during construction and commissioning would no longer be in place during the O&M phase. Emergency generators on the WTGs or OCS-DC would only operate during emergencies or testing; emissions would thus be infrequent and negligible.

A smaller number of vessels would be needed during the O&M phase compared to the construction phase. The total estimated emissions during O&M of the OCS sources are 76.3 tpy CO, 183.8 tpy NO_x, 4.3 tpy VOCs, 0.2 tpy SO_2, 3.4 tpy $PM_{2.5}$, and 3.4 tpy PM_{10} (69.2 metric tpy CO, 166.7 metric tpy NO_x, 3.9 metric tpy VOCs, 0.18 metric tpy SO_2, 3.1 metric tpy $PM_{2.5}$, and 3.1 metric tpy PM_{10}) (COP Appendix K, Sunrise Wind 2022). These potential emissions would come largely from crew transport and support. Use of the emergency generators on the OCS-DC is estimated to produce less than 1 percent of potential emissions. Sunrise Wind is applying for an OCS air permit and is expecting to obtain the permit in fourth quarter of 2023. The potential air emissions during the offshore O&M phase would be less than during the construction phase.

Offshore wind energy development would cause beneficial impacts by offsetting emissions from fossil fuel electricity generation, potentially improving regional air quality and reducing GHGs, and by providing health benefits. The minimum and maximum annual avoided emissions from operation of the proposed Project and the minimum and maximum estimated avoided emissions over a 25-year project lifetime are provided in Table 3.4.1-4. The proposed Project is anticipated to displace emissions of NO_x, SO_2, VOC, CO, GHG (CO_2, N_2O, CH_4), particulate matter, black carbon, and lead. These estimates were based on a minimum of 3,083,520 MW-hours generated per year and a maximum of 3,854,400 MW-hours generated per year (COP Appendix K, Sunrise Wind 2022). The avoided emissions would have long-term minor to moderate beneficial impacts.

Table 3.4.1-4. Emissions Avoided by Operation of the Proposed Project (tons)

Avoided Emissions	NOx	SO2	CO	VOC	PM10	PM2.5	CO2	CH4	N2O	CO2e
Minimum Annual	1,179	1,227	1,380	85	270	377	2,074,241	68	9	2,078,623
Maximum Annual	1,474	1,534	1,725	106	337	471	2,592,802	85	11	2,598,205
Minimum over 25 years	51,963,818	30,681	34,499	2,124	6,745	9,426	51,856,033	1,689	220	51,963,818
Maximum over 25 years	64,954,791	38,351	43,124	2,655	8,432	11,783	64,820,041	2,112	275	64,951,791

Source: COP Appendix K, Sunrise Wind 2022.

The potential health benefits of avoided emissions were evaluated using USEPA's CO-Benefits Risk Assessment (COBRA) health impacts screening and mapping tool (USEPA 2022d). This tool estimates the health and economic benefits of clean energy policies. The COBRA web edition was used to analyze the health impacts of avoided emissions in New York, Connecticut, Rhode Island, and Massachusetts. New York was chosen as the state where emission changes would occur. The Fuel Combustion Electric Utility sector was selected as the sector where emission changes would occur. The change of emissions used was the maximum annual avoided emissions in NO_x (1,474 tons), SO_2 (1,534 tons), VOCs (106 tons), and $PM_{2.5}$ (471 tons) estimated for the Sunrise Wind Project (Appendix K). The tool estimates the total health benefit, which encompasses all saved costs of the avoided health events. COBRA includes a discount rate (3 percent or 7 percent) to express future economic values in present terms because not all health effects and associated economic values occur in the year of analysis; this accounts for the 'time value of money' (USEPA 2022d). The analysis was performed using both discount rates to provide a range of estimated health benefit costs. For the New York, Connecticut, Massachusetts, and Rhode Island area at the 3 percent discount rate, the estimated health benefits would range from $125,104,502 to $281,805,697, and at a 7 percent discount rate, the saved costs would range from $111,660,890 to $251,311,078. This would be a long-term minor beneficial impact.

Climate change: GHG emissions expected to occur during offshore O&M activities would contribute to climate change. The O&M CO_2e emissions are estimated to be 20,242 tpy (18,363 metric tpy) (COP Appendix K, Sunrise Wind 2022). These estimated emissions would be much less than estimated for the construction phase and estimated from the state of New York (Table 3.4.1-1). The estimated O&M CO_2e emissions are approximately two orders of magnitude lower than the minimum estimated annual avoided CO_2e emissions (2,078,623 tons) (Table 3.4.1-4). Development of the proposed Project would have a minor beneficial impact on climate change.

The OCS-DC would use SF_6 insulated switchgears for electrical insulation purposes. The maximum potential volume of SF_6 that may be used for the OCS-DC is 3,960 pounds (COP Section 3.3.6.1). A maximum of 0.020 tons/year of fugitive SF_6 emissions may occur during operation of the OCS-DC (COP Section 4.3.4.2). The switchgears are designed to be completely sealed and would be expected to result in little to no SF_6 emissions. All SF_6 insulated switchgears would contain low pressure detectors in case a leak was to occur (APM AQ-07).

Accidental releases: Accidental chemical spills or leaks and subsequent HAP emissions could occur during offshore O&M activities. Spill containment measures on the WTGs and OCS-DC and implementation of BMPs would minimize or eliminate accidental HAP emissions; however, minor HAP emission could occur from broken hoses, pipes, or fasteners (COP Section 4.2.5.1, Sunrise Wind 2022). Accidental releases would be infrequent and less likely to occur than during the construction phase.

3.4.1.5.3 Conceptual Decommissioning

3.4.1.5.3.1 Onshore Activities and Facilities

Air emissions: Impacts on air quality from onshore activities during the decommissioning phase would be similar to or of lesser intensity than during the construction and installation phase and would occur for a shorter period of time. Activities would include removing the OIC; however, the OnCS-DC and OTC could be abandoned in place (COP Section 4.2.1.3, Sunrise Wind 2022). The potential emissions (e.g., CO, NO_x, VOCs, $PM_{2.5}$, PM_{10}) and sources (e.g., fossil fuel combustion in construction vehicles and equipment) would be similar to those described for the construction phase. Air emissions from decommissioning were not estimated but are expected to be less than during the construction phase because some facilities may be left in place and because of improved emission control technology and more stringent emission standards 25-35 years in the future. Decommissioning activities would occur in accordance with requirements and permits at that time and with the decommissioning plan. Air emissions would be short-term. Decommissioning would have a minor to moderate impact on air quality.

Climate change: GHG emissions from decommissioning were not estimated but are expected to be less than during the construction phase because some facilities may be left in place and because of improved emission control technology and more stringent emission standards 25-35 years in the future. Decommissioning activities would occur in accordance with requirements and permits at that time and with the decommissioning plan. GHG emissions would be short term. Decommissioning would have a minor to moderate impact on air quality.

Accidental releases: HAP emissions from accidental chemical spills or leaks during decommissioning may occur infrequently. Emissions would be short-term and would occur at the source. Accidental releases would be minimized or avoided through implementation of BMPs and would have a minor to moderate impact on air quality.

3.4.1.5.3.2 Offshore Activities and Facilities

Air emissions: Activities during the decommissioning phase would be similar to the construction and installation phase but would occur for a shorter period. Activities would include removing the structure and foundations of the SRWF, OCS-DC, and SRWEC. There would be a short-term increase in marine vessel and helicopter traffic. It is expected that similar equipment would be used as during construction, but air emissions are expected to be less because of improved emission control technology and more stringent emission standards 25-35 years in the future. Decommissioning is expected to be completed within 2 years and any emissions would cease after decommissioning is complete. Decommissioning would occur in accordance with requirements and permits at that time and would have a minor to moderate impact on air quality.

Climate change: Offshore activities during the decommissioning phase would be similar to the construction and installation phase. There would be a short-term increase in marine vessel and helicopter traffic. It is expected that similar equipment would be used as during construction, but GHG emissions are expected to be less because of improved emission control technology and more stringent emission standards 25-35 years in the future. Decommissioning is expected to be completed within 2 years and any emissions would cease after decommissioning is complete.

Accidental releases: HAP emissions from accidental chemical spills or leaks during decommissioning could occur infrequently. Emissions would be short-term and would occur at the source. Accidental releases would be minimized or avoided through implementation of BMPs and would have a minor to moderate impact on air quality.

3.4.1.5.4 Cumulative Impact of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. In the context of reasonably foreseeable environmental trends and considering all individual IPFs, the contribution of the Proposed Action to air quality impacts from ongoing and planned activities would be negligible to minor. The main drivers for this impact rating are combustion emissions from marine vessel, air, and vehicle traffic; construction equipment; and fugitive dust emissions. Emissions would be higher during overlapping activities from ongoing and planned projects but would be short-term and cover large geographic areas. Over the lifetime of the Proposed Action, emissions would decrease as emission control technologies improve and emission control standards become more stringent. As the Proposed Action and other offshore wind projects come online, BOEM anticipates that overall emissions from fossil fuel power generation would decrease and would contribute to a minor to moderate beneficial indirect impact on air quality through avoided emissions and health benefits.

3.4.1.5.5 Conclusions

Impacts of the Proposed Action

Once operational, the proposed Project would benefit air quality because of reduced emissions from fossil-fuel powered electricity generating facilities and the potential health benefits. The potential emissions from onshore and offshore activities during the construction and installation, O&M, and decommissioning phases would have a **minor** to **moderate** short-term impact on air quality but would be dispersed throughout the construction, O&M, or decommissioning phases. More air quality impacts would occur during the construction and decommissioning phases than during the O&M phase because of increased vessel traffic, fugitive dust emissions, and increased use of construction equipment and vehicles. Sunrise Wind would implement PM&E measures to minimize or eliminate potential impacts. Pollutant emissions are not expected to exceed NAAQS because emissions would be spread out in time over the 2-year construction phase, would be less during the O&M and decommissioning phases, and would occur over a large geographic area.

While there would be emissions of GHGs and criteria pollutants during the construction, O&M, and decommissioning phases, these emissions would be less than the total avoided emissions possible from the proposed Project and would provide **minor** to **moderate beneficial** impacts. The minimum potential annual avoided CO_2e emissions from the proposed Project are estimated as 2,078,623 tons (1,885,695 metric tons) (COP Appendix K, Sunrise Wind 2022). The potential offshore CO_2e emissions during construction of the proposed Project are approximately 10 times less (230,504 tons [209,110 metric tons]) and 2 to 4 orders of magnitude lower than potential onshore construction emissions. The range of potential avoided NO_x emissions (1,179 to 1,474 tons [1,070 to 1,337 metric tons]) is similar to the potential emissions during construction of the proposed Project (less than 10 tpy [9.1 metric tons] to approximately 1,000 tpy [907 metric tons] depending on location). However, the minimum expected total avoided NO_X emissions over the 25-to 35-year lifetime of the proposed Project is 29,486 tons (26,749 metric tons) (COP Appendix K, Sunrise Wind 2022). Similarly, the range of potential avoided VOC emissions (85 tons to 106 tons [77 to 96 metric tons]) is higher than the potential construction, O&M, and decommissioning emissions. Thus, the emissions during construction and operation of the proposed Project would be offset by the avoided emissions and would provide a **minor** to **moderate beneficial** impact.

Cumulative Impacts from the Proposed Action

As the Proposed Action and other offshore wind projects come online, BOEM anticipates that overall emissions from fossil fuel power generation would decrease and would contribute to a **minor** to **moderate beneficial** indirect impact on air quality through avoided emissions and health benefits.

3.4.1.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.4.1.6.1 Construction and Installation

3.4.1.6.1.1 Onshore Activities and Facilities

Under Alternative C-1, impacts on air quality from air emissions, climate change, and accidental releases from onshore construction and installation activities would be the same as described above for the Proposed Action.

3.4.1.6.1.2 Offshore Activities and Facilities

Under Alternative C-1, the construction of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Air, GHG, and HAP emissions would occur from the same sources as described for the Proposed Action. Under Alternative C-1, emissions during construction would be the same as the Proposed Action because the same number of WTGs would be installed.

3.4.1.6.2 Operations and Maintenance

3.4.1.6.2.1 Onshore Activities and Facilities

Under Alternative C-1, impacts on air quality from air emissions, climate change, and accidental releases during onshore O&M activities would be the same as described above for the Proposed Action.

3.4.1.6.2.2 Offshore Activities and Facilities

Under Alternative C-1, impacts to air quality from air emissions, climate change, and accidental releases during O&M would be the same as described for the Proposed Action because the same number of WTGs would be operated and require maintenance. The maintenance schedule would likely be similar to the Proposed Action.

3.4.1.6.3 Conceptual Decommissioning

3.4.1.6.3.1 Onshore Activities and Facilities

Impacts on air quality from air emissions, climate change, and accidental releases during onshore decommissioning activities would be the same as described above for the Proposed Action.

3.4.1.6.3.2 Offshore Activities and Facilities

Air quality impacts from air emissions, climate change, and accidental release during decommissioning of the offshore facilities would be the same as the Proposed Action because the same number of WTGs would need to be decommissioned.

3.4.1.6.4 Cumulative Impacts of Alternative C-1

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to air quality impacts from ongoing and planned activities would be would not be materially different than the Proposed Action. Ongoing and planned activities, including the Proposed Action or Alternative C-1, would have a minor to moderate beneficial impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.

3.4.1.6.5 Conclusions

Impacts of Alternative C-1

Under Alternative C-1, impacts on air quality from onshore construction, O&M, and decommissioning would be the same as those described for the Proposed Action. Impacts on air quality from offshore construction, O&M, and decommissioning would not change substantially under Alternative C-1 compared to the impacts described above for the Proposed Action because the same number of WTGs would be installed, maintained, and decommissioned. Under Alternative C-1, the offshore construction and decommissioning phases would be completed in a similar amount of time as compared to the Proposed Action. BOEM expects Alternative C-1 would have a **minor** to **moderate** short-term impact on air quality but would be dispersed throughout the construction, O&M, or decommissioning phases.

Cumulative Impacts of Alternative C-1

BOEM anticipates impacts would be similar to the cumulative impacts of the Proposed Action. Ongoing and planned activities, including the Proposed Action or Alternative C-1, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits. Ongoing and planned activities, including Alternative C-1, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.

3.4.1.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

3.4.1.7.1 Construction and Installation

3.4.1.7.1.1 Onshore Activities and Facilities

Under Alternative C-2, impacts on air quality from air emissions, climate change, and accidental releases from onshore construction and installation activities would be the same as described above for the Proposed Action.

3.4.1.7.1.2 Offshore Activities and Facilities

Under Alternative C-2, the construction of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Alternative C-2 includes the relocation of 12 WTGs to the eastern side of the Lease Area. Air, GHG, and HAP emissions would occur from the same sources as described for the Proposed Action. Under Alternative C-2, emissions from vessel traffic and installation of the IAC may be slightly more than the Proposed Action because of the longer distance needed to reach the eastern side of the Lease Area.

3.4.1.7.2 Operations and Maintenance

3.4.1.7.2.1 Onshore Activities and Facilities

Under Alternative C-1, impacts on air quality from air emissions, climate change, and accidental releases during onshore O&M activities would be the same as described above for the Proposed Action.

3.4.1.7.2.2 Offshore Activities and Facilities

Under Alternative C-2, the O&M of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Air, GHG, and HAP emissions would occur from the same sources as described for the Proposed Action. Under Alternative C-2, emissions during O&M of the WTGs or IAC may be marginally higher than the Proposed Action because of the longer vessel travel distance and longer length of IAC needed to reach the eastern side of the Lease Area.

3.4.1.7.3 Conceptual Decommissioning

3.4.1.7.3.1 Onshore Activities and Facilities

Impacts on air quality from air emissions, climate change, and accidental releases during onshore decommissioning activities would be the same as described above for the Proposed Action.

3.4.1.7.3.2 Offshore Activities and Facilities

Under Alternative C-2, air quality impacts from air emissions, climate change, and accidental release during decommissioning would be marginally higher than the Proposed Action because of the longer distance and IAC length needed to reach the eastern side of the lease area.

3.4.1.7.4 Cumulative Impacts of Alternative C-2

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to air quality impacts from ongoing and planned activities would be marginally more than the Proposed Action. Ongoing and planned wind projects, including the Proposed Action, Alternative C-1, or Alternative C-2, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.

3.4.1.7.5 Conclusions

Impacts of Alternative C-2

Under Alternative C-2, impacts on air quality from onshore construction, O&M, and decommissioning would be the same as those described for the Proposed Action and Alternative C-1 because the onshore activities would be the same under all alternatives. Impacts on air quality from offshore construction, O&M, and decommissioning would be slightly more under Alternative C-2 compared to the impacts described above for the Proposed Action and Alternative C-1 because of increased vessel emissions due to the longer distance needed to reach the eastern side of the Lease Area and because of the longer length of IAC that would need to be installed, maintained, and decommissioned. Alternative C-2 would have a **minor** to **moderate** impact on air quality.

Cumulative Impacts of Alternative C-2

Ongoing and planned wind projects, including the Proposed Action, Alternative C-1, or Alternative C-2, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.

3.4.1.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall minor to moderate adverse impacts and minor to moderate beneficial impacts on air quality resources. However, impacts on air quality from offshore construction, O&M, and decommissioning would be slightly more under Alternative C-2 when compared to Alternative B and C-1 because of increased vessel traffic due to the longer distance to the eastern side of the lease area and length of IAC. Table 3.4.1-5 provides an overall summary of alternative impacts.

Table 3.4.1-5. Comparison of Alternative Impacts on Water Quality

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C1)	Fisheries Habitat Minimization (Alternative C2)
Air quality	*Proposed Action*: The Proposed Action would have a short-term **minor** to **moderate** adverse effect from air emissions, climate change, and accidental releases. While there would be emissions of GHGs and criteria pollutants during the construction, O&M, and decommissioning phases, these emissions would be less than the total avoided emissions possible from the proposed Project and would provide **minor** to **moderate** **beneficial** impacts. *Cumulative Impacts of the Proposed Action:* The potential emissions from onshore and offshore activities during the construction and installation, O&M, and decommissioning phases would have a **minor** to **moderate** short-term impact on air quality but would be dispersed throughout the construction, O&M, or decommissioning phases. BOEM anticipates that overall emissions from fossil fuel power generation would decrease and would contribute to a **minor** to **moderate** **beneficial** indirect impact on air quality through avoided emissions and health benefits.	*Alternative C-1*: Alternative C-1 would have a **minor** to **moderate** adverse effect from air emissions, climate change, and accidental releases. **Minor** to **moderate beneficial** indirect impact from reduced emissions from fossil-fueled energy sources and associated health benefits. *Cumulative Impacts of Alternative C-1*: The potential emissions from onshore and offshore activities during the construction and installation, O&M, and decommissioning phases would have a **minor** to **moderate** short-term impact on air quality but would be dispersed throughout the construction, O&M, or decommissioning phases. Ongoing and planned activities, including Alternative C-1, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.	*Alternative C-2*: Alternative C-2 would have a **minor** to **moderate** adverse effect from air emissions, climate change, and accidental releases. **Minor** to **moderate beneficial** indirect impact from reduced emissions from fossil-fueled energy sources and associated health benefits. *Cumulative Impacts of Alternative C-2*: The potential emissions from onshore and offshore activities during the construction and installation, O&M, and decommissioning phases would have a **minor** to **moderate** short-term impact on air quality but would be dispersed throughout the construction, O&M, or decommissioning phases. Ongoing and planned wind projects, including Alternative C-2, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.

3.4.1.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2; however for air quality, there are no measures currently proposed by BOEM. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to air quality.

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3.4.2 Water Quality

This section discusses the existing water quality conditions and the potential impacts on water quality from the Proposed Action, the alternatives, and future offshore wind farm development. The GAA (refer to Figure D-2 in Appendix D) includes onshore waters crossed by Project components, a 10-mi (16.1-km) buffer around the offshore Project components, transit routes, and a 15.5-mi (24.9-km) buffer around the ports that may be used for the Proposed Action. Important parameters used to describe the water quality of an area include dissolved oxygen (DO), water temperature, pH, chlorophyll-a, turbidity, salinity, nutrients, and contaminants.

3.4.2.1 Description of the Affected Environment and Future Baseline Conditions

Water quality within the GAA is managed under the Clean Water Act (CWA) at the federal level by BOEM and USACE and at the state level by New York, Rhode Island, and Massachusetts agencies. BOEM has jurisdiction over offshore water quality for waters containing the SRWF and SRWEC. The state of New York has jurisdiction over the waterbodies crossed by the SRWEC-NYS and the onshore facilities (Sunrise Wind 2022). The NPS administers the Fire Island National Seashore on Fire Island which and has jurisdiction over the water column within Great South Bay, Narrows Bay, and Moriches Bay. New York, Rhode Island, and Massachusetts have authority over concurrence with the CZMA Federal Consistency Certification.

Sources of pollution to water include point sources, such as pipe or sewer outflows, wastewater or industrial discharges, and non-point sources which include land use practices (e.g., agriculture, urban and stormwater runoff, atmospheric deposition) (COP, Section 4.3.3.1, Sunrise Wind 2022). Water quality in the area is influenced by river runoff (e.g., Connecticut River), surface runoff (from coastal cities), and spills or leaks of chemicals or wastes.

3.4.2.1.1 Onshore

The state of New York assigns all waters a classification to describe the best uses and the applicable narrative and numeric water quality standards. Information applicable to the proposed Project Area can be found in the New York Codes, Rules, and Regulations Title 6 (6NYCRR). The onshore transmission cable (OTC) would cross the ICW and Carmans River. The ICW is the area of Great South Bay between Smith Point County Park on Fire Island and Smith Point Marina on Long Island. The state of New York classifies the water in this area as class SA (NYSDEC 2021a). Class SA waters uses include shellfishing for market purposes, primary and secondary contact recreation and fishing; the waters shall be suitable for fish, shellfish and wildlife propagation and survival (NYCRR 2021b). Applicable water quality standards are provided in Table 3.4.2-1 (NYCRR 2021c, 2021d).

Table 3.4.2-1. Narrative and Numeric Water Quality Standards for Class SA and Class C(TS) Waters

Parameter	Class C(TS)	Class SA
pH	Shall not be less than 6.5 nor more than 8.5.	The normal range shall not be extended by more than one-tenth (0.1) of a pH unit.
DO	For trout spawning (TS) waters the DO concentration shall not be less than 7.0 mg/L from other than natural conditions.	Shall not be less than a daily average of 4.8 mg/L
Dissolved solids	Shall be kept as low as practicable to maintain the best usage of waters but in no case shall it exceed 500 mg/L.	NA
Taste-, color-, and odor-producing, toxic and other deleterious substances	None in amounts that would adversely affect the taste, color or odor thereof, or impair the waters for their best usages.	
Turbidity	No increase that would cause a substantial visible contrast to natural conditions.	
Phosphorus and nitrogen	None in amounts that would result in growths of algae, weeds and slimes that would impair the waters for their best usages.	

Source: NYCRR 2021c, 2021d.

Note: mg/L milligram per liter

The Carmans River is one of four major rivers on Long Island and is in the town of Brookhaven in Suffolk County on Long Island, New York. It is within the Atlantic-Long Island Sound water basin which drains all Long Island (NYSDEC 2022a). The Carmans River originates in the central portion of Long Island and flows south-southeast through the Central Pine Barrens and Wertheim National Wildlife Refuge and empties into Bellport Bay; it is approximately 10-mi (16.1-km) long (TU 2022). The upper 8-mi (12.9-km) reach of the river is freshwater, and the lower 2 mi (3.2 km) are brackish. The section of the Carmans River that would be crossed by the OTC is freshwater (COP Appendix L, Sunrise Wind 2022) and is classified by the state of New York as Class C(TS) meaning it is Class C and standards for trout spawning waters apply (NYCRR 2021a). The best use of Class C water is fishing, and the water shall be suitable for fish, shellfish and wildlife propagation and survival, and primary and secondary contact recreation (NYCRR 2021e). The tidal portion of the Carmans River is Class SC. Applicable water quality standards are provided in Table 3.4.2-1 (NYCRR 2021c, 2021d).

The water quality of Carmans River is influenced by the groundwater that feeds the river, atmospheric deposition, surface and stormwater runoff, agriculture, wastewater, biological activity, and vegetation (Town of Brookhaven 2013). The Carmens River is primarily (95 percent) fed by groundwater from the Nassau/Suffolk Long Island Sole Source Aquifer. This aquifer underlies all Long Island and is the sole source of freshwater (USEPA 2021a); the aquifer would be crossed by all the onshore components. Contaminants, in the Carmens River drainage area, that have impacted the groundwater quality but have not impacted the river were documented (NYSDEC 2008). The town of Brookhaven adopted the

Carmans River Conservation and Management Plan to preserve and protect land within the watershed and water quality in the river and to prevent degradation of water quality (Town of Brookhaven 2013).

The NYSDEC completed a biological and water quality assessment of the Carmens River in September 2008 (NYSDEC 2008). One of the monitoring sites was just downstream of where the OTC would cross the river. The biological assessment profile indicated a slight to moderate impact from a natural state depending on the biological index reflecting good to poor water quality. The DO concentration was 9.6 mg/L and pH was 7.4. The nutrient biotic index for phosphorus and nitrogen indicated eutrophic conditions. Municipal and industrial sources were identified as the source of water quality impacts.

The reach of the Carmans River from approximately 0.4 river miles (RM) (0.6 km) downstream of the crossing site to approximately 7 RMs (11.3 km) upstream was listed as impaired for pH in the Draft 2020-2022 Clean Water Act Section 303(d) List of Impaired Waters (NYSDEC 2022b). The Carmans River is designated as impaired for its best use (i.e., fishing) because of pH (NYSDEC 2021a). Great South Bay was listed as impaired due to DO and nitrogen levels in 2010; the uses of fishing and secondary contact recreation are listed as impaired (NYSDEC 2021b). Suffolk County developed the Suffolk County Subwatershed Wastewater Plan to address degrading water quality conditions due to high nitrogen levels in marine freshwater and groundwater (SCDHS 2020). Wastewater is the predominant source of nitrogen pollution, followed by fertilizer. Nitrogen concentrations in Great South Bay have increased by 20 percent to 30 percent over the past 15 years (SCDHS 2020).

The United States Geological Survey (USGS) maintains a site (USGS No. 01305000 Carmans River at Yaphank, New York) approximately 3 RMs (4.8 km) upstream of where the OTC would cross the Carmans River that monitors river flow and several water quality parameters (USGS 2022). Water quality data collected since 2014 is provided in Table 3.4.2-2. Water temperature and DO exhibit the typical seasonal variations. DO concentrations were higher in winter/spring and lower in the summer/early fall pH ranged from 6.5 to 7.0 (Table 3.4.2-2).

Table 3.4.2-2. Water Quality Data Collected at USGS No. 01305000 Carmans River at Yaphank, NY

Date	Water Temperature (°C)	Specific conductance (µS/cm)	DO (mg/L)	DO Percent Saturation	pH	Dissolved Solids (mg/L)	Organic Nitrogen (mg/L)	Nitrate+Nitrite (mg/L)	Orthophosphate (mg/L as PO_4)	Phosphorus (mg/L)
9/24/2014	16.3	197	9.5	97	6.8	117	< 0.13	1.44	< 0.012	0.008
3/12/2015	8.7	192	11.5	97	6.6	111	0.2	1.63	0.023	0.01
6/19/2015	21.5	195	9.1	103	6.8	116	0.82	1.27	0.024	0.01
9/25/2015	16.6	213	8.7	88	6.7	121	0.23	1.37	0.015	0.006
3/30/2016	12.9	202	11.4		6.5	121	0.16	1.62	0.014	0.006
6/30/2016	22.7	214	8.8	102	6.9	125	0.25	1.25	< 0.012	0.009
9/23/2016	18.6	218	8.5	91	6.8	122	0.33	1.3	< 0.012	0.007
11/14/2017	7.4	216	11.1	91	6.7	127	0.37	1.74	0.019	0.005
3/19/2018	8	217	11.9	101	6.7	122	0.27	1.82	0.016	0.007
5/30/2018	18.5	201	7.8	83	6.5	117	0.13	1.49	0.016	0.006
9/21/2018	18.9	229	7.5	80	6.6	125	0.78	1.69	0.03	0.011
11/29/2018	8.6	208	10.8		6.9	113	0.5	1.98	0.036	0.012
3/25/2019	9.3	208	10.7		6.9	123	0.25	2.09	0.035	0.006
6/03/2019	17.7	214	9.2		6.7	121	0.27	1.73	0.022	0.009
6/07/2019	20.5	219	8.2		6.6					
8/29/2019	18.8	209	8.3		6.7	118	0.32	1.46	0.024	0.008
11/06/2019	10.3	210	9.5		7	121	0.15	1.91	0.019	0.008
2/24/2020	7.1	198	11.6		6.5	121	0.19	2.06	< 0.012	0.005
5/26/2020	20	203	9.1	99	6.6	117	0.23	1.42	< 0.012	0.007
8/27/2020	19.6	204	8.4	92	6.7	109	< 0.19	1.22	< 0.012	0.009
11/09/2020	13.2	202	9.2	87	6.7	119	0.15	1.83	< 0.012	0.007
2/17/2021	5.7	193	11.9	94	6.8	116	< 0.26	1.95	< 0.012	0.004
5/04/2021	14.8	190	9.5	95	6.7	107	0.22	1.46	< 0.012	0.006
9/13/2021	19.6	203	8.2	89	6.5	113	< 0.15	1.5	0.016	0.008
11/16/2021	9.2	202	10.6	92	6.6		< 0.28	1.83	< 0.012	0.004

Notes: µS/cm (microsiemens per centimeter); PO_4 (phosphate).

The Suffolk County Department of Health Services monitors water quality at a site approximately 2 RMs (3.2 km) downstream of where the OTC cross would the Carmens River (station 95052) and at a site in the ICW (station 90100). Water quality monitoring results from 2015 to 2019 are provided in Table 3.4.2-3 (adapted from Table 4.3.3-1 and the text in Section 4.3.3.1 COP, Sunrise Wind 2022).

Table 3.4.2-3. Water Quality Monitoring Results Completed by the Suffolk County Department of Health Services in 2015 to 2019

Parameter	Station 95052	Station 90100
DO (mg/L)	1.3-11	3.9-12.3
Chlorophyll-a (µg/L)	0.6-44.9	0.53-53.29
Ammonia (mg/L)	0.054	0.073
Nitrite+Nitrate (mg/L)	0.83	1.09
Total Nitrogen (mg/L)	0.39	1.45
Orthophosphate (mg/L)	0.018	0.012
Total Phosphorus (mg/L)	0.064	0.083

The water surrounding some of the proposed ports are listed on state impairment lists. The Port of Albany and the Port of Coeymans are on a reach of the Hudson River in New York that is listed as impaired for fishing because of PCB pollution (NYSDEC 2022b). Port Jefferson Harbor in New York is listed for shellfishing and primary contact recreation due to fecal coliform. Upper New York Bay, containing the Port of Brooklyn and the Port of New York, is impaired for fishing because of PCBs and dioxins. The Port of Montauk at Lake Montauk, New York, is listed for fishing due to fecal coliform (NYSDEC 2022b). The Paulsboro Marine Terminal on the Delaware River in New Jersey is listed for not supporting fish consumption and aquatic life (NJ DEP 2022). The Thames River at the Port of New London in Connecticut is listed for not supporting marine aquatic life and shellfish (CT DEEP 2020). The New Bedford Marine Commerce Terminal in the New Bedford Inner Harbor in Massachusetts is listed for aesthetics, fish consumption, fish and other aquatic life and wildlife, recreation, and shellfish harvesting (MA DEP 2020). The Port of Providence on the Providence River, Rhode Island, is listed for fish and wildlife habitat because of DO and total nitrogen and for recreation because of fecal coliform (RI DEM 2022).

3.4.2.1.2 Offshore

The SRWF is located southeast of Block Island, and south of Rhode Island sound on the outer continental shelf in the mid-Atlantic Bight. The mid-Atlantic Bight extends from Cape Lookout off North Carolina to Nantucket Shoals off southern New England. Water depths at the SRWF range from approximately 115 ft to 203 ft (35 m to 62 m) (COP Section 4.3.1.1, Sunrise Wind 2022). Typical current velocities vary with depth with stronger currents near the surface that decrease with depth. Overall, surface currents flow to the west in spring to early summer and shift to the east in late summer to fall. Sediments at the SRWF generally consist of a mix of sand and muddy sand, silt, and clay (COP Section 4.3.3.1, Sunrise Wind

2022) in the southwest of the SRWF with courser sediments to the east and north (COP Section 4.3.2.1, Sunrise Wind 2022). No sand waves are present at the current proposed location of the SRWF. However, areas of sand accumulation in low relief areas were identified across the offshore area. Sediment along the SRWEC-OCS generally consists of sand and muddy sand with some areas of coarse gravelly sand, sand accumulation, and ripple areas.

Several reports describing data collected from waters offshore of Rhode Island and New York were reviewed and results are briefly summarized below to provide a general characterization of water quality in the GAA. Codiga and Ullman (2011) analyzed water temperature and salinity data collected between 1980 and 2007 and water temperature, salinity, DO, chlorophyll-a, and turbidity data collected in 2009 and 2010 for the Rhode Island Ocean Special Area Management Plan. Bathis et al. (2009) presents water quality data collected along the mid-Atlantic Bight in May 2006 from a joint USEPA and NOAA program. The OceanReports tool was created by BOEM and NOAA to provide an online interactive tool to present environmental ocean characteristics for user-specified areas (NOAA 2021).

The USEPA prepared the National Coastal Condition Reports (NCCR) to describe the environmental conditions in coastal waters. The most recent report describes conditions for 2003 to 2006 (USEPA 2012). The NCCR provides ratings of poor, fair, or good for water quality parameters in coastal waters. In the most recent evaluation published in 2012, the Northeast coastal region (i.e., coastal and estuarine waters from Maine to Virginia) was rated as fair for water quality based on data for DO, chlorophyll-a, dissolved inorganic nitrogen, and dissolved inorganic phosphorus. There was a spatial gradient in the water quality rating with more sampling sites rated fair or good off the coasts of Massachusetts, Rhode Island, Connecticut, and eastern Long Island with more fair and poor sites in western Long Island, and near New York City and New Jersey (USEPA 2012).

In the SRWF and SRWEC-OCS area, water temperature and salinity vary seasonally causing the water column to stratify in late summer with reduced mixing between the surface and bottom waters (Codiga and Ullman 2011; COP Section 4.3.1.1 Sunrise Wind 2022). Upwelling bottom waters and storms in the fall cause mixing and disrupt the thermal stratification pattern. In winter, water temperatures near the surface range from approximately 39 °F to 41°F (4 °C to 5°C) while temperatures are 40°F to 43°F (4.5°C to 6°C) near the bottom. Water temperatures near the surface in summer are 64°F to 68°F (18°C-20°C) and 52°F to 55°F (11°C to 13°C) near the bottom. Surface water temperatures have a greater seasonal variation (up to 59°F or 15°C) than bottom waters (approximately 41°F or 5°C). Overall, water temperatures are cooler on the eastern side of the SRWF than on the west (Codiga and Ullman 2011; COP Section 4.3.1.1, Sunrise Wind 2022). Water temperatures recorded in May 2006 throughout the mid-Atlantic Bight ranged from 46.0°F to 64.2°F (7.8°C to 17.9°C) near the surface and from 43.7°F to 59.4°F (6.5°C to 15.2°C) near the bottom (Bathis et al. 2009).

Salinity ranges from approximately 31.5 to 34.5 practical salinity scale (PSS) throughout the GAA. In general, salinity increases with increasing depth and with distance offshore and is higher in the southern end of Rhode Island Sound near the SRWF (COP Section 4.3.1.1, Sunrise Wind 2022). Surface water salinities are highest in the fall and winter, decrease in the spring due to rain and melting, and begin increasing again in summer (Codiga and Ullman 2011; COP Section 4.3.1.1, Sunrise Wind 2022). In May 2006, salinity values near the surface were 31.2 to 33.3 PSS and were 32.2 to 34.4 PSS near the bottom of the mid-Atlantic Bight (Bathis et al. 2009).

Ocean waters in the offshore Project Area have been shown to be well oxygenated (Bathis et al. 2009; Sunrise Wind 2022). DO concentrations vary seasonally with highest concentrations in early spring and lowest in early fall. In the Rhode Island Sound, DO was reported to be greater than 10 milligrams/liter (mg/L) in March 2009 and between 5 to 9 mg/L during the remainder of the year (Codiga and Ullman 2011). Throughout the mid-Atlantic Bight, DO ranged from 7.7 to 9.7 mg/L near the surface and 8.1 mg/L to 9.9 mg/L near the bottom (Bathis et al. 2009). These values are considered to represent good water quality based on DO content (USEPA 2012).

Chlorophyll-a levels within the offshore Project Area have been observed to be low (less than 5 micrograms/liter [µg/L]) (Bathis et al. 2009; Codiga and Ullman 2011). Chlorophyll-a was observed to vary seasonally with values below 1 µg/L in summer and 1 to 3 µg/L in spring (NOAA 2021; Sunrise Wind 2022). Chlorophyll-a concentrations less than 5 µg/L are considered good quality (USEPA 2012). Overall, the northeast coastal region was rated fair which represents chlorophyll-a concentrations ranging from 5 to 20 µg/L (USEPA 2012).

The NCCR report rated dissolved inorganic nitrogen and dissolved inorganic phosphorus in Northeast Coastal Waters as good (concentrations of less than 0.1 mg/L) and fair (concentrations ranging from 0.01 to 0.05 mg/L), respectively (USEPA 2012). Bathis et al. (2009) reported dissolved inorganic nitrogen concentrations of 0.01 to 0.20 mg/L in surface waters and higher concentrations of 0.01 to 0.54 mg/L in bottom waters of the mid-Atlantic Bight; dissolved inorganic phosphorus ranged from 0.02 to 0.06 mg/L at the surface and 0.02 to 0.12 mg/L in bottom waters. Also, in the mid-Atlantic Bight, pH values of 8.0 to 8.6, and total suspended solid concentrations of 0.9 to 13.5 mg/L have been reported (Bathis et al. 2009).

3.4.2.2 Impact Level Definitions for Water Quality

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on water quality from the alternatives, including the Proposed Action. Table 3.4.2-4 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for water quality. Table G-4 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to water quality. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of 1 year or less. Long-term impacts may occur throughout the duration of a project.

Table 3.4.2-4. Definition of Potential Impact Levels for Water Quality

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Impacts on water quality would be undetectable.	Impacts on water quality would be undetectable.
Minor	Impacts on water quality would be detectable but would not result in degradation of water quality in exceedance of standards. Impacts could be avoided with PMEs.	Small and measurable improvement in water quality.
Moderate	Impacts on water quality would be detectable and could result in localized, short-term degradation of water quality in exceedance of standards. Impacts could be minimized with PMEs.	Notable and measurable improvement in water quality.
Major	Impacts on water quality would be detectable and could result in extensive, long-term degradation of water quality in exceedance of standards.	Regional improvement in water quality.

3.4.2.3 Impacts of Alternative A - No Action on Water Quality

When analyzing the impacts of the No Action Alternative on water quality, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities, on the baseline condition for water 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, as described in Appendix E*, Planned Activities Scenario*.

3.4.2.3.1 Impacts of the No Action Alternative

Under Alternative A, baseline water quality conditions would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities. Ongoing activities that could impact water quality in the GAA include onshore development (e.g., urbanization, wastewater or point source discharges, agriculture, forestry), land disturbance (e.g., construction), recreational activities, atmospheric deposition, discharges from marine vessels, dredging, port improvement, commercial fishing, military use, submarine cable and pipeline emplacement, terrestrial runoff, and climate change. Contaminated runoff or accidental releases into surface or groundwaters from these activities could cause exceedances of water quality standards; these impacts would be minimized or avoided through BMPs, state and federal regulations and permitting requirements. BOEM anticipates that impacts from these activities could be short-term to long-term depending on the nature and magnitude of the activities and could have a negligible to moderate impact on water quality.

Ongoing offshore wind activities within the GAA that contribute to impacts on water quality include:

- Continued O&M of the Block Island Project (5 WTGs) installed in State waters;

- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island Project and ongoing construction of the Vineyard Wind 1 and South Forks projects would affect water quality through the primary IPFs of accidental releases, cable emplacement and maintenance, discharges, and port utilization. Ongoing offshore wind activities would have the same type of impacts from the IPFs that are described in following section for planned offshore wind activities.

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 Proposed Action).

Other planned wind activities that could impact water quality in the GAA are onshore development, land disturbance, recreational activities, atmospheric deposition, discharges from marine vessels, dredging, port improvement, commercial fishing, military use, submarine cable and pipeline emplacement, terrestrial runoff, and climate change. These activities may result in short-term exceedances of water quality standards following a large accidental release, spill, or discharge or short-term increases in turbidity.

The sections below summarize the potential impacts of planned offshore wind activities on water quality during construction, O&M, and decommissioning of the projects. Future offshore wind activities other than the Proposed Action that may result in water quality impacts within the MA/RI Lease Area include Vineyard Wind, New England Wind, Mayflower, Beacon Wind, Bay State Wind, and Liberty Wind. Only the New England Wind Project and Mayflower Project are expected to have an overlapping construction schedule with the Proposed Action in 2024. BOEM anticipates planned offshore wind activities would affect water quality through the following IPFs.

Accidental releases: Planned offshore wind activities may cause accidental releases of contaminants (e.g., oils, fuels, lubricants, coolants, solvents) to the ocean or to onshore waters from marine vessel use, on-vessel equipment, or onshore construction vehicles and equipment. Accidental spills could occur during transfer of fluids, refueling, construction, maintenance, collisions between vessels or with structures, or from large storms. Accidental releases would be short term, localized to the area of the spill or leak, and be more likely to occur during the construction phase because of increased vessel traffic in ports and offshore construction areas. The probability of a vessel collision or allision is higher if the construction phases of planned offshore wind projects overlap which could occur between 2023 and 2030.

Approximately 425,012 gallons (gal) of coolant fluids, 1,144,968 gal oils and lubricants, and 244,427 gal diesel fuel are estimated to be used in the MA/RI Island Lease Area. Other chemicals, including grease, paints, and SF_6, would be used at the offshore wind projects, and black and gray water may be stored in sump tanks on facilities. BOEM completed a modeling study to evaluate the likelihood of a chemical spill associated with routine O&M at offshore wind facilities (Bejarano et al. 2013). BOEM found that the risk of a catastrophic release (all oils totaling 129,000 gal [488,318 L] of all chemicals totaling 29,000 gal [109,777 L]) was very low (1 time in greater than or equal to 1,000 years) while small releases (several hundred gallons) were more likely. A small accidental release would have a minor to moderate impact on water quality because it would be short-term and localized to the area of the spill or leak. Future offshore wind projects would be required to comply with all regulatory requirements and permits and to develop an Oil Spill Response Plan which requires a rapid spill response, containment, and cleanup for all onshore and offshore activities. A large, catastrophic spill would have short-term to long-term impacts depending on the type and volume of material spilled and impacts on water quality could be minor to major.

An accidental release of trash or debris would be infrequent because planned offshore wind projects would be required to comply with federal and international regulations regarding the management and disposal of trash. An accidental release of trash or debris would have a negligible impact on water quality.

Onshore construction and installation activities would involve the use of fuel and lubricating and hydraulic oils. Use of heavy equipment onshore could result in potential spills during active use or refueling activities. It is assumed that a Spill Prevention, Control, and Countermeasure Plan would be prepared for each project in accordance with applicable regulatory requirements, and would outline spill prevention plans and measures to contain and clean up spills if they were to occur. Additional mitigation and minimization measures (such as refueling away from wetlands, waterbodies, or known private or community potable wells) would be in place to decrease impacts on water quality. Impacts on water quality would be limited to periods of onshore construction and periodic maintenance over the life of each project.

Anchoring: Anchoring during planned offshore wind activities would impact water quality through sediment suspension and deposition, and increases in turbidity. Anchoring would occur during the construction and installation, O&M, and decommissioning phases of future offshore facilities. Anchoring is estimated to disturb 687 ac (2.78 km^2) of the seabed in the MA/RI Lease Area. Impacts to water quality would be short-term and within and adjacent to the anchorage area. Impacts could be greater if anchoring activities from more than one project were occurring at the same time. However, due to the localized nature of the sediment plumes, impacts are not expected to overlap geographically. Impacts on water quality would be minor or moderate.

Cable emplacement and maintenance: The installation of offshore export cables is estimated to disturb 2,114 acres (8.6 km^2), and construction of IAC is estimated to disturb 996 acres (4.0 km^2) of the seabed from future offshore wind activities. The emplacement and maintenance of cables would result in increased turbidity from the suspension and deposition of sediment. Sediment transport modeling from cable installation completed for the Proposed Action estimated that sediment plumes would remain within approximately 9.8-ft (3-m) above the seabed, that turbidity levels would return to ambient levels within less than 1 hour, and that the maximum deposition would occur within less than approximately

1,000 ft (305 m) from the cable centerline (Woods Hole Group 2021). It is anticipated that future offshore wind projects would use cable emplacement methods that would be most likely to minimize impacts on water quality as much as feasible. Impacts on water quality from future offshore wind activities would be minor or moderate, short-term, localized, and would not be expected to overlap geographically.

Discharges: Permitted discharges would be more likely during the construction and decommissioning phases of planned offshore wind projects and would be infrequent during O&M. During construction, there would be an incremental increase in vessel traffic near ports and in the offshore construction areas and a corresponding increase in regulated discharges (e.g., properly treated wastes, uncontaminated bilge water). All vessels would be required to comply with BMPs and state and federal regulatory requirements and permits related to the prevention and control of discharges.

Offshore wind Project structures and facilities (e.g., WTGs, cables) are generally self-contained and do not generate discharges under normal operating conditions. Vessels have onboard containment plans and measures in place to avoid or minimize discharges. Due to the staggered increase in vessels from various projects; the current regulatory requirements administered by USEPA, USACE, USCG, and BSEE; and the restricted allowable discharges, the overall impact of discharges from vessels is anticipated to be short-term, localized, and staggered over time and would have a negligible or minor impact on water quality.

Offshore wind substations that use a high voltage direct current (HVDC) system to convert AC electricity to DC for long range transmission may require a cooling system (Middleton and Barnhart 2022). The conversion of AC to DC generates a large amount of heat as a byproduct, and the HVDC system must be cooled when operating. The heated water is then discharged back to the ocean. Future offshore wind projects that use a HVDC system would be required to obtain a NPDES permit for the cooling system discharge. There may be a short-term, localized effect on water temperatures in the area surrounding the outlet pipe until the discharge water has mixed and reached equilibrium. It is generally accepted that the heated discharge water would have a minimal effect given the large mass of surrounding ocean and because it would be absorbed and cool to ambient water temperatures over time (Middleton and Barnhart 2022).

Land disturbance: The onshore construction associated with future offshore wind development could cause land disturbance from site preparation, clearing, grading, filling, and excavating. Land disturbance for offshore wind projects that are at a distance from waterbodies and that implement erosion and sediment control measures would be less likely to impact water quality. Construction and installation of onshore components near waterbodies may involve ground disturbance, which could lead to unvegetated or otherwise unstable soils. Precipitation events could potentially erode the soils, resulting in sedimentation of nearby surface or coastal waters and subsequent increased turbidity. Onshore construction activities would comply with all state and federal permits, erosion and sedimentation control plans, and stormwater pollution prevention plans which would minimize or avoid impacts on water quality. While onshore construction activities may occur at the same time, they likely would not overlap geographically. Any sedimentation into nearby waterbodies following land disturbance would be short-term and localized and have a negligible or minor impact on water quality.

Port utilization: Planned offshore wind projects would use ports as staging areas, for material assembly and fabrication, crew transfer, and to support offshore construction and O&M. In-water work associated with port upgrades or expansion would increase vessel traffic and the risk of an accidental spill, leak, or discharge. Any required port upgrades or expansion 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, governmental agencies, states, other offshore wind developers). Impacts on water quality from port utilization would be minor or moderate, short-term, and localized.

Presence of structures: Planned offshore wind activities could result in the installation of up to 193 WTGs and approximately 7 converter stations in the MA/RI Lease Area. The installation of WTG foundations and scour protection would impact water quality through the disruption of bottom current patterns, leading to increased movement, suspension, and deposition of sediments. In the MA/RI Lease Area, the total footprint from foundations with the addition of scour protection is estimated to be 93 acres (0.4 km^2). In addition, the presence of structures has been shown to alter the vertical and horizontal mixing patterns of ocean waters which could influence water quality (e.g., water temperature, salinity, DO) by changing the thermal stratification and mixing between surface and deep waters (e.g., Carpenter et al. 2016; Cazenave et al. 2016). Results from a recent hydrodynamic model of four different WTG build-out scenarios of the offshore MA/RI Lease Areas 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). The results of the hydrodynamic model study show that introduction of the offshore wind structures into the offshore wind energy area modifies the oceanic responses of current magnitude, temperature, and wave heights by (1) reducing the current magnitude through added flow resistance, (2) influencing the temperature stratification by introducing additional mixing, and (3) reducing current magnitude and wave height by extracting energy from the wind by the offshore wind turbines. Alterations in currents and mixing would affect water quality parameters such as temperature, DO, and salinity, but would vary seasonally and regionally.

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 the 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 (e.g., galvanic anodes emitting metals, such as aluminum, zinc, and indium, and organic coatings releasing organic compounds due to weathering and leaching). The current understanding of chemical emissions for offshore wind structures is that emissions appear to be low, suggesting a low environmental impact, especially if compared to other offshore activities, but 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.

3.4.2.3.3 Conclusions

Impacts of the No Action Alternative

Under Alternative A, the No Action Alternative, water quality would continue to be affected by existing environmental trends and ongoing activities. Water quality would continue to be impacted by existing sources (e.g., runoff, industrial or municipal point sources, atmospheric deposition, agriculture, marine vessel traffic, dredging, coastal road construction, recreation and tourism, harbor and port operations). Ongoing activities include vessel traffic, military activities, onshore development and land disturbance, port development, commercial and industrial activities, recreational activities, and installation of new offshore structures. The No Action Alternative would result in **negligible** to **moderate** short-term impacts on water quality through sediment suspension and deposition, anchoring, new cable emplacement, accidental releases or discharges, port utilization, presence of structures, or land/seafloor disturbance.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities would continue. Planned offshore wind projects are anticipated to impact water quality through anchoring; cable installation/maintenance; land disturbance; port utilization; presence of structures; accidental chemical spills, leaks, or trash discharges; and sediment suspension and deposition. These IPFs could result in short-term exceedances of water quality standards. Future offshore wind projects may result in a small increase in vessel traffic, particularly during the construction and decommissioning phases, with corresponding potential impacts on water quality. Increased vessel traffic would be localized to the ports, transit routes, and offshore construction areas. Construction and decommissioning activities associated with other offshore wind activities would lead to increases in sediment suspension and turbidity in the offshore lease areas during the first 6 to 10 years of construction of projects and in the latter part of the 30-year life spans of offshore wind projects due to decommissioning activities. BOEM has considered the possibility of impacts resulting from accidental releases; a **moderate** or **major** impact could occur if there was a large-volume, catastrophic release. However, the probability of catastrophic release occurring is very low, the expected size of the most likely spill would be very small, and such a spill would be expected to occur infrequently. Continuation of existing environmental trends and activities under the No Action Alternative would result in **negligible** to **moderate** impacts on navigation and vessel traffic.

The potential impacts on water quality from planned activities would be avoided or minimized through state and federal regulations and development would comply with all permit requirements (e.g., implementation of BMPs, Oil Spill Response Plan, Erosion and Sedimentation Control Plan, and Stormwater Pollution and Prevention Plan). Considering all the IPFs together, BOEM anticipates the overall potential impacts on water quality associated with planned offshore wind activity would be **minor** or **moderate**.

3.4.2.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than those described in the sections below. The primary proposed PDE parameters (Appendix C) that would influence the magnitude of the impact on water quality include the following:

- The number, capacity, and location of WTGs: the level of impact related to the WTGs is proportional to the number of WTGs installed and the amount of seabed disturbed;
- The amount of vessel use during construction/installation, O&M, and decommissioning: the number of vessels used influences the potential risk of fuel or chemical spills or releases;
- The length of the IAC and export cables: the amount of cable installed influences the amount of seafloor disturbed and sediment mobilized;
- Sediment type influences the amount of sedimentation, deposition, and disturbance;
- Offshore and onshore cable installation and laying methods;
- Different routes for the onshore transmission cable: the use of different routes influences the potential water bodies crossed by the cable; and
- Quantity and type of oil, lubricants, or other chemicals contained in the equipment, vessels, and WTG.

Variability of the proposed Project design as a result of the PDE includes the number of WTGs (influences number of foundation), capacity of WTGs (influences size of foundation), length of cables (influences volume of seabed disturbed), area of scour protection (influences amount of sedimentation and deposition), number and frequency of vessel use. Changes in design may affect the magnitude, location, and mechanism of water quality impacts.

3.4.2.5 Impacts of Alternative B - Proposed Action on Water Quality

The Proposed Action would contribute to impacts on water quality from accidental releases and discharges, anchoring, cable emplacement and maintenance, land disturbance, port utilization, and presence of structures.

3.4.2.5.1 Construction and Installation

3.4.2.5.1.1 Onshore Activities and Facilities

Accidental release: Accidental release of fuels, oils, solvents, lubricants, drilling, or hydraulic fluids to surface, ground, or coastal waters could occur from construction vehicles, heavy equipment, HDD activities, and refueling during construction and installation of the onshore Project components. The likelihood of a large oil or chemical spill is low, and the magnitude of the impact would depend on the spill volume. However, a direct spill into a water body could degrade water quality. Any impact on surface, coastal, or ground water quality, including the Nassau/Suffolk Long Island Sole Source Aquifer, would be avoided or minimized through implementation of BMPs (e.g., APM GEN-06 site specific monitoring, APM GEN-08 minimize disturbance to sensitive habitat, APM GEN-10 prepare waste management and hazardous materials plans), development and implementation of a Stormwater Pollution Prevention Plan and a Spill, Prevention, Control, and Countermeasure Plan (APM GEN-11), and environmental protection measures described in COP Section 4.3.3.3, Sunrise Wind 2022. An Inadvertent Return Plan would be developed and implemented to avoid or minimize the accidental release of drilling fluid during HDD for installation of the OTC (APM GEN-12).

Good housekeeping and proper waste collection, storage, and disposal techniques would be implemented to minimize impacts on water quality from trash and debris. All trash and debris created during onshore construction and installation activities would be properly disposed of or recycled at licensed waste management and recycling facilities (APM GEN-10).

Environmental protection and mitigation measures from applicable federal and state permits would be followed which would minimize impacts on water quality. Construction of the onshore facilities is expected to be completed within 2 years and any impacts on water quality would cease after construction is complete. Potential impacts on water quality are anticipated to be localized and short-term and minor or moderate.

Anchoring: There would be no impacts on water quality during the construction and installation of onshore facilities from anchoring.

Cable emplacement and maintenance: Construction and installation of the onshore cables could impact water quality through increased sedimentation and turbidity. Cable emplacement would be conducted using trenchless methods to minimize or avoid impacts on water quality and in accordance with the erosion and sedimentation control plan. Potential impacts to water quality are anticipated to be localized and short-term and negligible to minor.

Discharges: Onshore construction activities would produce waste (e.g., solid waste, chemicals, oils, solvents, sewage) that would be properly controlled, stored, and disposed of in accordance with state and federal permits (APM GEN-10). The OnCS-DC, onshore interconnection cable (OIC), and OTC would be self-contained and would not generate discharges. Discharges would be more likely during the onshore construction phase because of the increased vehicle and equipment use. Impacts on water quality would be negligible or minor.

Seafloor/Land disturbance: Construction of the onshore facilities would require short-term ground disturbing activities, such as clearing, grading, excavating, trenching, and HDD at the landfall work area, during TJB and HDD installation, installation of the OIC and OTC, and construction of the OnCS-DC. Land disturbance activities would impact the water quality of surface, ground (i.e., the Nassau/Suffolk Long Island Sole Source Aquifer), or coastal waters (e.g., shoreline of Smith Point County Park, Fire Island) through erosion, sedimentation, deposition, resuspension of contaminated sediment, and increased turbidity. Impacts on water quality from land disturbance would be more likely during the construction phase.

Land disturbance during onshore construction would be minimized by installing facilities in areas that have been previously disturbed or developed (APM GEN-01). Sunrise Wind selected locations for the OnCS-DC, landfall site, and transmission route that would minimize land disturbances. A maximum area of 7 ac (0.03 km^2) would be disturbed for construction of the OnCS-DC; land disturbance near the OnCS-DC would be minimal because the site is near other industrial and commercial developments and contains minimal vegetated areas (COP Section 2.2.1.1, Sunrise Wind 2022). Smith Point County Park was chosen as the proposed landfall site because it has sufficient workspace within a developed area and minimal conflicts with adjacent land uses. HDD activities would be used to install the SRWEC to the TJB and the OTC which would minimize land disturbance. The OIC and proposed onshore transmission route is primarily within an existing right-of-way and near paved, disturbed areas which would confine any disturbance to the construction areas. The disturbance would cease after the cable installation has been completed. Areas disturbed for the short-term creation of construction work areas would be returned to pre-existing conditions.

Sediment suspension and deposition to the ICW and Carmans River could occur during construction and installation of the OTC. The maximum lengths of the ICW and Carmans River that would be crossed are 2,660 ft (811 m) and 1,990 ft (607 m), respectively (COP Section 3.3.2.3, Sunrise Wind 2022). The ICW and Carmans River would be crossed using trenchless installation methods (i.e., HDD) to avoid or minimize impacts to water quality. An Inadvertent Return Plan would be developed and implemented to avoid or minimize the accidental release of drilling fluid during HDD for installation of the OTC (APM GEN-12). All land disturbance activities during onshore construction would be conducted in compliance with federal permits (Section 404, Section 401 Water Quality Certification), the New York SPDES General Permit for Stormwater Discharges associated with Construction Activities, an approved SWPPP, and environmental protection measures described in Section 4.3.3.3 of the COP (Sunrise Wind 2022) at a minimum. These measures would serve to protect the Smith Point County Park and Fire Island Wilderness Areas. Construction of all onshore facilities is expected to be completed within 2 years. Potential impacts to water quality would be localized and short-term and cease after construction is completed. Impacts on water quality from land disturbance would be minor or moderate.

Port utilization: Multiple ports are being considered for use during the construction phase. In-water work associated with port upgrades or expansion would increase vessel traffic and the risk of an accidental spill, leak, or discharge. Any required port upgrades or expansion 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, governmental agencies, states, other offshore wind developers). Impacts on water quality from port utilization would be minor or moderate, short-term, and localized.

Presence of structures: The presence of structures in coastal waters, such as docks, would not likely impact water quality. An impact could occur if a vessel collides with a structure causing an accidental chemical spill or leak. However, the risk of this is low and any spill would be quickly contained and cleaned. A collision is more likely during the construction phase because of the increased vessel traffic.

The impacts of the Proposed Action on onshore water quality due to the presence of structures would be negligible.

3.4.2.5.1.2 Offshore Activities and Facilities

Accidental releases: Fuels, oils, solvents, and chemicals would be used during construction of the offshore facilities and would be stored on the WTGs and OCS. Approximately 350,291 gal of coolants, 507,282 gal of oils and lubricants, and 105,190 gal of diesel fuel are estimated to be used for the Proposed Action. BOEM has conducted modeling to evaluate the likelihood of a chemical spill at offshore wind facilities at three locations along the Atlantic Coast, including an area in the RI/MA Lease Area with a similar number of WTGs (98) as the Proposed Action (Bejarano et al. 2013). Results of the model found that the likelihood of a catastrophic, or maximum case scenario, release of 129,000 gal of oil mixture was 'Very Low' meaning it could occur one time in 1,000 or more years. The most likely type of spills to occur were from the WTGs at a volume of 90 to 440 gal at a rate of 1 time in 5 years or a diesel fuel spill of up to 2,000 gal at a rate of one time in 91 years (Bejarano et al. 2013). Overall, the risk of an accidental spill or leak is low but more likely during the construction phase because of the increased vessel traffic and equipment use. The increased vessel traffic could increase the probability of a collision or allision resulting in an accidental release. However, this would be unlikely because of safety measures such as requirements for vessel lighting and marking, vessel speed restrictions, and spacing of facilities (APM GEN-07). Overall, the probability of an oil or chemical spill occurring that would be large enough to affect water quality is low, and the degree of impact on water quality would depend on the spill volume. If a large spill were to occur (e.g., 129,000 gal, Bejarano et al. 2013), impacts would be short-term to long-term depending on the volume and type of material released. Overall, impacts on water quality from spills and leaks would be short-term and minor to moderate because construction activities would comply with state and federal regulations and impacts would only occur during accidental events (WQ-02). Sunrise Wind would follow all BMPs, an Oil Spill Response Plan, and other mitigation measures described in Section 4.3.3.3 of the COP (Sunrise Wind 2022) at a minimum.

The release of contaminants within sediments due to sediment resuspension and deposition is expected to be minor because there are no USEPA-designated ocean disposal sites overlapping or immediately adjacent to the SRWF (USEPA 2021b). Impacts on water quality from resuspension of contaminated sediments would be negligible or minor.

Sunrise Wind would follow all BOEM and United States Coast Guard (USCG) regulations and good housekeeping practices related to the storage and disposal of all trash and debris created during construction and installation of the offshore components. All trash and debris would be properly stored on vessels for disposal or recycling at an appropriate facility on land. Sunrise Wind would follow BMPs including orderly storage of equipment and tools and keeping work areas clean. The disposal of trash and debris to the marine environment is prohibited, and thus unlikely to occur (BOEM 2013). The potential impact of trash and debris on water quality is negligible or minor.

Anchoring: Construction of the offshore facilities would require anchoring of vessels to the seabed which would cause increased sedimentation, deposition, and turbidity. Anchoring could disturb the seabed through penetration of the anchors, dragging of anchors, or the sweeping of chains. The extent and magnitude of impacts from anchoring would depend on the type and size of anchoring used, vessel drag distance, and the sediment characteristics. Approximately 11 acres of seabed is expected to be disturbed due to anchoring (Appendix E). Impacts on water quality from anchoring would be minor.

Cable emplacement and maintenance: All of the potential cable installation techniques (e.g., jet plowing, mechanical plowing, mechanical cutting, dredging, backfill plowing) would disturb the seafloor. Site preparation activities, such as sand wave clearance and boulder removal, would be required prior to cable installation. Cable emplacement would cause sediment suspension and deposition and increased turbidity; however, the impacts would be short-term and minor.

Sediment transport modeling was completed to estimate suspended sediment levels from installation of the IAC, SRWEC-OCS, SRWEC-NYS, and sand wave leveling using controlled flow excavation (CFE) and trailing suction hopper dredge (TSHD) (Woods Hole Group 2021). In the model, turbidity levels were represented as total suspended sediment (TSS), and deposition was represented as thickness above seafloor. For installation of the SRWEC-OCS, the TSS plume was predicted to remain within approximately 9.8 ft (3 m) above the seafloor with maximum concentrations occurring within 2,969 ft (905 m) of the cable centerline. TSS was predicted to return to ambient levels within 0.4 hours. Sedimentation levels above 0.4 inch (10 mm) extended to 791 ft (241 m) from the cable centerline and covered 832.3 ac (3.4 km^2). Sand wave leveling along the SRWEC-OCS would be required using either CFE or TSHD. Using either method, TSS concentrations above 0.003 ounces (oz) (100 mg) were not predicted to occur. Overall, the TSHD technique was modeled to have a smaller impact on TSS levels.

For installation of the IAC, modeling was completed for a typical and worst-case scenario (i.e., using jet plowing). Results showed that maximum TSS concentrations (greater than 100 mg/L) occur within 2,031 ft (619 m) to 3,346 ft (1,020 m) of the cable centerline (Woods Hole Group 2021). The plume remained primarily within approximately 9.5 ft to 12.8 ft (2.9 m to 3.9 m) above the seafloor. TSS levels were estimated to return to ambient levels within 0.4 hour to 0.5 hour after completion of installation. Installation of the SRWEC-NYS using HDD found that TSS concentrations above 100 mg/L would not occur. The TSS plume was predicted to remain within 8.2 ft (2.5 m) above the seafloor, and TSS concentrations were predicted to return to ambient levels within 0.34 hour after completing installation. Overall, the sediment transport modeling estimated that sediment plumes would quickly settle to the seabed (less than 1 hour) and would be limited to within 9.8 ft to 13.1 ft (3 m to 4 m) above the seabed. Impacts on water quality from cable emplacement would be short-term, localized, and minor.

Discharges: Discharges of chemicals, sewage, or wastewater (e.g., domestic water, deck drainage, uncontaminated ballast and bilge water) from marine vessels used during offshore construction may occur. All marine vessels used during construction would be required to comply with international, federal, and state regulations and standards for the management, storage, treatment, and disposal of solid and liquid wastes. All vessel operators would be trained and licensed. All solid and liquid wastes would be properly treated and disposed of at appropriate waste receiving sites on land.

The discharge of bilge water, ballast water, and domestic water is permitted (BOEM 2013; 33 CFR 151.10). These wastes are expected to quickly disperse, dilute, and biodegrade (BOEM 2013); thus, these regulated discharges would be expected to have minor, local, and short-term impacts. Sunrise Wind would follow all BMPs and the Emergency Response Plan/Oil Spill Response Plan and other mitigation measures described in Section 4.3.3.3 of the COP (Sunrise Wind 2022) at a minimum.

Seafloor/land disturbance: Offshore construction activities would cause short-term seafloor disturbance. Installation of the WTG foundations and OCS-DC, anchoring, seafloor preparation (e.g., sand wave leveling, boulder relocation), and cable installation would cause short-term, localized increases in sediment suspension, deposition, and turbidity levels. The maximum estimated area of seafloor disturbance during construction of the WTG foundations is 3,835 ac (15.5 km^2); OCS-DC is 37.6 ac (0.15 km^2), IAC is 2,150 ac (8.7 km^2), SRWEC-OCS is 1,185 ac (4.8 km^2), and of the SRWEC-NYS is 74 ac (0.3 km^2) (COP Section 3.3.3.4, 3.3.5.2, 3.3.7.1, Sunrise Wind 2022). Disturbance from cable laying would be confined to a narrow region around the cable trench. Construction of the offshore components is expected to be completed within 18 months. Seafloor disturbance would be short-term and cease after construction is complete. Impacts on water quality would be negligible or minor and would be minimized or avoided through use of BMPs and other mitigation measures described in Section 4.3.3.3 of the COP (Sunrise Wind 2022) at a minimum.

Port utilization: Several ports are being considered to support the offshore construction phase. The short-term increase in vessel traffic during construction may increase the likelihood of an accidental release or discharge or sedimentation. Impacts on water quality would be negligible or minor, short-term and localized and minimized through implementation of BMPs and measures described in Section 4.3.3.3 of the COP (Sunrise Wind 2022) at a minimum.

Presence of structures: There are currently no existing stationary facilities or structures within the Lease Area; therefore, there is currently no risk of an allision or collision. After the WTGs and OCS-DC are constructed, the potential risk of collision or allision would be low and an accidental release or discharge would be unlikely because of the reasons discussed above in the *Accidental Releases* section (APM GEN-07). The presence of structures is known to alter the vertical and horizontal mixing patterns of ocean waters which could influence water quality (e.g., water temperature, salinity, DO, turbidity) by changing the thermal stratification and mixing between surface and deep waters (e.g., Carpenter et al. 2016; Cazenave et al. 2016). Impacts on water quality from the installation of structures would be minimized through implementation of BMPs and compliance with permits and would be negligible or minor.

3.4.2.5.2 Operations and Maintenance

3.4.2.5.2.1 Onshore Activities and Facilities

Accidental releases: Operation of the OnCS-DC would require the storage and use of oils, fuels, and lubricants. A maximum of 104,833 gal (396,836 L) of oils, fuels, and lubricants could be used to operate the OnCS-DC. Passenger vehicles and heavy equipment used during maintenance activities (e.g., equipment testing, routine repairs, vegetation clearing) could infrequently result in the accidental release of fuels or oils during use or refueling. The OTC would not contain any chemicals or fuels and would not be susceptible to leaks. Operation and preventive maintenance activities would be completed in accordance with an O&M Plan. Implementation of the SPCC Plan (APM GEN-11), as well as environmental protection measures described in Section 4.3.3.3 of the COP (Sunrise Wind 2022), would prevent or minimize the accidental release of fuels, oils, or lubricants to onshore waters and would contain measures for containment and clean up. Fewer vehicles and equipment would be used during the O&M phase and impacts on water quality would be less likely than during construction. Impacts to water quality due to an inadvertent release would be short-term and localized.

Trash and debris may be generated during O&M activities; the amount of trash and debris would be less than during the construction phase. Good housekeeping and proper waste management methods would minimize or avoid the introduction of trash and debris to onshore waters (APM GEN-10). Potential impacts to onshore water quality would be minor.

Anchoring: There would be no impacts on water quality during O&M activities at onshore facilities from anchoring.

Cable emplacement and maintenance: Impacts on water quality due to cable emplacement and maintenance would be minimal and would only occur if non-routine maintenance or repair activities were needed for the OIC or OTC. Sediment suspension or deposition could occur if there is a fault or failure of an onshore cable in or near the ICW or Carmans River that requires repair. If sediment disturbance is necessary, environmental protection measures and permit requirements would be followed. The SWPPP would include erosion and sedimentation controls to prevent or minimize the introduction of sediment to onshore waters. Potential impacts to water quality would be minor and short-term and less than those that may occur during the construction phase.

Discharges: Operation of the OnCS-DC would require the use of oils, fuels, and lubricants and maintenance vehicles would use engine fuel. Implementation of the SPCC Plan would prevent or minimize the accidental discharge of chemicals or fuels. Impacts to water quality due to an inadvertent discharge would be minor, short-term, and localized.

Seafloor/Land Disturbance: Land disturbance due to O&M activities at the onshore facilities is expected to be minimal. Land disturbance could occur if a repair or replacement is needed that would require re-excavation along the cable. Potential impacts to water quality from land disturbance would be less frequent than during the construction phase.

Port utilization: Several ports are being considered to support O&M activities. Port utilization for onshore O&M would have a negligible or minor impact on water quality.

Presence of structures: The presence of structures in coastal waters, such as docks and piers, would not likely impact water quality during onshore O&M activities. An impact could occur if a vessel collides with a structure causing an accidental chemical spill or leak. Vessel traffic would be less than during the construction phase, and the risk of a collision or allision is low. Any spill or discharge would be quickly contained and cleaned. The impacts of the Proposed Action on onshore water quality due to the presence of structures would be negligible.

3.4.2.5.2.2 Offshore Activities and Facilities

Accidental releases: During the offshore O&M phase, impacts on water quality from accidental releases could occur during periodic vessel use for regular inspections and maintenance practices and from on-vessel equipment used for repairs or maintenance. Routine inspections of electrical components and minor corrective and preventative maintenance actions would occur multiple times per year (COP Section 3.5.2, Sunrise Wind 2022). Annual maintenance activities would include above water and visual inspections, routine service and safety checks, and oil and high-voltage maintenance (COP Section 3.5.4, Sunrise Wind 2022). Non-routine (e.g., corrective and major repairs) maintenance would occur as needed. Accidental releases during the O&M phase would be less likely than during the construction phase because there would be fewer vessels.

Oils, gases, lubricants, and fuels would be used at the OCS-DC in transformers and reactors, fuel tanks, cranes, rotating equipment, pumps, generators, and chilling /cooling units. Each of the WTGs would require oils, fuels, and lubricants for the bearings, accumulators, pumps, actuators, gearbox, transformer, emergency generator, and cooling system. There is a low risk of an accidental release from the generator on each WTG and the OCS-DC because they would only be used during emergencies. Approximately 203,916 gal of oils, fuels, gases, and lubricants are currently estimated to be used for the OCS-DC (COP Section 3.3.6.1, Sunrise Wind 2022), and a maximum of 27,452 gallons of oils, lubricants, and gas may be stored on each WTG (COP Section 3.3.8.1, Sunrise Wind 2022). Impacts on offshore water quality would be avoided or minimized through measures to contain accidental releases at the WTGs including 100 percent leakage-free joints, high pressure sensors, oil level sensors to detect leakages, and retention reservoirs that could contain 110 percent of the volume of any potential leaks (COP Section 3.3.8.1, Sunrise Wind 2022). Accidental release avoidance and minimization measures for the OCS-DC include a minimum of 110 percent secondary containment of all oils, greases, and lubricants, gas density monitoring devices to detect leaks, and not storing chemicals on the platform (COP Section 3.3.6.1, Sunrise Wind 2022). Sunrise Wind would follow all BMPs and the Emergency Response Plan/Oil Spill Response Plan and other mitigation measures described in Section 4.3.3.3 of the COP (APM GEN-11, Sunrise Wind 2022) at a minimum. The potential impact on water quality from an accidental release would be minor or moderate.

Impacts to water quality from trash and debris during the O&M phase are expected to be similar to, but less likely, than during the construction and installation phase because there would be fewer marine vessels used. All regulatory requirements would still apply. Best management and good housekeeping practices would be implemented to minimize or avoid the potential accidental disposal of trash or debris to the ocean.

Anchoring: There would be a minimal impact on water quality due to anchoring during offshore O&M activities because there would be fewer vessels required. Vessel anchoring could be necessary for repairs or maintenance and only for vessels that would need to be onsite for an extended period. This would be infrequent over the 25 to 35-year operational life of the proposed Project. Impacts on water quality would be negligible or minor.

Cable emplacement and maintenance: The IAC and SRWEC are not expected to have maintenance requirements unless a fault or failure requiring repair were to occur, which would be infrequent. Also, it is expected that only a minor amount of cable protection would need to be replaced over the 25-to-35-year lifetime of the Project. Non-routine maintenance and repair activity would impact water quality through sediment suspension, deposition, and increased turbidity. Impacts on water quality through cable emplacement and maintenance during offshore O&M activities over the lifetime of the Project would be short-term, less than during the construction phase, and minor.

Discharges: Impacts to water quality from discharges and releases during the O&M phase are expected to be similar to, but less likely, than during the construction and installation phase because there would be fewer marine vessels used. The estimated amount of solid and liquid wastes generated during 1-year of offshore operations is 1,056 cubic yards (cy^3) (807 cubic meters [m^3]) compared to 13,833 cy^3 (10,576 m^3) generated during offshore construction (COP Section 3.3.10.3, 3.5.6, Sunrise Wind 2022). All international, federal, and state regulations regarding the management, storage, and disposal of wastes would still apply during O&M activities. Unpermitted, accidental discharges would be unlikely to occur, and any impact would be short-term and localized.

Operation of the OCS-DC would require the continuous withdrawal and discharge of non-contact cooling water. The daily design intake flow for the OCS-DC would be 8.1 million gallons per day (MGD), and the daily average intake flow would range from 4.0 to 5.3 MGD. The maximum daily average discharge temperature would be 90°F, and the daily average discharge temperature would be 86°F (TRC 2021). The vertical discharge pipe would be oriented downward in the water column, and the thermal effluent would be discharged at a depth of 40 ft (12 m) below local mean sea level. Hydrothermal modeling determined that this represented the optimal depth for discharge of the heated effluent because rapid and complete mixing would occur and would prevent the thermal plume from migrating to the surface or benthos (TRC 2021). The thermal plume would be contained within 87 feet of the discharge point and occupy a maximum area of 731 ft^2 under a worst-case scenario. Further, modeling demonstrated that discharge at this depth would not impact water quality beyond the regulatory mixing zone of 330 ft (100 m) from the point of discharge. The chlorine proposed to be added to the cooling water during normal operation would dissipate prior to discharge. Under the CWA, facilities that employ a cooling water intake structure with a design intake flow greater than 2 MGD and use at least 25 percent of the water withdrawn for cooling purposes are required to obtain an NPDES permit. Sunrise Wind submitted an NPDES permit application to USEPA in December 2021 (TRC 2021). Water quality monitoring during operation would occur as specified in the NPDES permit.

Seafloor/Land Disturbance: Seafloor disturbance during offshore O&M activities could occur during routine maintenance of infrastructure on the seabed, such as foundations, scour protection, and cable protection. Certain O&M activities could require presence of either a jack-up vessel or anchored barge vessel. Seafloor disturbance may cause a short-term increase in turbidity, sediment suspension, and deposition. Sunrise Wind would implement BMPs and comply with environmental protection measures to minimize or avoid sediment suspension and deposition during O&M activities. Sediment suspension and deposition would to be localized and only result in short-term increases in turbidity near the location of the disturbance. Potential impacts to water quality would be similar to, but less likely, than during construction because the area of seafloor disturbance would be less.

Port utilization: Several ports are being considered to support O&M activities. Impacts on water quality (i.e., accidental chemical spill or discharge) from port utilization could occur from vessel collision or allision during O&M activities; however, this would be infrequent and less likely than during the construction phase. Impacts on water quality from port utilization during O&M would be negligible or minor.

Presence of structures: The presence of the 94 WTG and the OCS-DC would present the risk of an allision and an impact on water quality from an accidental chemical spill, leak, or discharge. The risk of a vessel collision or allision with a structure would be low and unlikely. Scour protection would be used at the WTG foundations which would minimize sediment transport around the foundations and the potential for sediment plumes. The total footprint from foundations with the addition of scour protection is estimated to be 108 acres (0.44 km^2). The presence of structures could alter the water mixing patterns and the distribution of water quality parameters by changing the thermal stratification and mixing between surface and deep waters (e.g., Carpenter et al. 2016; Cazenave et al. 2016). Results from a recent BOEM (2021) hydrodynamic model of four different WTG build-out scenarios of the offshore MA/RI Lease Area 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. The results of the hydrodynamic model study show that introduction of the offshore wind structures into the offshore wind energy area modifies the oceanic responses of current magnitude, temperature, and wave heights by (1) reducing the current magnitude through added flow resistance, (2) influencing the temperature stratification by introducing additional mixing, and (3) reducing current magnitude and wave height by extracting energy from the wind by the offshore wind turbines. Alterations in currents and mixing would affect water quality parameters such as temperature, DO, and salinity, but would vary seasonally and regionally. Overall, impacts on water quality from the presence of structures during O&M would be negligible or minor.

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 the 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 (e.g., galvanic anodes emitting metals, such as aluminum, zinc, and indium, and organic coatings releasing organic compounds due to weathering and leaching). The current understanding of chemical emissions for offshore wind structures is that emissions appear to be low, suggesting a low environmental impact, especially if compared to other offshore activities (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.

3.4.2.5.3 Conceptual Decommissioning

3.4.2.5.3.1 Onshore Activities and Facilities

Impacts on water quality are expected to be similar to or less than those described for the construction phase. The OnCS-DC may be repurposed, and the OTC may be abandoned in place which would limit the amount of land disturbance, the potential for an accidental release or discharge, and shorten the length of time needed for decommissioning activities.

3.4.2.5.3.2 Offshore Activities and Facilities

Impacts on water quality during offshore decommissioning activities are expected to be similar to or less than impacts during the construction phase. There would be a short-term increase in marine vessel use compared to the O&M phase. Decommissioning is expected to be completed within 2 years and any impacts would cease after decommissioning is complete. Decommissioning would occur in accordance with requirements and permits at that time and would have a minor to moderate impact on water quality.

3.4.2.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. In the context of reasonably foreseeable environmental trends and ongoing and planned activities, the contribution of the Proposed Action to water quality impacts from the individual IPFs would range from negligible to moderate. Ongoing and planned activities related to onshore or offshore development, recreation and commercial activities, military use, port improvement, dredging, and submarine cable and pipeline emplacement would contribute to impacts on water quality through the primary IPFs of accidental releases, cable emplacement and maintenance, discharges, land/seafloor disturbance, port utilization, and the presence of structures by causing sediment suspension and deposition, increased turbidity, altering water currents and water chemistry, or causing exceedances of water quality standards. These impacts would be short-term and localized. The impacts from a large-volume accidental release could be moderate.

3.4.2.5.5 Conclusions

Impacts of the Proposed Action

Impacts on water quality from the Proposed Action would range from **negligible** to **moderate**. All onshore and offshore activities during the construction, O&M, and decommissioning phases would be conducted in compliance with federal and state regulations and permits, with BMPs, and environmental protection measures described in Section 4.3.3.3 of the COP (Sunrise Wind 2022) which would help to minimize or avoid impacts on water quality.

Although the risk of an accidental discharge or release of chemicals, oils, fuel, lubricants, trash, or debris is low during all phases of the Proposed Action, in the event a release was to occur, the impact on water quality would be **minor** or **moderate** depending on the volume of the spill and the type of material spilled. The impact would be short-term because Sunrise Wind would follow regulations and permitting rules requiring rapid containment and clean up. Impacts from port utilization or the presence of structures would be **negligible** or **minor**. Sediment suspension, deposition, and increased turbidity would have a **minor** impact during anchoring, cable emplacement and maintenance, and seafloor/land disturbance; sediment plumes would be localized and short term.

Cumulative Impacts of the Proposed Action

Considering all the IPFs together, BOEM anticipates the overall potential impacts on water quality associated with planned offshore wind activity would be **minor** or **moderate**. Ongoing and planned activities related to onshore or offshore development, recreation and commercial activities, military use, port improvement, dredging, and submarine cable and pipeline emplacement would contribute to impacts on water quality through the primary IPFs of accidental releases, cable emplacement and maintenance, discharges, land/seafloor disturbance, port utilization, and the presence of structures by causing sediment suspension and deposition, increased turbidity, altering water currents and water chemistry, or causing exceedances of water quality standards. These impacts would be short-term and localized. The impacts from a large-volume accidental release could be **moderate**.

3.4.2.6 Impacts of Alternative C-1: Reduced Layout from Priority Areas via Exclusion of up to 8 WTG positions

3.4.2.6.1 Operations and Maintenance

3.4.2.6.1.1 Onshore Activities and Facilities

Under Alternative C-1, impacts on water quality from onshore construction and installation activities would be the same as described for the Proposed Action.

3.4.2.6.1.2 Offshore Activities and Facilities

Under Alternative C-1, the construction of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on water quality would be similar to the Proposed Action because the same number of WTGs would be installed. Under Alternative C-1, similar levels of seafloor disturbance and sediment suspension would be expected and similar amounts of oils, lubricants, and fuels would be needed as compared to the Proposed Action.

3.4.2.6.2 Operations and Maintenance

3.4.2.6.2.1 Onshore Activities and Facilities

Under Alternative C-1, impacts on water quality from onshore decommissioning activities would be the same as described for the Proposed Action.

3.4.2.6.2.2 Offshore Activities and Facilities

Under Alternative C-1, impacts to water quality during offshore O&M activities would likely be similar to the Proposed Action because the same number of WTGs would be operated and maintained. It is assumed that the maintenance schedule would be the same as the Proposed Action. The volume of oils, lubricants, coolants, and fuels needed for O&M would be similar and potential impacts from accidental releases or discharges would be similar to the Proposed Action.

3.4.2.6.3 Conceptual Decommissioning

3.4.2.6.3.1 Onshore Activities and Facilities

Under Alternative C-1, impacts on water quality from onshore decommissioning activities would be the same as described for the Proposed Action.

3.4.2.6.3.2 Offshore Activities and Facilities

Under Alternative C-1, water quality impacts during decommissioning of the offshore facilities would be the same as described for the Proposed Action because there is no difference in offshore components between the Proposed Action and Alternative C-1.

3.4.2.6.4 Cumulative Impacts of Alternative C-1

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to water quality impacts from ongoing and planned activities would not be substantially different than the Proposed Action. Considering all the IPFs together, BOEM anticipates that the cumulative impacts of Alternative C-1 would have negligible to moderate impacts on water quality.

3.4.2.6.5 Conclusions

Impacts of Alternative C-1

Under Alternative C-1, impacts on water quality from onshore and offshore construction, O&M, and decommissioning would be similar to the Proposed Action. The potential for offshore impacts from seafloor disturbance, anchoring, cable emplacement, accidental releases or discharges, port utilization, and the presence of structures would not change substantially under Alternative C-1 compared to the impacts described above for the Proposed Action because the same number of WTGs would be installed, maintained, and decommissioned. Alternative C-1 would have a **negligible** to **moderate** impact on water quality.

Cumulative Impacts of Alternative C-1

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to water quality impacts from ongoing and planned activities would not be substantially different than the Proposed Action. Considering all the IPFs together, BOEM anticipates that the cumulative impacts of Alternative C-1 would have **negligible** to **moderate** impacts on water quality.

3.4.2.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

3.4.2.7.1 Construction and Installation

3.4.2.7.1.1 Onshore Activities and Facilities

Under Alternative C-2, impacts on water quality from onshore construction and installation activities would be the same as described for the Proposed Action.

3.4.2.7.1.2 Offshore Activities and Facilities

Under Alternative C-2, the construction of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Alternative C-2 includes the relocation of 12 WTGs to the eastern side of the Lease Area. Impacts on water quality from the individual IPFs of accidental releases and discharges, cable emplacement and maintenance, and seafloor disturbance would be marginally higher than the Proposed Action because of the longer vessel travel distance and the longer length of IAC needed to reach the eastern side of the Lease Area. The volume of oils, lubricants, grease, coolants, and fuels needed would be similar or the same under Alternative C-2. Impacts from port utilization and the presence of structures would be similar to the Proposed Action.

3.4.2.7.2 Operations and Maintenance

3.4.2.7.2.1 Onshore Activities and Facilities

Under Alternative C-2, impacts on water quality from onshore O&M activities would be the same as described for the Proposed Action.

3.4.2.7.2.2 Offshore Activities and Facilities

Under Alternative C-2, the O&M of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Under Alternative C-2, impacts to water quality during offshore O&M activities from cable maintenance would be slightly higher than the Proposed Action because of the greater amount of IAC needed to reach the eastern side of the Lease Area. There would be slightly greater risk of an accidental release or discharge because of the longer marine vessel travel distance. Under this alternative, the maintenance schedule would likely be the same as the Proposed Action. Impacts from port utilization or the presence of structures would be the same as the Proposed Action.

3.4.2.7.3 Conceptual Decommissioning

3.4.2.7.3.1 Onshore Activities and Facilities

Under Alternative C-2, impacts to water quality from onshore decommissioning activities would be the same as described for the Proposed Action.

3.4.2.7.3.2 Offshore Activities and Facilities

Water quality impacts during decommissioning of the offshore facilities would be substantially the same as described for the Proposed Action. Potential water quality impacts from accidental releases or discharges and seafloor disturbance would be slightly higher because of the longer IAC and transit route to the relocated WTGs.

3.4.2.7.4 Cumulative Impacts of Alternative C-2

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to water quality impacts from ongoing and planned activities would be slightly more, but not materially different, than the Proposed Action and Alternative C-1. Considering all the IPFs together, BOEM anticipates that the cumulative impacts of Alternative C-2 would have **negligible** to **moderate** impacts on water quality.

3.4.2.7.5 Conclusions

Impacts of Alternative C-2

Impacts on water quality under Alternative C-2 from construction, O&M, and decommissioning of the WTGs would be similar to the Proposed Action and Alternative C-1 because the same number of WTGs would be installed. Relocating 12 WTGs to the eastern side of the Lease Area would require longer transit distances and a change in the layout of the IAC. The contribution of Alternative C-2 to water quality impacts during construction, O&M, and decommissioning would be slightly more, but not materially different, than the Proposed Action and Alternative C-1 because of the longer length of IAC needed to reach the eastern side of the Lease Area. Alternative C-2 would have a **negligible** to **moderate** impact on water quality.

Cumulative Impacts of Alternative C-2

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to water quality impacts from ongoing and planned activities would be slightly more, but not materially different, than the Proposed Action and Alternative C-1. Considering all the IPFs together, BOEM anticipates that the cumulative impacts of Alternative C-2 would have **negligible** to **moderate** impacts on water quality.

3.4.2.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall negligible to moderate adverse impacts on water quality resources. Alternative C-2 during construction, O&M, and decommissioning would have slightly more adverse impacts, but not materially different, than the Proposed Action and Alternative C-1 because of the longer length of IAC needed to reach the eastern side of the Lease Area. Table 3.4.2-5 provides an overall summary of alternative impacts.

Table 3.4.2-5. Comparison of Alternative Impacts on Water Quality

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C1)	Fisheries Habitat Minimization (Alternative C2)
Water quality	Negligible to moderate adverse effects on water quality. Minor effects from anchoring, cable emplacement and maintenance, and seafloor or land disturbance. Minor or moderate effects from accidental releases or discharges, including non-contact cooling water. Negligible or minor effect from port utilization or the presence or structures.	Negligible to moderate adverse effects on water quality. Minor effects from anchoring, cable emplacement and maintenance, and seafloor or land disturbance. Minor or moderate effects from accidental releases or discharges, including non-contact cooling water. Negligible or minor effect from port utilization or the presence or structures.	Negligible to moderate adverse effects on water quality. Minor effects from anchoring, cable emplacement and maintenance, and seafloor or land disturbance. Minor or moderate effects from accidental releases or discharges, including non-contact cooling waters. Negligible or minor effect from port utilization or the presence or structures

3.4.2.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2; however for water quality, there are no measures currently proposed by BOEM. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to water quality.

3.5 Biological Resources

3.5.1 Bats

This section examines potential impacts on bats from the proposed Project, alternatives, and future offshore wind activities in the GAA (Appendix D, Figure D-3). The bat GAA, as depicted in Appendix D, includes the United States eastern coast from Maine to Florida extending from 0.5 mi onshore to cover Project component sites and 100 mi offshore.

3.5.1.1 Description of the Affected Environment and Future Baseline Conditions

Eight of the nine bat species present in the northeastern United States and the GAA (Appendix D) are found on Long Island and have the potential to occur within or proximate to the offshore Sunrise Wind Export Cable-New York State/Offshore Converter Station (SRWEC-NYS/SRWEC-OCS-DC) and the onshore activities: Onshore Converter Station (OnCS-DC), transmission cable, and interconnection cable (Stegemann and Hicks n.d.). These species can be categorized into two groups based on roosting habitat and migratory behavior: cave-hibernating bats and migratory tree bats. The five non-migratory cave-hibernating bats include the eastern small-footed bat (*Myotis leibii*), the big brown bat (*Eptescius fuscus*), the ESA-listed northern long-eared bat (*Myotis septentrionalis*; threatened), and the little brown bat (*Myotis lucifugus*) and tri-colored bat (*Perimyotis subflavus*) which are both currently under review for listing under the ESA. The three migratory tree-roosting bats include the eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*) (Stantec 2018b). The ESA-listed Indiana bat (*Myotis sodalist*; endangered) is not known to occur in Long Island's Nassau or Suffolk counties (USFWS 2021a) and to date has not been located during regional offshore vessel-based acoustic bat surveys (Pelletier et al. 2013; Stantec 2018b; Sunrise Wind 2022). Therefore, this species is not expected to occur in the proposed Project Area.

In North America, insectivorous bats have a general hearing range of 10 to 100 kilohertz (kHz), depending on the species and specific behavior, with the most sensitive frequency band between 20 and 50 kHz and are generally unable to hear frequencies below 500 hertz (Hz) (DoN 2018). While hearing is echolocating bats' primary sense for foraging and avoiding obstacles, they also use a combination of auditory and visual cues, magneto-reception, and spatial memory for long-distance navigation. Hoary bats, for example, sometimes abandon echolocation when flying, relying solely on intermittent visual cues (True 2021). When there are no reflective surfaces for echolocation, it is possible that bats flying over the ocean use visual cues and therefore are unlikely to fly over the ocean when visibility is low (True 2021).

Bats are active in the region from March through November and use a wide variety of terrestrial habitats (e.g., forests, open fields. riparian corridors, wetlands, urban areas) for foraging. Caves, mine shafts, understructure of bridges, and trees are used for roosting (COP Appendix P, Sunrise Wind 2021; COP Section 4.4.7, Sunrise Wind 2022). In late summer and fall, non-migratory cave-dwelling bats disperse from summer habitats to winter hibernacula (caves, abandoned mines). Migratory tree-roosting bats migrate longer distances over land and offshore to overwinter in the milder climate of southern states, often at coastal locations (Stantec 2016; Stantec 2018b; Sunrise Wind 2022).

Sightings and acoustic recordings have detected bats flying over the open ocean in the Atlantic region between North Carolina and Nova Scotia (Solick 2021). In contrast to cave-dwelling bats, which are rarely found offshore, migratory tree-roosting bats have been sporadically found offshore during spring and fall migrations, especially in low wind and mild weather conditions. Acoustic studies observed that 80 percent of offshore bat detections in this region occurred during August and September (Dowling 2017; Shaylyn 2013; Pelletier 2013; Sunrise Wind 2022). Offshore sightings were recorded in July, August, September, and October (Solick 2021; Hatch 2013). Recent studies detected bats up to 80 mi (129 km) from land (Stantec 2016), and historical data include observations of bats as far offshore as 1,212 mi (1,950 km) (Hatch 2013). Bats can fly at high altitudes of at least 8,000 ft (2,438 m) (Peurach 2003). Flight altitudes of over 656 ft (200 m) above sea level have been documented in the offshore Mid-Atlantic (Hatch 2013).

In summary, non-migratory cave-hibernating bat activity is greater onshore and at coastal locations when compared to offshore (NPS 2018; Smith 2016; Stantec 2018b; Sunrise Wind 2022). Migratory tree-roosting bats are expected to be more common in onshore and nearshore locations but may occur offshore (Pelletier 2013; Sunrise Wind 2022) (Stantec 2016). A description of existing east coast bat resources is presented in the Vineyard Wind 1 FEIS Volume II: Appendix A (BOEM 2021). Additional distribution information is included in the COP Volume I, Section 4.4.7 (Sunrise Wind 2022) and Appendix P (Sunrise Wind 2021).

Future ongoing onshore and offshore activities (disturbance, displacement, injury, mortality, and habitat conversion) would continue to occur in the region. These impact-producing activities would have minor short- and long-term effects on regional bat populations.

3.5.1.2 Impact Level Definitions for Bats

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on bats from the alternatives, including the Proposed Action. Table 3.5.1-1 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for bats. Table G-5 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to bats. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project.

Table 3.5.1-1. Definition of Potential Adverse and Beneficial Impact Levels for Bats

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Impacts on individual bats and/or their habitat, if any, would be at the lowest levels of detection and barely measurable, with no perceptible consequences to individuals or the population.	Impacts on individual bats and/or their habitat would be beneficial but at the lowest levels of detection and barely measurable.
Minor	Impacts on bats are detectable and measurable but are low-intensity, highly localized, and short-term in duration. Impacts on individuals and/or their habitat do not lead to population-level effects.	Impacts on individual bats and/or their habitat are detectable and measurable. The effects are likely to benefit individuals, be localized, and/or be short-term and are unlikely to lead to population-level effects.
Moderate	Impacts on individual bats and/or their habitat are detectable and measurable; they are of medium intensity, can be short- or long-term, and can be localized or extensive. Impacts on individuals and/or their habitat could have population-level effects, but the population can sufficiently recover from the impacts or enough habitat remains functional to maintain the viability of the species both locally and throughout their range.	Impacts on individual bats and/or their habitat are detectable and measurable. These benefits may affect large areas of habitat, be long-term, and/or affect a large number of individuals and may lead to a detectable increase in populations but is not expected to improve the overall viability or recovery of affected species or population.
Major	Impacts on individual bats and/or their habitat detectable and measurable; they are of severe intensity, can be long lasting or permanent, and are extensive. Impacts to individuals and/or their habitat would have severe population-level effects and compromise the viability of the species.	Impacts on individual bats and/or their habitat are detectable and measurable. These impacts on habitat may be short-term, long-term, or permanent and would promote the viability of the affected species/population and/or increase the affected species/population levels.

3.5.1.3 Impacts of Alternative A - No Action on 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 other planned non-offshore wind and offshore wind activities, as described in Appendix E, *Planned Activities Scenario*.

3.5.1.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for bats would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities. Ongoing activities within the GAA that contribute to impacts on bats are generally associated with onshore impacts, including 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. Impacts associated with climate change have the potential to reduce reproductive output and increase individual mortality and disease occurrence. Other future non-Project actions other than offshore wind development activities that may affect bats include new submarine cables and pipelines, oil and gas activities, increasing onshore construction, marine minerals extraction, port expansions, and installation of new structures on the OCS (Refer to Appendix E for a complete description of ongoing and planned activities). These activities may result in short term or permanent displacement and injury or mortality to individual bats, but population-level effects would not be expected.

Global climate change is an ongoing risk to bats although the associated impact mechanisms are complex, not fully understood, and difficult to predict with certainty. Possible impacts to bats include increased storm severity and frequency; increased disease frequency; and altered habitat, ecology, and migration patterns (Sherwin 2013). Over time, climate change and coastal development would alter existing habitats, rendering some areas unsuitable for certain species and more suitable for others.

Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on bats include:

- Continued O&M of the Block Island project (5 WTGs) installed in State waters
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect bats through the primary IPFs of noise, presence of structures, and land disturbance. Ongoing offshore wind activities would have the same type of impacts from noise, presence of structures, and land disturbance that are described in detail in the following section for planned offshore wind activities, but the impacts would be of lower intensity.

The sections below summarize the potential impacts of planned offshore wind activities on bats during construction, O&M, and 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.

3.5.1.3.2 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 Proposed Action).

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

The sections below summarize the potential impacts of planned offshore wind activities on bats during construction, O&M, and 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. Construction of numerous offshore wind projects (approximately 29 in varying stages of development) is projected for the period of 2022 to 2030. Future offshore wind activities may affect bats through the following primary IPFs.

Land disturbance: A small amount of infrequent construction impacts associated with onshore power infrastructure would be required over the next 6 to 10 years to connect offshore future wind energy projects to the electric grid. Typically, this would require only small amounts of natural habitat removal as the onshore facilities would be constructed in developed areas. Short-term impacts associated with habitat loss and/or avoidance or displacement during construction may occur, but no injury or mortality of individuals would be expected. As such, onshore land disturbance construction associated with future offshore wind development would short-term, minor, and not be expected to appreciably contribute to overall impacts on bats (BOEM 2019).

Noise: Onshore construction noise may result in short-term displacement of individual bats (Schaub 2008). Offshore construction, particularly pile-driving activities, would create noise and may temporarily displace bats; however, research studies indicate that bats may be less sensitive to short-term changes in noise thresholds than other terrestrial animals and that no short-term changes or permanent loss in hearing would be expected from noise (Simmons 2016). Offshore construction noise could result in avoidance or displacement, but these impacts are expected to be short-term due to the known limited use of offshore areas by bats during spring and fall migration periods (refer to Section 3.5.1.1). Therefore, the overall impact of construction noise to bats would be minor.

Traffic: Most of the construction vehicle activities for future wind energy projects would occur during daytime hours which are non-active periods for bats. It is possible for vehicle approaches to disturb bats, particularly near dusk or pre-sunrise times. Maintenance vessels would be present and operating during offshore O&M activities. Direct collision mortality impacts from construction traffic and stationary vehicles would be expected to be rare events since bats use echolocation to avoid objects. Indirect disturbance impacts may occur but would be short term. Support vessels present during WTG construction and export cable activities may provide artificial roosting sites for bats and provide a beneficial effect in energy conservation. Onshore cable construction would occur primarily during the day in mostly developed onshore locations where bats are not roosting. The onshore impacts to bats from construction and installation traffic range from negligible to minor and short- to long-term. The impacts to bats from anticipated O&M vessel cable laying traffic would be short-term, beneficial, and minor.

Lighting: Nighttime lighting associated with onshore structures and construction vessels could attract and concentrate insects and, therefore, attract foraging bats. In addition, this type of lighting can influence the composition and abundance of insects (Davies 2012). If insects are attracted to construction lighting, then foraging bats in the area may benefit from lighting; however, light-associated collision impacts are not expected because bats use echolocation to avoid structures. Acoustical bat detection data confirmed bat utilization of onshore and nearshore environments to be much greater than offshore environments. Non-migratory cave-hibernating bat activity is greater onshore and at coastal locations compared to offshore (NPS 2018; Smith 2016; Stantec 2016; Sunrise Wind 2022). Migratory tree-roosting bat activity is more common onshore and nearshore than offshore (Pelletier 2013; Sunrise Wind 2022). Onshore light-attraction impacts for bats range from beneficial and negligible to minor and long-term during construction and O&M.

Presence of structures: The primary offshore threats to bats from future offshore wind energy projects are from the potential disruption of migration patterns and mortality via collisions with WTGs. Offshore structures may attract bats or serve as concentration points for offshore activity (Peterson 2016), putting them at risk of collision with operating WTG blades. Although adverse impacts to bats resulting from collision mortality cannot be quantified based on existing studies, some level of mortality is expected during operations at offshore wind facilities (Solick 2021). Any new operating facility would require a thorough regulatory and environmental review to avoid, minimize, and mitigate adverse impacts to bats. Outside of migration, bats are infrequently found offshore. In addition, the proposed 1.0-nm (1.9-km) spacing between WTG structures with future offshore wind development and the distribution spacing between known projects would reduce collision exposure risk. Individual migratory bats would pass through the rotor-swept zone (RSZ) or pass by wind development sites with only slight course corrections. As a result, adverse impacts to bats would be minor and long-term.

3.5.1.3.3 Impacts of Alternative A on ESA-Listed Species

Based on the information contained in this document, BOEM anticipates that the reasonably foreseeable offshore wind activities are likely to adversely affect but not jeopardize the continued existence of the northern long-eared bat.

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 Proposed Action). Based on the information contained in this document, BOEM anticipates that the reasonably foreseeable offshore wind activities are likely to adversely affect but not jeopardize the continued existence of the northern long-eared bat.

3.5.1.3.4 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and conceptual decommissioning would not occur; and potential impacts on bats associated with the proposed Project would not occur; however, ongoing activities would have continued short- to long-term impacts on bats, primarily through construction-related displacement and operational noise, lighting, collision risk, habitat changes, and climate change. Onshore habitat removal areas are small when compared with other past, present, and reasonably foreseeable activities in the region. Population-level effects are not expected to occur to bats from future activities. BOEM anticipates that the overall impacts associated Alternative A, the No Action Alternative, when combined with all other ongoing activities (including ongoing offshore wind projects) in the GAA would result in overall **minor** adverse impacts

Based on available literature, non-migratory cave-hibernating bats do not typically occur in the OCS, while migratory tree-roosting bats are expected to be infrequent and limited users of the OCS. The IPFs associated with future OCS wind development projects are not expected to significantly affect bat populations. BOEM anticipates that the bat impacts due to ongoing activities associated with the Alternative A - No Action of these ongoing activities would be **negligible** to **minor** adverse and **minor beneficial**. BOEM anticipates that the overall impacts associated Alternative A, the No Action Alternative, when combined with all other planned activities (including offshore wind) in the GAA would result in overall **minor** adverse impacts.

Cumulative Impacts of the No Action Alternative

Other planned non-offshore wind activities that may affect bats include new submarine cables and pipelines, oil and gas activities, increasing onshore construction, marine minerals extraction, port expansions, and installation of new structures on the OCS (see Appendix E for a complete description of planned activities). These activities may result in short-term and permanent onshore habitat impacts and short-term or permanent displacement and injury of or mortality to individual bats, but population-level effects would not be expected. BOEM anticipates that the overall impacts associated Alternative A, the No Action Alternative, when combined with all on-going and planned activities (including offshore wind) in the GAA would result in overall **minor** adverse impacts.

3.5.1.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than those described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts to bats:

- The extent of forested bat foraging/roosting habitat removal at the proposed onshore facility site and/or along the onshore cable route
- Timing of onshore construction
- WTG number and size

Variability of the proposed Project design is outlined in Appendix C. Below is a summary of potential variances in impacts to bats:

- **Forest habitat removal**: Changes in OnCS-DC location and onshore cable could increase or decrease acreage of forested habitat cleared during construction and increase or decrease the potential impacts depending on the extent of cleared acreage. If tree clearing is required in areas with trees suitable for bat roosting during the period when northern long-eared bats may be present, develop avoidance and minimization measures in coordination with U.S. Fish and Wildlife Service (USFWS) and New York State Department of Economic Conservation (NYSDEC) and conduct pre-construction habitat surveys.
- **WTG number and size**: Potential collision impacts to bats would decrease with fewer WTGs and increase with a greater number of WTGs; however, if a larger turbine is used to replace each smaller removed turbine to maintain the Project's generating capacity, the overall airspace exposure collision would be nearly identical since the total WTG RSZ area in the proposed Project Area would not appreciably change during operations.
- **Construction timing**: Construction clearing scheduled during the non-active season for bats (December-February) would decrease roosting/foraging impacts to the extent practicable. Variance of impacts would not be expected from construction clearing and operational activities.

3.5.1.5 Impacts of Alternative B - Proposed Action on Bats

The activities associated with offshore SRWF (94 11-MW WTGs out of 102 potential positions) and SRWEC-OCS/SRWEC-NYS cabling, and OnCS-DC, transmission cable, and interconnection cable with Alternative B include construction and installation, O&M, and decommissioning. These actions have the potential to cause both direct and indirect impacts to bats. The IPFs associated with construction and post construction O&M activities include land disturbance, lighting, noise, traffic, and presence of structures. These IPFs are thoroughly discussed in the bat assessment prepared for this Project (COP Appendix P, Sunrise Wind 2021). The conclusions of the bat assessment are presented in this section and include consideration of the Project's mitigation and monitoring measures (Appendix H).

3.5.1.5.1 Construction and Installation

3.5.1.5.1.1 Onshore Activities and Facilities

Land disturbance: Potential direct impacts to bat species resulting from land disturbance caused by onshore construction include potential habitat loss and direct mortality or injury. Construction of the OnCS-DC would impact up to 4.7 ac (0.019 km^2) of developed land and 2.3 ac (0.009 km^2) of forested land. Tree clearing on the forested land could potentially reduce suitable bat summer foraging and roosting habitat. Mitigation and monitoring measures include seasonal restrictions and vegetation clearing provisions to avoid direct impact to bats, as well as the 4(d) rule for the ESA-listed northern long-eared bat (Appendix H). Onshore cable construction would occur primarily during the day in mostly developed onshore locations where bats are not roosting. The Project would reduce the potential impacts to bats by conducting tree clearing during winter months to the extent practicable. If tree clearing is required in areas suitable for northern long-eared bat roosting, the project proponents would develop specific avoidance and minimization measures in coordination with USFWS and NWDEC and would conduct pre-construction habitat surveys. The potential for construction land disturbance impacts to bats are considered minor, localized, and short-term because of the small area impacted compared to the surrounding regional landscape.

Noise: Noise during daytime/nighttime construction activities has the potential to indirectly impact bats. Bats respond most strongly (awoke from torpor[13]) to colony and vegetation noise and less to traffic noise (Luo 2014). Bats are known to avoid loud noises (Schaub 2008). No bat-specific study has been conducted on HDD noise, but it is expected that their response would be similar to highway noise (COP Appendix P, Sunrise Wind 2021). A recent study noted that bats may be less sensitive to short-term noise threshold shifts than other mammals, and as a result, bats are not expected to experience short-term or permanent hearing loss during construction (Simmons 2016). During the summer when bats are active, construction activity noise may temporarily disrupt or displace bats; however, noise impacts would be minor, localized, and short-term.

Traffic: Most of the construction vehicle activities would occur during bat non-active daytime hours. It is possible that vehicle approaches may disturb bats, particularly near dusk or pre-sunrise times. Direct collision mortality impacts from construction traffic and stationary vehicles would be expected to be rare events as bats use echolocation to avoid objects. Indirect disturbance impacts may occur but would be short term. The onshore impacts to bats from construction or installation traffic range from negligible to minor and short- to long-term.

Lighting: Nighttime lighting may be used during some of the OnCS-DC construction. Nighttime lighting may attract and concentrate insects and, therefore, attract foraging bats. In addition, the type of lighting can influence the composition and abundance of insects (Davies 2012). If insects are attracted to construction lighting, then foraging bats in the area may benefit from lighting; however, light associated with collision impacts are not expected because bats use echolocation to avoid structures. The Project would use lighting technology that minimizes impacts on avian bat species to the extent practicable. Onshore light attraction impacts for bats range from to negligible to minor beneficial and short-term during construction and installation of the onshore facilities.

3.5.1.5.1.2 Offshore Activities and Facilities

Noise: Offshore construction noise could result in avoidance or displacement, but these impacts are expected to be short-term due to the known limited use of offshore areas by bats during spring and fall migration periods (Refer to Section 3.5.1.1). Additionally, noise associated with construction and installation is not expected to impact bats over the long term as they can habituate to repeated noise (Luo 2014). Therefore, the overall impact of construction noise to bats would be short-term and minor.

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[13] Torpor is a hypometabolic condition associated with low body temperatures. It enables animals to survive periods of unfavorable environmental conditions. Depending on the duration of the hypometabolic state, the torpor can be daily torpor (short-term) or hibernation (long-term). Accessed August 2022. http://www.differencebetween.net/science/difference-between-torpor-and-hibernation/#ixzz7cYmhvsTY

Traffic: Construction and support vessels are expected to be present during construction and installation. Direct collision mortality impacts from construction and support vessels would be expected to be rare events since bats use echolocation to avoid objects, and the speed of vessel traffic is expected to be relatively slow. Support vessels present during construction and installation operations may provide artificial roosting sites for bats and aid in energy conservation. In addition, bats may benefit from lighted vessels and platforms which can attract insects and provide foraging opportunities. Overall, impacts related to construction and installation traffic would be short-term and negligible to minor with negligibly beneficial impacts.

Lighting: Lighting impacts to bats have been previously discussed in the onshore activities and facilities construction and installation section. These impacts identified are expected to be the same but of longer duration. Lighting impacts may be negligible to negligibly beneficial over the short term for bats through concentration of their prey base and improved foraging opportunities.

3.5.1.5.2 Operations and Maintenance

3.5.1.5.2.1 Onshore Activities and Facilities

Land disturbance: During the O&M phase of the Project, the only sources of land disturbance are expected to be routine maintenance of facilities and potential repair actions; however, no new facilities would be constructed, no additional habitat would be disturbed during O&M, and effects to bats would be negligible.

Noise: Operational noise associated with the OnCS-DC is not expected to impact bats as they can habituate to repeating noise disturbances (Luo 2014).

Traffic: Collision impacts with the OnCS-DC are not expected as bats echolocate to avoid structures.

Lighting: Nighttime lighting may be used on the OnCS-DC facilities. Nighttime lighting may attract and concentrate insects and, therefore, attract foraging bats. If insects are attracted to construction lighting, then foraging bats in the area may benefit from lighting; however, light associated with collision impacts are not expected because bats use echolocation to avoid structures. The Project would use lighting technology that minimizes impacts on avian bat species to the extent practicable. Onshore light attraction impacts for bats range from to negligible to negligibly beneficial and long-term during construction and installation of the onshore facilities.

3.5.1.5.2.2 Offshore Activities and Facilities

Noise: Operational noise associated WTGs is not expected to impact bats as they can habituate to repeating noise disturbances (Luo 2014).

Traffic: Maintenance vessels would be present and operating during offshore O&M activities. Direct collision mortality impacts would be expected to be rare events. Indirect disturbance impacts may occur but would be short term. The impacts to bats from O&M vessel traffic would be localized, minor, and intermittent. Support vessels present during O&M activities may provide artificial roosting sites for bats and provide a negligible beneficial effect in energy conservation. In addition, bats may benefit from lighted vessels that may attract insects and provide foraging opportunities. Collision with vessels is unlikely as bats use echolocation to avoid structures. Overall, impacts related to vessel traffic during O&M would be negligible to negligibly beneficial and short-term.

Lighting: Lighting on WTGs would be limited to navigational lighting. Due to their offshore location and the intermittent operation of navigational lighting, WTG lighting is not anticipated to provide increased insect abundance and is, therefore, expected to have no impact to bats.

Presence of structures: Although adverse impacts to bats resulting from collision mortality cannot be quantified based on existing studies, some level of mortality is expected during operations at offshore wind facilities (Solick 2021). Any new operating facility would require a thorough regulatory and environmental review to avoid, minimize, and mitigate adverse impacts to bats. Outside of migration, bats are infrequently found offshore. In addition, the proposed 1.0-nm (1.9-km) spacing between WTG structures with the SRWF would reduce collision exposure risk. Bats use echolocation to effectively avoid collisions with visible infrastructure. Bat collision impacts with stationary infrastructure would be rare, unexpected occurrences. Individual migratory bats would pass through the RSZ or pass by wind development sites with only slight course corrections. While the collision potential for individual bat fatalities exists from WTG operational activities, it is unlikely to impact bat populations since offshore bat occurrence and abundance is expected to be low. As a result, adverse impacts to bats from collision would be minor and long-term.

3.5.1.5.3 Conceptual Decommissioning

3.5.1.5.3.1 Onshore Activities and Facilities

Land disturbance: Land disturbance would be negligible since no new land would be disturbed during the process.

Noise: Noise impacts to bats would be the same or less than those described for construction activities. Onshore impacts to bats would range from negligible to minor and short-term during decommissioning.

Traffic: Traffic impacts to bats would be the same or less than those described for construction activities. Bats would avoid visible infrastructure with echolocation. Onshore impacts to bats would range from negligible to minor and short-term during decommissioning.

Lighting: Lighting impacts to bats would be similar to those described for the construction activities. Lighting impacts would be expected to range from negligible to negligibly beneficial from increased prey availability due to nighttime lighting.

3.5.1.5.3.2 Offshore Activities and Facilities

Noise: Noise impacts to bats would be the same or less than those described for construction activities. Bats would avoid lighted areas and visible infrastructure with echolocation. Noise impacts to bats would be negligible to minor and short-term during decommissioning.

Traffic: Construction and support vessels are expected to be present during conceptual decommissioning activities. Direct collision mortality impacts from construction and support vessels would be expected to be rare events since bats use echolocation to avoid objects, and the speed of the vessel traffic is slow. Support vessels present during decommissioning may provide artificial roosting sites for bats and aid in energy conservation. Overall, impacts related to decommissioning would be negligible and short-term.

Lighting: Lighting impacts to bats have been previously discussed in the construction and installation section. These impacts identified are expected to be similar or less than for conceptual decommissioning due to a shorter overall expected duration of these activities. Lighting impacts may be negligible to beneficially minor for bats through concentration of their prey base and improved foraging opportunities.

3.5.1.5.4 Impacts of Alternative B on ESA-Listed Species

Based on the information contained in this document, it could be anticipated that the Proposed Action would likely adversely affect but not jeopardize the continued existence of the northern long-eared bat.

3.5.1.5.5 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on bats through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and 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 the infrequent and limited anticipated 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. Short-term 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. 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 GAA.

The cumulative impacts on bats would likely be negligible because the occurrence of bats offshore is low, and onshore habitat loss is expected to be minimal. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute an undetectable increment to the cumulative noise, presence of structures, and land disturbance impacts on bats.

3.5.1.5.6 Conclusions

Impacts of the Proposed Action

Project construction and installation, O&M, and conceptual decommissioning would cause impacts from the following IPFs: land disturbance, noise, traffic, lighting, and the presence of structures. BOEM anticipates the impacts resulting from the Proposed Action alone would range from negligible to minor adverse impacts and negligible to minor beneficial impacts. Therefore, BOEM expects the overall impact on bats from the Proposed Action alone to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

Cumulative Impacts of the Proposed Action

In the context of other reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual IPFs would range from negligible to minor impacts over both the short- and long-term, depending on the species. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **minor** impacts to bats. Even though the overall effect would be detectable and measurable, the impacts to individuals and their habitats would not lead to population-level effects.

3.5.1.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Under Alternative C-1, the same number of turbine locations (94 WTGs) under the Proposed Action may be approved by BOEM; however, 8 WTG potential positions from Priority Area 1 along the northern boundary of the lease area would be excluded from consideration (Figure 2.1.3-2). The WTG positions to be removed from Priority Area 1 were selected to maximize the largest contiguous complex habitat area feasible and/or to reduce the number of 11-MW WTGs located near presumed Atlantic cod spawning location(s). This alternative would not significantly alter the construction methods, O&M, or conceptual decommissioning of the Project. This alternative would not increase the impact level or likelihood of impacts for bats as compared to the Proposed Action. Therefore, Alternative C-1 would be expected to have negligible to moderate impacts on bats from construction and installation, O&M, and conceptual decommissioning activities.

3.5.1.6.1 Construction and Installation

3.5.1.6.1.1 Onshore Activities and Facilities

Onshore impacts to bats would be the same as those described for the Proposed Action. Onshore impacts to bats would be minor and short-term.

3.5.1.6.1.2 Offshore Activities and Facilities

Offshore impacts to bats would be the same as those described for the Proposed Action. Offshore impacts to bats would be minor and long-term.

3.5.1.6.2 Operations and Maintenance

3.5.1.6.2.1 Onshore Activities and Facilities

Onshore impacts would be the same as described for the Proposed Action. Onshore impacts to bats would be minor and long-term.

3.5.1.6.2.2 Offshore Activities and Facilities

Offshore impacts would be the same as described for the Proposed Action. Offshore impacts to bats would be negligible to minor and long-term.

3.5.1.6.3 Conceptual Decommissioning

3.5.1.6.3.1 Onshore Activities and Facilities

Onshore impacts would be the same as described for the Proposed Action. Onshore impacts to bats would be minor and short-term.

3.5.1.6.3.2 Offshore Activities and Facilities

Offshore impacts would be the same as described for the Proposed Action. Offshore impacts to bats would be minor and short-term.

3.5.1.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts of Alternative C-1 considered the impacts of this alternative in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on bats through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and 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 the infrequent and limited anticipated 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. Short-term 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. 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 bats would likely be negligible because the occurrence of bats offshore is low, and onshore habitat loss is expected to be minimal. In context of reasonably foreseeable environmental trends, Alternative C-1 would contribute an undetectable increment to the cumulative noise, presence of structures, and land disturbance impacts on bats.

3.5.1.6.5 Impacts of Alternative C-1 on ESA-Listed Species

Based on the information contained in this document, BOEM anticipates that Alternative C-1 for the SRWF Project would likely adversely affect but not jeopardize the continued existence of the northern long-eared bat.

3.5.1.6.6 Conclusions

Impacts of Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for bats. Therefore, the conclusions for impacts of Alternative C-1 are the same as described under the Proposed Action (Alternative B). BOEM expects the overall impact on to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

Cumulative Impacts of Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for bats. Therefore, the conclusions for cumulative impacts of Alternative C-1 are the same as described under the Proposed Action (Alternative B). BOEM expects the overall impact on to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

3.5.1.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

Alternative C-2 differs from Alternative B (Proposed Action) only with the location of the WTGs. WTGs initially planned for the western side of the Project would be moved to an open area on the eastern side of proposed Project Area to minimize impacts to fisheries habitat. Onshore and offshore construction and installation, O&M, and conceptual decommissioning impacts would be the same as described for Alternative B.

3.5.1.7.1 Construction and Installation

3.5.1.7.1.1 Onshore Activities and Facilities

Onshore impacts to bats would be the same as those described for Alternative B. Onshore impacts to bats would be minor and short-term.

3.5.1.7.1.2 Offshore Activities and Facilities

Offshore impacts to bats would be the same as those described for Alternative B. Offshore impacts to bats would be minor and long-term.

3.5.1.7.2 Operations and Maintenance

3.5.1.7.2.1 Onshore Activities and Facilities

Onshore impacts would be the same as described in Alternative B. Onshore impacts to bats would be minor and long-term.

3.5.1.7.2.2 Offshore Activities and Facilities

Offshore impacts would be the same as described in Alternative B. Offshore impacts to bats would be negligible to minor and long-term.

3.5.1.7.3 Conceptual Decommissioning

3.5.1.7.3.1 Onshore Activities and Facilities

Onshore impacts would be the same as described in Alternative B. Onshore impacts to bats would be minor and short-term.

3.5.1.7.3.2 Offshore Activities and Facilities

Offshore impacts would be the same as described in Alternative B. Offshore impacts to bats would be minor and short-term.

3.5.1.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts of Alternative C-2 considered the impacts of this alternative in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on bats through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and 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 the infrequent and limited anticipated 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. Short-term 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. 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 bats would likely be negligible because the occurrence of bats offshore is low, and onshore habitat loss is expected to be minimal. In context of reasonably foreseeable environmental trends, Alternative C-2 would contribute an undetectable increment to the cumulative noise, presence of structures, and land disturbance impacts on bats.

3.5.1.7.5 Impacts of Alternative C-2 on ESA-Listed Species

Based on the information contained in this document, we anticipate that Alternative C-2 for the SRWF Project is likely to adversely affect but not jeopardize the continued existence of the long-eared bat.

3.5.1.7.6 Conclusions

Impacts of Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for bats. Therefore, the conclusions for impacts of Alternative C-2 are the same as described under the Proposed Action (Alternative B). BOEM expects the overall impact on to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

Cumulative Impacts of Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for bats. Therefore, the conclusions for cumulative impacts of Alternative C-2 are the same as described under the Proposed Action (Alternative B). BOEM expects the overall impact on to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

3.5.1.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall minor adverse impacts on bats. Table 3.5.1-2provides an overall summary of alternative impacts.

Table 3.5.1-2. Comparison of Alternative Impacts on Bats

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Bats	*Proposed Action*: BOEM anticipates the impacts resulting from the Proposed Action alone would range from negligible to minor adverse impacts and negligible to minor beneficial impacts. Therefore, BOEM expects the overall impact on bats from the Proposed Action alone to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects. *Cumulative Impacts of the Proposed Action:* Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **minor** impacts to bats. Even though the overall effect would be detectable and measurable, the impacts to individuals and their habitats would not lead to population-level effects.	*Alternative C-1*: Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for bat compared to the Proposed Action. BOEM expects the overall impact on to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects. *Cumulative Impacts of Alternative C-1*: Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for bat compared to the Proposed Action. The conclusions for cumulative impacts of Alternative C-2 are the same as described under the Proposed Action. BOEM expects the overall impact on to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.	*Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for bats. BOEM expects the overall impact on to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects. *Cumulative Impacts of Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for bats. The conclusions for cumulative impacts of Alternative C-2 are the same as described under the Proposed Action. BOEM expects the overall impact on to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

3.5.1.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to bats.

3.5.2 Benthic Resources

This section discusses potential impacts on benthic resources, other than fishes and commercially important benthic invertebrates, from the proposed Project, alternatives, and future offshore wind activities in the GAA (COP, Appendix D, Figure D-4; Sunrise Wind 2021). The benthic GAA, as describe in Appendix D, covers the offshore cable alignments including a 330-ft (100-m) buffer, the ICW-HDD area where the cables leave the mainland, and the SRWF lease area. For the assessment of future offshore activities, the analysis area was expanded to include an approximately 10-mi (16-km) buffer and prior and ongoing studies of Southern New England region were reviewed to characterize the benthic environment. Benthic resources include the sediments, substrate, and living resources on the bottom of a water body, in this instance, the Atlantic Ocean and waters within the Southern New England Region of the Mid-Atlantic Bight. Benthic communities vary depending on the physical habitat characteristics including water depth, substrate properties and composition, level of disturbance, and light availability. Benthic communities may shift in response to biological interactions such as predation, competition, and seasonal species migrations.

3.5.2.1 Description of the Affected Environment and Future Baseline Conditions

3.5.2.1.1 Regional Setting

The Lease Area is located offshore of the Northwestern Atlantic OCS within the Southern New England Region; a portion is within the southern part of the RI and MA WEAs and the remainder is located within the western portion of the MA WEA. The SRWEC is planned to extend westward from the southern part of the lease area through the NYB to Fire Island, NY (see Figure 1.1-1 of the COP; Sunrise Wind 2022). In 1968, the United States obtained an easement from NY for the "use and occupation by the United States of America for the purposes of Fire Island National Seashore of lands now or formerly under the waters of the Atlantic Ocean in the Towns of Islip and Brookhaven.” The NPS administers these lands extending 1,000 ft (304.8 m) southerly into the Atlantic Ocean as part of Fire Island National Seashore (FINS). The SRWEC would then cross the ICW to connect with the onshore facilities.

The SRWF and the SRWEC would cross waters that transition from the continental slope and coastal areas near Long Island Sound extending out onto the OCS. The benthic assessments confirmed the presence of this region’s characteristic mobile sandy substrate and associated benthic communities that are adapted to survive in dynamic ocean conditions (COP, Appendices M1, M2, and M3; Sunrise Wind, 2021). Although there are likely shifts in benthic community assemblages and particular taxa abundances from year-to-year and seasonally, the benthic habitat and ecological functioning of the benthic community is generally stable in the marine portions of the Project Area. Specific sensitive taxa in the region, including soft corals, are generally long-lived and sessile. As such, their distributions and presence are not strongly influenced by seasonality (Sunrise Wind 2022).

Benthic communities provide important ecosystem functions related to trophic (food web) processes as well as contributing to habitat complexity in the generally homogeneous sandy/soft substrate typical of the region. The species that inhabit the benthic habitats of the OCS include infaunal species, those living in the sediments (e.g., polychaetes, amphipods, mollusks), and epifaunal species, those living on the seafloor surface (mobile; e.g., sea stars, sand dollars, sand shrimp) or attached to substrates (sessile; e.g., barnacles, anemones, tunicates). In addition to trophic links and biogenic structure, benthic species can also serve important roles in facilitating nutrient and carbon cycling in the sediments through functions such as water filtration, biodeposition, bioirrigation, and bioturbation. A summary of these species, likelihood of presence, and the potential time of year that they could be present in the region is included in Table 5.2-3 of the COP, Appendix M-1 (Sunrise Wind 2021).

Site-specific benthic habitat assessments were conducted in the spring (SRWF and SRWEC–OCS) and summer 2020 (SRWEC–NYS) (COP, Appendix M1 and M2; Sunrise Wind 2021), using a combined SPI/PV system. The data generated from these SPI/PV surveys met BOEM Benthic Habitat Survey Guidelines (BOEM 2019) to characterize surface sediments; delineate and characterize hard bottom areas; identify and confirm benthic flora and fauna, including sessile and slow-moving invertebrates; identify sensitive habitats; establish preconstruction baseline benthic conditions against which post-construction habitats can be compared; and determine the suitability of sampled reference areas to serve as controls for future monitoring and assessment.

There are five benthic resource assessment areas for the Sunrise Wind Project: 1) the SRWEC alignment within New York State waters (SRWEC-NYS); 2) the SRWEC alignment on the OCS; 3) the ICW-HDD area; 4) the ICW temporary equipment area; and 5) the SRWF. The benthic assessments reviewed existing data and conducted sampling for a 10-mi (16-km)-buffer radius around the lease area (COP, Appendix M1; Sunrise Wind 2021) and a 330-ft (100 m)-buffer on either side of the SRWEC and ICW-HDD (COP, Appendix M2; Sunrise Wind 2021). Benthic resources vary among these five areas and would be discussed separately. Sediment grain size distribution is an important factor of benthic habitats and influences benthic community distributions and can be used to infer benthic taxa that are likely present in a particular environment. Linking the physical substrate characteristics with the biological functional and taxonomic composition is accomplished using the CMECS (FGDC 2012), as recommended by BOEM (BOEM 2019). CMECS provides a standard means to categorize the physical (substrate) and biological (biotic) components of environments.

Four reference areas were sampled and characterized to provide a baseline for post-construction monitoring (COP, Appendix M1; Sunrise Wind 2021). In general, the physical and biological features characterizing the four reference areas were similar to the nearby stations at the SRWF and SRWEC–OCS. This indicates that these potential reference areas are likely suitable for comparison after cable installation and wind farm construction.

3.5.2.1.2 Surficial Sediments and Geomorphology

Surficial sediments were mapped for a portion of SRWF and along the route of the SRWEC in the OCS and NY state waters based on both acoustic and SPI/PV ground-truthing surveys (COP, Appendices M1, M2, and M3; Sunrise Wind 2021). The sea bottom sediments in the SRWF and the SWREC generally consist of a mix of sand and muddy sand coastal plain sediments, with coarser, glacially deposited sands and gravels in the northwestern portion of the SRWF and locally elsewhere. Patches of mixed sediments also occur, as well as occasional lenses of muddy sediments.

Within the ICW-HDD, surficial sediments generally consist of Holocene gravels and fine sands, muddy sands, and sandy muds. Surficial sediments on the inner continental shelf within the SRWEC–NYS alignment primarily consist of Holocene-era fine to medium quartz beach, dune sands, and finer-grained sediments (Williams 1976). These sediments are generally 6 to 16 ft (2 to 5 m) thick but can be up to 33 ft (10 m) thick in the vicinity of ebb-tide shoals or large, linear, obliquely shore-attached sand ridges (Bokuniewicz 2011; Schwab 2000). Also present in some areas of the SRWEC–NYS alignment are coarse sand and gravel glacial outwash deposits of Pleistocene age (Williams 1976). Medium-density boulder fields identified in the nearshore area of SRWEC–NYS as part of benthic mapping are likely associated with Pleistocene-era glacial outwash or moraine deposits (COP, Appendix M3; Sunrise Wind 2021).

Surficial sediments on the outer shelf within the SRWEC–OCS alignment generally consist of Holocene or Pleistocene fine to medium quartz marine sands, interbedded with lenses of silt and clay (Williams 1976). These sediments are typically 33 to 98 ft (10 to 30 m) thick, and possibly as thick as 295 to 328 ft (90 to 100 m) where deposits have filled an intricate paleochannel system cut into the Upper Pleistocene surface formed during the last marine transgression (Bokuniewicz 2011; Schwab 2000; Williams 1976).

Within the SRWF, surficial sediments include both Holocene or Pleistocene fine to medium quartz marine sands and muddy sands, interbedded with lenses of silt and clay, and coarser glacially deposited sands and gravels. The SRWF is in the vicinity of the terminal moraine associated with the maximum extent of the Laurentide continental ice sheet (Fugro 2019) where it lies atop the open continental shelf. The sediments associated with the glacial moraine in the northern and western parts of the SRWF include Pleistocene sand and gravel fluvioglacial outwash deposits and reworked sand, gravel, and silt sediments from glacial processes. Boulder deposits are present in the vicinity of the glacial moraine. These boulders are part of moraine deposits, glacial outwash, or glacial erratics transported by glacial ice rafts. Benthic sediment mapping classified areas as glacial moraine and till based on morphological interpretation of an irregular seafloor (COP, Appendix M3; Sunrise Wind, 2021).

Seabed slopes are generally very low, with an average gradient of less than 0.1 degrees (0.15 percent). Within glacially deposited boulder fields, rugosity can be high, with seabed gradients locally exceeding 5 degrees. Sediment bedforms develop in finer grained sediments as a response to hydrodynamic conditions induced by currents and wave action. Sediment bedforms identified in inner and outer shelf sandy sediments include ripples (less than 1.6 ft [0.5 m] in height), mega ripples (1.6 to 5 ft [0.5 to 1.5 m] in height), and occasionally sand waves (more than 5 ft [1.5 m] in height). In some areas, sandy sediments are without notable bedforms, indicating lower-energy sand deposition areas. Generally, softer silt/clay sediments within the SRWF and the SWREC lack surficial bedforms, indicating low-energy depositional environments.

3.5.2.1.3 General Area Characteristics

The dominant CMECS substrate group across all areas surveyed was sand or finer, and small, dispersed areas of gravels were also encountered. Dominant substrate subgroups present in order of prevalence included very fine sand, fine sand, medium sand. There were some dispersed areas of gravels and a few cobbles and very infrequent boulders, although some area surveys encountered no boulders (e.g., SWREC-OCS). The CMECS biotic setting for all areas surveyed was benthic/attached biota and the biotic class was faunal bed. Although the biotic subclass is not directly based on sediment grain size distributions, it reflects them at the scale of relevance to the dominant fauna present, thus serving as an integrator of physical and biological characteristics of the seafloor. CMECS expressly states that "substrate type is such a defining aspect of the faunal bed class that CMECS Faunal Bed subclasses are assigned as physical-biological associations involving both biota and substrate" (FGDC 2012). Biotic subclass varied somewhat among the benthic resource assessment areas, but soft sediment fauna generally dominated the stations surveyed with occurrences of attached fauna (where hard substate components were present) and inferred fauna. Specific fauna and spatial trends observed are described below for each assessment area.

Table 3.5.2-1 summarizes results relevant to the discussion of the benthic habitat surveys conducted by INSPIRE Environmental in 2020 at the four assessment areas.

3.5.2.1.4 ICW-HDD

A portion of the OTC would cross the Long Island ICW where it opens into Bellport Bay near the William Floyd Parkway Bridge (Figure 3.3.3-3 in the COP, Sunrise Wind 2022). An HDD would be used to place the cable to avoid impacts to coastal resources. This assessment area is in a narrow section of the ICW connecting Narrow Bay with Bellport Bay. The ICW is maintained for vessel traffic and dredging to maintain the 6 ft (2 m) depth and dredge material redistribution does occur on a regular basis. In 2012, dredged materials were used to repair a barrier island breach caused by Hurricane Sandy near Smith Point County Park, the proposed landfall site for the SRWEC (USACE 2022).

The eight stations along the alignment were classified by the CMECS Biotic Subclass as either soft sediment fauna or attached fauna. The north side of the channel had a thick carpet of polychaete tubes across the sediment–water interface. The two stations on the south side of the channel were characterized by sand ripples with some biotic tracks. The two central station had small gravels encrusted with bryozoa (moss animals) over muddy sand. Tufts of floating macroalgae were noted in multiple PV replicates collected from the ICW HDD. SAV beds including some eel grass (*Zostera marina)* were found off the south shore of the channel.

3.5.2.1.5 SRWEC-NYS Alignment

The first 6.2 mi (10 km)-long segment of the SRWEC alignment would be developed in NYS waters off the coast of Long Island, New York. The alignment begins at Smith Point County Park and proceeds east to the boundary of NYS waters approximately 3 nm (3.45 mi; 5.56 km) offshore. This portion of the SRWEC disturbance corridor would cover approximately 74.1 ac (0.3 km^2); however, benthic survey stations covered a much broader buffer (1,083 ft [330 m]) on either side of the proposed corridor to thoroughly characterize the environment.

All 35 stations surveyed consisted of soft sediments ranging from very fine sand to medium sand with visual evidence of generally low organic matter content, although there was evidence of the presence of benthic microalgae at many of the stations (COP, Appendix M2; Sunrise Wind 2021). The sediment grab samples were all primarily sand with minor fractions of silt/clay and gravel. The macrohabitat characteristics indicated greater bedload transport nearer to shore with more distinct ripples in the sand as well as greater suspended material which contributed to higher turbidity. This trend indicates decreasing wave action effects proceeding from shallower waters out into deeper areas. Water depths ranged from 15 to 88 ft (5 to 27 m) with shallower areas nearer to shore.

Hermit crabs (Coenobitidae), sand dollars (*Echinarachnius parma*), burrowing anemones (cerianthids) and tube-building polychaetes (*Diopatra* sp.) were commonly observed in the SPI and PV images across SRWES-NYS stations. Sediment grab analysis revealed the infaunal community was generally dominated by two polychaetes (*Polygordius* sp. and *Mediomastus* sp.), with high occurrences of the amphipod, *Protohaustorius wigleyi*, at the nearshore stations.

Table 3.5.2-1. Select Physical and Biotic Characteristics of Benthic Habitats Summarized by Proposed Project Component Areas

Area	No. of Samples	Water Depth ft (m)			Dominant Substrate[1]		Biotic Subclass[1]	Common Taxa Observed
		Minimum	Maximum	Average	Group	Subgroups		(n = # Stations)
ICW-HDD	8	NR	NR	NR	Sand or finer and gravel	Sandy gravel	Soft sediment fauna; attached fauna	None (n=8)
SRWEC-NYS	35	15 (4.6)	88 (26.8)	57.1 (17.4)	Sand or finer	Very fine sand, fine sand	Soft sediment fauna	Dioptera (n=7) Ceriantthid (n=10) Sand Dollar (n=21)
SRWEC-OCS	107	89.9 (27.4)	224.1 (68.3)	161.7 (42.3)	Sand or finer, gravel/gravel mixes	Very fine sand, fine sand	Soft sediment fauna; attached fauna	Dioptera (n=2) Ceriantthid (n=10) Sand Dollar (n=42)
SRWF	252	128 (39.0)	259.1 (79.0)	161.7 (49.3)	Sand or finer, gravel/gravel mixes	Very fine sand, fine sand	Soft sediment fauna; attached fauna	Sabelid (n=4) Ceriantthid (n=10) Sand Dollar (n=11)

Sources: COP, Appendices M1, M2, and M3 (Sunrise Wind 2021).

[1] CMECS classifications (FGDC 2012).

Note: NR = not recorded

3.5.2.1.6 SRWEC-OCS

After crossing into federal waters, the SRWEC alignment proceeds approximately 40 mi (64 km) east, then turns to the northeast and continues for another 45 mi (72 km) to the lease area boundary (see Figure 1.1-1 in the COP, Sunrise Wind 2022). This portion of the SRWEC disturbance corridor would cover approximately 1,260 ac (170 km by 30 m); however, benthic surveys covered a much broader buffer (1,082 ft [330 m]) on either side of the proposed corridor to thoroughly characterize the environment.

The affected environment for the proposed cable alignment crosses a transitional zone separating waters off the barrier islands and Long Island Sound from the OCS (BOEM 2013) and is within the Mid-Atlantic oceanic ecoregion, or the Southern New England Region. These waters support a diverse and abundant assemblage of fishes and invertebrates, including many commercially and recreationally important species which are discussed in Section 3.6.1, Commercial Fisheries and For-Hire Recreational Fishing.

The 2020 surveys identified two distinct regions of the SRWEC–OCS based on sediment composition and benthic community: 1) the western stations extending from the three-mile New York State waters boundary to where the planned cable corridor turns northeastward, and 2) the eastern portion including the remaining stations along the SRWEC–OCS extending to the SRWF (COP, Appendix M-1; Sunrise Wind 2021). Sediments transition from medium sand and fine sand (CMECS Substrate Subgroups) with ripples in the western portion to very fine sand with limited small-scale bedforms along the eastern portion of the SRWEC–OCS. The biological components of the benthic environment along the SRWEC–OCS follow a similar pattern. Generally, the western portion of the SRWEC–OCS had high densities of sand dollars while the eastern portion of the SRWEC–OCS was inhabited by burrowing anemones (cerianthids) and sea stars. This corroborates previous reports that observed high occurrences of sand dollars and sand ripples in this general area (e.g., NYSERDA 2017). Gravel was uncommon in sediments along the SRWEC–OCS, and no boulder fields were observed at any of the stations along the SRWEC–OCS. In soft bottom habitats, one cluster of scattered boulders was mapped east of the corridor bend and dispersed scattered boulders were observed along the entire corridor east of the bend; west of the corridor bend, scattered boulders were rarely observed. At the two stations that did have gravel present, the macrohabitat types were identified as sand with pebbles/granules, the maximum gravel size was pebble/granule, and there was no observed attached epifaunal growth. Water depths ranged from 15 to 88 ft (5 to 27 m) with shallower areas nearer to shore.

3.5.2.1.7 SRWF Lease Area

The SRWF portion of the Project would be developed on the OCS, approximately 26.5 nm (30.5 mi [48.1 km]) east of Montauk, New York. The lease area comprises approximately 86,769 ac (351 km^2).

Sediments were overwhelmingly from CMECS Substrate Group Sand or Finer in 252 samples taken in the SRWF. The presence or absence of bedforms in the PV images provides a snapshot in time of the small-scale sediment mobility in a given area. In the deeper regions of the SRWF, small scale sediment mobility was generally low, as assessed through the general lack of bedforms observed; however, some spatial trends in sediment composition were observed: the northwest region had more stations with gravels;

the southeast and west-central regions were characterized by finer substrata and limited small-scale sediment mobility; the northeast region was generally composed of fine to coarse sand with sand ripples common. These regions are delineated in COP, Appendix M1, Figure 3.1-1 (Sunrise Wind 2021). Boulders were infrequently observed within the SRWF and only in the northwest region of the sample area. The presence of coarser habitat components and some hard substrates (gravels and boulders) that serve as potential attachment for epifauna places the northwest region of the lease area in a higher complexity habitat class (see Figures 3.1-2, 3.1-3, and 3.1-5 in the COP, Appendix M1; Sunrise Wind 2021).

The biological attributes of the SRWF followed spatial trends corresponding with the physical features. Stations in the southeast region of the SRWF, which were predominantly very fine sand (CMECS Substrate Subgroup) and sand and mud (macrohabitat type), had high occurrences of burrowing anemones (cerianthids) and sabellid worms. Stations in the northeast region of the SRWF, which were predominantly medium sand or fine sand (CMECS Substrate Subgroup) and sand with ripples (macrohabitat type), had high occurrences of sand dollars. The northwest region of the SRWF, which was more heterogenous in seabed composition but included higher frequency of gravelly sand and sandy gravel (CMECS Substrate Subgroups) compared to the rest of the SRWF and was generally more complex in macrohabitat types (e.g., sand with mobile gravel, patchy cobbles and boulders on sand), was inhabited by attached epifauna (e.g., hydroids [*Tubularia* spp.], sea stars, and bryozoa).

All of the evaluated GAA's overlap Cox Ledge, an area of concern for fishery managers because it provides important habitat for several commercially and recreationally important species—notably, spawning habitat for Atlantic cod (*Gadus morhua*). A portion of Cox Ledge was designated by the NEFMC as a habitat management area to protect EFH for a number of managed fish species. NOAA acknowledged the importance of Cox Ledge but disapproved the designation because they concluded the proposed gear restrictions approved by the NEFMC would likely be ineffective at minimizing impacts on habitat function (NEFMC 2018; NOAA 2017). BOEM is currently funding a 3-year study (AT-19-08) examining movement patterns of Atlantic cod, black sea bass (*Centropristis striata*), and other species in the southern New England region, including the SRWF Lease Area. The study is being conducted by NMFS and a team comprising a state resource agency, a university, and a nonprofit organization (BOEM 2019). Given the level of concern raised about potential impacts on Cox Ledge and Atlantic cod, the discussion of potential effects presented in the following sections places emphasis on this and other species of particular concern.

3.5.2.1.8 Sensitive Taxa and Species of Concern

Sensitive seafloor habitats in the Mid-Atlantic ecoregion include corals, SAV beds, and valuable cobble and boulder habitat (BOEM 2019). Cobble and boulder habitat can serve as structure for hard and soft corals, nursery ground for juvenile lobster, and as preferable benthic habitat for squid to deposit their eggs. Taxa considered sensitive for this region include corals, seagrass beds, squid eggs, and American lobster (*Homarus americanus*).

In the SRWEC–NYS area, species of ecological concern and/or concern regarding possible habitat disturbance from offshore wind construction and operation activities include black sea bass (*Centropristis striata*), Atlantic cod, sea scallop (*Placopecten magellanicus*), and ocean quahog (*Arctica islandica*) (Guida 2017).

The benthic surveys did not identify any sensitive taxa, species of special concern, or nonnative taxa at any of the stations along the SWEC-NYS or the ICW-HDD; however, within the estuarine environment of the ICW HDD, the presence of seagrass beds, such as those observed along the south shore of the channel, are considered sensitive and ecologically important benthic habitat.

In the SRWF area, one sensitive taxon was identified. Northern star coral, *Astrangia poculata*, a nonreef-building hard coral, occurred at five stations within the SRWF. Two species of special concern, a sea scallop, *Placopecten magellanicus*, and bivalve siphons indicative of ocean quahog were documented in the SRWF area. The sea scallops observed were isolated individuals at 7 of the 252 stations, no scallop beds or high-density areas were observed. The bivalve siphons were observed at one station (station 130).

3.5.2.2 Impact Level Definitions for Benthic Resources

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on benthic resources from the alternatives, including the Proposed Action. Table 3.5.2-2 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for benthic resources. Table G-6 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to benthic resources. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a Project.

Table 3.5.2-2. Definition of Potential Impact Levels for Benthic Resources

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Impacts on benthic resources are undetectable or barely measurable, with no consequences to individuals or populations.	No measurable impacts or effects to the benthic habitat setting or benthic resources would occur.
Minor	Impacts on benthic resources are detectable and measurable but are low-intensity, highly localized, and short term in duration. May include impacts to or loss of individuals, but these impacts would not result in population-level effects.	Small and measurable effects that would comprise one or more of the following: improvement in ecosystem health, increase in the extent and quality of habitat for both special status species and species common to the proposed Project Area, or increase in populations of species common to the proposed Project Area.

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Moderate	Impacts on benthic resources are detectable and measurable. These impacts could result in population-level effects, but those effects would likely be recoverable and would not affect population viability.	Notable and measurable effects that would comprise one or more of the following: improvement in ecosystem health, increase in the extent and quality of habitat for both special status species and species common to the proposed Project Area, or increase in populations of species common to the proposed Project Area.
Major	Impacts on benthic resources are significant and extensive, long term in duration, and could have population-level effects that are not recoverable, even with mitigation.	Regional or population-level effects that would comprise one or more of the following: improvement in ecosystem health, increase in the extent and quality of habitat for both special status species and species common to the proposed Project Area, or increase in populations of species common to the proposed Project Area.

3.5.2.3 Impacts of Alternative A - No Action on Benthic Resources

When analyzing the impacts of the No Action Alternative on benthic resources, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities, on the baseline conditions for benthic resources. 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 E*, Planned Activities Scenario*.

3.5.2.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for benthic resources described in Section 3.5.2, Affected Environment would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities. Ongoing offshore wind activities within the GAA (a 330 ft (100 m) buffer along the cable routes and a 10 mi (16 km) radius centered on the SRWF lease area) that contribute to impacts on benthic resources include:

- Ongoing construction of the South Fork project (12 WTGs and 1 OSS) in OCS-A

The South Fork project would affect benthic resources through the primary IPFs of noise, presence of structures, EMF, and seafloor disturbance. Ongoing offshore wind activities would have the same type of impacts from noise, presence of structures, EMF, and seafloor disturbance that are described in detail in the following section for planned and ongoing offshore wind activities, but the impacts would be of lower intensity.

3.5.2.3.2 Cumulative Impacts of the No Action Alternative

At the time of this Draft EIS, there are several offshore wind projects in various stages of permitting and development. As such, the following is a general description of potential impacts due to offshore wind and other ongoing actions in the analysis area; however, it is impossible to predict with certainty which projects would be in process, under construction, or operating in the near future. Therefore, this impacts analysis makes assumptions about the magnitude and extent of potential impacts based on currently licensed offshore wind projects and those under consideration as well as other ongoing activities in the impacts assessment area.

Seafloor disturbance: Based on projects currently under evaluation or development, up to 2,000 ac (809 ha) could be affected by anchoring or mooring activities during offshore wind energy development within the EFH, finfish, and invertebrate GAA, as well as 30 or more acres (0.12 or more km^2) within the benthic GAA. This offshore energy facility construction would involve direct disturbance of the seabed, leading to direct impacts on benthic, finfish, and invertebrate resources or degradation of sensitive habitats, including EFH. In general, however, these effects would be localized to the disturbance footprint and vicinity. The severity of these effects would vary depending on the species and life stage sensitivity to specific stressors that extend into the area, resulting in minor to moderate impacts on benthic resources. Such impacts are expected to be localized and short-term but could be long-term if they occur in eelgrass beds or hard-bottom habitats.

Future activities would disturb more than 1,000 ac (4.05 km^2) of seabed from cable installation within the EFH, finfish, and invertebrate GAA, as well as close to 2,000 ac (8.09 km^2) within the benthic GAA, resulting in the long-term alteration of benthic habitat. The specific type and extent of habitat conversion and the resulting effects on benthic habitats, EFH, invertebrates, and finfish would vary depending on the Project design and site-specific conditions. The widespread development of offshore renewable energy facilities would, however, create a distributed network of artificial reefs on the mid-Atlantic OCS. These reefs form biological hotspots that could support species range shifts and expansions, nonnative species, and changes in biological community structure (Degraer 2017; Methratta 2019; Raoux 2017). Those changes could influence fish and invertebrate community structure in the future, but the likelihood, nature, and significance of these potential changes are difficult to predict and a topic of ongoing research.

Presence of structures: The future addition of new WTG and OSS foundations in the EFH, finfish, and invertebrate GAA, as well as foundations within the benthic GAA could result in artificial reef effects that influence benthic habitat and fish and invertebrate community structure within and in proximity to the Project footprints. This could in turn influence the abundance and distribution of EFH species. While reef effects would largely be limited to the areas within and or close to wind farm footprints, the development of individual or contiguous wind energy facilities in nearby areas could produce cumulative effects that would be permanent and moderately beneficial for some species from habitat conversion and have minor adverse effects due to permanent habitat loss for soft bottom specialized benthic species. New structures would attract structure-oriented fishes as long as the structures remain. Abundance of certain fishes may increase with short-term to permanent moderate impacts.

Hydrodynamic disturbance resulting from the broadscale development of large offshore wind farms is a topic of emerging concern because of potential effects on the Mid-Atlantic Bight cold pool. The cold pool is a mass of relatively cool water that forms in the spring and is maintained through the summer by stratification. The cold pool supports a diversity of fish and other marine species that are usually found farther north but thrive in the cooler waters it provides (Chen 2018; Lentz 2017). Changes in the size and seasonal duration of the cold pool over the past 5 decades are associated with shifts in the fish community composition of the Mid-Atlantic Bight (Chen 2018; Kohut 2019). Several lease areas within the RI-MA WEAs are located on the approximate northern boundary of the cold pool. The potential effects of extensive wind farm development on features like the cold pool is a topic of emerging interest and ongoing research (Chen 2016). Changes in cold pool dynamics resulting from future activities, should they occur, could conceivably result in changes in benthic habitat suitability and fish community structure, but the extent and significance of these potential effects are unknown.

Sediment suspension and deposition: Under the No Action Alternative, several thousand miles of cable would be added in the EFH, finfish, and invertebrate GAA, as well as within the benthic GAA. Cable placement and other related construction activities would disturb the seabed, creating plumes of fine sediment that would disperse and resettle in the vicinity. The resulting effects on benthic habitats, EFH, finfish, and invertebrates would be similar in nature to those observed during construction of the Block Island Wind Farm (BIWF) (Elliot 2017) but would vary in extent and severity depending on the type and extent of disturbance and the nature of the substrates. These effects would be short-term in duration, effectively ending once the sediments have resettled. Similarly, suspended sediment concentrations close to the disturbance could exceed levels associated with behavioral and physiological effects on fish and invertebrates but would dissipate with distance, generally returning to baseline conditions within a few hours. In theory, bed-disturbing activities occurring nearby (i.e., within a few hundred feet) could elevate suspended sediment levels, resulting in short-term, minor adverse effects on benthic habitat, EFH, finfish, and invertebrates.

Noise: Numerous proposed offshore wind construction projects could be developed on the Mid-Atlantic OCS between 2022 to 2030 (see Appendix E). This would result in noise-generating activities—specifically, impact pile-driving, HRG surveys, construction and O&M vessel use, and WTG operation. BOEM believes it is reasonable to conclude that impact pile-driving, construction vessel, and HRG survey noise from future projects could adversely affect EFH, invertebrates, and finfish. In addition, construction noise impacts from future actions elsewhere in the mid-Atlantic OCS could adversely affect demersal and pelagic fish and invertebrates that migrate to or use the GAA during part of their life cycle. Noise transmitted through water and through the seabed can cause injury to or mortality of benthic resources in a limited area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area. The extent would depend on pile size, hammer energy, and local acoustic conditions. The affected areas would likely be recolonized in the short term. In the planned activities scenario, noise from pile-driving that causes behavioral changes could affect the same populations or individuals multiple times in a year or in sequential years, although impacts are expected to be minor. Due to the unknowns associated with projects, the timing, extent, and severity of these effects on habitat and aquatic community structure cannot currently be quantified.

Tougaard (2020) summarized available monitoring data on wind farm operational noise, including both older generation geared turbine designs and quieter modern direct drive systems like those proposed for the SRWF. In their review, they evaluated approximately 40 wind projects with turbines ranging from 0.2 to 6.15 MW. They determined that operating turbines produce underwater SPL on the order of 105-128, in the 25-Hz to 1-kHz range as measured at 50 m; however, the turbines evaluated were smaller capacity, and the total number of turbines in the projects evaluated was less than what is proposed at SRWF. Tourgaard's levels were consistent with the noise levels observed at the BIWF (110 to 125 dB SPL; Elliot 2019) More recently, Stober and Thomsen (2021) used monitoring data and modeling to estimate operational noise from larger (10 MW) current generation direct drive WTGs and concluded that these designs could generate higher operational noise levels than those reported in earlier research; however, these studies and models have demonstrated that noise generated by wind turbines attenuates rapidly with distance from the turbines (falling below normal ocean ambient noise within ~1 km from the source), and the combined noise levels from multiple turbines is lower or comparable to that generated by a small cargo ship and unlikely to be detectable to fish and invertebrates outside the respective wind farm footprints. The available information suggests the effects of operational underwater noise from future activities would occur for the life of the proposed Project but are not anticipated to have population-level effects and effects to benthic invertebrates would be negligible.

Vibration from impact pile-driving can be transmitted through sediments. Benthic habitat is composed of various types of sediment, structural features that are formed by that sediment (e.g., interstitial spaces between boulders, sand waves), and organisms that reside in and on the sediment. Substrates and associated structural features are poor transmission media for and are relatively unaffected by underwater noise. Past research has shown that invertebrates are sensitive only to the particle motion component of noise. Detectable particle motion effects on invertebrates are typically limited to within 7 ft (2 m) of the source or less (Carroll 2016; Edmonds 2016; Hawkins 2014; Payne 2007); however, recent research (Jones 2020; Jones 2021) indicate that longfin squid, an EFH invertebrate species, can sense and respond to vibrations from impact pile-driving at a greater distance based on sound exposure experiments. This suggests that infaunal organisms, such as clams, worms, and amphipods may exhibit a behavioral response to vibration effects over a larger area. For example, noise has been shown to affect bivalves based on reactions where bivalves close their valves and burrow deeper when subjected to noise and vibration stimuli (Roberts and Elliott 2017). Prolonged closure could reduce respiration and growth, prevent expulsion of wastes, and lead to mortality, though the duration of pile-driving actions within the small radius of potential effects for infaunal organisms is expected to be on the order of hours. With impulse impacts, such as those from pile-driving, physiological sound thresholds may be exceeded for some species, resulting in injury or mortality, especially for affected species in the immediate vicinity (less than tens of meters), but additional research is needed.

Noise transmitted through water and/or through the seabed can cause injury and/or mortality to benthic resources in a limited area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area. Although construction within the WEA is expected to last from 2023 to 2030, the pile-driving activity at any given site would be on the order of days. Since the WTGs are spaced up to 1 nm apart, impacts from pile-driving at other WTGs would not be detectable beyond the area immediately surrounding a WTG. Actual placement of the piles could result in mortality of infaunal and sessile organisms in the immediate area, but affected areas would likely be recolonized in the short term, and the overall impact on benthic resources would be minor. Given the limited area where vibration is detectable by infaunal organisms and the distance between proposed and operating offshore developments vibration would not be detectable by invertebrates outside of each project and impacts to benthic resources due to vibration would be highly proximal and expected to be minor for organisms in the immediate area of disturbance but negligible in the context of the GAA.

Electromagnetic field (EMF): At least seven submarine power and communications cables cross the RI-MA WEAs. These cables would presumably continue to operate and generate EMF effects under the No Action Alternative. While the type and capacity of those cables is not specified, the associated baseline EMF effects can be inferred from available literature. Electrical telecommunications cables are likely to induce a weak EMF on the order of 1 to 6.3 microvolts per meter within 3.3 ft (1 m) of the cable path (Gill 2005). Fiber-optic communications cables with optical repeaters would not produce EMF effects.

Under the No Action Alternative, several thousand miles of cable would be added in the EFH, finfish, and invertebrate GAA, as well as within the benthic GAA, producing EMFs in the immediate vicinity of each cable during operations. BOEM anticipates that the proposed offshore energy projects would use high-voltage alternating current (HVAC) transmission, but high-voltage direct current (HVDC) designs are possible and could occur. BOEM would require these future submarine power cables to have appropriate shielding and burial depth to minimize potential EMF effects from cable operation. EMF effects from these future projects on benthic habitats, EFH, invertebrates, and finfish would vary in extent and significance depending on overall cable length, the proportion of buried versus exposed cable segments, and project-specific transmission design (e.g., HVAC or HVDC, transmission voltage). While EMFs are measurable within tens of feet of cable corridors, bottom-dwelling invertebrates (e.g., lobster) are impacted by the field as they temporarily pass over the cable location. Accordingly, EMF effects from future activities would be negligible; however, (Hutchison 2018; Hutchison 2020b) have observed behavioral responses in lobster that were exposed to an EMF from an HVDC cable in a controlled environment, meaning that higher level (e.g., minor or moderate) effects could result should future projects use HVDC transmission. The effect of EMF on benthic organisms is an area where more research is needed to assess the potential impacts of large cable networks on benthic fauna.

Accidental releases and discharges including trash and debris: Offshore wind energy development could result in the accidental release of water quality contaminants, trash, or other debris, which could theoretically lead to an increase in debris and pollution in the GAAs (see Section 3.4.2 for characterization of existing marine pollution conditions). In general, the types of accidental hazardous materials releases associated with marine construction projects consist of fuels, lubricating oils, and other petroleum products. BOEM prohibits the discharge or disposal of solid debris into offshore waters during any activity associated with the construction and operation of offshore energy facilities (30 CFR 250.300). The USCG similarly prohibits the dumping of trash or debris capable of posing entanglement or ingestion risk (MARPOL, Annex V, Public Law 100−220 [101 Stat. 1458]). Compliance with these requirements would effectively minimize releases of trash and debris.

Increased vessel traffic associated with offshore renewable energy construction presents the potential for the inadvertent introduction of invasive species during discharge of ballast and bilge water. BOEM would require all Project construction vessels to adhere to existing state and federal regulations related to ballast and bilge water discharge, including USCG ballast discharge regulations (33 CFR 151.2025) and EPA NPDES Vessel General Permit standards, effectively avoiding the likelihood of non-native species invasions through ballast water discharge. Considering these requirements and the dispersed distribution of planned offshore energy facilities, existing water quality trends are likely to continue.

The impacts from ongoing activities and future non-offshore wind activities stem from the increased potential for releases over the next 30 years due to increasing vessel traffic and ongoing, chronic releases. Future offshore wind activities would contribute to an increased risk of releases and impacts on benthic resources. The contribution from future offshore wind activities would represent a low percentage of the overall risk from ongoing activities. In context of reasonably foreseeable environmental trends, the combined impacts on benthic resources (mortality, decreased fitness, disease) from accidental releases and discharges are expected to be negligible, localized, and short-term due to the likely limited extent and duration of a release.

3.5.2.3.3 Impacts of Alternative A on ESA-Listed Species

There are no ESA-listed threatened or endangered invertebrate or coral species, nor are there any benthic species currently proposed for listing in the New England/Mid-Atlantic Region as reported by NMFS (NOAA 2021). Therefore, there would be no potential for impacts to ESA-listed species under the No Action Alternative.

3.5.2.3.4 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and conceptual decommissioning would not occur; and potential impacts on benthic habitat, EFH, invertebrates, and finfish species associated with the proposed Project would not occur; however, ongoing activities would have continued, short- to long-term impacts on benthic habitat, EFH, invertebrates, and finfish species.

Considering all the IPFs together, BOEM anticipates that the overall impacts associated with ongoing activities, including permitted offshore wind projects, and environmental trends in the GAA would result in **moderate** adverse impacts and could potentially include **moderate beneficial** impacts on benthic resources due to the artificial reef effect (habitat conversion).

Cumulative Impacts of the No Action Alternative

While the proposed Project would not be built as proposed under the No Action Alternative, BOEM expects ongoing activities, future non-offshore wind activities, and future offshore wind activities to have continuing short- to long-term impacts (disturbance, displacement, injury, mortality, reduced reproductive success, habitat degradation, habitat conversion) on benthic resources, finfish, invertebrates, and EFH, primarily through resource exploitation/regulated fishing effort, dredging, bottom trawling, bycatch, pile-driving noise, new cable emplacement, the presence of structures, and climate change.

Based on the analysis presented under the above IPFs, BOEM anticipates that the impacts of ongoing activities, especially seafloor disturbances caused by sediment dredging and fishing using bottom-tending gear, would be **moderate** for benthic resources. Reasonably foreseeable activities other than offshore wind include increasing vessel traffic; increasing construction, marine surveys, marine minerals extraction, port expansion, and channel deepening activities; and the installation of new towers, buoys, and piers would result in **minor** impacts for benthic resources. BOEM expects the combination of ongoing activities and reasonably foreseeable activities other than offshore wind to result in **moderate** impacts on benthic resources, primarily driven by ongoing dredging and fishing activities.

The combined significance criteria in Table 3.5.2-2 are used to characterize the combined effects of all IPFs likely to occur under the No Action Alternative. BOEM expects ongoing activities, future non-offshore wind activities, and future offshore wind activities to have short-term to permanent impacts (e.g., disturbance, injury, mortality, habitat degradation, habitat conversion) on benthic resources, primarily through pile-driving noise, anchoring, new cable emplacement, the presence of structures during operations of future offshore facilities (i.e., foundations, cable, and scour protection), climate change, and ongoing seafloor disturbances caused by sediment dredging and fishing using bottom-tending gear. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in **moderate** adverse impacts and could potentially include **moderate beneficial** impacts on benthic resources due to the artificial reef effect (habitat conversion). Future offshore wind activities are expected to contribute considerably to several IPFs, primarily new cable emplacement and the presence of structures—namely, foundations and scour/cable protection.

The No Action Alternative would forgo the benthic monitoring that Sunrise Wind has voluntarily committed to perform, the results of which could provide an understanding of the effects of offshore wind development; benefit future management of finfish, invertebrates, and EFH; and inform planning of other offshore developments; however, other ongoing and future surveys could still provide similar data to support similar goals.

3.5.2.4 Relevant Design Parameters & Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below (Sunrise Wind 2022). The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts to benthic resources:

- The total amount of scour protection for the foundations, inter-array cables, and offshore export cable corridors that results in long-term habitat alteration;

- The installation method of the export cable in the offshore export cable corridors and for inter-array and inter-link cables in the Wind Farm Area and the resulting amount of habitat temporarily altered;
- The number and type of foundations used for the WTGs and OSS: Sunrise Wind would construct a maximum of 94 11-MW WTGs within 102 possible positions and 1 OSS;
- The methods used for cable laying and landfalls, as well as the types of vessels used and the amount of anchoring;
- The amount of pre-cable laying dredging or preparation, if any, and its location; and
- The time of year when foundation and cable installations occur.

Variability of the proposed Project design exists as outlined in Appendix E. Below is a summary of potential variances in impacts:

- The number, size, location, and amount of scour protection for WTG and OSS foundations: the level of impact related to foundations is proportional to the number of foundations installed; fewer foundations would present less risk to benthic organisms.
- Location of WTGs with respect to benthic habitat types. WTGs sited in or near more complex habitat types (coarse substrates and boulders) would have greater potential for impacts on benthic resources.
- Offshore export cable routes and OSS footprints: the route chosen (including variants within the general route) and OSS footprints would determine the amount of habitat affected.
- Season of construction: spring and summer are the primary spawning seasons for many benthic invertebrates as well as fish that lay demersal eggs. Project activities during these seasons would likely have greater impacts due to localized disruption of these processes and impacts on reproductive processes and sensitive early life stages.

3.5.2.5 Impacts of Alternative B - Proposed Action on Benthic Resources

The sections below summarize the potential impacts of the Proposed Action on benthic resources during the various phases of the Proposed Action. Routine activities would include construction, O&M, and decommissioning of the Project, as described in Chapter 2, Section 2.1.2 *Alternative B - Proposed Action.* Table 2.1.2-1 summarizes the SRWF Project components for the Proposed Action and (Sunrise Wind 2022) a detailed map showing the location of all proposed WTGs, inter-array cables, and the OSS is provided in Figure 2.1.2-1. (Sunrise Wind 2022).

Table 3.5.2-3 summarizes the estimates for short- and long-term benthic habitat disturbances by offshore Project components and is based on surveys conducted in 2020 (COP, Appendices M-1, M-2, and M-3, Sunrise Wind 2021) and summarized in Section 3.5.2.1. The lease area comprises approximately 86,769 ac (35,114 ha) and the SRWEC disturbance corridor would cover approximately 1,259 ac (170 km by 30 m). Although some areas of the benthic habitat would be permanently altered by the project even after decommissioning, it is not possible to estimate the acres that would not return to their current state.

Table 3.5.2-3. **Short-term and Long-term Benthic Habitat Disturbance by Project Component for the Proposed Action**

Project Component	Component Acres	Short-term Disturbance		Long-term Disturbance	
		Acres	%	Acres	%
SRWEC (NYS and OCS)	1,320.83	1,270.20	96%	468.90	36%
SRWF Total	5,743.80	5,743.80	100%	892.46	16%
Lease Area	86,769	7,014.00	8.1%	1,361.36	1.6%

Sources: COP, Appendices M-1, M-2, and M-3 (Sunrise Wind 2021).

Construction, O&M, and decommissioning activities associated with the SRWF and SRWEC have the potential to cause both direct and indirect impacts on the benthic habitat and living resources of the affected environment discussed above. Impacts would vary by habitat, species, and life stage, with some species/life stages being more vulnerable than others. IPFs associated with the construction and O&M phases of the Project are identified in Table G-7 in Appendix G and described separately, by phase, for the SRWF and SRWEC in the following sections. In general, onshore activities including construction, O&M, and decommissioning of the Project have minimal potential to affect benthic resources. Potential impacts would be discussed for the ICW-HDD, but no other onshore Project components have potential for direct or indirect impacts to benthic resources.

3.5.2.5.1 Construction and Installation

Sunrise Wind estimates that the construction and installation of the SWREC would take approximately 8 months, that the SRWF WTG foundations and associated structures would take approximately 5 months, and that the IAC would take approximately 7 months. Some of these activities would occur concurrently, while others must be completed in sequence or would progress along an alignment. The COP, Figure 3.2.2-1 (Sunrise Wind 2022), provides a Project construction timeline of approximately 15 months to complete all components. No single area is likely to experience disturbance or impacts from construction activities for the entire 15-month period, and the analyses presented used estimated durations of 7 to 12 months since activities may affect multiple areas concurrently or intermittently over longer periods.

3.5.2.5.1.1 Onshore Activities and Facilities

Onshore facilities would not have direct or indirect impacts on benthic resources with the exception of the ICW HDD alignment where it crosses Bellport Bay.

Seafloor disturbance: The COP (Sunrise Wind 2022) states that the three HDD exit pits, located offshore beyond the FINS boundary, would disturb up to 61.8 ac (25 ha) of soft bottom benthic habitat. These areas would be reclaimed after cable installation is completed. Because the cable under the ICW would be placed at a target depth of 5 to 75 ft (1.5 to 25 m) beneath the ground surface or channel bottom using an HDD, it is unlikely that the benthos in the channel would be disturbed to the extent that infaunal organisms, the macroalgae beds on the north side, or the narrow seagrass areas along the south shore would be affected. No trenching or channel surface disturbance is planned as part of the ICW-HDD. Given the small area and short duration of the disturbance, the impacts to benthic habitat and fauna are likely to be minor. Since the ICW is dredged periodically to facilitate vessel traffic, the level of disturbance from the HDD would be negligible in comparison (USACE 2022).

Sediment suspension and deposition: The shoreline disturbing activities would result in short-term increases in sediment suspension and deposition near the HDD exit pits onshore and offshore; however, sediment control structures onshore and turbidity controls offshore are part of the proposed environmental protection measures (see COP, Section 4.4.3.1, Sunrise Wind 2022) for construction and would minimize sediment delivery to the channel. When compared to the background level of sediment suspension due to maintenance dredging and vessel traffic in the ICW, the potential for impacts to benthic resources due to the HDD would be negligible.

Noise and vibration: There would be short-term impacts to the benthic fauna due to vibration and noise generated by drilling and construction equipment during the HDD process. The extent and duration of these impacts would be minimal and would be negligible to the benthic communities near the HDD alignment when viewed in the context of background levels of noise and vibration due to vessel traffic in the channel and on the highway bridge adjacent to the alignment. These mechanisms for these impacts would be similar to those described below under the offshore activities and facilities.

EMF: Because EMFs are generated by power production when WTGs are operating, there would be no potential for impacts from EMFs on the benthic environment during construction beyond background levels.

Discharges and releases: Sunrise Wind would develop an Inadvertent Return Plan prior to construction that would describe the measures that would be implemented to prevent and identify inadvertent releases of drilling fluid.

Trash and debris: The construction phase has the greatest potential for generating solid waste and construction debris at onshore facilities, including the ICW-HDD. Sunrise Wind would comply with applicable federal, state, and local laws, comprehensive measures prior to and during construction to avoid, minimize, and mitigate impacts related to trash and debris disposal. Good housekeeping practices would be implemented to minimize trash and debris in work areas, including orderly storage of tools, equipment, and materials, as well as proper waste collection, storage, and disposal to keep work areas clean and minimize potential environmental impacts. Collected trash and debris would be disposed of in a landfill and/or recycling center as appropriate. Based on these factors, accidental releases of trash and debris from onshore federally approved activities are not expected to appreciably contribute to adverse benthic habitat impacts, and therefore the effects of the Proposed Action would be negligible.

Temporary structures: The temporary landing structure that may be deployed to aid in the transport of equipment and materials for the Landfall HDD and ICW HDD may impact the benthic and shellfish resources in its direct vicinity. The sessile and slow-moving benthic organisms inhabiting the sediments below where the floating pier (1,500 sq ft) may be installed near Smith Point County Park may be crushed by the spuds from the barge. The pier may be temporarily grounded at low tides, which may lead to injury or mortality. The temporary landing structure may crush SAV if it exists directly below the structure when it becomes grounded. The temporary landing structure may also shade the sediments in its vicinity, reducing the photosynthetic capacity of SAV. A preconstruction SAV survey would be conducted in the ICW, and the proposed temporary landing structure would be positioned to avoid and minimize impacts to this sensitive habitat to the extent practicable. The pier is likely to be used from fall to spring which would reduce potential impacts to SAV by avoiding the peak growing season.

3.5.2.5.1.2 Offshore Activities and Facilities

Table 3.5.2-4 summarizes the acres of seafloor and benthic habitat types affected by the construction and decommission stages (short-term) and the acres that would remain disturbed for the life of the Project (long-term) based on data presented in the COP and COP, Appendix M-3 (Sunrise Wind 2021). These estimates rely on assumptions regarding the distribution of seafloor structure that would require leveling (ripples) or relocation (boulders) based on the Project-specific benthic assessments as well as a review of other benthic surveys in the WEA. Benthic habitat types were crosswalked to the NOAA Complexity categories as follows (Appendix M-3 of COP (Sunrise Wind 2021)):

- Large-grain complex: Areas having large boulders present (includes areas of Glacial Drift)
- Complex: Areas with SAV or sediments greater than 5 percent gravel of any size (CMECS Substrate Class Rock, CMECS Substrate Groups of Gravelly, Gravel Mixes, and Gravels, as well as Shell Substrate CMECS classifications) On request from NOAA Habitat, sand and mud habitats with boulder fields that were previously crosswalked to the “heterogeneous complex” category, were crosswalked to “complex.”
- Soft bottom: Includes silt, sand, and mud habitats.

Table 3.5.2-4. Maximum Potential Impacts to Benthic Habitats by NOAA Habitat Complexity Category from Proposed Project Design and Associated Assumptions and Information from the COP Related to Areas of Anticipated Impact [1]

Project Component	Maximum Construction Disturbance Acres	Proportional Disturbance by Habitat Type			Total Area of Anticipated Impacts to the Seafloor (Acres)
		Large Grain Complex Acres (%)	Complex Acres (%)	Soft Bottom Acres (%)	
SRWEC and Landfall HDD Cable Installation and Seafloor Preparation					
Short-Term[2]	1,270.2	0 (0%)	90.6 (7%)	1,179.6 (93%)	1,320.83
Long-Term[3]	468.9	0 (0%)	29.6 (6%)	439.3 (94%)	38.5
SRWF: Monopole foundations (94 WTGs among 102 possible sites) AND Scour Protection for WTGs and Cables					
Short-Term[4]	3,871.5	22.9 (1%)	1,586.5 (42%)	2,225.9 (58%)	137.5
Long-Term[5]	110.76	0.11 (0.1%)	47.89 (43%)	62.76 (57%)	110.76
SRWF: Inter-array Cable and Protections					
Short-Term[6]	1,945	0 (0%)	766.2 (39%)	1,178.4 (61%)	2,150.00
Long-Term[7]	781.7	0 (0%)	307.9 (39%)	473.8 (61%)	139.36

Notes:

1 Table adapted from Table 4-1 in COP, Appendix M-3 (Sunrise Wind 2021). The current indicative GIS layout was used to determine the distribution of benthic habitat types crosswalked to NOAA Habitat Complexity Categories within the total maximum footprint of each Project element. This may result in different total numbers from those presented in the COP (Sunrise Wind 2022); for example, the current indicative IAC network is 264.3 km in GIS, whereas the Project design envelope presented in the COP allows for a 10% increase on this value for a total of 290 km, allowing for some changes to the length of the IAC as Sunrise Wind further refines its design and construction plans. The total allowable values presented in the COP (Sunrise Wind 2022) have been used to calculate the values presented in the "Total Area of Anticipated Impacts to the Seafloor" column.

SRWEC and Landfall HDD Cable Installation and Seafloor Preparation

2 These areas assume disturbance of the entire SRWEC corridor and include the preparation for up to three HDD pits, the support area, a survey area, and the construction of a floating pier to assist during the HDD construction.

3 Up to 5% of the entire up to 160-km-long SRWEC–OCS, 8 km, and up to 5% of the entire up to 10-km-long SRWEC–NYS, 0.5 km, may require cable protection. Cable protection would measure up to 39 ft (12 m) wide. Therefore, a total area of up to 25.2 ac (23.7 ac for the SRWEC–OCS; 1.5 ac for the SRWEC–NYS) may require cable protection. Up to 9 crossings of SRWEC–OCS are anticipated that would require protection (1.48 ac per crossing). A total of up to 13.3 ac of additional cable protection may be needed for these crossings.

It is assumed up to 1,640 ft (500 m) of cable protection would be required. These acreages would make up approximately 7.6% of the entire SWEC.

Monopole Foundations (94 WTGs among 102 possible sites) and Scour Protection for WTGs and Cables

4 Estimates are based on 1.06 ac per monopile foundation (n=102 sites) (foundations + scour protection + CPS stabilization), plus 2.68 ac for the OCS-DC. The maximum total area that may be permanently impacted by foundations, scour protection, and CPS stabilization totals 110.76 ac.

5 Estimate uses a 220-m radius around each WTG foundation, which equates to 37.6 ac to include the area of seafloor preparation only that surrounds the maximum long-term footprint of the foundation, scour protection, and CPS stabilization is approximately 37.6 ac per WTG foundation and around the OCS-DC, for a total of approximately 3,871.5 ac inclusive of all 102 WTG sites and the OCS-DC.

Inter-array Cable and Protections

6 The area of the full IAC corridor of seafloor disturbance represents a conservative assumption for maximum short-term seafloor disturbance; it is anticipated that less than the full area would be temporarily disturbed by seafloor preparation and cable installation activities.

[7] Up to 15% of the entire up to 290-km long IAC network, 43.5 km, may require cable protection. Cable protection would measure up to 39-ft (12-m) wide.
Therefore, an area of up to 129 ac plus up to 10.36 ac additional cable protection at 7 of the IAC network crossings may require cable protection. If cable protection were needed across the entire up to 290-km long IAC network a total of 859.9 ac would be needed.

Seafloor disturbance: Seafloor-disturbing activities would include seafloor preparation, impact and/or vibratory pile-driving/foundation installation, IAC installation, and vessel anchoring (including spuds from jack-up vessels). These activities could cause injury or mortality to benthic species and negatively affect their habitats. The impacts associated with these activities would be local and would cease after the construction is complete in a given area. Seafloor disturbance and habitat alteration would encompass a small portion of similar available benthic habitat in the area.

As detailed in Appendix H, the Project includes several mitigation measures to limit impact to benthic resources. APMs include performing pre-siting surveys and pre-construction, construction, and post-construction surveys, minimizing seabed disturbance, avoiding sensitive habitats and areas that would require extensive seabed alterations, avoiding anchoring in sensitive habitats (e.g., hard-bottom habitats, seagrass beds, nearshore areas), and minimizing the amount of cable and scour protection installed. Pre-siting and pre-construction surveys would be used to guide final placement of WTGs and cable alignment to avoid sensitive habitats.

The total width of the disturbance corridor for installation of the SRWEC would be up to 98 ft (30 m), inclusive of any required sand wave leveling and boulder clearance, and trenching is expected to be as deep at 7 ft (2.1 m). The benthos is generally concentrated in the uppermost layers of the sediments on the seafloor, and any sessile organisms in the area of disturbance (where trenches are cut) are likely to be crushed or buried. Sessile and slow-moving benthic species, including infaunal species, eggs, and larvae, that cannot avoid seafloor preparation or cable installation equipment, may be subject to mortality and injury if they are present within the impact area during construction. Boulder clearance associated with seafloor preparation is expected to have direct impacts on benthic and shellfish resources in the limited areas it may be required along the IAC corridor and around individual foundations. Loss of attached fauna is expected during boulder relocation. Relocated boulders may be recolonized, but microhabitats on the boulder would be shifted and attached fauna may not survive relocation or be able to adapt to a different positioning; however, these relocated boulders are expected to return to their pre-Project habitat function with relatively rapid (less than 1 year) recolonization expected (Guarinello 2020). Additionally, boulder relocation may result in aggregations of boulders, creating new features that may serve as high value habitat. For example, this increased complex structured habitat may benefit juvenile lobsters and fish by providing an opportunity for refuge compared to surrounding patchy habitat.

If necessary, CFE or suction hopper dredging may be used for sand wave leveling during installation of the IAC. This method utilizes thrust to direct waterflow into sediment, creating liquefaction and subsequent dispersal. The CFE tool draws in seawater from the sides and then jets this water out from a vertical down pipe at a specified pressure and volume. The water withdrawal volumes are expected to be approximately 250 to 650 million gallons (946 to 2,460 million liters) for the jet-plow and approximately 191 to 516 million gallons (724 to 1,953 million liters) for CFE equipment. The down pipe is positioned over the cable alignment, enabling the stream of water to fluidize the sands around the cable, which allows the cable to settle into the trench under its own weight. During the process, the fluidized sand gets deposited within the local sand wave field. Local impact caused by entrainment of zooplankton and ichthyoplankton during hydraulic plowing or dredging can lead to mortality. These losses are expected to be very low based on a previous assessment conducted for the Sunrise Wind Farm, which found that the total estimated losses of zooplankton and ichthyoplankton from jet plow entrainment were less than 0.001 percent of the total zooplankton and ichthyoplankton abundance present in the study area, which encompassed a linearly buffered region of 9 mi (15 km) around the export cable and 16 mi (25 km) around the wind farm (INSPIRE Environmental 2019). The impacts to eggs and larvae from CFE are expected to be similar to those observed from jet plow trenching and are not expected to result in population-level impacts.

Other seafloor preparation activities, IAC installation, and installation of cable protection would occur along the IAC corridor and around individual foundations and would be expected to have similar direct short-term impacts on benthic and shellfish resources as boulder clearance in these areas.

The installation of the WTG and OCS–DC foundations and associated scour protection could crush and/or displace benthic species, particularly sessile species and eggs and larvae within the impact area of the foundations and scour protection. Because of the slow speed of the seafloor preparation and cable installation equipment and limited size of the impact areas, it is expected that most mobile benthic species would be able to avoid these activities and would not be subject to mortality or injury but may still experience some direct impact. Vessel anchoring (including spuds from jack-up vessels) could cause mortality or injury to slow-moving or sessile benthic species within the impact areas of the spuds, anchors, and anchor chain sweep. The extent of vessel anchoring impacts would vary, depending on the vessel type, number of vessels, and duration onsite, but would be smaller in spatial extent than other seafloor-disturbing construction activities.

In areas of seafloor disturbance, benthic habitat recovery and mobile and sessile benthic infaunal and epifaunal species abundances may take 1 to 3 years to recover to preimpact levels, based on the results of a number of studies on benthic recovery (e.g., Carey 2020; Guarinello 2020; AKRF 2012; Germano 1994; Hirsch 1978; Kenny 1994). Based on a review of impacts of sand mining in the US Atlantic and Gulf of Mexico, softbottom communities within the cable corridors would recover within 3 months to 2.5 years (Kraus 2018; Brooks 2006; BOEM 2015; Normandeau Associates 2014). A separate review of case studies from cable installations in Atlantic and Pacific temperate zones concludes that recovery of benthic communities on the OCS (less than 262 ft [80 m] depth) occurs within a few weeks to 2 years after plowing, depending on the available supply of sediment (Brooks 2006). Recovery time varies somewhat with the method of installation, with more rapid recovery after plowing than jetting (Kraus 2018).

Benthic habitat recolonization rates depend on the benthic communities in the area surrounding the affected region. Sand sheet and mobile sand with gravel habitats as found within and near the SRWF are often more dynamic in nature; therefore, they are quicker to recover than more stable environments, such as fine-grained (e.g., silt) habitats and rocky reefs (Dernie 2003). Species inhabiting these dynamic habitats are adapted to deal with physical disturbances, for example, frequent sedimentation associated with strong bottom currents and ground swell. As such, these communities are expected to recolonize more quickly after a disturbance than communities not well-adapted to frequent disturbance (e.g., cobble and boulder habitats). Mobile species may be indirectly affected by the short-term reduction of benthic forage species; however, given the prevalence of similar habitat in the area, this is likely to be a minor impact. In summary, the entire area of the disturbance corridor for the SRWEC is likely to experience moderate impacts due to the level of disturbance required for trenching (see Table G-6 in Appendix G). In contrast the area required to construct the SRWF and IAC is a small (8 percent) portion of the lease area. Therefore, in the context of habitat available within the lease area, the impacts to benthic resources due to the short-term seafloor disturbance associated with construction activities would be moderate.

Sediment suspension and deposition: Seafloor-disturbing activities would result in short-term increases in sediment suspension and deposition. Sediment transport modeling was performed using the PTM in the Surface-Water Modeling System, which is a two-dimensional Lagrangian particle tracking model developed by the CIRP and the DOER at the USACE Research and Development Center. Details on the PTM, data input into the model, and output from the model simulation runs are summarized in the COP, Appendix H and Table 4.4.2-2 in the COP (Sunrise Wind 2021; Sunrise Wind 2022).

For the IAC, two representative segments of installation by jet plow were simulated and the modeling results indicate that sediment plumes with TSS concentrations exceeding the ambient conditions by 100 mg/L could extend up to 3,346 ft (1,020 m) from the cable corridor centerline. The model estimated that the elevated TSS concentrations would be of short duration and are expected to return to ambient conditions within 0.5 hour following the cessation of cable burial activities. The modeling results indicate that sedimentation from IAC burial is expected to exceed 0.4 in (10 mm) of deposition a maximum of 220 ft (67 m) from the cable centerline covering an area of 7.4 ac (3.0 ha) of the seafloor, and the TSS plume is predicted to be primarily contained within the lower portion of the water column, approximately 12.8 ft (3.9 m) above the seafloor.

Suspension of sediments into the water column and the redistribution of sediments that fall out of suspension could result in mortality of benthic organisms through smothering and irritation to respiratory structures, particularly sessile species and species with limited mobility. Mobile organisms are expected to temporarily vacate the area and move out of the way of incoming sediments (MMS 2007). Most marine species have some degree of tolerance to higher concentrations of suspended sediment because storms, currents, and other natural processes regularly result in increases in turbidity (MMS 2009); however, eggs and larval organisms are especially susceptible to smothering through sedimentation. Also, smaller organisms are likely more affected than larger organisms, as larger organisms may be able to extend feeding tubes and respiratory structures above the sediment (United Kingdom Department for Business Enterprise and Regulatory Reform 2008).

Maurer (1986) found that several species of marine benthic infauna (e.g., the clam Mercenaria, the amphipod *Parahaustorius longimerus*, and the polychaetes *Scoloplos fragilis* and *Nereis succinea*) exhibited little to no mortality when buried under up to 3 in (8 cm) of various types of sediment (from predominantly silt-clay to pure sand). The modeling results indicate that sedimentation from IAC construction can be expected to exceed 0.4 in (10 mm) of deposition out to 220 ft (67 m) from the jet plow activity, with a total of 7.4 ac (3.0 ha) of seafloor that may experience more than 0.4 in (more than 10.2 mm) of sediment deposition during construction. The modeled depth of sedimentation is unlikely to adversely affect the marine benthic infauna.

As discussed above, following a seabed disturbance, benthic habitat recovery may take up to 1 to 3 years and for benthic organism abundances to return to preimpact numbers (e.g., (AKRF 2012; Brooks 2006; Germano 1994; Hirsch 1978; Kenny 1994; Kraus 2018; BOEM 2015; Normandeau Associates 2014). Recovery time varies somewhat with the method of installation, with more rapid recovery after plowing than jetting (Kraus 2018).

As noted previously, benthic habitats within and near the SRWF, including sand sheet and mobile sand with gravel, are dynamic in nature and as such, the benthic organisms are generally adapted to disturbances associated with natural sediment resuspension and deposition events (e.g., storms, tidal currents, circulation). Therefore, these benthic communities recover more quickly than communities inhabiting more stable environments such as fine-grained (e.g., silt) habitats and rocky reefs (Dernie 2003). In areas with cobble and boulder habitat, the benthic organisms are not well adapted to frequent sedimentation and, therefore, may take longer to recolonize after the disturbance.

In summary, the entire area of the disturbance corridor for the SRWEC is likely to experience moderate impacts due to the localized suspended sediment and deposition produced by trenching (see Table G-6 in Appendix G). In contrast the area affected by construction activities for the SRWF and IAC is a small (8 percent) portion of the lease area; however, mortality due to disturbance and burial of benthic species would be likely. Therefore, in the context of habitat available within the lease area, the impacts to benthic resources due to the short-term increase in TSS and sediment deposition associated with construction activities would be moderate.

Noise and vibration: Benthic habitat is composed of various types of sediment, structural features that are formed by that sediment (e.g., interstitial spaces between boulders, sand waves), and organisms that reside in and on the sediment. Substrates and associated structural features are poor transmission media for and are relatively unaffected by underwater noise. Benthic invertebrates are sensitive only to the particle motion component of noise. Detectable particle motion effects on invertebrates are typically limited to within 7 ft (2 m) of the source or less (Carroll 2016; Edmonds 2016; Hawkins 2014; Payne 2007).

Vibration from impact pile-driving can be transmitted through sediments. Recent research (Jones 2020; Jones 2021) indicate that longfin squid, an EFH invertebrate species, can sense and respond to vibrations from impact pile-driving at a greater distance based on sound exposure experiments. This in turn suggests that infaunal organisms, such as clams, worms, and amphipods, may exhibit a behavioral response to vibration effects over a larger area, but additional research is needed. Noise transmitted through water and/or through the seabed can cause injury and/or mortality to benthic resources in a limited area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area. Although the duration of the construction phase is expected to cover 5 months or more, the pile-driving activity at any given site would be on the order of days. Since the WTGs are spaced up to 1 nm apart, impacts from pile-driving at other WTGs would not be detectable beyond the area immediately surrounding a WTG. Actual placement of the piles could result in mortality of infaunal and sessile organisms in the immediate area, but affected areas would likely be recolonized in the short term, and the overall impact on benthic resources would be minor.

EMF: No EMF are anticipated to be generated by construction activities; therefore, there is no potential for impacts due to this IPF for this phase.

Discharges and releases: Project-related marine vessels operating during construction would be required to comply with regulatory requirements for management of onboard fluids and fuels, including prevention and control of discharges. Trained, licensed vessel operators would adhere to navigational rules and regulations, and vessels would be equipped with spill containment and cleanup materials. Additionally, Sunrise Wind would comply with applicable International Maritime Organization (IMO) International Convention for the Prevention of Pollution from Ships (MARPOL), federal (USCG), and state (NY) regulations and standards for reporting treatment and disposal of solid and liquid wastes generated during all phases of the Project. Sunrise Wind would file an Emergency Response Plan that would cover accidental discharges and oil spills. Some liquid wastes would be permitted as discharge into marine waters (i.e., domestic water, deck drainage, treated sump drainage, uncontaminated ballast water, and uncontaminated bilge water); these are not expected to pose an adverse impact to marine resources as they would quickly disperse, dilute, and biodegrade (BOEM 2013).

All vessels would similarly comply with USCG standards regarding ballast and bilge water management. Liquid wastes from vessels (including sewage, chemicals, solvents, and oils and greases from equipment) would be properly stored, and disposal would occur at a licensed receiving facility. As required by 30 CFR 585.626, chemicals to be utilized during the Project are provided in Appendix E-1 and in Tables 3.3.1-2 and 3.3.6-2 of the COP (Sunrise Wind 2021; Sunrise Wind 2022). Any unanticipated discharges or releases are expected to result in minimal, short-term impacts; activities are heavily regulated and unpermitted discharges are considered accidental events that are unlikely to occur. In the unlikely event that a reportable spill was to occur, the National Response Center would be notified, followed by the EPA, BOEM, and USCG, as outlined in Appendix E-1 of the COP (Sunrise Wind 2021). Because of the restrictions and mitigation measures designed to prevent spills and discharges, and the implementation of spill response plans, the risk to benthic resources from discharges and releases is negligible.

Trash and debris: Any active vessel operating within a marine environment has the potential to create trash and debris; however, the discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by BOEM (30 CFR 250.300) and the USCG (MARPOL, Annex V, Pub. L. 100-220 [101 Stat. 1458]). In accordance with applicable federal, state, and local laws, Sunrise Wind would implement comprehensive measures prior to and during Project construction activities to avoid, minimize, and mitigate impacts related to trash and debris disposal. All trash and debris would be properly stored on vessels for later disposal of on land at an appropriate facility per 30 CFR 585.626(b)(9). Trash and debris would be contained on vessels and offloaded at port or construction staging areas. Food waste that has been ground and can pass through a 1-in (25-mm) mesh screen may be disposed of according to 33 CFR 151.51-77. All other trash and debris returned to shore would be disposed of or recycled at licensed waste management and/or recycling facilities. Disposal of any other form of solid waste or debris in the water is prohibited, and good housekeeping practices would be implemented to minimize trash and debris in vessel work areas including orderly storage of tools, equipment, and materials, as well as proper waste collection, storage, and disposal to keep work areas clean and minimize potential environmental impacts. With proper waste management procedures, the potential for trash or debris to be introduced into the marine environment and cause impacts to the benthic habitat is expected to be negligible.

3.5.2.5.2 Operations and Maintenance

3.5.2.5.2.1 Onshore Activities and Facilities

As noted under the construction impacts analyses, there is little to no potential for onshore activities and facilities to affect benthic resources. Once the ICW-HDD is completed, there would be no further activity at the onshore construction site. Therefore, no direct or indirect impacts to benthic resources from any of the IPFs are anticipated due to the O&M of onshore facilities.

3.5.2.5.2.2 Offshore Activities and Facilities

Seafloor disturbance: Once constructed, the SRWF would result in localized changes to seafloor topography and hydrodynamics due to the presence of foundations, scour protection, and cable protection. The seafloor overlaying the majority of buried IAC (where cable protection would not exist) is expected to return to preconstruction conditions over time and no long-term changes to sediment mobility and depositional patterns are expected. Minimal impacts on benthic species are expected from O&M of the IAC, as they would be buried beneath the seabed; however, seafloor disturbance during O&M of the SRWF may occur during maintenance of bottom-founded infrastructure (e.g., foundations, scour protection, cable protection), anchoring by maintenance vessels for routine maintenance of WTGs or OCS–DC, and nonroutine maintenance of the IAC and SRWEC. During O&M, anchoring would be limited to vessels required to be onsite for an extended duration.

Removing soft bottom habitat may result in both negative and beneficial direct long-term impacts on benthic species. Species that have life stages associated with soft bottom habitats, such as ocean quahog (*Arctica islandica*), waved and chestnut Astarte clam (*Astarte undata* and *A. castanea*), Atlantic surf clam (*Spisula solidissima*), sand shrimp (*Crangon septemspinosa*), amphipods, channeled whelk

(*Busycon carica*), and horseshoe crab (*Limulus polyphemus*), may experience long-term effects as their available habitat would be slightly reduced; however, the completed SWREC alignment and the WTG foundations and OCS-DC within the SRWF would create new benthic habitat structure within the lease area. The IAC would likely require targeted surface protection in areas of consolidated glacial moraine that are already hard bottom, which would not result in long-term habitat conversion. The COP (Sunrise Wind 2022) estimates that 110.76 ac (44.82 ha) of hard surface foundation and associated scour protection and 139.36 ac (56.40 ha) of cable associated structures and protections would remain on the seafloor for the life of the Project. When added together, the total acreage that would be converted from soft bottom to hard bottom represents a negligible fraction of the total soft bottom on the southern New England continental shelf, but the dispersed nature of the areas may have less predictable effects.

Each WTG would be spaced approximately 1.15 mi (1 nm) from the adjacent WTGs in the array, so these hard bottom analogous habitat areas would create a regular, patchy, higher complexity habitat where epifaunal organisms could attach. The riprap materials surrounding the foundations for scour protection would provide shelter and hiding areas for more mobile organisms such as crabs, squid, and fish. Colonization of the new seafloor features would take approximately the same time as is estimated for recovery of disturbed habitat, or from several months up to 3 years. The Project is expected to operate for 25 years or more, so this habitat would be a long-term feature. Once colonized, these complex habitat patches would likely attract other species as a food source, spawning area, or shelter site. As these foundations extend from below the seafloor to above the surface of the water, the development of attached benthic fauna and flora zonation with depth is expected (De Mesel 2015; De Backer 2017). Macroalgal zonation may occur ranging from deeper growing red foliose algae and calcareous algae to kelps and other species more common in shallow environments. Other species that may benefit from the increased hard substrate, which would exhibit zonation with depth, include sea anemones and other anthozoans, bivalves such as horse mussel (*Modiolus modiolus*) and blue mussel (*Mytilus edulis*), green sea urchin (*Strongylocentrotus droebachiensis*), barnacles, hydrozoans, sponges, and other fouling organisms. Similar effects have been seen at offshore oil rigs where ocean communities develop and resemble those found at natural and artificial reef structures. Hutchison (2020b) found that attached fauna including mussels colonized the five turbine foundations and jacket structures at the BIWF within 3 years of construction to the extent that the structures became areas of high biotic diversity and began to proceed through habitat and community successional stages. Although the SRWF is farther offshore and would use a monopole structure different from the BIWF, it is reasonable to expect that similar habitat and community development would occur once construction is completed. The spacing of the SRWF WTGs is close enough to allow for dispersal of gametes and larval forms of attached organisms which may facilitate the progressive colonization of the structures farther offshore.

The increase in habitat heterogeneity and hard substrate may promote not only the growth of native epibenthic species, as discussed above, but may potentially promote colonization by nonindigenous species and/or range-expanding species. The potential effects of the colonization of non-native and invasive species on the community assemblage and ecosystem function varies by species and abundance. Additionally, epibenthic species from southern regions, such as the Mid-Atlantic, may utilize this novel habitat as their populations move northward as suitable environmental conditions shift northward in response to climatic drivers (i.e., range-expansion species).

Long-term disturbance of the areas required for the SRWEC and SRWF constitute a relatively small percentage of the available habitat in the lease area and the OCS, and these impacts would be locally focused and dispersed (Table G-6 in Appendix G). Therefore, the potential for effects to the benthic to seafloor disturbance during Project O&M would be minor.

Sediment suspension and deposition: Increases in sediment suspension and deposition during O&M would result from vessel anchoring and non-routine maintenance activities that require exposing the IAC. Impacts on benthic resources and shellfish resulting from sediment suspension and deposition during these activities are expected to be similar to those discussed for the construction phase but on a more limited spatial scale. Additional organic matter deposition due to the colonization of the new hard bottom habitats and monopiles is likely and may be another factor in the habitat succession in and around these structures.

The reduced level of activities that would contribute to sediment suspension and deposition coupled with the dispersed and intermittent nature of these disturbances suggest that the potential for effects to the benthic resources during O&M of the Project would be negligible.

Noise and vibration: Impacts on benthic and shellfish resources from vessel noise during O&M are expected to be similar to those discussed for construction, though lesser in extent. The noise generated by vessel would be similar to the range of noise from existing vessel traffic in the region and is not expected to substantially affect the existing underwater noise environment. The WTGs would produce low-level continuous underwater noise during operation. Low-frequency sounds are produced when the blades spin, and Elliot (2019) found that direct drive WTGs produced noise levels lower than the older turbines (Kikuchi 2010, Betke 2004). There are no conclusive studies on the impacts of WTG operational noise on benthic species; however, the rapid colonization of underwater structures at operational wind farms suggests that benthic and invertebrate communities would be unlikely to be affected. Noise levels from WTGs operation are not expected to result in injury or mortality of benthic or shellfish species; therefore, impacts due to noise are expected to be negligible.

EMF: Once energized, the Project IAC would produce a magnetic field and an induced electric field that would decrease in strength rapidly with distance. The IAC would be shielded to block the electric field produced by the voltage impressed on the conductors and, where feasible, segments not meeting the target burial depth (2 to 7 ft [0.6 to 2 m]) beneath the seafloor would be protected by additional cover. Submarine transmission cables are sources of magnetic fields as well as induced electrical fields (Snyder 2019). Exposure of marine species to EMF could be short- or long-term, depending on the mobility and behavior of the species/life stage (Woodruff 2012; Love 2015; Love 2016; United Kingdom Department for Business Enterprise and Regulatory Reform 2008).

As detailed in the COP, Appendix J1 (Sunrise Wind 2021), the AC magnetic fields and induced electric fields from operational IAC would decrease quickly with increasing distance. At a height of 3.3 ft (1 m) directly over the cables at peak loading, AC magnetic and induced electric-field levels were calculated to be 4.5 mG and 0.09 millivolts per meter (mV/m), decreasing to 0.1 mG and less than 0.01 mV/m or less at a horizontal distance of ±10 ft (3 m) from the cables. Where the SRWEC cables are buried together to a depth of 3.3 ft (1 m), the change in DC magnetic field from that of Earth's geomagnetic field would be +129 mG with induced electric fields (in an ocean current of 2 ft/sec [0.6 m/s]) of 0.38 mV/m. Based on these modeling results and recent research, the EMF associated with the operation of the IAC, SRWF, and SRWEC would be below the detection capability of most invertebrate species and are unlikely to result in measurable impacts on benthic invertebrate species or populations.

While certain fish and crustacean species are known to detect EMF at static and low AC frequencies (Taormina 2018; Gill 2014), the ability of soft-bodied benthic invertebrates to detect EMF is not as well understood. The levels of EMF from AC subsea cables at the Virginia Offshore Wind Technology Advancement Project site were found to not adversely affect benthic habitats (BOEM 2015). Similarly, the EMFs from subsea cables associated with the BIWF were determined to have no effect on sturgeon or their prey (NMFS 2015). The finding that neither sturgeon nor their prey would be affected by EMF can be extrapolated to the dominant benthic species in the marine portions of the Project Area; the Atlantic sturgeon is a bottom feeder reported to prefer polychaetes and arthropods (Johnson 1997). Based on field data from operational wind projects in Europe and the United States Atlantic coast, and modeling results of potential effects of EMF on managed species, the IAC would have minimal direct long-term impact on benthic and shellfish resources.

Field surveys on the behavior of large crab species and lobster at AC and DC submarine cable sites (Love 2017; Hutchison 2018) suggest that the Project's calculated magnetic-field levels (COP Appendix J-1, Sunrise Wind 2021) are not likely to impact the distribution and movement of large epibenthic crustaceans. Ancillary data and observations from these field studies suggest that cephalopod behavior is similarly unaffected by the presence of 60-Hz AC cables. Hutchison (2018; 2020) assessed the responses of American lobster to an DC cable under field conditions and concluded that EMF resulted in small-scale changes in lobster distribution within the cages, although the cable was not observed to present a barrier to movement. In contrast, two marine crab species on the Pacific coast (Dungeness crab [*Metacarcinus magister*] and *Cancer productus*) were reported to be insensitive to EMF from energized subsea cables (Love 2017). A synthesis paper on the current understanding of potential impacts of EMF on invertebrates concludes that while some studies have shown changes in individuals during laboratory studies, not enough information is available to determine how those changes may extend to the population or community level or ecological processes (Albert 2020).

Based on the modeling results and existing evidence, the EMF associated with the vast majority of the cable routes (i.e., where cables are installed together) would be below the detection capability of most invertebrate species and are unlikely to result in measurable impacts on benthic invertebrate species. In a small area (approximately 1 percent at the total length of Project DC cables, where cables are separated for installation via HDD) at landfall, DC EMFs would be higher than along the high voltage direct current (HVDC) cable route. In this area, fields may be detectable by some species; however, as this represents a small proportion of the total site and available coastal habitat, population-level effects on key invertebrate species are not expected and impacts are expected to remain negligible.

Discharges and releases: Impacts from accidental discharges and releases during O&M are expected to be similar to, but of lesser likelihood than during construction, as there would be fewer Project-related marine vessels during this phase, and regulatory requirements and preventative measures would still apply. Unpermitted discharges or releases are considered accidental events, and in their unlikely occurrence, these are expected to result in minimal, short-term impacts. Permitted discharges are not expected to pose an adverse impact to marine resources as they would quickly disperse, dilute, and biodegrade (BOEM 2013).

During operation, the OCS–DC would require continuous seawater cooling water withdrawals and subsequent discharge of heated effluent back to the receiving waters (Section 3.4.2.4). The maximum design intake flow (DIF) and discharge volume is 8.1 million gallons per day with actual intake flow (AIF) and discharge volumes that are dependent on ambient source water temperature and facility output. Preliminary hydrodynamic modeling indicates that there would be some highly localized increases in water temperature in the immediate vicinity of the discharge location of the OCS–DC. The design, configuration, and operation of the cooling water intake system (CWIS) for the OCS–DC would be permitted as part of an individual NPDES permit and additional details would be included in the permit application submitted to the EPA. Because of the restrictions and mitigation measures designed to prevent spills and discharges, and the implementation of spill response plans, the risk to benthic resources from discharges and releases is negligible.

Trash and debris: Impacts from marine disposal of trash and debris during O&M are expected to be similar to, but of lesser likelihood than during construction, as there would be fewer Project-related marine vessels during this phase, and regulatory requirements and preventative measures would still apply. The unanticipated marine disposal of trash and debris is considered an unpermitted, accidental event, and containment and good housekeeping practices would be implemented similar to those described under the construction activities previously. With proper waste management procedures, the potential for trash or debris to be introduced into the marine environment and cause impacts to the benthic resources is expected to be negligible.

3.5.2.5.3 Conceptual Decommissioning

WTGs and foundations (along with their associated transition pieces) now have an expected operating life of at least 25 years, and substantially longer with prudent inspection and maintenance practices. This timeframe is applicable to offshore wind facilities worldwide, including for SRWF. At the end of the Project's operational life, it would be decommissioned in accordance with a detailed Project decommissioning plan developed in compliance with applicable laws, regulations, and BMPs at that time. The Project is planned with the intent that all components would be removed, and disturbances would be reclaimed at decommissioning. Sunrise Wind would develop a final decommissioning and removal plan for the facility that complies with all relevant permitting requirements that account for changing circumstances, evolving science, and any relevant legislation.

Removing offshore facilities including the SWREC, WTG foundations, and the IAC, would incur impacts similar in extent and magnitude to those described for their construction. Some removal processes may create less adverse impacts than construction; therefore, impacts from decommissioning are not addressed separately in this section, with one exception. The Project's introduction of complex habitat in the offshore environment is expected to result in beneficial impacts, which would be reversed at the time of decommissioning. This reversal of beneficial effects is discussed briefly below for each IPF.

3.5.2.5.3.1 Onshore Activities and Facilities

As noted under the construction impacts analyses, there is little to no potential for onshore activities and facilities to affect benthic resources. Once the ICW-HDD is completed, there would be no further activity at the onshore construction site. Therefore, no direct or indirect impacts to benthic resources from any of the IPFs are anticipated due to the decommissioning of onshore facilities.

3.5.2.5.3.2 Offshore Activities and Facilities

Seafloor disturbance: At the end of the Project's operational life, Project structures would be decommissioned in accordance with a detailed Project decommissioning plan that would be developed in compliance with applicable laws, regulations, and BMPs at that time. All facilities would be removed to a depth of 15 ft (4.6 m) below the mudline, unless otherwise authorized by BOEM (30 CFR § 585.910(a)). This plan would account for changing circumstances during the operational phase of the Project and would reflect new discoveries particularly in the areas of marine environment, technological change, and any relevant amended legislation. Absent permission from BOEM, Sunrise Wind would complete decommissioning within 2 years of termination of the lease.

If the human-made structures are to be removed at the end of the Project's operational life, as currently prescribed, this would reverse the expected beneficial impacts on benthic and shellfish resources through the introduction of complex habitat. Over time, the disturbed area is expected to revert to preconstruction conditions, which would result in a beneficial impact for species and life stages that inhabit soft bottom habitats which as previously noted often recover within 1 to 3 years of disturbance. Overall, habitat alteration from decommissioning is expected to cause minimal impacts because similar soft and hard bottom habitats are already present in and around the SRWF and SRWEC (COP, Appendices M-1, M-2, and M-3; Sunrise Wind 2021); however, monitoring of the ocean communities in and around the hard bottom habitat, cable protection areas, and monopoles should be used to determine if the array of these habitats has ecological effects across the lease area that exceed those expected form the conversion of a relatively small area of the OCS habitat.

A recent review on the impacts of decommissioning engineered structures provides the case for considering alternatives to a mandated complete removal of all engineered structures. The paper emphasizes the potential importance of man-made submerged structures as complex habitats potentially supporting a rich localized food web (Fortune 2020). Benthic habitat monitoring at the foundations and the surrounding seabed would document the direct realized effects of these novel hard surfaces on benthic and shellfish resources.

Documenting the established epifaunal community that would inhabit the foundations and the infaunal community at the base of these structures would provide information on the habitat value, including its value as refuge and food source for other marine species. The data gathered from these post-construction benthic surveys would be used to inform decommissioning strategies in the future.

Sediment suspension and deposition: Sediment deposition and increases in suspended sediment during decommissioning are expected to be similar in extent, but lower in magnitude and duration for decommissioning phase; however, removal requires excavation to a depth of 15 ft (4.6 m) below the mudline, unless otherwise authorized by BOEM (30 CFR § 585.910[a]), which may disturb some areas more than was required in construction. Recontouring of the seafloor may be required to complete reclamation of areas where structures displaced sediments. Even with these potential increases to sediment disturbance in some aspects of decommissioning, the time for suspended materials to resettle and the time for the benthic areas to recover would be expected to be similar to the 2.5 years estimated for post-construction.

Noise and vibration: Impacts from noise and vibration including excavation and removal of structures during decommissioning are expected to be similar to, but of shorter duration and lesser magnitude than during construction.

EMF: No EMFs are anticipated to be generated by decommissioning activities; therefore, there is no potential for impacts due to this IPF for this phase.

Discharges and releases including trash and debris: Impacts from accidental releases or discharges including marine disposal of trash and debris during decommissioning are expected to be similar to, but of lesser likelihood than during construction, as there would be fewer Project-related marine vessels during this phase, and regulatory requirements and preventative measures would apply. The Project's permits would require a spill response plan, updated to comply with prevailing regulations at this phase of the Project. The unanticipated marine disposal of trash and debris is considered an unpermitted, accidental event, and containment and good housekeeping practices would be implemented similar to those described under the construction activities above. With proper waste management procedures, the potential for trash or debris to be introduced into the marine environment and cause impacts to the benthic habitat is expected to be negligible.

3.5.2.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on benthic resources through the primary IPFs of seafloor disturbance, presence of structures, and changes to noise and EMF. The proliferation of offshore wind farms and their associated offshore infrastructure have the potential to change attributes of the seafloor environment within the multiple lease areas.

3.5.2.5.5 Impacts of Alternative B on ESA-Listed Species

There are no ESA listed threatened or endangered invertebrate or coral species nor are there any benthic species currently proposed for listing in the New England/Mid-Atlantic Region as reported by NMFS (NOAA 2021).

3.5.2.5.6 Conclusions

Impacts of the Proposed Action

During SRWF construction, seafloor disturbance and sediment suspension/deposition are expected to affect sessile species and organisms with limited mobility, including early life stages (e.g., larvae and eggs) more than mobile species; however, these impacts, as well as impacts associated with construction noise, are expected to be short-term and cease when construction activity stops. During O&M of the SRWF, impacts associated with seafloor disturbance, sediment suspension/deposition, and noise are expected to be similar but lesser in extent compared to construction.

Seafloor disturbance activities that result in the conversion of soft sediment habitats to hard bottom habitat associated with foundations, scour protection, and cable protection (e.g., concrete mattresses or rock berms) along portions of the SWREC and IAC routes, are expected to have long-term, **minor beneficial** impacts on benthic organisms that rely on complex, hard bottom habitats. Benthic habitat recovery and the recolonization by benthic infaunal and epifaunal species may take up to 1 to 3 years (e.g., AKRF 2012; Germano 1994; Carey 2020; Hirsch 1978; Kenny 1994). The change in character of the more uniform, low complexity habitat within the lease area and the SWREC alignments to patchy, higher complexity habitat would have localized effects on the distribution and number of benthic species and the higher trophic levels such as fish and larger, mobile invertebrates. Because the SRWEC, WTGs, and the IAC would be present for 25 years or longer, these effects may alter the ocean community within the Project boundaries. Decommissioning would remove these hard structures and the organisms that would have attached to them. The removal of these dispersed, higher complexity areas en masse would be a substantial disturbance to the localized benthic communities and there would not be alternative sites of similar character available for recolonization; however, in the context of the OCS and the Mid-Atlantic Bight, these changes would affect a negligible portion of the available habitat.

Inadvertent discharges/releases, trash and debris, and EMF are expected to have **negligible** impacts on benthic and shellfish resources during construction, O&M, and decommissioning of the SRWF.

None of the IPFs are expected to result in population-level effects on benthic species, due to the scale and intensity of the Project activities, and the availability of similar habitat in the surrounding area. The impacts discussed in this section would vary slightly by habitat composition within the SRWF, but the intensity and duration of the impacts are not expected to exceed the significance criteria for minor effects.

BOEM anticipates the impacts resulting from the Proposed Action alone would range from **negligible** to **moderate**. Therefore, BOEM expects the overall impact on benthic resources from the Proposed Action and ongoing activities to be **moderate**, as the overall effect would be notable, but the resource would be expected to recover completely without remedial or mitigating action. Additionally, **minor beneficial** impacts may result due to the artificial reef effect (habitat conversion to hard bottom).

Cumulative Impacts of the Proposed Action

In the context of other reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual IPFs would range from negligible to moderate, depending on the species and habitat component. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action and future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities would result in **moderate** adverse impacts and could potentially include **moderate beneficial** impacts on benthic resources due to the artificial reef effect (habitat conversion). The overall effect would be notable, but the resource would be expected to recover completely without remedial or mitigating action.

The Proposed Action is limited in scale compared to some of the offshore renewable energy projects planned in the GAA. BOEM estimates the Proposed Action and other planned future projects would result in the development of 2,563 WTG and OSS foundations in the larger analysis area as well as up to 283 foundations within the benthic GAA. Most of these projects are larger in scale than the Proposed Action, and many projects could be developed in adjacent lease areas. Depending on how they are located and distributed, the development of multiple large-scale projects could have broader scale cumulative effects on biological communities than the Proposed Action considered in isolation. More research and project monitoring are needed to determine the likelihood and potential significance of broader cumulative effects on invertebrates and benthic habitats.

3.5.2.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Alternative C-1 would have the same number of turbine locations (94 WTGs) as the Proposed Action that may be approved by BOEM; however, 8 WTG positions from Priority Areas 1, 2, 3 or 4 would be excluded from consideration for development (Figure 2.1.2-2). There would be no changes to the onshore facilities, the SRWEC alignments, or the construction timeline and activities. The changes proposed in Alternative C-1 would focus on the number, arrangement, and generating capacity of the WTGs and necessary rearrangement of the IAC to accommodate the new spatial arrangements. Therefore, the discussion of impacts in these sections would focus on the attributes that are substantively different from those under the Proposed Action. In addition, the changes in spatial arrangement are unlikely to affect the duration, intensity, or magnitude of the effects described for the following IPFs: noise and vibration, EMF, discharges and releases, or trash and debris. NEPA directs that an EIS focus on the differences among the alternatives to allow evaluation of their comparative merits. This focus does not disregard the impacts previously described, but the reader is directed to review the direct and indirect impacts to benthic resources described under the Proposed Action. A comparison of the alternatives and their potential impacts by IPF is provided in Section 3.5.2.7.

Under Alternative C-1, the same number of turbine locations (94 WTGs) as under the Proposed Action may be approved by BOEM; however, 8 WTG potential sites from Priority Area 1 along the northern boundary of the lease area would be excluded from consideration for development (Figure 2.1.3-2). NMFS identified priority areas for habitat conservation based on backscatter data (Figure 2.1.3-2). NMFS considers these areas of contiguous complex bottom habitat that should be excluded from development to avoid and/or minimize impacts to complex fisheries habitats, while still meeting BOEM's purpose and need for the Project. The priority areas were identified based on recent, preliminary data suggesting limited cod spawning activity in the area, assumed hard bottom complex substrate, and the presence of large boulders. Priority Area 1 is considered the highest priority for conservation and includes 16 WTG positions as well as the OCS-DC (Figure 2.1.3-2). With only eight positions to exclude for Alternative C-1, all 8 WTG positions were eliminated from Priority Area 1. To identify which 8 positions to remove, BOEM relied on the locations and densities of boulders in areas of high backscatter returns. Boulders can be considered a critical element of potential sensitive habitat (Gardline 2021). Gardline (2021) identified boulders as objects that (1) returned a strong backscatter signal indicative of hard substrates; (2) were observed to have a distinct shadow or measurable height; and (3) had diameters greater than 1.6 ft (0.5 m). The density of boulders (number of boulders/250 km^2) on the seafloor surrounding each WTG position was calculated using the ESRI ArcGIS Pro Spatial Analyst Density function (Figure 3.5-1 and Table B-2.1 in Appendix B). Then, boulder densities within NMFS's Priority Area 1 were ranked and the eight contiguous WTG positions with the highest boulder densities within Priority Area 1 were identified for exclusion in Alternative C (Figure 3.5.2-1).

Boulder densities were highest in WTG position 87 to 94, with the exception of WTG position 91, and were identified for exclusion from development (Figure 3.5.2-1). WTG position 91 has a slightly lower boulder density (15.6/250 km^2) when compared to WTG position 96 (16.0/250 km^2); however, WTG position 91 was chosen for exclusion to provide contiguous fisheries habitat without disturbance. While low densities of boulders occur within Priority Areas 2 and 4, Priority Area 1 was deemed the higher priority due to proximity to Cox Ledge. The positions identified for exclusion within Alternative C-1 were determined to be most optimal for minimizing fisheries habitat impacts.

This alternative would require a change of the outlay of IAC, which could result in an increase or decrease of the total miles of IAC; however, since the actual locations and arrangement for the IAC have not been defined, the potential change in disturbance acreage cannot be quantified definitively at this time. Table 3.5.2-5 presents estimates of the different impact areas for Alternative C-1 based on the acres of impact per monopole foundation and miles of IAC per WTG provided in the COP (Sunrise Wind 2022).

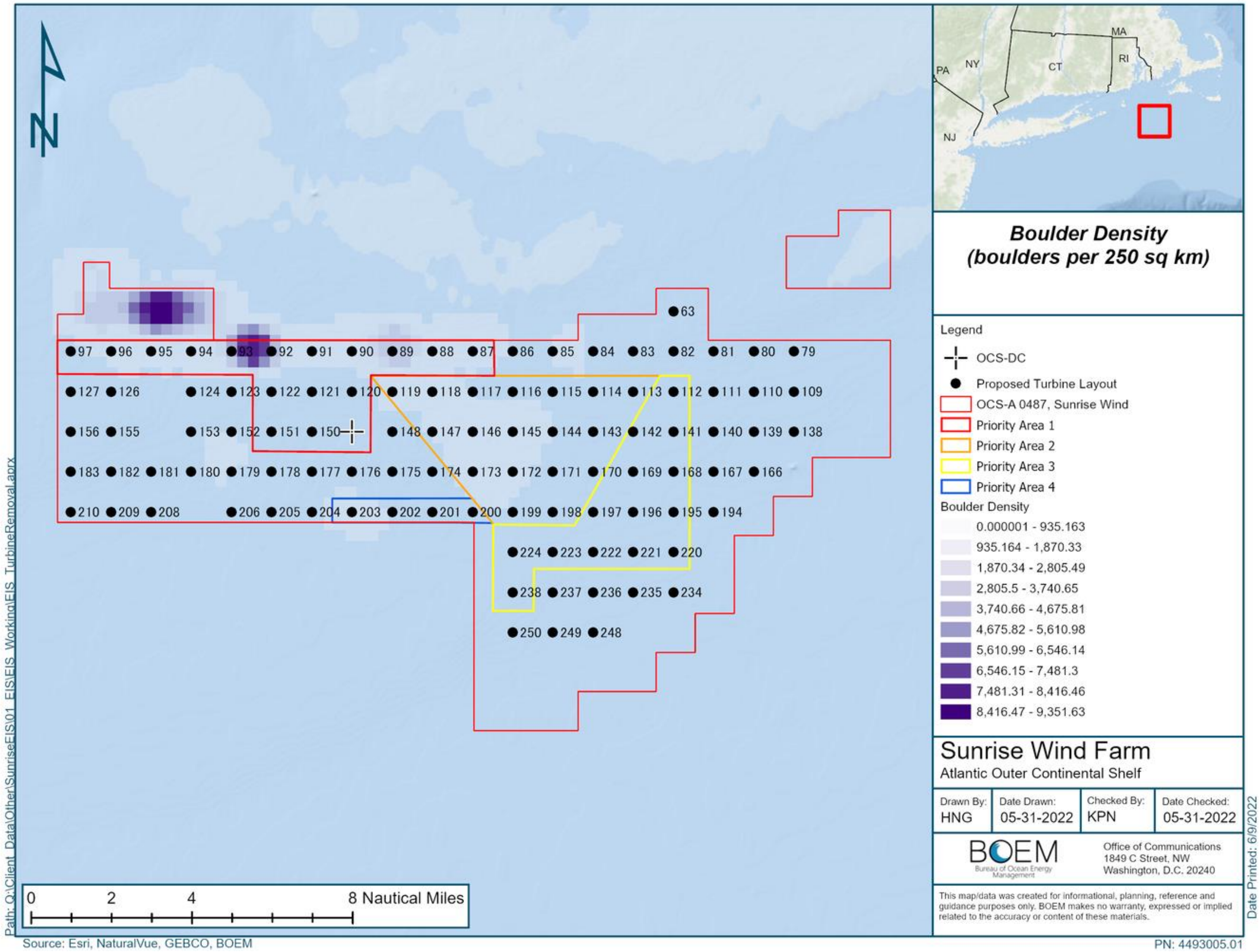


Figure 3.5.2-1. **Boulder Densities within the Sunrise Wind Lease Area**

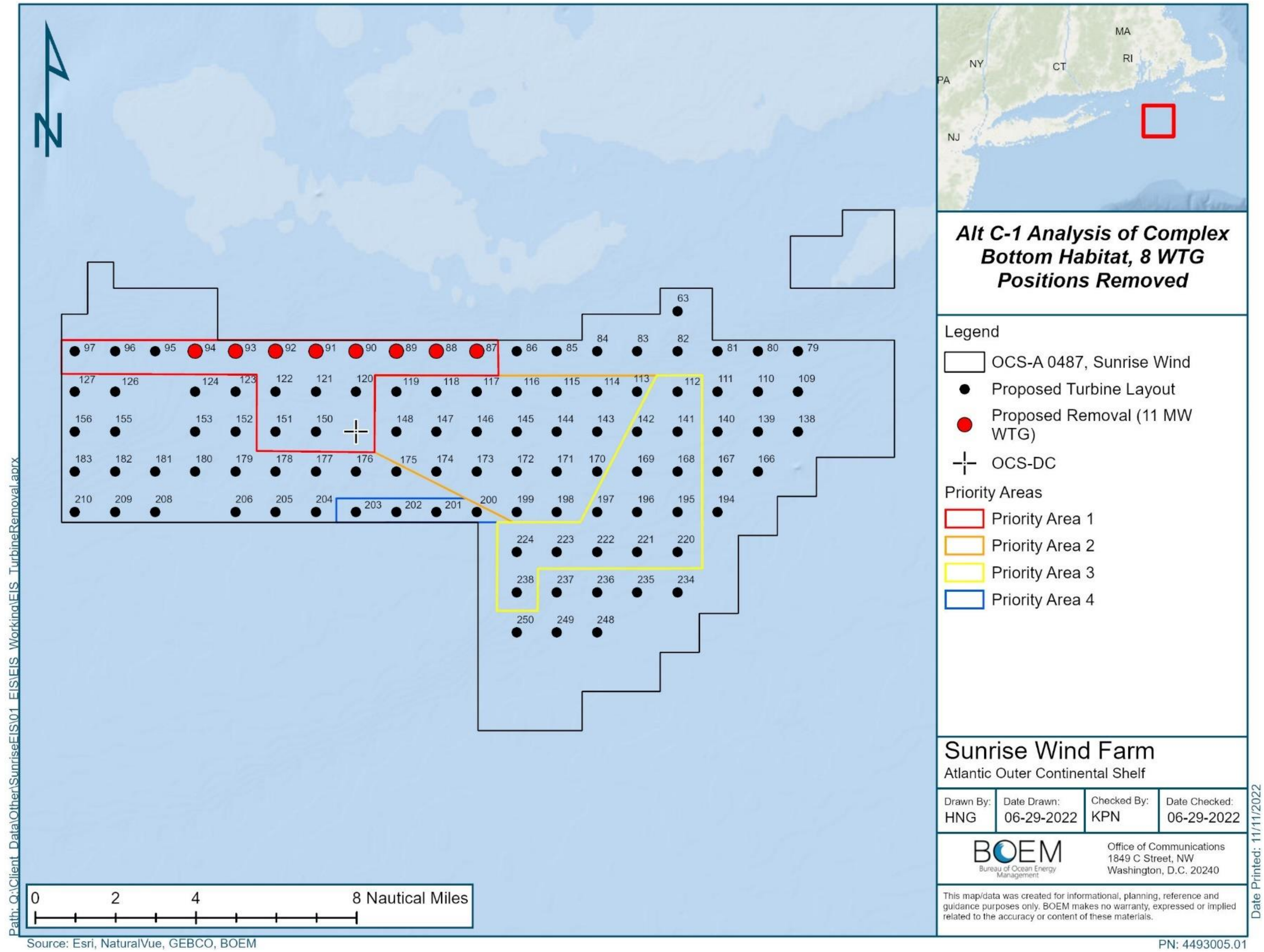


Figure 3.5.2-2. WTG Positions Identified for Removal under Alternative C-1

3.5.2.6.1 Construction and Installation

3.5.2.6.1.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to benthic resources due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.2.6.1.2 Offshore Activities and Facilities

As noted above, Alternative C-1 would not change any aspect of the SRWEC alignments described under the Proposed Action; therefore, the discussion of impacts for Alternative C-1 would focus on the SRWF and the lease area. Table 3.5.2-5 summarizes the estimated seafloor disturbance areas under Alternative C-1. These estimates are based on assumptions for disturbance areas for Project components presented in Table 4-1 of the COP, Appendix M3 (Sunrise Wind 2021).

Table 3.5.2-5. Maximum Potential Impacts to Benthic Habitats by NOAA Habitat Complexity Category from Proposed Alternatives C-1 and C-2 Project Design and Associated Assumptions and Information from the COP Related to Areas of Anticipated Impact [1]

Project Component	Maximum Construction Disturbance Acres	Proportional Disturbance by Habitat Type			Total Area of Anticipated Impacts to the Seafloor (Acres)
		Large Grain Complex Acres (%)	Complex Acres (%)	Soft Bottom Acres (%)	
SRWEC and Landfall HDD Cable Installation and Seafloor Preparation					
SRWF					
Alt C-1: Monopile foundations (94 WTGs) AND Scour Protection for WTGs and Cables					
Short-Term[2]	3,570.72	0	1,308.61	2,225.90	137.5
		0%	37%	62%	
Long-Term[3]	102.28	0	37.13	65.15	102.28
		0%	36%	64%	
Alt C-1: Inter-array Cable and Protections					
Short-Term[4,5]	2,160	0	623.99	1,178.40	2,150.00
			29%	55%	
Long-Term[6]	781.7	0	296.46	473.8	139.36
		0%	39%	61%	
Alt C-2: Monopile foundations (94 WTGs) and Scour Protection for WTGs and Cables					
Short-Term	3,534.22	0	857.44	2,640.57	137.5
		0%	36%	62%	
Long-Term	102.28	0	24.30	77.87	102.28
		0%	24%	76%	
Alt C-2: Inter-array Cable and Protections[5]					
Short-Term	1,945	0	410.68	1,391.71	TBD
		0%	39%	61%	
Long-Term	781.70	0	296.46	490.96	139.36
		0%	38%	63%	

Notes:

1 Table adapted from Table 4-1 in Appendix M3: Benthic Habitat Mapping. The current indicative GIS layout was used to determine the distribution of benthic habitat types crosswalked to NOAA Habitat Complexity Categories within the total maximum footprint of each Project element. This may result in different total numbers from those presented in the COP; for example, the current indicative IAC network is 264.3 km in GIS, whereas the project design envelope presented in the COP allows for a 10% increase on this value for a total of 290 km, allowing for some changes to the length of the IAC as Sunrise Wind further refines its design and construction plans. The total allowable values presented in the COP have been used to calculate the values presented in the "Total Area of Anticipated Impacts to the Seafloor" column.

SRWEC and Landfall HDD Cable Installation and Seafloor Preparation (no changes)
Monopole foundations (94 WTGs) AND Scour Protection for WTGs and Cables

2 Estimate uses a 220-m radius around each WTG foundation, which equates to 37.6 acres to include the area of seafloor preparation only that surrounds the maximum long-term footprint of the foundation, scour protection, and CPS stabilization is approximately 36.5 acres per WTG foundation and around the OCS-DC, for a total of approximately 3,759 acres inclusive of all 94 WTGs and the OCS-DC.

3 Estimates are based on 1.06 acre per monopile foundation (n=94) (foundations + scour protection + CPS stabilization), plus 2.68 acres for the OCS-DC. The maximum total area that may be permanently impacted by foundations, scour protection, and CPS stabilization totals 110.76 acres.

Inter-array Cable and Protections

[4] The area of the full IAC corridor of seafloor disturbance represents a conservative assumption for maximum short-term seafloor disturbance; it is anticipated that less than the full area would be temporarily disturbed by seafloor preparation and cable installation activities.

[5] For Alternative C, the exact locations and amounts of the reductions in IAC mileage are unknown, but because the WTGs positions would be excluded or relocated from areas of higher quality habitat, the reduction in cable lengths to occur in these habitats is assumed at the rate of approximately 1.48 mi/ WTG. The short-term acreage per WTG served by the IAC was set at 17.78 ac), and the long-term acreage per WTG served by the IAC was set at 1.43 ac.

[6] Up to 15% of the entire up to 290-km long IAC network, 43.5 km, may require cable protection. Cable protection would measure up to 39 ft (12 m) wide. Therefore, an area of up to 129 acres plus up to 10.36 acres additional cable protection at 7 of the IAC network crossings may require cable protection. If cable protection were needed across the entire up to 290-km long IAC network a total of 859.9 acres would be needed.

Seafloor disturbance: The intent of the WTG arrangements proposed under Alternative C-1 is to reduce seafloor disturbance in areas of higher habitat complexity and relocate those disturbances to less-sensitive habitat types. All other aspects of the impacts related to construction of the SRWF would remain unchanged, and the same the Applicant Prepared Measures (APM) and mitigation requirements from state and federal permits would apply as well.

Alternative C-1 would retain the same number of WTGs as the Proposed Action but would remove 8 WTG locations in Priority Area 1 from consideration. These eight sites would be relocated to the southeastern side of the lease area. Since the number of WTGs remains unchanged, the total area of disturbance is likely to be unchanged as well; however, the avoidance of the long-term disturbance of approximately 8.53 ac (3.43 ha) of large-grain complex and complex habitats (Table 3.5.2-5) would reduce the overall level of adverse impacts to benthic resources during construction. Relocating the 8 WTGs would remove construction activities in these areas thereby reducing short-term disturbance in these habitats by approximately 300.79 ac (121.72 ha).

Sediment suspension and deposition: The proposed WTG arrangements under Alternative C-1 would shift some of the seafloor disturbance away from more complex habitat areas (Refer to short-term area comparisons in Table 3.5.2-5). Other than this shift in location, there would be no substantive difference in the level or duration of impacts to benthic resources from sediment suspension or deposition as compared to that described under the Proposed Action.

Noise and vibration: Changing the number and location of the WTGs for the SRWF is not likely to appreciably affect the noise or vibration generated during the construction phase of the Project as compared to the Proposed Action. The areas of higher complexity habitat that would be avoided would experience less noise and vibration, but otherwise the mechanisms and levels of impact would be expected to be that same as the Proposed Action.

EMF: There would be no substantive difference in the potential for impacts to benthic resources from EMF under Alternative C-1 as compared to the Proposed Action.

Discharges and releases: There would be no substantive difference in the potential for impacts to benthic resources from discharges or releases under Alternative C-1 as compared to the Proposed Action.

Trash and debris: There would be no substantive difference in the potential for impacts to benthic resources from trash or debris under Alternative C-1 as compared to the Proposed Action.

3.5.2.6.2 Operations and Maintenance

3.5.2.6.2.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the O&M of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to benthic resources due to the O&M of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.2.6.2.2 Offshore Activities and Facilities

Seafloor disturbance: The shift of WTGs out of the higher priority habitat areas on the northwestern portion of the lease area would remove impacts to those areas. Otherwise, the expected changes from introducing hard bottom habitat to areas of homogenous soft bottom habitats would be similar to those described under the Proposed Action. In addition, Alternative C-1 would have the same number of WTGs as the Proposed Action; therefore, the extent of any beneficial impacts to benthic resources from the WTG structures would remain unchanged.

Sediment suspension and deposition: The proposed WTG arrangements under Alternative C-1 would shift some of the seafloor disturbance during O&M away from more complex habitat areas (Refer to long- term area comparisons in Table 3.5.2-5). Other than this shift in location, there would be no substantive difference in the level or duration of impacts to benthic resources from sediment suspension or deposition as compared to that described under the Proposed Action.

Noise and vibration: Changing the location of the WTGs for the SRWF is not likely to appreciably affect the noise or vibration generated during the O&M phase of the Project as compared to the Proposed Action. The areas of higher complexity habitat that would be avoided would experience less noise and vibration, but otherwise the mechanisms and levels of impact would be expected to be that same as the Proposed Action.

EMF: There would be no substantive difference in the potential for impacts to benthic resources from EMF during O&M under Alternative C-1 as compared to the Proposed Action.

Discharges and releases: There would be no substantive difference in the potential for impacts to benthic resources from discharges or releases during O&M under Alternative C-1 as compared to the Proposed Action.

Trash and debris: There would be no substantive difference in the potential for impacts to benthic resources from trash or debris during O&M under Alternative C-1 as compared to the Proposed Action.

3.5.2.6.3 Conceptual Decommissioning

3.5.2.6.3.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the decommissioning processes for the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to benthic resources due to the decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.2.6.3.2 Offshore Activities and Facilities

Seafloor disturbance: The shift of WTGs out of the higher priority habitat areas on the northwestern portion of the lease area would remove impacts to those areas. Otherwise, the expected changes from removing hard bottom habitat associated with the WTG foundations and support structures and returning those areas to areas of homogenous soft bottom habitats would be similar to those described under the Proposed Action.

Sediment suspension and deposition: The proposed WTG arrangement under Alternative C-1 would shift some of the seafloor disturbance during decommissioning away from more complex habitat areas (Refer to long-term area comparisons in Table 3.5.2-5). Other than this shift in location, there would be no substantive difference in the level or duration of impacts to benthic resources from sediment suspension or deposition during decommissioning as compared to that described under the Proposed Action.

Noise and vibration: Changing the location of the WTGs for the SRWF is not likely to appreciably affect the noise or vibration generated during the decommissioning phase of the Project as compared to the Proposed Action. The areas of higher complexity habitat that would be avoided would experience less noise and vibration, but otherwise the mechanisms and levels of impact would be expected to be that same as the Proposed Action.

EMF: No EMFs are anticipated to be generated by decommissioning activities under any alternative; therefore, there is no potential for impacts due to this IPF for this phase.

Discharges and releases: There would be no substantive difference in the potential for impacts to benthic resources from discharges or releases during decommissioning under Alternative C-1 as compared to the Proposed Action.

Trash and debris: There would be no substantive difference in the potential for impacts to benthic resources from trash or debris during decommissioning under Alternative C as compared to the Proposed Action.

3.5.2.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts of Alternative C-1 considered the impacts of this alternative in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on benthic resources through the primary IPFs of seafloor disturbance, presence of structures, and changes to noise and EMF. The proliferation of offshore wind farms and their associated offshore infrastructure have the potential to change attributes of the seafloor environment within the multiple lease areas.

3.5.2.6.5 Impacts of Alternative C-1 on ESA-Listed Species

There are no ESA-listed threatened or endangered invertebrate or coral species, nor are there any benthic species currently proposed for listing in the New England/Mid-Atlantic region as reported by NMFS (NOAA 2021).

3.5.2.6.6 Conclusions

Impacts of Alternative C-1

Relocating 8 WTGs from areas of higher complexity habitat to areas of soft bottom, homogeneous habitat would reduce the overall adverse impacts of the WTG array on benthic resources. Although this shift may change the IAC array length, the total area of disturbance for WTGs and the IAC within areas of high complexity habitat would be reduced. The magnitude of this reduction would be **minor**, but in the context of the overall offshore wind development planned in this region, incremental decreases in impacts may have **minor beneficial** impacts to the OCS habitat overall. BOEM expects the overall impacts to be similar to the Proposed Action.

Cumulative Impacts of Alternative C-1

Alternative C-1 does not differ substantially in size or extent from the Proposed Action, and both are limited in scale compared to some of the offshore renewable energy projects planned in the GAA. Most of the offshore wind projects under consideration or development are larger in scale than this alternative, and many projects could be developed in adjacent lease areas. Depending on how they are located and distributed, the development of multiple large-scale projects could have broader scale cumulative effects on biological communities than an individual project considered in isolation. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with Alternative C-1 and future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities would result in **moderate** adverse impacts and could potentially include **moderate beneficial** impacts on benthic resources due to the artificial reef effect (habitat conversion).

3.5.2.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

Under the Fisheries Habitat Impact Minimization Alternative C-2, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OCS within the proposed Project Area and associated inter-array and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, to reduce impacts to complex fisheries habitats that are the most vulnerable to long-term impacts as compared to the Proposed Action, certain WTG positions would be excluded from development. Under this alternative, the same number of installed WTGs as described for the Proposed Action may be approved by BOEM.

This alternative considered and prioritized areas of complex habitat to be excluded from development to avoid and minimize impacts to complex fisheries habitats, while still meeting the purpose and need for the Project. Areas for prioritization were identified by NMFS based on recent, preliminary data suggesting limited Atlantic cod spawning activity in the vicinity of the Project Area, assumed hard bottom complex substrate, and the presence of large boulders (Figure 2.1.3-2). Priority Area 1 is considered the highest priority for conservation by NMFS and includes 16 WTG positions as well as the OCS-DC. In Alternative C-1, 8 WTG position were identified for removal within this area. For Alternative C-2, this analysis was expanded upon to relocate 12 WTG positions from the Priority Areas to the eastern side of the lease area, in addition to removing the 8 WTG positions identified in Alternative C-1. This alternative assumes that habitat is more suitable for development on the eastern side of the lease area, but this assumption may change following surveys conducted in this area in the summer of 2022.

Alternative C-2 considers four WTG position configurations (C-2a, C-2b, C-2c, and C-2d) to address NMFS priority areas, provide continuous habitat, and avoid boulder fields. All eight positions identified in Alternative C-1 would remain excluded for development in all alternate configurations. An additional 12 WTG positions were selected for relocation based on a similar analysis for Alternative C-1. To identify which 12 positions to relocate, BOEM relied on the locations and densities of boulders in NMFS priority areas; boulders can be considered a critical element of potential sensitive habitat (Gardline 2021). Gardline (2021) identified boulders as objects that (1) returned a strong backscatter signal indicative of hard substrates; (2) were observed to have a distinct shadow or measurable height; and (3) had diameters greater than 1.6 ft (0.5 m). The density of boulders (number of boulders/250 km^2) on the seafloor surrounding each WTG position was calculated using the ESRI ArcGIS Pro Spatial Analyst Density function (Table B-2.2 in Appendix B). Then, boulder densities within ranked and multiple configurations were developed to provide options of ideal WTG position configurations. NMFS priority areas, highest boulder densities, and maintaining contiguous habitat informed how these alternative choices were developed.

3.5.2.7.1 Alternative C-2a

Alternative C-2a prioritized excluding 8 WTG positions and relocating 3 WTG position along the northern section of Priority Area 1 to maintain continuous habitat, and then excluded the remaining 9 WTG positions from areas with the highest boulder densities in Priority Area 2 (Figure 3.5.2-3). The results of this analysis provided continuous habitat but did not remove WTG positions from the lower section of Priority Area 1. Based on available data, lower Priority Area 1 has few to no boulders and non-complex habitat (Table B-2.2 in Appendix B). Habitat within the lower section of Priority Area 1 is soft bottom habitat consisting of sand and muddy sand, with the exception of WTG position 122, which has complex habitat and coarse, mobile sediments but not boulders. Boulder density at the WTG positions identified for removal/relocation ranged from 0 boulders/250 km^2 (WTG 97) to 4,665.5 boulders/250 km^2 (WTG 92).

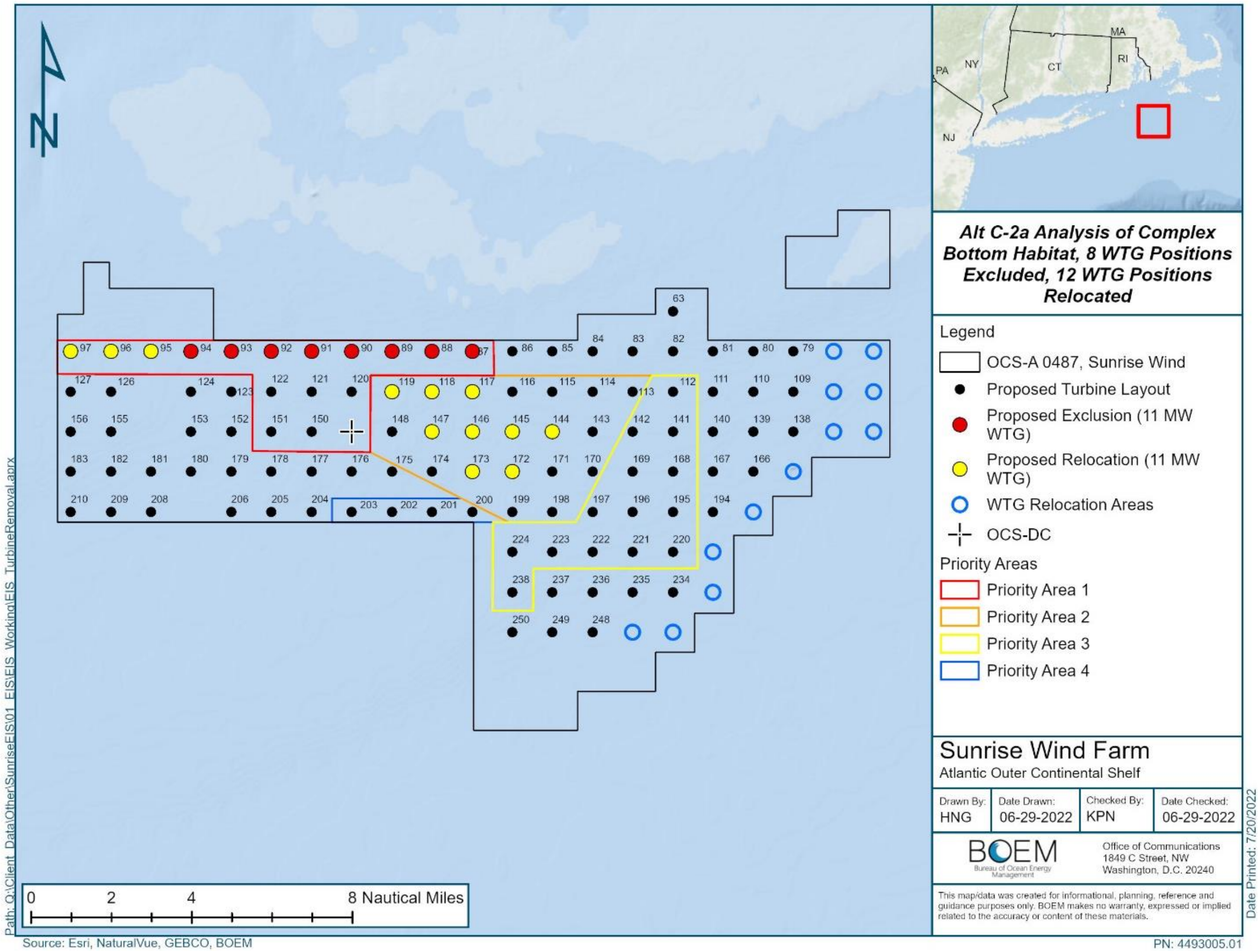


Figure 3.5.2-3. Alternative C-2a WTG Position Exclusion and Relocation Analysis

3.5.2.7.2 Alternative C-2b

In Alternative C-2b, WTG positions were excluded within Priority Area 1 if boulders were present, then Priority Areas were disregarded and WTG positions with the highest densities of boulders were excluded. This resulted in 8 WTG positions excluded and 2 WTG postions relocated from Priority Area 1, 8 WTG positions relocated from Priority Area 2, and then the 1 WTG position was relocated from Priority Area 4. Additionally, 1 WTG position was relocated that was not located in a Priority Area (Figure 3.5.2-4). This alternative does not maintain contiguous habitat but identifies the highest densities of boulders. WTG position 85 and 203 are isolated from other removal locations. WTG 203 is within Priority Area 4 and has a boulder density of 12.4 boulders/250 km^2; WTG 85 is not located within a Priority Area and has a boulder density of 15 boulders/250 km^2.

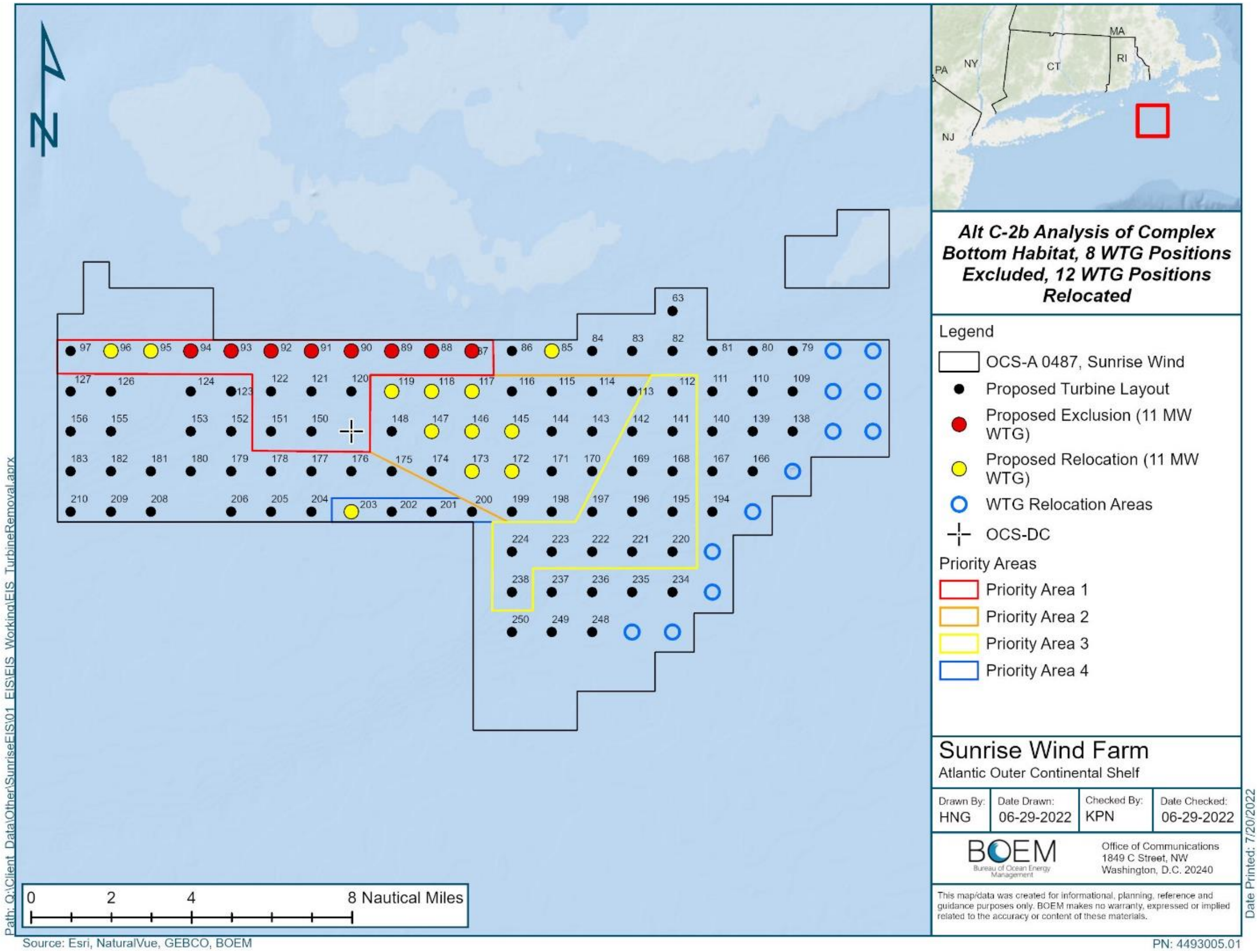


Figure 3.5.2-4. Alternative C-2b WTG Position Exclusion and Relocation Analysis

3.5.2.7.3 Alternative C-2c

Alternative C-2c excluded/relocated all 16 WTG positions from Priority Area 1 and then relocated an additional 4 WTG positions with the highest boulder densities in Priority Area 2 (Figure 3.5.2-5). This alternative provides continuous habitat with the exception of WTG 172 (479 boulders/250km^2) and WTG 173 (204.6 boulders/250km^2) which are located near the southern portion of Priority Area 2.

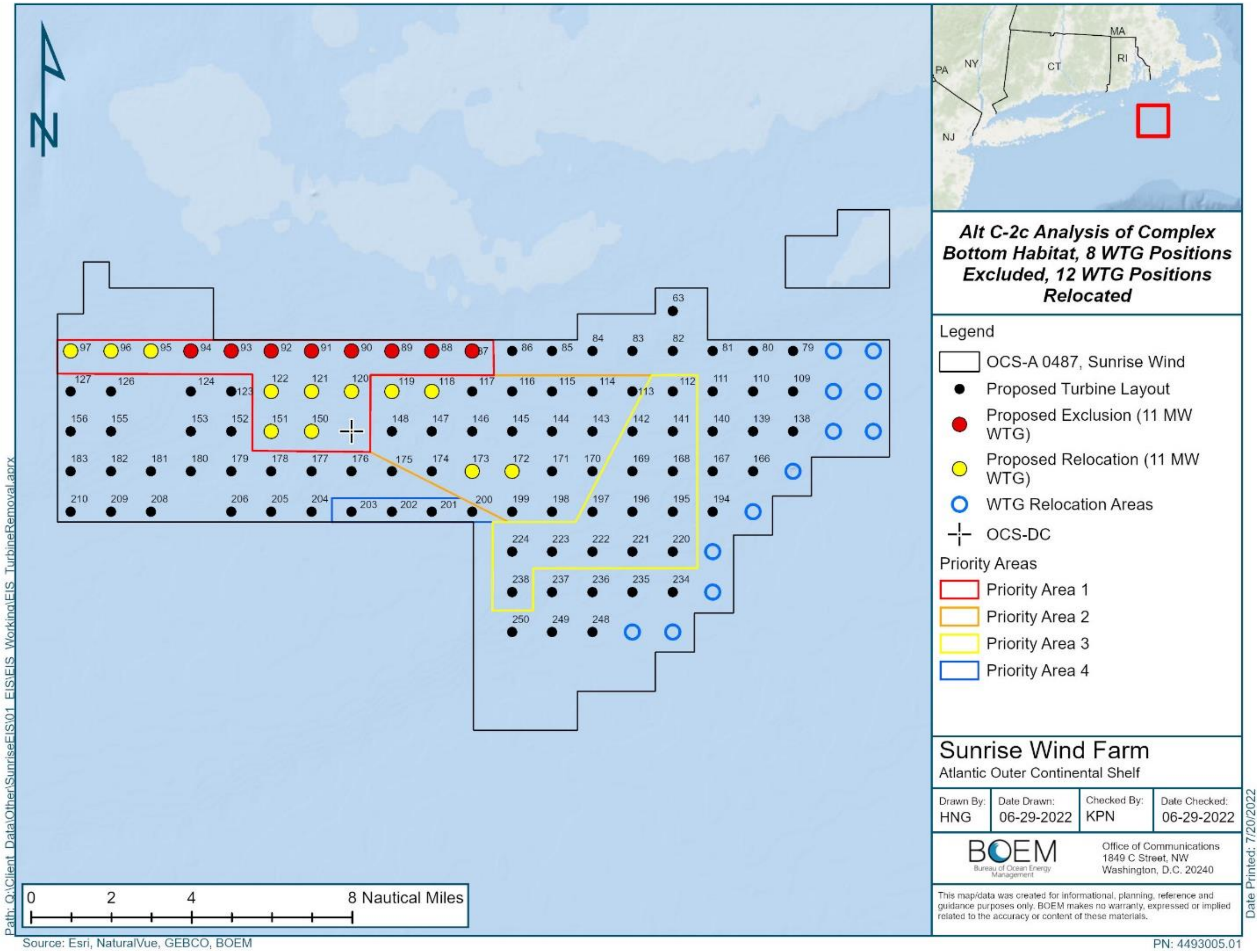


Figure 3.5.2-5. Alternative C-2c WTG Position Exclusion and Relocation Analysis

3.5.2.7.4 Alternative C-2d

Alternative C-2d identified the WTG positions with the highest boulder density within Priority Area 1 and excluded/relocated them. Once all WTG positions with boulders in Priority Area 1 were identified for removal/relocation, the analysis moved to Priority Area 2. The remaining 9 WTG positions that had the highest boulder densities were identified for removal (Figure 3.5.2-6). This alternative provides contiguous habitat but excludes WTG 97 in the northwestern corner of the lease area and Priority Area 1. This alternative provided results similar to Alternative C-2a, the only difference in results was excluding WTG 97 from relocation. WTG 97 is located in mobile coarse sediment with ripples and complex habitat (Table B-2.2 in Appendix B).

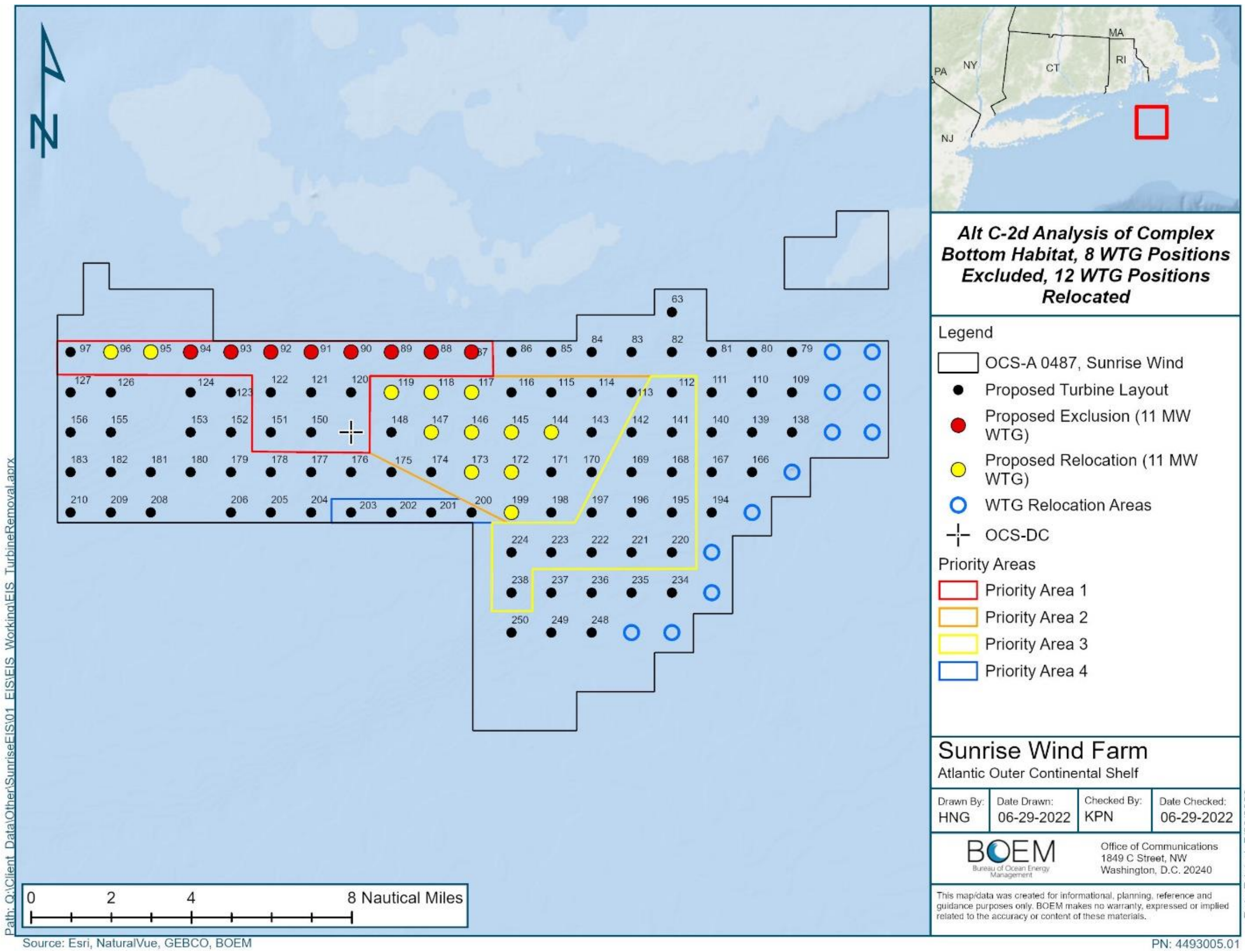


Figure 3.5.2-6. Alternative C-2d WTG Position Exclusion and Relocation Analysis

3.5.2.7.5 Construction and Installation

3.5.2.7.5.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to benthic resources due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.2.7.5.2 Offshore Activities and Facilities

As noted above, Alternative C-2 would not change any aspect of the SRWEC alignments described under the Proposed Action; therefore, the discussion of impacts for these alternatives would focus on the SRWF and the lease area. Table 3.5.2-5 summarizes the estimated seafloor disturbance areas for each of the options under Alternative C (C-1 and four variations of C-2). These estimates are based on assumptions for disturbance areas for Project components presented in Table 4-1 of the COP, Appendix M3 (Sunrise Wind 2021).

Seafloor disturbance: The intent of the WTG arrangement proposed under Alternatives C-2 is to reduce seafloor disturbance in areas of higher habitat complexity and relocate those disturbances to less-sensitive habitat types. All other aspects of the impacts related to construction of the SRWF would remain unchanged, and the same APMs and mitigation requirements from state and federal permits would apply as well.

Alternative C-2 would exclude the 8 WTG positions described in Alternative C-1 and would shift an additional 12 positions to the eastern side of the lease area. The avoidance of the approximately 23 ac (9 ha) of large grain complex habitat (Table 3.5.2-5) for the WTG foundations would reduce the overall level of adverse impacts to benthic resources during construction.

Sediment suspension and deposition: The proposed WTG arrangements under Alternative C-2 would shift some of the seafloor disturbance away from more complex habitat areas (Table 3.5.2-5). Other than this shift in location, there would be no substantive difference in the level or duration of impacts to benthic resources from sediment suspension or deposition as compared to that described under the Proposed Action.

Noise and vibration: Changing the location of the WTGs for the SRWF is not likely to appreciably affect the noise or vibration generated during the construction phase of the proposed Project as compared to the Proposed Action. The areas of higher complexity habitat that would be avoided would experience less noise and vibration, but otherwise the mechanisms and levels of impact would be expected to be that same as the Proposed Action.

EMF: There would be no substantive difference in the potential for impacts to benthic resources from EMFs under Alternative C-2 as compared to the Proposed Action.

Discharges and releases: There would be no substantive difference in the potential for impacts to benthic resources from discharges or releases under Alternative C-2 as compared to the Proposed Action.

Trash and debris: There would be no substantive difference in the potential for impacts to benthic resources from trash or debris under Alternative C-2 as compared to the Proposed Action.

3.5.2.7.6 Operations and Maintenance

3.5.2.7.6.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the O&M of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to benthic resources due to the O&M of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.2.7.6.2 Offshore Activities and Facilities

Seafloor disturbance: The shift of WTGs and associated IAC out of the higher priority habitat areas on the northwestern portion of the lease area would remove impacts to those areas. Otherwise, the expected changes from introducing hard bottom habitat to areas of homogenous soft bottom habitats would be similar to those described under the Proposed Action.

Sediment suspension and deposition: The proposed WTG arrangements under Alternative C-2 would shift some of the seafloor disturbance impacts during O&M from the more complex habitat areas (Table 3.5.2-5) to the eastern portion of the lease area. It is unlikely that this would cause a substantive difference in the level or duration of impacts to benthic resources from sediment suspension or deposition as compared to that described under the Proposed Action.

Noise and vibration: Changing the location of the WTGs for the SRWF is not likely to appreciably affect the noise or vibration generated during the O&M phase of the Project as compared to the Proposed Action. The areas of higher complexity habitat that would be avoided would experience less noise and vibration, but otherwise the mechanisms and levels of impact would be expected to be the same as the Proposed Action.

EMF: There would be no substantive difference in the potential for impacts to benthic resources from EMFs during O&M under Alternative C-2 as compared to the Proposed Action.

Discharges and releases: There would be no substantive difference in the potential for impacts to benthic resources from discharges or releases during O&M under Alternative C-2 as compared to the Proposed Action.

Trash and debris: There would be no substantive difference in the potential for impacts to benthic resources from trash or debris during O&M under Alternative C-2 as compared to the Proposed Action.

3.5.2.7.7 Conceptual Decommissioning

3.5.2.7.7.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the decommissioning processes for the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to benthic resources due to the decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.2.7.7.2 Offshore Activities and Facilities

Seafloor disturbance: The shift of WTGs out of the higher priority habitat areas on the northwestern portion of the lease area would remove impacts to those areas. Otherwise, the expected changes from removing hard bottom habitat associated with the WTG foundations and support structures and returning those areas to homogenous soft bottom habitats would be similar to those described under the Proposed Action.

Sediment suspension and deposition: The proposed WTG arrangement under Alternative C-2 would shift some of the seafloor disturbance during decommissioning away from more complex habitat areas (Table 3.5.2-5). Other than this shift in location, there would be no substantive difference in the level or duration of impacts to benthic resources from sediment suspension or deposition during decommissioning as compared to that described under the Proposed Action.

Noise and vibration: Changing the location of the WTGs for the SRWF is not likely to appreciably affect the noise or vibration generated during the decommissioning phase of the proposed Project as compared to the Proposed Action. The areas of higher complexity habitat that would be avoided would experience less noise and vibration, but otherwise the mechanisms and levels of impact would be expected to be that same as the Proposed Action.

EMF: During the decommissioning phase, turbines would cease to be operated and EMFs effects associated with the IAC and SRWEC would be eliminated; therefore, there is the potential for minor beneficial impacts due to the elimination of EMF impacts as a result of decommissioning.

Discharges and releases: There would be no substantive difference in the potential for impacts to benthic resources from discharges or releases during decommissioning under Alternative C-2 as compared to the Proposed Action.

Trash and debris: There would be no substantive difference in the potential for impacts to benthic resources from trash or debris during decommissioning under Alternative C-2 as compared to the Proposed Action.

3.5.2.7.8 Cumulative Impacts of Alternative C-2

The cumulative impacts of the variations proposed under Alternative C-2 considered the impacts of this alternative in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on benthic resources through the primary IPFs of seafloor disturbance, presence of structures, and changes to noise and EMF. The proliferation of offshore wind farms and their associated offshore infrastructure have the potential to change attributes of the seafloor environment within the multiple lease areas.

3.5.2.7.9 Impacts of Alternative C-2 on ESA-Listed Species

There are no ESA listed threatened or endangered invertebrate or coral species, nor are there any benthic species currently proposed for listing in the New England/Mid-Atlantic region as reported by NMFS (NOAA 2021).

3.5.2.7.10 Conclusions

Impacts of Alternative C-2

Relocating up to 20 WTG positions from areas of higher complexity habitat to areas of soft bottom, homogeneous habitat could reduce the overall adverse impacts of the WTG array on benthic resources; although results from the additional surveys planned prior to final turbine site selection are needed to confirm existing habitat along the eastern portion of the lease area. The magnitude of this reduction would likely be minor, but in the context of the overall offshore wind development planned in this region, incremental decreases in impacts may have **minor beneficial** impacts to the OCS habitat overall. BOEM expects the overall impacts to be similar to the Proposed Action.

Cumulative Impacts of Alternative C-2

Alternative C-2 does not differ substantially in size or extent from the Proposed Action, and both are limited in scale compared to some of the offshore renewable energy projects planned in the GAA. Most of the offshore wind projects under consideration or development are larger in scale than this alternative, and many projects could be developed in adjacent lease areas. Depending on how they are located and distributed, the development of multiple large-scale projects could have broader scale cumulative effects on biological communities than an individual project considered in isolation. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with Alternative C-2 and future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities would result in **moderate** adverse impacts and could potentially include **moderate beneficial** impacts on benthic resources due to the artificial reef effect (habitat conversion).

3.5.2.8 Comparison of Alternatives

The three action alternatives differ primarily in the locations of the WTGs with respect to complex habitat. The focus of the fisheries habitat minimization alternatives to the Proposed Action (Alternative B) is on reducing short- and long-term disturbance in the Priority Areas by removing 8 WTG positions from the areas with complex habitat features and shifting 8 to 20 WTGs from the northwestern side of the lease area where complex habitat is more common to the eastern side where benthic habitat is assumed to be predominately soft-bottom and homogeneous. However, because the actual locations for the 94 WTGs under the Proposed Action among the 102 possible location are not final at this time, we can provide a preliminary comparison of the potential mitigating effects of Alternatives C-1 and C-2, which assumes that fewer WTGs would be located in higher value habitat and would reduce the overall impacts to this resource (Table 3.5.2-6). Similarly, the 8 and 20 WTG positions proposed to be relocated under Alternatives C-1 and C-2, respectively, would shift impacts from higher-value habitat areas to more homogeneous areas, but the actual locations are not yet finalized. However, it is possible to present a preliminary estimate of the reductions in impacts to higher complexity habitat based on the planned relocations described for Alternatives C-1 and C-2. Table 3.5.2-7 presents this comparison.

Table 3.5.2-6. Comparison of Alternative Impacts Benthic Habitat Impacts

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Benthic Habitats	*Proposed Action*: BOEM anticipates the impacts resulting from the Proposed Action alone would range from **negligible** to **moderate**. Therefore, BOEM expects the overall impact on benthic resources from the Proposed Action and ongoing activities to be **moderate**, as the overall effect would be notable, but the resource would be expected to recover completely without remedial or mitigating action. Additionally, **minor beneficial** impacts may result due to the artificial reef effect (habitat conversion to hard bottom). *Cumulative Impacts of the Proposed Action:* In the context of other reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual	*Alternative C-1*: Impacts resulting from the relocation of the 8 WTGs would be **minor**, but in the context of the overall offshore wind development planned in this region, incremental decreases in impacts may have **minor beneficial** impacts to the OCS habitat overall. BOEM expects the overall impact on benthic resources to be similar to the Proposed Action, **moderate** adverse. *Cumulative Impacts of Alternative C-1*: Considering all the IPFs together, BOEM anticipates that the overall impacts associated with Alternative C-1 and future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities would result in **moderate** adverse impacts and could potentially	*Alternative C-2*: Impacts resulting from the relocation of the 8 WTGs would be **minor**, but in the context of the overall offshore wind development planned in this region, incremental decreases in impacts may have **minor beneficial** impacts to the OCS habitat overall. BOEM expects the overall impact on benthic resources to be similar to the Proposed Action, **moderate** adverse. *Cumulative Impacts of Alternative C-2*: Considering all the IPFs together, BOEM anticipates that the overall impacts associated with Alternative C-2 and future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities would result in **moderate** adverse impacts and could potentially include **moderate beneficial** impacts on benthic resources due

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
	IPFs would range from negligible to moderate, depending on the species and habitat component. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action and future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities would result in **moderate** adverse impacts and could potentially include **moderate beneficial** impacts on benthic resources due to the artificial reef effect (habitat conversion).	include **moderate beneficial** impacts on benthic resources due to the artificial reef effect (habitat conversion).	to the artificial reef effect (habitat conversion).

Table 3.5.2-7. Comparison of Preliminary Estimate of the Reductions in Impacts to Higher Complexity Habitat Based on the Planned Relocations Described for Alternatives B, C-1 and C-2

Habitat type	Proposed Action (Alternative B) (acres)	Fisheries Habitat Minimization (Alternative C-1) (acres)	Fisheries Habitat Minimization (Alternative C-2) (acres)
Monopole Foundations (94 WTGs among 102 locations) AND Scour Protection for WTGs and Cables			
Short-term total	3,835.00	3,570.72	3,734.22
Short-term large grain complex	22.90	0.00	0.00
Short-term Complex	1,586.50	1,308.62	857.44
Short-term Soft-bottom	2,189.40	2,189.40	2,640.58
Long-term	110.76	102.28	102.28
Long-term large grain complex	0.11	0.00	0.00
Long-term Complex	45.50	37.13	24.41
Long-term Soft-bottom	60.52	60.52	73.24
Inter-array Cable and Protections			
Short-term total	2,160.17	2,160.17	1,945.00
Short-term large grain complex	0.00	0.00	0.00
Short-term Complex	766.20	623.99	410.68
Short-term Soft-bottom	1,178.40	1,178.40	1,391.71
Long-term	781.70	781.70	781.70
Long-term large grain complex	0.00	0.00	0.00
Long-term Complex	307.90	296.46	296.46
Long-term Soft-bottom	473.80	473.80	490.96

3.5.2.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2; however for benthic resources, there are no measures currently proposed by BOEM. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to benthic resources.

3.5.3 Birds

This section discusses potential impacts on Birds from the proposed Project, alternatives, and future offshore wind activities in the GAA (Appendix D, Figure D-5). The bird GAA, as depicted in Appendix D, includes the United States eastern coast from Maine to Florida extending from 0.5 mi onshore to cover Project component sites and 100 mi offshore.

3.5.3.1 Description of the Affected Environment and Future Baseline Conditions

Several avian species groups occur seasonally within or in proximity to the onshore and offshore portions of the Project Area and the GAA, which extends from 0.5 mi (0.8 km) inland to 100 mi (161 km) offshore along the United States coast from Maine to Florida (Appendix D). Situated within the Atlantic Flyway, the Project Area is located within one of four major North American north-south migration routes for many species of seabirds, shorebirds and waterfowl, raptors, and songbirds (Menza 2012). This flyway is an important migratory pathway for up to 164 species of marine/coastal waterbirds and a similar number of land birds with the majority using this pathway annually migrating between wintering and breeding grounds (Watts 2010; New York State Breeding Bird Atlas 2007; Veit 2016; Normandeau 2021). Both the coastal and marine environments along the Atlantic Flyway provide important resources for hundreds of these avian species at migration stopover sites, as well as breeding locations, and wintering areas (Menza 2012). Birds use a wide variety of habitats (e.g., forests, grasslands, riparian corridors, lakes, wetlands, coastal shorelines, and offshore marine waters) for breeding, foraging, and roosting.

During migration waterbirds using the Atlantic Flyway typically fly 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. 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 near the shoreline (Watts 2010). COP Tables 4.4.6.1, 4.4.6-2, 4.4.6-3, and 4.4.6-4 (COP, Section 4.4.6; Sunrise Wind 2021) list the timing; distribution; and status of marine, coastal, and land bird taxonomic groups and species that may occur within or proximate to the OnCS–DC and the offshore SRWEC-NYS, SRWEC-OCS, and SRWF Project areas , and are incorporated here by reference.

3.5.3.1.1 General Distribution OnCS-DC and SRWEC-NYS

Many species of waterfowl, shorebirds, waders, raptors, songbirds, and seabirds may occur at the onshore facilities areas, along the nearshore SRWEC-NYS cable route, and in the adjacent surrounding region on Fire Island, a barrier island that runs parallel to Long Island. Located within the North Atlantic Coast Ecoregion of New York (NYSDEC 2022a), terrestrial/aquatic bird habitats of the onshore portions of the Project Area include forests, grasslands, developed areas, beaches, and surface waters such as wetlands, lakes, ponds, rivers.

Many birds use coastal and marine habitats year-round, particularly waterfowl, shorebirds, and other wading birds. Waterfowl such as geese and ducks and wading birds such as herons and egrets typically utilize inland, coastal, and wetland habitats during overwintering or summer breeding, and only occur offshore during migration (Sunrise Wind 2022). Most shorebirds breed and forage along coastal beaches and, other than the uniquely marine phalaropes, only occur offshore during migration.

Colonial seabird and piping plover (*Charadrius melodus*) surveys on coastal Long Island have reported active breeding sites for the least tern (*Sternula antillarum*), common tern (*Sterna hirundo*), Forster's tern (*Sterna forsteri*), black skimmer (*Rynchops niger*), and gull-billed tern (*Gelochelidon nilotica*) (Jennings 2018). Pied-billed grebe (*Podilymbus podiceps*) may breed at locations in the vicinity of the onshore transmission cable/interconnection cable (New York State Breeding Bird Atlas 2007). Each of these species has the potential to utilize resources at or adjacent to the onshore facilities as foraging, nesting, or migrating habitat. The NYSDEC has indicated that terns have historically nested on dredged material adjacent to the Smith Point Marina parking lot (see COP, Section 4.4.6; Sunrise Wind 2022).

Land birds using the surrounding coastal region include songbirds and raptors. A variety of these passerines and other birds migrate along the Atlantic Coast and could fly over the Project Area (particularly onshore facilities, the nearshore SRWEC-NYS cable route, and landing sites during migration and may utilize stopover sites and staging areas along the coast. Songbirds breed in onshore habitats during summer and are only present offshore during spring and fall migrations. Raptors, including accipiters, buteos, and harriers, may breed and forage in upland habitats and pass through the area during spring and fall migration. Falcons, osprey, and eagles may utilize coastal areas to breed, forage, and migrate (Sunrise Wind 2022). The New York State Breeding Bird Atlas 2000-2005 survey results indicated that the northern harrier (*Circus hudsonius*) may breed at locations in the vicinity of the onshore transmission cable/interconnection cable (New York State Breeding Bird Atlas 2007). Northern harriers may also occur along the shoreline to hunt for avian and rodent prey from spring through fall (Smith 2020).

3.5.3.1.2 General Distribution SRWEC-OCS and SRWF

The SRWF would be situated on the OCS in waters ranging in depth from 114 to 203 ft (35 to 62 m) and located approximately 30.5 mi (49.1 km) east of Montauk, New York and 16.7 mi (26.8 km) from Block Island, Rhode Island (COP, Appendix G1; Sunrise Wind 2021). Various fish, crustaceans, and other zooplankton are available in this offshore area as prey for diving birds at different depths, including the benthos. A total of 83 marine bird species are known to regularly occur off the eastern seaboard of the United States (Nisbet 2013). The diversity of marine bird species that use the Project Area and surrounding region is due in part to its location within the Mid-Atlantic Bight, a region where species that breed in both the Northern and Southern Hemispheres overlap (BOEM 2022). Bird groups expected to use deeper offshore waters within the GAA at least seasonally or year-round include loons, shearwaters, fulmars, storm-petrels, gannets, sea ducks, jaegers, gulls, terns, and alcids (COP, Appendix P; Sunrise Wind 2021).

The SRWEC-OCS is located within federal offshore waters of the OCS where a variety of marine birds and/or non-marine migratory bird species are expected to be comparable to those described for the SRWF. Birds known to occur near NYS waters include terns, gulls, cormorants, and shorebirds during summer and sea ducks, dabbling ducks, loons, grebes, alcids, and migrating passerines during spring and summer migrations and winter. Other more pelagic species that could occur include the Cory's shearwater (*Calonectris borealis*), northern gannet (*Morus bassanus*), and black-legged kittiwake (*Rissa tridactyla*) (Sunrise Wind 2022).

3.5.3.1.3 Endangered Species Act-Listed Species

Species that are federally designated as Threatened or Endangered under the ESA and that may occur in any portion of the Project Area include the piping plover (threatened), rufa red knot (*Calidris canutus rufa*; threatened), and roseate tern (*Sterna dougallii*; endangered). The black-capped petrel (*Pterodroma hasitata*) has been proposed for listing and could potentially occur in the region; however, this species is generally associated with waters deeper than the nearshore waters utilized by the three currently listed species (USFWS 2019).

No ESA-defined critical habitat is currently designated for ESA-listed birds in or near the Project Area. Critical habitat for the rufa red knot has been proposed and encompasses 649,066 ac (2626.7 km^2) from Massachusetts to Texas. The portion of proposed critical habitat near the Project Area is on southern Long Island and includes 1,001 ac (4.05 km^2) in Moriches Inlet, Sussex County; 1,821 ac (7.37 km^2) in Jones Inlet, Nassau County; and 5,458 ac (22.09 km^2) in Jamaica Bay, Queens County (USFWS 2021b).

Piping Plover: Piping plovers nest on sandy beaches near the Project Area and pass through the region during spring and fall migrations. They are present in the region from March to September and nest on beaches on Long Island from April through August (NYSDEC 2017). Results of the 2018 Long Island colonial waterbird surveys found 82 active piping plover breeding sites and 404 breeding pairs along the coast and barrier islands (Jennings 2018). Fire Island at Smith Point County Park had 25 breeding pairs of piping plover in 2018 (Jennings 2018). Piping plover nests have been documented within the Great South Bay area (NYSERDA 2017b). Although offshore flights of piping plovers are believed to be infrequent, telemetry data indicate that the potential exists for this species to infrequently fly over the SRWF (COP, Appendix P; Sunrise Wind 2021).

Rufa Red Knot: This shorebird undertakes long distance migratory flights (up to 5,000 mi [8,000 km]; Baker 2013) between breeding grounds in the Arctic and wintering grounds in the southeastern United States, Caribbean, northern Brazil, and Argentina (Tierra del Fuego) (Baker 2013). The red knot may be present along the United States East Coast, including New York, Rhode Island, and Massachusetts, during spring and fall migratory periods (NYSERDA 2017a); the rufa subspecies' primary stopover during spring migration is Delaware Bay (Niles 2009). Red knots may stopover to forage in salt meadows and mudflats of the South Shore of Long Island (NYSDEC 2014) and may stopover to forage in intertidal areas and roost on beach habitats near the landfall/ICW work area at Smith Point. While primarily a terrestrial or coastal migrant, telemetry data indicate that the potential exists for this species to infrequently fly over the SRWF (COP, Appendix P; Sunrise Wind 2021).

Roseate Tern: This species of seabird breeds in colonies on coastal islands of the northeastern Atlantic coast and Atlantic Canada and winters in South America (Gochfeld 2020; USFWS 2010). Roseate terns migrate through the Project Area region on their way to coastal breeding sites in New England and Atlantic Canada and breed on small islands as far south as Long Island (NYSDEC 2022b). Ninety percent of the roseate tern population breeds in the Cape Cod-Long Island area (within 150 nm of the Fire Island landing site) on rocky coastal islands, outer beaches, or salt marsh islands with protective vegetation to conceal nests (USFWS 2001; Veit 1993). On Long Island, most breeding pairs nest on Great Gull Island (Jennings 2018; NYSDEC 2014; NYSERDA 2017a), which is located off the eastern end of the North Fork of Long Island (approximately 50 mi from the Fire Island landing site). Results of the 2018 Long Island colonial seabird surveys found over 2,000 roseate tern breeding pairs on Great Gull Island (Jennings 2018), approximately 48 mi (77 km) east-northeast of Smith Point Park. Roseate terns have historically nested along the barrier beach at FINS (NYSERDA 2017a) and potentially in the vicinity of the cable landfall location at Smith Point County Park (NPS 2018; Peters 2008), and they may forage over shallow waters or loaf in the area. Fire Island Inlet, approximately 25 mi (40 km) west-southwest of Smith Point County Park, has also provided important foraging habitat (Peters 2008). Roseate terns may be found offshore, but occurrence, frequency and number of roseate terns would be expected to be relatively low there (COP, Appendix P; Sunrise Wind 2021).

3.5.3.1.4 Non-ESA-Listed Species

Several other birds that are not federally listed but are designated by individual states as threatened, endangered, or otherwise vulnerable are likely to occur in the Project Area. State-listed bird species documented or potentially present in the offshore SRWF and SRWEC-OCS/SRWEC-NYS cable routes and onshore facilities include the state threatened northern harrier, bald eagle (*Haliaeetus leucocephalus*), least tern, and common tern (Table 5, Stantec 2018a). Bald eagles were delisted from their endangered ESA status in August 2007 but are still federally protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act (MBTA). Suitable bald eagle habitat on Long Island is limited near onshore Project components (Stantec 2018a), and no bald eagle nests have been recorded.

3.5.3.2 Impact Level Definitions for Birds

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on birds from the alternatives, including the Proposed Action. Table 3.5.3-1 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for birds. Table G-7 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to birds. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project.

Table 3.5.3-1. Definition of Potential Adverse and Beneficial Impact Levels for Birds

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Impacts on individual birds and/or their habitat, if any, would be at the lowest levels of detection and barely measurable, with no perceptible consequences to individuals or the population.	Impacts on individual birds and/or their habitat would be beneficial but at the lowest levels of detection and barely measurable.
Minor	Impacts on birds are detectable and measurable but are low-intensity, highly localized, and short-term in duration. Impacts on individuals and/or their habitat do not lead to population-level effects.	Impacts on individual birds and/or their habitat are detectable and measurable. The effects are likely to benefit individuals, be localized, and/or be short-term and are unlikely to lead to population-level effects.
Moderate	Impacts on birds and/or their habitat are detectable and measurable; they are of medium intensity, can be short- or long-term, and can be localized or extensive. Impacts on individuals and/or their habitat could have population-level effects, but the population can sufficiently recover from the impacts or enough habitat remains functional to maintain the viability of the species both locally and throughout their range.	Impacts on individual birds and/or their habitat are detectable and measurable. These benefits may affect large areas of habitat, be long-term, and/or affect a large number of individuals and may lead to a detectable increase in populations but is not expected to improve the overall viability or recovery of affected species or population.
Major	Impacts on individual birds and/or their habitat detectable and measurable; they are of severe intensity, can be long-lasting or permanent, and are extensive. Impacts to individuals and/or their habitat would have severe population-level effects and compromise the viability of the species.	Impacts on individual birds and/or their habitat are detectable and measurable. These impacts on habitat may be short-term, long-term, or permanent and would promote the viability of the affected species/population and/or increase the affected species/population levels.

3.5.3.3 Impacts of Alternative A - No Action on 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, as described in Appendix E.

3.5.3.3.1 *Impacts of the No Action Alternative*

Under the No Action Alternative, baseline conditions for birds described in Section 3.5.3, Affected environment would continue to follow current regional trends and respond to IPFs introduced by ongoing non-offshore wind and offshore wind activities. Ongoing non-offshore wind activities within the GAA that contribute to impacts to birds are generally associated with onshore and offshore construction and climate change. Onshore construction activities and associated impacts are expected to continue along current trends and have the potential to affect bird species through short-term and permanent habitat removal and noise impacts that could cause avoidance behavior and displacement. Bird strikes will continue to be an additional risk associated with ongoing wind projects. Mortality of individual birds is likely to occur, but population level effects are not 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 birds include:

- Continued O&M of the Block Island project (5 WTGs) installed in State waters
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect birds through the primary IPFs of noise, presence of structures, and land disturbance. Ongoing offshore wind activities would have the same type of impacts from noise, presence of structures, and land disturbance that are described in detail in following section for planned offshore wind activities but the impacts would be of lower intensity.

3.5.3.3.2 *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 Proposed Action).

Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on birds through the primary IPFs of noise, presence of structures, land disturbance, and bird strike. The construction, O&M, and 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. Other future non-Project activities other than offshore wind development activities that may affect birds include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities).

A general description of the IPFs that could occur in the GAA from future planned offshore wind development activities is provided in the following section.

Seafloor disturbance/Sediment suspension and deposition: Localized, short term seabed disturbance and associated increased suspended sedimentation could occur during construction of future planned wind farm cables (see Appendix E). Elliott (2017) monitored TSS levels during construction of the BIWF.

The observed TSS levels were far lower than levels predicted by the reference model, dissipating to baseline levels less than 50 ft (15.2 m) from the disturbance. Both the modeled TSS effects, which are conservatively high, and the observed TSS effects were short term and within the range of baseline variability; however, these effects would be short-term (lasting only a few tide cycles) due to the low mobility of sediments (primarily sand) in cable and foundation installation areas (Stantec, 2020). Disturbed seafloor from construction of future offshore wind projects may affect diving birds' foraging success due to reduced visibility from suspended sediments or may affect some prey species (e.g., benthic assemblages), although impacts to prey in the Project Area vicinity are expected to be short term and local. Forage fish may become less visible for diving birds and benthic organisms (e.g., mollusks) may be less visible for diving sea ducks. Suspended sediment concentrations during activities other than dredging would, however, remain within 9.8-ft (3-m) of the seabed, and turbidity levels would return to ambient levels in less than 1 hour (see Appendix H). Birds would be able to successfully forage in adjacent areas and would not be expected to be affected by increased suspended sediments. Therefore, impacts would be minor, and no population-level effects on birds would occur.

Noise: Construction noise (i.e., pile-driving) from 29 projected offshore wind projects anticipated between 2022 to 2030 (Bennun 2021) along with G&G surveys and vessel traffic could increase underwater and airborne noise levels. Preliminary studies on bird behavior indicated that seabirds may exhibit avoidance behaviors in response to underwater noises (Hansen 2020). Underwater noise may cause behavioral changes in some diving or swimming birds, ranging from mild annoyance to escape behavior, which could affect foraging in feeding habitats adjacent to foundation piles (BOEM 2014; BOEM 2016). Potential impacts could be greater if avoidance and displacement of birds occurred during staging, when birds are concentrated in large numbers to rest and feed prior to seasonal migrations. Because seabirds have the ability to leave the water, it is expected that increased noise levels would cause avoidance behavior that is likely to prevent birds from experiencing PTS or TTS from underwater construction noise associated with G&G and pile-driving activities, and any impacts would be short-term and minor.

Approaching vessel noise could temporarily disturb some individual diving birds, but they would be expected to acclimate to the noise or move away, potentially resulting in short term displacement. Collectively, these noise sources would be short term and localized and result in a minor impact to these birds.

Low-flying aircraft (i.e., rotary-winged [helicopters]/fixed-winged) generate noise from engines, airframe, and propellers. The dominant tones for these types of aircraft are generally below 500 Hz (BOEM 2022) and within the airborne auditory range of birds. Rotary-winged/fixed-wing aircraft may cause birds in flight or on the sea surface to flush, resulting in increased energy expenditure. Disturbance to birds would be short term and localized with impacts dissipating once the aircraft departs the area. Birds may return to relaxed behavior within 5 minutes of the overflight (Komenda-Zehnder 2003); however, birds can be disturbed up to 0.6 mi (1.0 km) away from an aircraft (Efroymson 2000). No population-level effects to birds would be expected.

Accidental releases - contaminants: Accidental discharges and releases of oil, fuel, or other hazardous materials could directly and indirectly affect birds. Toxin ingestion has the potential to result in lethal and sublethal impacts on birds, including decreased hematological function, dehydration, drowning, hypothermia, starvation, and weight loss (Briggs 1997; Haney 2017; Paruk 2016). Indirect effects of the oiling of feathers can lead to sublethal effects, such as changes in flight efficiencies, resulting in increased energy expenditure during daily and seasonal activities, including chick provisioning, commuting, courtship, foraging, long-distance migration, predator evasion, and territory defense (Maggini 2017). The likelihood of adverse population-level impacts on birds from accidental releases of hazardous materials from future activities on the OCS is considered by BOEM to be low. Current regulations and requirements imposed on federally approved activities prohibit vessels from dumping potentially harmful debris, require measures to avoid and minimize spills of toxic materials, and provide mechanisms for spill reporting and response. Based on these factors, accidental releases and discharges from federally approved activities on the OCS are not expected to appreciably contribute to adverse bird impacts, and, therefore, the effects of the No Action Alternative would be negligible to birds.

Accidental releases - trash and debris: Accidental disposal of trash and debris (plastics, paper, wood, glass, and/or metal) into water represents a risk factor to birds as they could potentially ingest or become entangled in debris. Ingestion of trash can negatively impact foraging and the ability to fly, which would ultimately reduce survival ability (Kühn 2015). Ingestion and inhalation of macro- and microplastics can indirectly affect birds by causing obstruction of the gastrointestinal tract and resulting in mortality. In addition, it can interfere with flight and foraging as well as reduced fitness due to the plastics acting as a vector for other contaminants such as PCBs or plastic-derived additives (Teuten 2009; Tanaka 2013; Yamashita 2011; Roman 2019; Wang 2021). Expected compliance with USCG vessel regulations would minimize exposure to trash or other debris. Therefore, accidental trash releases from offshore construction and maintenance vessels would be rare, and, therefore, the effects of the No Action Alternative would be negligible.

Traffic: Traffic associated with the construction of onshore transmission and interconnection cables, operations and maintenance, and decommissioning for future offshore wind activities could also affect shorebirds, some seabirds, and land birds that use the terrestrial habitats in the immediate vicinity of construction activities. Traffic-related impacts would have short term, minor impacts on birds because construction would occur in already developed areas where birds are habituated to these types of activities. Therefore, the impacts associated with construction traffic would be comparable to existing sources of traffic in the local area.

In offshore areas, vessel, aircraft, and helicopter traffic could cause some birds, including loons, grebes, petrels, shearwaters, gannets, cormorants, sea ducks, terns, and skimmers to temporarily avoid the vicinity surrounding the WTGs and routes used by vessels and aircraft. Birds may collide with the vessels at night if vessels flush birds resting on the water; however, construction traffic would be short-term and similar to normal, non-wind farm-related traffic and is not likely to cause permanent displacement or a high risk of collision mortality.

Aircraft operating in association with future wind activities may pose a risk of collision with birds; however, general aviation traffic accounts for approximately 2 bird strikes per 100,000 flights (Dolbeer 2021). Because number of aircraft flights associated with offshore wind development are expected to be minimal in comparison to baseline conditions, aircraft strikes with birds are highly unlikely to occur. As such, aircraft traffic associated with future wind activities would not be expected to appreciably contribute to overall impacts on birds, and therefore would have negligible impact.

Lighting: Nighttime lighting associated with offshore structures and vessels could represent a source of attraction, particularly for nocturnally-migrating birds under certain low-visibility environmental conditions (reference – many standard ones). As a result of this attraction, birds and bird flocks have the potential to become disoriented, “entrapped” into circling the light to the point of exhaustion or collide with operating WTGs and associated structures and vessels (Rebke 2019; USFWS [United States Fish and Wildlife Service] 2022). The WTGs and OCS-DC would have hazard and aviation obstruction lighting that would be incrementally added through 2030. Structure lighting may pose an increased collision or predation risk (Hüppop 2006); however, this risk would be localized in extent and minimized by BOEM lighting guidelines (BOEM 2019; Kerlinger 2010). Lighting for WTGs would consist of flashing red aircraft obstruction lighting, which has not been found to be a source of attraction for birds or their prey. Vessel lighting would result in short term and minor impacts to birds while construction is occurring, while WTG lighting could result in negligible to minor long-term impacts.

Presence of structures: The presence of infrastructure can lead to beneficial and adverse impacts on certain birds. Beneficial effects to some locally foraging diving seabirds or seaducks can occur from the reef effect and the associated increase in certain prey resources. Potential adverse impacts include increased risk of entanglement from gear loss and damage, migration disturbances, and displacement by or collision with WTGs. Similar impacts may arise from other project-associated infrastructures, such as buoys, met towers, foundations, scour and cable protections, and transmission cable infrastructure.

The primary impacts to bird resources expected from the presence of structures would be displacement and collision of migrating birds and flocks with the rotating turbine blades from operating WTGs. Behavioral reactions can include avoidance, resulting in functional habitat or energy loss and attraction, causing an increased risk of collisions with WTGs within the planned WEAs (BOEM 2019; Peschko 2020).

As discussed in BOEM (2012), at least 55 bird species could encounter operating WTGs on the Atlantic OCS. The abundance of bird species that overlap with the anticipated development of wind energy facilities on the Atlantic OCS, however, is relatively small as modeled 47 of those species by Winship (2018). The relative seasonal exposure is expected to be very low, ranging from 0 to 5.2 percent (see Table 3.4.3-2 in (BOEM 2021b).

With the proposed 1.15-by-1.15-mi (1.85-by-1.85-km) spacing between structures associated with future offshore wind development and the distribution of anticipated projects, only a small percentage of bird species migrating over the OCS are expected to encounter WTGs. The spacing between turbines would permit some birds to fly through individual lease areas without changing course or with only making minor course corrections to avoid operating WTGs (BOEM 2022). The additional travel distance would be a maximum of 5 nautical miles, which is a small distance in comparison to the distances traveled during most migrations. Loons, sea ducks, terns, and alcids are most likely to have high displacement ranks (COP, Appendix P; Sunrise Wind 2021); however, the relative density of birds in the OCS is low, and relatively few birds are likely to encounter wind turbines (BOEM 2021b). Displacement would be miniscule when compared with the overall daily distances traveled by migratory birds, and so is unlikely to cause displacement impacts to most individuals. The WEA is not within critical rest or feeding areas nor is it anticipated interfere with small proportion of birds' that fly through the area ability to reach these areas. Therefore, displacement impacts from future planned offshore wind activities would be long-term but minor, and no population-level effects would be expected.

In the contiguous United States, bird collisions with operating WTGs are believed to be relatively rare events, with one recent study estimating 140,000 to 328,000 (mean = 234,000) birds killed annually by 44,577 onshore turbines (Loss 2013); although collision fatality rate calculations for large commercial-scale WTGs have been limited by confounding variables including knowledge of scavenger rates and the difficulty in observing collisions and collecting specimens over a large area. Data collection for offshore WTG facilities can also be affected by variable carcass sinking rates and other limits to observing and collecting specimens at sea. A collision vulnerability model constructed for SRWF found that no offshore bird species had a high collision vulnerability score; all shearwaters and petrels, most gulls, and terns had a medium collision vulnerability score (COP, Appendix P; Sunrise Wind 2021). Given that a very small proportion of birds of all species would transit the WEA each year, that most birds would fly below the RSZ during the day or above the RSZ at night (COP, Appendix P; Sunrise Wind 2021), and the relative low density of birds in the OCS, few birds are likely to encounter wind turbines in the planned WEAs (BOEM 2021b). Collision impacts from future planned offshore wind activities would long-term but minor, and no population-level effects would be expected during turbine operations.

The addition of WTGs to the offshore environment could result in increased functional loss of habitat for those bird species with higher displacement sensitivity; however, open water habitat is not a limiting factor for bird species in the area and substantial foraging habitat for birds would remain available given that future wind farms are only expected to occur in a relatively small portion of the OCS (COP, Appendix P; Sunrise Wind 2021). Therefore, impacts to birds from habitat loss due to displacement would be minor, and no population-level impacts would occur.

In the Northeast and Mid-Atlantic Bight, fisheries observers and monitors documented 655 bycatch events of seabirds in 2015 and 2016 through interaction with commercial fishing gear each year. Of those, 94 percent were with gillnets and involved shearwaters, gulls, cormorants, gannets, murres, fulmars, and loons (Sigourney 2019). Localized increase in recreational fishery target species associated with construction of structures may result in increased use of the areas immediately around the WTGs for recreational fishing. Therefore, the addition of new WTGs could potentially increase the entanglement risk associated with fishing gear for some species, leading to various bird injuries and mortalities. Impacts from fishing gear would generally be localized; however, the risk of occurrence would continue if structures remained in place. WTGs and foundations could increase pelagic productivity in local areas (English 2017) with these new structures creating a reef effect habitat for structure-oriented and/or hardbottom prey species. As observed by English (2017) and Causon (2018), the reef effect habitat associated with WTGs has led to local increases in biomass and diversity within 1 or 2 years after construction, indicating that offshore wind farms can generate beneficial long-term impacts on local ecosystems, translating to increased foraging opportunities for some marine bird species. Therefore, the presence of structures may result in minor beneficial impacts for the duration of the future offshore wind projects (Degraer 2020).

3.5.3.3.3 Impacts of Alternative A on ESA-Listed Species

Based on the information contained in this document, BOEM anticipates that the reasonably foreseeable offshore wind activities are likely to result in rare cases of mortality for ESA-listed birds. Therefore, the effects from future wind projects are likely to adversely affect but not jeopardize the continued existence of piping plovers, rufa red knots, and roseate terns.

3.5.3.3.4 Conclusions

Impacts of the No Action Alternative

The proposed Project would not be built under the No Action Alternative and hence would not itself have any adverse impacts on birds. BOEM expects ongoing activities, non-offshore wind and future offshore wind would have continuing short term and long-term impacts to bird species, including federally listed species. Wind and non-wind activities would introduce land disturbance, seafloor disturbance/sediment suspension and deposition, noise, traffic, accidental releases, lighting, and the presence of structures to the GAA (Appendix D), as well as alter existing bird habitat. The IPFs associated with existing and ongoing projects are not expected to significantly alter bird populations. BOEM anticipates that impacts to birds due to ongoing activities associated with the No Action Alternative would include **minor** adverse impacts as well as the potential for **minor beneficial** impacts.

Cumulative Impacts of the No Action Alternative

Considering all the IPFs from future offshore projects, including future offshore wind development, BOEM anticipates that the overall impacts associated with offshore wind activities in the GAA under the No Action Alternative would result in long-term **moderate** adverse impacts but could potentially include **minor beneficial** impacts because of the presence of structures. The majority of offshore structures in the GAA would be attributable to the 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 short term and would not be expected to be biologically significant.

3.5.3.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario for the Proposed Action; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts to birds:

- The new OnCS–DC and the routing of the onshore transmission cable
- The number of WTGs
- The size of the WTGs
- The time of year during which construction occurs

Variability of the proposed Project design exists as outlined in Appendix C. Below is a summary of potential variances in impacts:

- Changes to the OnCS–DC location and size and/or the routing location and length of the onshore transmission cable which could require the removal of trees and other natural habitat suitable for nesting, foraging, or roosting birds.
- The number of WTGs: a decrease in the number of WTGs would decrease the potential of collision mortality and displacement impacts to flying birds.

Season of construction: the activity and distribution of birds exhibit distinct seasonal changes. For instance, summer and fall months (generally May through October) constitute the most active season for birds in the Project Area, and the months of April and November coincide with major migration events. Therefore, construction during months in which birds are not present, not breeding, or less active would have a lesser impact on birds than construction during more active times.

3.5.3.5 Impacts of Alternative B - Proposed Action on Birds

The activities associated with offshore SRWF (94 11-MW WTGs out of 102 potential positions) and SRWEC-OCS/SRWEC-NYS cabling, and OnCS-DC, transmission cable, and interconnection cable with Alternative B include construction and installation, O&M, and decommissioning. These actions have the potential to cause both direct and indirect impacts to birds. The IPFs associated with construction and post construction O&M activities include land disturbance, seafloor disturbance/sediment suspension and deposition, noise, traffic, accidental releases, lighting, and the presence of structures. These IPFs are thoroughly discussed in the bird assessment prepared for this Project (COP, Appendix P; Sunrise Wind 2021). The conclusions of the bird assessment are presented in this section and include consideration of the Project’s mitigation and monitoring measures (Appendix H).

3.5.3.5.1 Construction and Installation

3.5.3.5.1.1 Onshore Activities and Facilities

Land disturbance: No physical impacts to beach habitats for avian foraging, breeding, and loafing and roosting areas are expected because installation for the SRWEC-NYS would occur under the beach; however, noise and human activity from installation of the cofferdam, from the landfall ICW/HDD in the sea-to-shore transition, and at beach work staging areas could result in short term, localized disturbance or displacement. The onshore SRWEC-NYS routes would be constructed within existing ROWs comprising predominantly developed land cover type (e.g., Homer 2015) with limited bird use, thus minimizing possible disturbances to land birds. Construction of the OnCS-DC, onshore transmission cable, and onshore interconnection cable is expected to result in removal of approximately 4.7 ac (0.019 km^2) of developed land and 2.3 ac (0.009 km^2) of permanent tree clearing resulting in negligible impacts to bird habitats. During the breeding season, clearing of trees or vegetation could result in destruction eggs and nestlings, thus adversely impacting some individuals; however, lasting impacts to local breeding populations are not anticipated since the eliminated habitat is small when compared to the available breeding habitat in the outside of the project footprint. The Project would perform pre-construction surveys for raptor nests, wading bird colonies, seabird nests, and shorebird nests during nesting periods to avoid impacts to the extent practicable. Where possible, trees and vegetation would be cut during winter months when most migratory birds are not present. Overall, land disturbance from construction and installation is expected to result in minor, short-term impacts to birds.

Seafloor disturbance/Sediment suspension and deposition: At the sea-to-shore transition, HDD would minimize potential construction impacts of seafloor disturbance and sediment suspension and disposition on the intertidal community of foreshore, backshore, dune, and interdunal area near the Fire Island landing site (Sunrise Wind 2022). No long-term changes in intertidal habitat community structure or prey availability (i.e., invertebrates, small crustaceans, bivalve mollusks, small polychaete worms, insects, and talitrid amphipods) are expected (see Section 3.5.5.5). Any increase in turbidity and sedimentation would be short term, localized, and minor, resulting in no lasting physical changes to coastal areas or beaches and result in negligible impacts to birds.

Noise: Noise associated with construction of the onshore transmission cable and interconnection cable could affect shorebirds, some seabirds, and land birds that use the terrestrial habitats in the immediate vicinity of construction activities. Noise-related impacts would have short term, minor impacts on these birds because construction would occur in already developed areas where birds are habituated to these types of activities. Therefore, the impacts associated with construction noise would be like existing sources of noise in the local area.

Noise from installation of the cofferdam and from HDD in the sea-to-shore transition and activities at beach work areas could result in short term, localized disturbance or displacement of listed threatened and endangered bird species. The piping plover and roseate tern could nest and/or forage in or near the area impacted during construction; both species have historically nested on Fire Island (NYSERDA 2017a; NPS 2018; Peters 2008). The migratory rufa red knot could forage near the landfall site and onshore SRWEC routes. The potential for impacts to these species was considered during the Project siting process. To ensure avoidance of nesting habitat and to minimize the potential for impacts, the HDD work area was set back at least 650 ft (198 m) from the mean high-water line so that the entrance point would be in interior land areas and the exit point would be offshore beyond the intertidal zone. Additionally, construction activities are scheduled to occur outside of the roseate tern and piping plover breeding periods (i.e., April 1 through August 31), and rufa red knots are migratory and do not nest in the United States. Because construction work at the selected landing site would occur largely outside of the breeding period to the extent practical (per APM measures) of listed species that might nest in the area and because use of the small area of shoreline by shorebirds at the landing sites would be minimal (Stantec 2018a), onshore impacts for listed species from noise and construction activity would be negligible to minor and short term.

Traffic: Traffic associated with construction of the onshore transmission cable and interconnection cable could also affect shorebirds, some seabirds, and land birds that use the terrestrial habitats in the immediate vicinity of construction activities. Traffic-related impacts would have short term, minor impacts on these birds because construction would occur in already developed areas where birds are habituated to these types of activities and would be comparable to existing sources of traffic in the local area Therefore, the impacts associated with construction traffic would be minor and short term.

3.5.3.5.1.2 Offshore Activities and Facilities

Seafloor disturbance/Sediment suspension and deposition: Seafloor preparation for the construction of the WTG foundations, scour protection installations, and the subsea cable installations (SRWEC-OCS and SRWEC-NYS in federal and state waters) could result in short-term habitat disturbance through seafloor disturbance and sediment suspension and deposition. These construction activities may temporarily displace prey sources and/or reduce prey visibility for foraging birds (e.g., gannets, cormorants, sea ducks, terns, and gulls) (Fox 2019); however, impacts would be negligible to minor given the localized nature of these impacts and the abundance of surrounding foraging habitat.

Noise: Construction noise and vessel traffic could increase underwater and airborne noise levels. Preliminary studies on bird behavior have indicated that seabirds may exhibit avoidance behaviors in response to underwater noises (Hansen 2020). Underwater noise may force some diving bird species to flee from foraging or staging habitats adjacent to foundation piles causing short-term stress and behavioral changes ranging from mild annoyance to escape behavior (BOEM 2014; BOEM 2016). Potential impacts could be greater if avoidance and displacement of birds occurred during their seasonal migration periods. Because seabirds could leave the water, it is expected that increased noise levels would cause avoidance behavior that is likely to prevent birds from experiencing PTS or TTS from underwater construction noise associated with G&G and pile-driving activities. Approaching vessel noise could disturb some individual diving birds which would eventually acclimate to the noise or move away, potentially resulting in short term displacement. Collectively, these noise sources would be short term and localized, resulting in a minor impact to these birds.

Low-flying aircraft (i.e., rotary-winged [helicopters]/fixed-winged) generate noise from engines, airframe, and propellers. The dominant tones for these types of aircraft are generally below 500 Hz (BOEM 2022) and are within the airborne auditory range of birds. Rotary-winged/fixed-wing aircraft noise may cause birds in flight or on the sea surface to flush, resulting in increased energy expenditure. Disturbance to birds would be short term and localized with impacts dissipating once the aircraft has departed the area. Birds may return to relaxed behavior within 5 minutes of the overflight (Komenda-Zehnder 2003); however, birds can be disturbed up to 0.6 mi (1.0 km) away from an aircraft (Efroymson 2000). The potential for bird collision decreases for aircraft flying at speeds greater than 93 miles per hour (mph) (150 km per hour) (Efroymson 2000). Approaching aircraft noise could disturb some individual diving birds which would eventually acclimate to the noise or move away, potentially resulting in short term displacement. No individual or population-level effects to birds would be expected. These noise source disturbances would be short term and localized, resulting in minor impact to these birds.

Accidental releases – contaminants, trash, and debris: Potential adverse impacts to birds from accidental contaminant discharges and releases (oil) or from improper disposal of trash and debris (macro/microplastics) during construction would be avoided or minimized with adherence to international (IMO MARPOL), federal (USCG, EPA, BOEM), state, and local regulations regarding disposal of solid and liquid wastes (see Section 3.1.6 in the COP; Sunrise Wind 2022), resulting in negligible to minor short-term impacts to birds.

Traffic: For offshore areas, vessel, aircraft, and helicopter traffic could cause some species of birds, including loons, grebes, petrels, shearwaters, gannets, cormorants, sea ducks, terns, skimmers, and migrant passerines, to temporarily avoid the area. Other species may be attracted to vessel traffic (e.g., gulls are attracted to fishing vessels). In some very rare cases, birds may collide with the vessels at night if vessels flush birds resting on the water; however, construction traffic would be short-term and similar to normal, non-wind farm-related traffic and is not likely to cause permanent displacement or a high risk of collision mortality.

Aircraft operating in association with future wind activities may pose a risk of collision with birds; however, general aviation traffic accounts for approximately 2 bird strikes per 100,000 flights (Dolbeer 2021). Because aircraft flights associated with offshore wind development are expected to be minimal in comparison to baseline conditions, aircraft strikes with birds are highly unlikely to occur. As such, aircraft traffic associated with offshore construction activities would not be expected to appreciably contribute to overall impacts on birds.

Vessel and aircraft traffic associated with construction and installation would result in minor, short-term impacts from behavioral disturbances from vessel and aircraft movement.

Lighting: Brightly illuminated offshore structures pose a risk to birds migrating at night (Rebke 2019; USFWS 2022). Birds can become disoriented by sources of artificial light (Zapata 2019; Sunrise Wind 2022). Lighting used during construction would be short term (two construction seasons) and limited to the minimum required for project safety to minimize potential impacts to wildlife. Construction vessels would use lighting technology that minimizes impacts on avian species to the extent practicable such as light shielding and downlights. WTGs would use radar-based ADLS aircraft obstruction lighting. The use of ADLS could result in a 99% reduction in operational time for WTG warning lights, and flashing red lights minimizes attraction of birds to WTGs in overcast conditions (Rebke 2019). Based on these factors, impacts to birds from lighting associated with construction would be negligible to minor.

3.5.3.5.2 Operations and Maintenance

3.5.3.5.2.1 Onshore Activities and Facilities

Land disturbance: The OnCS–DC is sited in an already developed area with minimal tree cover. Infrequent land disturbance during O&M is expected to be comparable to general commercial and industrial activities already occurring in the area. The applicant protection measures (APMs) outlined in Appendix H of this Draft EIS would be used to minimize impacts. Therefore, potential impacts associated with O&M are considered short-term and minor.

Noise: Infrequent sources of noise during O&M are expected to be comparable to general commercial and industrial activities already occurring in the area. Impacts to avian species anticipated during O&M of the OnCS–DC would be the introduction of new sounds associated with the synchronous condenser building. Anthropogenic sources of noise can have negative impacts on fitness and breeding success of land birds (Kleist 2018). The APMs outlined in the EIS Appendix H would be used to minimize noise impacts. Therefore, potential impacts associated with O&M are considered short-term and minor.

Accidental Releases – contaminants, trash, and debris: Short-term, routine, and non-routine maintenance activities of the OnCS–DC and onshore transmission cable and interconnection cable may result in accidental discharges and releases; however, any long-term risks would be minor and mitigated through implementation of the spill prevention and control measures and associated BMPs.

Traffic: Infrequent routine and non-routine maintenance traffic during O&M are expected to be comparable to general commercial and industrial activities already occurring in the area. The APMs outlined in the EIS Appendix H would be used to minimize impacts. Therefore, potential impacts associated with O&M are considered short-term and minor.

Lighting: Infrequent nighttime lighting during O&M are expected to be comparable to general commercial and industrial activities already occurring in the area (e.g., commercial shipping and fishing vessels, operating wind farms). The APMs outlined in the EIS Appendix H would be used to minimize impacts. Therefore, potential impacts associated with O&M are considered short-term and minor.

3.5.3.5.2.2 Offshore Activities and Facilities

Seafloor disturbance/Sediment suspension and deposition: Seafloor disturbance and sediment suspension and deposition during O&M would primarily result from vessel anchoring, jack-up, and any maintenance activities that would require exposing and reburying the IAC. These activities are expected to be non-routine events; they are not expected to occur with any regularity. It is likely that pelagic and mobile benthic prey species present near the SRWF during any maintenance activities would temporarily avoid the area in which activities are occurring, and zooplankton species may face localized, short-term displacement. However, any alterations to marine bird prey distributions are expected to occur over a small scale and a short period. Therefore, the potential impacts to birds from seafloor disturbance/sediment suspension and deposition during O&M would be negligible.

Noise: Low-flying aircraft (i.e., rotary-winged [helicopters]/fixed-winged) generate noise from engines, airframe, and propellers. The dominant tones for these types of aircraft are generally below 500 Hz (BOEM 2022) and within the airborne auditory range of birds. During the O&M phase of the Proposed Action, rotary-winged/fixed-wing aircraft may cause birds in flight or on the sea surface to flush, resulting in increased energy expenditure. Disturbance to birds would be short term and localized with impacts dissipating once the aircraft departs. Birds may return to relaxed behavior within 5 minutes of the overflight (Komenda-Zehnder 2003); however, birds can be disturbed up to 0.6 mi (1.0 km) from an aircraft (Efroymson 2000). The potential for bird collision decreases for aircraft flying at speeds greater than 93 miles per hour (mph) (150 km per hour) (Efroymson 2000). Aircraft noise could disturb some individual diving birds which would eventually acclimate to the noise or move away, potentially resulting in short term displacement. These noise source disturbances would be short term and localized, with no population-level effects expected, resulting in minor impact to these birds.

Accidental releases – contaminants, trash, and debris: Accidental discharges and releases of contaminants (oil) and trash and debris (macro/microplastics) are expected to generally be like other offshore construction and installation resulting in negligible to minor short-term impacts with implementation of APMs outlined in Appendix H of this Draft EIS.

Traffic: Vessel and aircraft used during O&M are expected to generally be similar to those used during offshore construction and installation, with similar levels of vessel traffic per year, resulting in negligible implementation of APMs outlined in EIS Appendix H.

Lighting: The WTGs and OCS-DC are required by the FAA to have aviation hazard navigation lights for the duration of the Project. Red flashing aviation obstruction lights are commonly used for this purpose at land-based wind facilities without observed increase in avian mortality compared with unlit turbine towers (Kerlinger 2010). Construction vessels would use lighting technology that minimizes impacts on avian species to the extent practicable such as light shielding and downlights. WTGs would use radar-based ADLS aircraft obstruction lighting. The use of ADLS could result in a 99% reduction in operational time for WTG warning lights, and flashing red lights minimizes attraction of birds to WTGs in overcast conditions (Rebke et al. 2019). The impact of the Proposed Action alone would not noticeably increase the impacts of light beyond those described under the No Action Alternative. In the context of existing conditions and reasonably foreseeable future activities, lighting from the Proposed Action during O&M is expected to have only non-measurable negligible impacts, if any, to individuals or populations would be expected.

Presence of structures: During the O&M period, the primary impact expected for various avian species would be colliding with, or avoiding, turbine blades within the RSZ at the SRWF during migration. Marine birds with relatively greater exposure to the SRWF (i.e., greater than land birds and coastal birds) were included in the SRWF vulnerability model (COP, Appendix P; Sunrise Wind 2021). Species with high population vulnerability scores (more vulnerability) include one species of sea duck, three species of tern, two species of gull, and two alcid species; however, the density of bird species with high collision sensitivity is low within the offshore portion of the Project Area during all seasons (see Figure 13 in COP,

Appendix P; Sunrise Wind 2021), and risk of collision would be reduced with implementation of APMs outlined in the EIS Appendix H (The MDAT density maps for these 38 species are available in the COP, Appendix P; Sunrise Wind 2021). COP, Appendix P, Table 2-14; Sunrise Wind (2021) presents the final vulnerability scores for those species groups as well as seasons of risk. Federally and state-listed bird species may be at risk of collision during offshore construction/installation although risk of collision is considered low because these species are expected to infrequently occur over the SRWF (Stantec 2018).

Species within the groups of loons and grebes, sea ducks, terns, and alcids had high displacement vulnerability scores (COP, Table 2.14; Sunrise Wind 2022). Displacement impacts are low for most other seabirds. Overall avian impacts would be minor because of the overall small area affected and the low number of birds affected within the entire OCS. Generally, the relative abundance of bird species that are most sensitive to displacement is low within the offshore portion of the Project Area, including several miles/kilometers outside the wind farm area during all seasons (see Figure 1-3 in COP, Appendix P, Sunrise Wind 2021).

In the Northeast and Mid-Atlantic Bight, fisheries observers and monitors have documented several hundred seabird bycatch events through interaction with commercial fishing gear in previous years, mainly with gillnets (Sigourney 2019). Localized increase in recreational fishery target species associated with of the presence structures may result in increased use of the areas immediately around the WTGs for recreational fishing. Therefore, the addition of new WTGs could potentially increase the entanglement risk associated with recreational fishing gear, leading to various bird injuries and mortalities. Impacts from fishing gear would generally be localized; however, the risk of occurrence would continue as long as structures remain in place.

WTGs and foundations could increase pelagic productivity in local areas (English 2017) with these new structures creating a reef effect habitat for structure-oriented and/or hardbottom prey species. As observed by English (2017) and Causon (2018), the reef effect habitat associated with WTGs (in Europe?) has led to local increases in biomass and diversity within 1 or 2 years after construction, indicating that offshore wind farms can generate increased foraging opportunities for some marine bird species. Therefore, the presence of proposed Project structures may result in minor beneficial impacts as long as they are present (Degraer 2020).

Long-term adverse impacts would be negligible to minor, depending on whether birds are at high risk for displacement, can access preferred habitat, or are at risk of entanglement. The reef effect associated with the WTG foundation and rock armoring would result in minor long-term beneficial impacts for some species.

3.5.3.5.3 Conceptual Decommissioning

Decommissioning would employ many of the same procedures and equipment used during construction. Hence, as in the construction phase, avoidance through scheduling and minimization by operational and abatement controls would also generally apply here.

The types of impacts to birds from conceptual decommissioning of the offshore SRWF and SRWEC-OCS would be similar to those described for the construction/installation phase. However, we anticipate that the overall level of impacts would be lower because pile-driving activities would not occur, and some structures and materials may be left in place such as scour protection and cable armoring.

3.5.3.5.3.1 Onshore Activities and Facilities

Noise: Noise would be a primary IPF during onshore decommissioning activities. Noise impacts to birds would be the same as or less than those described for onshore construction activities since the intensity and duration of potential impacts would likely be reduced from those discussed in the construction section because some materials and structures, including scour armoring and cables, may be left in place during decommissioning. Impacts to birds would be minor and short-term during decommissioning.

Traffic: Traffic would be a primary IPF during this activity. Traffic impacts to birds would be the same as or less than those described for construction activities because the intensity and duration of potential impacts would likely be reduced from those discussed in the construction section because some materials and structures, including scour armoring and cables, may be left in place. Impacts to birds would be minor and short-term during decommissioning.

Onshore impacts from land disturbance, seafloor disturbance, and suspended sediments to birds would be the similar to or of lower impact as those previously discussed for the onshore construction and installation.

3.5.3.5.3.2 Offshore Activities and Facilities

Noise: Noise would be the primary IPF associated with offshore decommissioning activities. If vessels are present for an extended time-period, they may provide beneficial roosting and foraging opportunities for birds from light-attracted insects. Underwater noise and disturbance levels generated during conceptual decommissioning would be similar to those described above for construction with the exception that pile-driving would not be required. The monopiles would be cut below the bed surface for removal using a cable saw or abrasive waterjet. Noise levels produced by this type of cutting equipment are generally indistinguishable from engine noise generated by the associated construction vessel (Pangerc 2016). Therefore, this decommissioning equipment would have significantly lower potential for noise effects compared to those already considered for construction vessel noise. Noise impacts to birds would be same or less than those described for construction activities. Impacts for all remaining IPFs to birds would be similar to those discussed for construction. Impacts to birds would be short-term and minor during decommissioning.

Traffic: Types of vessels used and overall vessel traffic during conceptual decommissioning is expected to be comparable to those associated with construction and installation. The APMs outlined in the EIS Appendix H would be used to minimize impacts. Therefore, potential impacts associated with conceptual decommissioning is considered short-term and minor.

3.5.3.5.4 Cumulative Impacts of the Proposed Action

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 Proposed Action).

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on birds through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and 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. Other future non-Project activities other than offshore wind development activities that may affect birds include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities could result in short-term or permanent displacement and injury to or mortality of individual birds, but population-level effects would not be expected for most species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, the Proposed Action would contribute an incremental increase in effects from the primary IPFs for birds.

3.5.3.5.5 Impacts of Alternative B on ESA-Listed Species

Based on the information contained in this document, we anticipate that the Proposed Action is likely to result in rare cases of mortality for ESA-listed birds. Therefore, the effects from future wind projects are likely to adversely affect but not jeopardize the continued existence of piping plovers, rufa red knots, and roseate terns.

3.5.3.5.6 Conclusions

Impacts of the Proposed Project

Project construction and installation, O&M, and conceptual decommissioning would cause impacts from the following IPFs: land disturbance, seafloor disturbance/sediment suspension and deposition, noise, traffic, lighting, accidental releases (contaminants, trash, and debris), and the presence of structures. Compared to construction and installation activities, impacts from proposed O&M activities would be similar but would occur at a lesser extent but for the life of the WTGs. BOEM anticipates adverse impacts resulting from the Proposed Action alone would range from **negligible** to **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the presence of structures and underwater armoring. Overall, impacts to individual birds and/or their habitat would be detectable and measurable but would not lead to long-term or population-level effects.

Cumulative Impacts of the Proposed Project

In the context of existing conditions other reasonably foreseeable planned actions, the incremental impacts from the Proposed Action resulting from individual IPFs would range from **negligible** to **moderate** depending on the species depending on habitat or seasonal uses that vary by species. Considering all the IPFs, BOEM anticipates that the overall avian impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and offshore wind activities would result in **moderate** adverse impacts to birds because those impacts that are detectable and measurable would not lead to long-term or population-level effects. Potential **minor beneficial** impacts may result from the presence of structures.

3.5.3.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Under Alternative C-1, the same number of turbine positions (94 WTGs) under the Proposed Action may be approved by BOEM; however, 8 WTG positions from Priority Area 1 along the northern boundary of the lease area would be excluded from consideration (Figure 2.1.3-1). The WTG sites to be removed from Priority Area 1 were selected to maximize the largest contiguous complex habitat area feasible and/or to reduce the number of 11-MW WTGs located near presumed Atlantic cod spawning location(s). This alternative would not significantly alter the construction methods, O&M, or conceptual decommissioning. Alternative C-1 would not increase the impact level or likelihood of impacts for birds; therefore, Alternative C would be expected to have negligible to minor impacts on birds from construction and installation, O&M, and conceptual decommissioning activities.

3.5.3.6.1 Construction and Installation

3.5.3.6.1.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.3.6.1.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.3.6.2 Operations and Maintenance

3.5.3.6.2.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the O&M of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the O&M of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.3.6.2.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the O&M methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the O&M of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.3.6.3 Conceptual Decommissioning

3.5.3.6.3.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the conceptual decommissioning of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to conceptual decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.3.6.3.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the conceptual decommissioning methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the conceptual decommissioning of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.3.6.4 Cumulative Impacts of Alternative C-1

The cumulative impact analysis for Alternative C-1 considers the impacts of this alternative in combination with other planned non-offshore wind activities and planned offshore wind activities.

Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on birds through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and 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. Other future non-Project activities other than offshore wind development activities that may affect birds include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities could result in short-term or permanent displacement and injury to or mortality of individual birds, but population-level effects would not be expected for most species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, Alternative C-1 would contribute an incremental increase in effects from the primary IPFs for birds.

3.5.3.6.5 Impacts of Alternative C-1 on ESA-Listed Species

Based on the information contained in this document, we anticipate that Alternative C-1 for the SRWF Project is likely to adversely affect but not jeopardize the continued existence of piping plovers, rufa red knots, or roseate terns.

3.5.3.6.6 Conclusions

Impacts of Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for birds. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the Proposed Action (Alternative B). BOEM anticipates adverse impacts resulting from Alternative C-1 would range from **negligible** to **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the presence of structures and underwater armoring. Overall, impacts to individual birds and/or their habitat would be detectable and measurable but would not lead to long-term or population-level effects.

Cumulative Impacts of Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for birds. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action (Alternative B). BOEM anticipates that the overall avian impacts associated with Alternative C-1 when combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and offshore wind activities would result in **moderate** adverse and potential **minor beneficial** impacts to birds.

3.5.3.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

The primary effect of Alternative C-2 is the relocation of WTGs from priority areas to the eastern portion of the lease area. This proposed change would not significantly alter the construction methods, O&M, or conceptual decommissioning and would not result in additional impacts to birds other than those described under the Proposed Action (Alternative B).

3.5.3.7.1 Construction and Installation

3.5.3.7.1.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.3.7.1.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.3.7.2 Operations and Maintenance

3.5.3.7.2.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the O&M of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the O&M of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.3.7.2.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the O&M methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the O&M of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.3.7.3 Conceptual Decommissioning

3.5.3.7.3.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the conceptual decommissioning of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to conceptual decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.3.7.3.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the conceptual decommissioning methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the conceptual decommissioning of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.3.7.4 Cumulative Impacts of Alternative C-2

The cumulative impact analysis for Alternative C-2 considers the impacts of this alternative in combination with other planned non-offshore wind activities and planned offshore wind activities.

Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on birds through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and 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. Other future non-Project activities other than offshore wind development activities that may affect birds include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities could result in short-term or permanent displacement and injury to or mortality of individual birds, but population-level effects would not be expected for most species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, Alternative C-2 would contribute an incremental increase in effects from the primary IPFs for birds.

3.5.3.7.5 Impacts of Alternative C-2 on ESA-Listed Species

Based on the information contained in this document, it is anticipated that Alternative C-2 for the SRWF Project is likely to adversely affect but not jeopardize the continued existence piping plovers, rufa red knots, or roseate terns.

3.5.3.7.6 Conclusions

Impacts of Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for birds. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the Proposed Action (Alternative B). BOEM anticipates adverse impacts resulting from Alternative C-1 would range from **negligible** to **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the presence of structures and underwater armoring. Overall, impacts to individual birds and/or their habitat would be detectable and measurable but would not lead to long-term or population-level effects.

Cumulative Impacts of Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for birds. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the cumulative impacts of the Proposed Action (Alternative B). BOEM anticipates that the overall avian impacts associated with Alternative C-2 when combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and offshore wind activities would result in **moderate** adverse and potential **minor beneficial** impacts to birds.

3.5.3.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall negligible to minor adverse impacts and minor beneficial impacts on birds. Table 3.5.3-2 provides an overall summary of alternative impacts.

Table 3.5.3-2. Comparison of Alternative Impacts on Birds

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Birds	Negligible to minor adverse impacts from traffic, seafloor disturbance/sediment suspension and deposition, noise, lighting, and accidental releases (contaminants, trash, and debris). Minor adverse impacts from land disturbance. Negligible to minor adverse effects and minor beneficial indirect impact from the presence of structures.	Negligible to minor adverse impacts from traffic, seafloor disturbance/sediment suspension and deposition, noise, lighting, and accidental releases (contaminants, trash, and debris). Minor adverse impacts from land disturbance. Negligible to minor adverse effects and minor beneficial indirect impact from the presence of structures.	Negligible to minor adverse impacts from traffic, seafloor disturbance/sediment suspension and deposition, noise, lighting, and accidental releases (contaminants, trash, and debris). Minor adverse impacts from land disturbance. Negligible to minor adverse effects and minor beneficial indirect impact from the presence of structures.

3.5.3.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to birds.

3.5.4 Coastal Habitat and Fauna

This section describes the coastal habitats and fauna of the affected environment and potential impacts to these resources with respect to the Proposed Action, alternatives, and ongoing and planned activities in the geographic area of analysis in which effects would be evident or expected.

Coastal habitats in the Project area include those located within state waters (which extend 3 nautical miles [5.6 km] from the shoreline) and inland to the mainland, inclusive of bays, back-barrier lagoons, and/or marshes (USFWS 1997) that separate the barrier islands from the coastal mainland on the Long Island south shore. Onshore Project activities would occur in Smith Point County Park on Fire Island before crossing William Floyd Parkway and then the ICW via HDD to Smith Point Marina on the mainland. Smith Point County Park includes 825 acres at the eastern end of Fire Island, within the boundaries of the 19,580-acre, 26-mile long, Fire Island National Seashore, although it is not managed by NPS. Smith Point County Park is also east of and adjacent to the Otis Pike Fire Island High Dune Wilderness, which is the only federally designated wilderness in the State of New York.

Coastal habitats of the barrier islands and south shore include the foreshore, backshore, dunes, and interdunal areas. Habitats along the mainland transmission corridor range from salt marshes to freshwater marshes and from maritime forests to upland and wetland forests. These coastal habitats are important to numerous species of fauna, including mammals, birds, herpetofauna, and invertebrates that depend on these habitats for food, water, shelter, and reproduction. The geographic area of analysis for coastal habitats and fauna includes export cable landfalls, onshore export cable routes, the OnCS-DC, and the interconnection to the existing Holbrook Substation, from landfall at Fire Island to the Holbrook Substation (Figure D-6, Appendix D).

The affected environment and environmental consequences of Project activities that are within the GAA and extend into state waters (i.e., HDD for cable landfalls and cable laying within 1 mile [1.6 kilometers] of cable landfalls) are presented in Sections 3.5.2 *Benthic Resources*; 3.5.5 *Finfish, Invertebrates, and Essential Fish Habitat*; 3.5.6 *Marine Mammals*; 3.5.7 *Sea Turtles*; and 3.4.2 *Water Quality*. Additional information on birds, bats, and wetlands is presented in Section 3.5.3 *Birds*, Section 3.5.1 *Bats*, and Section 3.5.8, *Wetlands* respectively.

3.5.4.1 Description of the Affected Environment and Future Baseline Conditions

3.5.4.1.1 Regional Setting

Long Island is a detached segment of the relatively flat alluvial Atlantic Coastal Plain of the Atlantic coast of the United States that was subsequently covered by moraine deposits, glacial drift, and outwash materials from the most recent glaciation. The island slopes gradually southward from an elevation of roughly 200 ft (60 m) from rocky shores and cliffs on the north side of the island to sandy beaches, marshes, mudflats, and barrier islands on the south shore. Relatively rare pine barrens and the nation's only maritime dune grasslands occur on the mainland (Griffith 2010; Sohl 2002). Maritime beaches, dunes, and forests occur along the coastal mainland and the barrier islands.

The bays along the south shore have an average depth of 6.5 ft (1.9 m) (Wilson et al. 1991) and an average salinity of 25.9 parts per thousand (ppt) (Tanski et al. 2001), compared to approximately 35 ppt in seawater and 0.5 ppt in fresh water. Approximately 70 mi (112.7 km) of the south shore, from mean high tide on the ocean side of the barrier islands to the inland limits of the mainland watersheds, are designated as the South Shore Estuary Reserve (SSER Council 2021). The estuary includes 173 mi^2 (448.1 km^2) of shallow bays behind (landward of) the barrier islands and 19,000 ac (76.9 km^2) of vegetated tidal wetlands. The tidal marshes, mud and sand flats, SAV, and broad shallows of this estuarine environment support finfish, shellfish, waterfowl, and other wildlife in the South Shore Estuary Reserve.

Climate change affects these and other coastal habitats due to factors such as sea level rise, increases in the number of storms, and subsequent erosion and habitat loss. Climate change factors also accounted for the loss of approximately 3.4 million ac (13,682 km^2) of forested coastal wetlands across the north Atlantic coastal plain between 1996-2016 (White et al. 2021). A climate change assessment of Fire Island National Seashore (Ricci et al. 2020) predicted vulnerability of coastal habitats and fauna to climate change and found saltmarshes, maritime forests, freshwater ecosystems, and coastal herpetofauna to be the most vulnerable to loss, with little capacity to adapt to climate change. Coastal habitats are considered highly vulnerable to the impacts of climate change, including non-climate stressors such as coastal development (Farr et al. 2021).

3.5.4.1.2 Barrier Islands

Barrier island shorelines are continually reworked by waves and tidal action and can change on a daily, seasonal, or annual basis, especially in response to severe weather events. For example, in 2012, Hurricane Sandy's wave energy and storm surge resulted in the loss of an average of 54-percent volume in beaches and dunes across Fire Island, with more than 75 percent of the volume loss estimated near the ICW at Smith Point (USGS 2013). Island widths along the south shore typically vary between 984 ft and 2,625 ft (300 m and 800 m) in width. Fire Island, one of five barrier islands along the south shore of Long Island (Tanski et al. 2001), is the landfall site for the Project. Like other barrier islands, it migrates landward due to the transfer of sand from the ocean to the bay side (Nordstrom and Jackson 2005), and breaches and washovers can form platforms that support seagrass meadows.

Vegetation patterns on Fire Island, inclusive of the Otis Pike Fire Island High Dune Wilderness, coincide with gradients of tidal inundation, salinity, and wind across the island from ocean to bay side (GPI 2008). The beaches have four zones: nearshore bottom (submerged areas below mean low water (MLW) to 29.5 feet (9.0 m); foreshore (intertidal areas between MLW to the high tide zone); backshore (exposed sandflats above high tide line to dunes, but occasionally submerged during storms or exceptionally high tides); and dunes that parallel the shore (areas of wind-blown sand ridges or mounds above the highest tide line and exposed to wind action) (USFWS 1997). Dune ridges often parallel the shoreline, and extensive sand flats, interdunal swales, and tidal marshes are behind the dunes. Plant species commonly found seaward of the primary dune and on the foredune include American beach grass (*Ammophila breviligulata*), beach pea (*Lathyrus maritimus*), dusty miller (*Artemisia stelleriana*), seaside goldenrod (*Solidago sempervirens*), common saltwort (*Salsola kali*), seaside spurge (*Euphorbia polygonifolia*), and sea rocket (*Cakile edentula*). On the leeward side of the primary dune, less salt-tolerant woody vegetation such as beach plum (*Prunus maritima*), northern bayberry (*Myrica pensylvanica*), Virginia creeper (*Parthenocissus quinquefolia*), and poison ivy (*Rhus radicans*) are also present. Bearberry (*Arctostaphylos uva-ursi*) and beach-heather (*Hudsonia tomentosa*) may also be found in the swale or near secondary dunes. The federally threatened seabeach amaranth (*Amaranthus pumilus*) may also occur in the sandy beach portions of the action area.

Interdunal swales have freshwater inputs via groundwater and may be characterized by wetland species such as purple gerardia (*Agalinis purpurea*), sundews (*Drosera* spp.), large cranberry (*Vaccinium macrocarpon*), and highbush blueberry (*V. corymbosum*). Farther inland, bogs, maritime thickets/forest and salt marshes may be present. On Fire Island, highbush blueberry swamp shrub, northern interdunal cranberry swale, and reedgrass marsh (Klopfer et al. 2002) communities occur (Grossman et al. 1998). Plant species in the bogs include cranberry, highbush blueberry, swamp azalea, (*Rhododendron viscosum*), narrow leaved cattail (*Typha angustifolia)*, wool grass (*Scirpus cyperinus*), common reed *(Phragmites australis*), swamp maple (*Acer rubrum*), sour gum (*Nyssa sylvatica*), sphagnum moss (*Sphagnum* spp*.),* royal ferns (*Osmunda* spp.), marsh St. Johnswort (*Hypericum virginicum*), red chokeberry (*Pyrus arbutifolia*), inkberry (*Ilex glabra*), smartweed (*Polygonum* spp.), various species of sedge (*Carex* spp.), and rushes. Tidal marshes are present along the low energy bay side of Fire Island in broad overwash areas and common species include saltmarsh cord grass (*Spartina alterniflora*), salt-meadow cordgrass (*S. patens*) and coastal salt grass (*Distichlis spicata*), depending on the level of tidal inundation.

3.5.4.1.3 Mainland

Approximately 18 percent of the bay side of Long Island was bulkheaded by 2009 (Nordstrom et al. 2009), which increases shoreline erosion. Sediment supply is considered the greatest threat to bayside beaches (and is reduced by bulkheading and shoreline hardening, dredging for navigation access, and disposal of dredged material in uplands (Ricci et al. 2020). Developed land uses, primarily residential, have replaced or degraded much of the historical natural communities on the mainland. Residential and recreation and open lands make up 37 and 27 percent of the landcover, respectively, in the Town of Brookhaven, Suffolk County, where onshore Project facilities would be located (see Section 3.6.5 *Land Use* for further detail). Recreation and open land in the Town of Brookhaven include lands developed for recreation, such as Smith Point County Park and Southaven County Park. Wertheim National Wildlife Refuge (NWR) and Otis Pike Fire Island High Dune Wilderness within the Fire Island National Seashore Wilderness Area have very limited development. The Central Pine Barrens is a 105,000 acre (424.9 km^2) natural area created by the Long Island Pine Barrens Protection Act in 1993 and a prominent feature on the mainland and includes the headwaters for the Carmans River. Tidal marshes are present along the coast of the mainland and the estuarine portion of the Carmans River, while freshwater marshes and forested wetlands occur farther inland and along the upper reaches of the Carmans River. Tidal marshes are analyzed in Section 3.5.8 *Wetlands*.

3.5.4.1.4 Significant Natural Communities and Habitats

The geographic area of analysis for coastal habitats and fauna is within the state coastal area of New York, as described in the State of NY (1982), the Long Island Sound Coastal Management Programs (1999), and the SSER Comprehensive Management Plan (SSER Council 2021). The geographic area of analysis overlaps or is proximate to state and/or federal designations, including the NYSDEC CEA, Significant Coastal Fish and Wildlife Habitats (SCFWH), NYNHP Significant Natural Communities, Fire Island National Seashore and the Otis Pike Fire Island High Dune Wilderness, and the Central Pine Barrens, described below and mapped in Figure 4.4.1-2 of the COP (Sunrise Wind 2022).

3.5.4.1.5 Critical Environmental Areas (CEA)

A portion of the landfall/ICW work area intercepts the Coastal Zone Area South CEA on the mainland. The onshore transmission cable traverses the CEA for approximately 1 mi (1.6 km) along William Floyd Parkway from the ICW work area to Fawn Place and for approximately 0.7 mi (1.1 km) across the Carmans River. Onshore facilities in the CEA are located primarily within existing developed areas such as parking lots and paved roadways.

3.5.4.1.6 Significant Coastal Fish and Wildlife Habitats (SCFWH)

There are four NYSDOS-designated SCFWHs that are intercepted or directly adjacent to onshore transmission facilities. These are described below and corresponding locations with respect to onshore facilities are listed in Smith Point ***County Park***: The Smith Point County Park SCFWH is the location of the landfall/ICW work area on Fire Island. The SCFWH is one of the largest segments of undeveloped barrier beach on Long Island. It provides feeding and nesting habitat for several rare, threatened, or endangered (RTE) avian species and supports populations of RTE plant species such as seabeach amaranth (*Amaranthus pumilus*) and seabeach knotweed (*Polygonum glaucum*). Park recreational use is high during the summer months and disturbance by pedestrian and off-road vehicle traffic is common (NYSDEC 2008b).

- ***Great South Bay – East:*** This SCFWH includes the Great South Bay and ICW crossing from the landfall/ICW work area on Fire Island to the landfall/ICW work area on mainland, west of and including, the Smith Point Bridge. It is the largest protected, coastal bay in the state of New York, provides feeding and nesting habitat for several RTE avian species, and supports one of the largest concentrations of wintering waterfowl in New York State (NYSDEC 2008a).
- ***Moriches Bay – West:*** The Moriches Bay SCFWH is just east of the Smith Point Bridge. Like Great South Bay, it is a large, protected, bay and provides feeding and nesting habitat for numerous species of fish and shellfish, avian species, and rare plants (NYSDEC 2008c).
- ***Carmans River:*** The proposed transmission cable crosses approximately 70 ft (21 m) of the Carmans River. The Carmans River SCFWH is undeveloped and one of four major rivers on Long Island. Rare species include the eastern tiger salamander (*Ambystoma tigrinum*), eastern box turtle (*Terapene carolina*), sea-run brown trout (*Salmo trutta*), and wild brook trout (*Salvelinus fontinalis*) (NYSDEC 2008d). The Carmans River flows through the Wertheim NWR, located approximately 350 ft (106.7 m) downstream of the proposed crossing.

- Table 3.5.4-1. ***Smith Point County Park:*** The Smith Point County Park SCFWH is the location of the landfall/ICW work area on Fire Island. The SCFWH is one of the largest segments of undeveloped barrier beach on Long Island. It provides feeding and nesting habitat for several rare, threatened, or endangered (RTE) avian species and supports populations of RTE plant species such as seabeach amaranth (*Amaranthus pumilus*) and seabeach knotweed (*Polygonum glaucum*). Park recreational use is high during the summer months and disturbance by pedestrian and off-road vehicle traffic is common (NYSDEC 2008b).
- ***Great South Bay – East:*** This SCFWH includes the Great South Bay and ICW crossing from the landfall/ICW work area on Fire Island to the landfall/ICW work area on mainland, west of and including, the Smith Point Bridge. It is the largest protected, coastal bay in the state of New York, provides feeding and nesting habitat for several RTE avian species, and supports one of the largest concentrations of wintering waterfowl in New York State (NYSDEC 2008a).
- ***Moriches Bay – West:*** The Moriches Bay SCFWH is just east of the Smith Point Bridge. Like Great South Bay, it is a large, protected, bay and provides feeding and nesting habitat for numerous species of fish and shellfish, avian species, and rare plants (NYSDEC 2008c).
- **Carmans River:** The proposed transmission cable crosses approximately 70 ft (21 m) of the Carmans River. The Carmans River SCFWH is undeveloped and one of four major rivers on Long Island. Rare species include the eastern tiger salamander (*Ambystoma tigrinum*), eastern box turtle (*Terapene carolina*), sea-run brown trout (*Salmo trutta*), and wild brook trout (*Salvelinus fontinalis*) (NYSDEC 2008d). The Carmans River flows through the Wertheim NWR, located approximately 350 ft (106.7 m) downstream of the proposed crossing.

Table 3.5.4-1. Summary of SCFWH, NYNHP Natural Communities and CEAs Intercepted by Proposed Onshore Facilities

Onshore Facility	SCFWH	NYNHP Significant Natural Communities	CEA
Landfall/ICW Work Area (Fire Island and Mainland)	Smith Point County Park Moriches Bay - West (adjacent) Great South Bay – East	Maritime beach and maritime intertidal gravel/sand beach Marine eelgrass meadow (adjacent) Marine Back-barrier lagoon (adjacent)	Not present
Onshore Transmission Cable Route	SCFWH Moriches Bay (adjacent to ICW HDD location) Great South Bay-East (ICW HDD) Carmans River crossing	Red maple-blackgum swamp (Carmans River) (300 ft (91 m) downstream of Sunrise Highway)	CEA South at ICW HDD and associated work area at Carmans River crossing; includes Central Pine Barrens
Onshore Connector Station (Union Avenue)	None	None	None
Onshore Interconnection Cable Route	None	None	None

Source: Verified data as reported in Appendix L of the COP (Sunrise Wind 2022)

3.5.4.1.7 Significant Natural Communities

Five significant natural community types were identified by the NYNHP (see agency correspondence in Appendix C of Appendix L of the COP, Sunrise Wind 2022) as intercepted by or directly adjacent to the proposed onshore facilities. Although not intercepted, the Otis Pike Fire Island High Dune Wilderness within Fire Island National Seashore is adjacent to the west side of Smith Point County Park and included here.

- ***Maritime beach and maritime intertidal gravel/sand beach:*** These communities are part of a 32 mi (51.5 km) maritime community that is partially within the Smith Point County Park SCFWH on Fire Island where landfall of the transmission cable is planned. Maritime beaches occur on unstable sand, gravel, or cobble shores above MHWL, are continually modified by wave and wind action, and are sparsely vegetated with beach grass (NYSDEC 2008b; Edinger et al. 2014).
- ***Marine eelgrass meadow:*** Extensive eelgrass (*Zostera marina)* meadows are present in Narrow Bay between Smith Point County Park on Fire Island and Smith Point Marina on the mainland. The grass beds provide spawning and foraging habitat for mollusks, crustaceans, juvenile fish, and diving ducks and help stabilize sediments (NYSDEC 2008a; Edinger et al. 2014). Further discussion of SAV is provided in Section 3.5.5 (*Finfish, Invertebrates, and Essential Fish Habitat*).
- ***Marine back-barrier lagoon:*** A large marine back-barrier lagoon occurs in parts of Great South Bay and Moriches Bay near the landfall/ICW work area, surrounded by developed lands. The protected shores of the lagoons support grass beds, mudflats, and salt marshes.
- ***Red maple-blackgum swamp:*** Red maple (*Acer rubrum*)–blackgum swamp is present approximately 300 ft (91 m) south of the LIE Service Road along the eastern side of the Carmans River. Dominant species include black tupelo (*Nyssa sylvatica*) and red maple, along with understory species such as clammy azalea (*Rhododendron viscosum*) and coastal sweet pepperbush (*Clethra alnifolia*) (NYSDEC 2008d). Faunal information for this community is very limited (Edinger et al. 2014). Further discussion of this community type is presented in Section 3.5.8, *Wetlands and Other Waters of the United States*.
- **Otis Pike Fire Island High Dune Wilderness:** The Otis Pike Fire Island High Dune Wilderness is adjacent to Smith Point County Park on the west side of the park and is the only federally designated wilderness in the State of New York. The Wilderness is managed by NPS and stretches approximately 7 miles west from the Wilderness Visitor Center adjacent to Smith Point County Park, west to Watch Hill, and includes approximately 1,363 acres of the Fire Island National Seashore. The Wilderness area provides backcountry camping opportunities and hiking, fishing, birdwatching, and nature viewing.
- **Central Pine Barrens:** The Central Pine Barrens occur in central western Long Island and undeveloped stretches of the bay sides of barrier islands (Central Pine Barrens Joint Planning & Policy Commission 2022), including the Long Island south shore. These pine barrens represent the largest remnant of a forest community that once encompassed more than 250 million acres (over 1,011 km^2). Pine barrens are fire-dependent and characterized by the presence of pitch pine (*Pinus rigida)*, but may be pine-or oak- dominated, with different proportions of the same species such as black huckleberry (*Gaylussacia baccata*), Blue Ridge blueberry (*Vaccinium pallidum*), and bear oak (*Quercus ilicifolia*). These communities are particularly recognized for the number of moth and butterfly species that rely on plants such as bear oak for survival and/or reproduction (Davis et al. 2005).

Development is prohibited in the designated Central Pine Barrens Core Preservation Area, which includes approximately 52,500 ac (212 km^2) and approximately 47,500 acres (192 km^2) of the Compatible Growth Area, where development is permitted (Central Pine Barrens Joint Planning & Policy Commission 2022). The onshore transmission cable traverses the Core Preservation and Compatible Growth areas at and adjacent to the Carmans River crossing. The Central Pine Barrens Commission has identified mitigation measures for development within the Core Preservation Area. The Core Preservation Area is characterized by predominantly forested wetlands, including red maple-blackgum swamp and oak uplands. The Compatible Growth Area on either side of the Carmans River crossing is developed but includes scattered remnant pine barrens. The onshore transmission cable has been located to the greatest extent practicable within existing road ROWs within the compatible growth area but includes two crossings of remnant pine barrens, one at Sunrise Highway crossing west of William Floyd Parkway and the other at the LIRR crossing.

3.5.4.1.8 Coastal Fauna

The onshore facilities are located entirely within the SSER, which is home to approximately 120 species of marine and coastal finfish, hundreds of birds, and a wintering territory for small numbers of marine mammals (Lynch 2017). Migratory shorebirds use the beaches, marshes, and especially the intertidal flats of Fire Island as feeding grounds (GPI 2008), feeding on invertebrates in the tidal flats, salt marshes, and ocean beaches in the area and resting on beaches. The habitats in Moriches Bay near the inlet are recognized as one of the best and most consistent shorebird concentration areas on Long Island, primarily in the fall.

Shorebirds, waterfowl, and wading birds are the primary terrestrial species in this area other than the abundant deer and fox (GPI 2008). Birds likely to occur within or proximate to the onshore facilities are provided in Table 4.4.6-4 in the COP (Sunrise Wind 2022), based on the NYS Breeding Bird Atlas (2000–2005). Terrestrial birds such as songbirds occur and breed in a variety of upland and coastal habitats and are only present offshore during migration. Hawk species (e.g., ospreys, harriers) breed and forage in upland habitats and pass through the area during migration. Bald eagles (*Haliaeetus leucocephalus*), protected under the Bald and Golden Eagle Protection Act of 1940 (as amended in 1962; BGEPA) have a year-round presence in the region (NYSDEC 2008b), are present year-round in the region and have been slowly increasing in numbers over the last 30 years. Bald eagles have also returned to Long Island (NYSDEC 2008b).

Dunes on Fire Island are habitat to species such as red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), and whitetail deer (*Odocoileus virginianus*). Fire Island also supports a major breeding population of the state endangered eastern mud turtle (*Kinosternon subrubrum*), which inhabits a variety of wetland habitats including ponds and freshwater and brackish marshes (Gibbs et al. 2007) and is considered critically imperiled at this northern edge of its distribution. This species is found in only seven wetland complexes on Long Island and nearby islands and the population is declining in all but one (NYNHP 2013).

3.5.4.1.9 Federally Listed Rare, Threatened, and Endangered (RTE) Species and Designated Critical Habitat

The NYNHP lists known occurrences of several RTE plant species within the vicinity of the transmission cable corridor and other areas associated with onshore facilities (see agency correspondence in Appendix C of Appendix L of the COP, Sunrise Wind 2022). A USFWS IPaC query indicated known occurrences of two federally listed plant species in the vicinity of the onshore facilities. Table 3.5.4-2 is a list of the known RTE plant occurrences and potential habitat for those species associated with the onshore facilities. Red maple-blackgum swamp is present in Southaven County Park, within 0.2 mi (321.9 m) of the onshore transmission cable and is potential habitat for RTE plant species blunt-lobed grape fern (*Botrychium oneidense*), Collins' sedge (*Carex collinsii*), and water pigmy weed (*Crassula aquatica*), although the potential habitat is outside the proposed work areas and none of these species were found during field surveys. Similarly, potential habitat in a remnant pine barren was surveyed for sandplain wild flax (*Linum intercursum*), a species listed as threatened by NYSDEC and noted to occur proximate to the onshore transmission cable, was not found. However, incidental observations were made of two state-listed species and one rare species: state-threatened little ladies' tresses (*Spiranthes tuberosa*) and Stuve's bush-clover (*Lespedeza stuevei*), and sickle-leaved golden aster (*Pityopsis falcata*, listed as rare on the NYNHP Watch List), respectively.

Seabeach amaranth (federally threatened) may occur in the maritime beach community at the landfall/ICW work area where suitable habitat is present. There is a documented occurrence of the species approximately 1 mile from the onshore project components and seabeach amaranth may occur in the sandy beach portions of the action area. Field surveys noted that the extensive recreation use and associated impacts from pedestrian and vehicle traffic in this location substantially limit the likelihood of seabeach amaranth occurrences (Appendix L of the COP, Sunrise Wind 2022), however, areas fenced to protect plovers and terns would also provide potential habitat for seabeach amaranth. Potentially suitable habitat for sandplain gerardia is provided in the northern portion of the landfall/ICW work area on Fire Island within the maritime shrubland community north of the parking area. This community supports maritime grassland-associated species interspersed within sandy openings amongst patches of shrubs. Potential habitat for sandplain wild flax is provided in the maritime dune community within the landfall/ICW work area, particularly in the stable back dune areas. Potentially suitable habitat is available in the maritime shrubland community in areas noted above for sandplain gerardia.

The NYNHP identified an occurrence of hairy-necked tiger beetle (*Cincindela hirticollis*), a rare but unlisted species associated with sand beaches, near the landfall/ICW work area on Fire Island (see agency correspondence in Appendix C of Appendix L in the COP, Sunrise Wind 2022). A review of aerial imagery indicates that the ICW HDD work area contains exposed sandy areas and field surveys, noted the maritime dune community, provides potentially suitable habitat for hairy-necked tiger beetle. In addition, the NYNH identified two unlisted but rare fish occurrences within the Carmans River near the onshore transmission cable: eastern pirate perch (*Aphredoderus sayanus*) and Atlantic silverside (*Menidia menidia*). The river reportedly provides important nursey habitat for striped bass (*Morone saxatilis*) and spawning and nursey habitats for alewife (*Alosa pseudoharengus*), Atlantic menhaden (*Brevoortia tyrannus*), white perch (*Morone americana*), and Atlantic silverside (NYSDEC 2008d). Field surveys confirmed that aquatic habitats of Carmans River provide potentially suitable habitat for both these species (Appendix L of the COP, Sunrise Wind 2022). A USFWS IPaC database query did not indicate occurrences of federally listed fish or non-avian or bat wildlife species in or proximate to the onshore facilities. A query of the New York Nature Explorer database indicates that several other species of fish and non-avian wildlife are known to occur within the Town of Brookhaven (Appendix B of Appendix L of the COP, Sunrise Wind 2022). Several RTE species of moths and butterflies may also occur in the pine barrens (Davis et al. 2005), as noted earlier.

Table 3.5.4-2. RTE and NYS Watch List Plant Species Documented by NYSDEC, USFWS, or Field Surveys Potentially Intercepted or Occurring in the Vicinity of Proposed Onshore Facilities

Project Component	Species	State Listing	Federal Listing	Habitat Association	Approximate Location	Field Results
Landfall/ICW Work Area	Sandplain Gerardia[1] *Agalinis* acuta	Endangered	Endangered	Maritime grassland and shrubland	No location information provided	None observed within area[3]; potential habitat at landfall/ICW work area but outside of landfall and ICW work area
	Seabeach Amaranth[1] *Amaranthus pumilus*	Threatened	Threatened	Maritime beach	No location information provided	None observed[3] but documented one mile from work area and may occur in the action area; potential habitat at landfall/ICW work area but outside of landfall and ICW work area
Onshore Transmission Cable Work Area: LIE Service Road Route[4]	Blunt-lobed Grape Fern[2] Botrychium oneidense	Threatened	NL	Floodplain forest, red maple-blackgum swamp	Southaven County Park, within 0.2 mi (0.3 km) of onshore transmission cable; in wet soil under shrubs and vines in red maple swamp	None observed[3]; potential habitat in wetlands associated with Carmans River and Southaven County Park but outside of proposed work areas
	Collins' Sedge[2] Carex collinsii	Endangered	NL	red maple-blackgum swamp	Southaven County Park, within 0.2 mi (0.3 km) of onshore transmission cable; abandoned fish hatchery (part of Suffolk County Park) in a red maple-tupelo swamp	None observed[3]; potential habitat in wetlands associated with Carmans River and Southaven County Park but outside of proposed work areas
	Water Pigmyweed[2] *Crassula aquatica*	Endangered	NL	Freshwater intertidal mudflat, freshwater intertidal shore, and	Within 0.2 mi (0.3 km) of onshore transmission cable; Carmans River, west side immediately	None observed[3], potential habitat in Carmans River but outside of proposed work areas

Project Component	Species	State Listing	Federal Listing	Habitat Association	Approximate Location	Field Results
				freshwater tidal marsh	south of Montauk Highway; bank of an intertidal section of river at a road embankment	
	Sandplain Wild Flax[2] *Linum intercursum*	Threatened	NL	Maritime dunes, maritime grassland, maritime shrubland, and pitch pine-scrub oak barrens	Within 0.6 mi (1.0 km) of onshore transmission cable: Station Avenue roadside; plants are on a roadside along pine barrens with very sparse vegetation, dominated by grasses and legumes	None observed; minimal potential habitat; potentially suitable habitat associated with Revilo Avenue work area was surveyed but no sandplain wild flax specimens were observed
	Little Ladies' Tresses[4] *Spiranthes tuberosa*	Threatened	NL	Pitch Pine – Scrub Oak Barren	No location information provided	Observed in vicinity but outside proposed work area
	Stuve's Bush-clover[4] *Lespedeza stuevei*	Threatened	NL	Pitch Pine – Scrub Oak Barren	No location information provided	Observed in vicinity but outside proposed work area
	Sickle-leaved Golden Aster[4] *Pityopsis falcata*	Rare (Watch List)	NL	Pitch Pine – Scrub Oak Barren	No location information provided	Observed in vicinity but outside proposed work area

[1] Source: USFWS IPaC. Accessed March 11, 2020 and April 19, 2021, as reported in Appendix L of the COP (Sunrise Wind 2022).

[2] Source: NY NHP Correspondence, March 27, 2020 and April 15, 202, as reported in Appendix L of the COP (Sunrise Wind 2022).

[3] Field surveys for RTE plants evaluated the potential for suitable habitat within the onshore facilities and were not targeted surveys to determine potential presence/probable absence of species, as reported in Appendix L of the COP (Sunrise Wind 2022).

[4] Source: September 8, 2021 field survey, as reported in Appendix L of the COP (Sunrise Wind 2022).

3.5.4.1.10 Onshore Facilities

Coastal habitats associated with the landfall/ICW work areas on Fire Island include maritime beaches, dunes, and grasslands. The landfall/ICW work on Fire Island includes the work area in Smith Point County Park, the adjacent HDD conduit stringing area, and Smith Point Marina on the mainland.

Assembly would include welding and short-term placement of assembled HDD conduit sections along approximately 3,500 ft (1,067 m) of beach.

The landfall/ICW work area on the mainland is primarily developed, including a paved parking lot and areas of beach and dune communities along the beach side and to the west and east of the parking lot of Smith Point County Park. Otis Pike Fire Island High Dune Wilderness is directly adjacent to the west side of Smith Point County Park. Coastal habitats in the landfall/ICW work area on the mainland include beach and dune communities located along the south side of the mainland and associated interdunal areas. The onshore facilities would be located mostly within existing developed areas including parking lots and paved roadways.

More detailed information concerning coastal and terrestrial habitat, including the results of NYSDEC and USFWS data requests, desktop assessment, and field surveys are presented in Appendix B of Appendix L in the COP, Sunrise Wind 2022.

3.5.4.2 Impact Level Definitions for Coastal Habitat and Fauna

This Draft EIS uses a four-level classification scheme to analyze potential impact levels to coastal habitat and fauna from the alternatives, including the Proposed Action. Table 3.5.4-3 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for coastal habitat and fauna. Table G-8 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to coastal habitat and fauna. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of the Project.

Table 3.5.4-3. Impact Level Definitions for Coastal Habitats and Fauna

Impact Level	Definition of Adverse Impact Levels	Definition of Beneficial Impact Levels
Negligible	Either no effect or no measurable impacts	Either no effect or no measurable impacts
Minor	Small, detectable, measurable, adverse impacts to habitat and/or fauna (abundance, diversity of both common and special-status species); localized; complete recovery anticipated without remedial or mitigating actions within a year; impacts avoidable.	Small and measurable effects that would increase the extent and quality of habitat for both special status species and species common to the lease area and/or increase in populations of species common to the lease area.
Moderate	Notable and measurable adverse impacts to the extent and quality of local habitat for common and special status species, the abundance or diversity of species, would occur and some may be irreversible; or the affected resource would recover completely with remedial or mitigating activities with a specified time frame.	Notable and measurable effects comprising an increase in the extent and quality of local habitat for both special-status species and species common to the lease area and/or an increase in individuals or populations of species common to the lease area.
Major	Measurable and widespread (population-level or regional) impacts to the extent and quality of local habitat for common and special status species and the abundance or diversity of species would occur; some impacts may be irreversible; full recovery not anticipated even with remediation or mitigation.	Regional or population-level increase in the extent and quality of habitat for both special status and commonly occurring species.

3.5.4.3 Impacts of Alternative A - No Action on 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 other planned non-offshore wind and offshore wind activities, as described in Appendix E*, 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 described in Section 3.5.4.1 Affected Environment would continue to follow current regional trends and respond to IPFs introduced by other non-offshore wind and offshore wind ongoing activities. Ongoing non-offshore wind activities within the GAA that contribute to impacts on coastal habitat and fauna are generally associated with onshore impacts, including onshore residential, commercial, and industrial development, and climate change. Onshore construction activities and associated impacts are expected to continue at current trends and have the potential to affect coastal flora and fauna through short term and permanent habitat removal or conversion, short term noise impacts during construction, and lighting, 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. Climate change and associated sea level rise can cause dieback of coastal habitats due to rising groundwater tables and increased saltwater inundation from storm surges and exceptionally high tides (Sacatelli et al. 2020). 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. 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. The effects of climate change on animals will likely include loss of habitat, population declines, increased risk of extinction, decreased reproductive productivity, and changes in species distribution (NJDEP 2020).

Other planned non-offshore wind activities that may affect coastal habitat and fauna primarily include increasing onshore development activities (see Appendix E for a description of planned activities scenarios). Similar to ongoing activities, other planned non-offshore wind activities may result in short term and permanent impacts on animals and vegetation, including disturbance, displacement, injury, mortality, habitat and plant degradation and loss, and habitat conversion.

3.5.4.3.2 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 Proposed Action).

Under the No Action Alternative, the proposed Project would not be built and impacts to coastal habitats and fauna described in the following section would not occur, although this does not preclude the implementation of future offshore wind projects in the region. Impacts from future offshore wind and other activities would continue and corresponding impacts to coastal habitats and fauna would persist.

Other planned and non-offshore wind activities that may affect coastal habitat and fauna include cables include new onshore cables and pipelines, onshore construction, port expansions, and development projects (e.g., residential, commercial, industrial). Future projects would contribute to individual displacement, injury, mortality, and habitat loss with respect to coastal habitats and fauna primarily due to land disturbance, but also accidental releases, air emissions, anchoring, cable emplacement, discharges, light, noise, presence of structures, and traffic. Activities from these projects may be short term, long-term, or permanent, depending on the amount of land disturbance and the timing and duration of the disturbance.

Potential cumulative impacts of planned offshore wind activities, including construction, O&M, and decommissioning of project, on coastal habitats and fauna are summarized below for each relevant IPF.

Accidental releases of fuel, fluids, or hazardous materials would potentially contaminate coastal habitats such as salt marshes and beaches, and fauna such as snails, crabs, and mollusks (discussed in Section 3.5.2) due to the release and/or cleanup activities. Accidental releases of fuel from offshore structures and offshore vessels would not likely reach coastal habitats, however. The most likely release is diesel fuel, but the expected size of such a spill is likely to have negligible, localized, and short term impacts to coastal habitats. Accidental disposal of trash into the water and coastal habitats represents a risk to fauna such as small mammals, birds, herpetofauna, and fish that may ingest or become tangled in the debris. Proper waste management procedures would reduce the potential for trash or debris to be inadvertently left in coastal habitats or waters. The cumulative impacts of accidental releases on coastal habitats are likely to be localized, short-term, and result in negligible impacts to coastal habitats.

Anchoring from small boats may occur along the shoreline during transmission cable landfall activities from the ocean side, potentially increasing turbidity and causing physical damage to coastal habitats such as seagrass beds and hardbottom habitats (see Section 3.5.2). Anchoring close to shore for crew and equipment transport may result in physical disturbance or damage to beaches and/or salt marshes. These impacts would be localized and short term. Any turbidity would be short term. Impacts to coastal habitats due to anchoring are expected to be short term and negligible.

Air emissions from vehicles and heavy machinery (e.g., drill rig, excavation and backfilling equipment, building construction) used in the construction of onshore facilities would result in short term and localized increases in air pollutants (see Section 3.4.1). The effects of air pollutants on biogeochemical cycling are well documented, although the effects on most terrestrial organisms and the interaction of air pollution with other stressors are less well understood (Lovett et al. 2009). However, onshore facilities equipment and fuel suppliers would comply with the applicable EPA or equivalent emission standards and construction and O&M emissions would have negligible to minor, and short-term impacts on coastal habitats and fauna. Long-term benefits of offshore wind include reduced carbon emissions and air pollutants such as nitrogen oxides, sulfur oxides, and mercury, compared with oil and coal combustion (Allison et al. 2019).

Cable emplacement into a trench or as part of a HDD crossing would result in negligible impacts to the environment. However, the cable cannot be installed without the corresponding land disturbance associated with trenching, HDD, traffic, structures, and other activities required to build the containment for the cable. The impacts of cable emplacement would be localized and short term and no greater that that described for land disturbance and other activities required for the installation. Cables buried deeply enough that the surface protection would not be needed would have no impact on coastal habitats.

Discharges of drilling slurry during HDD at landfall would occur during Project installation and construction. Where HDD is used, an Inadvertent Return Plan would be prepared and implemented to minimize the potential risks associated with the release of drilling fluids. Discharges from vessels are not permitted within 3 nm of shore and are not expected to impact coastal habitats. Onshore construction activities such as trenching may require dewatering and BMPs would be used such as diversion, filtering, and energy dissipation devices. Dewatering activities would be short term, and water drawdown would be minimal. All earth disturbances from construction activities would comply with State Pollutant Discharge Elimination System General Permits for Stormwater Discharges associated with Construction Activities and the approved SWPPP for the Project. The likelihood of impacts to coastal habitats and fauna as a result of discharges from the proposed Project are negligible.

Land disturbance is expected to account for the greatest amount of impact to coastal habitats and fauna when compared to other IPFs. Land disturbance would result from construction and installation of transmission cables and associated infrastructure and an OnCS-DC construction. Habitats disturbed during trenching and cable installation would be reseeded with native vegetation where practicable. Total lengths of transmission cable corridor for onshore facilities are much smaller when compared with offshore cables and most of the onshore transmission cables are placed within ROWs, utility clearances, and/or other developed areas thereby avoiding habitats and fauna. Onshore activities such as pipe stringing may occur on beaches and would disturb vegetation and fauna for the duration of Project construction.

Adverse impacts to habitats would occur along cable routes due to trenching, vegetation removal, soil compaction, surface water runoff or pooling, and potential inadvertent burial of vegetation and fauna during construction ROW and locations where the transmission cable installation changes between trenching and HDD. With few exceptions, trenching and burial of transmission cable would be limited to previously disturbed areas, such as transportation ROWs. Trenchless cable crossings (i.e., HDD and jack-piping) are typically used to avoid sensitive environmental areas such beaches, wetlands, and river crossings. For cable installations outside of roadways, such as greenbelt areas, areas would typically be backfilled to the original grade elevation and hydroseeding to prevent soil erosion.

Negligible impacts to coastal habitats are anticipated from areas disturbed by the OnCS-DC facilities because these facilities are generally constructed in already developed areas. Construction of the transmission cable and interconnection facility would provide opportunities for the introduction and establishment of invasive species that would subsequently pose a risk to native vegetation and fauna. In ROW areas, impacts would be short-term and negligible given the areas are already disturbed. In undisturbed habitats, the potential risk is much higher. An ISMP would be implemented to avoid and manage the introduction and spread of invasive plant species that would likely have negative impacts on native plants and coastal habitat.

Certain work activities (e.g., HDD conduit stringing and tree removal) would result in impacts to coastal habitat and RTE species, such as seabeach amaranth during times of establishment and flowering. Impacts to biologically significant times of year for sea turtles and shore birds are presented in Sections 3.5.3 and 3.5.4, respectively.

Construction activities may also contribute to erosion and sedimentation during construction and result in impacts to sensitive environmental resources. Disturbed habitats are expected to return to their previous condition following construction completion without further restoration. Displaced mobile wildlife would repopulate former habitats once construction is complete and the habitat would recover to pre-construction conditions. Since construction occurs predominantly in already developed areas where wildlife is habituated to human activity regardless of the cable route chosen, impacts of land disturbance would be short-term and negligible to minor because very little construction associated with cable transmission corridors occurs in undisturbed areas.

Maintenance such as periodic clearing of vegetation along existing utility ROWs and other activities to maintain public utilities disturbs and temporarily displaces mobile fauna and may result in injury or death of less mobile species, albeit at a local level. Clearing and conversion of coastal habitats to developed uses results in permanent loss of the habitat for fauna. Outside currently protected areas, the conversion of natural areas to developed residential, commercial, and industrial uses is expected to continue.

Lighting impacts to coastal habitats and fauna in the geographic area of analysis from vessels transiting to/from the landfall and coastal work locations or from vessels installing cables in the geographic area of analysis would occur primarily during construction. Light may emanate from onshore structures associated with the Project construction onshore. The extent of impacts would be limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats would likely be undetectable and negligible.

Noise from offshore wind construction activities is not expected to be noticeable in onshore coastal habitats and fauna due to the distance to the offshore activities. Noise pollution is a reported threat to terrestrial fauna such as amphibians, reptiles, and invertebrates, which are already highly threatened (Sordello et al. 2020) and noise would be expected from onshore construction activities. Noise from activities such as trenching and HDD of export cables and construction of onshore facilities, would disturb and displace coastal fauna that may be present during construction. Since construction would occur primarily in already developed ROWs where wildlife is absent or already habituated to human activity and noise, adverse impacts are not anticipated in most places. In potentially sensitive areas outside of ROWs, noise is expected to cause short term displacement of fauna into adjacent available habitat, although fauna could return. Noise is also anticipated intermittently during construction and O&M phases with similar results. Therefore, impacts to fauna would be short term and short-term, resulting in negligible to minor impacts.

Presence of structures such as onshore transmission cables and associated facilities along the proposed transmission route is expected to convert existing habitats to hard-top and/or impervious surfaces for cable protection and facilities such as the converter station. These changes would occur during construction and persist as long as the structures remain, resulting in permanent, but minor, habitat loss along the transmission corridor. Cables buried deeply enough that surface protection would not be used would have no impact on coastal habitats and fauna. OnCS-DC facilities would be constructed in a compatible area of industrial or commercial land use and would therefore have negligible impacts on coastal habitats and fauna.

Traffic from vessels and onshore traffic may impact coastal habitats and fauna via physical disturbance of habitats and/or collisions with fauna such as small mammals, birds, and herpetofauna, and/or compaction or crushing of vegetation. Vessel traffic associated with offshore wind energy development may increase during landfall/ICW work activities. Loss or disturbance of coastal habitats such as beaches and marshes could occur due to wake erosion from vessel traffic associated with offshore wind energy but would be limited to approach channels and the coastal areas near ports and bays. Given the amount and nature of vessel traffic into and out of these ports, the small size and number of vessels associated with the Project would result in negligible to minor increases, if any, to wake-induced erosion of associated channels.

Onshore vehicle traffic detours during construction of onshore facilities may increase the number of vehicles along more sensitive alternative routes. Traffic delays may cause travelers to detour through more sensitive areas where coastal habitats and vegetation would be disturbed by increased traffic noise, debris from road and vehicles, and potential collisions with wildlife or off-road detours that damage vegetation may occur. Collisions between wildlife and vehicles or construction equipment would be rare because most individuals are expected to avoid construction areas. However, species with limited mobility, especially herpetofauna, would be more vulnerable to this impact, resulting in minor, short term, adverse impacts to some species. Traffic disruptions would result in additional noise and dust, typical of other utility construction projects. These impacts would be short term and overall, impacts to coastal habitats from traffic would be negligible to minor.

Climate change effects on seasonal timing and patterns of species distributions and ecological relationships would continue, resulting in permanent and ongoing changes in coastal habitats, with corresponding impacts on associated fauna. The landward migration of the barrier island shoreline would continue, and sea level rise would ultimately alter the amount and types of coastal habitat available (NPS 2020). Climate change, sea-level rise, and other ongoing activities and planned actions would continue to result in the compression of coastal habitats as sea levels rise and reduces the extent of undeveloped coastal areas.

Offshore wind projects that reduce the need for carbon-based fuels such as oil and coal could result in simultaneous and substantial reductions in cumulative carbon emissions (Allan et al. 2020), increases in which are a substantial cause of rising earth temperatures (Lindsey 2020). Loss of coastal vegetation such as seagrasses would reduce the amount of carbon sequestration in the ocean (i.e., blue carbon). Therefore, long term impacts of the Proposed Action may be beneficial to coastal habitats and fauna by helping to reduce the impacts of ongoing climate change on these resources, although this is tempered by the potential reduction in carbon sequestration.

3.5.4.3.3 Impacts of Alternative A on ESA-Listed Species

Impacts of future and ongoing projects to ESA-listed plant and faunal species in the GAA would contribute to individual displacement, injury, mortality, and habitat loss or modification via noise, land disturbance, vehicle collisions, and climate change. Cable installation impacts to listed species are unlikely due to installation in primarily ROWs and other developed areas; impacts that may occur would not be permanent, and species would likely return to disturbed areas following completion of construction, depending on the amount of land disturbance. Permanent loss of habitat due to construction of buildings such as converter stations is also unlikely because onshore facilities are typically constructed in already developed areas.

Adverse impacts to ESA-listed species from the No Action Alternative would include impacts of future offshore wind projects, which would be the same as those described for the Proposed Action. The two federally listed plant species (seabeach amaranth and sandplain gerardia) in the vicinity of the work area would be affected by future offshore wind projects if the project footprint coincided with the species location(s). Potential impacts to birds and bats are addressed in Sections 3.5.1 *Bats* or 3.5.3 *Birds*.

3.5.4.3.4 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, coastal habitats would continue to respond to and reflect current regional trends and current and future environmental and societal activities such as ongoing coastal development. Conditions of coastal habitats in the GAA are relatively stable, but can change. For example, marine eelgrass habitats are in decline, with a loss of over 20 percent from 1994 to 2011 (Costello and Kenworthy 2011). The impacts of ongoing activities, especially land disturbance due to development, would be potentially **moderate**. The combined impacts of ongoing activities and planned actions other than offshore wind are expected to result in **moderate** impacts on coastal habitats.

Offshore wind impacts to coastal habitats and fauna under the No Action Alternative would continue due to erosion, sea level rise, and land development, particularly residential uses, consistent with current regional trends in ongoing and planned activities, including offshore wind project impacts. Construction activities may result in loss of coastal habitat and short term or permanent displacement and injury or mortality of individual animals, but population-level effects would not be expected. Land disturbance activities associated with development and maintenance would contribute to elevated levels of erosion and sedimentation and accidental releases of fuels or hazardous material discharges of effluent and debris would continue due to ongoing coastal construction and marine activities.

Cumulative Impacts of the No Action Alternative

Future projects would contribute to individual displacement, injury, mortality, and habitat loss or modification via noise, land disturbance, vehicle collisions, and climate change. Cable installation impacts from these projects would not be permanent, and fauna would likely return to disturbed areas following completion of construction, depending on the amount of land disturbance. Permanent loss of habitat due to construction of buildings such as converter stations would be significant if located in sensitive habitats. Future offshore wind activities are expected to affect coastal habitat and fauna via the primary IPFs presented for the Proposed Action and have similar impacts, resulting in **negligible** to **minor** impacts to coastal habitats and fauna.

Considering the combined effects of IPFs on coastal habitats and fauna, the overall impacts associated with future offshore wind activities, combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable planned actions other than offshore wind would include both **minor** and **moderate** impacts. Land disturbance is expected to continue to have the greatest impact on the condition of coastal habitats and fauna in the geographic area of analysis.

3.5.4.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on coastal habitats and fauna:

- Landfall short term disturbance (onshore) of up to 6.5 ac (0.02 km^2), including the ICW HDD landfall work area, for up to two HDD cables, temporary anchoring walls, and drilling rig, in addition to 2.5 ac (0.01 km^2) for the beach stringing area and trenching to the ICW crossing (Table 3.3.3-2 Landfall HDD Maximum Design Scenario and Table 3.3.3-3 Maximum Disturbance Areas for SRWEC Landfall in COP, Sunrise Wind 2022).
- Temporary Landing Structure, connecting ramp, and stabilizing spuds used for materials and equipment transport adjacent are anticipated. The floating pier would include direct short term impacts of up to 1,500 ft^2 (139.4 m^2) of SAV and/or benthic macroalgae due to direct ground disturbance and shading. No recent SAV or benthic macroalgae habitats were mapped in these areas based on the 2020 video survey (see Table 3.4.1-1; Figure 3.4-1 of COP Appendix N1, Sunrise Wind 2022), although historical data from 2018 and 2002 indicate presence of 0.8 acres (3237.5 square meters) and 0.3 acres (1214.1 square meters)of SAV in the areas east and west of ICW crossing, respectively, and a preconstruction SAV survey would be conducted prior to construction to confirm current presence of SAV. The likelihood of impacts to intertidal and subtidal vegetated habitats would be considered very low given that the proposed Temporary Landing Structure would be positioned to avoid and minimize impacts to these sensitive habitats to the extent practicable. Use of the proposed Temporary Landing Structure would occur between fall and spring, and thus would minimize impacts to any SAV present during the growing season.
- Onshore transmission cable, up to 17.5 mi (28.2 km) long, with a short term disturbance corridor of 30 ft (9.1 m), an operational ROW of 60 ft (18.3 m), and transmission joint bays (Table 3.3.2-4 in the COP, Sunrise Wind 2022).
- Carmans River crossing would include a maximum length of 1,990 ft (607 m) (COP Section 3.3.2.3, Sunrise Wind 2022) within the Carmans River SCFWH. The HDD trenchless construction methods proposed would avoid direct impacts to surface waters and wetlands and no in-water activities would occur. However, tree removal and other construction-related disturbance would occur during installation.
- An OnCS-DC with a disturbance footprint of up to 7 ac (0.03 km^2) and an operational footprint of 6 acres (0.02 km^2) (Table 3.3.1-4 Maximum Disturbance Areas for the OnCS–DC Site in the COP, Sunrise Wind 2022).
- May through June are the months in which seabeach amaranth and sandplain gerardia are monitored for germination and the plants may persist through early November. Construction outside of this window would have fewer impacts than during the growing season.

Variances in these parameters would not result in impacts any greater than those for the Proposed Action, because these design parameters represent the maximum construction footprint for onshore facilities. Parameters that may change and affect the magnitude of the impact include the transmission route itself, the location of splicing vaults along the transmission route, changes in the footprint of the OnCS-DC, and the location of the HDD stringing area.

Variances in offshore design parameters would not alter the level of impact to coastal habitats and fauna because the offshore parameters would have no effect on these onshore resources.

3.5.4.5 Impacts of Alternative B - Proposed Action on Coastal Habitat and Fauna

The geographic area of analysis for impacts to coastal habitats and fauna is limited to proposed onshore facilities, from landfall of the transmission cable at Smith Point County Park to the Union Street converter station and to the existing electrical grid at the Holbrook Substation on the Long Island mainland (see Figure D-6 in Appendix D).

Primary IPFs relevant to coastal habitats and fauna in the geographic area of analysis are listed in Table G-8 of Appendix G. Areal extent of impacts to coastal habitats from onshore facilities construction and operation and maintenance are provided in Table 3.5.4-4.

Table 3.5.4-4. Acres of SCFWH, NYNHP Significant Natural Communities, and CEAs

Transmission Corridor Width*	Total Area		SCFWH Area		NYNHP Significant Natural Communities		CEA		Total Impacts to Designated Habitats		Remaining Other Land Uses	
	ac	ha	ac	ha	ac	ha	ac	ha	ac	ha	ac	ha
30 ft total	102.7	41.6	31.0	12.5	8.9	3.6	12.6	5.1	39.3	15.9	63.4	25.7
60 ft total	162.5	65.7	35.7	14.5	9.8	4.0	18.5	7.5	47.8	19.3	114.7	46.4

* Includes 29.57 ac (0.048 km^2) landfall/ICW work areas, 7.18 ac (0.029 km^2) Union Street converter station footprint, 6.02 ac (0.024 km^2) Holbrook substation, 0.01 ac in the Carmans River SCFWH and 2.07 ac (0.008 km^2) splicing vaults.

Sources: CEA 2020, LandUse 2016, NYNHP Significant Natural Communities 2021, Parks 2021, SCFWH 2013.

3.5.4.5.1 Construction and Installation

Anchoring, cable emplacement, land disturbance, presence of structures, and traffic are the primary IPFs relevant to coastal habitats and fauna as a result of construction and installation activities.

3.5.4.5.1.1 Onshore Activities and Facilities

The potential impacts to coastal habitats from the construction and installation phases of the Proposed Action are summarized in the following sections for each relevant IPF. Impacts to these resources from offshore wind project in general are addressed under the No Action Alternative (Section 3.5.4.4.2).

Impacts to coastal habitats would be associated primarily with land disturbance during construction activities. The Proposed Action would disturb and/or alter habitats during construction and operations and disturbance may last the duration of construction in some places, but habitat would recover without the need for mitigation or restoration in most cases. Although local mortality may occur, population-level impacts to coastal habitats and fauna are not expected due to avoidance and minimization and the relatively small geographic area of analysis being impacted. Overall impacts to coastal habitats and fauna would be expected to be negligible to minor as a result of the Proposed Action, described below for each relevant IPF.

Anchoring: Anchoring along the shoreline during transmission cable landfall activities would have short term and negligible impacts to coastal habitats such as seagrass beds and hardbottom habitats due to the short term nature of these impacts and the anticipated recovery.

A Temporary Landing Structure may be installed at Smith Point County Park to support transport of equipment and materials for onshore construction along the ICW. This would result in 0.01 acres (40 square meters) of short term impacts to tidal wetlands because the pier would be grounded at low tide and the pier would require spud installation to ensure stability. Any impacts during construction would be short term, localized, and complete recovery of the ICW bottom would be anticipated. Depending on the logistics, the Temporary Landing Structure may be required from fall to spring. Overall, impacts to coastal habitats due to anchoring associated with the floating pier are expected to be short term and negligible.

Cable emplacement: Land disturbance from cable emplacement, trenching, HDD, traffic, structures, and other activities would be localized and short term and no greater that that described for land disturbance and other activities required for the installation. Cables buried deeply enough that the surface protection would not be needed would have no impact on coastal habitats. The total length of the transmission cable corridor for the onshore facilities is approximately 89,959 ft (27,420 m) and less than 1 percent (385 ft; 117 m) of the corridor is outside of existing ROWs or utility clearances. The HDD stringing area would require an additional estimated 3,316 ft (1,010.7 m) of beach outside of existing ROWs and developed areas and activities in this area would disturb vegetation and fauna for the duration of Project construction.

Land disturbance: Land disturbance is expected to account for the greatest amount of impact to coastal habitats and fauna when compared to other IPFs. Land disturbance would result from construction and installation of transmission cables and associated infrastructure and an OnCS-DC construction. Habitats disturbed during trenching and cable installation would be reseeded with native vegetation where practicable. A summary of the areal extent of land disturbances associated with onshore facilities construction and O&M to significant and critical natural communities (described in Section 3.5.4.1 and mapped in Figure 4.4.1-2 of the COP Sunrise Wind 2022) is provided in Primary IPFs relevant to coastal habitats and fauna in the geographic area of analysis are listed in Table G-8 of Appendix G. Areal extent of impacts to coastal habitats from onshore facilities construction and operation and maintenance are provided in Table 3.5.4-4.

The proposed transmission cable corridor and onshore facilities construction footprint includes approximately 102.7 ac (0.4 km^2) along and associated with the 30-foot (9.1-m) disturbance area, inclusive of the 30-foot (9.1-m) disturbance corridor, landfall/ICW work areas, HDD stringing area, and splicing vaults. Significant and critical natural communities intercepted include SCFWH and NYNHP Significant Natural Communities; Central Pine Barrens and Carmans River are entirely within the CEA; all other areas overlap substantially. These areas make up 38.3 percent (39.3 acres; 0.16 km^2) of the onshore facilities footprint associated with the 30-foot (9.1-m) disturbance corridor but are located almost exclusively along existing transportation corridors and associated ROWs and utilities clearances. The remaining area (61.7 percent of the footprint) is primarily recreation and open space and utilities (see Section 3.6.5 *Land Use and Coastal Infrastructure* for greater detail on these land uses).

The landfall/ICW work area is mapped in Figure 3.3.3-3 of the COP (Sunrise Wind, 2022). Landfall activities would include HDD stringing on the beach and the use of a drill rig and sheetpiles in the landfall work areas to anchor the onshore drill rig drilling activities (Figure 3.3.3-4 of the COP and detailed in the Project EM&CP). Where the offshore transmission cable is proposed to make landfall (i.e., above MHWL) to be joined with the onshore transmission cable at the transition joint bays, all proposed cable routes would intercept maritime beach, a rare and significant coastal community. Impacts to habitats proximate to the landfall/ICW work areas would be avoided by using HDD technology to bury the cable beneath the beach and dune habitats and to take the transmission cable across the ICW in Great South Bay at Smith Point. Post construction, all work areas would be graded and/or backfilled and returned to pre-construction conditions. Because HDD conduit stringing on the beach would result in the loss of any vegetation it intercepts, there is potential for disturbance of seabeach amaranth if it is present.

Along most of the transmission route, localized adverse impacts to habitats would occur due to trenching, vegetation removal, soil compaction, surface water runoff or pooling, and potential inadvertent burial of vegetation and fauna during construction ROW and locations where the transmission cable installation changes between trenching and HDD. With few exceptions, trenching and burial of transmission cable would be limited to previously disturbed areas, such as transportation ROWs. Trenchless cable crossings (i.e., HDD and jack-piping) would be used to avoid sensitive environmental areas such as the ICW, Carmans River, Central Pine Barrens Core Preservation Area, and/or other obstructions (e.g., LIRR), as described in Table 3.3.2-5 of the Onshore Transmission Cable and Onshore Interconnection Cable Crossing of the COP (Sunrise Wind 2022). No in-water activities would occur at the Carmans River crossing. For installations outside of roadways, such as greenbelt areas, final restoration would typically involve backfilling to the original grade elevation and hydroseeding to prevent soil erosion. Where the onshore transmission cable is proposed to cross through the Central Pine Barrens Compatible Growth Area proximate to Victory Avenue, the cable would be trenched within the developed highway ROW.

The Union Avenue OnCS-DC location is a developed industrial/commercial land use site with linear forest features along the parcel boundaries and would be cleared for construction. Negligible impacts to coastal habitats are anticipated from areas disturbed by the OnCS-DC. Construction of the transmission cable and interconnection facility would provide opportunities for the introduction and establishment of invasive species that would subsequently pose a risk to native vegetation and fauna. In ROW areas, impacts would be short-term and negligible given the areas are already disturbed. In undisturbed habitats, the potential risk is much higher. An ISMP would be implemented to avoid and manage the introduction and spread of invasive plant species that would likely have negative impacts on native plants and coastal habitat.

Time-of-year restrictions for certain work activities (e.g., HDD conduit stringing and tree removal) would be employed to the extent practicable to avoid or minimize direct impacts to coastal habitat and RTE species, including seabeach amaranth, during construction of the landfall and onshore facilities. Work that would occur outside of these time-of-year restriction periods would be first coordinated with state and federal agencies to develop construction monitoring and impact minimization plans or mitigation plans, as appropriate. Impacts to sea turtles and shore birds are presented in Sections 3.5.3 and 3.5.4, respectively.

Construction activities may contribute to erosion and sedimentation during construction. Where appropriate, short-term erosion controls would be installed and maintained until the work areas are restored and stabilized. An ERP/OSRP, SWPPP, and SPCC Plan would be implemented to avoid and minimize impacts to sensitive environmental resources. Disturbed habitats are expected to return to their previous condition following construction completion without further restoration. Displaced mobile wildlife would repopulate former habitats once construction is complete and the habitat would recover to pre-construction conditions. Since construction would predominately occur in already developed areas where wildlife is habituated to human activity regardless of the cable route chosen, impacts of land disturbance would be short-term and negligible to minor because very little of the construction along the cable transmission corridor would occur in undisturbed areas and complete recovery is anticipated following Project completion.

Presence of structures: Presence of structures relevant to coastal habitats and fauna include onshore transmission cables and associated facilities along the proposed transmission route; the presence of these structures is expected to convert existing habitats to hard-top and/or impervious surfaces for cable protection and facilities such as the converter station (cable installation is addressed above). The OnCS-DC would be constructed in a compatible area of industrial or commercial land use and would therefore have negligible impacts on coastal habitats and fauna.

Traffic: Traffic from onshore vehicles may impact coastal habitats and fauna via physical disturbance of habitats and/or collisions.. Onshore vehicle traffic detours during construction of onshore facilities may increase the number of vehicles along more sensitive alternative routes. Increases in already common pedestrian and vehicle disturbance at Smith Point County Park would result in further disturbance of maritime dune and grassland habitats and could impact the federally threatened seabeach amaranth. Traffic delays may cause travelers to detour through sensitive areas such as the Wertheim NWR where coastal habitats and vegetation would be disturbed by increased traffic noise, debris from road and vehicles, and potential collisions with wildlife or off-road detours that damage vegetation may occur but would be rare for wildlife due to avoidance of construction noise and activity. Species with limited mobility, especially herpetofauna, would be more vulnerable to this impact, resulting in minor, short term, adverse impacts to some species. Additional impacts from noise and dust would be short term and negligible to minor.

3.5.4.5.1.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna from the Proposed Action would be limited to onshore activities and facilities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.5.4.5.2 Operations and Maintenance

3.5.4.5.2.1 Onshore Activities and Facilities

O&M would be limited to regular and intermittent maintenance to onshore transmission cables and the OnCS-DC. Regular O&M activities would not result in additional or further adverse impacts to coastal habitat or fauna habitat. However, when cable inspection or repairs require excavation, resulting in land disturbance, negligible, short-term, and localized adverse impacts to coastal habitats and fauna would be expected. Light resulting from structures and vessels would lead to negligible impacts, if any, on coastal habitats and fauna because of the distance from the coastal habitats and fauna to the offshore facilities. Impacts to coastal habitats and fauna from conceptual decommissioning would be no greater than for construction impacts.

The total estimated footprint of onshore facilities is an estimated 162.5 ac (0.66 km^2) for the construction footprint associated with the 60-foot (18.3-m) O&M footprint, inclusive of the 60-foot (18.3-m) cable transmission cable O&M corridor, work areas, HDD stringing area, and splicing vaults. Significant and critical natural communities (i.e., SCFWH, significant natural communities, CEAs, and Central Pine Barrens) account for 39 percent (47.8 ac; 0.2 km^2) of the total construction and O&M area associated with the 60-foot (18.3-m) O&M corridor. The remaining area (61.0 percent of the footprint) is primarily recreation and open space and utilities (see Section 3.6.5 *Land Use and Coastal Infrastructure* for greater detail on these land uses).

Overall, the Proposed Action would result in negligible to minor impacts to coastal habitat loss and negligible to minor impacts on coastal fauna due to individual mortality and short term displacement. No population impacts to coastal fauna would be expected from operation and maintenance activities.

O&M that includes an ISMP or monitoring would be a benefit to coastal habitats and fauna and provide needed data with respect to potential impacts of onshore transmission cables to coastal habitats and fauna.

3.5.4.5.2.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna from the Proposed Action would be limited to onshore activities and facilities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.5.4.5.3 Conceptual Decommissioning

3.5.4.5.3.1 Onshore Activities and Facilities

Impacts to coastal habitats and fauna from conceptual decommissioning would be similar to construction impacts described for the Proposed Action. Overall, the conceptual decommissioning would have negligible to minor amounts of coastal habitat loss and negligible to minor impacts on fauna due to mortality and short term displacement.

3.5.4.5.3.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna from the Proposed Action would be limited to onshore activities and facilities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.5.4.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts analysis of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to onshore cable installation, converter station construction, O&M along cable corridors, and decommissioning of the Project, would contribute to impacts on coastal habitats and fauna through the primary IPFs of anchoring, land disturbance, cable installation and maintenance, presence of structures, and traffic.

The construction, O&M, and decommissioning of onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of anchoring, cable installation and maintenance, land disturbance, presence of structures, and traffic. Offshore wind components are not expected to have more than negligible to minor impacts on coastal habitats and fauna. Onshore components have the potential to result in disturbance and short-term or permanent loss of onshore habitat and individual fauna if onshore substations are constructed in sensitive areas. Onshore cable installation and maintenance would result in short-term loss of habitat and displacement of fauna. These short-term disturbances for construction and cable installation would not be expected to have population level impacts within the geographic analysis area.

3.5.4.5.5 Impacts of Alternative B on ESA-Listed Species

Two federally listed plant species (endangered sandplain gerardia and threatened seabeach amaranth) would be potentially impacted by construction of Proposed Action. The proposed landfall/ICW work area on Fire Island north of the parking area includes maritime shrubland habitat and maritime grassland species associated with the federally endangered sandplain gerardia. Maritime beach community is habitat to federally threatened seabeach amaranth and is in the vicinity of the landfall/ICW work area. However, the maritime beach community is used extensively for recreation and impacts from pedestrian and vehicle traffic substantially limit the likelihood of seabeach amaranth occurrences. Notably, the federally threatened seabeach amaranth is considered more vulnerable to non-climate stressors such as coastal development and invasive species rather than climate change (Ricci et al. 2020).

Any potential habitat impacts to seabeach amaranth are the same as those addressed for the piping plover (see section 3.5.3.3.1, above). Coordination with USFWS during the permitting phase of the Project would occur to determine potential effects of the Project on these species. If needed, mitigation actions would be developed for monitoring and protecting the species. To minimize the risk of Project activities incidentally damaging or killing plants, conservation measures for any Project activities proposed for any beach or dune during the growing season of May 15 through November 30 would be implemented. Conclusions presented in this section include consideration of the Project's mitigation and monitoring measures, including those for seabeach amaranth (Appendix H).

No federally listed animals are reported as occurring in in the geographic area of analysis for coastal habitats and fauna that are not addressed in Section 3.5.1 *Bats* or 3.5.3 *Birds*. Activities at the landfall work area proximate to the sand beach habitat on Fire Island would be confined to existing developed areas to avoid and minimize potential impacts to the rare hairy-necked tiger beetle. If conducted on the beach, HDD cable duct stringing, however, may result in the short-term disturbance to any vegetation in the area for approximately 2 to 3 weeks per cable between October and March. Seabeach amaranth may occur on the sandy beach and its presence has been documented approximately 1 mile away. Activities affecting seabeach amaranth are the same as those described for plovers under 3.5.3 *Birds* and protections would be similar. If construction were to occur outside time-of-year restrictions for certain activities (e.g., HDD conduit stringing and tree removal), then coordination with state and federal agencies to develop construction monitoring and impact minimization plans or mitigation plans would be undertaken, as appropriate. There is no designated critical habitat designated within the footprint of the Proposed Action. With respect to impacts to ESA-listed species, results of consultation with USFWS pursuant to Section 7 of the ESA will be included in the Final EIS. Impacts to state-listed species from construction of the Project would be similar to those discussed for other habitats and fauna. There are no federally designated critical habitats in the geographic area of analysis. Consequently, no impacts to federally listed species or critical habitat would be expected.

3.5.4.5.6 Conclusions

Impacts of the Proposed Action Alternative

Areas most sensitive to potential impacts of the Proposed Action are associated with the landfall/ICW work area on Fire Island and the mainland, and the Carmans River crossing, and include significant and critical natural areas that would be disturbed during Project construction. The landfall/ICW work areas at Smith Point County Park and Smith Point Marina include paved parking lot and open land used for recreational activities, but HDD stringing activities may occur on the beach, disturbing any vegetation or fauna present, and may affect, but are not likely to adversely affect, the seabeach amaranth. The use of HDD for installation would minimize impacts to onshore habitats and protect wildlife in those habitats. For installations outside of roadways, such as greenbelt areas, final restoration typically involves backfilling to the original grade elevation and hydroseeding to prevent soil erosion. Two federally listed plant species (no federally listed non-avian or non-bat animal species) reportedly occur in or proximate to the work areas. Neither plant was found during site surveys of the area, but appropriate habitat is present proximate to the work area. Coordination with the USFWS regarding protections for these species would be implemented.

Overall impacts to coastal habitats and fauna from the Proposed Action would be **negligible** to **minor** as a result of the loss of individuals and disturbance to habitats for the duration of Project construction but no population level impacts to fauna and no permanent loss of habitat is expected.

Cumulative Impacts of the Proposed Action Alternative

Considering the combined effects of IPFs on coastal habitats and fauna, the overall impacts associated with the Proposed Action in combination with future offshore wind activities, ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable planned actions other than offshore wind would include both **minor** and **moderate** impacts. Land disturbance is expected to continue to have the greatest impact on the condition of coastal habitats and fauna in the geographic area of analysis.

3.5.4.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.5.4.6.1 Construction and Installation

3.5.4.6.1.1 Onshore Activities and Facilities

None of the components included under Alternative C-1 would alter the construction of the proposed onshore facilities as compared to the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C would be the same as those described for the Proposed Action.

3.5.4.6.1.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-1 would be limited to onshore activities and facilities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.5.4.6.2 Operations and Maintenance

3.5.4.6.2.1 Onshore Activities and Facilities

None of the components under Alternative C-1 would alter the O&M of the proposed onshore facilities described for the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action.

3.5.4.6.2.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-1 would be limited to onshore O&M activities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.5.4.6.3 Conceptual Decommissioning

3.5.4.6.3.1 Onshore Activities and Facilities

None of the components included under Alternative C would alter the decommissioning processes for the proposed onshore activities described for the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action.

3.5.4.6.3.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-1 would be limited to onshore O&M activities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.5.4.6.4 Cumulative Impacts of Alternative C-1

Cumulative impacts to coastal habitats and fauna under Alternative C-1 would be the same as those described for the Proposed Action Alternative.

3.5.4.6.5 Impacts of Alternative C-1 on ESA-Listed Species

None of the components under Alternative C-1 would alter the proposed onshore facilities described for the Proposed Action. Therefore, impacts to ESA-listed species from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action.

3.5.4.6.6 Conclusions

Impacts of Alternative C-1

None of the components under Alternative C-1 would alter the proposed onshore activities and facilities, O&M, or conceptual decommissioning described for the Proposed Action. Therefore, impacts to coastal habitats and fauna, including ESA-listed species, from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action.

Cumulative Impacts of Alternative C-1

Cumulative impacts to coastal habitats and fauna under Alternative C-1 would be the same as those described for the cumulative Proposed Action impacts.

3.5.4.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

None of the components included under Alternative C-2 would alter the construction of the proposed onshore facilities as compared to the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C would be the same as those described for the Proposed Action.

3.5.4.7.1 Construction and Installation

3.5.4.7.1.1 Onshore Activities and Facilities

3.5.4.7.1.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-2 would be limited to onshore activities and facilities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.5.4.7.2 Operations and Maintenance

3.5.4.7.2.1 Onshore Activities and Facilities

None of the components under Alternative C-2 would alter the O&M of the proposed onshore facilities described for the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-2 would be the same as those described for the Proposed Action.

3.5.4.7.2.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-2 would be limited to onshore O&M activities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.5.4.7.3 Conceptual Decommissioning

3.5.4.7.3.1 Onshore Activities and Facilities

None of the components included under Alternative C would alter the decommissioning processes for the proposed onshore activities described for the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-2 would be the same as those described for the Proposed Action.

3.5.4.7.3.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-2 would be limited to onshore O&M activities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.5.4.7.4 Cumulative Impacts of Alternative C-2

Cumulative impacts to coastal habitats and fauna under Alternative C-1 would be the same as those described for the No Action Alternative.

3.5.4.7.5 Impacts of Alternative C-2 on ESA-Listed Species

None of the components under Alternative C-2 would alter the proposed onshore facilities described for the Proposed Action. Therefore, impacts to ESA-listed species from the reconfigured layout under Alternative C-2 would be the same as those described for the Proposed Action.

3.5.4.7.6 Conclusions

Impacts of Alternative C-2

None of the components under Alternative C-2 would alter the proposed onshore activities and facilities, O&M, or conceptual decommissioning described for the Proposed Action. Therefore, impacts to coastal habitats and fauna, including ESA-listed species, from the reconfigured layout under Alternative C-2 would be the same as those described for the Proposed Action.

Cumulative Impacts of Alternative C-2

Cumulative impacts to coastal habitats and fauna under Alternative C-2 would be the same as those described for the cumulative Proposed Action.

3.5.4.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall negligible to minor adverse impacts and minor beneficial impacts on coastal habitats and fauna. Table 3.5.4-5 provides an overall summary of alternative impacts.

Table 3.5.4-5. Comparison of Alternatives Impacts on Coastal Habitat and Fauna

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C1)	Fisheries Habitat Minimization (Alternative C2)
Coastal Habitat and Fauna	*Proposed Action*: Overall impacts to coastal habitats and fauna from the Proposed Action would be **negligible** to **minor** as a result of the loss of individuals and disturbance to habitats for the duration of Project construction but no population level impacts to fauna and no permanent loss of habitat is expected. *Cumulative Impacts of the Proposed Action:* The overall impacts associated with the Proposed Action in combination with future offshore wind activities, ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable planned actions other than offshore wind would include both **minor** and **moderate** impacts. Land disturbance is expected to continue to have the greatest impact on the condition of coastal habitats and fauna in the geographic area of analysis.	*Alternative C-1*: None of the components under Alternative C-1 would alter the proposed onshore activities and facilities, O&M, or conceptual decommissioning described for the Proposed Action. Therefore, impacts to coastal habitats and fauna, including ESA-listed species, from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action, **negligible** to **minor.** *Cumulative Impacts of Alternative C-1*: Cumulative impacts to coastal habitats and fauna under Alternative C-1 would be the same as those described for the cumulative Proposed Action impacts, **minor** and **moderate** impacts.	*Alternative C-2*: None of the components under Alternative C-2 would alter the proposed onshore activities and facilities, O&M, or conceptual decommissioning described for the Proposed Action. Therefore, impacts to coastal habitats and fauna, including ESA-listed species, from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action, **negligible** to **minor.** *Cumulative Impacts of Alternative C-2*: Cumulative impacts to coastal habitats and fauna under Alternative C-2 would be the same as those described for the cumulative Proposed Action impacts, **minor** and **moderate** impacts.

3.5.4.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2; however for coastal habitat and fauna, there are no measures currently proposed by BOEM. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to coastal habitat and fauna.

3.5.5 Finfish, Invertebrates, and Essential Fish Habitat

This section discusses potential impacts on the existing finfish, invertebrate resources, and designated Essential Fish Habitat (EFH) in the geographical analysis area (see Figure D-7, Appendix D) of the proposed SRWF, the SRWEC, and the Onshore Transmission Cable Project components. It provides a qualitative assessment of the impacts associated with each alternative on finfish, invertebrates, and EFH. This section is closely aligned with Section 3.5.2, *Benthic Resources*, which discusses benthic invertebrates, and benthic habitat resources within the Project. This section is also supported by COP Appendix M1, Appendix M2, Appendix N1, and Appendix N2 (Sunrise Wind 2022).

The GAA for finfish, invertebrates, and essential fish habitat encompasses the Scotian Shelf, Northeast Shelf, and Southeast Shelf Large Marine Ecosystems, which captures most of the movement range within U.S. marine waters for most species in this group (Appendix D, Figure D-7). Since the EFH, invertebrates, and finfish GAA encompasses the Gulf of Maine down to Cape Hatteras, North Carolina, for the purposes of Project-specific analysis in this Draft EIS, the focus is on EFH, invertebrates, and finfish that would be likely to have regular or common occurrences in the SRWF and SRWEC and could be impacted by Project activities. The finfish GAA encompasses the extent of potential effects on finfish and their habitats. Thus, while Project-related impacts to finfish habitat are restricted to a relatively small footprint, the GAA for Project-impacts to finfish is necessarily large because marine populations and their dispersal patterns range over broad areas exposed to potential cumulative effects from offshore wind energy development.

3.5.5.1 Description of the Affected Environment and Future Baseline Conditions

The WEA would be in the offshore waters of RI and MA on the northeastern Atlantic continental shelf in the Rhode Island Sound. This area represents a transitional area separating Narragansett Bay and the Long Island Sound from the OCS (BOEM 2013). This is a dynamic oceanic environment, known to inhabit a wide variety of fish and invertebrate species. These waters straddle the New England and Mid-Atlantic regions and serve as the southern boundary for some New England species and the northern boundary for some Mid-Atlantic species. Summer flounder HAPC occurs anywhere in this area where SAV or macroalgae occurs.

The SRWF overlaps Cox Ledge, an area of concern for fishery managers because it provides important habitat for several commercially and recreationally important species—notably, spawning habitat for Atlantic cod (*Gadus morhua).* A portion of Cox Ledge was designated by the New England Fishery Management Council (NEFMC) as a habitat management area to protect EFH for a number of managed fish species. NOAA acknowledged the importance of Cox Ledge but disapproved the designation because it concluded the proposed gear restrictions approved by the NEFMC would likely be ineffective at minimizing impacts on habitat function (NEFMC 2022). The NEFMC (NEFMC 2022) is currently finalizing a new EFH Habitat Area of Particular Concern (HAPC) designation that include complex habitats on Cox Ledge and surroundings used by spawning Atlantic cod and other EFH species. BOEM is currently funding a 3-year study examining movement patterns of Atlantic cod, black sea bass, and other species in the southern New England region, including the Lease Area. The study is being conducted by NMFS and a team comprising a state resource agency, a university, and a nonprofit organization (BOEM 2019). Peer-reviewed literature and reporting on this research would be considered in the Sunrise Wind

Final EIS if available. Given concern raised about potential impacts on Cox Ledge and Atlantic cod, the discussion of potential effects presented in the following sections places emphasis on this and other species of particular concern.

3.5.5.1.1 Finfish

Finfish off the coasts of NY, MA, and RI include sharks, demersal, and pelagic finfish assemblages (BOEM 2013). These include numerous EFH species and five federally listed species that are known or may occur in the SRWF or SRWEC. There are also important anadromous species, demersal species (groundfish), and highly migratory pelagic finfish found throughout the region. The finfish resources of the region support diverse and highly valued commercial and recreational fisheries with more information provided in Section 3.6.1 *Commercial Fisheries and For-Hire Recreational Fishing*. BOEM has funded several surveys of finfish species occurrence in the RI/MA WEA and MA WEA, where the Project is located, with findings described by Guida et al. (2017). Guida et al. (2017) noted that there was considerable overlap between the dominant cold and warm season species between the two adjacent WEAs, but a greater number of overall taxa (101) were found in the MA WEA. The EFH assessment prepared for the Project provides additional detail on federally managed fish species that occur in the geographic area.

Finfish species in southern New England generally have broad distributions, with many ranging from Cape Hatteras, North Carolina to Georges Bank and beyond. The WEA supports finfish species that are typical of the region, with a wide range of diversity of fishes and squid present in the area (Guida et al. 2017). Some species are present in the area in both warm and cold seasons, but the relative abundance varies greatly for most species by season (Guida et al. 2017). Data from the most recent 14-year summary of NEFSC seasonal trawls (2003-2016) in the RI/MA WEA demonstrates a diversity of fishes and squid in the area, with 45 taxa collected in the cold months, 45 taxa collected in the warm months, and 59 species collected in total (Guida et al. 2017). In cold months, seasonal trawl samples were dominated by Atlantic herring (*Clupea harengus*), winter skate (*Leucoraja ocellata*), and little skate (*Leucoraja erinacea*), and in warm months, seasonal trawl samples were dominated by longfin squid (*Doryteuthis pealeii*), Atlantic butterfish (*Peprilus triacanthus*), and scup (*Stenotomus chrysops*). Little skate was the only species to dominate catch in both seasons (Guida et al. 2017).

Based on their primary habitat association, finfish can be divided into two general groupings, demersal and pelagic. Demersal species (groundfish) spend at least part of their adult life state on or close to the ocean bottom. Habitat preferences vary between species and life stages. Flatfish and skates spend the majority of their lives directly on the seabed, whereas species like Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), and black sea bass (*Centropristis striata*) live on or near hard bottom seabed during one or more life stage. Table 4.4.3.-2 of the COP (Sunrise Wind 2022) provides a summary of common habitat types for finfish species known to occur in the region. Demersal fish are important to the ecosystem within the SRWF and have an important economic role in the Project Area.

Pelagic fish are generally schooling fish that occupy the mid- to upper water column as juveniles and adults and are distributed from the nearshore to the continental slope and beyond. Pelagic species occupy the surface to midwater depths (0 to 3,281 feet [0 to 1,000 meters]) from the shoreline to the continental shelf and beyond. Some species are highly migratory and may be present in the near-coastal and shelf surface waters of the Mid-Atlantic Bight in the summer, taking advantage of the abundant prey in the warm surface waters. Highly migratory finfish travel long distances and often across domestic and international boundaries. Examples of these species include tunas (*Scombridae* spp.), billfishes (*Istiophoridae* spp. and *Xiphias gladius*), and many sharks (*Elasmobranchii* spp.). Coastal migratory pelagic species include fast-swimming schooling fishes that range from shore to the continental shelf. These fish use the highly productive coastal waters of the more expansive Mid-Atlantic Bight during the summer months and migrate to deeper and/or distant waters during the remainder of the year (BOEM 2013). Examples of coastal pelagic species that could occur enter the Project area include forage fish such as anchovy (*Engraulidae* spp.), shad (*Alosa* spp.), and menhaden (*Clupeidae* spp.), and the predatory fish that prey upon them.

Demersal and pelagic finfish encompass a diversity of species that associate with the full range of environment types that occur in the geographic area. Estuarine species are commonly found in nearshore areas where freshwater inputs from large rivers mix with the ocean. Some species are purely marine and are primarily found in offshore environments. Anadromous species migrate between the ocean and lower-salinity riverine environments for spawning. Demersal species of anadromous fish that could potentially be present in the Project area include striped bass (*Morone saxatilis*) and Atlantic sturgeon (*Acipenser oxyrhynchus*) and pelagic anadromous species that could occur within the Project area including American shad (*Alosa sapidissima*), alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), Atlantic menhaden (*Brevoortia tyrannus*), and Atlantic sea herring (*Clupea harengus*) (BOEM 2013; Scotti et al. 2010). Table 4.4.3.-1 of the COP (Sunrise Wind 2022) summarizes information on species of economic or ecological importance that are potentially present in the SRWF and surrounding region. These species were selected based on literature review, agency correspondence, fish sampling results from the Block Island Wind Farm, and EFH source document review. This list does not include every species that has the potential to occur in the SRWF.

Additionally, nearshore and onshore Project features could impact riverine systems. The Carmans River is located in the Town of Brookhaven, Long Island, and extends approximately 10 mi (16 km) from central Long Island to Bellport Bay (part of Great South Bay) (NYSDEC 2008). Carmans River is identified as one of only four major riverine systems on Long Island and it contains extensive undeveloped lands. The tidal river begins approximately 2 mi (3 km) north of Bellport Bay and is primarily within the Wertheim National Wildlife Refuge (NYSDEC 2008), which is to the south of the Onshore Transmission Cable. The Onshore Transmission Cable crosses the Carmans River where it is classified as freshwater. The tidal portion of the river supplies important nursey habitat for striped bass and bluefish (*Pomatomus saltatrix*), as well as spawning and nursey habitats for alewife, Atlantic menhaden, white perch (*Morone americana*), and Atlantic silverside (*Menidia menidia*) (NYSDEC 2008). Many freshwater fish species occur in the river including a naturally reproducing population of brook trout (*Salvelinus fontinalis*), yellow perch (*Perca flavescens*), white perch, largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), and unusually abundant concentrations of Eastern pirate perch (*Aphredoderus sayanus*) (NYSDEC 2008). American eel (*Anguilla rostrata*) juveniles and adults can be found in both the tidal and freshwater portions of the river (NYSDEC 2008.) The Carmans River is also identified as one of the few streams on Long Island that supports concentrations of sea-run brown trout (*Salmo trutta*) and wild brook trout (NYSDEC 2008).

Finfish often consume prey across multiple trophic levels, and their diet may change depending on their life stage. Both demersal and pelagic finfish species may consume fish, invertebrates, planktonic organisms, and detritus, with shellfish, worms, copepods, and other invertebrates being significant types of prey in New England waters. The most common vertebrate finfish prey species include herring, menhaden, northern and sand lance (*Ammodytidae* spp.), and silver hake (*Merluccius bilinearis*) (COP Section 4.4.3; Sunrise Wind 2022).

Five federally listed species may occur in the vicinity of the Project Area: Atlantic salmon (*Salmo salar*), Atlantic sturgeon, shortnose sturgeon (*Acipenser brevirostrum*), giant manta ray (*Manta birostris*), and oceanic whitetip shark (*Carcharhinus longimanus*). However, the SRWF does not overlap with critical habitat for any of these species. Of these species, the Atlantic sturgeon is the only one whose occurrence is common enough that they may be exposed to impacts of the Project (COP Section 4.4.3; Sunrise Wind 2022). Atlantic salmon are not known to occur within or near the Project Area, with the only potential for overlap with their distribution being their migration route in the Gulf of Maine. This area may be transited by vessels, but there is no evidence of interactions between vessels and Atlantic salmon, and vessel strikes are not identified as a threat in the listing determination (74 Federal Register 29344) or the recent recovery plan (USFWS and NMFS 2018).

Regional effects of climate change are influencing finfish. In response to ocean warming, the distribution of both demersal and pelagic finfish resources is undergoing marked changes in the Project Area and across all of southern New England (Hare et al. 2016). In response to increasing water temperatures, the distributional ranges of many groundfish species in New England waters have shifted northward and into deeper waters, and it is predicted that more fish species will follow (Nye et al. 2009; Pinsky et al. 2013). For example, black sea bass has been increasing in abundance over the past several years in New England as water temperatures increase (Kuffner 2018; McBride et al. 2018). Additionally, several pelagic forage species, including Atlantic butterfish, scup, and Atlantic mackerel (*Scomber scombrus*) have been increasing in the waters in and surrounding the SRWF (McManus et al. 2018). Shifts in distribution could possibly be mediated by changes in spawning locations and shifts in spawning time (Walsh et al. 2015). It is expected that further water temperature increases in southern New England are expected to exceed the global ocean average by at least a factor of two, with ocean circulation patterns also projected to change (Saba et al. 2016). The finfish community structure of the Mid-Atlantic and southern New England OCS is also shifting due to fishing pressure and modification of coastal and estuarine habitats (NOAA 2022b).

3.5.5.1.2 Invertebrates

Invertebrate resources assessed in this section include pelagic invertebrates, specifically squid and pelagic invertebrate eggs and larvae; benthic invertebrates associated with soft sediments; and benthic invertebrates associated with hard surfaces.

Within the analysis area, numerous benthic invertebrate species have pelagic eggs and larvae that utilize currents to disperse offspring. These pelagic eggs and larvae are the prey base for a variety of species during one or more life stages and are a component of EFH. Additionally, squid, specifically longfin inshore squid (*Doryteuthis pealeii*) and northern shortfin squid (*Illex illecebrosus*), are pelagic invertebrate species that could also potentially occur within the analysis area.

The benthic environment of the RI-MA and MA WEA is dominated by sandy sediments, with coarser sediments including gravels, found in shallower areas (Bay State Wind 2019; Deepwater Wind South Fork, LLC 2019, Stokesbury 2014; LaFrance et al. 2010). In the Northwest Atlantic OCS, the Soft Sediment Fauna Subclass typically includes deep-burrowing polychaetes, tube-building amphipods and polychaetes, as well as epifaunal species including sand shrimp (*Crangon septemspinosa*), sand dollars (*Clypeasteroida*), and sea stars (*Asteroidea*) (Guida et al. 2017; Stokesbury 2012, 2014; Deepwater Wind South Fork LLC 2019; DWW Rev I, LLC 2020). Soft bottom habitats, including those documented during the site-specific benthic surveys (e.g., sand and mud, sand with ripples, and sand with pebbles/granules) are suitable for the following ecologically and economically important shellfish species: Atlantic sea scallop (*Placopecten magellanicus*), Jonah crab (*Cancer borealis*), Atlantic rock crab (*Cancer irroratus*), channeled whelk, (*Busycotypus canaliculatus*), ocean quahog clam (*Artica islandica*), Atlantic surf clam (*Spisula soliddissima*), and horseshoe crab (*Limulus polyphemus*). Additionally, longfin squid (*Doryteuthis* (Amerigo) *pealeii*) may utilize sand with pebbles/granules habitats (COP Appendix M1; Sunrise Wind 2022). Sea scallops (*Placopecten magellanicus*), ocean quahogs (*Arctica islandica*), and surf clams (*Spisula solidissima*) are all commercially harvested bivalves that inhabit soft bottom habitats in the Northwest Atlantic OCS. EFH for sea scallop overlaps with the planned SRWEC corridor as well as the western portion of the SRWF and EFH for Atlantic surf clam occurs around the nearshore portions of the SRWEC corridor (NMFS 2020). Additional information on the distribution of commercially fished bivalve species can be found in the EFH assessment.

Hard bottom habitats are limited in regional distribution in the Northwest Atlantic OCS compared to sandy and soft bottom habitats (CoastalVision and Germano and Associates 2010; Greene et al. 2010; Poppe et al. 2014). Hard-surface invertebrates prefer substrates such as boulders and cobbles as complex habitat. Hard-surface invertebrates include a diversity of species, with some that firmly attach to surface and some that crawl, rest, cling to the surface of, and/or shelter in the spaces between hard substrates. These species have adaptations that allow for them to stay in contact with the hard substrate. Examples of mobile hard-substrate invertebrates include American lobster (*Homarus americanus*), crabs, starfish, sea urchins, and amphipods. Examples of attached hard-substrate invertebrates include barnacles, anemones, and tunicates (COP Section 4.4.2; Sunrise Wind 2022).

Several commercially important invertebrate species, such as lobster, Atlantic sea scallop, longfin and shortfin squid, and ocean quahog, occur within the geographical analysis area of the SRWF, the SRWEC, and the Onshore Transmission Cable. The affected environment for invertebrates and many fish species is influenced by commercial and recreational harvest of certain species, habitat modification, benthic habitat disturbance by fishing activities such as vessel anchoring and bottom-disturbing methods, and regional shifts in biological community structure caused by climate change. Some commercial fishing methods, specifically dredges and bottom trawling, are a source of chronic disturbance of seabed habitats. Depending on the frequency of disturbance, this type of fishing activity can impact community structure and diversity and limit recovery (Nilsson and Rosenberg 2003; Rosenberg et al. 2003). The severity and rate of recovery from fishing-related disturbance is variable and dependent on the type of gear used and the nature of the affected habitat. This threat is ongoing and would impact aquatic species in the proposed Project area regardless of Proposed Action alternatives or other future offshore construction activities.

3.5.5.1.3 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act requires federal agencies to consult with NMFS on activities that could adversely affect EFH. NOAA defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (NOAA 2022a). EFH has been defined for various species in the Northeastern United States offshore and nearshore coastal waters by NMFS, New England Fisheries Management Council (NEFMC), and the Mid-Atlantic Fishery Management Council (MAFMC). Together, these agencies maintain Fishery Management Plans (FMPs) for specific species or species groups to regulate commercial and recreational fishing and define EFH within their geographic regions. NMFS's Highly Migratory Species Division is responsible for the management of tunas, sharks, swordfish, and billfish in the proposed Project Area. Within state waters associated with the proposed Project Area, commercial and recreational fisheries are further managed by several state regulatory agencies, including the Atlantic States Marine Fisheries Commission (ASMFC), as well as ocean management plans of various types. Additionally, unmanaged forage species such as anchovies, silversides, and sand lances may be found throughout state and federal waters within the proposed Project Area. Many of these species have not been assessed and abundance of most forage species varies annually based on environmental factors independent of the stock biomass (MAFMC 2017).

BOEM has prepared an EFH assessment for the Project. The EFH assessment provides detailed descriptions of preferred habitat and life history information of species with EFH habitat within the Project Area. EFH has been designated for the species or management groups that occur within the Project Area.

- Atlantic herring *(Clupea harengus)*
- Bluefish *(Pomatomus saltatrix)*
- Highly migratory species (e.g., tunas *[Thunnini]*, swordfish *[Xiphias gladius]*, and sharks *[Selachimorpha]*)
- Mackerel *(Scomber scombrus)*, squids *(Decapodiformes)*, and butterfish *(Peprilus triacanthus)*
- Monkfish *(Lophius americanus)*
- Northeast multispecies (large mesh) (e.g., Atlantic cod *[Gadus morhua]*, Atlantic pollock *[Pollachius virens]*, haddock *[Melanogrammus aeglefinus]* and windowpane flounder *[Scophthalmus aquosus]*)
- Northeast multispecies (small mesh) (e.g., red hake *[Urophycis chuss]* and silver hake *[Merluccius bilinearis]*)
- Shellfish, Atlantic seascallop *(Placopecten magellanicus)*, Atlantic surfclam *(Spisula solidissima)*, and ocean quahog *(Arctica islandica)*
- Skates *(Rajidae)*
- Spiny dogfish *(Squalus acanthias)*
- Summer founder *(Paralichthys dentatus)*, scup *(Stenotomus chrysops)* and black sea bass *(Centropristis striata)*

Within the SRWF, 42 species of fish and invertebrates have life stages with designated EFH, including 26 with demersal life stages and 27 with pelagic life stages (COP Appendix N1; Sunrise Wind 2022). Within a 0.5-mi (800-m) corridor around the SRWEC-NYS centerline, 32 species of fish and invertebrates have life stages within designated EFH, including 20 with demersal life stages and 21 with pelagic life stages (COP Appendix N1; Sunrise Wind 2022). Within Great South Bay, 17 species of fish and invertebrates have life stages with designated EFH (COP Appendix N1; Sunrise Wind 2022).

In the Northeast region, NMFS and the regional management councils have identified subsets of EFH as Habitat Areas of Particular Concern (HAPC). These are habitat types and/or geographic areas identified by regional fishery management councils and NMFS as priorities for habitat conservation, management, and research, but the HAPC designation does not confer any specific habitat protection (MAFMC 2016). These areas are identified based on one or more of the following considerations: (1) the importance of the ecological function provided by the habitat, (2) the extent to which the habitat is sensitive to human-induced environmental degradation, (3) whether, and to what extent, development activities are, or would be, stressing the habitat type, and (4) the rarity of the habitat type (MAFMC 2016). The MAFMC identifying HAPC for summer flounder as “All native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH” (MAFMC 2016). Additionally, HAPC for juvenile Atlantic cod, defined as occurring between the mean high-water line and a depth of 66 ft (20 m) in rocky habitats, in SAV, or in sandy habitats adjacent to rocky and SAV habitats for foraging from Maine through Rhode Island, can be found in the region, but it does not occur within the footprint of the SRWF or SRWEC, nor its immediate vicinity (COP Section 4.4.3; Sunrise Wind 2022).

In July 2022, the NEFMC approved a proposed HAPC designation comprising large-grained complex and complex benthic habitats wherever present within the area bounded by a 6.2-mile buffer around the RI/MA and MA WEAs. The designation is intended to protect high-value complex habitats within this area, emphasizing currently known and potentially suitable areas used by Atlantic cod for spawning. This designation would also apply to large-grained complex and complex benthic habitats used by Atlantic herring, Atlantic Sea scallop, little skate, monkfish, ocean pout, red hake, silver hake, windowpane flounder, winter flounder, winter skate, and yellowtail flounder. This HAPC is not actually defined by the presence of habitat but by the presence of offshore wind. This new HAPC designation is currently being finalized and has not yet been implemented.

3.5.5.2 Impact Level Definitions for Finfish, Invertebrates, and Essential Fish Habitat

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on finfish, invertebrates, and EFH from the alternatives, including the proposed action Table 3.5.5-1 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for finfish, invertebrates, and EFH. Table G-9 in Appendix G identifies potential IPFs, Issues, and Indicators to assess impacts to finfish, invertebrates, and EFH. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project.

Table 3.5.5-1. Impact Level Definitions for Finfish, Invertebrates, and Essential Fish Habitat

Impact Level	Adverse	Beneficial
Negligible	Impacts on species or habitat would be so small as to be unmeasurable	Impacts on species or habitat would be so small as to be unmeasurable
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 would be short term in nature.	Impacts on species and their habitat are detectable and measurable. The effects are likely to benefit individuals, be localized and/or be short term and unlikely to lead to population-level effects
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.	Impacts on species and/or their habitat are detectable and measurable. These benefits may affect large areas of habitat, be long-term, and/or affect a large number of individuals and may lead to a detectable increase in populations but is not expected to improve the overall viability or recovery of affected species or population.
Major	Impacts would affect the viability of the population and would not be fully recoverable or permanent. Impacts on habitats would result in population-level impacts on species that rely on them.	Impacts on species and/or their habitat are detectable and measurable. These impacts on habitat may be short-term, long-term, or permanent and would promote the viability of the affected species/population and/or increase the affected species/population levels.

3.5.5.3 Impacts of Alternative A - No Action on Finfish, Invertebrates, and Essential Fish Habitat

When analyzing the impacts of the No Action Alternative on finfish, invertebrates, and EFH, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities on the baseline conditions. 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 E*, Planned Activities Scenario*.

3.5.5.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for finfish, invertebrates, and EFH described in Section 3.5.5.1, Affected Environment would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities. Ongoing offshore wind activities within the GAA that contribute to impacts on finfish, invertebrates, and EFH are generally associated with pile-driving noise, new cable emplacement, and the presence of structures and climate change. These impacts are expected to continue at current trends and have the potential to affect finfish, invertebrates, and EFH species through short-term and permanent habitat removal and noise impacts, which could cause avoidance behavior and displacement. Mortality of individual species 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 GAA that contribute to impacts on Finfish, Invertebrates, and Essential Fish Habitat include:

- Continued O&M of the Block Island project (5 WTGs) installed in State waters
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect finfish, invertebrates, and EFH through the primary IPFs of with pile-driving noise, new cable emplacement, and the presence of structures. Ongoing offshore wind activities would have the same type of impacts from noise, presence of structures, and land disturbance that are described in detail in the following section for planned offshore wind activities, but the impacts would be of lower intensity.

3.5.5.3.2 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 Proposed Action).

Baseline conditions for finfish, invertebrates, and EFH would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities. Ongoing activities within the GAA that contribute to impacts on finfish, invertebrates, and EFH are generally associated with commercial harvesting and fishing activities, fisheries bycatch, water quality degradation and pollution, effects on benthic habitat from dredging and bottom trawling, accidental fuel leaks or spills, and climate change. Some mobile invertebrates can migrate long distances and encounter a wide range of stressors over broad geographical scales (e.g., longfin and shortfin squid). Their mobility and broad range of habitat requirements may also mean that limited disturbance may not have measurable effects on their stocks (populations). However, longfin and shortfin squid may be more negatively impacted as sand wave leveling may affect their spawning grounds. Finfish populations are composed largely of long-range migratory species; it would be expected that their mobility and broad ranges would preclude many short-term impacts associated with ongoing offshore impacts throughout the GAA. However, as more wind farms are installed the construction impacts become additive and species may not be able to entirely avoid effects. Invertebrates with more restricted geographical ranges or sessile invertebrates or life stages can be subject to the above stressors over time and can be more sensitive (Guida et al. 2017).

Accidental releases and discharges: As future offshore wind energy activities continue, there is the potential for accidental releases during construction activities, operations, and any decommissioning of offshore facilities. Accidental releases include things such as contaminants to water quality, trash, and debris. The typical hazardous materials that are accidentally released from marine construction activities include fuels, lubricating oils, and petroleum products. These releases have the potential to cause localized increases in water pollution.

Regulations from BOEM currently prohibit any discharge or dumping of solid debris into offshore waters during activities associated with construction and operation of offshore energy facilities (30 CFR

250.300). The United States Coast Guard (USCG) also prohibits any dumping of trash or debris that may pose entanglement or ingestion risk (MARPOL, Annex V, Public Law 100−220 (101 Stat. 1458)). The ability to comply with these regulations would minimize release of trash and other debris into the associated waters.

Offshore wind construction projects would cause an increase in vessel traffic that may lead to the introduction of invasive species during ballast and bilge water discharges. The impacts from the release of invasive species on finfish, invertebrates, and EFH can have the potential to be adverse, widespread, and potentially permanent if the species were to become established and outcompete native species (Piet et al. 2021). All offshore wind related construction vessels would be required by BOEM to adhere to state and federal regulations for ballast and bilge water discharges which include the USCG ballast discharge regulations (33 CFR 151.2025) and the EPA NPDES Vessel General Permit standards. Water quality trends are likely to continue with little to no change in the future with the consideration of projects following these requirements. Accidental releases due to future offshore wind energy activities are likely to be localized and the impacts would be short term, and minor on finfish, invertebrates, and EFH.

Anchoring: In the future offshore wind scenario, there would be increased vessel anchoring during survey activities and during the construction, installation, maintenance, and decommissioning of offshore components. In addition, anchoring/mooring of meteorological towers or buoys could be increased. Anchoring causes short-term disturbance to seafloor, which would be considered short-term impacts that occur regularly throughout the GAA. These activities would increase turbidity and could result in direct mortality of benthic, finfish, and invertebrate resources or degradation of sensitive hard-bottom habitats, including EFH. Anchoring would cause increased turbidity levels and would have the potential for physical contact to cause lethal or sublethal effects on invertebrates. The construction, operation, and maintenance of future offshore wind projects would disturb seafloor habitat, increasing turbidity and potentially disturbing, displacing, or injuring benthic habitat, finfish, and invertebrates. This disturbance would be localized and short-term, representing considerably less than 1 percent of the total available benthic habitat within the GAA. Potential impacts would be minimized by the implementation of mitigation measures. For finfish specifically, it is unlikely that adult fish would be directly affected by anchoring and impacts would be negligible. However, less-mobile life stages such as eggs and larvae could experience direct mortality or smothering from turbidity with impacts occurring at a local, small scale, not at population or species level, and they would be short-term, minor, and localized. It would be expected that recovery of any affected species would occur in the short term, although degradation of sensitive habitats could persist in the long term.

Physical seabed disturbance due to anchoring would generally result in localized and short-term impacts on invertebrate resources, with recovery in the short term. Mobile invertebrates would be temporarily displaced, whereas sessile and slow-moving invertebrates could be subject to localized lethal and sublethal impacts. Demersal eggs and larvae would be particularly vulnerable to sediment disturbance and resettlement. High rates of mortality can occur in longfin squid egg masses if exposed to abrasion. In contrast, if the anchoring activity leads to the restructuring of patchy cobble boulder habitat into more linear, continuous cobble habitat, the change may provide juvenile lobsters with higher-value small-scale habitat, where predation rates would be expected to be lower (Guarinello and Carey 2020).

Impacts would be expected to be localized, turbidity would be short-term, and mortality of sessile invertebrate and life stages from contact would be recovered in the short term. Degradation of sensitive habitats, such as eelgrass beds and hard-bottom habitats, if it occurs, could be long term to permanent. The overall impacts of anchoring on finfish, invertebrates, and EFH are likely to be negligible to minor, localized, and short term.

Cable emplacement/maintenance: Cable emplacement and maintenance activities (including dredging) would disturb sediments and cause sediment suspension, which could disturb, displace, and directly injure finfish species and EFH. Short-term disturbance of seafloor habitats could disturb, displace, and directly injure or result in mortality of invertebrates in the immediate vicinity of the cable-emplacement activities. Sediment disturbance and resettlement could also affect eggs and larvae, particularly demersal eggs such as winter flounder, ocean pout, and longfin squid eggs as well as skate egg cases, which have high rates of mortality if egg masses are exposed to abrasion. When new cable emplacement and maintenance cause resuspension of sediments, increased turbidity could have an adverse impact on filter-feeding fauna such as bivalves. Depending on the substrate being disturbed, invertebrates could be exposed to contaminants via the water column or resuspended sediments, but effects would depend on the degree of exposure.

Cable emplacement and maintenance activities could result in short-term impacts and over time may result in long-term habitat alterations. The intensity of impacts would depend on multiple factors, including time of year, sediment type, and habitat type being affected where activities occur. For example, in areas where sand is the predominant sediment type, disturbed sediments would be expected to settle out of the water column relatively quickly and travel shorter distances than if the seabed was dominated by finer sediments (mud). The impact of increased turbidity on invertebrates depends on both the concentration of suspended sediment and the duration of exposure. Plume modeling completed for other wind development projects within the region and with similar sediment characteristics (Vineyard Wind 1, Block Island Wind Farm, and Virginia Offshore Wind Technology Advancement) predict that suspended sediment would usually settle well before 12 hours have elapsed (Ocean Wind 2021). Sediment transport modeling for the SRWF estimated that elevated levels of TSS due to jet plow methods for installation of the SRWEC and IAC would return to ambient levels within 0.3 hours (COP Appendix H; Sunrise Wind 2022). BOEM, therefore, expects relatively little impact from increased turbidity (separate from the impact of direct sediment deposition) due to cable-emplacement and maintenance activities. The cable routes for future projects are under discussion and have not been fully determined at this time. This IPF could cause impacts during construction and maintenance activities. Assuming future projects use installation procedures similar to those proposed in Appendix E, the extent of impacts would be limited to approximately 6 feet (0.9 meter) to either side of each cable. Therefore, the duration and extent of impacts would be limited and short term, and it would be expected that finfish and invertebrates would recover following this disturbance; however, EFH and other habitats such as eelgrass or hard-bottom habitats may remain permanently altered (Hemery 2020), as eelgrass would be expected to require a greater amount of time to recover. Affected hard-bottom habitat would not be expected to recover but the extent of hard-bottom habitat that could potentially be affected is assumed to be low relative to the amount of this habitat available throughout the GAA.

Based on the assumptions provided in Appendix E, offshore cables associated with future wind projects would be similar to those of the Project, including inter-array cables, substation interconnection cables, and offshore export cables. The GAA for finfish and invertebrates is over 16 million acres (64,750 km^2) in size. The total seafloor disturbance would represent less than 0.1 percent of the GAA, and suspended sediment should settle well before 12 hours. Cable routes that intersect sensitive EFH such as eelgrass beds or rocky bottom and other more complex habitats may cause long-term or permanent impacts; otherwise, impacts of habitat disturbance and mortality from physical contact with finfish and invertebrates would be recovered in the short term, and overall impacts would be expected to be negligible to minor.

EMF: Several submarine power and communication cables exist in the Mid-Atlantic, the Southern OCS and surrounding coastal locations that emit an electromagnetic field (EMF) due to electric charges and the movement of electric charges. EMFs are present in the marine environment naturally and from anthropogenic sources. Under the no action alternative, BOEM is anticipating several proposed offshore energy projects throughout the next decade in the vicinity of SRW that would generate EMFs. EMF effects from these future projects on finfish, invertebrates, and EFH would vary in extent and significance depending on overall cable length, the proportion of buried versus exposed cable segments, and project-specific transmission design (e.g., HVAC or HVDC, transmission voltage). EMF strength diminishes rapidly with distance, and EMF that could elicit a behavioral response in an organism would likely extend less than 50 feet (15.2 meters) from each cable. When submarine cables are laid, installers typically maintain a minimum separation distance of at least 330 feet (100 meters) from other known cables to avoid inadvertent damage during installation, which also precludes any additive EMF effects from adjacent cables.

Population-level impacts on finfish have not been documented for EMF from alternating current cables (CSA Ocean Sciences Inc. and Exponent 2019). There is no evidence to indicate that EMF from undersea alternating current power cables adversely affects commercially and recreationally important fish species within the southern New England area (CSA Ocean Sciences Inc. and Exponent 2019). A more recent review by Gill and Desender (2020) supports these findings, where fish were found to be affected by EMF at high intensity for a small number of individual finfish species; however, response in finfish was not found to occur at the EMF intensities associated with marine renewable energy projects. For example, behavioral impacts have been documented for benthic species such as skates near operating direct current cables (Hutchison et al. 2018, 2020). Skates exhibited changes in behavior in the form of increased exploratory searching and slower movement speeds near the EMF source, but EMFs did not appear to present a barrier to animal movement.

The effects of EMF on invertebrate species have not been extensively studied, and studies of the effects of EMF on marine animals have mostly been limited to commercially important species such as lobster and crab (e.g., Love et al. 2017; Hutchison et al. 2020). Burrowing infauna may be exposed to stronger EMFs, but scientific data are limited. Recent reviews by Gill and Desender (2020), Albert et al. (2020), and CSA Ocean Sciences Inc. and Exponent (2019) of the effects of EMF on marine invertebrates in field and laboratory studies concluded that measurable effects could occur for some species, but not at the relatively low EMF intensities representative of marine renewable energy projects. For example, behavioral impacts were documented for lobsters near a direct current cable (Hutchison et al. 2018) and a domestic electrical power cable (Hutchison et al. 2020), including subtle changes in activity (e.g., broader search areas, subtle effects on positioning, and a tendency to cluster near the EMF source), and only when the lobsters were within the EMF. There was no evidence of the cable acting as a barrier to lobster movement and no effects were observed for lobster movement speed or distance traveled.

Additionally, faunal responses to EMF by marine invertebrates, including crustaceans and mollusks (Hutchison et al. 2018; Taormina et al. 2018; Normandeau et al. 2011), include interfering with navigation that relies on natural magnetic fields, predator/prey interactions, avoidance or attraction behaviors, and physiological and developmental effects (Taormina et al. 2018).

EMF levels would be highest at the seabed and in the water column above cable segments that cannot be fully buried and are laid on the bed surface under protective rock or concrete blankets. Invertebrates in proximity to these areas could experience detectable EMF levels and minimal associated behavioral effects. These unburied cable segments would be short and widely dispersed. CSA Ocean Sciences, Inc. and Exponent (2019) found that offshore wind energy development as currently proposed would have negligible effects, if any, on bottom dwelling finfish and invertebrates residing within the southern New England area. For pelagic species within the same area, no negative effects were expected from offshore wind energy development as currently proposed because of their preference for habitats located at a distance from the seabed.

The information summarized above indicates that EMF impacts on finfish, invertebrates, and EFH would be biologically insignificant, highly localized, and limited to the immediate vicinity of cables and would be undetectable beyond a short distance; however, localized impacts would persist as long as cables are in operation. Most exposure is expected to be of short duration, and the affected area would represent an insignificant portion of the available habitat for finfish and mobile invertebrate species; therefore, impacts on finfish, invertebrates, and EFH would be expected to be negligible.

Light: Light can be an attraction source to finfish and invertebrates and can sometimes influence biological cycles such as spawning. Future offshore wind project activities would produce additional light from vessels and from offshore structures. Vessels that are lit during construction, maintenance, or decommissioning would follow the lighting guidelines from BOEM. The guidelines issued by BOEM for construction vessels to avoid and minimize artificial lighting impacts from offshore energy facilities should minimize any adverse effects to fish and other aquatic organisms (Orr et al. 2016). Future activities would be required to adhere to these guidelines and because many of the navigation and vessel lights are not downward facing, the amount of light penetrating the water is anticipated to be minimal. Impacts from vessel lighting would likely be insignificant relative to activities not related to offshore wind that occur throughout the GAA. Furthermore, potential impacts from lighting would be anticipated to have little impact on finfish and invertebrates during daylight hours and would be limited by the depth of the water in the offshore wind lease areas.

The overall impacts of light on finfish, invertebrates, and EFH are likely to be negligible, localized, and short term, resulting in little change to these resources. As such, light from future offshore wind development would not be expected to appreciably contribute to overall impacts on these resources and impacts would be negligible.

Noise: Under the No Action alternative, human activities would continue to generate underwater noise with the potential to affect finfish, invertebrates, and EFH. Existing and future sources of anthropogenic underwater noise include commercial, government and military, research, and recreational vessel activity, and the development and operation of other wind energy projects on the OCS. Several offshore wind project construction periods would overlap between 2022 to 2030 (see Appendix E). Construction from these projects, most notably pile-driving, would create airborne and underwater noise with moderate potential to affect marine organisms, including finfish and invertebrates, as well as EFH. These effects range from low-level behavioral effects, foraging, mating, predator avoidance, and navigation to short-term hearing impairment (Madsen, 2006; Weilgart, 2007). Permanent sublethal hearing injuries, although possible, are unlikely to occur based on current and anticipated future impact avoidance and minimization requirements. Other sources of noise from wind projects include helicopters and aircraft used for transportation and facility monitoring, G&G surveys, WTG operation, and vessel traffic associated with these activities.

The noise associated with offshore wind project construction and operation generally falls into two categories: (1) impulsive noise sources, such as impact pile-driving, which generate sharp instantaneous changes in sound pressure and (2) intermittent non-impulsive noise sources, such as vessel engine noise, vibratory pile-driving, and WTG operation, which remain relatively constant and stable over a given time period. Impulsive and non-impulsive noise sources associated with offshore wind projects and other activities likely to occur on the OCS in the future are discussed below.

Noise impacts from G&G activities are anticipated to occur annually for the foreseeable future but would be localized. Seismic surveys that are used for oil and gas exploration create high-intensity impulsive noise that penetrate into the seabed and could potentially cause injury or behavioral impacts on finfish and invertebrates (BOEM 2012). It is important to note that seismic surveys for the purposes of offshore wind are generally used to investigate shallow hazards and hard-bottom areas for the purposes of evaluating the feasibility of turbine installation; as such, seismic surveys for offshore wind do not require use of seismic air guns (used for oil and gas exploration), which penetrate miles into the seabed. Consequently, seismic surveys for offshore wind have far fewer impacts than those for oil and gas exploration. Oil and gas exploration on the Atlantic OCS is currently unlikely. These impacts would be highly localized around the sound source and would be short term in duration. Finfish and invertebrates in the general area but not in the immediate vicinity of the sound source could experience short-term stress and short-term behavioral changes in a larger area affected by the sound.

The most significant impulsive noise source associated with offshore wind projects is pile-driving noise during the construction phase. WTG foundation installation involves impact pile-driving, which produces high SPLs in both the surrounding in-air and underwater environments. Pile-driving noise is produced intermittently during construction for a period of 4 to 6 hours per day. Potential noise exposure events would occur intermittently over several weeks during the allowable construction window (which may vary and would be determined through consultation with NMFS) in the GAA. Under the No Action alternative, construction of potentially 3,109 WTGs would generate short-term and intermittent impulsive underwater noise with the potential to impact finfish and invertebrates. These effects would be limited to specific construction windows beginning in 2022 and continuing through 2030.

Depending on their distribution in relation to construction activities and the timing of that construction, the duration and frequency of any exposure of finfish and invertebrates to construction noise would be variable. An individual may be exposed to anywhere from a single pile-driving event (lasting no more than a few hours on a single day) to intermittent noise over a period of weeks if an individual travels over the larger GAA where pile-driving may be occurring. The potential effects of exposure to pile-driving noise would range from minor, short-term behavioral with no biological consequences to injury or mortality. Highly mobile finfish likely would be displaced from the area, most likely showing a behavioral response; however, fish in the immediate area of pile-driving activities could suffer injury or mortality. Affected areas would likely be recolonized by finfish in the short term following completion of pile-driving activity. Early life stages of finfish, including eggs and larvae, could experience mortality or developmental issues because of noise; however, thresholds of exposure for these life stages are not well studied (Weilgart 2018). As explained above, the use of measures to mitigate exposure is expected to reduce the potential for injury. The probability and extent of potential impacts are situational and dependent on several factors including pile size, impact energy, duration, site characteristics (i.e., water depth, sediment type), time of year, and species, among others that have been considered in the acoustic exposure modeling (COP, Appendix I1, Sunrise Wind 2022).

Impacts from pile-driving noise on finfish would also depend on other factors that affect local fish populations, including time of year. Impacts from noise would be greater if occurring during spawning periods or in spawning habitat, particularly for species that are known to aggregate in specific locations to spawn, use sound to communicate, or spawn once in their lifetime. Prolonged localized behavioral impacts on specific finfish populations over the course of years could reduce reproductive success for multiple spawning seasons for those populations, which could result in long-term decline in local populations. However, based on behavioral studies of black sea bass (Jones et al. 2020), fish behavior returns to a pre-exposure state following completion of noise impacts. Additionally, as acoustic impacts decline with distance, it is unlikely that impacts of pile-driving from offshore wind farms outside of a certain threshold distance would result in any local population being subject to multiple years of acoustic impacts that would result in long-term impacts on the population. Therefore, impacts on finfish from pile-driving are anticipated to be short-term and intermittent during periods when pile-driving is actively occurring. It is important to note that no future non-offshore wind pile-driving activities have been identified within the GAA for this resource other than current ongoing activities.

Marine invertebrates lack internal air spaces and gas-filled organs needed to detect sound pressure and so are considered less likely to experience injury from over-expansion or rupturing of internal organs, the typical cause of lethal noise-related injury in vertebrates (Popper et al. 2001). Noise thresholds for adult invertebrates have not been developed because of a lack of available data, but some invertebrates are responsive to particle motion and are therefore capable of vibration reception (e.g., crustaceans, squid) (Mooney et al. 2020). This is supported by other studies that found American lobster and shore crabs (*Carcinus maenas*) to have some capability to detect and respond to sound (Jézéquel et al. 2021; Aimon et al. 2021).

The longfin squid has been found to exhibit an initial startle response, comparable to that of a predation threat, to pile-driving impulses recorded from a wind farm installation, but upon exposure to additional impulses, the squid's startle response diminished quickly, indicating potential habituation to the noise stimulus (Jones et al. 2020). After a 24-hour period, the squid seem to re-sensitize to the noise, which is an expected response to natural stimuli, as well. Squid schooling and shoaling behavior could be interrupted when exposed to pile-driving impulse noises, which could affect predation risk. Feeding behavior in longfin squid was disrupted by exposure to playbacks of pile-driving noise, resulting in increased failure of predation attempts on killifish (*Fundulus heteroclitus*). Regardless of whether they were hunting, squids exhibited comparable alarm responses to noise. Hearing measurements confirmed the noise was detected by the squid (Jones et al. 2021).

Noise transmitted through water and through the seabed can cause a disturbance response in invertebrates within a limited area around each pile and short-term stress and behavioral changes in individuals over a greater area (e.g., discontinuation of feeding activity). The extent depends on pile size, hammer energy, and local acoustic conditions, with the affected areas recolonized in the short term. These impacts are therefore anticipated to be short-term and intermittent, occurring only during active impact and vibratory pile driving.

The majority of anthropogenic underwater noise in the marine environment is continuous noise from large vessel engines, specifically ocean-going cargo, tanker, and container vessels. Other sources of noise like small vessels, wind farm operations, and other activities are likely to account for a small percentage of the total anthropogenic sound energy in the future ocean environment. Virtually all of the long-term noise effects associated with offshore wind energy projects during operations would be intermittent and non-impulsive in nature. Non-impulsive noise sources include helicopters and fixed-wing aircraft used for facility monitoring, vibratory pile-driving, construction and O&M vessel noise, and operational noise from WTGs.

Helicopters and fixed-wing aircraft, and vessels may be used during initial site surveys, protected species monitoring prior to and during construction, crew transportation, and facility monitoring; however, little noise from aircrafts propagates through the water column. Therefore, impacts on finfish from aircraft use are not likely to occur. Future activities related to offshore wind presumably would be related to increased vessel traffic associated with both construction and maintenance of WTGs and associated facilities. Vessels associated with construction were found to be loud enough at a distance of up to 10 feet (3 meters) to induce avoidance of finfish and invertebrates but not cause physical harm to the fish (MMS 2009). The behavioral avoidance impacts would be short term.

WTG operation is another source of continuous noise but is not expected to result in biologically significant effects on marine organisms. According to measurements at the Block Island Wind Farm, low-frequency noise generated by turbines reach ambient levels at 164 feet (50 m) (Miller 2017). Other studies have observed noise levels ranging from 109 to 127 dB re 1 µPa at 46 and 65.6 ft (14 and 20 m), respectively, at operational wind farms (Tougaard 2009). Operational noise and ambient noise both increase in conjunction with wind speed, meaning that WTG noise is only audible within a short distance from the source (Kraus 2016; Thomsen 2015). Even though these measurements have all been on much smaller WTGs than are planned for the Atlantic coast, operational noise from regional wind farm development is not expected to result in any adverse effects to finfish and invertebrates. The overall impacts of noise on finfish, invertebrates, and EFH are likely to be negligible to minor, localized, and short-term.

Port utilization: Port expansion and upgrades along the East Coast would be likely throughout the next decade to support the construction of offshore wind developments. The general trend along the East Coast of the United States from Virginia to Maine indicates that port activity would increase modestly in the foreseeable future. These increases in port activity may require port modifications that could cause localized, minor impacts on finfish and EFH, likely resulting in short-term displacement of finfish. Existing ports within the GAA have already affected finfish, invertebrates, and EFH. It is anticipated that modifications of ports would cause short-term and localized impacts on finfish, invertebrates, and EFH, likely resulting in behavioral responses, such as avoiding the area during port modification activities. These impacts would be limited to the short term and would not be expected to affect finfish and invertebrate species at a population level; however, mortality at less-mobile life stages such as eggs and larvae could occur if individuals were present in the immediate vicinity of port modification activity. The overall impacts of port utilization on finfish, invertebrates, and EFH are likely to be negligible to minor, localized, and short-term. As such, the impacts from future offshore wind development would be expected to be negligible to minor.

Presence of structures: Presence of structures could lead to impacts on finfish, invertebrates, and EFH through entanglement, gear loss or damage, hydrodynamic disturbance, fish aggregation, habitat conversion, and migration disturbances. These impacts could occur through addition of buoys, meteorological towers, WTG foundations, scour/cable protection, and transmission cable infrastructure. Over the next 35 years, development is expected to continue within the GAA, providing additional structures on the seafloor. Based on assumptions of development for future offshore wind projects, an estimated 3,075 foundations would be developed in the GAA (Appendix E). BOEM assumes that proposed future wind projects would include similar components for construction, i.e., WTGs, offshore and onshore cable systems, OSS, onshore O&M facilities, and onshore interconnection facilities, all of which would increase the total number of structures within the GAA over the next 35 years. In the GAA, structures are anticipated predominantly on sandy bottom, except for cable protection, which is more likely to be needed where cables pass through hard-bottom habitats. The potential locations of cable protection for planned activities have not been fully determined at this time; however, any addition of scour protection/hard-bottom habitat would represent substantial new hard-bottom habitat, as the GAA is predominantly composed of sand, mud, and gravel substrates.

No future activities were specifically identified within the GAA specific to entanglement and gear loss and damage; however, it is reasonable to assume that fishing activities (both commercial and recreational) may increase over time in the vicinity of structures due to the likelihood of fish and crustacean aggregation. Damaged and lost fishing gear caught on structures may result in ghost fishing or other disturbances, potentially leading to finfish mortality. Impacts from fishing gear would be localized; however, the risk of occurrence would remain if the structures were present. The presence of structures in an otherwise primarily sandy benthic environment would provide a more complex environment, likely to attract finfish and invertebrates such as mobile crustaceans of commercial value. As such, entanglement and gear loss may cause increased impacts on finfish, including mortality and alteration of habitats. These impacts would be localized and short term; however, they would likely persist intermittently if structures remained in place.

The addition of future structures and underwater foundations associated with future offshore wind projects would influence benthic habitats during construction. Once in place, these structures could provide the addition of artificial reefs that can influence benthic habitats and change the abundance and distribution of fish and invertebrate community structures. These effects would most likely be localized to the areas adjacent to the structures underwater, but as more structures are installed, they could produce more overall effects due to habitat loss and habitat conversion favoring structure-oriented species in the future. It is likely that the abundance of some fish species may increase with the new structures in place. The ecological response to new underwater structures would be an increase in diversity and biomass of flora and fauna that colonize the structural habitat. The long-term impacts of these structures would need to be studied in more detail to understand the lasting effects these structures may have on ecological communities (Degraer et al. 2020).

In light of the above information, BOEM anticipates that the impacts associated with the presence of structures may be negligible or minor beneficial and long term. The impacts on finfish, invertebrates, and EFH resulting from the presence of structures would persist for the duration for which the structures remain.

Seafloor disturbance: Seafloor habitat is routinely disturbed through dredging (for navigation, marine minerals extraction, and military purposes) and commercial fishing use of bottom trawls and dredge fishing methods. While fishing occurs over a large geographic area, bottom tending gears have much shallower penetration depths into the sediment than most offshore construction techniques or excavation tools. Abandoned or lost fishing gear remains in the aquatic environment for extended time periods, often entangling or trapping mobile invertebrate and fish species. Based on data from NOAA, bycatch affects many species throughout the GAA—most notably, windowpane flounder, blueback herring, shark species, and hake species; the majority of bycatch is a result of open area scallop trawls, large-mesh otter trawls, conch pots, and fish traps (NOAA 2019). Water-quality impacts from ongoing onshore and offshore activities affect nearshore habitats, and accidental spills can occur from pipeline or marine shipping. Invasive species can be accidentally released in the discharge of ballast water and bilge water from marine vessels. The resulting impacts on invertebrates and finfish depend on many factors but can be widespread and permanent, especially if the invasive species becomes established and outcompetes native species.

Ongoing dredging for the purposes of navigation results in short-term, localized impacts, such as habitat alteration and change in complexity, on finfish, invertebrates, and EFH. Dredging would be expected to occur most often in areas of sand waves where jet plowing would not be sufficient to meet target burial depths for cables, pipelines, etc. It would be expected that plumes of sediment resulting from dredging activities would redeposit to areas composed of similar sediments, due to the sandy nature of the seafloor throughout much of the GAA. Sandy or silty habitats, which are abundant in the GAA, are quick to recover from dredging disturbance. Newcombe and MacDonald (1991) suggest impacts from settlement of resuspended sediment plumes increase with the concentration of resuspension and the duration over which invertebrates are exposed to that plume. When studying the dredge plume dynamics of New York/New Jersey Harbor, USACE (2015) noted that sediment concentrations decreased exponentially with time and distance in the down-current direction (within 15 minutes of release, concentrations were noted to be less than 50 mg/L). Resuspension of coarse-grained sands within the offshore wind lease areas is expected to be limited in duration, resulting in a relatively short exposure of finfish and invertebrates to the plume. Seabed profile alterations could cause long-term or permanent impacts on EFH. Mechanical trenching, used in more resistant sediments (e.g., gravel, cobble), causes seabed profile alterations during use, although the seabed is typically restored to its original profile after utility line installation in the trench. Habitat function in these areas would be expected to recover in the short term following dredging activities.

Habitat alterations resulting from dredging would have negligible to minor impacts on finfish and invertebrates that would be short-term; however, long-term or permanent impacts on EFH could be possible.

Sediment deposition: Under the No Action alternative, future offshore wind projects could disturb over 15,400 ac (6,232 ha) of seabed while installing associated undersea cables, causing an increase in suspended sediment. This disturbance would result in short-term plumes of suspended sediments in the immediate construction areas. Research from the Block Island Wind Farm concluded that suspended sediment levels due to construction were found to be 100 times lower than model predictions completed before construction (Elliot et al. 2017) and dissipated to baseline levels less than 50 ft (15.2 m) from the disturbance. Both the modeled TSS effects, which are conservatively high, and the observed TSS effects were short term and within the range of baseline variability. These effects would be short term (lasting only a few tide cycles) due to the low mobility of sediments (primarily sand) in the proposed cable lay down area (Stantec 2020).

Finfish are unlikely to be affected by sediment deposition or burial; however, sessile life stages of some finfish such as eggs and larvae could be smothered by sediments, causing mortality. Impacts would be expected to vary by time of year, based on when any finfish species may spawn. Overall impacts due to sediment deposition and burial would be considered negligible to minor, localized, and short-term.

Dredging and mechanical trenching used during cable installation could cause localized, short-term impacts (habitat alteration, lethal and sublethal effects) on invertebrates through sediment deposition and seabed profile alterations. Sediment deposition could result in adverse impacts on invertebrates, including smothering. The tolerance of invertebrates to being covered by sediment (sedimentation) varies among species and life stage. Some sessile shellfish may only tolerate 0.4 to 0.8 inch (1 to 2 centimeters), while other benthic organisms can survive burial in upward of 7.9 inches (20 centimeters) (Essink 1999). Demersal eggs and larvae would be particularly vulnerable to sediment disturbance and resettlement. For example, high rates of mortality can occur in winter flounder, ocean pout eggs, longfin squid egg masses, and skate egg cases if exposed to abrasion. For migratory invertebrate species, impacts would be expected to vary by time of year, based on the species' presence in the vicinity of the cable lay down area. Overall impacts from sediment deposition would be short-term and minor. Disturbance of sand waves that may impact finfish and invertebrate use may take a longer time to recover than other habitats.

Regulated fishing effort: Regulated fishing is an ongoing activity that impacts finfish, invertebrates, and EFH. Fishing can modify the distribution, bottom disturbance, and mortality of fisheries in the area. Ongoing offshore wind activities and construction developments can influence the management measures chosen to support fisheries management goals, altering the nature, distribution, and intensity of fishing-related impacts on fish, invertebrates, and EFH. Reduced fishing activity due to restrictions associated with wind energy development may benefit some overfished finfish and invertebrate species by reducing fishing pressure and allowing some recovery. Regulated fishing aims to achieve a sustainable loss of biomass for commercially regulated finfish and invertebrate populations. Fishing activity also has indirect impacts through bycatch and ghost fishing by abandoned and lost fishing gear. Changes to the management of commercial fisheries enforced by states, municipalities, or NOAA (depending on jurisdiction) could result in changes to the distribution and intensity of fishing-related impacts on finfish and invertebrate populations. However, the commercial fisheries buffer zone regulations and recreational catch limits are not expected to change or result in any population decline. Overall, the intensity of impacts resulting from regulated fishing effort is anticipated to be long term and qualify as minor to moderate.

Climate change: Future trends for climate change predict that fish, invertebrates, and EFH may experience adverse effects going forward. Several factors of climate change impact the world's oceans including increasing water temperatures, ocean acidification, and changing weather patterns. These factors are causing a shift in the distribution of many important fish species toward cooler or deeper waters. These changes can and would have significant impacts on not only the commercial and recreational fishing industry, but on the health of fish stocks in the North Atlantic (Alexander et al. 2020, Sumaila et al. 2020). Ocean acidification is another process being accelerated by climate change that is causing the oceans to become more acidic as more carbon dioxide enters the atmosphere. This increased acidity can have adverse effects on invertebrate groups that rely on calcareous shells to thrive, as well as fish that utilize reef systems for protection and habitat (Espinel-Velasco et al. 2018). Global climate change has the potential to affect the distribution and abundance of invertebrates and their food sources, primarily through increased water temperatures but also through changes to ocean currents and increased acidity. The Northeast shelf (including New England) has experienced increasingly elevated temperatures in both surface and bottom depths (NOAA 2022c). Finfish and invertebrate migration patterns can be influenced by warmer waters, as can the frequency or magnitude of disease (Hare et al. 2016). Regional water temperatures that increasingly exceed the thermal stress threshold may affect the recovery of the American lobster fishery off the East Coast of the United States (Rheuban et al. 2017). Ocean acidification driven by climate change is contributing to reduced growth and, in some cases, decline of invertebrate species with calcareous shells. Increased freshwater input into nearshore estuarine habitats can result in water quality changes and subsequent effects on invertebrate species (Hare et al. 2016).

Based on a recent study, northeastern marine, estuarine, and riverine habitat types were found to be moderately to highly vulnerable to stressors resulting from climate change (Farr et al. 2021). In general, rocky and mud bottom, intertidal, SAC, kelp, coral, and sponge habitats were considered the most vulnerable habitats to climate change in marine ecosystems (Farr et al. 2021). Similarly, estuarine habitats considered most vulnerable to climate change include intertidal mud and rocky bottom, shellfish, kelp, SAV, and native wetland habitats (Farr et al. 2021). Riverine habitats found to be most vulnerable to climate change include native wetland, sandy bottom, water column, and SAV habitats (Farr et al. 2021). As invertebrate habitat, finfish habitat, and EFH may overlap with these habitat types, this study suggests that marine life and habitats could experience dramatic changes and decline over time as impacts from climate change continue.

Planned non-offshore wind activities that may affect finfish, invertebrates, and EFH include new submarine cables and pipelines, tidal energy projects, marine minerals extraction, dredging, military use, marine transportation, fisheries use and management, global climate change, and oil and gas activities These activities would result in the same types of impacts as described for ongoing non-offshore wind activities. Appendix E, Attachment 1, provides additional information on finfish, invertebrates, and EFH impacts associated with ongoing and planned activities.

3.5.5.3.3 Impacts of Alternative A on ESA-Listed Species

Impacts to endangered species associated with ongoing offshore wind activities are likely to be insignificant. Subadult and adult Atlantic sturgeon are known to occur in marine waters year-round and many of the IPFs discussed in the above sections could apply. The most sensitive IPF to sturgeon would most likely be the noise associated with construction, including pile-driving; however, those activities are most likely to occur in the summer when Atlantic sturgeon utilize more nearshore and riverine water, reducing their risk significantly (Ingram et al. 2019).

3.5.5.3.4 Conclusions

Impacts of the No Action Alternative

Under the No Action alternative, finfish, invertebrates, and EFH would likely continue to be affected by existing environmental trends in the region. Ongoing activities are expected to have continuing short-term and permanent impacts (disturbance, displacement, injury, mortality, and habitat conversion) on finfish, invertebrates, and EFH. Continuation of existing environmental trends and activities under the No Action Alternative would result in **minor** to **moderate** impacts on finfish, invertebrates, and EFH.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and fish, invertebrates, and EFH would continue to be affected by natural and human caused IPFs. Any responses would be dependent on the continued anthropogenic activities. Even though the current project would not be constructed under the No Action Alternative, BOEM anticipates several renewable offshore projects to be constructed in the next decade that could have short-term or potentially permanent impacts on fish, invertebrates, and EFH. Possible impacts could include benthic habitat disturbance and degradation, displacement of species, injury, or mortality. Aside from renewable energy construction activities, the trend of commercial fishing pressures and climate change would continue to be a **moderate** threat to fish, invertebrates, and EFH.

Activities other than offshore wind developments have the potential to impact fish, invertebrates, and EFH in the reasonably foreseeable future. These activities include increased vessel traffic, any new submarine cable installations or pipelines, onshore construction activities, marine survey or explorations, mineral extractions, port expansions, channel dredging activities, and the installation of any new offshore structures, buoys, or piers (Appendix E). These reasonably foreseeable activities and their impacts on fish, invertebrates and EFH are anticipated to be **minor** to **moderate**. Ongoing fishing pressures would exacerbate the impacts to fish, invertebrates, and EFH more so than construction related activities. The most significant ongoing impacts related to fishing pressure would include clam and scallop dredging and bottom trawling activities and would control the condition of fisheries and invertebrate species structure in the geographical analysis area for the future.

3.5.5.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on finfish, invertebrates, and EFH:

- The number, size, and locations of WTGs;
- Total length of IAC;
- Number and locations of OCC;
- Total length of OCC interconnector cable; and
- Time of year during which construction occurs.

Variability of the proposed Project design exists as outlined in Appendix C. Below is a summary of potential variances for impacts:

- WTG number, size, and locations: The level of hazard related to WTG is proportional to the number of WTGs installed, with fewer WTGs requiring fewer foundations, resulting in less construction-related impacts.
- Offshore cable route and OSS footprint: The route of the cable and footprint of the OSS would determine that type and amount of seafloor habitat impacts.
- Season of construction: Finfish vary in their migration movements, meaning that certain species and lifestages may be present at during different seasons, and their chosen depth in the water column may also be influenced by season and water temperature. Some mobile invertebrates also vary in their migration movements, and sensitive life stages are present at certain times of the year. Any construction window would affect finfish species, such as Atlantic sturgeon.

Although some variation is expected in the design parameters the assessment of impacts to finfish, invertebrates and EFH in this section considers the maximum case scenario.

3.5.5.5 Impacts of Alternative B - Proposed Action on Finfish, Invertebrates, and Essential Fish Habitat

3.5.5.5.1 Construction and Installation

SRWF would be located within federal waters (Atlantic Ocean) on the OCS, specifically in the Lease Area, approximately 16.4 nm (18.9 miles, 30.4 km) south of Martha's Vineyard, Massachusetts; approximately 26.5 nm (30.5 miles, 48.1 km) east of Montauk, New York; and approximately 14.5 nm (16.7 miles, 26.8 km) from Block Island, Rhode Island. A detailed map showing the locations of all proposed WTGs, IAC, and the OSS is provided in Figure 3.3.4-1 in the COP (Sunrise Wind 2022).

The Proposed Action would consist of up to 95 foundations for the WTGs and OCS-DC, with a maximum embedment depth of up to 164 ft (50 m) for monopile foundations, and 295 ft (90 m) for OCS-DC piled jacket foundations. The maximum area of seafloor footprint per foundation, inclusive of scour protection and CPS stabilization is 1.06 ac (4,290 m^2) for WTG monopile foundations and 2.64 ac (10,684 m^2) for the OCS–DC foundation structure.

The SRWEC would consist of one 320-kV DC export cable bundle buried to a target depth of 3 to 7 ft (1 to 2 m) with a maximum total corridor length of approximately 105 mi (169 km), a maximum individual cable diameter of 7.8 in (200 mm), a maximum disturbance corridor width of 98 ft (30 m), a maximum seafloor disturbance for horizontal directional drilling (HDD) exit pits of 61.8 ac (25 ha), and a maximum disturbance for Landfall Work Area (onshore) of up to 6.5 ac (2.6 ha).

The SRWF would include a stationary Offshore Converter Station (OCS-DC) which would collect the medium voltage alternating current (AC) power generated by the WTGs, convert it to direct current (DC), transform it to higher voltage for transmission, and transport that power to the Project's onshore electrical infrastructure via the SRWEC. The OCS-DC would withdraw seawater for cooling and discharge the heated effluent to the surrounding environment. The withdrawal of raw seawater would occur through a cooling water intake structure (CWIS) to dissipate heat produced through the AC to DC conversion and then discharge this heated water as effluent to the marine receiving waters. The DIF for the OCS-DC is 8.1 million gallons per day (MGD); however, the average intake flow (AIF) would generally range from 4.0 MGD to 5.3 MGD.

3.5.5.5.1.1 Onshore Activities and Facilities

Seafloor and land disturbance: Onshore facilities would be expected to have minimal impacts on EFH, including littoral zone habitats such as SAV and tidal wetlands, due to the majority of the facilities being on land, as well as the use of HDD where the Onshore Transmission Cable crosses the ICW between Bellport Bay and Narrow Bay, just west of the Smith Point bridge. The proposed Onshore Transmission Cable route may cross under SAV or macroalgae, which is considered HAPC for summer flounder. Video surveillance confirmed that SAV and benthic macroalgae covered a very small area (1.7 acres) within the assessment area surrounding the ICW HDD route (COP Appendix N1, Sunrise Wind 2022).

Installation of the cable via HDD would avoid direct impacts to marine vegetated habitats as this methodology avoids disturbance to the seafloor; HDD exit pits and work areas would not overlap with littoral zone habitats in the ICW HDD Assessment Area (COP Appendix N1, Sunrise Wind 2022). Similarly, the extent of wetlands within the ICW HDD Assessment Area were mapped using NYSDEC tidal wetlands data (NYSDEC 1974); and no impacts would be anticipated to these habitats from the ICW HDD installation as use of this methodology avoids disturbance to the seafloor; however, impacts could occur in the unlikely event of an inadvertent release of drilling fluid (addressed below).

A Temporary Landing Structure that may be installed to aid in the transport of equipment and materials for the Landfall HDD and ICW HDD could potentially impact EFH in its direct vicinity. Two floating pier assessment areas (east, west) have been established within which a single Temporary Landing Structure could be deployed to support construction activities at Smith Point County Park. The west pier assessment area would cover 2.5 acres, and the east area would cover 1.7 acres. The Temporary Landing Structure would be up to approximately 1,500 sq ft (0.03 acres) and would consist of a floating module and a ramp connecting the floating module to shore. The Temporary Landing Structure would be secured to the seabed with spuds. The tidal range in the ICW is approximately 2 ft and depending on the tides and water depths at the selected location, a portion of the Temporary Landing Structure may be grounded at times, particularly closer to the shoreline. The Temporary Landing Structure would likely be set up for a few weeks in the fall and a few weeks in the spring to assist with equipment transport. Depending on the logistics planning, the Temporary Landing Structure could need to remain in place from fall to spring.

The east and west pier assessment areas were examined for SAV and benthic macroalgae extent, as well as wetland presence. No recent SAV or benthic macroalgae habitats were mapped in these areas (see Table 3.4.1-1; Figure 3.4-1 of COP Appendix N1, Sunrise Wind 2022). Historical data from 2018 and 2002 indicate the potential presence of 0.8 acres of SAV in the west area; however, the 2020 video survey of this area did not document the presence of any SAV or benthic macroalgae. Historical data from 2002 indicate the potential presence of 0.3 acres of SAV in the east area; confirmatory surveys are planned for late summer or fall of 2022.

Should subtidal vegetated habitat (SAV and/or benthic macroalgae) be present in the area at the time of construction and could not be avoided in siting the pier, up to 1,500 sq ft (0.03 acres) could be indirectly and temporarily impacted if these habitats completely overlap with the planned pier location. Short-term indirect impacts over the entire area of overlap between the pier and the vegetated habitats would result from shading effects that could reduce the photosynthetically active radiation available to SAV. Depending on the ultimate pier location, direct short-term impacts of no more than approximately 960 sq ft (0.02 acres) to vegetated benthic habitat would be possible during times that portions of the pier would be grounded and from direct contact with spuds from the Temporary Landing Structure and barge. A preconstruction SAV survey would be conducted prior to construction to confirm current presence of SAV. The likelihood of impacts to intertidal and subtidal vegetated habitats would be considered very low given that the proposed Temporary Landing Structure would be positioned to avoid and minimize impacts to these sensitive habitats to the extent practicable. Use of the proposed Temporary Landing Structure would occur between fall and spring, and thus would minimize impacts to any SAV present during the growing season.

The NYSDEC tidal wetlands (1974) category of "coastal shoals, bars, and mudflats" was the only tidal wetlands mapped within the assessment areas–0.9 acres in the west area and 0.05 acres in the east area (see Table 3.4.1-1 and Figure 3.4-1 in COP Appendix N1, Sunrise Wind 2022). This category is defined as "The tidal wetland zone that at high tide is covered by saline or fresh tidal waters, at low tide is exposed or is covered by water to a maximum depth of approximately one foot and is not vegetated." Direct short-term impacts of up to approximately 960 sq ft (0.02 acres) to this habitat would be possible during times when portions of the pier would be grounded and from direct contact of spuds from the Temporary Landing Structure and barge.

Subtidal (below low tide) portions of the east and west pier assessment areas could be suitable habitat for benthic eggs, such as winter flounder. Only a small area directly under the spuds and the portion of the pier that rests on subtidal seafloor would have an impact on these habitats. Direct short-term impacts to egg habitat would be expected to be extremely minor given the very small area of impact and the low amounts of sedimentation expected from pier construction. In addition, and although the current EFH definition for winter flounder eggs includes mud and muddy sand (NEFMC 2017), Wilber et al. (2013) found that in New York harbors winter flounder had very specific habitat preferences and were more likely to utilize sandy sediments than muddy or silty bottoms or bottoms with a high percentage of total organic carbon. Should the subtidal sediments in the area selected for siting the pier have higher components of mud than sand, the potential for egg habitat and, thus, the potential for the Temporary Landing Structure to impact winter flounder eggs, would be further reduced. Seafloor and land disturbance effects on finfish, invertebrates, and EFH during construction and installation activities would be minimal, short-term in nature and have negligible impacts.

Sediment deposition: Construction of the Onshore Transmission Cable would be accomplished using HDD methodology where the proposed route crosses the ICW. The proposed Onshore Transmission Cable route would cross under SAV habitat in the ICW that is considered HAPC for summer flounder. The use of HDD would avoid impacts to tidal wetlands and SAV; however, impacts could occur in the unlikely event of an inadvertent release of drilling fluid. An inadvertent release occurs when drilling fluids (i.e., naturally occurring bentonite clay) migrate unpredictably to the surface of the seafloor through fractures, fissures, or other conduits in the underlying rock/sediments. An inadvertent release of drilling fluid along the HDD segment could cause a short-term turbidity plume; however, bentonite clay particles would be expected to settle quickly due to the natural flocculation of clay particles in seawater. Although bentonite by itself is non-toxic, it is a fine particulate material that could become entrained in the water column and transported to other locations if sufficient current velocities were present, causing turbidity and sedimentation.

Mobile species could be temporarily displaced by a turbidity plume and, depending on the thickness of materials settling on the seafloor, demersal eggs/larvae could be at risk of smothering or other injury. Demersal/benthic finfish eggs and larvae in the vicinity of a release could potentially experience short-term, direct impacts from a short-term increase in sedimentation/ deposition. Eggs and larvae can be more sensitive to sediment deposition (Berry et al. 2003), as they may be unable to relocate from the affected areas and, therefore, would be more susceptible to impacts from an inadvertent release compared to juveniles and adults. Impacts on EFH species, if they were to occur, would be minimal, short-term and localized, and would generally be limited to individuals in the immediate vicinity of the release. Disturbance of sand waves that may impact finfish and invertebrate use may take a longer time to recover than other habitats.

Accidental release: Although no impacts from discharges and releases are anticipated, spills or accidental releases of fuels, lubricants, or hydraulic fluids could occur during use of trenchless installation and duct bank installation methods, installation of the Onshore Transmission Cable or Onshore Interconnection Cable, or during construction activities at the OnCS–DC. A Spill Prevention, Control, and Countermeasure (SPCC) Plan would be developed, and any discharges or release would be governed by NYS regulations. Any unanticipated discharges or releases within the Onshore Facilities during construction would be expected to result in minimal, short-term impacts; activities would be heavily regulated, and discharges and releases would be considered accidental events that would unlikely occur. Additionally, where HDD would be utilized, an Inadvertent Return Plan would be prepared and implemented to minimize the potential risks associated with release of drilling fluids. The potential for a significant loss of drilling fluid in this inshore environment would be considered low. Given this information, impacts on summer flounder HAPC, finfish, and EFH as a result of an inadvertent release of drilling fluid would not be expected. Effects on finfish, invertebrates, and EFH from accidental release would be minimal, short-term in nature and have negligible impacts.

3.5.5.5.1.2 Offshore Activities and Facilities

Offshore construction of the SRWF and SRWEC could likely result in potential impacts to finfish, invertebrates and EFH that are discussed below.

Accidental release and discharge: As discussed above in the No Action Alternative, BOEM and the USGS would ensure all construction activity vessels are prohibited from the discharge of trash and debris and procedures would be in place and followed such as spill prevention and response plans throughout construction phase to minimize and avoid accidental releases and spills of any hazardous materials during all phases of construction. Under these guidelines, Project construction-related impacts to finfish, invertebrates and EFH from potential accidental releases would be negligible. Most small accident spills impacts would be localized in area and action would be put in place immediately to address and mitigate any potential impacts from emergency spills. If an unlikely larger spill occurs, the impacts on species would be moderate due to the potentially adverse impacts to water quality. Spills that may occur are expected to do so at the surface and impact the upper or surface-mixed layer of the water column.

As discussed in the No Action Alternative, the risk of the release of invasive species if appropriate guidelines are followed would be low and the attributable impacts would be negligible. If any accidental spill of invasive species occurred directly related to construction vessel activities and the invasive species were to become established and outcompete native species, the impacts could potentially be major. Ongoing trends and future planned activities would cause additional risk for the likelihood of accidental spills beyond those attributed to the proposed Project. If appropriate guidelines are followed, effects on finfish, invertebrates, and EFH from accidental release and discharge would be minimal, short-term and have negligible impacts.

Anchoring: The short-term impacts of vessel anchoring on finfish, invertebrates, and EFH would include direct contact of anchors and associated equipment with the seafloor bottom. The impacts of anchor contact with the bottom would cause increased turbidity in the immediate, localized areas with the potential to temporarily disturb finfish, invertebrates, and EFH. Injury, mortality, and potential habitat degradation could be possible and would mostly impact invertebrates if occurred. Direct contact of an anchor with a finfish is possible but the likelihood is very rare. Localized impacts would be short-term, and any physical contact would be recovered in the short-term.

Sensitive habitat areas such as eelgrass beds, or hard bottom substrates would be more susceptible to anchoring with the potential for longer term or permanent impacts. Habitat characterization and mapping, along with the required development of an anchoring plan would minimize any anchoring in sensitive habitats and reduce the area of sensitive habitats to be affected. If degradation of sensitive habitat were to occur, the impacts could be longer term, but the impacts from anchoring during construction are no greater than the impacts of anchor proposed from ongoing and planned future activities in the future. The combined impacts of anchoring on finfish, invertebrates, and EFH in the context of foreseeable environmental trends and ongoing and planned activities are expected to be negligible to minor.

Light: Any artificial lighting from construction activities would be attributed to deck lighting and navigation purposes of vessels from dusk to dawn. Vessels would be required to comply with guidance from BOEM to minimize or reduce lighting that affects the aquatic environment. Finfish and invertebrate impacts due to artificial light are highly species dependent and can either cause attraction or avoidance (Orr et al. 2016). Most impacts are associated with more permanent light sources associated with nearshore or overwater permanent structures. Any lighting effects on finfish, invertebrates, and EFH during construction activities would be minimal, short-term in nature and have negligible impacts.

Noise: Noise and vibration associated with construction activities such as pile-driving, geological surveys, and dredging could impact finfish, invertebrates and EFH. Impacts are dependent on a variety of factors, including the source and intensity of the noise source, as well as the species in the area. Pile-driving activity is likely to produce the most intense underwater noise levels and have the potential to initiate a response from finfish and invertebrates. Typical responses may include short-term displacement, or disruption of common activities during feeding and movement, with less likely and more severe responses including physiological reactions that could lead to mortality (Popper et al. 2015). The Fisheries Hydroacoustic Working Group (2008) established conservative thresholds for the impacts from sound on fish (Table 3.5.5-2). There are currently no established thresholds for the impacts of sound on invertebrates. In general, crustaceans and mollusks lack internal air spaces and as a result are less sensitive to noise-related injury than fish.

Offshore construction activities associated with the proposed action primarily from pile-driving activities could cause fish to suffer behavioral and/or physiological responses based on distance from the sound source, equipment used, substrate and environmental conditions (Popper et al. 2015).

The current threshold classification considers effects on fish mainly through sound pressure without taking into consideration the effect of particle motion. Popper et al. (2014) and Popper and Hawkins (2018) suggest that extreme levels of particle motion induced by various impulsive sources may also have the potential to affect fish tissues and that proper attention needs to be paid to particle motion as a stimulus when evaluating the effects of sound on aquatic life. However, lack of evidence for any source due to extreme difficulty of measuring particle motion and determining fish sensitivity to particle motion renders establishment of any guidelines or thresholds for particle motion exposure currently not possible (Popper et al. 2014; Popper and Hawkins 2018).

Table 3.5.5-2. Impacts of Noise Levels on Fish

	Physiological Effects		Behavioral Disturbance [c]
	Lpk (dB re 1 μPa)	Le, 24 hr (dB re 1 μPa²s)	Lp (dB re 1 μPa)
Fish Type	Impulsive	Impulsive	Impulsive / Non-Impulsive
Fish (≥ 2 grams) [a]	206	187	150
Fish (< 2 grams) [a]	206	183	150
Fish without swim bladder [b]	213	216	150
Fish with swim bladder not involved in hearing [b]	207	203	150
Fish with swim bladder involved in hearing [b]	207	203	150

Source: [a]FHWG (2008), [b]Popper et al. (2014), Andersson et al. 2007; Wysocki et al. 2007; Mueller-Blenke et al. 2010; Purser and Radford 2011.

Note: dB re 1 μPa = decibel re 1 micropascal; Lpk = peak sound pressure level; dB re 1 μPa = decibels re 1 micropascal; Lrms = root-mean-square sound pressure level; dB re 1 μPa²s = decibel re 1 micropascal squared second; SEL = sound exposure level accumulated over 24 hours.

Acoustic propagation modeling of the impact pile-driving activities for the Proposed Action was undertaken to determine distances to the established injury and disturbance thresholds for fish (Küsel et al. 2021). Two types of piles were considered: 8-and 11-meter tapered monopiles (26 feet [8 meters] at the waterline and 36 feet [11 meters] at the mudline) and 2.44-meter pin piles. Impact hammer installation of the monopile foundations would produce the most intense underwater noise impacts with the greatest potential to cause injury-level effects on fish; therefore, these effects are the focus of the assessment below. Sound fields from 8- and 11-meter monopiles were modeled at one representative location in the Offshore Project area using IHC S-4000 and IHC S-2500 impact hammers. The modeling also used a 10-dB-per-hammer-strike noise attenuation to incorporate the use of a single noise-abatement system (e.g., one or multiple bubble curtain[s]). The resulting values represent a radius extending around each pile where potential injurious-level or behavioral effects could occur and are presented in Table 3.5.5-3. Soft start during impact pile-driving is a mitigation technique that involves the gradual increase in hammer blow energy to allow marine life to leave the area. Soft starts would be employed prior to commencement of any impact pile-driving. Soft starts would include at least 20 minutes of four to six strikes per minute at 10 to 20 percent of the maximum hammer energy.

Table 3.5.5-3. Summary of Acoustic Radial Distances (R95 in kilometers) with 10dB Attenuation for Fish during Monopile Impact Pile Installation

Threshold Type	Threshold Level	Acoustic Radial Distance (R^{95} km) during Summer	Acoustic Radial Distance (R^{max} km) during Winter
Behavior (all fish)	150 dB re 1 µPa	5.18	7.54
Injury (all fish)	206 dB re 1 µPa	0.07	0.07
Injury (fish >2 grams)	187 dB re 1 µPa	4.93	6.85
Injury (fish <2 grams)	183 dB re 1 µPa	6.06	9.35

Source: Küsel et al. 2021.

Note: Cumulative sound exposure level values were calculated for a 24-hour period for the installation of a single 8- and 11-meter tapered monopile using a IHC S-4000 hammer.

Sound exposure guidelines and regulations designed to protect finfish are described in terms of sound pressure levels, but the observable effects of high intensity noise sources on finfish may actually be caused by exposure to particle motion (Popper and Hawkins 2018). However, the particle motion levels associated with a high intensity noise source are difficult to measure and isolate from sound pressure levels. There is currently very limited understanding of the potential effects of particle motion on finfish and invertebrates.

All fishes (including elasmobranchs) detect and use particle motion, even for those fishes that are also sensitive to sound pressure (Popper and Hawkins 2019). Fishes that do not possess a swim bladder (sharks, mackerel, flatfish), as well as fishes with a swim bladder distant from the ear (salmon, tuna, most teleosts) are thought to primarily be sensitive to particle motion (Hawkins et al. 2020). Fishes with the swim bladder close to the ear (Atlantic cod, eels) or where the swim bladder is connected to the ear (herrings) are able to detect sound pressure as well as particle motion (Hawkins et al. 2020). In these finfish, the swim bladder and other gas-filled organs may act as a type of acoustic transformer, converting sound pressure into particle motion (Popper and Hawkins 2018). The movement of these organs may indirectly stimulate the otolith structures such that fishes experience particle motion both from the noise source and from this indirect signal (Popper and Hawkins 2018).

Cephalopods, including cuttlefish, octopus, and squid species, are likely sensitive to particle motion rather than sound pressure (e.g., Packard et al. 1990; Mooney et al. 2010), with the lowest particle motion thresholds reported at 1 to 2 Hz (Packard et al. 1990). Particle motion thresholds were measured for longfin squid between 100 and 300 Hz, with a threshold of 110 dB re 1 µPa reported at 200 Hz (Mooney et al. 2010). No other studies have measured particle motion. Cephalopods appear to be particularly sensitive to low frequency sound. Solé et al. (2017) estimated that trauma onset may begin to occur in cephalopods at received sound pressure levels (Lrms) from 139 to 142 dB re 1 µPa at one-third octave bands centered at 315 Hz and 400 Hz. A recent study found impulsive pile-driving noise resulted in a change in squid (*Doryteuthis pealeii*) behavior, with squid exhibiting body pattern changes, inking, jetting, and startle responses (Jones et al. 2020).

Longfin squid (*Doryteuthis pealeii*) are known to spawn inshore in southern New England waters from May to July (Hatfield and Cadrin 2002). Noise from impact pile-driving and/or vibratory pile-driving may temporarily cause a disturbance to spawning habitat, however the majority of spawning habitat occurs inshore of the SRWF Project Area (MAFMC 2011) and therefore pile-driving noise is not expected to result in measurable impacts on spawning squid habitat.

Sessile invertebrates such as bivalves may respond to sound exposure by closing their valves (e.g., Kastelein 2008; Roberts et al. 2015; Solan et al. 2016) much as they do when water quality is temporarily unsuitable. In one study, the duration of valve closure was shown to increase with increasing vibrational strength (Roberts et al. 2015). Clams may respond to anthropogenic noise by reducing activity and moving to a position above the sediment-water interface.

For exposed species, noise from impact pile driving and/or vibratory pile driving may temporarily reduce habitat quality and cause mobile species to temporarily vacate the area (Hawkins et al. 2014; Neo et al. 2015). Some fish species may move away from the area before noise levels exceed the threshold for injury, but given the size of the potential zones of ensonification exceeding the behavioral disturbance threshold, harassment of individual fish would be possible (Popper et al. 2014; Neo et al. 2015).). During summer months the radial distances to SEL_{max} injury thresholds are a maximum of 3.76 mi (6.06 km) for large fish and 14.9 mi (4.93 km) for small fish; during winter months radical distances to SEL_{max} injury thresholds are a maximum of 4.25 mi (6.85 km) for large fish and 5.81 mi (9.35 km) for small fish; these SEL_{max} estimates assume fish remain stationary during pile driving and that this sound level occurs throughout the entire water column (Küsel et al. 2021). In reality, fish would be moving around, which could, for some species, lessen the impact during pile driving, which would only occur for an approximately 4-hr period each day.

An Atlantic cod winter spawning grounds have been identified in a broad geographical area that includes Cox Ledge and surrounding locations. Historically, Atlantic cod have been managed in U.S. waters as two units: the Gulf of Maine and the Georges Bank management units. Recently, an Atlantic Cod Stock Structure Working Group was formed and identified a number of mismatches between the current management units and biological stock structure and proposed a new biological stock structure that accounts for inshore and offshore separation and spawning timing. McBride and Smedbol (2022) summarize several lines of evidence supporting the conclusion that the Atlantic cod found in the Southern New England waters of the Mid-Atlantic Bight are one of five reproductively isolated spawning stocks that occur in U.S. waters.

In Southern New England, Atlantic cod spawn primarily from December through May (Dean et al. 2020; Langan et al. 2020). Atlantic cod produce “grunts” which may play a significant role in their reproductive behavior (Rowe and Hutchings 2004; Stanley et al. 2017). Courtship and spawning behavior, including vocalizations, occur primarily at night (Dean et al. 2014, Zemeckis et al. 2019), with peak spawning communication occurring approximately 4 – 6 hours after sunset (Zemeckis et al. 2019). Noise impacts from impact pile driving could be greater if pile driving occurs in spawning habitat, occurs during peak spawning periods, and/or results in reduced reproductive success in one or more spawning seasons, which could result in long-term effects to populations if one or more-year classes suffers suppressed recruitment. During environmental noise impacts such as pile driving, acoustic masking may occur when animals fail to detect biologically important acoustic cues, such as spawning communication. However, acoustic masking is an environmental stressor that ceases as soon as the noise stops, with no lingering effects. For example, Atlantic cod, hake, and black sea bass belong to the hearing specialist group and rely on sound for communication and other important behaviors. Stanley et al. (2020) determined that noise from activities like impact pile driving could interfere with spawning black sea bass communication during spawning, but concluded that the fish would likely return to normal spawning behavior once the acoustic impact ceased.

Cod display high spawning site fidelity, meaning that a spawning population will return to the same locations year after year (McBride and Smedbol 2022). Alteration of the ambient noise environment during evening spawning periods could interfere with communication and alter behavior in ways that could disrupt localized cod spawning aggregations (Dean et al. 2012; Rowe and Hutchings 2006), raising concerns about noise impacts from impact pile driving from the Proposed Action. No impact pile driving would occur in the SRWF from January 1 through April 30 to protect North Atlantic right whales, which would also be protective of spawning Atlantic cod. Additionally, the use of sound attenuation (e.g., bubble curtains) would reduce the area of potential impacts from impact pile driving.

Additional studies funded by BOEM to describe cod use of the habitats within and in proximity to the SRWF are ongoing. Two years of data have been collected in the three-year study, although no formal reports analyzing the data have been completed. During the studies, Atlantic cod have been detected in the Northwest corner of the SRWF where fixed station telemetry receivers have been installed. However, to date no cod grunts have been detected in the SRWF area.

Short-term and short-range impacts on EFH could also occur due to geophysical surveys, vessel noise, construction equipment noise, and/or aircraft noise. Limited research has been conducted on underwater noise from mechanical/hydro-jet plows. Generally, the noise from this equipment is expected to be masked by louder sounds from vessels. Also, as most noise generated by these pieces of equipment would be below the sediment surface and associated with the high-pressure jets, noise levels are not expected to result in injury or mortality to EFH species but may cause mobile species to temporarily vacate the area. The duration of noise at a given location would be short, as the installation vessel would only be present for a short period at any given location along the cable route.

Short-term, localized geophysical surveys during the construction period may include the use of multi-beam echosounders, side-scan sonars, shallow penetration sub-bottom profilers, medium penetration sub-bottom profilers and marine magnetometers. The survey equipment to be employed would be equivalent to the equipment utilized during survey campaigns associated with Lease Area OCS-A 0500 conducted in 2016, 2017, 2018, 2019, and 2020 and with Lease Area OCS-A 04876 conducted in 2018, 2019 and 2020 (CSA Ocean Sciences Inc. 2020) and would not be expected to result in measurable impacts on EFH.

Helicopters could be used for crew transfers between the SRWF and shore. Underwater noise associated with helicopters would be generally brief as compared with the duration of audibility in the air (Richardson et al. 1995). The noise generated by aircraft would be similar to the range of noise from existing aircraft traffic in the region and is not expected to substantially affect the existing underwater noise environment.

Vessel noise may also cause mobile species to temporarily vacate the area. Vessel sound source levels have been shown to cause several different effects, the most common of which are behavioral responses, including avoidance, alteration of swimming speed and direction, and alteration of schooling behavior (Vabø et al. 2002; Handegard and Tjøstheim 2005; Sarà et al. 2007; Becker et al. 2013; Slabbekoorn et al. 2019). These studies also demonstrated that the behavioral changes generally were short-term or that fish habituated to the noises. EFH species in the vicinity of construction vessels may be affected by vessel noise but the duration of the disturbance would occur over a very short period at any given location. Noise from vessel traffic is also expected to be similar to existing background vessel traffic noise in the area.

Construction noise associated with the Proposed Action is likely to result in short-term impacts that may cause a range of responses from fishes and invertebrates. The effects may include behavioral responses with the potential to cause direct injury and mortality only if fish are in the immediate area of the sound source, but many are likely to avoid such disturbance. The overall impacts of construction noise impacts on finfish and invertebrates would likely be minor.

Seafloor disturbance: Habitat alteration and seafloor disturbance from offshore construction activities could cause injury or mortality to benthic/demersal species and affect their habitat and spawning. Specifically, seafloor-disturbing activities could result in a loss of spawning habitat for Atlantic cod, as studies suggest that cod often demonstrate spawning site fidelity, returning to the same fine-scale bathymetric locations year after year to spawn (Hernandez et al. 2013; Siceloff and Howell 2013). An active Atlantic cod winter spawning ground has been identified in a broad geographical area that includes Cox Ledge and surrounding locations (Zemeckis et al. 2014; Cadrin et al. 2020; Dean et al. 2020; Langan et al. 2020). There is currently a BOEM funded acoustic telemetry study to better understand the distribution and habitat use of spawning cod on and around Cox Ledge. Given the availability of similar surrounding habitat, Project activities are not expected to result in measurable impacts on spawning Atlantic cod.

Non-lethal impacts on EFH from seafloor preparation activities are expected to be short-term, as any effects would cease shortly after seafloor preparation is completed in a given area and only a small portion of the available habitat in the area would be disturbed. Impacts on EFH species that have pelagic early and/or later life stages within the SRWF are expected to be limited as pelagic habitats would not be directly affected by seafloor preparation, aside from temporary seawater intake associated with controlled flow excavation (CFE) equipment used with sand wave leveling. However, these species may temporarily vacate the area of disturbance and entrainment in construction equipment is not expected to result in population-level impacts.

Impacts on EFH associated with boulder clearance and related seafloor preparation activities are expected to be low. Boulders relocated during seafloor preparation would be in new locations and may be in new physical configurations in relation to other boulders. Concerning these spatial and physical attributes, the boulders are not expected to return to pre-project conditions. However, relatively rapid (less than 1 year) recolonization of these boulders is expected (Guarinello et al. 2017) that would return these boulders to their pre-project habitat function. Additionally, if relocation results in aggregations of boulders, these new features could serve as high value refuge habitat for juvenile lobster and fish that prefer structured habitat, as they may provide more complexity and opportunity for refuge than surrounding patchy habitat.

Impacts on EFH associated with seafloor disturbance from impact pile-driving and/or vibratory pile-driving and installation of the foundations (WTG and OCS–DC) and scour protection are expected to be similar to those produced from seafloor preparation. Impact pile-driving and/or vibratory pile-driving, and foundation installation could crush benthic/demersal species, particularly eggs and larvae, but also less mobile, older life stages that could not vacate the area. Limited impacts on EFH are expected for pelagic species because they are not expected to be near the seafloor during work activities or subject to crushing or injury through placement of the piles and foundations.

Impacts on EFH associated with the IAC installation would be expected to result in similar impacts as those for seafloor preparation, as the cables would be installed in the same area that would have been disturbed during seafloor preparation. Because of the slow speed of the cable installation equipment and limited size of the impact area, it would be expected that most mobile benthic/demersal and pelagic finfish would temporarily leave the area of disturbance; however, eggs, larvae, and other sessile or slower moving species could be subject to injury or mortality. Additionally, fish eggs and larvae (ichthyoplankton), as well as zooplankton, could be entrained during jet plow installation of the IAC and CFE for targeted-area cable installation. During these activities, seawater would be used to circulate through hydraulic motors and jets during installation. The water withdrawal volumes are expected to be approximately 250 to 650 million gallons (946 to 2,460 million liters) for the jet-plow and approximately 191 to 516 million gallons (724 to 1,953 million liters) for CFE equipment. Although this seawater would be released back into the ocean, species could be drawn into the water intake (entrained), and it is assumed that all entrained eggs, larvae, and zooplankton would be killed. These losses would be expected to be very low, based on a previous assessment conducted for South Fork Wind (SFW), which found that the total estimated losses of zooplankton and ichthyoplankton from jet plow entrainment were less than 0.001 percent of the total zooplankton and ichthyoplankton abundance present in the study area that encompassed a linearly buffered region of 15 km around the export cable and 25 km around the wind farm (INSPIRE Environmental 2018). Only early life stages of fishes would be impacted by the jet plow; later life stages would not be impacted.

EFH species would be expected to move back into the area after construction; however, in areas of seafloor disturbance, demersal/benthic habitat recovery and benthic infaunal and epifaunal species abundances may take up to 1 to 3 years to recover to pre-impact levels. (AKRF Inc. et al. 2012; Germano et al. 1994; Hirsch et al. 1978; Kenny and Rees 1994). Recolonization of sediments by epifaunal and infaunal species and the return of mobile fish and invertebrate species would allow this area to continue to serve as foraging habitat. Pelagic species/life stages could be indirectly affected by the short-term reduction of benthic forage species, but these impacts would be expected to be small given the availability of similar habitats in the area. Other species could be attracted to the disruption and prey on dislodged benthic species or other species injured or flushed during seafloor preparation, IAC installation, and vessel anchoring activities.

Sediment deposition and suspension: Seabed disturbance during Project construction would result in short-term plumes of suspended sediments in the immediate construction area. Research conducted for the Block Island Wind Farm suggests that observed TSS levels were far lower than levels predicted using the same modeling methods, dissipating to baseline levels less than 50 ft (15.2 m) from the disturbance. Both the modeled TSS effects, which are conservatively high, and the observed TSS effects were short term and within the range of baseline variability. However, these effects would be short term (lasting only a few tide cycles) due to the low mobility of sediments (primarily sand) in the proposed cable lay down area (Stantec 2020).

Sediment transport modeling for the Project was performed by Woods Hole Group using the Particle Tracking Model (PTM) in the Surface-Water Modeling System (see COP Appendix H; Sunrise Wind 2022). Several model simulations were run to evaluate the concentrations of suspended sediments, spatial extent and duration of sediment plumes, and the seafloor deposition resulting from IAC and SRWEC burial activities. The grain size distributions used for modeling were based on grab samples from federal waters collected during field studies performed for the Project, and USGS sediment core data for NYS waters (USGS 2014).

For the SRWF IAC, a representative segment of installation by jet plow was simulated and the modeling results indicate that sediment plumes with TSS concentrations exceeding the ambient conditions by 100 mg/L could extend up to 3,346 ft (1,020 m) from the cable centerline. The model estimated that the elevated TSS concentrations would be of short duration and expected to return to ambient conditions within 0.3 hours following the cessation of cable burial activities. The modeling results indicate that sedimentation from IAC burial is expected to exceed 0.4 inch (10 mm) of deposition out to a maximum of 220 ft (67 m), with a total of 7.4 acres of seafloor experiencing more than 0.4 inch (10 mm) of sediment deposition during construction. Additionally, the TSS plume is expected to be primarily contained within the lower portion of the water column, approximately 8.2 ft (2.5 m) above the seafloor.

During installation of the SRWEC–OCS, modeling results indicate that during jet plowing, sediment plumes with TSS concentrations exceeding the ambient conditions by 100 mg/L could extend up to 2,969 ft (905 m) from the cable centerline in federal waters. The model estimated that the elevated TSS concentrations would be of short duration and expected to return to ambient conditions within 0.4 hours following the cessation of cable burial activities. Sedimentation from SRWEC–OCS burial is predicted to exceed 0.4 inch (10 mm) of deposition up to 791 ft (241 m) from the cable centerline. This thickness of sedimentation is expected to cover approximately 832.3 acres (3.37 km2) in federal waters, and the TSS plume is expected to be primarily contained within the lower portion of the water column, approximately 6.6 ft (2.0 m) above the seafloor.

For sand wave leveling associated with SRWEC–OCS construction, modeling results indicate that sediment plumes with TSS concentrations exceeding ambient conditions by 100 mg/L could extend up to 5,052 ft (1,540 m) from the cable corridor centerline in federal waters (trailing suction hopper dredge with bulk disposal scenario). The model estimated that the elevated TSS concentrations from sand wave leveling would be of short duration and expected to return to ambient conditions within up to 0.4 hours following the cessation of sand wave leveling activities in federal waters. Sedimentation from sand wave leveling along the SRWEC–OCS is predicted to exceed 0.4 inch (10 mm) of deposition up to 1,427 ft (435 m) from the activity (CFE sand wave leveling scenario). This thickness of sedimentation is expected to cover approximately 174.2 acres (0.70 km2) in federal waters. Longfin squid spawning generally occurs from May to July in the near-shore portions of the SRWEC–OCS corridor (Hatfield and Cadrin 2002). Longfin squid lay eggs on a wide variety of substrates (MAFMC 2011) and impacts to squid egg mops could occur from sediment suspension and deposition from sand wave leveling within this time frame.

Most marine species have some degree of tolerance to higher concentrations of suspended sediment because storms, currents, and other natural processes regularly result in increases in turbidity (MMS

2009). Direct impacts on benthic/demersal EFH could include mortality, injury, or short-term displacement of the organisms living on, in, or near the seafloor. Sediment deposition on eggs or larvae may result in smothering, potentially resulting in mortality (MMS 2007). Demersal/benthic early life stages in or near the area of disturbance would be most affected, but these impacts are not expected to result in population-level effects. Pelagic species could also be affected but are expected to temporarily vacate the area to avoid the disturbance and pelagic habitat quality is expected to quickly return to pre-disturbance levels.

3.5.5.5.2 Operations and Maintenance

3.5.5.5.2.1 Onshore Activities and Facilities

Seafloor disturbance: Minimal impacts on EFH would not be expected from O&M of the Onshore Transmission Cable, as it would be buried beneath the seabed of the ICW, between Bellport Bay and Narrow Bay. Any non-routine maintenance would occur through the HDD cable duct and would not impact the environment or organisms within the ICW.

EMF: As discussed for the SRWEC–OCS, a modeling analysis of the magnetic fields and induced electric fields anticipated to be produced during operation of the Onshore Transmission Cable was performed by Exponent Engineering, and results are included in the COP Appendix J2 (Exponent Engineering 2020b). It is not expected that finfish, invertebrates, and EFH would be measurably affected by EMF from the Onshore Transmission Cable.

Accidental releases: The OnCS–DC would require various oils, fuels, and lubricants to support its operation, and sulfur hexafluoride (SF6) gas would also be used for electrical insulating purposes. As described above in the construction section, accidental discharges, releases, and disposal could indirectly cause habitat degradation, but risks would be avoided through implementation of the measures described in the SPCC.

3.5.5.5.2.2 Offshore Activities and Facilities

Accidental releases: Impacts due to accidental release during the O&M phase are expected to be similar to, but of lesser likelihood than during, construction as there would be fewer Project-related marine vessels during this phase, and regulatory requirements and preventative measures would still apply. Unpermitted discharges or releases are considered accidental events, and, in their unlikely occurrence, these are expected to result in minimal, short-term impacts. Permitted discharges are not expected to pose an adverse impact to marine resources as they would quickly disperse, dilute, and biodegrade (BOEM, 2013). Because the effects of authorized discharges would be extremely localized and accidental discharges are considered to be very unlikely, impacts from discharges and releases during O&M would be negligible.

Cable maintenance: During O&M, impacts due to cable maintenance would be similar although less intense and on a more limited scale than that described for the construction phase. Non-routine maintenance activities could require exposing and reburying portions of the IAC or SRWEC for repair, as well as maintenance of the cable protection where present. The seafloor overlaying the buried IAC and SRWEC would be expected to return to pre-maintenance conditions over time and no long-term changes would be expected due to cable maintenance.

Light: Artificial lighting during O&M would be associated with vessels, the WTGs, and the OCS–DC for operational safety and security purposes. As discussed for the construction phase, the response of fish species to artificial lights is highly variable and depends on several factors such as the species, life stage, and the intensity of the light. Small organisms are often attracted to lights, which in turn attract larger predators to feed on the prey aggregations. Other species may avoid artificially illuminated areas. However, lighting would be limited to the minimum necessary to ensure safety and to comply with applicable regulations. Because of the limited area that would have artificial lighting relative to the surrounding areas, and because no underwater lighting is proposed, impacts on EFH would be expected to be insignificant.

Presence of structures: The monopile foundations and associated hard structures that would be constructed for the SRWF may displace existing benthic habitat for invertebrates and some fish species, as well as potential EFH species. However, the structures would serve as replacement habitat structure that would create an artificial reef effect for fish and new habitat for colonizing invertebrates. It has been shown in recent studies that offshore wind structures can increase the amount of habitat for invertebrates that colonize hard structure or complex benthic habitats. Biological productivity may increase and create diverse invertebrate communities which was seen years after the construction of the Block Island Wind Farm (Hutchison et al. 2020). There was a shift in community structure from aggregations of mussels and barnacles to more dense colonization by corals, hydroids, anemones, crabs, sea stars, and snails. (Causon and Gill 2018).

Demersal fish communities are likely to increase once structures associated with the WTGs are in place and benefit from the increased biological productivity. Longer term population and habitat effects from these structures and the associated biological changes are unknown. Maintenance impacts from Project monitoring vessel traffic, including the potential for increased vessel strikes on fish and other species would be low. Any sampling that utilizes gear that may pose a risk to fish species, including gillnet sampling, could be potentially hazardous to some vulnerable species.

Monopile foundations that are affixed to the bottom and their associated scour protection have the potential to impact the local hydrodynamics. As currents flow by the structures, there would be some turbulence occurring that can leave wakes in the immediate area depending on the conditions. These wake changes can increase the potential mixing of the bottom and surface layers of the water column with the potential to impact stratification, nutrient circulation, and possible larval dispersal (van Berkel et al. 2020, Schultze et al. 2020).

Hydrodynamic disturbance is an emerging topic of concern because of potential effects on the Mid-Atlantic Bight cold pool, a seasonal oceanographic feature that influences regional biological oceanography. Changes in the size and seasonal duration of the cold pool over the past five decades have been associated with shifts in the fish community composition of the Mid-Atlantic Bight. The cold pool is a mass of relatively cool water that forms in the spring and is maintained through the summer by stratification. It supports a diversity of fish and other marine species that are usually farther north but thrive in the cooler waters it provides (Chen 2018; Lentz 2017). Structures may reduce wind-forced mixing of surface waters, whereas water flowing around the foundations may increase vertical mixing (Carpenter et al. 2016). During summer, when water is more stratified, increased mixing could increase pelagic primary productivity near the structure, increasing the algal food source for zooplankton and filter feeders. Increased mixing may also result in warmer bottom temperatures, increasing stress on some shellfish and fish at the southern or inshore extent of the range of suitable temperatures. Changes in cold pool dynamics resulting from future activities, should they occur, could conceivably result in changes in habitat suitability and fish community structure, but the extent and significance of these potential effects are unknown.

No future activities were specifically identified within the GAA specific to entanglement and gear loss and damage; however, it is reasonable to assume that fishing activities (both commercial and recreational) may increase over time in the vicinity of structures due to the likelihood of fish and crustacean aggregation. Damaged and lost fishing gear caught on structures may result in entrapment, entanglement, or mortality of marine life in discarded, lost, or abandoned fishing gear, or other disturbances, potentially leading to finfish mortality. Impacts from fishing gear would be localized; however, the risk of occurrence would remain as long as the structures are present. The presence of structures in an otherwise primarily sandy benthic environment would provide a more complex environment, likely to attract finfish and invertebrates such as mobile crustaceans of commercial value. As such, entanglement and gear loss may cause increased impacts on finfish, including mortality and alteration of habitats. These impacts would be localized and short term; however, they would likely persist intermittently as long as structures remain in place.

In general, fish and invertebrate impacts due to longer term habitat alteration are likely to be beneficial to some species and cause alteration and loss of habitat for others. The amount of overall habitat that is small in comparison to the abundant habitat available in the area and therefore the impacts are expected to be minor.

Continuing environmental trends from climate change causing any further degradation to available habitat may further inhibit the recovery time for some species after decommissioning. Overall, the decommissioning process could result in both short- and long-term adverse impacts that would most likely range from minor to moderate.

BOEM anticipates that the impacts associated with the presence of structures may be negligible to moderate and long term. The impacts on finfish, invertebrates, and EFH resulting from the presence of structures would persist for the duration for which the structures remain.

Noise: Impacts on EFH from ship and aircraft noise during O&M of the SRWF are expected to be similar to those discussed for the construction phase, though much lesser in intensity and spatial extent. The underwater noise generated by vessel and aircrafts would be similar to the range of noise from existing vessel and aircraft traffic in the region and are not expected to substantially affect the existing underwater noise environment.

Offshore WTGs produce continuous, non-impulsive underwater noise during operation, mostly in lower-frequency bands below 8 kilohertz. There are several recent studies that present sound properties of similar turbines in environments comparable to that of the proposed Project. These are presented in detail in the Underwater Acoustic and Exposure Modeling Survey (Küsel et al. 2021). A recent compilation of operational noise from several wind farms, with turbines up to 6.15 MW in size, showed that operational noise generally attenuates rapidly with distance from the turbines (falling below normal ocean ambient noise within ~1km from the source), and the combined noise levels from multiple turbines is lower or comparable to that generated by a small cargo ship (Tougaard et al. 2020). Larger turbines do produce higher levels of operational noise, and the least squares fit of that dataset would predict that an SPL measured 100 m from a hypothetical 15 MW turbine in operation in 10 m/s (19 kt or 22 mph) wind would be 125 dB re 1 µPa. Using a direct drive is expected to lower noise levels significantly; by approximately 10 dB quieter than other equivalently sized jacket pile turbines.; There is also reason to believe, based on the Tougaard et al. 2020 dataset, that operational noise from jacket piles could be louder than from monopiles due to there being more surface area for the foundation to interact with the water, however the paper does point out that received level differences among different pile types could be confounded by differences in water depth and turbine size. In any case, additional data is needed to fully understand the effects of size, foundation type, and drive type on the amount of sound produced during turbine operation.

Some degree of habituation to these operational noise and particle motion effects is to be anticipated. Bedjer et al. (2009) argued that habituation of organisms to ongoing low-level disturbance is not necessarily a neutral or benign process. Lindeboom et al. (2011) found no difference in the residency times of juvenile cod around monopiles between periods of WTG operation and non-operation. In a similar study, the abundance of cod, eel, shorthorn sculpin (*Myoxocephalus scorpius*), and goldsinny wrasse (*Ctenolabrus rupestris*) were found to be higher near WTGs, suggesting that potential noise impacts from operation did not override the attraction of these species to the artificial reef habitat (Bergström et al. 2013). In addition, habituation to particle motion effects could make individual fish or invertebrates less aware of approaching predators, or could cause masking effects that interfere with communication, mating or other important behaviors.

Collectively, these findings suggest that the SRWF operations could have limited adverse effects on habitat suitability for EFH-designated species within a certain distance of each monopile foundation. The extent of these effects is difficult to quantify as they are likely to vary depending on wind speed, water temperature, ambient noise conditions, and other factors. Operational noise from WTGs is low frequency (60–300 Hz) and at relatively low sound pressure levels near the foundation (100–151 dB re 1 µPa) and decreases to ambient within 1 km (Küsel et al. 2022). Underwater sounds emitted by WTGs are audible to fish, and invertebrates but are lower than the regulatory injury and typically lower than the behavioral thresholds for marine fauna, and often are lower than the ambient sound levels that these animals typically experience. It is unlikely that WTG operations would cause injury or behavioral responses to marine fauna, so the risk is of impact is expected to be low (Küsel et al. 2022).

Short-term, localized impacts from geophysical surveys during O&M may occur from the use of multi-beam echosounders, side-scan sonars, shallow penetration sub-bottom profilers, medium penetration sub-bottom profilers and marine magnetometers. The survey equipment to be employed would be equivalent to the equipment utilized during survey campaigns associated with Lease Area OCS-A 0500 conducted in 2016, 2017, 2018, 2019, and 2020 and with Lease Area OCS-A 0487 conducted in 2019 and 2020 (CSA Ocean Sciences Inc. 2020) and are not expected to result in measurable impacts on EFH.

EMF: During operation, powered transmission cables would produce EMF (Taormina et al. 2018). To minimize EMF generated by cables, all cabling under the Proposed Action would include electric shielding (Sunrise Wind 2022). The strength of the EMF rapidly decreases with distance from the cable (Taormina et al. 2018). Ocean Wind proposes to bury cables to a target burial depth of up to 4 to 6 feet (1.2 to 1.8 meters) below the surface, well below the aerobic sediment layer where most benthic infauna live.

The scientific literature provides some evidence of responses to EMF by fish and mobile invertebrate species (Hutchison et al. 2018; Taormina et al. 2018; Normandeau et al. 2011), although recent reviews (CSA Ocean Sciences, Inc. and Exponent 2019; Gill and Desender 2020; Albert et al. 2020) indicate the relatively low intensity of EMF associated with marine renewable projects would not result in impacts. Effects of EMF may include interference with navigation that relies on natural magnetic fields, predator/prey interactions, avoidance or attraction behaviors, and physiological and developmental effects (Taormina et al. 2018).

CSA Ocean Sciences, Inc. and Exponent (2019) found that offshore wind energy development as currently proposed would have negligible effects, if any, on bottom-dwelling finfish and invertebrates residing within the southern New England area. Although demersal biota would be most likely to be exposed to EMF from power cables, potential exposure would be minimized because EMF quickly decays with distance from the cable source (CSA Ocean Sciences, Inc. and Exponent 2019). In the case of mobile species, an individual exposed to EMF would cease to be affected when it leaves the affected area. An individual may be affected more than once during long-distance movements; however, there is no information on whether previous exposure to EMF would influence the impacts of future exposure. For pelagic species within the southern New England area, no negative effects were expected from offshore wind energy development as currently proposed because of their preference for habitats located at a distance from the seabed. Therefore, BOEM expects localized and long-term, though not measurable, impacts on finfish, invertebrates, and EFH from EMF from the Proposed Action. Section 5.1.4.1 of the EFH Assessment provides a detailed discussion of EMF impacts on EFH and EFH-designated species from the Proposed Action.

In context of reasonably foreseeable environmental trends, the Proposed Action would contribute an undetectable increment to the combined impacts from ongoing and planned activities including offshore wind. The Proposed Action would slightly increase the impacts of EMF in the GAA beyond those described under the No Action Alternative. The combined impact on finfish, invertebrates, and EFH would likely be negligible and localized though long term.

Discharges: The location, design, and operation of the cooling water discharge was selected minimize the thermal plume size to the greatest extent practicable and preventing thermal plume migration to the surface waters or benthos. The OCS-DC would include three openings for intake pipes located approximately 30 ft (10 m) above the pre-installation seafloor grade. The water depth of the intake pipe openings was selected to minimize the potential of biofouling and entrainment of ichthyoplankton and to take advantage of the cooler water temperatures found at depth to maximize cooling potential of water withdrawn. Further details of the OCS-DC are in the NPDES permit application submitted to EPA in December 2021 (Sunrise Wind 2022, Appendix N2).

To identify the optimal location for the cooling water discharge, the Cornell Mixing Zone Expert System (CORMIX) was used to evaluate the mixing zone associated with multiple discharge locations in the water column. The assessment considered four different seasons using a 2 degrees Fahrenheit (°F) (1 degree Celsius [°C]) temperature differential (ΔT) threshold to delineate the extent of the mixing zone. The optimal location for the Dump Caisson discharge was determined to be approximately 40 ft (12 m) below local mean sea level (LMSL). At this optimized location rapid and complete mixing occurs. The thermal plume would be contained to a distance of 87 ft (27 m) from the outfall and occupy a maximum area of 731 ft^2 (66.9 m^2) in a worst-case, slack tide scenario.

The OCS-DC intake was designed to have a maximum through-screen velocity of 0.43 ft/s which is below the EPA threshold of 0.5 ft/s so is protective against impingement of juvenile and adult fish. Identification of fish species and life stages that would be most susceptible to entrainment from the OCS-DC were evaluated based on their abundance or their significance to commercial and recreational fisheries. The NPDES permit included annual entrainment estimates of ichthyoplankton grouped within the egg and larval stages (Sunrise Wind 2022, Appendix N2). Since no distinction was made between the two life stages within the NPDES permit, entrainment numbers were considered larval estimates only when calculating adult equivalent losses to be conservative. Additional information regarding design and operational technologies available to minimize, reduce, or eliminate the impacts associated with entrainment of egg and larval life stages at the OCS-DC can be found in the NPDES permit application (Sunrise Wind 2022, Appendix N2). To evaluate impacts of this entrainment, entrainment estimates for adult equivalent losses (AELs) were completed for eight abundant or commercially important fish species and are listed in as estimates of the number of entrained organisms removed from the population that otherwise would have survived to some future age, or age of equivalence. To estimate AELs for the OCS-DC, the annual estimates of entrained larvae and eggs (x') from Appendix N2 of Sunrise Wind (2022) were multiplied by the survival fraction at a given life stage (Equation (1)):

$$AEL = \sum_{j=1}^{n} S_{i,A} N_i \quad (1)$$

Where N_i is the number of fish lost at stage *i* and $S_{i.A}$ represents the fraction of fish expected to survive from age *i* to the age of equivalence. m

Survival rates of early life stages are often expressed on a life stage-specific basis so that the fraction surviving from any life stage to adulthood (or age of equivalence) is expressed as the product of survival fractions for all life stages through which a fish must pass before reaching adulthood (or the age of equivalence):

$$S_{i,A} = \prod_{j=i}^{j_{\max}} S_j \quad (2)$$

The parameters used to estimate the adult equivalence, such as instantaneous natural mortality and instantaneous fishing mortality rates at varying life stages, were acquired from the Environmental Protection Agency (EPA) Regional Benefits Analysis for the Final Section 316(b) Phase III existing facilities rule (EPA 2006). Age of adulthood for the eight species of interest were obtained from Fishes of the Gulf of Maine (Collette and Klein-MacPhee 2002). Results of the estimate can be found in Appendix B.

Four finfish species listed on the Endangered Species Act (ESA) may occur near or in the SRWF:

- Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*);
- Shortnose sturgeon (*Acipenser brevirostrum*);
- Giant manta ray (*Manta birostris*); and
- Oceanic whitetip shark (*Carcharhinus longimanus*).

No critical habitat for these finfish species is present within the SRWF. Although these four federally listed species have ranges that may include the SRWF, the Atlantic sturgeon is the only one of these species whose occurrence is regular or common in the SRWF and thus may be exposed to impacts from the CWIS. The Atlantic sturgeon spawns in the freshwater of large rivers with juveniles migrating seaward at a length of approximately 2 ft (0.8 m). Juvenile and adult sturgeon typically inhabit shallow coastal waters comprised of sand and gravel substrates with water depths of 30 to 150 ft (10 to 50 m) (Stein et al., 2004a). Based on these life history characteristics, early life stages are not susceptible to entrainment and larger life stages would not be susceptible to impingement during operation of the OCS-DC.

Seafloor disturbance: Minimal impacts on EFH would be expected from operation of the SRWEC–OCS, as it would be buried beneath the seabed where feasible and protected. Seafloor disturbance during O&M of the SRWEC–OCS would be limited to non-routine maintenance that may require uncovering and reburial of the cables, as well as maintenance of cable protection where present. These maintenance activities and associated vessel anchoring are expected to result in similar direct impacts on EFH as those discussed for construction, although the extent of disturbance would be limited to specific areas along the SRWEC–OCS route.

Cable protection (e.g., concrete mattresses or rock placement) could be placed in select areas along the SRWEC–OCS. The introduction of engineered concrete mattresses or rock to areas of the seafloor can cause local disruptions to circulation, currents, and natural sediment transport patterns, though these impacts would be expected to be insignificant given the miniscule surface area associated with the cable protection compared to the surrounding waters. Under normal circumstances, these segments of the SRWEC–OCS would remain covered as by sediment and associated cable protection (where applicable). In non-routine situations, these segments could be uncovered, and reburial could be required (for buried portions of the SRWEC). The seafloor overlaying the majority of buried SRWEC–OCS (where cable protection would not exist) would be expected to return to pre-construction conditions over time and no long-term changes to sediment mobility or depositional patterns are expected.

Indirect impacts on EFH associated with O&M activities for the SRWEC–OCS would be expected to result in similar impacts as those discussed for the IAC but would be limited in spatial extent. The protection of the cable with concrete mattresses or rock may result in the long-term conversion of soft bottom habitat to hard bottom habitat. Similar to the foundations, this cable protection may have a long-term impact on EFH species associated with soft bottom habitats and a long-term beneficial impact on EFH species associated with hard bottom habitats, depending on the quality of the habitat created by the secondary cable protection, and the quality of the benthic community that colonizes that habitat.

Gear utilization: Sunrise Wind has developed a Fisheries and Benthic Monitoring Plan in accordance with recommendations set forth in *Guidelines for Providing Information on Fisheries for Renewable Energy Development on the Atlantic Outer Continental Shelf* (BOEM 2019). Monitoring would commence in 2022, and continue through 2027, encompassing all three phases of cable installation (before, during, and after installation). Surveys would include otter trawl surveys, acoustic telemetry for highly migratory species (HMS), scallop surveys, and benthic monitoring for soft- and hard bottom habitats. Gear restrictions, closures, and other regulations set forth by take reduction plans would be adhered to as with typical scientific fishing operations to reduce the potential for interaction or injury.

Sunrise Wind has contracted with scientists at the University of Massachusetts Dartmouth School for Marine Science and Technology (SMAST) and the Commercial Fisheries Research Foundation (CFRF) to execute a seasonal (i.e., four sampling events per year, approximately three months apart) trawl survey using an asymmetrical BACI experimental design. The otter trawl survey at Sunrise Wind would be carried out synoptically with the trawl survey at the Revolution Wind Farm lease area. An otter trawl survey is an appropriate sampling gear for the Sunrise Wind Lease Area and the nearby control sites because this gear had broad selectivity and would effectively sample for multiple species, including groundfish (e.g., winter flounder, windowpane flounder, yellowtail flounder, Atlantic cod), monkfish, skates (e.g., winter and little skates), red hake, longfin squid, and others. A sample size of 15 trawl tows per area would be targeted per season in each year at the start of the survey.

The acoustic telemetry survey for HMS would cover the Lease Area and adjacent inshore areas. This acoustic telemetry monitoring effort would build on baseline studies by including five additional years of data collection, an expansion of the receiver array, and the deployment of an additional 150 acoustic transmitters for HMS. The project would be overseen by Anderson Cabot Center for Ocean Life (ACCOL) at the New England Aquarium, with Dr. Jeff Kneebone serving as the Principal Investigator. ACCOL would partner with INSPIRE Environmental to execute the field work, data analysis, and reporting.

The acoustic telemetry survey for the Sunrise Wind Export Cable would be established along the route of the SRWEC, and dedicated telemetry tagging would occur to evaluate the potential impacts associated with the operation of the SRWEC on important marine species. The focal species for this study were chosen based on several factors including their known sensitivity to EMF, their ecological significance or importance to regional commercial and recreational fisheries, and their geographic overlap with the SRWEC. Monitoring efforts would focus on species associated with the benthos, given that they would experience the greatest potential impacts from EMF (Snyder et al. 2019). The species selected for telemetry monitoring are American lobsters, horseshoe crabs, winter skates, sandbar sharks, sand tiger sharks, dusky sharks, and smooth dogfish.

Sunrise Wind would partner with researchers at Coonamessett Farm Foundation (CFF) to carry out HabCam survey for scallops and other benthic organisms within the SRWF and a nearby control area, and the survey would be executed using a BACI design. Similar to other fisheries-independent surveys for scallops in the region, the survey would be executed once per year, targeting sampling in summer. The target is to achieve two years of pre-construction monitoring, and the survey would continue during construction, and for at least two years after construction has been completed. This survey would be carried out in collaboration with a local scallop vessel(s). The primary objective of the HabCam survey is to investigate the relative abundance of scallops and other resources in the SRWF Area ("SRW impact") and reference area ("control") over time. Using the HabCam survey equipment and protocols would ensure that the data collected as part of this fisheries monitoring plan would be compatible and standardized with fisheries-independent data that are used to inform scallop science, stock assessment, and management. The HabCam survey approach also is well-suited to sampling within the lease area following construction. Sunrise Wind is currently working with researchers at CFF to develop the sampling protocols and statistical analyses associated with this survey, and those details would be included in a future iteration of the monitoring plan once they are available.

Benthic monitoring of hard and soft bottom habitats as well as bottom habitats in New York waters. Bottom habitat monitoring would focus on measuring changes in percent cover, species composition and volume of macrofaunal attached communities (native and non-native species groups) and physical characteristics (rugosity, boulder density). These parameters would serve as proxies for resulting changes to the complex food web. Soft bottom habitat monitoring would focus on measuring physical factors and indicators of benthic function (bioturbation and utilization of organic deposits; Simone and Grant 2020), which would serve as proxies for functional changes in the community composition. It is expected that the introduction of fines and organic content sourced from the epibenthic community on the WTG foundations would support increased deposit feeding benthic invertebrate communities in the soft sediments around the structures.

To accomplish the objectives of the novel hard bottom monitoring, high resolution video imagery captured using a remotely operated vehicle (ROV) would be employed. Video imagery would be used to document epifaunal community characteristics on the novel hard surfaces (WTG foundations and scour protection layers, OCS-DC jacket, cable protection layers). Benthic functioning of the soft bottom habitats would be captured by documenting physical parameters (grain size major mode) and biological factors (bioturbation and utilization of organic material) with a sediment profiling imaging/plan view (SPI/PV) system. It is expected that the epibenthic community that colonizes the WTG foundations and OCS-DC jacket would supply organic matter to the sediments below through filtration, biodeposition, and general deposition of detrital biomass. This organic material sourced from the biological activity of the epibenthic community on the foundation structures would likely alter the infaunal community activity, increasing sediment oxygen demand and promoting the activity of deep-burrowing infauna. Based on benthic monitoring results in other offshore wind farms, the effects of the WTG foundation on the surrounding soft sediment habitat would be expected to decrease with increasing distance from the WTG. The benthic monitoring plan for state waters includes details of the pre-construction and post-construction surveys of soft sediment habitats along the SRWEC-NYS (Sunrise Wind 2022). A combination of SPI/PV imaging and sediment grab sampling would be used to monitor these benthic environments.

The otter trawls surveys are designed to capture a representative sample of demersal fish species present in the impact and reference areas, emphasizing EFH and other species of commercial and recreational interest. This activity would directly affect EFH species and their prey through mortality of most or all of the trawled individuals. In addition to these direct impacts, bottom-disturbing trawls can alter the composition and complexity of soft-bottom benthic habitats. For example, when trawl gear contacts the seabed it can flatten sand ripples, remove epifaunal organisms and biogenic structures like worm tubes, and expose anaerobic sediments. In this case, the survey tracks have been pre-selected by commercial fishermen based on their known suitability for bottom trawling. This indicates that the associated seabed is subjected to regular disturbance by commercial fishing activity, and that this type of disturbance has already and would continue to occur regardless of whether the Fisheries Research Monitoring Plan is implemented. Impacts on EFH species through capture during the trawl survey would not result in population-level impacts. Trawl surveys are not likely to significantly alter the rate and extent of disturbance of soft-bottom benthic habitat relative to the environmental baseline. BOEM therefore concludes that beam trawl surveys would not change the effects determination for EFH for any species in the EFH Assessment. Mitigation measures for species protected under the ESA species that would be enacted during the trawl surveys include a short tow duration of 20 minutes; sampling during daylight only; marine mammal monitoring by the captain or other scientific crew member before, during, and after haul back; trawl operations commencing as soon as possible once the vessel arrives on station; and opening of codend during haul back as quickly and carefully as possible to avoid damaging any protected species that may have been incidentally captured.

In context of reasonably foreseeable environmental trends, the Proposed Action would contribute an undetectable increment to the impacts on finfish from ongoing and planned activities including offshore wind, which would likely be negligible, as impacts from fisheries surveys are expected to be localized and finfish are highly mobile and would be expected to experience short-term and localized behavioral impacts where finfish may be displaced or captured by active survey gear. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute an undetectable increment to the combined impacts (disturbance, displacement, injury, and mortality) on invertebrates and EFH, which would likely be negligible and short term, as impacts from surveys are expected to be localized and would often occur along transects already included in fisheries surveys. However, the time period for recovery would depend on the mobility and life stage of each species, with sessile organisms less able to avoid impacts and mobile organisms more able to avoid impacts. Because benthic monitoring for the Project would be via remote equipment, the only impact to EFH and EFH species could be short-term, localized disturbance by vessels, lights and automated underwater vehicles which could induce behavioral changes in mobile species that would cause them to leave the area.

3.5.5.5.3 Conceptual Decommissioning

3.5.5.5.3.1 Onshore Activities and Facilities

Onshore decommissioning activities associated with the SRWF would likely have negligible impacts on finfish, invertebrates, and EFH.

3.5.5.5.3.2 Offshore Activities and Facilities

Project conceptual decommissioning would have similar impacts on invertebrates and fish species to those anticipated for the Proposed Action, but the degree and magnitude of these effects would likely be different. The newly introduced surfaces are expected to develop a complex community of benthic invertebrates. The removal of these surfaces would likely injure or cause mortality to invertebrates attached to the hard surfaces or inhabiting the interstitial spaces and permanently alter benthic habitats within the decommissioning area. Any invertebrates that are living among these habitats may or may not survive, depending on whether they are able to find other suitable habitats. The invertebrates associated with softer bottom benthic habitats may be able to recover within a faster time period after conceptual decommissioning is completed. Whereas the invertebrate species associated with complex benthic habitat within the conceptual decommissioning area could take much longer to recover.

Project conceptual decommissioning of offshore components would require the use of construction vessels of similar number and class as used during construction. Decommissioning activities would produce similar short-term effects on finfish and invertebrates to those described above for proposed Project construction. Underwater noise and disturbance levels generated during conceptual decommissioning would be similar to those described above for construction, with the exception that pile-driving would not be required. The monopiles would be cut below the bed surface for removal using a cable saw or abrasive waterjet. Noise levels produced by this type of cutting equipment are generally indistinguishable from engine noise generated by the associated construction vessel (Pangerc 2016).

Therefore, this decommissioning equipment would have significantly lower potential for noise effects comparted to those already considered for construction vessel noise. The effects of Project conceptual decommissioning on marine mammals would, therefore, range from negligible to minor.

3.5.5.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the proposed would impact fish, invertebrates, and EFH on different levels depending on life stages and habitat preferences of each species. Activities that are associated with benthic disturbances are unlikely to impact any species that rely on pelagic habitats. Those species that rely on benthic habitats may suffer variable impacts that are likely to be short term in duration and not permanent. The longer-term presence of the construction related structures would impact both pelagic and benthic habitats and may displace some species while construction activities occur. However, the longer-term presence of structures has been shown to provide potentially beneficial impacts to several invertebrate and fish resources due to artificial reef effects (Hutchison et al. 2022). Therefore, the overall impacts associated from the Proposed Action are anticipated to be **negligible** to **moderate** on finfish, invertebrates and EFH.

3.5.5.5.5 Impacts of Alternative B on ESA-Listed Species

Impacts to endangered species associated due to the Proposed Action are likely to be insignificant. Subadult and adult Atlantic sturgeon are known to occur in marine waters year-round and many of the IPFs discussed in the above sections could apply. The most sensitive IPF to sturgeon would most likely be the noise associated with construction, including pile-driving, however those activities are most likely to occur in the summer when Atlantic sturgeon utilize more nearshore and riverine water, reducing their risk significantly (Ingram et al. 2019).

The threatened giant manta ray occurs in offshore water near upwelling areas at the edge of the continental shelf. Their occurrences in the Mid-Atlantic OCS are very rare, and the impacts of the Proposed Action are expected to be minimal. The other listed species (Atlantic salmon, Shortnose sturgeon, and oceanic whitetip shark) also have very rare occurrences in the Project area, thus it is highly unlikely that these species would suffer any impacts due to construction, installation, operation, and maintenance, or decommissioning of the Project including from the OCS-DC.

3.5.5.5.6 Conclusions

Impacts of the Proposed Action

BOEM anticipates construction and installation, O&M, and conceptual decommissioning of the Proposed Action would have **negligible** to **moderate** impacts on finfish, invertebrates and EFH. The primary risks would be associated with cable installation, and noise from construction, most prominently associated with pile-driving activities. Although there may be longer term habitat alteration effects from the cable installation for benthic species, the overall habitat disturbance would be relatively minor in relation to available habitat. Noise related impacts can be avoided by mobile fish species and are unlikely to be sensed by invertebrates unless in very close proximity to the sound source, and the impacts are likely to be short-term and not constant in duration. Increases in turbidity associated with dredging activities, and water withdrawal from jet plowing and other methods could temporarily impact pelagic egg and larval stages as well as EFH species. The anticipated path and overall footprint of these activities would be relatively small for the Proposed Action and would not have significant impacts on vulnerable life stages relative to the overall habitat available regionally. All construction, installation, operations, maintenance, and decommissioning activities associated with the SRWF Project would implement measures to mitigate and reduce the potential of any adverse impacts to aquatic resources. Monitoring and mitigation measures would be followed in consultation with NMFS, and with coordination with federal and state agencies.

Entrainment estimates for egg and larval species regarding the OCS-DC are anticipated to be **minor** as demonstrated by the calculated equivalent adult losses. Even though over 1 million of the abundant Atlantic herring eggs and larvae are estimated to be entrained at the OCS-DC that only equates to less than 600 adult Atlantic herring. Other potentially entrained species equates to substantially lower equivalent adults. The location, design, and operation of the cooling water discharge was selected minimize the thermal plume size to the greatest extent practicable and preventing thermal plume migration to the surface waters or benthos. The thermal plume would be contained to a distance of 87 ft (27 m) from the outfall and occupy a maximum area of 731 ft^2 (66.9 m^2) in a worst-case, slack tide scenario. Impacts from the thermal plume are expected to be **minor.**

Cumulative Impacts of the Proposed Action

BOEM anticipates that the cumulative impacts on finfish, invertebrates and EFH in the GAA would be **negligible** to **moderate**. Considering all IPFs together, BOEM anticipates that the overall impacts on finfish, invertebrates, and EFH in the GAA associated with the Proposed Action when combined with the impacts from ongoing and planned activities including offshore wind would be **negligible** to **moderate**.

3.5.5.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Under the Fisheries Habitat Impact Minimization Alternative C-1, the construction, operation, maintenance, and eventual decommissioning of the 11-MW WTGs and an OCS within the proposed Project area and associated inter-array and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, to reduce impacts to complex fisheries habitats that are the most vulnerable to long-term impacts as compared to the Proposed Action, certain WTG positions would be excluded from development. Under this alternative, the same number of installed WTGs as described for the Proposed Action may be approved by BOEM.

This alternative considered and prioritized contiguous areas of complex habitat to be excluded from development to avoid and minimize impacts to complex fisheries habitats, while still meeting BOEM's purpose and need for the Project. Areas for prioritization were identified by NMFS based upon on recent detections of Atlantic cod spawning activity in the vicinity of the Project Area, assumed hard bottom complex substrate, and the presence of large boulders (see Figure 2.1-2). Priority Area 1 is considered the highest priority for conservation and includes 16 WTG positions as well as the OCS-DC. With only 8 positions to exclude for Alternative C-1, all were eliminated from Priority Area 1. To identify which 8 positions to remove, BOEM relied on the locations and densities of boulders, which can be considered a critical element of potential sensitive habitat (Gardline 2021). Gardline (2021) identified boulders as objects that 1) returned a strong backscatter signal indicative of hard substrates; 2) were observed to have a distinct shadow or measurable height; and (3) had diameters greater than 0.5 m. The density of boulders (number of boulders/250 km^2) on the seafloor surrounding each WTG position was calculated using the ESRI ArcGIS Pro Spatial Analyst Density function (Figure 3.5.2-1, Table B-2.1 in Appendix B). Then, boulder densities within NMFS's Priority Area 1 were ranked and the eight contiguous WTG positions with the highest boulder densities within Priority Area 1 were identified for exclusion in Alternative C-1 (Figure 3.5.2-2). The positions identified for exclusion within Alternative C-1 were determined to be most optimal for minimizing fisheries habitat impacts (see Section 3.5.2.6 *Benthic Resources* and Appendix B for additional discussion).

3.5.5.6.1 Construction and Installation

3.5.5.6.1.1 Onshore Activities and Facilities

Under Alternative C-1, there would be no difference in onshore construction and installation activities or facilities as compared to the Proposed Action. Onshore construction and installation activities associated with Alternative C-1 would likely have negligible impacts on finfish, invertebrates, and EFH. Under Alternative C-1, onshore construction and installation impacts would be the same as described for the Proposed Action.

3.5.5.6.1.2 Offshore Activities and Facilities

Construction and installation IPFs to finfish, invertebrates and EFH associated with Alternative C-1 would be similar to those described under the Proposed Action. The exclusion of 8 WTG positions within the design of Alternative C-1 was intended to reduce the number of WTG positions located in complex bottom habitat. although there could be decreased impacts to complex bottom habitat if the 8 selected WTG positions were not developed. Adverse impacts would be negligible to minor and short-term.

3.5.5.6.2 Operations and Maintenance

3.5.5.6.2.1 Onshore Activities and Facilities

Onshore operations and maintenance activities associated with Alternative C-1 would likely have negligible impacts on finfish, invertebrates, and EFH. Under Alternative C-1, onshore construction and installation impacts would be the same as described for the Proposed Action.

3.5.5.6.2.2 Offshore Activities and Facilities

Operations and maintenance IPFs to finfish, invertebrates and EFH associated with Alternative C-1 would be similar to those described under the Proposed Action. Adverse impacts would be negligible to minor and short-term. Potential beneficial impacts from the installation of structures would include artificial reef effects that can influence benthic habitats and change the abundance and distribution of fish and invertebrate community structures. The relocation of 8 WTGs within the design of Alternative C-1 would reduce the number of WTGs located in presumed Atlantic cod spawning locations and areas with complex bottom habitat.

3.5.5.6.3 Conceptual Decommissioning

3.5.5.6.3.1 Onshore Activities and Facilities

Onshore decommissioning activities associated with the SRWF Alternative C-1 would likely have negligible impacts on finfish, invertebrates, and EFH.

3.5.5.6.3.2 Offshore Activities and Facilities

Offshore activities associated with the decommissioning of the Alternative C-1 would be similar to those described under the Proposed Action.

3.5.5.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts on finfish, invertebrates and EFH from Alternatives C-1 would likely be **negligible** to **minor** due to a reduced impact on finfish, invertebrates and EFH given that the WTGs would be removed from prioritized contiguous areas of complex habitat to be excluded from development to avoid and minimize impacts to complex fisheries habitats, while still meeting BOEM's purpose and need for the Project. Areas for prioritization were identified by NMFS based upon on recent detections of Atlantic cod spawning activity in the vicinity of the Project Area, assumed hard bottom complex substrate, and the presence of large boulders

3.5.5.6.5 Impacts of Alternative C-1 on ESA-Listed Species

The impacts of Alternative C-1 on ESA listed species would be similar to those described under the Proposed Action.

3.5.5.6.6 Conclusions

Impacts of Alternative C-1

The impacts of Alternative C-1 on finfish, invertebrates, and EFH would be similar to those described under the Proposed Action. However, Alternative C-1 could potentially result in reduced overall impacts on finfish, invertebrates, and EFH due to the change in layout aimed to reduce the amount of WTGs located in the presumed Atlantic Cod spawning locations. Overall, the potential impacts associated from the Alternative C-1 are anticipated to be **negligible** to **minor.**

Cumulative Impacts of Alternative C-1

The cumulative impacts on finfish, invertebrates and EFH from Alternatives C-1 would likely be **negligible** to **minor** due to a reduced impact on finfish, invertebrates and EFH given that the WTGs would be removed from prioritized contiguous areas of complex habitat to be excluded from development to avoid and minimize impacts to complex fisheries habitats, while still meeting BOEM's purpose and need for the Project.

3.5.5.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

Under the Fisheries Habitat Impact Minimization Alternative C-2, the construction, operation, maintenance, and eventual decommissioning of the 11-MW WTGs and an OCS within the proposed Project Area and associated inter-array and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, to reduce impacts to complex fisheries habitats that are the most vulnerable to long-term impacts as compared to the Proposed Action, certain WTG positions would be excluded from development. Under this alternative, the same number of installed WTGs as described for the Proposed Action may be approved by BOEM.

This alternative considered and prioritized areas of complex habitat to be excluded from development to avoid and minimize impacts to complex fisheries habitats, while still meeting the purpose and need for the Project. Areas for prioritization were identified by NMFS based on recent detections of Atlantic cod spawning activity in the vicinity of the Project Area, assumed hard bottom complex substrate, and the presence of large boulders (Figure 2.1.3-2). Priority Area 1 is considered the highest priority for conservation by NMFS and includes 16 WTG positions as well as the OCS-DC. In Alternative C-1, 8 WTG position were identified for removal within this area. For Alternative C-2, this analysis was expanded upon to relocate 12 WTG positions from the Priority Areas to the eastern side of the lease area in addition to excluding development of the 8 WTG positions identified in Alternative C-1. This alternative assumes that habitat on the eastern side of the lease area is more suitable, but this assumption may change depending on the results of additional surveys conducted in this area during the summer of 2022.

In Alternative C-2, four WTG position configurations (C-2a, C-2b, C-2c, and C-2d) are considered to address NMFS priority areas, provide continuous habitat, and avoiding boulder fields (see Section 3.5.2.6 *Benthic Resources*). All 8 positions identified in Alternative C-1 would remain excluded for development in all alternative C-2 configurations. An additional 12 WTGs were selected for relocation to the eastern portion of the lease area based on a similar analysis for Alternative C-1. To identify which 12 WTG positions to relocate, BOEM relied on the locations and densities of boulders in NMFS priority areas; boulders can be considered a critical element of potential sensitive habitat (Gardline 2021). Gardline (2021) identified boulders as objects that 1) returned a strong backscatter signal indicative of hard substrates; 2) were observed to have a distinct shadow or measurable height; and (3) had diameters greater than 0.5 m. The density of boulders (number of boulders/250 km^2) on the seafloor surrounding each WTG position was calculated using the ESRI ArcGIS Pro Spatial Analyst Density function (Figure 3.5.2-1., Table B-2.2 in Appendix B). Then, boulder densities within the priority areas were ranked and multiple configurations were developed to provide options of ideal WTG position configurations. NMFS’s priority areas, highest boulder densities, and maintaining contiguous habitat informed how these alternative configurations were developed.

3.5.5.7.1 Construction and Installation

3.5.5.7.1.1 Onshore Activities and Facilities

Under Alternative C-2, there would be no difference in onshore construction and installation activities or facilities as compared to the Proposed Action. Impacts due to onshore construction and installation activities associated with Alternative C-2 would be the same as described for the Proposed Action.

3.5.5.7.1.2 Offshore Activities and Facilities

Construction and installation IPFs to finfish, invertebrates and EFH associated with Alternative C-2 would be similar to those described under the Proposed Action; although there could be decreased impacts to complex bottom habitat if the 8 selected WTG positions were not developed and an additional 12 WTG positions were relocated to the eastern portion of the lease area. The addition of WTG positions in the eastern portion of the lease area would result in additional inter-array cabling, which would increase seafloor disturbance, sediment suspension/deposition, EMF, and noise impacts. Adverse impacts would be negligible to minor and short-term. The design of Alternative C-2 was intended to reduce the number of WTG positions located in complex bottom habitat.

3.5.5.7.2 Operations and Maintenance

3.5.5.7.2.1 Onshore Activities and Facilities

Under Alternative C-2, there would be no difference in onshore O&M activities or facilities as compared to the Proposed Action. Impacts due to onshore O&M activities associated with Alternative C-2 would be the same as described for the Proposed Action.

3.5.5.7.2.2 Offshore Activities and Facilities

Operations and maintenance IPFs to finfish, invertebrates and EFH associated with Alternative C-2 would be similar to those described under the Proposed Action. The addition of WTG positions in the eastern portion of the lease area would result in additional inter-array cabling, which would increase seafloor disturbance, sediment suspension/deposition, EMF, and noise impacts. Adverse impacts would be negligible to minor and short-term. Potential beneficial impacts from the installation of structures would include artificial reef effects that can influence benthic habitats and change the abundance and distribution of fish and invertebrate community structures. The exclusion of 8 WTG positions and relocation of an additional 12 WTG positions within the design of Alternative C-2 was undertaken to reduce the number of WTGs located in the presumed Atlantic cod spawning locations and areas with complex bottom habitat. However, the same number of WTGs would be operated and maintained as described for the Proposed Action.

3.5.5.7.3 Conceptual Decommissioning

3.5.5.7.3.1 Onshore Activities and Facilities

Under Alternative C-2, there would be no difference in onshore decommissioning activities or facilities as compared to the Proposed Action. Impacts due to onshore decommissioning activities associated with Alternative C-2 would be the same as described for the Proposed Action.

3.5.5.7.3.2 Offshore Activities and Facilities

Offshore activities associated with the decommissioning of the Alternative C-2 would be similar to those described under the Proposed Action.

3.5.5.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts on finfish, invertebrates and EFH from Alternatives C-2 would likely be **negligible** to **minor** due to a reduced impact on finfish, invertebrates and EFH given that the WTGs would be removed from prioritized contiguous areas of complex habitat to be excluded from development to avoid and minimize impacts to complex fisheries habitats, while still meeting BOEM's purpose and need for the Project. Areas for prioritization were identified by NMFS based upon on recent detections of Atlantic cod spawning activity in the vicinity of the Project Area, assumed hard bottom complex substrate, and the presence of large boulders

3.5.5.7.5 Impacts of Alternative C-2 on ESA-Listed Species

The impacts of Alternative C-2 on ESA listed species would likely be similar to those described under the Proposed Action as the same number of WTGs would be installed, operated and maintained, and decommissioned. The placement of WTGS within the lease area.

3.5.5.7.6 Conclusions

Impacts of Alternative C-2

The impacts of Alternative C-2 on finfish, invertebrates, and EFH would be similar to those described under the Proposed Action. However, Alternative C-2 could potentially result in reduced overall impacts on finfish, invertebrates, and EFH due to the change in layout aimed to reduce the number of WTGs located in the presumed Atlantic Cod spawning locations and complex bottom habitat areas. Overall, the potential impacts associated from the Alternative C-2 are anticipated to be **negligible** to **minor.**

Cumulative Impacts of Alternative C-2

The cumulative impacts on finfish, invertebrates and EFH from Alternatives C-2 would likely be **negligible** to **minor** due to a reduced impact on finfish, invertebrates and EFH given that the WTGs would be removed from prioritized contiguous areas of complex habitat to be excluded from development to avoid and minimize impacts to complex fisheries habitats, while still meeting BOEM's purpose and need for the Project.

3.5.5.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternative B, the proposed action, would have negligible to moderate adverse impacts on finfish, invertebrates, and EFH. Negligible to moderate adverse impacts would be caused by increased substrate disturbance, habitat disturbance, and sedimentation. Construction, O&M, and decommissioning of alternatives C-1 and C-2 would have negligible to minor impacts. Adverse impacts would be caused by increased substrate disturbance, habitat disturbance, and sedimentation, similar to the proposed action. However, alternative C-1 and C-2 potentially reduce impacts to presumed Atlantic cod habitat and spawning locations. Table 3.5.5-4 provides an overall summary of alternative impacts.

Table 3.5.5-4. Comparison of Alternative Impacts on Finfish, Invertebrates, and EFH Impacts

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C1)	Fisheries Habitat Minimization (Alternative C2)
Finfish, invertebrates, and EFH	*Proposed Action*: BOEM anticipates construction and installation, O&M, and conceptual decommissioning of the Proposed Action would have **negligible** to **moderate** impacts on finfish, invertebrates and EFH. The primary risks would be associated with cable installation, and noise from construction, most prominently associated with pile-driving activities Entrainment estimates for egg and larval species regarding the OCS-DC are anticipated to be **minor** as demonstrated by the calculated equivalent adult losses. *Cumulative Impacts of the Proposed Action:* BOEM anticipates that the cumulative impacts on finfish, invertebrates and EFH in the GAA would be **negligible** to **moderate**. Considering all IPFs	*Alternative C-1*: Alternative C-1 could potentially result in reduced overall impacts on finfish, invertebrates, and EFH due to the change in layout aimed to reduce the amount of WTGs located in the presumed Atlantic Cod spawning locations. Overall, the potential impacts associated from the Alternative C-1 are anticipated to be **negligible** to **minor.** *Cumulative Impacts of Alternative C-1*: The cumulative impacts on finfish, invertebrates and EFH from Alternatives C-1 would likely be **negligible** to **minor** due to a reduced impact on finfish, invertebrates and EFH given that the WTGs would be removed from prioritized contiguous areas of complex habitat to be excluded from development to avoid and minimize impacts to complex fisheries habitats, while still	*Alternative C-2*: Alternative C-2 could potentially result in reduced overall impacts on finfish, invertebrates, and EFH due to the change in layout aimed to reduce the number of WTGs located in the presumed Atlantic Cod spawning locations and complex bottom habitat areas. Overall, the potential impacts associated from the Alternative C-2 are anticipated to be **negligible** to **minor.** *Cumulative Impacts of Alternative C-2*: The cumulative impacts on finfish, invertebrates and EFH from Alternatives C-2 would likely be **negligible** to **minor** due to a reduced impact on finfish, invertebrates and EFH given that the WTGs would be removed from prioritized contiguous areas of complex habitat to be excluded from development to avoid and minimize impacts to complex

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C1)	Fisheries Habitat Minimization (Alternative C2)
	together, BOEM anticipates that the overall impacts on finfish, invertebrates, and EFH in the GAA associated with the Proposed Action when combined with the impacts from ongoing and planned activities including offshore wind would be **negligible** to **moderate**.	meeting BOEM's purpose and need for the Project.	fisheries habitats, while still meeting BOEM's purpose and need for the Project.

3.5.5.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to finfish, invertebrates, and essential fish habitat.

3.5.6 Marine Mammals

This section discusses potential impacts on marine mammals from the proposed Project, alternatives, and future offshore wind activities in the GAA (Appendix D, Figure D-8). The marine mammal GAA as described in Appendix D, includes the Scotian Shelf, Northeast Shelf, and Southeast Shelf Large Marine Ecosystems (LME).

3.5.6.1 Description of the Affected Environment and Future Baseline Conditions

Of the 40 marine mammal species with occurrence records off the northeastern coast of the United States (DoN 2005), 16 species are expected to occur in the proposed Project Area (Table 3.5.6-1). These species may occur near the onshore facilities (SRWEC landfall location at Smith Point on Long Island, New York) and the in-water areas which range from state waters (SRWEC-NYS from the shoreline to a maximum depth of 95 ft [29 m]) to federal waters (SRWEC-OCS with maximum depth of 223 ft [68 m] and SRWF which ranges from 114.8 ft to 203.4 ft [35 m to 62 m] in depth) (COP Appendix G1, Sunrise Wind 2021b). Expected marine mammal occurrence in these areas is summarized in (Table 3.5.6-1) and is based on known habitat associations, habitat modeling, confirmed sightings and acoustic detections in the proposed Project Area and general region, and the potential for occurrence based on these factors regardless of how frequent that occurrence may be. Ongoing threats to these species in this region include vessel strikes, entanglement in fishing gear, fisheries bycatch, contaminants, disease, climate change, and noise (i.e., marine construction activities, vessel traffic, seismic surveys, sonar, and other military training activities) (Grieve et al. 2017; Hayes et al. 2021 MacLeod 2009; Record 2019).

Brief descriptions of the regional and proposed Project Area occurrence of the cetacean (whales, dolphins, and porpoises) and pinniped species (seals and walrus) expected to occur in the proposed Project Area are provided below. Cetaceans include mysticetes (baleen whales) and odontocetes (toothed whales). The ESA-listed species include three endangered mysticetes - the North Atlantic right whale (*Eubalaena glacialis*), fin whale (*Balaenoptera physalus*), and sei whale (*B. borealis*) - and one endangered odontocete - the sperm whale (*Physeter macrocephalus*). Of these ESA species, critical habitat has only been designated for the North Atlantic right whale. Non ESA-listed species include two pinniped species (harbor seal [*Phoca vitulina*] and gray seal [*Halichoerus grypus*]), two mysticetes (humpback whale [*Megaptera novaeangliae*] and common minke whale [*B. acutorostrata*], and eight odontocetes (common bottlenose dolphin [*Tursiops truncatus*], Atlantic spotted dolphin [*Stenella frontalis*], common dolphin [*Delphinus delphis*], Atlantic white-sided dolphin [*Lagenorhynchus acutus*], Risso's dolphin [*Grampus griseus*], long-finned pilot whale [*Globicephala melas*], short-finned pilot whale [*G. macrorhynchus*], and harbor porpoise [*Phocoena phocoena*].

Although occasional occurrences are possible, blue whales (*B. musculus*), which are endangered under the ESA, are not expected to occur in the proposed Project Area. The blue whale is considered an occasional visitor (Hayes 2020) to the US EEZ, which may represent the limits of its feeding range (CETAP 1982; Wenzel et al. 1988). Sightings on the continental shelf in southern New England are limited and include three sightings of probably the same blue whale southeast of Montauk Point during summer 1990 (Kenney 2010). Five blue whale sightings were recorded during the recent aerial surveys in the New York Bight (NYB) for the NYSDEC and New York State Energy Research and Development Authority (NYSERDA) (; NYSERDA 2020; Tetra Tech and LGL 2020). All sightings were in waters deeper than 203.4 ft

(62 m) (NYSERDA 2020; Zoidis et al. 2021). Blue whales were not observed in the proposed Project Area during the recent Northeast Large Pelagic Survey Collaborative (NLPSC) aerial surveys which covered the Rhode Island and Massachusetts Wind Energy Areas (RI-MA WEAs) (Kraus et al. 2016; O'Brien et al. 2021a; O'Brien et al. 2021b; Quintana et al. 2019; Stone et al. 2017). Blue whale vocalizations were sparsely detected from acoustic devices during winter (Kraus et al. 2016); however, due to the far detection range of a blue whale vocalization (more than 108 nm [more than 200 km]) (Kraus et al. 2016) and the lack of blue whale sightings during these recent surveys, these vocalizing blue whales were likely not within the proposed Project Area. During the recent Atlantic Marine Assessment Program for Protected Species (AMAPPS) studies, blue whales were sighted (Palka et al. 2021b) and acoustically detected along the shelf break as opposed to the shelf (Palka et al. 2021d) which further supports the occurrence of blue whales in waters farther offshore than the proposed Project Area.

Striped dolphins (*S. coeruleoalba*) are not expected to occur in the proposed Project Area due to this species' known association with deeper waters and the lack of sightings recorded near the proposed Project Area. Striped dolphins were included in the habitat-based density models that NMFS generated for the RI-MA WEA using AMAPPS 2010-2017 data (Palka et al. 2021c). Average seasonal abundance estimates ranged from 0.5 individuals in the fall to 1.3 individuals in the summer (Palka et al. 2021c). Sightings recorded during these surveys (Palka et al. 2021a) were consistent with the known distribution of this species along the continental shelf edge and farther offshore (CETAP 1982). No striped dolphin sightings were recorded in or near the RI-MA WEA (Palka et al. 2021a) during these recent surveys or previous AMAPPS surveys (Hayes 2020), and no sightings of this species were recorded in the proposed Project Area during recent geophysical surveys (Gardline 2021a; 2021b; Smultea Sciences 2020a; 2020b). In the NYB, no striped dolphins were sighted during the monthly NYSDEC surveys (March 2017 - February 2020) (Tetra Tech and LGL 2020), and sightings recorded during the NYSERDA digital aerial survey were primarily in deep waters (along the shelf break and farther offshore) (NYSERDA 2020).

Table 3.5.6-1. Marine Mammals Expected to Occur in the Proposed Project Area

Species [1]	Stock	ESA|MMPA Status [2, 3]	Stock Abundance	Annual M&SI[4]	Expected to Occur in SRWF, SRWEC-OCS, and SRWEC-NYS	Expected to Occur in Onshore Facilities
North Atlantic right whale (*Eubalaena glacialis*)	Western North Atlantic	E|S	336; 368[5]	7.7	Yes	No
Humpback whale (*Megaptera novaeangliae*)	Gulf of Maine	None	1,396	12.15	Yes	No
Common minke whale (*Balaenoptera acutorostrata*)	Canadian East Coast	None	21,968	10.6	Yes	No
Sei whale (*Balaenoptera borealis*)	Nova Scotia	E|S	6,292	0.8	Yes	No
Fin whale (*Balaenoptera physalus*)	Western North Atlantic	E|S	6,802	1.8	Yes	No
Sperm whale (*Physeter macrocephalus*)	North Atlantic	E|S	4,349	0	Yes	No
Common bottlenose dolphin (*Tursiops truncatus*)	Western North Atlantic Offshore	None	62,851	28	Yes	No
	Western North Atlantic Northern Migratory Coastal	S[6]	6,639	12.2–21.5	Yes	No
Atlantic spotted dolphin (*Stenella frontalis*)	Western North Atlantic	None	39,921	0	Yes	No
Common dolphin (*Delphinus delphis*)	Western North Atlantic	None	172,974	390	Yes	No
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Western North Atlantic	None	93,233	27	Yes	No
Risso's dolphin (*Grampus griseus*)	Western North Atlantic	None	35,215	34	Yes	No
Long-finned pilot whale (*Globicephala melas*)	Western North Atlantic	None	39,215	9	Yes	No

Species [1]	Stock	ESA|MMPA Status [2, 3]	Stock Abundance	Annual M&SI[4]	Expected to Occur in SRWF, SRWEC-OCS, and SRWEC-NYS	Expected to Occur in Onshore Facilities
Short-finned pilot whale (*Globicephala macrorhynchus*)	Western North Atlantic	None	28,924	136	Yes	No
Harbor porpoise (*Phocoena phocoena*)	Gulf of Maine, Bay of Fundy	None	95,543	164	Yes	No
Harbor seal (*Phoca vitulina*)	Western North Atlantic	None	61,336	339	Yes	Yes
Gray seal (*Halichoerus grypus*)	Western North Atlantic	None	27,300	4,453	Yes	Yes

Notes: All stock information is based on the most recently available data included in the NOAA stock assessment report draft for 2021 (NMFS 2022) and the last stock assessment report update for each stock (Hayes 2021; Hayes 2020). Expected occurrence is based on known habitat associations, confirmed sightings, and the potential for occurrence regardless of how abundant or common.

[1] Naming convention follows the Society for Marine Mammalogy list of marine mammal species and subspecies (Committee on Taxonomy 2021).

[2] ESA Status: E = Endangered

[3] MMPA Status: S = Strategic

[4] M&SI = Total annual observed human-caused mortality (M) and serious injury (SI) are mean annual figures for the period 2015–2019 derived from incidental fishery entanglement records and vessel strike records.

[5] The best estimate of abundance in the draft 2021 stock assessment report is 368 whales which is based on data through 30 November 2019 (NMFS 2022). Based on data through 7 September 2021, the population estimate for 2020 was 336 whales (Pettis 2022).

[6] This stock is also designated as depleted under the MMPA due to the UME in 1988-1989 which affected the western North Atlantic Coastal Stock of common bottlenose dolphins. The Northern Migratory Coastal Stock retains the depleted designation as a result of its origin from the western North Atlantic Coastal Stock (Hayes 2021).

Table 3.5.6-2. Abundance Estimates[1] of Marine Mammals Expected to Occur in the Proposed Project Area

Species/Group	Annual SRWF | RI-MA WEA	Winter SRWF | RI-MA WEA	Spring SRWF | RI-MA WEA	Summer SRWF | RI-MA WEA	Fall SRWF | RI-MA WEA
North Atlantic right whale[2]	19.03 | N/A	31.20 | N/A	43.23 | N/A	0.51 | N/A	1.18 | N/A
Humpback whale	2.27 | 9.8	0.45 | 1.8	2.31 | 12.5	2.18 | 19.0	4.16 | 5.8
Common minke whale	1.32 | 10.2	0.81 | 5.3	2.29 | 15.7	1.54 | 13.1	0.65 | 6.7
Sei whale	0.11 | 7.7	0.02 | 4.8	0.28 | 11.1	0.12 | 9.0	0.03 | 5.9
Fin whale	3.45 | 5.6	2.49 | 1.9	3.77 | 6.3	4.76 | 10.0	2.79 | 4.2
Sperm whale	0.13 | 0.5	0.02 | 0.3	0.02 | 0.2	0.38 | 1.0	0.11 | 0.5
Common bottlenose dolphin	13.54 | 131.7	5.90 | 83.0	2.63 | 87.6	18.60 | 228.9	27.03 | 127.2
Atlantic spotted dolphin	0.46 | 1.1	0.06 | 0.3	0.12 | 1.1	0.66 | 2.0	0.99 | 1.0
Common dolphin	150.08 | 1297.8	227.13 | 515.0	46.40 | 356.3	97.77 | 2534.7	229.00 | 1785.1
Atlantic white-sided dolphin	47.58 | 27.5	41.67 | 18.9	52.87 | 53.5	56.00 | 19.6	39.77 | 17.9
Risso's dolphin	0.17 | 4.3	0.19 | 1.2	0.05 | 2.1	0.27 | 9.2	0.19 | 4.5
Long-finned pilot whale[3]	13.00 | 5.5	N/A | 0.8	N/A | 4.7	N/A | 11.1	N/A | 5.3
Short-finned pilot whale[3]	13.00 | 1.4	N/A | 0.1	N/A | 1.7	N/A | 3.2	N/A | 0.6
Harbor porpoise	59.70 | 569.1	77.70 | 917.3	148.50 | 837.0	4.02 | 256.8	8.57 | 265.3
Seals (*Phocidae*)[2]	46.68 | 1866.3	86.42 | N/A	82.72 | 4668.0	10.80 | 370.0	6.77 | 561.0

[1] The seasonal and annual abundance estimates provided in this table are average absolute estimates corrected for perception and availability bias. Seasons are defined as follows: spring (March through May), summer (June through August), fall (September through November), and winter (December through February). The estimates for the SRWF were derived from Duke University's Habitat-based Marine Mammal Density Models for the US Atlantic (Roberts 2016; Roberts 2018; Roberts 2017) and include OCS Lease Area 0487 with a 10-km (6.2 mi) buffer. These models were updated in 2017 and 2018 for most species and in 2021 for the North Atlantic right whale. Data from the NLPSC surveys have been included in the North Atlantic right whale model but none of the other models yet. The abundance estimates for the RI-MA WEA (study area included all WEAs off RI and MA and a 10-km [6.2 mi] buffer) are from NMFS's habitat-based density models and include shipboard and aerial line transect data collected under AMAPPS during 2010 to 2017 (Palka 2021). The timeframe is 2014 to 2017 for sei whales and harbor porpoises, 2015 to 2017 for long-finned pilot whales, and 2010 to 2017 for all other species.

[2] This species/group was not included in NMFS's density surface models for the RI-MA WEA using 2010-2017 data (Palka 2021). RI-MA WEA abundance estimates included in table are based on at-sea seal sightings for the *Phocidae* group (harbor, gray, and unidentified seals) recorded during AMAPPS 2010-2013 surveys (Palka 2017). Availability bias correction was not included in the estimates.

[3] The estimates for the SRWF are for the group pilot whales (*Globicephala* spp.) because the individual species were not modeled separately.

3.5.6.1.1 ESA-Listed Species

North Atlantic Right Whale: The North Atlantic right whale (*Eubalaena glacialis*, hereafter referred to as "right whale" in this document) remains one of the most endangered large whales in the world with an estimated population size of 336 whale based on data through September 7, 2021 (Pettis et al. 2022). Despite decades of protection, a combination of anthropogenic impacts and low calving rates continue to impede recovery of this species. Currently, the most significant threats to right whale survival include entanglement in fishing gear and collisions with vessels (Knowlton and Kraus 2001). Between 2003 and 2018, 43 mortalities documented between Florida and the Gulf of St. Lawrence were due to entanglement and vessel strikes (Sharp et al. 2019). NOAA declared An Unusual Mortality Event (UME) for this species in 2017 (NOAA Fisheries 2022c). The UME is ongoing, and the current total confirmed mortalities are 34 North Atlantic right whales. The primary cause appears to be human interactions, specifically vessel strikes or rope entanglements (NOAA Fisheries 2022c).

Ten Seasonal Management Areas (SMAs) are designated along the United States East Coast to protect North Atlantic right whales from vessel strikes. Most vessels equal to or greater than 65 ft (19.8 m) in length are required to transit at speeds of 10 knots (11.5 mph) or less in these SMAs during certain times of the year (NMFS 2008). The SMA in Block Island Sound overlaps with the proposed Project Area; the mandatory speed restriction for this area is in effect from November 1 through April 30. In addition, speed restrictions are encouraged in Dynamic Management Areas (DMAs) and Right Whale Slow Zones which are triggered by the presence of North Atlantic right whales.

This species ranges widely across the Northwest Atlantic Ocean mostly along the United States and Canadian coasts. Generally, North Atlantic right whales travel along the coast annually moving between the northern portions of the range where they feed and the southern portions, which support calving and breeding (Brown 1986; Jefferson et al. 2015; Winn et al. 1986). Critical habitat is designated in right whale foraging areas in the Gulf of Maine and Georges Bank region and calving areas off the Southeast US coast (NMFS 2016) (Figure 3.5.6-1). Right whale occurrence is concentrated in these areas in February through June and November through March, respectively (Hamilton and Mayo 1990; Kenney et al. 1995; Nichols et al. 2008; Winn et al. 1986); however, not all individuals in the population complete this migration, and the seasonal distribution of many whales is unknown. North Atlantic right whales are often detected in these well-known habitat areas outside of the 'typical' time periods (Kenney 2001; Patrician et al. 2009; Winn et al. 1986). North Atlantic right whales have been recorded in the mid-Atlantic year-round e.g., Estabrook 2021; O'Brien et al. 2021a; Quintana et al. 2019; Whitt et al. 2013). Some individuals have been sighted throughout the fall and winter on the northern feeding grounds, and a large portion of the population may spend the winter in several northern areas, such as the Gulf of Maine and Cape Cod Bay (Clark et al. 2010; Cole et al. 2013; Mussoline et al. 2012). Results from a recent study using long-term acoustics data (2004-2014) confirmed the year-round presence of North Atlantic right whales across their entire range, an increase in right whale presence in the mid-Atlantic region since 2010, and a simultaneous decrease in presence in the northern Gulf of Maine (Davis et al. 2017).

The proposed Project Area is part of the NMFS-designated migratory corridor biologically important area (BIA) for the right whale (LaBrecque et al. 2015). Right whale high-use areas have recently been identified in the Gulf of St. Lawrence and south of Cape Cod (Table 3.5.6-2), which includes the proposed Project Area. Based on survey and acoustics data collected during the NLPSC study in the RI-MA WEAs, North Atlantic right whales were recorded in the WEAs year-round, and hot spots of right whale occurrence were identified within the WEAs and nearby on Nantucket Shoals (Kraus et al. 2016; O'Brien et al. 2021a; O'Brien et al. 2021b; Quintana et al. 2019; Stone et al. 2017). This study confirmed the use of this area by adults, juveniles, and mom-calf pairs with multiple whales resighted across months and years (Kraus et al. 2016; O'Brien et al. 2021a; Stone et al. 2017). As many as 137 individual whales have been identified based on preliminary photo analyses (O'Brien et al. 2021a). Both feeding and courtship behaviors (Surface Active Groups) were observed (Kraus et al. 2016; Stone et al. 2017). Oceanographic survey results indicate that the zooplankton community composition in the MA WEA is similar to that of Cape Cod Bay (Quintana et al. 2019), a well-known feeding, socializing, and nursery area for North Atlantic right whales (Mayo et al. 2018). Based on survey data, higher abundances are expected in the proposed Project Area during winter and spring compared to the other seasons (Table 3.5.6-2). This estimated abundance is consistent with mean monthly acoustic detections in this region which have been higher during January through March and lower during July through September (Kraus et al. 2016; Stone et al. 2017) and the peak abundance recorded in the NYB during April and December (Zoidis et al. 2021).

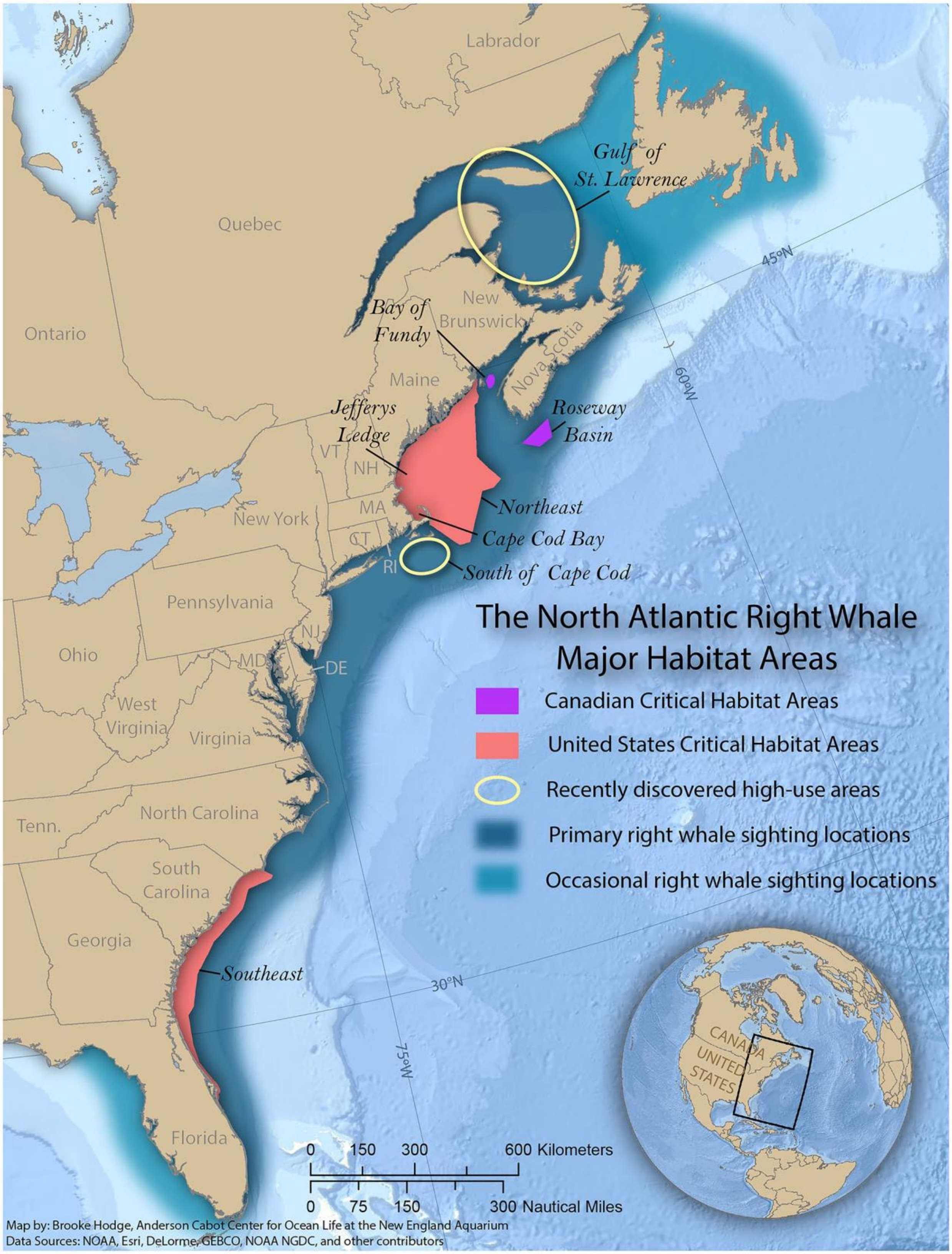


Figure 3.5.6-1. Critical Habitats and Other High Use Areas of the North Atlantic Right Whale Map

Sei Whale: Sei whales are often found in oceanic waters but do occur on the continental shelf (Horwood 1987; NMFS (National Marine Fisheries Service) 2022). In the western North Atlantic Ocean, sei whales range primarily from Georges Bank north to Davis Strait (northeast Canada, between Greenland and Baffin Island) (Perry et al. 1999). During the spring, sei whale abundance in United States waters increases, and sightings are concentrated along the eastern margin of Georges Bank, into the Northeast Channel area, south of Nantucket, and along the southwestern edge of Georges Bank (CETAP 1982; Palka et al. 2021c; Roberts et al. 2016). Peak abundance in the proposed Project Area is estimated to be during spring (Table 3.5.6-2) although sei whales may occur in this region throughout the year. AMAPPS 2010-2017 surveys recorded sei whales in or near the RI-MA WEAs during spring and summer (Palka et al. 2021a). The sei whale was the least common baleen whale species recorded during the NYSDEC and NLPSC studies. In the NYB, this species was sighted during spring (Tetra Tech and LGL 2020) and acoustically detected primarily during March, April, and May (Estabrook 2021). The NYSERDA surveys recorded sei whales during August, February/March, and April/May; individuals were observed as close as 11.5 mi to 23 mi (10 nm to 20 nm) from Long Island (NYSERDA 2020). In the RI-MA WEAs, sei whales, including calves, were sighted in spring and summer (March through June) (Kraus et al. 2016; O'Brien et al. 2021a; Quintana et al. 2019; Stone et al. 2017), and feeding behavior was observed (Kraus et al. 2016; Stone et al. 2017).

Fin Whale: Fin whales are common year-round in United States Atlantic EEZ waters, particularly north of Cape Hatteras (Davis et al. 2020; Edwards 2015). Fin whales may occur in the proposed Project Area during any time of the year. Peak abundance in the proposed Project Area is estimated to be during summer (Table 3.5.6-2) which coincides with peak abundance of this species in the NYB (Zoidis et al. 2021). AMAPPS 2010-2017 surveys recorded fin whales in or near the RI-MA WEAs during spring and summer (Palka et al. 2021a). Fin whales were commonly detected year-round during recent NYB studies (Estabrook 2021; NYSERDA 2020; Tetra Tech and LGL 2020). Although visual surveys recorded some seasonal variations in occurrence, acoustic detections were nearly continuous throughout the year (Estabrook 2021). Fin whales are known to feed in this region; a feeding BIA for fin whales is designated March to October east of Montauk Point (LaBrecque et al. 2015). Feeding behavior has been observed in/near the proposed Project Area (Kraus et al. 2016; Stone et al. 2017). During the RI-MA WEA studies, fin whales were sighted and acoustically detected year-round with peak sightings recorded between April and August (Kraus et al. 2016; O'Brien et al. 2021a; O'Brien et al. 2021b; Quintana et al. 2019; Stone et al. 2017). At least three sightings of fin whale calves have been recorded in this region (Kraus et al. 2016; Stone et al. 2017).

Sperm Whale: Sperm whales are frequently sighted seaward of the continental shelf off the eastern United States (CETAP 1982; Kenney and Winn 1987; Waring et al. 1993). Although females are rarely sighted in shallow waters over the continental shelf (Whitehead 2003), adult males are known to inhabit shallow waters of 328 ft (100 m) or less in portions of their range (Croll et al. 1999; Garrigue and Greaves 2001; Scott and Sadove 1997; Whitehead et al. 1992). Regular sightings of sperm whales are well documented in shallow shelf waters (average water depth of 55 m) southeast of Montauk Point during spring, summer, and fall (Scott and Sadove 1997). It is thought that sperm whales may use this area as foraging habitat since sightings are concentrated in the channel between Block Island Sound and Block Canyon where there is a localized abundance of squid (Scott and Sadove 1997).

Sperm whales may occur in the proposed Project Area during any time of the year; however, peak abundance is estimated to be during summer (Table 3.5.6-2). Sperm whales have been recorded year-round in the NYB (Estabrook 2021; NYSERDA 2020; Tetra Tech and LGL 2020) with peak abundance during summer (Zoidis et al. 2021). During the AMAPPS 2010-2017 and NLPSC surveys, sperm whales were sighted in or near the RI-MA WEAs during summer and fall (Kraus et al. 2016; O'Brien et al. 2021a; Palka et al. 2021a; Stone et al. 2017) Sleeping behaviors were observed in relatively shallow waters during the NLPSC studies (O'Brien et al. 2021a).

3.5.6.1.2 Non-ESA-Listed Species

Humpback Whale: In the western North Atlantic, humpback whales feed during spring, summer and fall over a geographic range encompassing the eastern coast of the United States including the Gulf of Maine, the Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland (Katona and Beard 1990). Feeding also occurs in the mid-Atlantic (Aschettino et al. 2020; Barco et al. 2002; Brown et al. 2018). During the winter, most of the North Atlantic population of humpback whales is believed to migrate south to calving grounds in the West Indies region (Smith et al. 1999; Stevick et al. 2003; Whitehead and Moore 1982); however, not all humpbacks migrate to the calving grounds every winter. Winter sightings of humpbacks are common in coastal waters of the southeastern United States and mid-Atlantic (Aschettino et al. 2020; Brown et al. 2018; Zeh et al. 2021; Zoodsma et al. 2016). Since January 2016, NOAA has investigated a UME for humpback whales due to elevated numbers of strandings along the United States Atlantic coast (NOAA Fisheries 2022a). From Maine to Florida, 156 humpback whale strandings were recorded thus far. Results of necropsy examinations on approximately half of the whales reveal human interactions such as ship strike or entanglement (NOAA Fisheries 2022a).

Humpback whales may occur in the proposed Project Area during any time of the year; lowest abundance in the proposed Project Area is estimated to be during winter (Table 3.5.6-2 Humpback whales were recorded year-round throughout the NYB (NYSERDA 2020; Tetra Tech and LGL 2020), including as close to shore as 5.75 mi (5 nm) from Long Island (NYSERDA 2020). Acoustic presence was highest during the fall and summer (Estabrook 2021), and abundance based on visual detections was highest during spring (Zoidis et al. 2021). In the NYB, probable foraging included bubble-net feeding and was the most common behavior observed and occurred during spring (May) and summer (June and July) (Tetra Tech and LGL 2020). AMAPPS 2010-2017 surveys recorded humpback whales in or near the RI-MA WEAs during all seasons except winter (Palka et al. 2021a). Humpbacks were sighted in the proposed Project Area in all seasons during recent geophysical surveys (Gardline 2021a; 2021b; Smultea Sciences 2020a; 2020b). Feeding and courtship behaviors were observed during the NLPSC surveys in the RI-MA WEAs (Kraus et al. 2016; O'Brien et al. 2021b; Stone et al. 2017). During these surveys, humpback whales were visually and acoustically detected year-round with peak sightings in spring and summer and high monthly acoustic presence December through June (Kraus et al. 2016; O'Brien et al. 2021a; O'Brien et al. 2021b; Quintana et al. 2019; Stone et al. 2017). Calves were observed in this area during spring and summer months (Kraus et al. 2016; Stone et al. 2017).

Common Minke Whale: Common minke whales (hereafter referred to as minke whales in this document) are widely distributed in the United States Atlantic EEZ (CETAP 1982). Since January 2017, NOAA has investigated a UME for minke whales due to elevated numbers of strandings along the United States Atlantic coast from ME through South Carolina (NOAA Fisheries 2022b). A total of 122 minke whale strandings were recorded thus far. Preliminary examinations reveal evidence of human interactions or infectious diseases (NOAA Fisheries 2022b).

Minke whales may occur in the proposed Project Area during any time of the year; highest abundance in the proposed Project Area is estimated to be during spring and summer (Table 3.5.6-2 In the NYB, sightings have been recorded on the continental shelf year-round (NYSERDA 2020; Tetra Tech and LGL 2020). Sighting rates for minke whales were highest in the summer (Tetra Tech and LGL 2020). AMAPPS 2010-2017 surveys recorded minke whales in or near the RI-MA WEAs during all seasons except winter (Palka et al. 2021a). Feeding behaviors were observed during the NLPSC surveys in the RI-MA WEAs (Kraus et al. 2016; Stone et al. 2017). During these surveys, minke whales were visually and acoustically detected year-round and were widely dispersed throughout the study area (Kraus et al. 2016; O'Brien et al. 2021a; O'Brien et al. 2021b; Quintana et al. 2019; Stone et al. 2017). Calves were sighted during spring/summer (Kraus et al. 2016; Stone et al. 2017).

Common Bottlenose Dolphin: Common bottlenose dolphins (hereafter referred to as bottlenose dolphins) from the Western North Atlantic offshore stock and Western North Atlantic northern migratory coastal stock may occur in the proposed Project Area. Although individuals were sighted as close to shore as 4.5 mi (7.3 km) in water depths of 55 ft (16.8 m) (Garrison et al. 2003), the offshore stock is primarily distributed along the outer continental shelf and continental slope from Florida to Georges Bank with confirmed sightings as far north as the Scotian Shelf (CETAP 1982; Hayes 2020; Kenney 1990). The northern coastal migratory stock occurs in estuarine, coastal, and shelf waters from Cape Lookout, North Carolina to Long Island, New York (Hayes 2018) with possible extralimital occurrences as far north as Cape Cod Bay (Wiley et al. 1994). Based on the known ranges of these two stocks, bottlenose dolphins sighted in or near the proposed Project Area are most likely to be part of the offshore stock; however, sightings of the migratory coastal stock are possible given the location of the proposed Project Area in relatively shallow, nearshore waters, the probable sightings as far north as Cape Cod Bay, and the potential for range shifts due to climate change.

Bottlenose dolphins may occur in the proposed Project Area during any time of the year; highest abundance in the proposed Project Area is estimated to be during summer and fall (Table 3.5.6-2). This species has been sighted year-round in the NYB (NYSERDA 2020). AMAPPS 2010-2017 surveys recorded bottlenose dolphins in the RI-MA WEAs during all seasons except winter when sightings were mostly south of Long Island (Palka et al. 2021a), which coincides with the more southernly distribution of the migratory coastal stock during this time of year (Hayes 2018). During the NLPSC surveys in the RI-MA WEAs, bottlenose dolphins were sighted year-round (Kraus et al. 2016; Quintana et al. 2019; Stone et al. 2017) and calves and mating behaviors were observed (Kraus et al. 2016; Stone et al. 2017).

Atlantic Spotted Dolphin: In the western North Atlantic, Atlantic spotted dolphins range from northern New England to Venezuela, including the Gulf of Mexico and the Caribbean Sea (Perrin et al. 1987). They are observed in continental shelf and slope waters (Hayes 2020; Mullin and Fulling 2003; Payne et al. 1984). This species has been sighted in the NYB in waters deeper than 229.6 ft (70 m) in November, May, and April/May (NYSERDA 2020). Peak abundance in the proposed Project Area is estimated to be during summer and fall (Table 3.5.6-2). Atlantic spotted dolphins were not recorded in the AMAPPS 2010-2017 surveys in or near the RI-MA WEAs; the closest sightings were recorded offshore of the WEAs during summer (Palka et al. 2021a). Atlantic spotted dolphins were not recorded during the NLPSC surveys in 2011-2015 or 2017-2019 (Kraus et al. 2016; O'Brien et al. 2021a; O'Brien et al. 2021b; Quintana et al. 2019; Stone et al. 2017). During geophysical surveys, a sighting of four dolphins was recorded as "possible Atlantic spotted dolphins" in the proposed Project Area in December 2019 (Smultea Sciences 2020b).

Common Dolphin: Off the United States and Canadian east coasts, common dolphins range from the Georgia/South Carolina border to Newfoundland (Jefferson et al. 2009). Along the United States Atlantic coast, common dolphins typically occur in temperate waters on the continental shelf between the 328 ft and 656 ft (100 m and 200 m) isobaths but also associate with the Gulf Stream (CETAP 1982; Selzer and Payne 1988; Waring and Palka 2002). This species is sighted year-round throughout the NYB (NYSERDA 2020; Tetra Tech and LGL 2020). The AMAPPS 2010-2017 surveys recorded common dolphins in or near the RI-MA WEAs throughout the year (Palka et al. 2021a). This species was sighted in all seasons during Project-specific geophysical surveys (Gardline 2021a; 2021b; Smultea Sciences 2020a; 2020b). The common dolphin was the most frequently sighted dolphin species during the NLPSC surveys in the RI-MA WEAs (Kraus et al. 2016; Stone et al. 2017). Sightings were year-round and scattered throughout the WEAs (O'Brien et al. 2021a; Quintana et al. 2019). Calves, feeding behaviors, and mating behaviors were observed (Kraus et al. 2016; O'Brien et al. 2021b; Stone et al. 2017). The lowest abundance of common dolphins in the proposed Project Area is estimated to be during spring (Table 3.5.6-2), which coincides with the lower number of nearshore sightings recorded in the NYB during April and May (NYSERDA 2020).

Atlantic White-sided Dolphin: Off the east coast of the United States, Atlantic white-sided dolphins are most common over the continental shelf from Hudson Canyon north to the Gulf of Maine (Palka et al. 1997). Virginia and North Carolina appear to represent the southern edge of their range, and peak occurrence in the mid-Atlantic is thought to be during spring and summer (Testaverde and Mead 1980). This species is found primarily in continental shelf waters up to 328-ft- (100-m) deep (CETAP 1982; Mate et al. 1994; Selzer and Payne 1988). Sightings in the NYB were recorded in shelf waters deeper than 229.6 ft (70 m) during fall (November) and winter (February/March/April) (NYSERDA 2020). Atlantic white-sided dolphins may occur in the proposed Project Area throughout the year; peak abundance is estimated to be during spring and summer (Table 3.5.6-2). This species was recorded in the proposed Project Area in June during geophysical surveys (Gardline 2021a). The AMAPPS 2010-2017 surveys recorded Atlantic white-sided dolphins in or near the RI-MA WEAs during spring and fall (Palka et al. 2021a). During the NLPSC surveys in or near the RI-MA WEAs, this species was sighted during all seasons except winter (Kraus et al. 2016; O'Brien et al. 2021a; O'Brien et al. 2021b; Quintana et al. 2019).

Pilot Whales: Pilot whales are typically distributed along the continental shelf break; however, movements over the continental shelf are commonly observed in the northeastern United States (CETAP 1982; NMFS (National Marine Fisheries Service) 2022; Payne and Heinemann 1993). The exact latitudinal ranges of the two species of pilot whales, short-finned pilot whales and long-finned pilot whales, remain uncertain (NMFS (National Marine Fisheries Service) 2022). In general, pilot whales sighted south of Cape Hatteras are expected to be short-finned pilot whales, while those sighted north of approximately 42 degrees north (°N) are expected to be long-finned pilot whales (Garrison and Rosel 2017); however, long-finned pilot whales are known to strand as far south as Florida, and short-finned pilot whales have stranded as far north as Massachusetts (Pugliares et al. 2016). The apparent ranges of the two pilot whale species overlap along the mid-Atlantic shelf break between Delaware and the southern flank of Georges Bank (Payne and Heinemann 1993; Rone and Pace 2012). Tagged short-finned pilot whales ranged along the shelf break as far north as Nantucket Shoals and Georges Bank (Thorne et al. 2017). Distinguishing between the two species of pilot whales during visual surveys is difficult; sightings often cannot be confidently identified to the species level and are recorded as "pilot whale spp." or "*Globicephala* spp."

Due to the uncertainty of the exact ranges of these species, the potential for range shifts due to climate change, and the difficulty distinguishing between these species in the field, both species are included as expected to occur in the proposed Project Area. Pilot whales may occur during all seasons based on historical occurrence records in this region (see DoN 2005; Kenney and Vigness-Raposa 2010). Peak abundance in the RI-MA WEAs is during the summer (Table 3.5.6-2). During the NLPSC surveys in and near the RI-MA WEAs, pilot whales, including calves, were sighted during spring and summer (Kraus et al. 2014; O'Brien et al. 2021a; Quintana et al. 2019). During recent surveys in the nearby NYB, pilot whales were sighted during all seasons except winter (NYSERDA 2020; Tetra Tech and LGL 2020), however, short-finned pilot whales were sighted in August (NYSERDA 2020).

Risso's Dolphin: Risso's dolphins are primarily distributed along the continental shelf edge from Cape Hatteras, North Carolina, northward to Georges Bank during the spring, summer, and fall (CETAP 1982; Payne et al. 1984). During winter, their range begins at the Mid-Atlantic Bight and extends into oceanic waters (Payne et al. 1984). In the NYB, Risso's dolphins were observed year-round. The NYSDEC surveys recorded sightings on the shelf and seaward of the shelf break (Tetra Tech and LGL 2020). Sightings recorded during the NYSERDA surveys were in waters deeper than the 295 ft (90-m) isobath (NYSERDA 2020). Peak abundance in the proposed Project Area is estimated to be during summer (Table 3.5.6-2). The AMAPPS 2010-2017 surveys recorded Risso's dolphins in or near the RI-MA WEAs during summer and fall (Palka et al. 2021a). During the recent NLPSC surveys in the WEAs, three sightings of Risso's dolphins were recorded in April 2012 just east of the proposed Project Area in the northern portion of the MA WEA (Kraus et al. 2013). Risso's dolphins were not sighted during the other NLPSC aerial surveys in 2011, remaining of 2012, 2013-2015 (Kraus et al. 2016; O'Brien et al. 2021a; O'Brien et al. 2021b; Quintana et al. 2019; Stone et al. 2017).

Harbor Porpoise: Off the United States east coast, harbor porpoises primarily range from Maine to North Carolina (CETAP 1982; Hayes et al. 2021; Northridge 1996). They occur most frequently over the continental shelf (Jefferson et al. 2015; Read 1999). Harbor porpoises have been sighted year-round in the NYB, primarily on the shelf and during winter and spring (NYSERDA 2020; Tetra Tech and LGL 2020). The AMAPPS 2010-2017 surveys recorded harbor porpoises in or near the RI-MA WEAs during all seasons except summer (Palka et al. 2021a). The NLPSC surveys in these WEAs recorded harbor porpoise sightings year-round (Kraus et al. 2016; Quintana et al. 2019; Stone et al. 2017). Abundance in the proposed Project Area is estimated to be lowest during summer (Table 3.5.6-2). From July through September, harbor porpoises are known to concentrate in the northern Gulf of Maine and southern Bay of Fundy (Palka 1995) with a few sightings in the upper Bay of Fundy and on the northern edge of Georges Bank (Palka 2000); however, sighting trends have shown more frequent sightings during summer in some years. Between October 2011 and June 2015, most harbor porpoise sightings were recorded from November through May (Kraus et al. 2016; Stone et al. 2017). Between February 2017 and July 2018, the highest number of sightings were during August 2017 (Quintana etl al. 2019), and between March 2020 and October 2020, only two harbor porpoises were sighted, and they were seen during summer (O'Brien et al. 2021b).

Harbor Seal: In the western North Atlantic, harbor seals occur year-round along the coasts of eastern Canada and Maine (Baird 2001; Boulva 1973; Gilbert and Guldager 1998; Katona et al. 1993; Zoidis et al. 2022) and seasonally along the coasts of southern New England to Virgina from September through late May (Jones and Rees 2021; Schneider and Payne 1983; Schroeder 2000; Toth et al. 2018). Between July 2018 and March 2020, the Northeast Pinniped UME included 3,152 seal strandings from Maine to

Virginia (NOAA Fisheries 2022d). Although most mortalities were of harbor and gray seals, some harp and hooded seal strandings were also added to this UME. Infectious disease may be the main cause, but tests are ongoing (NOAA Fisheries 2022d).

Haul-out sites near the proposed Project Area are on Block Island and Long Island (Kenney and Vigness-Raposa 2010; Schroeder 2000). Recent aerial surveys of pinniped haul-out sites in this region identified over 900 harbor and gray seals in Moriches Bay, Shinnecock Bay, Montauk, Fisher's Island, Little Gull Island, Block Island, and Narragansett Bay (Atlantic Marine Conservation Society 2016). Harbor seals have been sighted during recent surveys in the NYB in winter 2016/2017 (February/March), winter 2017/2018 (March/April), and spring 2019 (April/May) (NYSERDA 2020). Unidentified seals, likely harbor or gray seals based on known distributions, were also sighted during spring and summer surveys (NYSERDA 2020; Tetra Tech and LGL 2020). The AMAPPS 2010-2017 surveys recorded harbor seals in and near the RI-MA WEAs (Palka et al. 2021b). During the NLPSC 2011-2015 aerial surveys of the RI-MA WEAs, harbor seals were sighted in August 2013 and February 2014 (Kraus et al. 2014). Harbor seals may occur in the proposed Project Area year-round based on the known seasonal occurrence of this species in southern New England during fall, winter, and spring; sightings in the RI-MA WEAs during summer (Kraus et al. 2014); and sightings in or near the proposed Project Area during winter, spring, and fall (Gardline 2021a; Smultea Sciences 2020a; 2020b). Peak abundance of seals in the proposed Project Area is estimated to be during winter and spring (Table 3.5.6-2).

Gray Seal: Along the east coast of the United States, gray seals range from Maine to North Carolina (Hammill et al. 1998; Harry et al. 2005; Hayes et al. 2021; Katona et al. 1993; Lesage and Hammill 2001). As mentioned previously, gray seals were part of the Northeast Pinniped UME which included 3,152 seal strandings from Maine to Virginia between July 2018 and March 2020 (NOAA Fisheries 2022d). Pupping sites in the United States are in Maine and Massachusetts; the closest site to the proposed Project Area is Noman's Land southwest of Martha's Vineyard (Wood et al. 2020). Recent aerial surveys of pinniped haul-out sites in this region identified over 900 harbor and gray seals in Moriches Bay, Shinnecock Bay, Montauk, Fisher's Island, Little Gull Island, Block Island, and Narragansett Bay (Atlantic Marine Conservation Society 2016). In the NYB, gray seals were recorded during winter and spring, and unidentified seals, likely harbor or gray seals based on known distributions, were sighted during spring and summer (NYSERDA 2020; Tetra Tech and LGL 2020). Gray seals may occur in the proposed Project Area during all seasons; peak abundance of seals in the proposed Project Area is estimated to be during winter and spring (Table 3.5.6-2). The AMAPPS 2010-2017 surveys recorded gray seals in and near the RI-MA WEAs (Palka et al. 2021b). The NLPSC surveys in these WEAs recorded gray seals during winter and spring (Kraus et al. 2014). Project-specific geophysical surveys recorded gray seals in or near the proposed Project Area during every season (Gardline 2021a; 2021b; Smultea Sciences 2020a; 2020b).

3.5.6.2 Impact Level Definitions for Marine Mammals

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on marine mammals from the alternatives, including the Proposed Action. Table 3.5.6-3 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for marine mammals. Table G-10 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to marine mammals. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project.

Table 3.5.6-3. Definition of Potential Adverse and Beneficial Impacts

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	The impacts on individual marine mammals and/or their habitat, if any, would be at the lowest levels of detection and barely measurable, with no perceptible consequences to individuals or the population.	Impacts on individual marine mammals and/or their habitat would be beneficial but at the lowest levels of detection and barely measurable.
Minor	Impacts on individual marine mammals and/or their habitat are detectable and measurable; however, they are of low intensity, short term, and localized. Impacts on individuals and/or their habitat do not lead to population-level effects.	Impacts on individual marine mammals and/or their habitat are detectable and measurable. The effects are likely to benefit individuals, be localized, and/or be short-term and are unlikely to lead to population-level effects.
Moderate	Impacts on individual marine mammals and/or their habitat are detectable and measurable; they are of medium intensity, can be short-term or long-term, and can be localized or extensive. Impacts on individuals and/or their habitat could have population-level effects, but the population can sufficiently recover from the impacts or enough habitat still is functional to maintain the viability of the species both locally and throughout their range.	Impacts on individual marine mammals and/or their habitat are detectable and measurable. These benefits may affect large areas of habitat, be long-term, and/or affect a large number of individuals and may lead to a detectable increase in populations but is not expected to improve the overall viability or recovery of affected species or population.
Major	Impacts on individual marine mammals and/or their habitat are detectable and measurable; they are of severe intensity, can be long lasting or permanent, and are extensive. Impacts to individuals and/or their habitat would have severe population-level effects and compromise the viability of the species.	Impacts on individual marine mammals and/or their habitat are detectable and measurable. These impacts on habitat may be short-term, long-term, or permanent and would promote the viability of the affected species/population and/or increase the affected species/population levels.

3.5.6.3 Impacts of Alternative A - No Action on Marine Mammals

When analyzing the impacts of the No Action Alternative on marine mammals, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities on the baseline conditions for marine mammals. 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 E.

3.5.6.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for marine mammals would continue to follow current regional trends and respond to IPFs introduced by other ongoing and planned activities. Marine mammals in the geographic analysis area are currently subject to a variety of ongoing human caused IPFs. The main known contributors to mortality events include collisions with vessels (ship strikes), entanglement with fishing gear, and fisheries bycatch. Other important IPFs considered include underwater noise from anthropogenic sources, pollution (accidental spills and waste discharge), and climate change. Many marine mammal migrations cover long distances, and these factors can have impacts on individuals over broad geographic and temporal scales. Impacts associated with climate change have the potential to reduce reproductive success and increase individual mortality and disease occurrence, which could have population-level effects.

Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on marine mammals include:

- Continued O&M of the Block Island project (5 WTGs) installed in State waters,
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect marine mammals through the primary IPFs of noise, presence of structures, and land disturbance. Ongoing offshore wind activities would have the same type of impacts from noise, presence of structures, and land disturbance that are described in detail in the following section for planned offshore wind activities but the impacts would be of lower intensity.

Traffic (vessel strikes): Studies indicate that maritime activities can have adverse effects on marine mammals due to vessel strikes (Laist et al. 2001; Moore and Clarke 2002). Almost all sizes and classes of vessels have been involved in collisions with marine mammals around the world, including large container ships, ferries, cruise ships, military vessels, recreational vessels, commercial fishing boats, whale-watch vessels, research vessels, and even jet-skis (Dolman et al. 2006). Research into vessel strikes and marine mammals focused largely on baleen whales given their higher susceptibility to a strike because of their larger size, slower maneuverability, larger proportion of time spent at the surface foraging, and inability to actively detect vessels using sound (i.e., echolocation). Focused research on vessels strikes on toothed whales is lacking. Factors that affect the probability of a marine mammal vessel strike and its severity include number, species, age, size, speed, health, and behavior of animal(s) (Martin et al. 2016; Vanderlaan and Taggart 2007); number, speed, and size of vessel(s) (Martin et al.

2016; Vanderlaan and Taggart 2007); habitat type characteristics (Vanderlaan and Taggart 2007); operator's ability to avoid collisions (Martin et al. 2016); vessel path (Martin et al. 2016; Vanderlaan and Taggart 2007); and the ability of a marine mammal to detect and locate the sound of an approaching vessel.

Vessel speed and size are important factors for determining the probability and severity of vessel strikes. The size and bulk of the large vessels inhibit the ability for crew to detect and react to marine mammals along the vessel's transit route. In 93 percent of marine mammal collisions with large vessels reported in Laist et al. (2001), whales were either not seen beforehand or were seen too late to be avoided. Laist et al. (2001) reported that most lethal or severe injuries are caused by ships 262-ft-long (80-m) or longer traveling at speeds greater than 15 mph (13 knots). A more recent analysis conducted by Conn and Silber (2013) built upon collision data collected by Vanderlaan and Taggart (2007) included new observations of serious injury to marine mammals as a result of vessel strikes at lower speeds (e.g., 2.3 mph and 6.3 mph (2 knots and 5.5 knots). The relationship between lethality and strike speed was still evident; however, the speeds at which 50 percent probability of lethality occurred was approximately 10 mph (9 knots).

Smaller vessels have been involved in marine mammal collisions. Minke, humpback, and fin whales have been killed or fatally wounded by whale-watching vessels around the world (Jensen and Silber 2003). Strikes occurred when whale-watching boats were actively watching whales as well as when they were transiting through an area, with the majority of reported incidences occurring during active whale-watching activities (Jensen and Silber 2003; Laist et al. 2001).

In general, large baleen whales are more susceptible to a vessel strike than smaller cetaceans and pinnipeds. While there are rare reports of toothed whales being struck by ships (Van Waerebeek et al. 2007; Wells and Scott 1997), these animals are at relatively low risk due to their speed and agility (Richardson et al. 1995). Pinnipeds are also fast and maneuverable in the water and have sensitive underwater hearing, enabling them to avoid being struck by approaching vessels (Jensen and Silber 2003; Laist et al. 2001). There are very few documented cases of seal or sea lion mortalities because of vessel strikes in the literature (Richardson et al. 1995). Large whales are more susceptible to vessel strikes than other marine mammals due to their large size, slower travel and maneuvering speeds, lower avoidance capability, and increased proportion of time they spend near the surface (Laist et al. 2001; Vanderlaan and Taggart 2007). In the marine mammal GAA, baleen whales at risk of collision include humpback whales, fin whales, sei whales, sperm whales, and, to a lesser extent, minke whales due to their smaller size (Hayes 2020; Hayes et al. 2021).

In 2017, vessel strikes were thought to be a leading cause of a UME for the North Atlantic right whale. A total of 34 individual died during this time. As a result, in 2008, NMFS implemented a seasonal, mandatory vessel speed rule in certain areas along the United States East Coast to reduce the risk of vessel collisions with North Atlantic right whale. These SMAs require vessel operators to maintain speeds of 11.5 mph (10 knots) or less and to avoid SMAs when possible. Effectiveness of the program was reviewed by NMFS in 2020. Results indicated that while it was not possible to determine a direct causal link, the mortality and serious injury incidents on a per-capita basis suggest a downward trend in recent years (NMFS 2020).

Fisheries interactions – entanglement and bycatch: Fisheries interactions can have adverse effects on marine mammal species, with estimated global mortality exceeding hundreds of thousands of individuals each year (Read et al. 2006). Marine mammals can ingest or become entangled in marine debris (e.g., ropes, plastic) that is lost from fishing vessels and other offshore activities. Most recorded marine megafauna entanglements are directly or indirectly attributable to ropes and lines associated with fishing gear (Benjamins et al. 2014). Large baleen whales are at greatest risk for entanglement due to their large body size and slow maneuverability. Of the species considered in this assessment, entanglement is listed as a threat to humpback whales, North Atlantic right whale, fin whales, sei whales, common bottlenose dolphins, and gray seals (Hayes 2020; Hayes et al. 2021). There is limited information regarding entanglements of fin, sei, and minke whales; however, evidence of fishery interactions causing injury or mortality has been noted for each of these species in the Greater Atlantic Regional Fisheries Office/NMFS entanglement/stranding database (Hayes et al. 2021). Of the available information, there are considerable data on the potential for entanglement of humpback whales and North Atlantic right whales. A study of 134 individual humpback whales in the Gulf of Maine suggested that between 48 and 65 percent of the whales experienced entanglements (Robbins and Mattila 2001) and that 12 to 16 percent encounter gear annually (Robbins and Mattila 2001). Along with vessel collisions (discussed above), entanglement of humpback whales could be limiting the recovery of the population (Hayes 2020). Entanglement in fishing gear was also identified as one of the leading causes of mortality in North Atlantic right whales and may be a limiting factor in the species' recovery (Knowlton 2012). Gray seals are at risk for entanglements (Hayes 2020; Hayes et al. 2021). However, observed serious injury rates are lower than would be expected from the anecdotally observed numbers of gray seals living with ongoing entanglements, as gray seals entangled in netting are common at haul-out sites in the Gulf of Maine and southeastern Massachusetts. This may be because the majority of observed animals are dead when they come aboard the vessel at bycatch (Josephson et al. 2021); therefore, rates do not reflect the number of live animals that may have broken free of the gear and are living with entanglements.

Bycatch occurs in various commercial, recreational, and subsistence fisheries with hotspots driven by marine mammal density and fishing intensity (Lewison et al. 2014). Small cetaceans and seals are at most risk of being caught as bycatch due to their small body size that allows them to be taken up in fishing gear. Of the species considered in this assessment, Risso's dolphins, short-beaked common dolphins, short-finned pilot whales, harbor porpoises, white-sided dolphins, harbor seals, harp seals, gray seals, and hooded seals have been documented in several fisheries' bycatch data. Several commercial fisheries have documented bycatch. The ones that most commonly report bycatch are pelagic longlining, bottom trawling, and sink gillnetting (Hayes 2020; Hayes et al. 2021). Purse seine fisheries, Atlantic blue crab trap/pot, North Carolina roe mullet stop net, and hook and line (rod and reel) have also noted instances of marine mammal bycatch.

Stranding data indicate that other marine mammal species may be affected by entanglements or bycatch; however, the contribution of fishery-related mortalities and serious injuries to these strandings is often difficult to determine. This is because not all of the marine mammals that die or are seriously injured wash ashore, and not all will show signs of entanglement or other fishery interaction (Hayes 2020; Hayes et al. 2021). As a result, the contribution of fisheries interactions to the annual mortality and injury of marine mammal species in the GAA and beyond is likely underestimated (Hayes 2020; Hayes et al. 2021).

Noise: Underwater sound is a pervasive issue throughout the world's oceans and can adversely affect marine mammals. Vessel traffic, seismic surveys, and active naval sonars are the main anthropogenic contributors to low and mid-frequency noises in oceanic waters (NMFS 2018), with vessel traffic the dominant contributor to ambient sound levels in frequencies below 200 Hz (Veirs et al. 2016). In the marine mammal GAA, underwater noise from anthropogenic sources includes offshore marine construction activities (including pile driving), vessel traffic, seismic surveys, sonar and other military training activities, and turbine operations. The long-term effects of multiple anthropogenic underwater noise stressors on marine mammals across their large geographical range are difficult to determine and relatively unknown. The potential for these stressors to have population-level consequences likely varies by species, among individuals, across situational contexts, and by geographic and temporal scales (Southall et al. 2021).

Accidental releases and discharges: Marine mammals are particularly susceptible to the effects of contaminants from pollution and discharges as they accumulate through the food chain or are ingested with garbage.

Polychlorinated biphenyls (PCBs) and chlorinated pesticides (e.g., dichlorodiphenyltrichloroethane [DDE], dieldrin) are of most concern and can cause long-term chronic impacts. These contaminants can lead to issues in reproduction and survivorship, and other health concerns (e.g., Jepson et al. 2016; Pierce et al. 2008) however, the population-level effects of these and other contaminants are unknown. Research on contaminant levels for many marine mammal species is lacking. Some information has been gathered from necropsies conducted from bycatch and therefore focus on smaller whale species and seals. Moderate levels of these contaminants have been found in pilot whale blubber (Muir et al. 1988) (Weisbrod et al. 2000). Weisbrod et al. (2000) examined PCBs and chlorinated pesticide concentrations in bycaught and stranded pilot whales in the western North Atlantic. Contaminant levels were similar to or lower than levels found in other toothed whales in the western North Atlantic, perhaps because they are feeding farther offshore than other species (Weisbrod et al. 2000). Also, high levels of toxic metals (e.g., mercury, lead, cadmium) and selenium were measured in pilot whales harvested in the Faroe Islands drive fishery (Nielsen et al. 2000).

Climate change: Global climate change is an ongoing risk to marine mammals although the associated impact mechanisms are complex, not fully understood, and difficult to predict with certainty. NMFS lists the long-term changes in climate change as a threat for almost all marine mammal species (Hayes 2020, Hayes et al. 2021). Climate change is known to increase temperatures, erosion and sediment deposition, disease frequency, ocean acidification, and storm severity and frequency; raise sea levels; and alter altered habitat, ecology, and migration patterns (Albouy et al. 2020; EPA (U.S. Environmental Protection Agency) 2016; Record 2019). Increased temperatures can alter habitat, modify species' use of existing habitats, change precipitation patterns, and increase storm intensity. Over time, climate change and coastal development would alter existing habitats, rendering some areas unsuitable for certain species and more suitable for others. Increase of the ocean's acidity has numerous effects on ecosystems including reducing available carbon that organisms use to build shells and causing a shift in food webs offshore (EPA (U.S. Environmental Protection Agency) 2016). This has the potential to affect the distribution and abundance of marine mammal prey. For example, between 1982 and 2018 the average center of biomass for 140 marine fish and invertebrate species along United States' coasts shifted approximately 20 mi (32 km) north. These species migrated an average of 21 ft (6.4-m) deeper (EPA (U.S. Environmental Protection Agency) 2016). Shifts in abundance of their zooplankton prey will affect baleen whales who travel over large distances to feed (Hayes 2020). The extent of these impacts is unknown; however, it is likely that marine mammal populations already stressed by other factors (e.g., North Atlantic right whales) will likely be the most affected by the repercussions of climate change.

3.5.6.3.2 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 Proposed Action).

This section provides a general description of potential impacts that could conceivably occur in the GAA from ongoing and future planned offshore wind activities, recognizing that the extent and significance of potential impacts cannot be fully quantified for projects that are in early phases and have not been fully designed. Should any or all ongoing and future activities described in Appendix E proceed, each would be subject to independent NEPA analyses and regulatory approvals, and their environmental effects would be fully considered therein.

Other future non-Project activities other than offshore wind development activities that may affect marine mammals include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities could result in short-term or permanent displacement and injury to or mortality of individual marine mammals, but population-level effects would not be expected. The exception to this is the North Atlantic right whale, due to the small size of its population and frequent occurrence in shallow coastal zones.

The paragraphs below provide an overview of what is known regarding the IPFs described above.

Seafloor disturbance: Future offshore wind projects could disturb seabed while installing associated undersea cables. Trenching activities to place transmission cables would create areas of short-term seafloor disturbance. Installation of WTGs, support equipment, scour protection, and other related equipment would result in the long-term alteration of substrates. These structures are likely to alter prey composition and distribution for some marine mammals, potentially resulting in beneficial effects to odontocetes. The potential impacts of the long-term shift in prey species in the SRWF are discussed in further detail below under *Visible Infrastructure.* Alterations to the seafloor are not expected to negatively impact prey resources for marine mammals, and the overall impact to marine mammals is expected to be negligible.

Sediment suspension and deposition: Future offshore wind projects could disturb seabed while installing associated undersea cables, causing an increase in suspended sediment. This disturbance would result in short-term plumes of suspended sediments in the immediate construction areas. Elliott (2017) monitored total suspended solids (TSS) levels during construction of the BIWF. The observed TSS levels were far lower than levels predicted by the reference model, dissipating to baseline levels less than 50 ft (15.2 m) from the disturbance. Both the modeled TSS effects, which are conservatively high, and the observed TSS effects were short-term and within the range of baseline variability; however, these effects would be short-term (lasting only a few tide cycles) due to the low mobility of sediments (primarily sand) in cable and foundation installation areas (Stantec 2020).

These disturbances would be localized in extent, limited in magnitude, and short-term. Data describing behavioral responses of marine mammals to localized turbidity plumes are limited, but available information suggests that most species would be insensitive to the associated changes in visibility (NOAA 2022). For example, visual impairment does not appear to impair the ability of gray seals or harbor seals to forage and move effectively (McConnell et al. 1999; Todd et al. 2015). Research on the TSS sensitivity of other marine mammal species, such as dolphins and large whales, is generally lacking; however, these species have developed echolocation for communicating, foraging, and navigating by evolving in an environment with variable and often low visibility (Tyack and Miller 2002). This suggests that a short-term reduction in visibility would not significantly impair behavior. Even if marine mammals were to alter their behavior in response to elevated TSS (e.g., by avoiding the disturbance and/or interrupting foraging), any potential exposures would be localized in extent, limited in magnitude, short-term and, therefore, unlikely to result in biologically significant effects to any individual marine mammal. Therefore, the anticipated effects of construction-related seabed disturbance on marine mammals would be short-term and negligible.

Noise: Under the No Action Alternative, human activities would continue to generate underwater noise potentially affecting marine mammals. Existing and future sources of anthropogenic underwater noise include commercial, government and military, research, and recreational vessel activity, and the development and operation of other wind energy projects on the OCS. Several offshore wind project construction periods would overlap during the 2022 to 2030 period (Appendix E). Construction from these projects, most notably pile driving, would create airborne and underwater noise with moderate potential to affect marine mammals. These effects range from low-level behavioral effects and interference with communication, foraging, mating, predator avoidance, and navigation to short-term or permanent hearing impairment (Madsen et al. 2006; Weilgart 2007). Other sources of noise from wind projects include helicopters and aircraft used for transportation and facility monitoring, pre- and post-construction environmental surveys, G&G surveys, WTG operation, and vessel traffic associated with these activities.

The noise associated with offshore wind project construction and operation generally falls into two categories: (1) impulsive noise sources, such as G&G surveys and impact pile driving, which generate sharp instantaneous changes in sound pressure and (2) non-impulsive noise sources, such as vessel engine noise, vibratory pile driving, and WTG operation, which remain relatively constant and stable over a given time period. Impulsive and non-impulsive noise sources associated with offshore wind projects and other activities likely to occur on the OCS in the future are discussed below.

3.5.6.3.2.1 Impulsive Noise – G&G Surveys

Without mitigation, certain types of G&G surveys could result in long-term, high-intensity impacts on marine mammals. These effects may include behavioral avoidance of the ensonified area and increased stress; short-term loss of hearing sensitivity; and permanent auditory injury depending on the type of sound source, distance from the source, and duration of exposure; however, G&G noise resulting from offshore wind site characterization surveys is of less intensity than the acoustic energy characterized by seismic air guns and affects a much smaller area than G&G noise from seismic air gun surveys typically associated with oil and gas exploration. Although seismic air guns are not used for offshore wind site characterization surveys, sub-bottom profiler technologies that are hull-mounted on survey vessels may incidentally harass marine mammals and would require mitigation and monitoring measures. Typically, mitigation and monitoring measures are required by BOEM through requirements of lease stipulations and required by incidental take authorizations (ITAs) from NOAA Fisheries pursuant to Section 101(a)(5) of the MMPA. Similarly, the requirement to comply with avoidance and minimization measures for these surveys would avoid any effects on individuals that could result in population-level effects to threatened and endangered populations listed under the ESA. These measures are project specific, with many required through the federal permitting process, and may include protected species observers (PSOs), passive acoustic monitoring, pre-survey monitoring, and the establishment of exclusion zones in which sound sources would be shut down when marine mammals are present. Because of the reasonably foreseeable mitigation measures required by federal permits and reviews, including Incidental Harassment Authorization or Letters of Authorization under the MMPA, G&G surveys from future offshore wind activities would be short term and minor, and no population-level effects are expected.

3.5.6.3.2.2 Impulsive Noise – Impact Pile-Driving

The most significant impulsive noise source associated with offshore wind projects is pile-driving noise during the construction phase. WTG foundation installation involves impact pile driving, which produces high sound pressure levels (SPL) in both the surrounding in-air and underwater environments. A typical foundation pile installation generates four to six consecutive hours of impulsive or vibratory noise with intensity levels like those described for the Proposed Action. Potential noise exposure events would occur intermittently over several weeks during the allowable construction window (which may vary and would be determined through consultation with NMFS) in the marine mammal GAA. Under the No Action Alternative, construction of offshore structures would generate intermittent impulsive underwater noise with the potential to impact marine mammals over the 9-year construction period. These effects would be limited to specific construction windows beginning in 2022 and continuing through 2030.

Depending on their distribution in relation to construction activities and the timing of that construction, the duration and frequency of any exposure of marine mammals to construction noise would be variable. An individual may be exposed to anywhere from a single pile-driving event lasting no more than a few hours on a single day to intermittent noise over a period of weeks if an individual travels over the larger GAA where pile driving may be occurring. The potential effects of exposure to pile-driving noise would range from minor, short-term behavioral disturbance with no biological consequences to auditory injury. As explained above, the use of measures to mitigate exposure is expected to reduce the potential for injury, and most individuals would only be exposed to noise that would result in TTS and behavioral impacts. The probability and extent of potential impacts are situational and are dependent on several factors including pile size, impact energy, duration, site characteristics (i.e., water depth, sediment type), time of year, and species, among others that have been considered in the acoustic exposure modeling (COP, Appendix I1, Sunrise Wind 2022a).

Pile-driving at neighboring projects is anticipated under the No Action Alternative. The RI-MA WEAs could have the greatest potential for concurrent pile-driving for construction of adjacent projects. The total number of concurrent construction days ranges from 16 to 103 days under the 1-foundation-per-day scenario and 8 to 52 days of pile-driving under the 2-foundations-per-day scenario, depending on the year. The Delaware and Maryland lease areas have a potential for 11 days of concurrent pile-driving in 2022. An individual marine mammal present in either of these areas on those days could be exposed to the noise from more than one pile-driving event per day, repeated over a period of days.

Concurrent pile-driving could occur for one or more projects on the same day. Concurrent pile-driving increases the daily amount of noise exposure in an area but decreases the total number of days of exposure in the same area. Pile-driving occurring within the same 24-hour period would extend the exposure period and create a greater impact area(s) in which marine mammals could be exposed to noise that may cause PTS. Individual marine mammals are not likely to be exposed to concurrent pile-driving days on non-neighboring projects because the distances separating leases in the different regions results in an unlikely potential of exposure to noise between two areas in a 24-hour period. Marine mammals may be exposed to pile-driving noise from the same or different projects on multiple days over the same year but not necessarily in the same geographic area. When pile-driving occurs over multiple days rather than concurrently, this potentially decreases the daily amount of impulsive noise exposure in an area from neighboring projects but increases the total number of days of exposure in the same area. A pile-driving scenario with project construction occurring on different days would result in the greatest number of exposure days. If project construction is timed to not overlap and occurs on separate days, the number of nonconcurrent days of pile-driving in any given year is greater than the concurrent pile-driving scenario and would have a greater number of days of behavioral impacts but a smaller potential for PTS or TTS.

Impulsive noise from WTG and other offshore structure installation may result in PTS, TTS, and behavioral impacts to marine mammals. The use of sound attenuation (e.g., bubble curtains) would reduce the area of potential impacts for marine mammals. The potential for PTS and TTS would be mitigated by the use of PSOs and exclusion zones. Concurrent pile driving activities would increase the potential for PTS injury and TTS but reduce the number of days that marine mammals would experience behavioral impacts. Pile driving that occurs on separate days reduces the potential for PTS and TTS but increases the number of days of behavioral impacts. These impacts would occur over multiple years and several locations throughout the geographic area. Based on the above information, impact pile driving is likely to result in moderate impacts to marine mammals through increased risk of PTS and TTS and behavioral impacts.

3.5.6.3.2.3 Non-Impulsive Noise

The majority of anthropogenic underwater noise in the marine environment is continuous noise from large vessel engines, specifically ocean-going cargo, tanker, and container vessels. Other sources of noise like small vessels, wind farm operations, and other activities are likely to account for a small percentage of the total anthropogenic sound energy in the future ocean environment. Virtually all of the long-term noise effects associated with offshore wind energy projects during operations would be occur intermittently and be non-impulsive in nature. Non-impulsive noise sources include helicopters and fixed-wing aircraft used for facility monitoring, vibratory pile driving, construction and O&M vessel noise, and operational noise from WTGs.

Helicopters and fixed-wing aircraft may be used during initial site surveys, marine mammal monitoring prior to and during construction, and facility monitoring. Noise and disturbance associated with helicopter and/or aircraft use may result in some short-term and short-term behavioral responses. These include reduced surfacing duration, abrupt dives, and alarm reactions such as breaching and tail slapping (Patenaude 2002); however, these effects have only been observed at distances of less than 1,000 ft (300 m). ESA and MMPA ITAs would require most aircraft associated with future wind farm projects would operate at greater altitudes except when flying low to inspect WTGs or taking off and landing on the service operations vessel. For this reason, aircraft operations are not expected to result in biologically significant effects on marine mammals.

Vibratory pile-driving would likely be used during offshore wind farm construction, typically to install temporary cofferdams at the sea-to-shore transition points for transmission cables and initial installation of jacket pile foundation pin piles. Vibratory pile-driving produces significant underwater noise with the potential to cause behavioral effects on marine mammals that can exceed 10 mi (16 km) from the source (Refer to Multi-Species Pile-Driving Calculator, Version 1.1, NMFS Protected Species Division, Silver Spring, Maryland); however, the large majority of offshore pile-driving activities are expected to be foundation installation with impact hammers. Vibratory pile-driving is expected to occur on far fewer days and therefore the total number of days per year at which marine mammals would experience behavioral impacts from vibratory pile-driving is very small, and overall impacts would be minor.

Vessel noise is likely the most significant source of non-impulsive noise associated with offshore wind projects. The frequency range for vessel noise falls within the known range of hearing for marine mammals and would be audible. Although vessel noise may have some effect on marine mammal behavior, it would be limited to temporary startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes (Erbe et al. 2018; Erbe et al. 2019; Nowacek et al. 2007). Studies indicate noise from shipping increases stress hormone levels in North Atlantic right whales (Rolland et al. 2012), and modeling suggests that their communication space has been reduced substantially by anthropogenic noise (Hatch et al. 2012). The authors also suggest that physiological stress may contribute to suppressed immunity and reduced reproductive rates and fecundity in North Atlantic right whales (Hatch et al. 2012; Rolland et al. 2012). Similar impacts could occur for other marine mammal species

Other behavioral responses to vessel noise could include animals avoiding the ensonified area, which may have been used as a forage, migratory, or socializing area. Results from studies on acoustic impacts from vessel noise on odontocetes indicate that small vessels at a speed of 5 kts (9 kmh) in shallow coastal water can reduce the communication range for bottlenose dolphins within 164 ft (50 m) of the vessel by 26 percent (Jensen et al. 2009). In a quieter, deep-water habitat, model results suggest that there could be a 58 percent reduction in the communication range of pilot whales from a similar-sized boat and speed (Jensen et al. 2009). Because lower frequencies propagate farther away from the sound source compared to higher frequencies, low-frequency cetaceans (mysticetes [baleen whales]) are at a greater risk of experiencing behavioral noise effects from vessel traffic. BOEM assumes that construction of future offshore wind projects (construction period estimated to last 2 years per project) would begin in earnest in 2021, peak in 2025, and conclude in 2030. Vessel activity could peak in 2025 with as many as 207 vessels involved in construction of reasonably foreseeable projects in the GAA (Refer to Section 3.5.6.3 *No Action Alternative*) although actual vessel numbers and trip numbers would vary based on individual project designs and port locations.

Vessel traffic from future offshore wind activities is not anticipated to measurably increase regional ambient noise levels due to the high ambient noise due to proximity to busy shipping lanes and marginal change to overall vessel traffic for the region. However, this increased offshore wind–related vessel traffic during construction and associated noise impacts could result in repeated localized, intermittent, and short-term impacts on marine mammals resulting in brief behavioral responses that would be expected to dissipate once the vessel or the individual has left the area BOEM expects that these brief responses of individuals to passing vessels would be unlikely given the patchy distribution of marine mammals and high levels of ambient noise due to the proximity to busy shipping routes; no stock or population-level effects would be expected. Should multiple project construction activities occur in close spatial and temporal proximity, the implementation of relevant avoidance, minimization, and mitigation measures would further reduce the potential for impact to marine mammals.

WTG operation is another source of continuous noise but is not expected to result in biologically significant effects on marine mammals. According to measurements at the Block Island Wind Farm, low-frequency noise generated by turbines reach ambient levels at 164 ft (50 m) (Miller and Potty 2017). Other studies observed SPL levels ranging from 109 to 127 decibels (dB) at 46 and 65.6 ft (14 and 20 m), respectively, at operational wind farms (Tougaard et al. 2009).

Further, Tougaard et al. (2020) summarized available monitoring data on wind farm operational noise, including both older generation geared turbine designs and quieter modern direct drive systems like those proposed for the SRWF. In their review, they evaluated approximately 40 wind projects with turbines ranging from 0.2 to 6.15 megawatts (MW). Tougaard further determined that operating turbines produce underwater SPL on the order of 105-128 dB in the 1025-Hz to 81-kHz range as measured at 164 ft (50 m); however, the turbines evaluated were smaller capacity, and the total number of turbines in the projects evaluated was less than what is proposed at SRWF. Tourgaard's levels were consistent with the noise levels observed at the BIWF (110 to 125 dB SPL; Elliot et al. 2019). However, these studies and models demonstrated that noise generated by wind turbines attenuates rapidly with distance from the turbine (falling below normal ocean ambient noise within approximately 0.6 mi [1 km] from the source), and the combined noise levels from multiple turbines is lower or comparable to that generated by a small cargo ship. Operational noise and ambient noise both increase in conjunction with wind speed, meaning that WTG noise is only audible within a short distance from the source even in increased wind conditions (Kraus et al. 2016; Thomsen et al. 2015), and are unlikely to be detectable to marine mammals outside the respective wind farm footprints. Therefore, operational noise from regional wind farm development would not result in any effects on marine mammal recruitment or survival.

Noise associated with cable laying would be produced by vessels and equipment during route identification, trenching, jet plow embedment, backfilling, dredging, and cable protection installation. Noise intensity and propagation would depend upon bathymetry, local seafloor characteristics, vessels, and equipment used (Taormina et al. 2018). Modeling estimates that underwater noise would remain above the 120 dB SPL threshold in an area of 98,842 ac (400 km^2) near the source (Bald et al. 2015; Nedwell and Howell 2004; Taormina et al. 2018). Assuming cable laying activities occur 24 hours per day and vessels continually move along the cable route, then estimated ensonified areas would not remain in the same location for more than a few hours (developed using Kirkpatrick et al. (2017)). Although this suggests a large area of effect, it is important to place construction vessel noise in context with the existing underwater noise environment. A significant proportion of cable-laying activities would cross through high vessel traffic areas (see COP, Appendix X, Sunrise Wind 2021e) where ambient underwater noise levels are likely to exceed the 120 SPL behavioral threshold. Although anthropogenic noise effects, particularly from vessel noise, would continue to adversely affect marine mammals into the future, construction vessel noise is unlikely to substantially alter this baseline condition and therefore would not substantially change existing levels of adverse effects on marine mammals. Ongoing non-impulsive noise from vessel traffic and the operation of WTGs is persistent and expected to continue indefinitely. Because of this, non-impulsive noise would have moderate effects on marine mammals over the long term.

EMF: Under the No Action Alternative, several thousand miles of new submarine electrical transmission cables would be added in the geographic area for marine mammals. Submarine power cables emit anthropogenic electric and magnetic fields (EMF) that can interact with natural geomagnetic EMF, potentially affecting the behavior of electromagnetic-sensitive species by disrupting cues. EMF are generated by current flow passing through power cables during operation and can be divided into EMFs (Taormina et al. 2018). Magnetic fields have a second induced component, a weak electric field, or an induced electric (iE) field. Both EMFs rapidly diminish in strength with increasing distance from the source.

Marine mammals appear to have a detection threshold for magnetic intensity gradients (i.e., changes in magnetic field levels with distance) of 0.1 percent of the earth's magnetic field or approximately 0.05 microtesla (µT) (Kirschvink 1990). Assuming a 50-mG (5 µT) sensitivity threshold (Normandeau Associates Inc. et al. 2011), marine mammals could theoretically detect EMF effects from the inter-array and SFEC cables but only in close proximity to cable segments lying on the bed surface. Individual marine mammals would have to be within 3 ft (0.9 m) or less of those cable segments to encounter EMF above the 50-mG detection threshold.

As marine mammals in the area would be transiting and/or foraging and would not spend significant time on the seafloor in proximity to the cables, no species- or population-level impacts to marine mammals are expected. The mobile nature and surfacing behavior in marine mammals likely limit time spent near the cables, reducing potential for EMF exposure. Data are limited but only minor responses, such as lingering near or being attraction to cables, have been noted in electrosensitive species (e.g., elasmobranchs, benthic species), and no interactions with anthropogenic EMF from submarine cables have been recorded for marine mammals. Therefore, potential effects to marine mammals from EMF exposure associated with the No Action Alternative, if present, are expected to be transient and negligible. Further discussion of potential EMF effects on marine mammals is available in the COP, Appendix J1 (Sunrise Wind 2022a).

Accidental releases - contaminants: Vessels associated with future offshore activities could generate exhaust and could be a source of potential accidental spills of petroleum-based toxics. Marine mammals that occur in the analysis area could be exposed to these contaminants. Inhalation of fumes from oil spills can result in mortality or sublethal effects on individual fitness, including adrenal effects, hematological effects, liver effects, lung disease, poor body condition, skin lesions, and several other health effects (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshita et al. 2017). Although these effects are acknowledged, the likelihood of adverse population-level impacts on marine mammals from accidental releases of debris or contaminants from future activities on the OCS is low. Current regulations and requirements imposed on federally approved activities prohibit vessels from dumping potentially harmful debris, require measures to avoid and minimize spills of toxic materials, and provide mechanisms for spill reporting and response. Based on these factors, accidental releases and discharges from federally approved activities on the OCS are not expected to appreciably contribute to adverse marine mammal impacts, and, therefore, the effects of the No Action Alternative would be negligible.

Accidental releases - trash and debris: Future activities in the offshore components of the OCS could result in the accidental release of trash or contaminants associated primarily with vessel activity during Project construction. The inadvertent releases would contribute to the existing hazard posed by chronic marine pollution and debris. Entanglement in or ingestion of marine debris is a significant source of human-caused mortality in marine mammals. For example, ingested debris was documented in up to 22 percent of beached marine mammal carcasses. Autopsies identified blockage of the digestive tract, injury, and malnutrition caused by ingested debris as the likely cause of mortality (Baulch and Perry 2014). Approximately 50 percent of marine mammal species worldwide have been documented ingesting marine litter (Werner et al. 2016). Although these effects are acknowledged, the likelihood of adverse population-level impacts on marine mammals from accidental releases of debris or contaminants from future activities on the OCS is low. Current regulations and requirements imposed on federally approved activities prohibit vessels from dumping potentially harmful debris in United States waters. Based on these factors, accidental releases of trash and debris from federally approved activities on the OCS are not expected to appreciably contribute to adverse marine mammal impacts, and therefore the effects of the No Action Alternative would be negligible.

Traffic: Vessel traffic associated with future offshore wind development poses a collision risk to marine mammals, especially North Atlantic right whales, other baleen whales, and calves that spend more time at and near the ocean surface. Vessel strike is relatively common with cetaceans and one of the primary causes of death to North Atlantic right whales (Kraus et al. 2005). The minimum rate of human-caused mortality and serious injury to North Atlantic right whales between 2013 and 2017 was estimated at 6.85 per year, with vessel strikes accounting for 1.3 mortalities per year (Hayes 2020). Marine mammals are more vulnerable to vessel strike when they are within the draft of the vessel, vessels are larger or faster, and when they are beneath the surface and not detectable by visual observers (Vanderlaan and Taggart 2007). Weather conditions (e.g., fog, rain, and wave height) and nighttime operations also reduce marine mammal detection. The probability of vessel strike for North Atlantic right whales decreased substantially as vessel speed fell below 17.3 mph (15 knots) (Vanderlaan and Taggart 2007); serious injury may rarely occur at speeds below 11.5 mph (10 knots) (Laist et al. 2001).

At the peak of projected offshore wind farm development in 2025, up to 207 construction vessels may be operating in the GAA. Although this is a large number, the overall increase in vessel activity is small relative to the baseline level and year to year variability of vessel traffic in the analysis area. In addition, the risk of marine mammal collisions is extremely low for most wind farm construction activities. Vessels working in the WEAs either remain stationary during turbine placement or are travelling slowly (i.e., at less than 11.5 mph [10 knots]) between turbine locations. Vessel speeds may increase when traveling between the WEAs and area ports unless voluntary or mandatory speed restrictions are in effect. Timing restrictions, use of PSOs, and other mitigation measures required by BOEM and NMFS would further minimize the potential for fatal vessel interactions. These measures would effectively minimize but not completely avoid collision risk. Any incremental increase in risk must be considered relative to the baseline level of risk associated with existing vessel traffic. Project O&M of wind farms would involve fewer vessels that are smaller in size, and the level of vessel activity would be far lower than during construction. Smaller vessels (i.e., less than 260 ft [79.2 m] in length) pose a lower risk of fatal collisions than larger vessels (Laist et al. 2001).

Offshore wind development could also alter commercial and recreation fishing vessel activity, which may lead to increased interactions with marine mammals that are also temporarily displaced out of lease areas during construction (Refer to Sections 3.6.1 *Commercial Fisheries and For-Hire Recreational Fishing* and 3.6.6 *Navigation and Vessel Traffic* for details). Overall, increased vessel traffic from future offshore wind activities and potentially increased commercial and recreational fishing activity over the long-term may result in minor impacts to marine mammals due to rare injurious or fatal collisions with vessels.

Lighting: The addition of up to 2,050 new offshore structures in the GAA with long-term hazard and aviation lighting, as well as lighting associated with construction vessels, would increase artificial lighting. Orr et al. (2013) concluded that the operational lighting effects from wind farm facilities to marine mammal distribution, behavior, and habitat use were uncertain but likely negligible if recommended design and operating practices are implemented. The cumulative impact of artificial lighting from future wind farm development and other offshore activities is anticipated to be negligible.

Presence of structures: The addition of additional new offshore structures in the GAA could increase marine mammal prey availability through creating new hard-bottom habitat, increasing pelagic productivity in local areas, or promoting fish aggregations at foundations (Bailey et al. 2014; English et al. 2017). The presence of WTGs can alter circulation and stratification down current from the structures, potentially altering oceanographic conditions at the local scale; however, the presence of additional structures could have broader effects on oceanographic conditions with the potential to influence the distribution marine mammals prey species at broader spatial scales.

Numerous surveys at offshore wind farms, oil and gas platforms, and artificial reef sites have documented increased abundance of smaller odontocete and pinniped species attracted to the increase in pelagic fish and benthic prey availability (Arnould et al. 2015; Lindeboom et al. 2011; Mikkelsen et al. 2013; Russell et al. 2014). Effects on fish populations may be adverse, beneficial, or mixed, depending on the species and location (van der Stap et al. 2016) but are expected to be small-scale within the context of the broader region. It is likely the reef effect caused by habitat alteration in the SRWF would provide beneficial foraging opportunities for some marine mammals although the number of species benefiting from this habitat and the significance of the benefit for these species remains uncertain (Bergström et al. 2014). Currently, there are no quantitative data on how large whale species (i.e., mysticetes) may be impacted by offshore windfarms (Kraus et al. 2019). Navigation through, or foraging within, the SRWF is not expected to be impeded by the presence of the WTG and OCS–DC foundations.

Current data suggest seals (Russell et al. 2014) and harbor porpoises (Scheidat et al. 2011) may be attracted to future offshore wind development infrastructure, likely because of the foraging opportunities and shelter provided. These species are expected to use habitat around the WTGs, as well as around offshore wind infrastructure, for feeding, resting, and migrating; however, the presence of structures may indirectly concentrate recreational fishing around foundations. In addition, ghost gear or lost commercial fishing nets may tangle around WTG foundations. Both could indirectly increase the potential for marine mammal entanglement leading to injury and mortality due to infection, starvation, or drowning (Moore and van der Hoop 2012). Entanglement in commercial fishing gear was identified as one of the leading causes of mortality in North Atlantic right whales and may be a limiting factor in the species recovery, with more than 80 percent of observed individuals showing evidence of at least one and 60 percent showing evidence of multiple entanglements (Knowlton et al. 2012). Wind farm mitigation measures include annual inspections of WTG foundations and surroundings to find and remove derelict fishing gear and debris. This would reduce entanglement risk for seals and porpoise foraging around the foundations. Importantly these mitigation measures would provide a new mechanism for removing derelict gear from the environment, incrementally reducing entanglement risk for all marine mammal species in the analysis area.

The long-term presence of WTG structures could displace marine mammals from preferred habitats or alter movement patterns, potentially changing exposure to commercial and recreational fishing activity. The evidence for long-term displacement is unclear and varies by species. For example, Long (2017) studied marine mammal habitat use around two commercial wind farm facilities before and after construction and found that habitat use appeared to return to normal after construction. Long cautioned that these findings were not definitive and additional research was needed. In contrast, Teilmann and Carstensen (2012) observed clear long-term (greater than 10 years) displacement of harbor porpoises from commercial wind farm areas in Denmark. Displacement effects remain a focus of ongoing study (Kraus et al. 2019).

The combined effects of the presence of wind farm structures on marine mammals are variable, ranging from incrementally adverse to incrementally beneficial, and difficult to predict with certainty. Broadly speaking, any effects on marine mammal prey species are expected to be localized and seasonal (NMFS 2020). Potential long-term, intermittent impacts would persist until conceptual decommissioning is complete and structures are removed. On balance, the presence of wind farm structures could alter marine mammal behavior at local scales and could indirectly expose individuals to injury but would not adversely affect marine mammal populations, and therefore may have minor adverse and minor beneficial effects to marine mammals over the long term.

Port utilization: Any port expansions required for reasonably foreseeable projects could increase the total amount of disturbed benthic habitat, potentially resulting in impacts on some marine mammal prey species. Increases in port utilization due to other offshore wind energy projects would lead to increases in vessel traffic and associated risk of vessel strike (Refer to Traffic subsection below). The resulting change in vessel traffic in the GAA cannot be predicted because, while some ports have been identified as possibilities for expansion, no specific project plans have been proposed. However, any future port expansion and associated increase in vessel traffic would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential effects on marine mammals regionwide.

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

Impacts to ESA-listed marine mammals are not expected to be different than for non-ESA-listed marine mammals. The primary sources of potential impacts for ESA-listed marine mammals include increased sound levels from pile installation activities and G&G surveys, project-related vessel traffic, and alteration of prey availability. Based on the information contained in this document, it is anticipated that the reasonably foreseeable offshore wind activities are likely to adversely affect, but not jeopardize the continued existence North Atlantic right, sei, fin, or sperm whales.

3.5.6.3.4 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and conceptual decommissioning would not occur. Marine mammals would continue to be affected by existing environmental trends and ongoing activities, and these would continue to have short-term to long-term impacts on marine mammals, primarily through construction- related accidental releases and discharge, noise, lighting, collision risk, habitat changes, and climate change.

BOEM anticipates that the marine mammal impacts due to ongoing activities associated with the Alternative A - No Action of these ongoing activities would be **negligible** to **moderate** adverse and **minor beneficial**.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities, and marine mammals would continue to be affected by natural and human-caused IPFs. Planned activities would also contribute to impacts to marine mammals. BOEM anticipates that the overall impacts associated Alternative A, the No Action Alternative, when combined with all other planned activities (including offshore wind) in the GAA would result in overall **moderate** adverse impacts.

3.5.6.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the following sections. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on marine mammals:

- The number of WTGs;
- Installation methods; and
- The time of year during which construction occurs.

Variability of the proposed Project design exists as outlined in Appendix C. Following is a summary of potential variances in impacts:

- WTG number and locations: the level of hazard related to WTGs is proportional to the number of WTGs installed; fewer WTGs would result in lower behavioral disturbance and decreased risk of short-term or permanent threshold shift for marine mammals during construction and installation and O&M. The potential reductions included in Alternatives C-1 and C-2 may reduce the extent and number of individuals affected but would not lower the overall impact level.
- Final installation methods: any variance to installation methods or materials used for the assumptions described in the COP (COP, Appendix I1, Sunrise Wind 2022a) may result in large changes to the areas where marine mammals may experience injury, PTS, TTS, or behavioral effects. Potential changes to installation methods may reduce or increase the extent and number of individuals affected but would not alter the overall impact level to marine mammals.

- Offshore export cable routes: the route chosen (including variants within the general route) would determine the amount of seafloor disturbance and duration of sediment suspension but would not alter the level of impacts to marine mammals.
- Season of construction: different marine mammals are present and active in the proposed Project Area at different times of year. Construction when fewer marine mammals are present would have a lesser impact than construction when higher numbers are present. Changes to the construction schedule could alter the number of individuals affected or change which species are primarily affected. This would not change the overall impact determination but may help reduce impacts to species whose populations are more sensitive to impacts.

3.5.6.5 Impacts of Alternative B - Proposed Action on Marine Mammals

The activities associated with offshore SRWF (94 11-MW WTGs within 102 potential positions) and SRWEC-OCS/SRWEC-NYS cabling, and OnCS-DC, transmission cable, and interconnection cable with Alternative B include construction and installation, O&M, and decommissioning. These actions have the potential to cause both direct and indirect impacts to marine mammals. The IPFs associated with construction and post construction O&M activities include accidental releases, seafloor disturbance, sediment suspension and deposition, electric and magnetic fields, lighting, noise, presence of structures, traffic, and port utilization. These IPFs are thoroughly discussed in the marine mammal assessment prepared for this Project (Appendix O, Sunrise Wind 2022a). The conclusions of the marine mammal assessment are presented in this section and include consideration of the Project's mitigation and monitoring measures (Appendix H).

3.5.6.5.1 Construction and Installation

3.5.6.5.1.1 Onshore Activities and Facilities

Construction and operation of onshore facilities is not expected to have any direct impacts to marine mammals, and the potential for impacts is negligible.

3.5.6.5.1.2 Offshore Activities and Facilities

Construction impacts to marine mammals could occur from the following IPFs: seafloor disturbance, sediment suspension and deposition, noise, electric and magnetic fields, discharges and release, trash and debris, vessel traffic, and lighting and marking. Unless otherwise noted, construction-related impacts would be short term. The potential for the impacts is discussed in detail the following sections.

Seafloor disturbance: Construction of the SRWF Project components would physically disturb the water column and seabed including seafloor preparation, structure footprint, scour protection, and CPS stabilization; however, the area affected at any given time would be minimal relative to the size of the area of direct effects and insignificant compared to current baseline levels of disturbance (Table 3.5.2-3 and Table 3.5.2-4). Additionally, seabed and water column disturbance from the construction of the SRWF is not expected to have any direct impact on prey resources for marine mammals. Therefore, direct effects to marine mammals and indirect effects to fish and invertebrate prey resources would not adversely impact annual rates of recruitment or survival: effects would be negligible (Refer to Section

3.5.2 *Benthic Habitat* and Section 3.5.5 *Finfish, Invertebrates, and Essential Fish Habitat* for additional discussion).

Installation methods and anticipated maximum disturbance corridors during construction are detailed in Section 3.3.3.4 of the COP (Sunrise Wind 2022a). Construction activities could temporarily disturb marine mammals or their prey species in the activity area. As detailed in Section 3.5.5 of this Draft EIS, mobile fish species are expected to temporarily relocate from the area immediately surrounding seafloor-disturbing activities, and marine mammals foraging in the vicinity may encounter a localized reduction in foraging opportunities; however, because prey would still be available within the overall region surrounding the SRWEC, impacts are limited to short-term effects on individual marine mammals and not groups or populations and would not adversely impact annual rates of recruitment or survival. Therefore, the effects of seafloor disturbance would be negligible.

Sediment suspension and deposition: Seabed disturbance during Project construction would result in short-term plumes of suspended sediments in the immediate construction area. Elliott (2017) monitored TSS levels during construction of the BIWF. The observed TSS levels were far lower than levels predicted using the same modeling methods, dissipating to baseline levels less than 50 ft (15.2 m) from the disturbance. Both the modeled TSS effects, which are conservatively high, and the observed TSS effects were short-term and within the range of baseline variability; however, these effects would be short-term (lasting only a few tide cycles) due to the low mobility of sediments (primarily sand) in the proposed dredge area (Stantec 2020). As discussed in Section 3.5.6.3, seals and dolphins have evolved in and are able to forage and move effectively in low-visibility conditions. This suggests that short-term reduction in visibility would not significantly impair behavior in response to elevated TSS. Even if marine mammals were to temporarily alter their behavior (e.g., by avoiding the disturbance and/or interrupting foraging), the disturbance would be localized in extent, limited in magnitude, and short-term.

As previously described, installation of the SRWEC would require the excavation of the seafloor within the SRWEC corridor in OCS and NYS waters. These seafloor-disturbing activities are expected to result in localized increases in suspended sediments and an associated increase in turbidity levels. As previously described for the SRWF, increased turbidity can decrease visibility and water quality around the SRWEC.

Sediment transport modeling was completed for the installation of the SRWEC in both offshore and nearshore waters. As described in the COP, Appendix H (Sunrise Wind 2022a), TSS concentrations are predicted to return to ambient levels (less than 10 mg/L) within 0.4 hours following installation of the modeled SRWEC–OCS cable corridor centerline and within 0.5 hours following installation of the modeled SRWEC–NYS cable corridor centerline. Furthermore, the TSS plumes were shown to be primarily contained within the lower portion of the water column, approximately 9.8 ft (3.0 m) above the seafloor for both SRWEC–OCS and SRWEC–NYS installation. These limited temporal effects over a relatively small area are not expected to interfere with marine mammal foraging success. Furthermore, after review of sediment transport modeling results, Sections 4.4.2 and 4.4.3 of the COP (Sunrise Wind 2022a) concluded that only short-term, limited impacts to fish and benthic species are expected from suspended sediments; therefore, secondary effects on availability of prey to marine mammals are not expected.

Additionally, HDD would occur within nearshore NYS waters when the SRWEC makes landfall on Fire Island. In general, this would involve HDD under the seafloor and intertidal zone using a drilling rig that would be located onshore within a designated Landfall Work Area. Drilling fluid (comprised of bentonite, drilling additives, and water) would be pumped to the drilling head to stabilize the created hole. Drilling fluid would then be used to prevent a collapse of the hole and cuttings would be returned to the landfall drill site. Excavation of exit pits would occur offshore within the surveyed corridor and outside of the Fire Island National Seashore boundary. Sediment transport modeling at the HDD exit pit is also reported in Appendix H. TSS concentrations were predicted to return to ambient levels (less than 10 mg/L) within 0.3 hours following completion of the excavation, while sediment deposition was predicted to extend a maximum of 79 ft (24 m) from the HDD exit pit, and to cover an area of 0.1 ha of the seafloor. The TSS plumes are predicted to be contained within the lower half of the water column, approximately 7.2 ft (2.2 m) above the seafloor. Considering the results of the sediment transport modeling and existing conditions along the modeled SRWEC cable corridor centerline, suspended sediments due to construction of the Project are expected to be a short-term disturbance to benthic habitats and are not expected to impact marine mammals directly. Similarly, suspended sediments are not likely to have long-term adverse impacts to prey species targeted for consumption by marine mammals along the SRWEC. Because the effects of sediment suspension are short-term, would not appreciably affect prey base, and would not adversely impact annual rates of recruitment or survival, the impact to marine mammals would be negligible. Even if marine mammals were to alter their behavior in response to elevated TSS (e.g., by avoiding the disturbance and/or interrupting foraging), any potential exposures would be localized in extent, limited in magnitude, and short-term and would not result in biologically significant effects to any individuals.

Noise: Sources of underwater noise during the construction phase of the SRWF include G&G survey equipment, MEC/UXO surveys, MEC/UXO detonations, impact pile driving, vibratory pile driving, vessels, and air traffic. Underwater noise generated by SRWF construction activities could adversely impact marine mammals that are present within areas of elevated noise. Section 4.4.4.2 of the COP (Sunrise Wind 2022a) provides a detailed overview of how underwater sounds may affect marine mammals.

As described in the COP, Appendix I1 (Underwater Acoustic Assessment, Sunrise Wind 2022a), BOEM and NOAA adopted the marine mammal injury thresholds based on the dual criteria of L_{pk} and sound exposure level (SEL) recommended by NMFS (2018). Table 3.5.6-4 summarizes the agency-adopted acoustic thresholds for marine mammals, which are used to evaluate noise impacts to marine mammals from impulsive sounds from impact pile driving and non-impulsive sounds generated by vessel traffic. Potential effects were modeled over a range of potential construction schedules and include the results for the highest level of potential impacts among all the construction schedules in this document. The primary sources of underwater noise that could be generated by the Project during construction of the SRWF are discussed in the following text.

Table 3.5.6-4. Summary of Relevant PTS Onset Acoustic Thresholds for Marine Mammal Hearing Groups

Faunal Group	Impulsive Signals[1]		Non-Impulsive Signals
	Unweighted L_{pk} (dB re 1 µPa)	Frequency-weighted $L_{E,24h}$ (dB re 1 µPa^2·s)	Frequency-weighted $L_{E,24h}$ (dB re 1 µPa^2·s)
Low Frequency Cetaceans	219	183	199
Mid Frequency Cetaceans	230	185	198
High Frequency Cetaceans	202	155	173
Phocid Pinnipeds in Water	218	185	201

Notes:

µPa = micropascal; µPa^2 s = micropascal squared second; dB = decibel(s); $L_{E,24hr}$ = decibel re 1 micropascal squared second cumulative sound exposure level; L_{pk} = peak sound pressure level; m = meter

Source: NMFS 2018; included in COP, Appendix I1 (Underwater Acoustic Assessment; Sunrise Wind 2022a)

[1] Dual-metric acoustic thresholds for impulsive sounds: The largest isopleth result of the two criteria is used for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds have also been considered.

The primary sources of underwater noise that could be generated by the Project during construction of the SRWF are discussed below.

3.5.6.5.1.2.1 Impulsive Sound – Geophysical Surveys

Short-term, localized G&G surveys during the construction period may include the use of multi-beam echosounders, side-scan sonars, shallow penetration sub-bottom profilers, medium penetration sub-bottom profilers, and marine magnetometers. The survey equipment to be employed would be equivalent to the equipment utilized during the G&G survey campaigns associated with Lease Area OCS-A 0500 conducted in 2016, 2017, 2018, 2019, and 2020 and with Lease Area OCS-A 0487 conducted in 2018, 2019, and 2020 (Gardline 2021a; 2021b; Smultea Sciences 2020a; 2020b). Site-specific verification was conducted of all geophysical equipment sound sources deployed within the marine portions of the proposed Project Area that operate within the functional hearing range of marine mammals. Without mitigation, certain types of G&G surveys could result in long-term, high-intensity impacts on marine mammals. These effects may include behavioral avoidance of the ensonified area and increased stress; short-term loss of hearing sensitivity; and permanent auditory injury depending on the type of sound source, distance from the source, and duration of exposure.

However, G&G noise resulting from offshore wind site characterization surveys is of less intensity than the acoustic energy characterized by seismic air guns and affects a much smaller area than G&G noise from seismic air gun surveys typically associated with oil and gas exploration. Although seismic air guns are not used for offshore wind site characterization surveys, sub-bottom profiler technologies that are hull-mounted on survey vessels may incidentally harass marine mammals and would be required to follow mitigation and monitoring measures. Typically, mitigation and monitoring measures are required by BOEM through requirements of lease stipulations and required by ITAs from NOAA Fisheries pursuant to Section 101(a)(5) of the MMPA. Mitigation and monitoring measures would lower the stock-level effects of the take of any marine mammals to negligible levels, as required by the MMPA, including potential for adverse behavioral responses and auditory injury (PTS/TTS). Similarly, the requirement to comply with avoidance and minimization measures for these surveys would avoid any effects on individuals that could result in population-level effects to threatened and endangered populations listed under the ESA. These measures include ramp up procedures, PSOs, passive acoustic monitoring, pre-clearance monitoring, and the establishment of exclusion zones in which sound sources would be shut down when marine mammals are present (Appendix H). Pre-clearance and shutdown zones are 1,640.4 ft (500 m) for North Atlantic right whale, and 328 ft (100 m) for the following species: fin whale, minke whale, sei whale, humpback whale, blue whale, sperm whale, Risso's dolphin, long and short-finned pilot whales, harbor porpoise, gray seal, and harbor seal.

3.5.6.5.1.2.2 Impulsive Sound - MEC/UXO Clearance Activities

As detailed in the COP, Section 3.3.3.4 (Sunrise Wind 2022b), prior to seafloor preparation, cable routing, and micro siting of all assets, the Project would implement a MEC/UXO Risk Assessment with Risk Assessment with Risk Mitigation Strategy (RARMS) designed to evaluate and reduce risk in accordance with the as low as reasonably practicable (ALARP) risk mitigation principle. The RARMS consists of a phased process beginning with a Desktop Study and Risk Assessment that identifies potential sources of MEC/UXO hazard based on charted MEC/UXO locations and historical activities, assesses the baseline (pre-mitigation) risk that MEC/UXO pose to the Project, and recommends a strategy to mitigate that risk to ALARP. COP, Appendix G2 (Sunrise Wind 2021c) presents this study and strategies.

Avoidance is the preferred approach for MEC/UXO mitigation; however, it is anticipated that there may be instances where confirmed MEC/UXO avoidance is not possible due to layout restrictions, presence of archaeological resources, or other factors that preclude micro siting. In such situations, confirmed MEC/UXO may be removed through in-situ disposal or physical relocation. Selection of a removal method would depend on the location, size, and condition of the confirmed MEC/UXO and would be made in consultation with a MEC/UXO specialist and in coordination with the appropriate agencies.

In situ disposal would be performed with low noise methods like deflagration of the MEC/UXO or cutting the MEC/UXO up to extract the explosive components. The MEC/UXO may be relocated through a "Lift and Shift" operation; the relocation would be to another suitable location on the seabed within the APE or previous designated disposal areas for either wet storage or disposal through low noise methods as described for in situ disposal. For all MEC/UXO clearance, mitigation measures include the use of noise attenuation to achieve a 10 dB reduction in sound levels, PSOs, passive acoustic monitoring, pre-survey clearance monitoring, and the establishment of exclusion zones in which sound sources would be shut down when marine mammals are present (Appendix H). Pre-clearance zones would be monitored for 60 minutes prior to blasting, with clearance zones detailed in Table 3.5.6-5.

Table 3.5.6-5. Mitigation and Monitoring Zones Associated with Unmitigated UXO Detonation of Binned Charge Weights

Species	UXO Charge Weight[1]				
	E4 (2.3 kg)	E6 (9.1 kg)	E8 (45.5 kg)	E10 (227 kg)	E12 (454 kg)
	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone[2] (m)
Low-Frequency Cetaceans	400	800	1,600	3,000	3,700
Mid-Frequency Cetaceans	50	50	100	400	500
High-Frequency Cetaceans	1,800	2,600	3,900	5,400	6,200
Phocid Pinnipeds	100	250	600	1,100	1,500

Source: Adapted from the draft PSMMP dated April 2022 (Sunrise Wind 2022d)

Notes:

kg = kilograms; m = meters; PK = peak pressure level; SEL = sound exposure level.

[1] UXO charge weights are groups of similar munitions defined by the U.S. Navy and binned into five categories (E4-E12) by weight (equivalent weight in TNT). Four project sites (S1-S4) were chosen and modeled (see Hannay and Zykov (2022) for the detonation of each charge weight bin).

[2] Pre-start clearance zones were calculated by selecting the largest Level A threshold (the larger of either the PK or SEL noise metric) for marine mammals and the largest distance to the Permanent Threshold Shift (PTS) threshold for sea turtles. Auditory injury thresholds (PTS PK or SEL noise metrics) were larger than modeled distances to mortality and non-auditory injury criteria. The chosen values were the most conservative per charge weight bin across each of the four modeled sites.

While mitigation and monitoring efforts are likely to reduce the potential for take, modeling was conducted to estimate the maximum number of individuals that may be exposed to effects for UXO/MEC detonations. The results model the worst-case scenario of up to three unmitigated detonations of the largest explosive category. Full details of the modeling and analysis can be found in the Sunrise Wind Petition for Incidental Take (Sunrise Wind 2022b).

Table 3.5.6-6. Estimated Number of Animals That May Experience PTS and Behavioral Disturbance from up to Three UXO/MEC Detonations in SRWF without Attenuation

Species	Level A Density-based Take Estimate	Level B Density-based Take Estimate	PSO Data Take Estimate	Mean Group Size	Highest Level B Take
Blue Whale*	0.0	0.0	-	1.0	1
Fin Whale*	2.4	12.2	0.7	1.8	13
Humpback Whale	2.9	14.7	2.2	2.0	15
Minke Whale	1.6	8.0	0.5	1.2	8
North Atlantic Right Whale*	2.0	10.3	0.1	2.4	11
Sei Whale*	0.2	0.9	0.0	1.6	2
Atlantic Spotted Dolphin	0.0	0.3	-	29.0	29
Atlantic White-Sided Dolphin	1.3	19.6	0.3	27.9	28
Bottlenose Dolphin	0.5	8.2	3.2	7.8	9
Common Dolphin	5.3	82.5	89.3	34.9	90
Harbor Porpoise	52.0	178.6	0.1	2.7	179

Species	Level A Density-based Take Estimate	Level B Density-based Take Estimate	PSO Data Take Estimate	Mean Group Size	Highest Level B Take
Pilot Whales	0.2	2.8	-	8.4	9
Risso's Dolphin	0.0	0.1	0.2	5.4	6
Sperm Whale*	0.0	0.1	-	1.5	2
Gray Seal	2.0	17.5	0.2	0.4	18
Harbor Seal	4.6	39.4	0.3	1.0	40

Source: Sunrise Wind Petition for Incidental Take (Sunrise Wind 2022b)

* ESA listed mammals

During Project construction, the likelihood of MEC/UXO encounter is very low. Sunrise Wind would work with BOEM to identify appropriate response actions, which may include developing an emergency response plan, conducting MEC/UXO-specific safety briefings, retaining an on-call MEC/UXO consultant, or other measures. Because the potential for effects from MEC/UXO clearance is extremely unlikely, but if required could result in injury of a low numbers of individuals, the effects would be negligible to minor and short-term.

3.5.6.5.1.2.3 Impulsive Sound - Impact Pile-Driving

Underwater noise generated by impact pile-driving is considered one of the predominant IPFs that could result in potential physiological and behavioral impacts on marine mammals due to the relatively high source levels produced by impact pile-driving and the large distances over which the noise is predicted to propagate. Up to 94 WTG foundations and 1 OCS-DC foundation with 4 legs would be installed. The typical SRWF WTG foundation pile installation would require approximately 1 to 4 hours of impact pile-driving to a final embedment depth of 164 ft (50 m) below the seafloor, with some difficult installations potentially taking up to 12 hours to install due to more difficult substrate conditions. After installation, the WTG would be placed on top of the foundation pile and the vessels would be repositioned to the next site. Between 1 and 3 WTG monopile foundations may be installed per day. For the OCS-DC foundation, the jacket foundation would be placed first, with the pin pile placed through the jacket and driven to its penetration depth (295 ft [90 m]). Pile-driving of each pin pile may take up to 48 hours. Because separate vessels are anticipated to be used for WTG and OCS-DC foundation installations, these activities may occur concurrently.

Potential noise effects on marine mammals are evaluated based on the intensity of the noise source, distance from the source, the duration of sound exposure, and species-specific sound sensitivity. Underwater noise impacts on marine mammals were evaluated using behavioral and injury-level thresholds for different marine mammal species groups developed by (NMFS (National Marine Fisheries Service) 2018). Specific injury thresholds are defined for different marine mammal species groups based on hearing sensitivity. Dual injury criteria have been defined for each group for instantaneous exposure to a single pile strike, and cumulative exposure to multiple pile strikes or extended non-impulsive sources like vibratory pile-driving or vessel noise over a 24-hour period (NMFS (National Marine Fisheries Service) 2018). NMFS behavioral thresholds are based on noise levels known to alter behavior and/or interfere with communication. These thresholds by species group for impulsive and non-impulsive noise are summarized in Table 3.5.6-7 and Table 3.5.6-8.

As part of the COP, Appendix I1 (Underwater Acoustic Assessment) (Sunrise Wind 2022a), impacts to marine mammals, sea turtles, and fish were assessed. The acoustic propagation model predicts sound fields for a 24-hour period, or a specific scenario, which includes consideration of the hammer energies required to drive the pile from start to finish, as well as the silent periods between two consecutive piles (if applicable in the impact pile driving scenario), and any proposed noise mitigation measures. Within this assessment, the JASCO Animal Simulation Model Including Noise Exposure (JASMINE) was utilized to predict the probability of exposure of animals to sound arising from pile driving operations during construction activities. Simulated animals (animats) were used to sample predicted three-dimensional sound fields derived from animal movement observations. Predicted sound fields were sampled so that animats were programmed to behave like marine species are expected to behave, including modeled responses to elevated sound levels. The output provided an exposure history for each animat included within the simulation. Both L_{PK} and SEL injury isopleths were calculated for each species based on corresponding acoustic criteria.

COP, Appendix I1 (Sunrise Wind 2022a), additionally modeled sound propagation distances based on expected construction scenarios associated with the PDE such as hammer type, pile type, pile schedule (hammer energy, number of strikes, piling duration), season, geographic location, and implementation of noise mitigation (i.e., sound attenuation) measures. The acoustic ranges to the SEL physiological threshold assume an animal is stationary within the propagated sound field and therefore the animal accumulates noise levels for the full 24-hour period. When realistic animal behavior and movement are considered, the predicted risk of exposure to accumulated noise levels with the potential to cause a physiological impact is lower. As evidenced by the variable monthly densities of marine mammals in the SRWF, seasonality is also an important parameter when estimating exposures and impacts from potential sources of underwater noise.

Project mitigation measures include an in-water construction window of May 1 to December 31 to minimize potential noise impacts on North Atlantic right whales. No pile driving would occur at the SRWF and OCS-DC facility outside of the construction window. This would effectively reduce the potential for North Atlantic right whale exposure to pile-driving noise; however, other marine mammal species may be present in the vicinity during this construction window and could be exposed to behavioral and injury-level noise effects. In addition, underwater noise could indirectly affect marine mammals by killing, injuring, or altering the behavior of fish prey species. As described in Appendix H, additional protection measures include noise attenuation technologies, soft starts for pile driving, timing restrictions, the use of trained 6 to 8 PSOs for monopile installation, exclusion and monitoring zones, passive acoustic monitoring systems, reduced visibility monitoring tools, adaptive vessel speed reductions, and utilization of software to share visual and acoustic detection data between platforms in real time. PSOs would perform pre-clearance monitoring of the area surrounding the construction site for 60 minutes prior to beginning pile driving. PSOs would also enforce shutdown zones when marine mammals are observed within the shutdown zones. Pile driving would not resume until individuals leave the shutdown zone of their own volition, and no animals are observed within the shutdown zone for at least 30 minutes. Pre-clearance monitoring and shutdown zones are detailed in Table 3.5.6-7 and Table 3.5.6-8. NOAA and BOEM are likely to require additional mitigation measures to reduce the likelihood of harmful noise exposure. The Project permitting would require similar and additional impact avoidance and minimization measures to limit the potential for adverse effects on marine mammals (Refer to Appendix H).

Table 3.5.6-7. Mitigation and Monitoring Zones[1,2] during Impact Pile-Driving for Summer and Winter with 10-dB Broadband Sound Attenuation

Species	Summer (May through November) Pre-Start Clearance and Shutdown Zone (m)[1,2]	Winter (December only) Pre-Start Clearance Zone and Shutdown Zone (m)[4,5]
North Atlantic right whale	At any distance	At any distance
Large whale	3,700	4,300
Delphinids	NAS perimeter	NAS perimeter
Harbor porpoise	NAS perimeter	NAS perimeter
Seals	100	100

Source: (adapted from the draft PSMMP dated April 2022 (Sunrise Wind 2022d))

Notes:

The shutdown zones for large whales (including North Atlantic right whale), porpoise, and seals are based upon the maximum Level A zone for each group.

1 Zones are based upon the following modeling assumptions:

- 8/11-m (tapered) monopile with 10 dB broadband sound attenuation.
- Either one or two monopiles driven per day, and either two or three pin piles driven per day. When modeled injury (Level A) threshold distances differed among these scenarios, the largest for each species group was chosen for conservatism.

2 Zone monitoring would be achieved through a combined effort of passive acoustic monitoring and visual observation (but not to monitor vessel separation distance).

3 Zones are derived from modeling that considered animal movement and aversion parameters (see more details in Section 4.3.5).

4 The pre-start clearance zones for large whales, porpoise, and seals are based upon the maximum Level A zone for each group.

5 The shutdown zones for large whales (including North Atlantic right whale), porpoise, and seals are based upon the maximum Level A zone for each group.

6 No Level A exposures were calculated for blue whales resulting in no expected Level A exposure range; therefore, the exposure range for fin whales was used as a proxy due to similarities in species.

Table 3.5.6-8. North Atlantic Right Whale Clearance and Real-Time PAM Monitoring Zones[1] during Impact Piling in Summer and Winter

Season	Minimum Visibility Zone[2]	PAM Clearance Zone (m)[3]	Visual Clearance Delay or Shutdown Zone (m)	PAM Shutdown Zone (m)	PAM Monitoring Zone (km)
Summer WTG	3,700	6,500	Any Distance	3,700	10
Winter WTG	4,300	7,004	Any Distance	4,300	10
Summer OCS-DC	5,600	6,500	Any Distance	5,600	10
Winter OCS-DC	6,500	6,700	Any Distance	6,500	10

Source: Adapted from the draft PSMMP dated April 2022 (Sunrise Wind 2022)

Notes:

1 Sunrise Wind may request modification to zones based on results of sound field verification

2 The minimum visibility zones for North Atlantic right whales are based upon the maximum Level A zones for the whale group.

3 The PAM pre-start clearance zone was set equal to the Level B zone to avoid any unnecessary take.

Each potential effect from impact pile driving has a range (isopleth) at which that impact may occur. Potential impacts, ordered in increasing likelihood, include single strike injury, PTS, TTS, and behavioral impacts. The ranges where a single strike injury, cumulative SEL injury, and behavioral impacts may occur are described in Table 3.5.6-9. Full details and results of all scenarios are provided in the COP, Appendix I1 (Sunrise Wind 2022a).

Table 3.5.6-9. Summary Table of Maximum Anticipated Exposure Ranges (ER95%) in km to Injury and Behavioral Effects from Impact Pile Driving Associated with Monopile and OCS-DC Foundation Installation across All Installation Scenarios Assuming a Minimum of 10 dB of Attenuation

Species		Injury		Behavior	
		SEL	L_{pk}	L_{rms}[1]	L_{rms}[2]
LF	Fin whale[3]	5.55	<0.01	6.23	6.24
	Minke whale (migrating)	2.88	<0.01	5.71	24.87
	Humpback whale	5.13	<0.01	6.23	6.24
	North Atlantic right whale[3]	3.62	<0.01	5.75	5.77
	Sei whale[3] (migrating)	4.22	<0.01	6.10	26.13
MF	Atlantic white-sided dolphin	0	0	5.52	2.76
	Atlantic spotted dolphin	0	0	6.70	2.23
	Short-beaked common dolphin	0	0	5.64	2.85
	Bottlenose dolphin, offshore	0	0	4.94	2.58
	Risso's dolphin	0	0	5.83	2.86
	Long-finned pilot whale	0	0	5.69	2.82
	Short-finned pilot whale	0	0	5.74	2.80
	Sperm whale[3]	0	0	5.95	2.84
HF	Harbor porpoise	0.81	0.25	5.83	43.29
PW	Gray seal	1.72	0	6.61	4.84
	Harbor seal	0.75	<0.01	5.96	4.32
	Fin whale[3]	5.55	<0.01	6.23	6.24

Source: Sunrise Wind 2022. Maximum values are from Tables 4.5-2 through 4.5-6 in COP, Appendix I1 (Sunrise Wind 2022a):

Notes:

[1] Unweighted thresholds (NMFS 2005).

[2] Frequency weighted thresholds (Wood 2012).

[3] Listed as Endangered under the ESA.

Sunrise Wind (2022a) estimated the number of individual marine mammals that could experience PTS (i.e., permanent hearing injury) and TTS (temporary loss of hearing sensitivity) or other short-term physiological and behavioral effects from exposure to construction-related underwater noise (Table 3.5.6-10). Sunrise Winds model considered proposed construction timing restrictions, the overall duration of monopile installation, and monthly species occurrence and density within and around the noise impact area. The impact scenarios assumed the installation of two to four pine piles and one to four monopiles per day, with a range of pile driving day of 26 to 51 pile driving days, and use of a noise attenuation systems to achieve a minimum of 10 dB of source reduction. PTS or TTS injury could occur in up to 2.59 percent of affected populations, while up to 5.19 percent of affected populations could experience behavioral impacts (Table 3.5.6-11); however, most populations experience much lower impacts.

Table 3.5.6-10. Maximum Mean Number of Marine Mammals from All Scenarios Predicted to Receive Sound Levels above Exposure Criteria with 10-dB Attenuation

Species		Injury		Behavior	
		SEL	L_{pk}	L_{rms}[1]	L_{rms}[2]
LF	Fin whale[3]	13.18	0.06	27.19	32.26
	Minke whale (migrating)	15.02	0.02	41.91	150.19
	Humpback whale	9.91	0.02	19.72	20.13
	North Atlantic right whale[3]	9.53	0.01	24.84	24.82
	Sei whale[3] (migrating)	0.98	<0.01	2.58	13.66
MF	Atlantic white sided dolphin	0.00	0.00	1195.27	459.53
	Atlantic spotted dolphin	0.00	0.00	7.99	3.68
	Short-beaked common dolphin	0.00	0.00	6136.16	2450.03
	Bottlenose dolphin, offshore	0.00	0.00	909.27	368.54
	Risso's dolphin	0.00	0.00	11.21	4.75
	Long-finned pilot whale	0.00	0.00	75.53	29.01
	Short-finned pilot whale	0.00	0.00	51.92	19.92
	Sperm whale[3]	0.00	0.00	3.52	1.36
HF	Harbor porpoise	2.57	6.66	402.53	3870.23
PW	Gray seal	4.24	0.00	962.81	917.04
	Harbor seal	6.86	2.98	1183.08	996.11
	Harp seal	6.66	0.06	1170.10	1075.91

Source: Sunrise Wind 2022a. Construction schedule assumptions are summarized in Section 1.2.3, COP, Appendix I1 (Sunrise Wind 2022a). Maximum values are from Tables 4.4-1 through 4.4-5.

Notes:

[1] Unweighted thresholds (NMFS 2005).

[2] Frequency weighted thresholds (Wood 2012).

[3] Listed as Endangered under the ESA.

Table 3.5.6-11. Modeled (E 95%) Maximum Estimated Marine Mammal Exposures from All Scenarios as a Percentage of Abundance with 10-dB Sound Attenuation

Species		Injury		Behavior	
		SEL_{cum}	L_{pk}	L_p[1]	L_p[2]
LF	Fin whale[3]	0.19	<0.01	0.40	0.47
	Minke whale (migrating)	0.07	<0.01	0.19	0.68
	Humpback whale	0.71	<0.01	1.41	1.44
	North Atlantic right whale[3]	2.59	<0.01	6.75	6.74
	Sei whale[3] (migrating)	0.02	<0.01	0.04	0.22
MF	Atlantic white sided dolphin	0	0	1.28	0.49
	Atlantic spotted dolphin	0	0	0.02	0.00
	Short-beaked common dolphin	0	0	3.55	1.42
	Bottlenose dolphin, offshore	0	0	1.45	0.59
	Risso's dolphin	0	0	0.03	0.01
	Long-finned pilot whale	0	0	0.19	0.07
	Short-finned pilot whale	0	0	0.18	0.07
	Sperm whale[3]	0	0	0.08	0.03
HF	Harbor porpoise	<0.01	<0.01	0.42	4.05
PW	Gray seal	0.01	0	3.53	3.36
	Harbor seal	<0.01	<0.01	1.93	1.62
	Harp seal	<0.01	0	0.02	0.01

Source: Sunrise Wind 2022a. Construction schedule assumptions are summarized in Section 1.2.3, COP, Appendix I1 (Sunrise Wind 2022a). Maximum values are from Tables 4.4-7 through 4.4-11.

Notes:

[1] Unweighted thresholds (NMFS 2005).

[2] Frequency weighted thresholds (Wood 2012).

[3] Listed as Endangered under the ESA.

Overall, the use of protection measures would reduce the likelihood of injury-level noise exposure to marine mammals. These measures would effectively avoid and minimize harmful noise exposure in most cases; however, the effect areas for PTS impacts to low-frequency cetaceans, auditory masking, and behavioral impacts to all marine mammal species are large enough that the potential for exposure cannot be ruled out. Some individual marine mammals, most likely belonging to the low-frequency cetacean group, could suffer permanent hearing injuries. Depending upon the severity of the injury, affected individuals may be less able to communicate, feed effectively, or identify predators. This could adversely affect the long-term survival and fitness of multiple individuals within a species. Masking and behavioral effects may include decreased ability to communicate, find food, or identify predators;

increased physiological stress; interruption of feeding; and avoidance of desirable habitats and interruption of feeding. These physiological and behavioral effects are likely to dissipate within hours to days after the exposure ceases (NMFS 2020; Pyć et al. 2018). The potential for injury, PTS, TTS, and repeated intermittent behavioral disturbances would create short-term, moderate impacts to marine mammals from the proposed Project.

Impact pile-driving noise could kill or injure or temporarily alter the distribution of fish and invertebrate prey (Refer to Section 3.5.2 *Benthic Habitat*, and Section 3.5.5 *Finfish, Invertebrates, and Essential Fish Habitat*) leading to indirect effects on marine mammal prey resources. These effects are limited in extent, short-term, and are unlikely to measurably affect the amount of prey available to marine mammals across the OCS. Therefore, the indirect adverse effects of underwater noise on marine mammal prey species would be negligible.

3.5.6.5.1.2.4 Non-Impulsive Noise – Vibratory Pile-Driving

Although vibratory pile-driving noise can cause behavioral effects at greater distances compared to impact pile-driving noise, the overall sound levels are less intense and less likely to cause injury. Low-frequency cetaceans would have to remain within 16 ft (4.9 m) over an entire day of vibratory pile driving during temporary cofferdam installation to experience permanent hearing injury, while high-frequency cetaceans would need to remain within less than 591 ft (180.1 m) from the cofferdam installation for an entire workday to experience hearing injury. Phocid pinnipeds would need to remain closer than 34 ft (10.4 m) from cofferdam installation to experience hearing injury. It is unlikely that highly mobile species like whales and seals would remain so close to a source of behavioral disturbance for an entire construction day, meaning that the likelihood of permanent hearing injury is low. Sunrise Wind (2022c) evaluated potential marine mammal exposure to 8-hour periods of vibratory pile driving occurring between October 1 and May 31 and concluded that cofferdam installation would not result in PTS effects on any of the 11 marine mammal species likely to occur in this noise exposure area. In contrast, depending on the month in which the activity occurs, 8 to 11 of these species could experience TTS or behavioral exposures.

Table 3.5.6-12. Ranges to Level A Harassment from Cumulative Sound Exposure Levels (SEL) and Level B Harassment from Vibratory Pile-Driving for Marine Mammal Hearing Groups. Results Are Maximum Modeled Distances Vibratory Installation of Metal Sheet Piles for Cofferdam Installation at the Export Cable Landfall Site

Hearing Group	Level A SEL Threshold[1] (dB re 1 µPa²s)	Level A Distance (m)	Level B SPL Threshold: 120 dB re 1 µPa Distance (m)
Low-frequency cetaceans (Baleen whales)	199	5	9,740
Mid-frequency cetaceans (Dolphins & other toothed whales)	198	0	9,740
High-frequency cetaceans (Porpoises)	173	210	9,740
Phocid pinnipeds (Seals)	201	10	9,740

Source: COP, Appendix I1, Sunrise Wind 2022a.

[1] Threshold of accumulated sound energy based on weighted exposure values that may result in PTS (permanent hearing injury) from NMFS 2018.

Monitoring and mitigation for vibratory pile installation includes the use of two PSOs, pre-clearance and shutdown zones, and ramp up procedures during days with decrease visibility of the shutdown zone. The pre-clearance and shutdown zone would be 492.1 ft (150 m) for all cetaceans. The PSO would halt pile driving if an individual enters the shutdown zone, and pile driving would not resume until the individual has left the shutdown zone and no animals have been observed for at least 15 minutes (dolphins, porpoises, and seals) or 30 minutes (whales). Appendix H describes the monitoring and mitigation for vibratory pile driving in further detail.

Behavioral effects for all marine mammals may extend 31,955.4 ft (9,740 m) based on NMFS unweighted threshold of 120 dB re 1 µPa²s. These effects would be short-term and intermittent and would result in short-term changes to behavior that may include avoidance, reduced communication, increased volume of vocalizations, and suspension of foraging activities. Based on the duration of these potential impacts, it is not expected that any population level effects would occur to marine mammals from vibratory pile driving actions.

Because vibratory pile-driving impacts would occur on a limited number of days and have a small area of potential auditory injury that would be monitored by protected species observers with shutdown zones, vibratory pile-driving noise from construction of the Proposed Action would result in minor, short-term impacts on marine mammals.

3.5.6.5.1.2.5 Non-Impulsive Noise –Vessels

Denes et al. (2020) modeled the distance required for construction vessel noise to drop below marine mammal behavioral thresholds. They determined that marine mammals would have to remain within 115 to 367 ft (35 to 112 m) of a stationary vessel using its dynamic positioning thrusters for 24 hours to experience cumulative injury. Construction vessel noise would exceed marine mammal behavioral thresholds over a larger area, extending from 42,362 to 48,077 ft (12,911 to 14,654 m) from the source.

The likelihood of any marine mammal species remaining close enough to a construction vessel for long enough to experience hearing injury is remote because marine mammals are mobile and unlikely to stay so close to noise exceeding behavioral thresholds for extended periods. Vessels underway produce lower noise levels and are moving, so the likelihood of injury level exposure for any marine mammal species is similarly remote.

Although construction vessels can produce noise levels sufficient to cause behavioral effects in marine mammals, BOEM anticipate that significant impacts affecting many individuals are unlikely given the patchy distribution of species in the direct effects area. In addition, a substantial portion of construction vessel activity would occur in an area having high levels of existing levels of vessel traffic. Construction vessel noise would be similar to baseline noise levels produced by existing large vessel traffic in the vicinity. BOEM concludes that although some individual marine mammals may experience short-term behavioral effects from vessel noise exposure, the limited nature of these effects and number of individuals affected would not be significant at stock or population levels. On this basis, the effects of vessel noise on marine mammals would be short-term and minor.

3.5.6.5.1.2.6 Non-Impulsive Noise – Aircraft

Additional sources of non-impulsive noise associated with construction of the Proposed Action include aircraft noise. Fixed-wing aircraft may be used during construction for marine mammal monitoring, and helicopters may be used for crew transport to and from construction vessels. Monitoring aircraft would operate at an altitude of 1,000 ft (300 m) consistent with established guidance. Aircraft operations at these altitudes have not been associated with observable behavioral effects on marine mammals (Patenaude et al. 2002). Noise from crew transport helicopters would increase during approach and departure from vessel landing pads but would not be expected to exceed disturbance thresholds or add significantly to behavioral disturbance caused by the presence of the vessels. For this reason, the effects of noise from aircraft operations on marine mammals would be negligible. Additional details on aircraft helicopter operations are provided in Appendix I3 of the COP (Sunrise Wind 2021f).

EMF: Because EMFs are generated by power production when WTGs are operating, no effects from the IPF are expected during construction of the offshore facilities.

Accidental releases – contaminants: Accidental discharges and releases represent a risk factor to marine mammals because marine mammals could potentially ingest, inhale, or have their fur or baleen fouled by contaminants. Marine mammal exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality or sublethal effects on the individual fitness, including adrenal effects, hematological effects, liver effects, lung disease, poor body condition, skin lesions, and several other health affects attributed to oil exposure (Mohr et al. 2008; Sullivan et al. 2019; Takeshita et al. 2017).

Project-related marine vessels operating during construction would be required to comply with regulatory requirements for management of onboard fluids and fuels including prevention and control of discharges. Trained, licensed vessel operators would adhere to navigational rules and regulations, and vessels would be equipped with spill containment and cleanup materials. Additionally, Sunrise Wind would comply with applicable international (IMO MARPOL), federal (USCG), and state (NY) regulations and standards for reporting treatment and disposal of solid and liquid wastes generated during all phases of the proposed Project. As described in COP, Appendix E-1 (Sunrise Wind 2021a), some liquid wastes would be permitted as discharge into marine waters (i.e., domestic water, deck drainage, treated sump drainage, uncontaminated ballast water, and uncontaminated bilge water); these are not expected to pose an adverse impact to marine resources as they would quickly disperse, dilute, and biodegrade (BOEM 2013).

All vessels would similarly comply with USCG standards regarding ballast and bilge water management. Liquid wastes from vessels (including sewage, chemicals, solvents, and oils and greases from equipment) would be properly stored, and disposal would occur at a licensed receiving facility. As required by 30 CFR 585.626, chemicals to be utilized during the Project are provided in COP, Appendix E-1 (Sunrise Wind 2021a). Any unanticipated discharges or releases are expected to result in minimal, short-term impacts; activities are heavily regulated, and unpermitted discharges are considered accidental events that are unlikely to occur. In the unlikely event that a reportable spill was to occur, the National Response Center would be notified, followed by the EPA, BOEM, and USCG, as outlined in COP, Appendix E-1 (Sunrise Wind 2021a). Because of the restrictions and mitigation measures designed to prevent spills and discharges, and the implementation of spill response plans, the risk to marine mammals from discharges and releases is negligible.

Accidental releases – trash and debris: Construction vessels pose a theoretical source of marine debris and accidental discharges of petroleum products and other toxic substances. Marine debris are a known source of adverse effects to marine mammals (Laist 1997; NOAA-MDP 2014a; 2014b). BOEM prohibits the discharge or disposal of solid debris into offshore waters during any activity associated with the construction and operation of offshore energy facilities (30 CFR 250.300). The USCG similarly prohibits the dumping of trash or debris capable of posing entanglement or ingestion risk (MARPOL, Annex V, Public Law 100−220 (101 Stat. 1458)). The Project would comply with these requirements. Given these restrictions, the risk to marine mammals from trash and debris from the Project is negligible.

Traffic: Construction vessels pose a potential collision risk and generate disturbance and artificial light. Long (2017) observed that marine mammals were temporarily displaced by offshore energy facility construction vessels. Based on information provided by Sunrise Wind, Project construction would require an estimated total of 50 vessel trips between the Port of New London, Connecticut, and the SRWF over the 2-year construction period, with an estimated maximum of six trips in any given month from U.S. ports outside of the RI-MA WEAs. Port traffic within the RI-MA WEAs would add an additional 127 one-way trips during WTG installation and 146 one-way trips during cable installation to the SRWF. Depending on the contractor selected, up to eight construction vessels could travel to the Lease Area from unspecified ports in Europe or elsewhere in the world. The construction vessels used for Project construction are described in Section 3.3.10 and Table 3.3.10-3 of the COP (Sunrise Wind 2022b). Typical large construction vessels used in this type of project range from 325 to 350 ft (99 to 107 m) in length, 60 to 100 ft (18 to 30 m) in beam, and draft from 16 to 20 ft (5 to 6 m) (Denes et al. 2020).

NMFS (2020) evaluated marine mammal collision risk for the similarly sized Vineyard Wind project. They concluded that the collision risk was negligible because of the nature of construction and planned mitigation measures which include vessel strike avoidance measures. Specifically, construction vessels either remain stationary when installing the monopiles and WTG/OSS equipment or move slowly (i.e., at less than 10 knots) when travelling between foundation locations. Cable laying vessels move very slowly on the order of 1 mile per day.

The Proposed Action includes mitigation and monitoring requirements that are fully detailed in Appendix H. Vessels related to project planning, construction, and operation shall travel at speeds in accordance with NOAA requirements or the agreed to adaptive management plan per to Project PSMMP (Sunrise Wind 2022d) when assemblages of cetaceans are observed. Vessels would also maintain a reasonable distance from whales and small cetaceans, as determined through site-specific consultations. Project-related vessels would be required to adhere to NMFS Regional Viewing Guidelines for vessel strike avoidance measures during construction and operation to minimize the risk of vessel collision with marine mammals. Operators shall be required to undergo training on applicable vessel guidelines, the identification of protected species, and observation skills. Vessel operators would monitor NMFS North Atlantic right whale reporting systems (e.g., the Early Warning System, Sighting Advisory System) (daily) for the presence of North Atlantic right whale during planning, construction, and operations within or adjacent to SMAs and/or DMAs. Within the SMAs and/or DMAs, vessel operators would implement the adaptive vessel speed plan in accordance with the PSMMP based on observations of North Atlantic right whale.

Planned mitigation measures, including voluntary speed restrictions and vessel operator training, would effectively limit collision risk when travelling to and from area ports. The Proposed Action would involve a similar number of vessels and vessel trips and would employ a similar suite of mitigation measures to those proposed for the Vineyard Wind project analyzed by NMFS. On this basis, BOEM concludes that collision-related effects on marine mammal species from the proposed Project are negligible.

Gear utilization: The Fisheries and Benthic Research Monitoring Plan (FMP) for the Proposed Action has been developed in accordance with recommendations set forth in *Guidelines for Providing Information on Fisheries for Renewable Energy Development on the Atlantic Outer Continental Shelf* (BOEM 2019b)(NMFS (National Marine Fisheries Service) 2016). The slow speed of mobile gear and the short tow times further reduce the potential for entanglements or other interactions for all mammals. Observations during mobile gear use have shown that entanglement or capture of large whale species is extremely rare and unlikely (NMFS (National Marine Fisheries Service) 2016). Although the trawl methods analyzed in commercial fisheries are comparable to the fishery monitoring methods proposed, the proposed trawl effort and tow times (20 minutes) for the proposed fisheries monitoring surveys are less than that previously considered by NMFS for commercial trawling activities. Consequently, the likelihood of interactions with listed species of marine mammals is lower than commercial fishing activities. The eDNA sampling surveys would be conducted coincidentally with the trawl surveys and subject to the same mitigation measures. Based on the above analysis, the likelihood of any potential impacts to is extremely unlikely to occur and the potential for impacts to marine mammals is **negligible**.

Structure Associated Fisheries Surveys

Chevron traps and baited remote underwater videos (BRUVs) have the potential to cause adverse impacts on marine mammals resulting from entanglement in lines and floats. The Final Environmental Impact Statement, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis for Amending the Atlantic Large Whale Take Reduction Plan (ALWTRP): Risk Reduction Rule (NOAA 2021) provides an analysis of data that shows entanglement in commercial fisheries gear represents the highest proportion of all documented serious and non-serious incidents reported for humpback, North Atlantic right, fin, and minke whales. Entanglement was the leading cause of serious injury and mortality for North Atlantic right, humpback, fin, and minke whales from 2010 to 2018 for cases where the cause of death could be identified (NOAA 2021).

The ALWTRP was last amended in 2021 and includes a combination of seasonal area closures and fishing gear modifications that are intended to reduce the risk of serious injury or mortality as a result of entanglement in commercial fishing gear. One required component of the ALWTRP has been the use of weak links for trap/pot fisheries in some areas (NOAA 2021). The requirements have been modified over time to include more areas and to lower breaking strengths (Borggaard et al. 2017). As discussed in the ALWTRP, it is believed that the weak links allow the buoy to break away and the rope to pull though the baleen if an entanglement occurs, although it is difficult to assess how well the weak link reduces serious injury and mortality (NOAA 2021). Another recommended risk reduction measure proposed is the use of weak rope or weak insertions. Based up Knowlton et al. (2016)), it is assumed that weak rope (engineered to break at 1,700 lb or less) would allow whales to break free from the ropes and avoid a life-threatening entanglement (NOAA 2021). Equipment used in the fisheries monitoring surveys would employ the use of both weak link and weak rope technologies that are consistent with the proposed changes in the ALWTRP. Additionally, traps and BRUVs would have limited soak times of <90 minutes and the vessel would remain on location during deployment. Lastly, neither traps nor BRUVs would be deployed if marine mammals are sighted near the proposed sampling station. Therefore, impacts to marine mammals are expected to be **negligible** based upon the limited number of associated buoy lines, the implementation of NOAA-required risk reduction measures, and that entanglement in gear would be extremely unlikely to occur.

Clam, Oceanographic, and Pelagic Fish Surveys

The equipment used in the clam, oceanography, and pelagic fish surveys pose minimal risk to marine mammals. Tows for the clam survey have a very short duration of 120 seconds, and the vessel is subject to mitigation measures similar to those for the trawl survey. Both the oceanographic and pelagic fish surveys are non-extractive and also subject to the mitigation measures as the structure-associated fish surveys. Based on the included mitigation measures and analysis contained in the trawl survey section above, the potential for impacts from the equipment used in clam, oceanography, and pelagic fish surveys on marine mammals is **negligible**.

Passive Acoustic Monitoring Surveys

The use of PAM buoys or autonomous PAM devices to monitor noise, marine mammals, passive acoustic telemetry tags, and the use of sound attenuation devices placed on the seafloor for mitigation during pile driving have been proposed by Sunrise Wind (Sunrise Wind 2022b).

Based on previous consultations, BOEM anticipates requiring that moored and autonomous PAM systems that may be used for monitoring would either be stationary (e.g., moored) or mobile (e.g., towed, autonomous surface vehicles [ASVs], or autonomous underwater vehicles [AUVs]), respectively. Moored PAM systems would use the best available technology to reduce any potential risks of entanglement. PAM system deployment would follow the same procedures as those described in the previous section to avoid and minimize impacts on ESA-listed species, as detailed in Appendices AA1 and AA2 of the COP (Sunrise Wind 2022c). The use of buoys for moored PAM systems, or any other intended purposes, would pose a negligible risk of entanglement to listed marine mammals.

Autonomous PAM systems could have hydrophone equipment attached that operates autonomously in a defined area. ASVs and AUVs in very shallow water can be operated remotely from a vessel or by line of sight from shore by an operator and in an unmanned mode. These autonomous systems are typically very small, lightweight vessels and travel at slow speeds. ASVs and AUVs produce virtually no self-generated noise and pose a negligible risk of injury to marine mammals from collisions due to their low mass, small size, and slow operational speeds. ASVs and AUVs are not expected to pose any reasonable risk of harm to listed species. Based on the above information, the potential impacts to marine mammals from passive acoustic monitoring is **negligible**.

Fisheries Survey Impacts to Prey

Fisheries surveys are designed not to have measurable impacts to surveyed resources and are not anticipated to have any measurable impact on prey availability for marine mammals. Tow durations for trawl surveys would be short (20 minutes) and would sample only extremely small portions of the action area. All trawl bycatch would be returned to the water whether alive or dead. Trap surveys may capture small numbers of prey resources for odontocetes and pinnipeds, but would not capture plankton, copepods, and small schooling fish that constitute capture prey items for mysticetes. Overall, the effects of fisheries surveys on potential prey resources would be so small that they cannot be meaningfully measured or evaluated and would have **negligible** impact to marine mammals.

Lighting: Artificial lighting during SRWF construction would be associated with navigational and deck lighting on vessels from dusk to dawn. It is likely that reaction of marine mammals to this artificial light is species-dependent and may include attraction or avoidance of an area. Artificial lighting may disrupt the diel migration of some prey species, which may secondarily influence marine mammal distribution patterns. Observations at offshore oil rigs showed dolphin species foraging near the surface and staying for longer periods of time around platforms that were lit (Cremer et al. 2009). Only a limited area around Project-related vessels would be lit, relative to the surrounding unlit open ocean areas, therefore impacts to marine mammals are negligible during construction.

Presence of structures: The potential impacts from the presence of structures created during the construction process are discussed below in the analysis for O&M.

3.5.6.5.2 Operations and Maintenance

3.5.6.5.2.1 Onshore Activities and Facilities

Operation and maintenance of onshore facilities is not expected to have any impacts to marine mammals.

3.5.6.5.2.2 Offshore Activities and Facilities

Seafloor disturbance: Seafloor disturbance during O&M would primarily result from vessel anchoring and jack-up and any maintenance activities that would require exposing and reburying the IAC. These activities are expected to be non-routine events and are not expected to occur with any regularity. It is likely that pelagic and mobile benthic prey species present near the SRWF during any maintenance activities would temporarily avoid the area in which activities are occurring, and zooplankton species may face localized, short-term displacement; however, any alterations to marine mammal prey distributions are expected to occur over a small scale and a short period. Therefore, the potential impacts to marine mammals from seafloor disturbance during O&M are negligible.

Sediment suspension and deposition: Any maintenance activities that would require exposing and reburying the IAC, and the use of vessel anchoring and jack-up may result in increases in sediment suspension and deposition, which may temporarily increase turbidity in the water column. These activities are expected to be non-routine events and are not expected to occur with any regularity. As discussed for the construction phase, sediment suspension and deposition could result in very short-term reductions in availability or detectability of marine mammal prey species and would have negligible impacts on prey species targeted for consumption by marine mammals in the SRWF and the overall foraging success of marine mammals.

Noise: Direct impacts to marine mammals associated with noise during O&M of the SRWEC may result from G&G surveys, WTG operation, support vessel and aircraft noise during routine and non-routine maintenance trips.

Impulsive Sound – Geophysical Surveys

Short-term, localized G&G surveys during the O&M period may include the use of multi-beam echosounders, side-scan sonars, shallow penetration sub-bottom profilers, medium penetration sub-bottom profilers, and marine magnetometers. The survey equipment to be employed would be equivalent to the equipment utilized during the G&G survey campaigns associated with Lease Area OCS-A 0500 conducted in 2016, 2017, 2018, 2019, and 2020 and with Lease Area OCS-A 0487 conducted in 2018, 2019, and 2020 (Gardline 2021a; 2021b; Smultea Sciences 2020a; 2020b). Site-specific verification has been conducted of all geophysical equipment sound sources deployed within the marine portions of the proposed Project Area that operate within the functional hearing range of marine mammals. Without mitigation, certain types of G&G surveys could result in long-term, high-intensity impacts on marine mammals. These effects may include behavioral avoidance of the ensonified area and increased stress; temporary loss of hearing sensitivity; and permanent auditory injury depending on the type of sound source, distance from the source, and duration of exposure.

However, G&G noise resulting from offshore wind site characterization surveys is of less intensity than the acoustic energy characterized by seismic air guns and affects a much smaller area than G&G noise from seismic air gun surveys typically associated with oil and gas exploration. Although seismic air guns are not used for offshore wind site characterization surveys, sub-bottom profiler technologies that are hull-mounted on survey vessels may incidentally harass marine mammals and would be required to follow mitigation and monitoring measures. Typically, mitigation and monitoring measures are required by BOEM through requirements of lease stipulations and required by ITAs from NOAA Fisheries pursuant to Section 101(a)(5) of the MMPA. Mitigation and monitoring measures would lower the stock-level effects of the take of any marine mammals to negligible levels, as required by the MMPA, including potential for adverse behavioral responses and auditory injury (permanent threshold shift/temporary threshold shift [PTS/TTS]). Similarly, the requirement to comply with avoidance and minimization measures for these surveys would avoid any effects on individuals that could result in population-level effects to threatened and endangered populations listed under the ESA. G&G surveys performed during O&M would adhere to the same mitigation requirements described above for construction and installation and detailed in Appendix H. Impacts from G&G surveys would be short-term and minor, and no population-level effects are expected.

Non-Impulsive Sound – WTG Noise

Operating WTGs produce mechanical noise that can transmit in the water column through the foundations, resulting in continuous underwater noise that is audible to marine mammals. The frequency and sound level generated from operating WTGs depends on WTG size, wind speed and rotation, foundation type, water depth, seafloor characteristics, and wave conditions (English et al. 2017; HDR 2019) (COP, Appendix O; Sunrise Wind 2021h). The number of WTGs in the SRWF may present complex acoustic environments and potentially accumulative noise when assessed as a whole rather than as individual WTGs. Madsen et al. (2006) estimated that noise propagated from wind farms may be audible to LF cetaceans up to 12.4 mi (10.8 nm; 20 km) away before reaching an ambient one third octave band SPL of 90 dB; however, this was in an area with no masking influence from shipping traffic and using the same calculations, the behavioral SPL threshold of 120 dB would be reached within 390 ft (119 m) of the turbine.

Notably, some marine mammal species (seals, mid-frequency cetaceans, high-frequency cetaceans) may be attracted to operational wind farms for foraging and shelter (Hammar et al. 2010; Russell et al. 2014). Aggregation of marine mammals around operational wind farms may indicate noise levels are insufficient to elicit behavioral disturbances or that the individuals become habituated to WTG noise (Teilmann and Carstensen 2012). Madsen et al. (2006) noted that due to the low SPLs from WTGs, operations were unlikely to cause hearing impairment to marine mammals; however, the noise produced by wind farms and potential impacts should be assessed within the context of the surrounding acoustic environment. There is no published literature assessing long-term movement of baleen whales in and around offshore wind farms.

While operational WTG noise would be present throughout the 25- to 35-year life of the proposed Project, the severity of potential impacts to marine mammals during O&M would be less than during the construction phase as there is no potential for physiological impacts due to WTG noise (Madsen et al. 2006; Scheidat et al. 2011). During O&M, anticipated impacts are limited to audibility and short-term, reversible behavioral responses such as changes in foraging, socialization or movement, or auditory masking, which could impact foraging and predator avoidance (MMS 2007).

Any operational noise effects from the SRWF are likely to be of low intensity and highly localized. Jansen and C. de Jong (2016) and Tougaard et al. (2009) concluded that marine mammals are able to detect operational noise within a few thousand feet of WTGs but the effects would have no significant impacts on individual survival, population viability, distribution, or behavior. Newer generation WTGs use direct drive motors that produce less noise and vibration than the models considered in the currently available research (Elliott et al. 2019; Tougaard et al. 2020), indicating that the effects of the proposed Project would likely be lower. On this basis, the effects of operational noise on marine mammals would be minor and long term.

Non-Impulsive Sound – Vessel Noise

Throughout the operational life of the SRWF, Sunrise Wind expects to use a variety of vessels to support O&M including SOVs with deployable work boats (daughter craft), CTVs, jack-up vessels, and cable laying vessels. Project vessels would undergo routine maintenance trips between the SRWF and potential ports in New York and Rhode Island. The types of impacts from vessel use during O&M would be similar to those described for construction, but the vessel traffic from O&M would be distributed over a much longer time period and result in fewer behavioral disruptions in any given year. Marine mammal individuals may experience direct, short-term, reversible behavioral disruptions due to the incremental contribution of O&M vessels at levels comparable to existing ambient vessel noise in the region. BOEM has concluded that although some individual marine mammals may experience short-term behavioral effects from vessel noise exposure, the limited nature of these effects and number of individuals affected would not be significant at stock or population levels. On this basis, the effects of vessel noise on marine mammals would be minor and long term.

Non-Impulsive Sound – Aircraft

Sunrise Wind expects to use a hoist-equipped helicopter and may also use unmanned aircraft systems to support O&M. Access to the OCS–DC would be provided from a boat landing or potentially a helicopter with a helideck located onsite. The type and number of unmanned aircraft systems and helicopters would vary over the operational lifetime of the Project. Impacts from aircraft use during O&M would be similar to those described for construction. All aircraft activities during O&M would comply with current approach regulations for any sighted North Atlantic right whales or unidentified marine mammals. The expected impacts from O&M aircraft operations are expected to be negligible.

EMF: The proposed project would consist of two offshore electric transmission systems: 180 mi (290 km) of 161 kV alternating current IAC and up to 106 mi (170 km) of 320 kV direct current SRWEC. These effects would be most intense at locations where the SRWEC cannot be buried and is laid on the bed surface covered by a stone or concrete armoring blanket. Approximately 2.97 mi (4.8 km) of the SRWEC cable and 2.1 mi (3.4 km) of the IAC could be unburied and would require surface armoring. Exponent Engineering, P.C. (2018) modeled anticipated EMF levels generated by the SRWEC and IAC. It estimated induced magnetic field levels ranging from 13.7 to 76.6 mG on the bed surface above the buried and exposed SRWEC cable and 9.1 to 65.3 mG above the IAC. Induced field strength would effectively decrease to 0 mG within 25 ft (7.6 m) of each cable. By comparison, the earth's natural magnetic field is more than five times the maximum potential EMF effect from the Project (Figure C-1, Appendix J; Sunrise Wind 2021j).

A modeling analysis of the magnetic and electric fields anticipated to be produced from Sunrise Wind's operational AC (i.e., IAC) and DC (i.e., SRWEC) cables was performed (COP, Appendix J1; Sunrise Wind 2021g). Assuming a conservative minimum target burial depth and no shielding effect of cable sheathing or armoring, produced magnetic and electric fields are low and attenuate rapidly with increasing distance. For the IAC, at a height of 3.3 ft (1 m) above seabed, directly over the IAC at peak loading, AC magnetic and electric field levels were calculated to be 4.5 milligauss (mG) and less than 0.09 millivolts/meter (mV/m), decreasing to 1.1 mG and less than 0.1 mV/m or less at a horizontal distance of ±10 ft (3 m) from the cables; however, previous literature (e.g., Hutchinson et al. 2018) suggest the magnetic fields and electric fields would generally be lower than the Sunrise Wind modeling suggests. For the SRWEC, DC magnetic fields over the majority of the route (where cables are bundled together) were calculated at a height of 3.3 ft (1 m) above the seabed at peak loading (assessed for permutations of four geographic directions and four cable configurations). The calculated change to Earth's ambient geomagnetic field is a maximum of ±129 mG, over the cables. The magnetic field from the cables decreases to ±41 mG at a horizontal distance of 10 ft (3 m) from the cables, contributing less than 10 percent of the ambient geomagnetic field level (approximately 506 mG). The flow of seawater within the ambient geomagnetic field from an ocean current of 2 feet per second (ft/s; 60 centimeters per second [cm/s]) induces a static DC electric field of 0.033 mV/m at a distance of ±10 ft (3 m) from the cables. At landfall, the DC magnetic field level evaluated at a height of 3.3 ft (1 m) above the seabed at peak loading was 1,730 mG above the 506 mG contributed by the geomagnetic field of the Earth. The corresponding induced DC electric field over the SRWEC in a 2 ft/sec (60 cm/s) ocean current is 0.14 mV/m. The EMF present during operations would cease once the project is decommissioned.

To minimize potential effects from EMF, both the IAC and SRWEC is proposed to be buried between 3 to 7 ft (0.9 to 2.1 m) deep below the seafloor, to the extent feasible, and feature various protective armoring and sheathing. Still, the magnetic fields measured at the seafloor may be slightly higher than the naturally occurring geomagnetic field of the earth.

As marine mammals in the area would be transiting and/or foraging and would not spend significant time on the seafloor in proximity to the proposed cables, no species- or population-level impacts to marine mammals are expected. The mobile nature and surfacing behavior in marine mammals likely limit time spent near the IAC and SRWEC, reducing potential for EMF exposure. Data are limited but only minor responses, such as lingering near or attraction to cables, have been noted in electrosensitive species (e.g., elasmobranchs, benthic species) and no interactions with anthropogenic EMF from submarine cables have been recorded for marine mammals. Therefore, potential effects to marine mammals from EMF exposure associated with the Sunrise Wind cable project, if present, are expected to be transient and negligible.

Accidental releases – cooling water: Seawater cooling would be needed for the OCS–DC (Refer to Section 3.3.6.1, COP, Sunrise Wind 2022b). During operation, the OCS–DC would require continuous cooling water withdrawals and subsequent discharge of heated effluent back to the receiving waters. The maximum DIF and discharge volume is 8.1 MGD with AIF and discharge volumes that are dependent on ambient source water temperature and facility output. Preliminary hydrodynamic modelling indicates that there would be some highly localized increases in water temperature in the immediate vicinity of the discharge location of the OCS–DC. The design, configuration, and operation of the CWIS for the OCS–DC would be permitted as part of an individual NPDES permit.

The OCS–DC would include three openings for intake pipes located approximately 30 ft (10 m) above the pre-installation seafloor grade. The water depth of the intake pipe openings was selected to minimize the potential of biofouling and entrainment of ichthyoplankton and to take advantage of the cooler water temperatures found at depth to maximize cooling potential of water withdrawn. The design intake velocity at the intake screens is less than 0.5 ft/s (less than 15.25 cm/s). This intake velocity estimate is below the threshold required for new facilities defined at 40 CFR §125.84(c) and is protective against the impingement of marine mammals.

Based on the highly localized area of potential effects on water temperature, it is unlikely that marine mammals would experience any impacts from cooling water discharges, and thus the potential for direct impacts would be negligible.

Operation of the seawater cooling system could potentially impact prey species for marine mammals. To analyze potential prey impacts that may be affected by OCS–DC operations, one representative species of zooplankton was considered. *Calanus finmarchicus* is a heavy-bodied, planktonic copepod that is an important prey species for several organisms in the region, including the North Atlantic right whale. Although additional species of zooplankton within the vicinity of the OCS–DC may also be susceptible to entrainment, *C. finmarchicus* was selected as representative due to its trophic importance in the ecosystem. Using the approach described in COP Appendix N2 (Sunrise Wind 2022b), the entrainment of *C. finmarchicus* from the National Centers for Environmental Information density data was estimated to be 1.1 billion organisms annually. For context, assuming an even distribution of this species and an average depth of 148 ft (45 m), the total abundance of *C. finmarchicus* within Lease Area OCS–A 0487 (109,252 ac) would be close to 2 trillion, and the annual entrainment losses would represent less than 0.1 percent of the local population for this zooplankton species.

It is important to note that these potential estimates assume 100 percent mortality of entrained organisms. There is potential that entrained individuals would survive passage through the CWIS due to short residence time in the system and a maximum water temperature exposure of only 90°F (32°C). Entrainment survival studies at existing power plants do not include directly comparable facilities or environments, but Review of Entrainment Survival Studies: 1970–2000 (EPRI (Electric Power Research Institute) 2000) identifies 91.4°F (33°C) as an upper threshold discharge temperature for many organisms to survive entrainment in existing power plants located along the Hudson River in New York. These potential mechanisms for entrainment survival have not yet been applied to this analysis but could be considered when evaluating overall biological impacts of the OCS–DC operation. Because the total entrained portion of the population of prey is less than 0.1 percent, and survival rates are likely higher than the assumed 100 percent mortality associated with entrainment in the cooling water system, the proportion of prey base that may be affected by the operation of the cooling water system is insignificant, and therefore may affect, but is not likely to adversely affect ESA-listed species.

Accidental releases – contaminants: Impacts from accidental discharges and releases of contaminants during O&M are expected to be similar to, but of lesser likelihood than during, construction as there would be fewer Project-related marine vessels during this phase, and regulatory requirements and preventative measures would still apply. Unpermitted discharges or releases are considered accidental events, and, in their unlikely occurrence, these are expected to result in minimal, short-term impacts. Permitted discharges are not expected to pose an adverse impact to marine resources as they would quickly disperse, dilute, and biodegrade (BOEM 2013). Because the effects of authorized discharges would be extremely localized and accidental discharges are considered to be very unlikely, impacts from discharges and releases during O&M would be negligible.

Accidental releases – trash and debris: Impacts from Project-related marine disposal of trash and debris during O&M are expected to be similar to, but of lesser likelihood than during, construction as there would be fewer Project-related marine vessels during this phase, and regulatory requirements and preventative measures would still apply. The unanticipated marine disposal of trash and debris is considered an unpermitted, accidental event, and containment and good housekeeping practices would be implemented to minimize the potential.

Indirectly, there may be an increased number of commercial and recreational fishing vessels that operate around the SRWF, which could increase the occurrence of trash and debris from these vessels being released in the SRWF. This could also increase the potential entanglement risk from netted fishing gear, longlines, ropes, traps, or buoy lines. Although unlikely, there is potential for entanglement or ingestion of line by marine mammals in the vicinity. Adverse impacts incurred from increased fishing activity in the SRWF are not anticipated, but in the event that a line or cable is lost, it could then present a higher risk to species entanglement including for the North Atlantic right whale. While such entanglements have the potential for a prolonged impact on the individual and may result in mortality, O&M of the SRWF is not expected to directly increase this risk. Therefore, project impacts from trash and debris during O&M would be negligible.

Traffic: Sunrise Wind expects to use a variety of vessels to support O&M, including SOVs with deployable work boats (daughter craft), CTVs, jack-up vessels, and cable laying vessels. Although the type and number of vessels would vary over the operational lifetime of the Project, five vessel types are currently being considered for O&M of the SRWF (three for routine activities and two for non-routine activities). There would be fewer vessels used for routine maintenance trips than for construction or non-routine maintenance, but they would occur over a longer period considering the 25- to 35-year operational life of the proposed Project. During SRWF O&M activities, the SOV would remain within the SRWF for up to 28 days and would therefore not make daily trips to port; crew changes would occur every 14 days via CTVs. Potential ports expected to be utilized during O&M of the SRWF are included in Table 3.3.10-1 and Figure 3.3.10-1 in the COP (Sunrise Wind 2022b).

Passenger vessels as well as O&M related vessels are likely to increase if the proposed Project is operational as the WTGs are likely to increase public interest and the presence of recreational boaters in the area. Within the SRWF, potential impacts to marine mammals during O&M include direct effects from vessel strike and behavioral disturbance, and indirect effects from increased fishing vessel presence. As potential effect of vessel traffic on marine mammals is a region-wide concern, BOEM is currently evaluating risk to whales from offshore vessel activities that support wind development. Results of this study are expected to contribute to existing knowledge and to inform decision-making on potential mitigation needs for vessel risks to whales in the US North, Mid-, and South Atlantic WEAs.

To monitor the number of vessels and traffic patterns for analysis and compliance with vessel speed requirements, all vessels associated with the proposed Project would be required to have operational AIS. All vessels would operate in accordance with applicable rules and regulations for maritime operation within US and federal waters. Additionally, the Project would adhere to vessel speed restrictions as appropriate in accordance with BOEM and NOAA requirements. Vessel activity during O&M would be localized and short-term. Similar to impacts described for the construction phase, in the unlikely event a strike was to occur during Project O&M that resulted in mortality or serious injury impacts to the most vulnerable ESA-listed species (e.g., North Atlantic right whale), the impact could result in population-level effects. Impacts to less vulnerable ESA-listed species and non-ESA listed species from vessel strikes may result in injury or mortality of individuals; however, mortality impacts are expected to be less likely to result in population-level effects.

In addition to the potential for strike, the presence of vessel traffic during O&M can be a stressor to marine mammals but potential behavioral effects are not likely to be discernable from potential effects experienced during existing regional vessel traffic conditions.

Project-related vessel traffic during O&M would adhere to the same mitigation requirements described above for construction and installation and detailed in Appendix H. Overall, increased vessel traffic from O&M activities and potentially increased commercial and recreational fishing activity may result in minor impacts to marine mammals due to rare injurious or fatal collisions with vessels over the long term.

Gear utilization: Fisheries surveys may be conducted during the O&M portion of the Proposed Action. Any surveys would be conducted with the same monitoring and mitigation measures described for surveys during the construction and installation phase. The potential impacts for marine mammals are evaluated in Section 3.5.6.5.1.8 above in the construction and installation section. Based on that information, the potential for impacts to marine mammals from gear utilization and fisheries surveys is negligible.

Lighting: The SRWF would introduce stationary artificial light sources to the analysis area. Orr et al. (2013) summarized available research on potential operational lighting effects from offshore wind energy facilities. They concluded that the operational lighting effects to marine mammal distribution, behavior, and habitat use would be negligible if recommended design and operating practices are implemented.

Presence of structures: The operational effects of the Project include the physical presence of the SRWF turbine and substation foundations, and alteration of benthic habitat by rock armoring and scour protection. Structural elements of the SRWF would be present throughout the 25- to 35-year operational life of the Project. Once WTG and OCS–DC foundations, scour protection, and IAC protection would alter the existing habitat, converting sandy bottom habitat to hard bottom habitat, and resulting in a reef effect that encourages colonization by assemblages of both sessile and mobile animals (Bergström et al. 2014; Coates et al. 2014; Wilhelmsson et al. 2006). Studies have shown that artificial structures can create increased habitat heterogeneity that is important for species diversity and density (Langhamer 2012).

Numerous surveys at offshore wind farms, oil and gas platforms, and artificial reef sites have documented increased abundance of smaller odontocete and pinniped species attracted to the increase in pelagic fish and benthic prey availability (Arnould et al. 2015; Lindeboom et al. 2011; Mikkelsen et al. 2013; Russell et al. 2014). Effects on fish populations may be adverse, beneficial, or mixed, depending on the species and location (van der Stap et al. 2016) but are expected to be small-scale within the context of the broader region. It is likely the reef effect caused by habitat alteration in the SRWF would provide beneficial foraging opportunities for some marine mammals although the number of species benefiting from this habitat and the significance of the benefit for these species remains uncertain (Bergström et al. 2014). Currently, there are no quantitative data on how large whale species (i.e., mysticetes) may be impacted by offshore windfarms (Kraus et al. 2019). Navigation through, or foraging within, the SRWF is not expected to be impeded by the presence of the WTG and OCS–DC foundations.

The long-term presence of WTG structures could displace some marine mammals from preferred habitats or alter movement patterns, potentially changing exposure to commercial and recreational fishing activity. The evidence for long-term displacement is unclear and varies by species. For example, Long (2017) studied marine mammal habitat use around two commercial wind farm facilities before and after construction and found that habitat use appeared to return to normal after construction. He cautioned that these findings were not definitive and additional research was needed. In contrast, Teilmann and Carstensen (2012) observed clear long-term (greater than 10 year) displacement of harbor porpoises from commercial wind farm areas in Denmark. Displacement effects remain a focus of ongoing study (Kraus et al. 2019).

Based on the above information, BOEM concludes that the presence of visible structures from the Proposed Action would have negligible to minor, short-term direct effects on marine mammal movement and migration, and long-term minor beneficial indirect effects on the distribution, abundance, and availability of marine mammal prey and forage resources.

3.5.6.5.3 Conceptual Decommissioning

3.5.6.5.3.1 Onshore Activities and Facilities

Conceptual decommissioning activities from onshore components of the project are not anticipated to have any direct impact on marine mammals.

3.5.6.5.3.2 Offshore Activities and Facilities

Project conceptual decommissioning of offshore components would require the use of construction vessels of similar number and class as used during construction. Decommissioning activities would produce similar short-term effects on marine mammals to those described above for proposed Project construction, including short-term displacement,behavioral alteration, and elevated TSS exposure. Underwater noise and disturbance levels generated during conceptual decommissioning are similar to those described above for construction, with the exception that pile driving would not be required. The monopiles would be cut below the bed surface for removal using a cable saw or abrasive waterjet. Noise levels produced by this type of cutting equipment are generally indistinguishable from engine noise generated by the associated construction vessel (Pangerc et al. 2016). Therefore, this decommissioning equipment would have significantly lower potential for noise effects comparted to those already considered for construction vessel noise. Decommissioning activities would be required to obtain all appropriate federal permits and would be required to implement mitigation measures based on those permits and the best available information at that time. It is anticipated that those mitigation measures would be similarly effective as those required for construction and installation. The effects of Project conceptual decommissioning on marine mammals would, therefore, range from negligible to minor.

3.5.6.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considers the impacts of the Proposed Action in combination with other ongoing and planned wind activities.

Ongoing and planned activities other than offshore wind development activities that may affect marine mammals include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities would contribute to the primary IPFs of noise, presence of structures, vessel strikes, and entanglement risk and could result in short-term or permanent displacement and injury to or mortality of individual marine mammals, but population-level effects would not be expected for most species. The exception to this is the North Atlantic right whale, due to the small size of its population and frequent occurrence in shallow coastal zones.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, the Proposed Action would contribute an incremental increase in effects from the primary IPFs for marine mammals.

3.5.6.5.5 Impacts of Alternative B – Proposed Action on ESA-Listed Species

Impacts to ESA-listed marine mammals are not expected to be different than for non-ESA-listed marine mammals. The primary sources of potential impacts for ESA-listed marine mammals include increased sound levels from pile installation activities and G&G surveys, project related vessel traffic, and alteration of prey availability. Based on the information contained in this document, we anticipate that the Proposed Action for the SRWF Project is likely to adversely affect but not jeopardize the continued existence of North Atlantic right, sei, fin, or sperm whales.

3.5.6.5.6 Conclusions

Impacts of the Proposed Action

Project construction and installation, operations and maintenance, and conceptual decommissioning would physically disturb the water column and seabed, as well as generate impulsive and non-impulsive noise, increase collision, entanglement, and spill exposure risk, and generate artificial light. Similar impacts from proposed Project O&M would occur, although at a lesser extent and duration. BOEM anticipates the adverse impacts resulting from the Proposed Action alone would range from **negligible** to **moderate,** with long-term **minor beneficial** impacts from increase prey availability. Adverse impacts are expected to result mainly from pile-driving noise and increased vessel traffic. Beneficial impacts are expected to result from the presence of structures. Therefore, BOEM expects the overall impact on marine mammals from the Proposed Action alone to be **moderate**, as the overall Impacts on individuals and/or their habitat could have population-level effects, but the population can sufficiently recover from the impacts or enough habitat still is functional to maintain the viability of the species both locally and throughout their range.

Cumulative Impacts of the Proposed Action

In the context of other reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual IPFs would range from **negligible** to **moderate**, depending on the species, and may potentially include **minor beneficial** impacts. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **moderate** impacts to marine mammals. BOEM made this call because the overall effect Impacts on individuals and/or their habitat could have population-level effects, but the population can sufficiently recover from the impacts or enough habitat still is functional to maintain the viability of the species both locally and throughout their range.

While the significance level of impacts would remain the same between the No Action Alternative and the Proposed Action, BOEM could further reduce impacts from the Proposed Action to marine mammals with mitigation measures conditioned as part of the COP approval by BOEM that also includes the mitigation, monitoring, and reporting requirements required in the NMFS biological opinion.

3.5.6.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Under Alternative C-1, the same number of turbine locations (94 WTGs) under the Proposed Action may be approved by BOEM; however, 8 WTG positions from NMFS' priority areas (Figure 2.1.3-2) would be excluded from consideration. The WTG sites to be removed from Priority Area 1 were selected to maximize the largest contiguous complex habitat area feasible and/or to reduce the number of 11-MW WTGs located near presumed Atlantic cod spawning location(s). This alternative would not significantly alter the construction methods, O&M, or conceptual decommissioning. This alternative would not increase the impact level or likelihood of impacts for marine mammals and may result in a slight reduction in potential impact duration and extent from construction activities and number of in-water structures. Therefore, the Alternative C-1 is expected to have negligible to moderate impacts on marine mammals from construction and installation, O&M, and conceptual decommissioning activities.

3.5.6.6.1 Construction and Installation

3.5.6.6.1.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to marine mammals due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.6.6.1.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to marine mammals due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.6.6.2 Operations and Maintenance

3.5.6.6.2.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the operations and maintenance of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to marine mammals due to the operation and maintenance of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.6.6.2.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the operations and maintenance methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to marine mammals due to the operations and maintenance of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.6.6.3 Conceptual Decommissioning

3.5.6.6.3.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the conceptual decommissioning of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to marine mammals due to conceptual decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.6.6.3.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the conceptual decommissioning methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to marine mammals due to the conceptual decommissioning of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.6.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts of Alternative C-1 consider the impacts of this alternative in combination with other ongoing and planned wind activities.

Ongoing and planned activities other than offshore wind development activities that may affect marine mammals include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities would contribute to the primary IPFs of noise, presence of structures, vessel strikes, and entanglement risk and could result in short-term or permanent displacement and injury to or mortality of individual marine mammals, but population-level effects would not be expected for most species. The exception to this is the North Atlantic right whale, due to the small size of its population and frequent occurrence in shallow coastal zones.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, Alternative C-1 would contribute an incremental increase in effects from the primary IPFs for marine mammals.

3.5.6.6.5 Impacts of Alternative C-1 on ESA-Listed Species

Impacts to ESA-listed marine mammals are not expected to be different than for non-ESA-listed marine mammals. The primary sources of potential impacts for ESA-listed marine mammals include increased sound levels from pile installation activities and G&G surveys, project related vessel traffic, and alteration of prey availability. Based on the information contained in this document, BOEM anticipates that Alternative C-1 for the SRWF Project would likely adversely affect but not jeopardize the continued existence of North Atlantic right, sei, fin, or sperm whales.

3.5.6.6.6 Conclusions

Impacts from Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for marine mammals. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the Proposed Action (Alternative B).

Cumulative Impacts from Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for marine mammals. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action (Alternative B).

3.5.6.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

The primary effect of this alternative is the relocation of WTGs from priority areas to the eastern portion of the lease area. This proposed change would not significantly alter the construction methods, operations and maintenance, or conceptual decommissioning and would not result in additional impacts to marine mammals other than those described under the Proposed Action (Alternative B).

3.5.6.7.1 Construction and Installation

3.5.6.7.1.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to marine mammals due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.6.7.1.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to marine mammals due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.6.7.2 Operations and Maintenance

3.5.6.7.2.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the operations and maintenance of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to marine mammals due to the operation and maintenance of the onshore activities or facilities other than what is described under the Proposed Action

3.5.6.7.2.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the operations and maintenance methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to marine mammals due to the operations and maintenance of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.6.7.3 Conceptual Decommissioning

3.5.6.7.3.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the conceptual decommissioning of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to marine mammals due to conceptual decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.6.7.3.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the conceptual decommissioning methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to marine mammals due to the conceptual decommissioning of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.6.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts of Alternative C-2 considers the impacts of this alternative in combination with other ongoing and planned wind activities.

Ongoing and planned activities other than offshore wind development activities that may affect marine mammals include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities would contribute to the primary IPFs of noise, presence of structures, vessel strikes, and entanglement risk and could result in short-term or permanent displacement and injury to or mortality of individual marine mammals, but population-level effects would not be expected for most species. The exception to this is the North Atlantic right whale, due to the small size of its population and frequent occurrence in shallow coastal zones.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, Alternative C-2 would contribute an incremental increase in effects from the primary IPFs for marine mammals.

3.5.6.7.5 Impacts of Alternative C-2 on ESA-Listed Species

Impacts to ESA-listed marine mammals are not expected to be different than for non-ESA-listed marine mammals. The primary sources of potential impacts for ESA-listed marine mammals include increased sound levels from pile installation activities and G&G surveys, project related vessel traffic, and alteration of prey availability. Based on the information contained in this document, we anticipate that Alternative C-2 for the SRWF Project is likely to adversely affect, but not jeopardize the continued existence North Atlantic right, sei, fin, or sperm whales.

3.5.6.7.6 Conclusions

Impacts from Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for marine mammals. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the Proposed Action (Alternative B).

Cumulative Impacts from Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for marine mammals. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action (Alternative B).

3.5.6.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall negligible to moderate adverse impacts and minor beneficial impacts on marine mammals. Table 3.5.6-13 provides an overall summary of alternative impacts.

Table 3.5.6-13. Comparison of Alternative Impacts on Marine Mammal

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Marine mammals	*Proposed Action*: BOEM anticipates the adverse impacts resulting from the Proposed Action alone would range from **negligible** to **moderate,** with long-term **minor beneficial** impacts from increase prey availability. Adverse impacts are expected to result mainly from pile-driving noise and increased vessel traffic. Therefore, BOEM expects the overall impact on marine mammals from the Proposed Action alone to be **moderate**, as the overall Impacts on individuals and/or their habitat could have population-level effects, but the population can sufficiently recover from the impacts or enough habitat still is functional to maintain the	*Alternative C-1*: Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for marine mammals. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the Proposed Action, **negligible** to **moderate adverse impacts,** with long-term **minor beneficial** impacts from increase prey availability. *Cumulative Impacts of Alternative C-1*: Alternative C-1 includes changes to turbine installation locations that	*Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for marine mammals. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the Proposed Action, **negligible** to **moderate adverse impacts,** with long-term **minor beneficial** impacts from increase prey availability. *Cumulative Impacts of Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
	viability of the species both locally and throughout their range. *Cumulative Impacts of the Proposed Action:* In the context of other reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual IPFs would range from **negligible** to **moderate**, depending on the species, and may potentially include **minor beneficial** impacts. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **moderate** impacts to marine mammals.	would not alter any of the findings for marine mammals. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action.	would not alter any of the findings for marine mammals. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action.

3.5.6.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to marine mammals.

3.5.7 Sea Turtles

This section discusses potential impacts on sea turtles from the proposed Project, alternatives, and future offshore wind activities in the GAA (Appendix D, Figure D-9). The sea turtle GAA as described in Appendix D, includes the Scotian Shelf, Northeast Shelf, and Southeast Shelf LMEs.

3.5.7.1 Description of the Affected Environment and Future Baseline Conditions

Of the five sea turtle species with occurrence records off the northeastern coast of the United States (DoN 2005), four species are expected to occur in the proposed Project Area (Table 3.5.7-1). These species may occur near the onshore facilities (SRWEC landfall location at Smith Point on Long Island, New York) and the in-water areas which range from state waters (SRWEC-NYS from the shoreline to a maximum depth of 29 m) to federal waters (SRWEC-OCS with maximum depth of 68 m and SRWF which ranges from 35 to 62 m in depth) (COP, Appendix G1; Sunrise Wind 2021b). Expected occurrence in these areas is summarized in Table 3.5.7-1 and is based on known habitat associations, confirmed sightings and strandings, and the potential for occurrence based on these factors regardless of how frequent that occurrence may be. Ongoing threats to these species in this region include, but are not limited to, entanglement in fishing gear, fisheries bycatch, marine debris ingestion or entanglement, vessel strike, nesting beach impacts, climate change, noise pollution, marine and coastal construction activities, vessel traffic, seismic surveys, sonar and other military activities, beach cleaning, beach nourishment, shoreline armoring, recreational beach equipment, beach driving, artificial lighting, and nest relocation (Hamann et al. 2010; Lutcavage et al. 1997; NMFS et al. 2011a; NMFS and USFWS 2008; NMFS and USFWS 2013a; NMFS and USFWS 2013b; Osgood 2008; TEWG 2007; Witherington and Martin 2003).

Brief descriptions of the regional and proposed Project Area occurrence of the sea turtle species expected to occur in the proposed Project Area are provided below. These species are all protected species under the ESA and include the green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), and Kemp's ridley sea turtle (*Lepidochelys kempii*). There is no critical habitat in or near the proposed Project Area. Although occasional occurrences are possible, hawksbill sea turtles (*Eretmochelys imbricata*), which are also protected under the ESA, are not expected to occur in the proposed Project Area and are not considered further in this Draft EIS. This species primarily occurs in warmer southern waters associated with coral reef habitats (NMFS and USFWS Diez et al. 2003; 1993) and is exceedingly rare north of Florida (GARFO 2021; Keinath et al. 1991; Lee and Palmer 1981; Parker 1995; Plotkin 1995; USFWS 2001). Kenney's (2010) assessment of sea turtles present in southern New England, the hawksbill turtle is considered a hypothetical species in this region based on the relatively few stranding records in Massachusetts and New York (Lazell 1980; Morreale et al. 1992; Prescott 2000; Zarriello and Steadman 1987). In addition, no hawksbill turtles have been sighted off the northeastern United States during recent AMAPPS surveys (e.g., NEFSC and SEFSC 2018; NEFSC and SEFSC 2020; 2021), RI-MA WEA surveys (Kraus et al. 2016; O'Brien et al. 2021a; Quintana et al. 2019; Stone et al. 2017), or Project-specific geophysical surveys (Gardline 2021a; 2021b; Smultea Sciences 2020a; 2020b).

Leatherback sea turtle: The leatherback sea turtle is the most globally distributed sea turtle species, ranging broadly from tropical and subtropical to temperate regions of the world's oceans (NMFS and USFWS 1992). Leatherbacks are a pelagic species but are commonly observed in coastal waters along the United States continental shelf (NMFS and USFWS 1992). In the northeastern United States, leatherbacks have a regular, seasonal occurrence. In the late winter and early spring, leatherbacks are distributed primarily in tropical latitudes (Stewart and Johnson 2006); survey data confirm that around this time of year, individuals begin to move north along the North American Atlantic coast. By February and March, the majority of leatherbacks found in Atlantic waters of the United States are distributed off northeastern Florida. This movement continues through April and May when leatherbacks begin to occur in large numbers off the coasts of Georgia and North and South Carolina (NMFS 1995; 2000). Leatherbacks become more numerous off the mid-Atlantic and southern New England coasts in late spring and early summer, and by late summer and early fall, they may be found in the waters off eastern Canada (CETAP 1982; Dodge et al. 2014; Shoop and Kenney 1992; Thompson et al. 2001).

Table 3.5.7-1. Sea Turtles Expected to Occur in the Proposed Project Area

Species[1]	DPS	ESA Status[2]	Regional Nester Abundance[3]	Strandings[4]	Expected to Occur in SRWF	Expected to Occur in SRWEC-OCS	Expected to Occur in SRWEC-NYS	Expected to Occur in Onshore Facilities[5]
Leatherback sea turtle (*Dermochelys coriacea*)	Northwest Atlantic	E	20,659 (Northwest Atlantic) (NMFS and USFWS 2020)	231	Yes	Yes	Yes	No
Loggerhead sea turtle (*Caretta caretta*)	Northwest Atlantic	T	38,334 (Northwest Atlantic) (Richards 2011)	250	Yes	Yes	Yes	Yes
Kemp's ridley sea turtle (*Lepidochelys kempii*)	N/A	E	4,395 (Gulf of Mexico) (NMFS and USFWS 2015)	174	Yes	Yes	Yes	Yes
Green sea turtle (*Chelonia mydas*)	North Atlantic	T	167,424 (North Atlantic DPS) (NMFS and USFWS 2016)	72	Yes	Yes	Yes	Yes

Notes: DPS = distinct population segment

[1] Taxonomy follows Pritchard (1997).

[2] ESA status: E = endangered, T = threatened

[3] Abundance estimates of nesting females are provided and use best available data. No absolute density/abundance estimates specific to the proposed Project Area are available yet. Duke University Marine Geospatial Ecology Laboratory's density models do not yet include turtle data, and the Navy's turtle density models are outdated (the Navy used NMFS Summer 1998 aerial survey data) and not spatially or seasonally stratified (DoN 2007).

[4] A stranding is defined as "a sea turtle that is either found dead or is alive but is unable to go about its normal behavior due to any injury, illness, or other problem" and is "found washed ashore or floating in the water". Data reflects reports from 2017 to 2021 from NY to MA (NMFS STSSN 2022).

[5] Occurrence in onshore facilities is based on nesting potential on Long Island. Leatherback nesting in the U.S. is mainly on the Atlantic coast of Florida (Stewart and Johnson 2006) with sporadic nesting in Georgia, South Carolina, and North Carolina (Rabon et al. 2003). Although hardshell turtle nesting beaches are primarily south of NY, loggerhead, green, and Kemp's ridley turtles are known to nest in the mid-Atlantic, and a Kemp's ridley recently nested on Long Island (Rafferty et al. 2019). A sea turtle nesting response plan is being developed for NY (Bonacci-Sullivan 2018).

Peak leatherback occurrence in the proposed Project Area is expected during the summer and fall although this species may occur in the region year-round. During recent aerial surveys in the NYB, leatherbacks were sighted during all seasons except winter, and most sightings were during summer and fall and were in nearshore and offshore waters (NYSERDA 2020; Tetra Tech and LGL 2019; 2020). AMAPPS surveys conducted from 2010 through 2013 routinely documented leatherbacks in New England waters, including the RI-MA WEAs (Palka 2017c). The STSSN reported 89 offshore and 142 inshore leatherback sea turtle strandings between 2017 and 2021 from New York to Massachusetts (NMFS STSSN 2022). During the NLPSC surveys in the RI-MA WEAs, leatherbacks were recorded during spring, summer, and fall with a strong peak in August (Kraus et al. 2016; O'Brien et al. 2021a; O'Brien et al. 2021b; Quintana et al. 2019; Stone et al. 2017). Sightings were documented close to shore (within 10 nm) (O'Brien et al. 2021a). During Project-specific geophysical surveys, leatherbacks were sighted in or near the proposed Project Area during June, July, August, and October (Gardline 2021a; Smultea Sciences 2020a).

Loggerhead sea turtle: Foraging loggerhead sea turtles range widely and have been observed along the entire Atlantic coast as far north as Canada (Brazner and McMillan 2008; Ceriani et al. 2014; Shoop and Kenney 1992). In southern New England, loggerhead sea turtles can be found seasonally, primarily during the summer and fall but are typically absent during the winter (Kenney and Vigness-Raposa 2010; Shoop and Kenney 1992) as distribution is dictated primarily by sea surface temperatures (SSTs). Loggerheads are associated with SSTs between 13°C and 28°C (55.5°F and 82.4°F) (Mrosovsky 1980); they tend to become lethargic in SSTs below 15°C (59°F) and may become incapacitated ("cold-stunned") at temperatures below 10°C (50°F) (Mrosovsky 1980; Schwartz 1978). Loggerheads occur north of Cape Hatteras primarily in late spring through early fall (May and October) with a peak occurrence in June; however, sightings are recorded in mid-Atlantic and northeast waters throughout the year (CETAP 1982; DoN (Department of the Navy) 2008a; 2008b; Lutcavage and Musick 1985; Shoop and Kenney 1992). During the summer, loggerheads may be found regularly in shelf waters from Delaware Bay to Hudson Canyon, including Long Island Sound and Cape Cod Bay (Burke et al. 1991; Prescott 2000; Shoop and Kenney 1992; UDSG 2000). As SSTs decrease in the winter, most individuals move south of Cape Hatteras to overwinter (Epperly et al. 1995; Hawkes et al. 2011; Mitchell et al. 2002). From November to April, loggerheads are primarily found off the coast of southern North Carolina in the South Atlantic Bight (Griffin et al. 2013); however, stranding and sighting data indicate that not all loggerheads leave mid-Atlantic and New England waters during the winter (Burke et al. 1991).

Loggerhead turtles may occur year-round in the proposed Project Area; peak occurrence is expected to be during summer and fall. Loggerheads are the most commonly sighted sea turtles on the shelf waters from New Jersey to Nova Scotia, Canada. During AMAPPS surveys between December 2014 and March 2015, 280 individuals were recorded in this region (Palka 2017a). Throughout the NYB, loggerheads are sighted year-round with fewer sightings recorded during the winter (NYSERDA 2020; Tetra Tech and LGL 2020). Large concentrations of loggerheads are regularly observed south and east of Long Island near the RI-MA WEAs (NEFSC and SEFSC 2018). During the NLPSC surveys, loggerhead turtles were sighted within the RI-MA WEAs during spring, summer, and fall with the greatest number of observations in summer and fall (Kraus et al. 2016; O'Brien et al. 2021a; O'Brien et al. 2021b; Quintana et al. 2019; Stone et al. 2017). During Project-specific geophysical surveys, loggerheads were sighted in or near the proposed Project Area during June, July, August, and September (Smultea Sciences 2020a). The STSSN reported 78 offshore and 172 inshore loggerhead sea turtle strandings between 2017 and 2021 from New York to Massachusetts, the highest number among all turtle species reported (NMFS STSSN 2022). In NYS waters, the New York Marine Rescue Center (NYMRC) documented 816 strandings of loggerhead sea turtles from 1980 to 2018 (New York Marine Rescue Center 2022). Winton et al. (2018) estimated densities of tagged turtles using data from 271 satellite tags deployed on loggerhead sea turtles between 2004 and 2016 and found that tagged loggerheads primarily occupied the continental shelf from Long Island, New York, south to Florida, but relative densities in the RI-MA WEAs increased between July and September. Collectively, available information indicates that loggerhead sea turtles are expected to occur commonly as adults, subadults, and juveniles from the late spring through fall, with the highest probability of occurrence from July through September (Winton et al. 2018).

Kemp's ridley sea turtle: Kemp's ridley sea turtles inhabit open-ocean and *Sargassum* habitats of the North Atlantic Ocean as post-hatchlings and small juveniles (Manzella et al. 1991; Witherington et al. 2012). The species is primarily associated with habitats on the continental shelf with preferred habitats consisting of sheltered areas along the coastline, including estuaries, lagoons, and bays (Burke et al. 1994; Landry and Costa 1999; Lutcavage and Musick 1985; Seney and Musick 2005) and nearshore waters less than 120 ft (37 m) deep although they can be found in deeper offshore waters (Shaver and Rubio 2008; Shaver et al. 2005). Their most suitable habitats are less than 33-ft-(10 m) deep with SSTs between 22 and 32°C (72 and 90°F) (Coyne et al. 2000). Seagrass beds, mud bottom, and live bottom are important developmental habitats (Schmid and Barichivich 2006). Large juveniles and adults move to benthic, nearshore feeding grounds along the Atlantic and Gulf coasts of the United States (Morreale and Standora 2005). Some juveniles may migrate as far north as New York and New England, arriving in these areas around June and leaving to travel south in early October (Morreale and Standora 2005). Nesting occurs primarily on a single beach at Rancho Nuevo on the eastern coast of Mexico (USFWS and NMFS 1992) with a few additional nests in Texas, Florida, South Carolina, and North Carolina (Foote and Mueller 2002; Godfrey 1996; Meylan et al. 1990; Weber 1995) and an occasional nest in Virginia (Boettcher 2015) and New York (Rafferty et al. 2019).

Kemp's ridley turtles may occur year-round in the proposed Project Area; occurrence is expected to be lowest during winter. Despite the amount of aerial survey effort conduced in the NYB and southern New England, this small turtle species is extremely difficult to observe via high-altitude surveys, so sightings may often go undetected. During the recent NYB surveys, relatively few Kemp's ridley turtles were sighted compared to other turtle species; sightings were recorded during spring, summer, and fall (NYSERDA 2020; Tetra Tech and LGL 2020). During NLPSC surveys in the RI-MA WEAs, Kemp's ridley sightings were during August and September 2012 (Kraus et al. 2016). During Project-specific geophysical surveys, one Kemp's ridley was sighted in the proposed Project Area during July 2020 (Gardline 2021a). The STSSN reported 17 offshore and 157 inshore Kemp's ridley sea turtle strandings between 2017 and 2021 from New York to Massachusetts (NMFS STSSN 2022), and the NYMRC documented strandings of 620 Kemp's ridley sea turtles within NYS waters between 1980 and 2018 (New York Marine Rescue Center 2022). Cold-stunned Kemp's ridley sea turtles are often found stranded on the beaches of Cape Cod (Liu et al. 2019; Wellfleet Bay Wildlife Sanctuary 2018). The first confirmed Kemp's ridley nesting event on Long Island was in July 2018 (Rafferty et al. 2019).

Green sea turtle: Along the east coast of the United States, adult green sea turtles are only occasionally found north of Florida, which is near the northern extent of the green turtle's Atlantic nesting range, although some nests have been documented in Georgia, the North and South Carolina, and Virginia

(Boettcher 2015; NMFS and USFWS 1991a; Peterson et al. 1985; Schwartz 1989; USFWS 2005). Juveniles and subadults range as far north as Massachusetts (NMFS and USFWS 1991a) and are occasionally observed in Long Island Sound, Nantucket Sound, and Cape Cod Bay (CETAP 1982; Lazell 1980; Morreale et al. 1992). The STSSN reported four offshore and 68 inshore green sea turtle strandings between 2017 and 2021 from New York to Massachusetts, and green sea turtles are found each year stranded on Cape Cod beaches (NMFS STSSN 2022; Wellfleet Bay Wildlife Sanctuary 2018). Sightings in or near the proposed Project Area are limited. This species may occur in the proposed Project Area in small numbers throughout the year. During the recent NYB surveys, one green sea turtle was sighted during spring 2016 (NYSERDA 2020). Kenney and Vigness-Raposa (2010) recorded one confirmed sighting within the RI-MA WEAs in 2005. Five green sea turtle sightings were recorded off the Long Island shoreline 10 to 30 mi (16 to 48 km) southwest of the WEAs during AMAPPS aerial surveys conducted from 2010 to 2013 (NEFSC and SEFSC 2018), but none were positively identified during the NLPSC aerial surveys of the RI-MA WEAs from October 2011 to October 2020 (Kraus et al. 2013; O'Brien et al. 2021a; O'Brien et al. 2021b; Quintana et al. 2019).

3.5.7.2 Impact Level Definitions for Sea Turtles

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on sea turtles from the alternatives, including the Proposed Action. Table 3.5.7-2 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for sea turtles. Table G-11 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to sea turtles. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project.

Table 3.5.7-2. Definition of Potential Impact Levels for Sea Turtles

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Impacts on sea turtles are undetectable or barely measurable, with no consequences to individuals or populations.	Impacts on individual sea turtles and/or their habitat would be beneficial but at the lowest levels of detection and barely measurable.
Minor	Impacts on sea turtles are detectable and measurable but are low-intensity, highly localized, and short-term in duration. May include impacts to or loss of individuals, but these impacts would not result in population-level effects.	Impacts on individual sea turtles and/or their habitat are detectable and measurable. The effects are likely to benefit individuals, be localized, and/or be short-term and are unlikely to lead to population-level effects.
Moderate	Impacts on sea turtles are detectable and measurable. These impacts could result in population-level effects, but those effects would likely be recoverable and would not affect stock or population viability.	Impacts on individual sea turtles and/or their habitat are detectable and measurable. These benefits may affect large areas of habitat, be long-term, and/or affect a large number of individuals and may lead to a detectable increase in populations but is not expected to improve the overall viability or recovery of affected species or population.

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
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.	Impacts on individual sea turtles and/or their habitat are detectable and measurable. These impacts on habitat may be short-term, long-term, or permanent and would promote the viability of the affected species/population and/or increase the affected species/population levels.

3.5.7.3 Impacts of Alternative A – No Action on 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 other planned non-offshore wind and offshore wind activities, as described in *Appendix E, Planned Activities Scenario*.

3.5.7.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for sea turtles would continue to follow current regional trends and respond to IPFs introduced by other ongoing offshore wind and non-offshore wind activities.

Important IPFs for sea turtles within the GAA are generally associated with noise and vessel strikes, the presence of structures, and ongoing climate change. Fuel spills and releases of trash and debris have lesser potential impact on sea turtles due to their low probability of occurrence and relatively limited spatial impact. Specific activities other than offshore wind development that may affect sea turtles include commercial fisheries bycatch; marine transportation; military use; oil and gas activities; undersea transmission lines, gas pipelines, and other submarine cables; tidal energy projects; dredging and port improvement; marine minerals use and ocean dredged material disposal, and global climate change (see Appendix E for a complete description of ongoing and planned activities). Also, the impacts of land use and coastal development affect sea turtles primarily through habitat loss from development near sea turtle nesting areas. These activities could result in short-term or permanent displacement and injury or mortality to individual sea turtles.

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, especially considering potential interactions with other IPFs. Possible impacts to sea turtles due to climate change include increased storm severity and frequency; increased erosion and sediment deposition; disease frequency; ocean acidification; and altered habitat, prey availability, ecology, and migration patterns (Hawkes et al. 2009). The potential implications of these factors and other related environmental changes for sea turtles, and the ways in which they are likely to interact with the effects of regional offshore wind development, are complex and uncertain. Increasing ocean temperatures are already having a quantifiable impact on ecological processes that affect sea turtles (NEFSC and SEFSC 2021). Evidence shows a northward shift in the distribution of certain species based on water temperature (McMahon and Hays 2006; NEFSC and SEFSC 2021), and future warming could result in a higher interaction between sea turtles and offshore wind farms, potentially magnifying the impacts and benefits described above. Over time, climate change, in combination with coastal and offshore development, would alter existing habitats, potentially rendering some areas unsuitable for certain species and more suitable for others. Green, loggerhead, and Kemp's ridley sea turtle populations have generally been increasing over the past few decades, while leatherback sea turtle populations have declined. Leatherback declines are thought to be primarily related to development of nesting habitat, incidental capture from fisheries, entanglement in fishing gear, and vessel strikes (NMFS and USFWS 2020). Therefore, potential climate change could result in population-level impacts on sea turtle species by displacement, impacts on prey species, altered population dynamics, and increased mortality.

Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on sea turtles include:

- Continued O&M of the Block Island project (5 WTGs) installed in State waters,
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect sea turtles through the primary IPFs of noise, presence of structures, and land disturbance. Ongoing offshore wind activities would have the same type of impacts from noise, presence of structures, and land disturbance that are described in detail in the following section for planned offshore wind activities but the impacts would be of lower intensity.

3.5.7.3.2 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 Proposed Action).

Planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on sea turtles through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and decommissioning of 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. These include other offshore wind and renewable energy projects, and potential port improvements to support the development of this industry regionwide (see Appendix E).

This Draft EIS expects that future offshore wind activities, exclusive of the Proposed Action, could affect sea turtles through the following primary IPFs: seafloor disturbance, sediment suspension and deposition, noise, electrical and magnetic fields, accidental releases of contaminants, trash, and debris, traffic, lighting, presence of structures, and port utilization. BOEM (2019c) identifies these important IPFs for sea turtles due to offshore wind activities on the North Atlantic OCS and describes the cause and-effect relationships between renewable energy projects and sea turtles.

Offshore wind activities have the potential to produce impacts from site characterization studies, site assessment data collection activities that involve installation of meteorological towers or buoys, and installation and operation of turbine structures. The IPFs deemed to have impacts on sea turtles are summarized in this section for offshore wind activities without the Proposed Action. This section provides a general description of these mechanisms, recognizing the extent and significance of potential effects on conditions cannot be fully quantified for projects that are in the conceptual or proposal stage and have not been fully designed. Where appropriate, certain potential effects resulting from these future actions can be generally characterized by comparison to effects resulting from the Proposed Action that are likely to be similar in nature and significance. The intent of this section is to provide a general overview of how future activities might influence future environmental conditions. Should any or all of the future activities described in Appendix E proceed, each would be subject to independent NEPA analyses and regulatory approvals, and their environmental effects would be fully considered therein.

Seafloor disturbance: Future offshore wind projects could disturb seabed while installing associated undersea cables. Trenching activities to place transmission cables would create areas of short-term seafloor disturbance. Installation of WTGs, support equipment, scour protection, and other related equipment would result in the long-term alteration of substrates. These structures are likely to alter prey composition for sea turtles by adding hard substrates that would result in a reef effect; however, prey availability is not considered a limiting factor for sea turtles. The area permanently altered by new infrastructure and scour protection would be miniscule in comparison to the area of the WEA and OCS region. short-term impacts would occur over a larger area but would be distributed in time from 2023 to 2030 and are expected to only have short term localized impacts. The area of short-term impacts would also be small in comparison to the WEA and OCS region. Alterations to the seafloor are not expected to negatively impact prey resources for sea turtles, and the overall impact to sea turtles is expected to be negligible.

Sediment suspension and deposition: Future offshore wind projects could disturb seabed while installing associated undersea cables, causing an increase in suspended sediment. This disturbance would result in short-term plumes of suspended sediments in the immediate construction areas. Elliott (2017) monitored TSS levels during construction of the BIWF. The observed TSS levels were far lower than levels predicted using the same modeling methods, dissipating to baseline levels less than 50-ft (15.2-m) from the disturbance. Both the modeled TSS effects, which are conservatively high, and the observed TSS effects were short term and within the range of baseline variability; however, these effects are short term (lasting only a few tide cycles) due to the low mobility of sediments (primarily sand) in a proposed dredge area (Stantec 2020).

This limited temporal effect over a relatively small area is not expected to interfere with sea turtle foraging success. Data are not available regarding impacts of suspended sediments on adult or juvenile sea turtles although elevated suspended sediments may cause individuals to alter normal movements and behaviors. Sea turtles are expected to avoid the immediate vicinity of sediment plumes; however, these changes in behavior would be limited in extent, short-term in duration, and likely too small to be detected (NOAA 2022).

Increases in suspended sediments may also alter the behavior or prey species for sea turtles. Seafloor disturbance during construction of future offshore wind projects may affect foraging success for some prey species and result in short-term behavior disturbances for individual prey species. Because these disturbances are be localized in extent, limited in magnitude, and short-term, only short-term, limited impacts to fish and invertebrates are expected from suspended sediments, and no population level impacts are expected for any prey species. Therefore, secondary effects from future wind activities to sea turtles from prey availability are expected to have minor, short-term adverse impacts.

Noise: Under the No Action Alternative, human activities would continue to generate underwater noise with the potential to affect sea turtles. Existing and future sources of anthropogenic underwater noise include commercial, government and military, research, and recreational vessel activity, and the development and operation of other wind energy projects on the OCS. Several offshore wind project construction periods would overlap from 2022 to 2030 (see Appendix E). Construction from these projects, most notably pile-driving, would create airborne and underwater noise with minor potential to affect sea turtles. Underwater noise could result in physiological and/or behavioral effects, including potential auditory injuries, short-term disturbance or displacement, and possible startle or stress responses. Injury and behavioral disturbance thresholds for sea turtles are provided in

Table 3.5.7-3. Permanent sublethal hearing injuries, although possible, are unlikely to occur based on current and anticipated future impact avoidance and minimization requirements. Other sources of noise from wind projects include helicopters and aircraft used for transportation and facility monitoring, G&G surveys, WTG operation, and vessel traffic associated with these activities.

Table 3.5.7-3. Injury and Behavioral Disturbance Thresholds for Sea Turtles

Response	Metric	Threshold Level
Behavioral	SPL (dB re 1 µPa)	175 dB
Injury	L_{pk} (dB re 1 µPa)	232 dB
Injury (Impulsive)	SEL (dB re 1 µPa^{2}s)	204 dB
Injury (Non-impulsive)	SEL (dB re 1 µPa2s)	220 dB

Notes:

µPa = micropascal(s); µPa^{2}s = micropascal squared second; dB = decibel(s); L_{pk} = peak sound pressure level; SEL = sound exposure level; SPL = sound pressure level

The noise associated with offshore wind project construction and operation generally falls into two categories: (1) impulsive noise sources, such as impact pile-driving, which generate sharp instantaneous changes in sound pressure and (2) non-impulsive noise sources, such as vessel engine noise, vibratory pile-driving, and WTG operation, which remain relatively constant and stable over a given time period. Impulsive and non-impulsive noise sources associated with offshore wind projects and other activities likely to occur on the OCS in the future are discussed below.

3.5.7.3.2.1 Impulsive Noise – G&G Surveys

Without mitigation, certain types of G&G surveys could result in long-term, high-intensity impacts on sea turtles. These effects may include behavioral avoidance of the ensonified area and increased stress; temporary loss of hearing sensitivity; and permanent auditory injury depending on the type of sound source, distance from the source, and duration of exposure; however, G&G noise resulting from offshore wind site characterization surveys is of less intensity than the acoustic energy characterized by seismic air guns and affects a much smaller area than G&G noise from seismic air gun surveys typically associated with oil and gas exploration. Although seismic air guns are not used for offshore wind site characterization surveys, sub-bottom profiler technologies that are hull-mounted on survey vessels may incidentally harass sea turtles and would require mitigation and monitoring measures.

None of the equipment operated during these surveys has source levels loud enough to result in PTS or TTS based on the peak or cumulative exposure criteria. Therefore, physical effects are extremely unlikely to occur. Sea turtles exhibit a behavioral response when exposed to received SPL levels of 175 dB, and some noise generated from G&G surveys is within their hearing range. Based on analysis of the potential for effects to ESA-listed species from G&G surveys in the Greater Atlantic Region performed by NMFS (Table 5 in NMFS 2021), the distance to the behavioral threshold for sea turtles is 131 ft (40 m) for boomers and bubble guns, and for sparkers, it is 295 ft (90 m) (NMFS 2021). Thus, a sea turtle needs to be within 295 ft (90 m) of the source to be exposed to potentially disturbing levels of noise. It is expected that sea turtles would react to this exposure by swimming away from the sound source; this limits exposure to a short time--just the few seconds it would take an individual to swim away to avoid the noise. The risk of exposure to potentially disturbing levels of noise is reduced by the use of PSOs to monitor for sea turtles. At the start of a survey, equipment cannot be turned on until the clearance zone is clear of turtles for at least 30 minutes. This condition is expected to reduce the potential for sea turtles to be exposed to noise that may be disturbing; however, even if a sea turtle is submerged and not seen by the PSO, in the worst case, it is expected that sea turtles would avoid the area ensonified by the survey equipment that they can perceive (NMFS 2021). This avoidance behavior would ensure that the duration of exposure was short and unlikely to accumulate to causing TTS or PTS.

Because the area where increased underwater noise would occur is transient and increased underwater noise would only be experienced in a particular area for only seconds, it is expected that any effects to behavior would be minor and limited to a short-term disruption of normal behaviors, short-term avoidance of the ensonified area, and minor additional energy expenditure spent while swimming away from the noisy area. If foraging or migrations are disrupted, they would quickly resume once the G&G survey vessel leaves the area. No sea turtles would be displaced from a particular area for more than a few minutes. While the movements of individual sea turtles would be affected by the sound associated with the survey, these effects are short-term (seconds to minutes) and localized (avoiding an area no larger than 295 ft [90 m] (NMFS 2021)), and there would be only a minor and short-term impact on foraging, migrating, or resting sea turtles. Effects to individual sea turtles from brief exposure to potentially disturbing levels of noise would be minor and limited to a brief startle, a short increase in swimming speed, and/or short-term displacement and would be so small that they cannot be meaningfully measured, detected, or evaluated. BOEM has concluded that disturbance of sea turtles from underwater noise generated by site characterization and site assessment activities would likely result in short-term displacement and other behavioral or nonbiologically significant physiological consequences (i.e., no injury or mortality would occur), and impacts on sea turtles would be short term and minor.

3.5.7.3.2.2 Impulsive Noise – Impact Pile-Driving

The most significant impulsive noise source associated with offshore wind projects is pile-driving noise during the construction phase. WTG foundation installation involves impact pile-driving, which produces high SPLs in both the surrounding in-air and underwater environments. A typical foundation pile installation generates 4 to 6 consecutive hours of impulsive or vibratory noise with intensity levels like those described for the Proposed Action (see Section 3.5.7.5). Potential noise exposure events would occur intermittently over several weeks during the allowable construction window (which may vary and would be determined through consultation with NMFS) in the sea turtle GAA. Under the No Action Alternative, construction of additional offshore structures would generate short-term and intermittent impulsive underwater noise with the potential to impact sea turtles. These effects would be limited to specific construction windows beginning in 2022 and continuing through 2030.

Due to the anticipated frequency and spatial extent of effects, impulsive underwater noise from impact pile-driving during planned offshore wind development represents the highest likelihood for exposure of individual sea turtles to adverse impacts from noise. Although these potential impacts are acknowledged, their potential significance is unclear because sea turtle sensitivity and behavioral responses to underwater noise are a subject of ongoing study (Elliott et al. 2019; Renewables Consulting Group 2018). Potential behavioral impacts may include altered submergence patterns, short-term disturbance, startle response (diving or swimming away), and short-term displacement of feeding / migrating and a short-term stress response, if present within the ensonified area (NSF and USGS 2011; Samuel et al. 2005). The accumulated stress and energetic costs of avoiding repeated exposure to pile-driving noise over a season or a life stage could have long-term impacts on survival and fitness (DoN 2018). Conversely, sea turtles could become habituated to repeated noise exposure over time and not suffer long-term consequences (O'Hara and Wilcox 1990). This type of noise habituation has been demonstrated for sea turtles even when the repeated exposures were separated by several days (Bartol and Bartol 2011; DoN 2018).

Sea turtles that are close to impact pile-driving could experience a short-term or permanent loss of hearing sensitivity. In theory, reduced hearing sensitivity could limit the ability to detect predators and prey or find potential mates, reducing the survival and fitness of affected individuals; however, the role and importance of hearing in these biological functions for sea turtles remain poorly understood (Lavender et al. 2014).

Mitigation measures such as those described in Section 4.0 and Appendix O of the COP (Sunrise Wind 2021h) would be required in all offshore wind development projects, and impacts to sea turtles from construction-related noise is likely to be limited to minimal or moderate short-term impacts on a small number of individuals. Short-term impacts on individuals would not be significant at the population level and would be minor overall.

3.5.7.3.2.3 Non-Impulsive Noise

Non-impulsive underwater noise sources in the GAA include baseline noise levels from commercial, military and government, research, and recreational vessel traffic; aircraft; and offshore development activities. The planned development of other wind energy facilities would contribute additional new sources of intermittent non-impulsive underwater noise, including helicopters and fixed-wing aircraft, construction and O&M vessels, and vibratory pile-driving during construction. Operational noise from WTGs constitutes a low-level, non-impulsive underwater noise source throughout the life of a given project.

Helicopters and fixed-wing aircraft may be used during initial site surveys, protected species monitoring prior to and during construction, and facility monitoring. Sea turtle responses to aircraft noise and disturbance is not well documented. Researchers have speculated that sea turtles are not highly sensitive to disturbance from aircraft (Jean et al. 2010). Helicopters and aircraft would operate at altitudes of 1,000 ft (300 m) or more except when helicopters are landing or departing from service vessels. NMFS (2020) determined that noise and disturbance effects on sea turtles from aircraft used for construction and O&M of the Vineyard Wind offshore wind facility would be insignificant. Based on this information, cumulative effects on sea turtles from aircraft used for wind energy development on the OCS would be negligible.

Vibratory pile driving used during submarine cable and port facility construction is the most intensive source of non-impulsive underwater noise expected to result from planned offshore wind energy development. Typical noise levels generated by vibratory pile driving used for facility development and port improvements are below thresholds associated with potential hearing injury in sea turtles. Vibratory pile-driving noise can exceed levels above behavioral disturbance thresholds (

Table 3.5.7-3) for sea turtles but only within a short distance (i.e., less than 33 ft [10 m]) from the source using the NMFS Multi-Species Pile Driving Calculator (Version 1.1, NMFS Protected Species Division, Silver Spring, Maryland). Given this low probability of exposure to above-threshold vibratory pile-driving noise and the fact that vibratory pile-driving activities would be limited in extent, short-term in duration, and widely separated, vibratory pile-driving noise effects on sea turtles would be negligible.

Construction and operational vessels are the most broadly distributed source of continuous non-impulsive noise associated with offshore wind projects. Sea turtle exposure to underwater vessel noise would incrementally increase as a result of planned offshore wind projects, especially during construction periods. Applying vessel activity estimates developed by BOEM based on their 2019 study *National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf* (BOEM 2019c), vessel activity could peak in 2024, with as many as 379 vessels involved in the construction of reasonably foreseeable projects (see Appendix E for details); however, this increase must be considered relative to the baseline level of vessel traffic.

Annual baseline traffic measured from July 1, 2018, to June 30, 2019, showed 172,267 transits in the Marine Traffic Study Area surrounding the WEA (Appendix X, COP; Sunrise Wind 2021i). Assuming that construction of up to five lease areas could be active at the same time, and assuming similar levels of vessel traffic as estimated for SRWF (323 vessel transits over a 2-year construction period, or 162 per year), construction activities could result in an increase of 810 transits of the WEA per year. This would represent an increase in vessel traffic of approximately 0.5 percent over baseline conditions, with most of the transit travel occurring in existing sea lanes from ports to the WEA. Due to the small change in vessel traffic from the baseline, and limited impact of vessel noise to sea turtles, no injury or behavioral effects from vessel noise are anticipated for planned offshore wind projects. Although sea turtles could become habituated to repeated noise exposure over time (Hazel et al. 2007), vessel noise effects for other wind farm development projects are expected to be broadly similar to noise levels from existing vessel traffic in the region. Nearly all vessels generate SPL of 190 dB or less and would not generate noise above the disturbance thresholds at distances greater than 10 m (Hatch et al. 2008). Nonetheless, periodic localized, intermittent, and short-term behavioral impacts on sea turtles could occur. Based on sea turtle responses to other types of disturbance (e.g., Bevan et al. 2018), turtle behavior is expected to return to normal when vessel noise dissipates. Given sea turtles' apparent tolerance exposure to high-level underwater noise produced by vessels, the short-term nature of any behavioral responses, and the patchy distribution of sea turtles in the GAA, the effects of vessel noise from future activities on sea turtles would be negligible.

The maximum anticipated noise levels produced by operational WTGs are below recommended thresholds for sea turtle injury and behavioral effects. Sea turtles appear to habituate to repetitive underwater noise not accompanied by an overt threat (Bartol and Bartol 2011; DoN 2018; Hazel et al. 2007). This suggests that even if WTGs generate noise detectable to sea turtles in the immediate proximity, the exposed individuals are not expected to experience measurable adverse effects. The effects of operational noise from future wind farm development on sea turtles would be negligible.

Ongoing non-impulsive noise due to future wind farm actions and associated vessel traffic and the operation of WTGs is persistent and expected to continue indefinitely; however, because of sea turtles' apparent tolerance for non-impulsive sources and the small area and short duration they may experience effects, non-impulsive noise would have a negligible effect on sea turtles.

EMF: Under the No Action Alternative, several thousand miles of new submarine electrical transmission cables would be added in the GAA for sea turtles. Each cable would generate EMF effects within the immediate proximity. Submarine power cables emit anthropogenic EMF that can interact with natural geomagnetic EMF, potentially affecting the behavior of electromagnetic sensitive species by disrupting cues. EMF are generated by current flow passing through power cables during operation and can be divided into electric fields and magnetic fields (Taormina et al. 2018). Magnetic fields have a second induced component, a weak electric field, or an induced electric field. Both electric and magnetic fields rapidly diminish in strength with increasing distance from the source.

The available evidence indicates that sea turtles are magnet-sensitive and orient to the Earth's magnetic field for navigation. Although sea turtles may detect magnetic fields as low as 0.05 milligauss (mG), they are unlikely to detect magnetic fields below 50 mG (Normandeau Associates Inc. et al. 2011; Snoek et al. 2016). Potential EMF effects are be reduced by cable shielding and burial to an appropriate depth. New submarine cables would be installed to maintain a minimum separation of at least 330 ft (100 m) from other known cables to avoid damaging existing infrastructure during installation. This separation distance avoids additive EMF effects from adjacent cables. Although artificial EMF effects on sea turtles are not well studied, the affected areas are be localized around unburied cable segments and limited to within 10 to 25 ft (3 to 7.5 m) of the cable surface (Snyder et al. 2019). Deviations in migration, therefore, would be small and would not significantly impact energy expenditure in sea turtles. EMF impacts from future non-Project activities would be negligible.

Accidental releases - contaminants: Toxic contaminants could be accidentally released as a result of increased human activity associated with future offshore wind construction activities. Aquatic contaminant exposure could result in mortality, and sublethal effects could impact many of the species' physiological systems during all life stages (Bembenek-Bailey et al. 2019; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Sea turtles may be affected sublethally in a variety of ways which could include experiencing depressed immune system function; poor body condition; and reduced growth rates, fecundity, and reproductive success (Gall and Thompson 2015; Hoarau et al.

2014; Nelms et al. 2016; Schuyler et al. 2014). Furthermore, accidental releases may indirectly impact sea turtles by impacting prey species; however, all vessels would comply with USCG regulations, and wind farm construction projects would comply with additional BOEM requirements that avoid and minimize accidental releases of fuel, oil, and other potential aquatic contaminants. Therefore, potential accidental releases would not appreciably contribute to adverse impacts to sea turtles, and these impacts would be negligible.

Accidental releases - trash and debris: All species of sea turtles have been documented ingesting plastic fragments (Bugoni et al. 2001; Hoarau et al. 2014; Nelms et al. 2016) and a variety of other anthropogenic waste (Tomás et al. 2002), likely mistaking debris for potential prey items (Schuyler et al. 2014). Ingesting trash or exposure to aquatic contaminants could be lethal to sea turtles; however, sea turtles may be affected sublethally in a variety of ways, which could include experiencing depressed immune system function; poor body condition; and reduced growth rates, fecundity, and reproductive success (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). Sea turtles could additionally become entangled in debris, causing lethal or injurious impacts. Entanglement in lost fishing gear is a significant cause of mortality in both juvenile and adult sea turtles and was noted as a threat to recovery for multiple ESA-listed turtles in the marine environment (NMFS and USFWS 1991b; 1992; NMFS 2011b). Based on a recent global review, 5.5 percent of encountered sea turtles were found to be entangled, and 90.6 percent of these were dead (Duncan 2017). Lost or discarded fishing gear was associated with most of these entanglements and is acknowledged as a major cause of mortality for listed sea turtles.

Although these effects are acknowledged, the likelihood of adverse population-level impacts on sea turtles from accidental releases of debris or contaminants from future offshore wind activities on the OCS is low. Current regulations and requirements imposed on federally approved activities prohibit vessels from dumping potentially harmful debris in United States waters. While precautions to prevent accidental releases would be employed by vessels and port operations associated with future offshore wind development, it is likely that some debris could be lost overboard during construction, maintenance, and routine vessel activities; however, the amount would likely be miniscule compared to other inputs already occurring. In the event of a release, it would be an accidental, low-probability event in the vicinity of project areas or the areas from ports to the project areas used by vessels. Based on these factors, accidental releases of trash and debris from federally approved activities on the OCS are not expected to appreciably contribute to adverse sea turtle impacts, and therefore the effects of the No Action Alternative would be negligible.

Traffic: Vessel strike is an increasing concern for sea turtles. The percentage of loggerhead sea turtles stranded with injuries consistent with vessel strikes increased from approximately 10 percent in the 1980s to 20.5 percent in 2004, although an unknown number may have been struck postmortem (NMFS and USFWS 2007). Sea turtles are expected to be most susceptible to vessel collision in shelf waters, where they forage. Furthermore, they cannot reliably avoid being struck by vessels exceeding 2 knots (Hazel et al. 2007); typical vessel speeds in the GAA may exceed 10 knots. Up to 70 vessels associated with offshore wind development may operate in the GAA during the peak construction period in 2025. Additional fishing vessels may be present in the vicinity due to the expected increase in fish biomass around the WTG structures. Increased vessel traffic could result in sea turtle injury or mortality; however, the proportional increase in vessel traffic from baseline would be minimal (refer to Section 3.6.6 [*Navigation and Vessel Traffic*] and Appendix E). Green, loggerhead, and Kemp's ridley sea turtle populations have generally been increasing over the past few decades, while leatherback sea turtle populations have declined. Despite the potential for individual fatalities, no population-level impacts on sea turtles are expected based on occurrence and potential exposure and the low number of additional strikes from wind turbine vessel traffic. Assuming other future offshore wind projects employ the same mitigation measures included in the proposed Project, impacts to sea turtles Nighttime artificial lighting associated with offshore structures and vessels could represent a source of attraction, avoidance, or other behavioral responses in sea turtles. Although responses to light have been studied in various species and life stages of sea turtles in nesting beach environments, the effects of offshore lighting remain uncertain. Shoreline development is the predominant existing artificial lighting source in the nearshore component of the GAA, whereas vessels, mainly fishing vessels, are the predominant artificial lighting source offshore. Future wind energy development would contribute additional light sources to the offshore component of the GAA, including a short-term increase in light from vessels used during construction, and the long-term use of navigational lighting on new WTGs and OSSs. An estimated 3,210 foundations are forecasted for future wind energy construction. Each structure would have minimal yellow flashing navigational lighting as well as red flashing FAA hazard lights in accordance with BOEM's (2019a) guidelines. Although the potential effects of offshore lighting on juvenile and adult sea turtles is uncertain, WTG lighting is anticipated to have a negligible effect on sea turtles based on the current lack of evidence that platform lighting leads to effects on sea turtles, as shown by decades of oil and gas platform operation in the Gulf of Mexico, which can have considerably more lighting than offshore WTGs (BOEM 2019c).

Presence of structures: The addition of additional new offshore foundations in the GAA could increase sea turtle prey availability by creating new hard-bottom habitat, increasing pelagic productivity in local areas, or promoting fish aggregations at foundations (Bailey et al. 2014). Sections 3.5.2 (*Benthic Habitat*) and 3.5.5 (*Finfish, Invertebrates, and Essential Fish Habitat*) discuss reef creation and altered water flow in detail. The significance of this reef effect is unknown but is not expected to result in biologically significant impacts to sea turtles given the broad geographic range of species during their annual foraging migrations.

The presence of structures could indirectly concentrate recreational fishing around foundations, which could indirectly increase the potential for sea turtle entanglement in both lines and nets (Gall and Thompson 2015; Nelms et al. 2016; Shigenaka et al. 2010). Entanglement in both lines and nets could lead to injury and mortality due to abrasions, loss of limbs, and increased drag, leading to reduced foraging efficiency and ability to avoid predators (Barreiros and Raykov 2014; Gregory 2009; Vegter et al. 2014). Between 2016 and 2018, 186 sea turtles were documented as hooked or entangled with recreational fishing gear (BOEM 2021). Due to the high number of foundations in a GAA, it is likely that recreational and for-hire fisheries would avoid overcrowding structures by dispersing effort across many WTG foundations; however, the risk of entanglement and hooking or ingestion of marine debris could slightly increase, since both fishers and turtles may be attracted to the same areas.

Structural elements of WTGs are likely to be present for the 25- to 35-year operational life of each generator. Once WTGs and OCS–DC have foundations have been installed within the seafloor, the presence of the operating WTGs would have converted the existing open water habitat to one with increased hard bottom, making it comparable to an artificial reef-like habitat. The presence of the WTG foundations, scour protection, and IAC protection creates three-dimensional hard bottom habitats resulting in a reef effect that is expected to attract numerous species of algae, shellfish, finfish, and sea turtles (Langhamer 2012; Reubens et al. 2013; Wilhelmsson et al. 2006). Sea turtles have been observed within the vicinity of offshore structures, such as oil platforms, foraging and resting under the platforms (Gitschlag and Herczeg 1994; National Research Council 1996). High concentrations of sea turtles have been reported around these oil platforms (Gitschlag and Herczeg 1994; National Research Council 1996).

As a result of the increased habitat and foraging opportunities at the new artificial reef-like habitat, sea turtles could potentially remain in areas longer than they normally would and could become susceptible to cold stunning or death; however, artificial habitat created by these offshore structures can provide multiple benefits for sea turtles, including foraging habitats, shelter from predation and strong currents, and methods of removing biological build-up from their carapaces (Barnette 2017; National Research Council 1996). It is estimated that offshore petroleum platforms in the Gulf of Mexico, provided an additional 2,000 mi^2 (5,180 km^2) of hard bottom habitat (Gallaway 1981). Wakes created by the presence of the foundations may influence distributions of drifting jellyfish aggregations; however, since other prey species available to sea turtles would not be affected by these wakes, impacts on sea turtle foraging are not expected to be substantial (Kraus et al. 2019).

On this basis, BOEM concludes that the presence of visible structures from O&M would have negligible direct effects on sea turtle movement and migration, and negligible to minor beneficial, long-term, indirect effects on the distribution, abundance, and availability of sea turtle prey and forage resources.

Port utilization: Any port expansions could increase the total amount of disturbed benthic habitat (see Alternative A - No Action discussion) 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 GAA, port expansions are not expected to impact sea turtles. Dredging for port facility improvement could lead to additional impacts on turtles from incidental entrainment, impingement, or capture. Dredging impacts on sea turtles are relatively rare, with most observed injury and mortality events in the United States associated with hopper dredging in and around core habitat areas in the southern portion of the GAA and along the Gulf Coast (Michel et al. 2013; USACE 2020). Ongoing maintenance dredging of these facilities may incrementally increase related risks to individual turtles over the lifetime of the facilities; however, typical mitigation measures such as timing restrictions should minimize this potential. Given the available information, the risk of injury or mortality of individual sea turtles resulting from dredging associated with the projects considered here is low and population-level effects are unlikely to occur. Therefore, associated effects of port expansions on sea turtles would be long term and minor. Potential vessel traffic impacts associated with port use are described under the Vessel Traffic section.

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

All sea turtles that are likely to occur in the proposed Project Area are listed as threatened or endangered under the ESA, therefore the effects to these species would the same as described above. Based on the information contained in this document, we anticipate that the reasonably foreseeable offshore wind activities are likely to adversely affect but not jeopardize the continued existence of leatherback, loggerhead, Kemp’s ridley, and green sea turtles.

3.5.7.3.4 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and conceptual decommissioning would not occur; and potential impacts associated with the Project to sea turtles would not occur. Sea turtles would continue to be affected by current environmental trends and ongoing activities that would continue to have short-term to long-term impacts on sea turtles, primarily through construction-related lighting, noise, habitat alternation, collision risk, and artificial reef effect.

BOEM anticipates that the sea turtle impacts due to current environmental trends and ongoing activities associated with the No Action Alternative would be **negligible** to **moderate** adverse with the potential for **minor beneficial** impacts.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities, natural and human-caused IPFs would continue to affect sea turtles. BOEM anticipates that the overall impacts associated Alternative A, the No Action Alternative, when combined with all other planned activities (including offshore wind) in the GAA would result in overall **moderate** adverse and **minor beneficial** impacts.

3.5.7.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on sea turtles:

- The number of WTGs;
- Installation methods;
- The time of year during which construction occurs.

Variability of the proposed Project design exists as outlined in Appendix C. Below is a summary of potential variances in impacts:

- WTG number and locations: the level of hazard related to WTGs is proportional to the number of WTGs installed; fewer WTGs would result in lower behavioral disturbance and decreased risk of TTS for sea turtles during construction and installation and O&M. The potential reductions included in Alternatives C-1 and C-2 may reduce the extent and number of individuals affected but would not lower the overall impact level.
- Final installation methods: any variance to installation methods or materials used for the assumptions described in the COP, Appendix I1 (Sunrise Wind 2021e), may result in large changes to the areas where sea turtles may experience TTS, or behavioral effects. Potential changes to installation methods may reduce or increase the extent and number of individuals affected but would not alter the overall impact level to sea turtles.
- Offshore export cable routes: the route chosen (including variants within the general route) would determine the amount of seafloor disturbance and duration of sediment suspension but would not alter the level of impacts to sea turtles.

- Season of construction: different sea turtles are present and active in the proposed Project Area at different times of year. Construction when fewer sea turtles are present would have a lesser impact than construction when higher numbers are present. Changes to the construction schedule could alter the number of individuals affected or change which species are primarily affected. This would not change the overall impact determination but may help reduce impacts to species whose populations are more sensitive to impacts.

3.5.7.5 Impacts of Alternative B - Proposed Action on Sea Turtles

The activities associated with offshore SRWF (94 11-MW WTGs out of 102 potential positions) and SRWEC-OCS/SRWEC-NYS cabling, and OnCS-DC, transmission cable, and interconnection cable with Alternative B include construction and installation, O&M, and decommissioning. These actions have the potential to cause both direct and indirect impacts to sea turtles. The IPFs associated with construction and post construction O&M activities include accidental releases, seafloor disturbance, sediment suspension, and deposition, electric and magnetic fields, lighting, noise, presence of structures, traffic, and port utilization. These IPFs are thoroughly discussed in the sea turtle assessment prepared for this Project (Sunrise Wind 2021j). The conclusions of the sea turtle assessment are presented in this section and include consideration of the Project's mitigation and monitoring measures (Appendix H).

3.5.7.5.1 Construction and Installation

3.5.7.5.1.1 Onshore Activities and Facilities

No regular sea turtle nesting occurs in the onshore portion of the proposed Project Area (refer to Section 3.5.7.1). However, no project activities are expected to be conducted in beach locations where nests may occur. Cable installation would be done through horizontal directional drilling underneath potential nesting sites, avoiding impacts to these areas. Construction and operation of onshore facilities is not expected to have any direct impacts to sea turtles, and the potential for impacts is negligible.

3.5.7.5.1.2 Offshore Activities and Facilities

Construction impacts to sea turtles could occur from the following IPFs: seafloor disturbance, sediment suspension and deposition, noise, electric and magnetic fields, discharges and release, trash and debris, vessel traffic, and lighting. Unless noted otherwise, construction-related impacts would be short-term. The potential for these impacts to occur are discussed in detail in the following sections.

Seafloor disturbance: During construction of the SRWF, seafloor disturbances would be associated with seafloor preparation, placement of scour protection/cable protection, foundation installation, vessel anchoring and jack-up, and IAC installation. These seafloor disturbances could directly impact benthic species such as mollusks and crabs which are prey for sea turtles. As foundations, anchors, and/or jack-ups are placed on the seafloor, direct injury or mortality could occur to benthic species residing within the footprint of the foundations. As discussed for benthic resources (Section 4.4.2.2 in COP; Sunrise Wind 2022b), it may take up to 5 years before stable communities are established following construction activities (Petersen and Malm 2006); however, the footprint of direct benthic impacts within the SRWF are minimal when compared to the ample available bottom habitat surrounding the SRWF. Additionally, mobile benthic species are likely to vacate the area during construction activities, avoiding direct injury/mortality.

A number of methodologies for sand wave leveling and cable installation are being considered to prepare the seafloor and install the IAC within the SRWF (e.g., suction hopper dredge, mechanical plow, jet plow) (see Section 3.3.3.4 in COP, Sunrise Wind 2022b). The suction hopper dredging technique recovers and relocates excavated materials from one location to another. A drag head is towed over the sand by a vessel while a pump pulls fluidized sand into the vessel's storage hopper. Any sediment removed would be relocated within the local sand wave field along the IAC. Once full, the vessel would relocate to a designated storage or disposal area to offload materials. Excavation activities have the potential to disturb, catch, or entrain sea turtles that may not have moved away from the source of the activity quickly enough (Murray 2011). This potential impact is most likely to harm resting turtles offshore and juveniles utilizing nearshore areas; however, the risk of injury to sea turtles from hopper dredges in particular is expected to be lower in the open ocean, compared to within navigational channels (Michel et al. 2013; USACE 2020). This may be due to the lower density of sea turtles in offshore waters, and the ability to move away from an active drag head. Consultations with agencies in development of environmental protection measures such as the use of PSOs (as detailed below) are likely to reduce risk of injury or mortality of individual sea turtles.

Potential impacts to sea turtles from seafloor disturbance are expected to include direct impact/injury to benthic prey, temporary loss of habitat for benthic prey species, and injury/mortality from use of installation techniques such as a suction hopper dredge; however, given the transient and short duration of construction activities (approximately 18 months), the wide availability of prey outside the SRWF, the ample available habitat surrounding the localized area of disturbances, and environmental protection measures, impacts on sea turtles from seafloor disturbances during construction of the SRWF are expected to be short-term and minimal. Because individual sea turtles may be injured or killed, but no population level impacts are anticipated, the construction activities for the SRWF would have a minor short-term impact on sea turtles.

Sediment suspension and deposition: SRWF construction activities associated with seafloor preparation, foundation installation, placement of scour protection/cable protection, vessel anchoring and jack-up, and IAC installation would directly result in short-term, localized increases in sediment suspension within the water column, which would increase turbidity. Increased turbidity could decrease visibility for sea turtles, potentially restricting predation efficiency. Additionally, the effects of turbidity on prey species (as discussed in Section 3.5.2 *Benthic Resources* and Section 3.5.5 *Finfish, Invertebrates, and Essential Fish Habitat*) could disrupt available forage for sea turtles and cause avoidance behavior within localized construction areas.

The extent of turbidity depends on sediment type and size as well as the expected duration of the sediment disturbing activities. For example, sediment-disturbing activities in sandy substrates with larger (heavier) particles typically results in shorter periods of elevated turbidity compared to similar work in areas with greater silt and clay content. The longer the disturbance continues, the longer the sediments are expected to be suspended within the water column.

The COP, Appendix H (Sediment Transport Modeling Report) (Sunrise Wind 2021d), provides further information on suspended sediments from installation of the IAC in federal waters. As detailed in Section 3.5.2 *Benthic Resources* and Section 3.5.5 *Finfish, Invertebrates, and Essential Fish Habitat,* only short-term, limited impacts to fish and invertebrates are expected from suspended sediments; therefore, secondary effects on sea turtle prey availability are not expected. As described in the COP,

Appendix H (Sunrise Wind 2021d), TSS concentrations are predicted to return to ambient levels (less than 10 mg/L) within 0.4 hours following installation of the modeled SRWEC–OCS cable corridor centerline and within 0.34 hours following installation of the modeled SRWEC–NYS cable corridor centerline. Furthermore, the TSS plumes were shown to be primarily contained within the lower portion of the water column, approximately 9.8-ft (3.0-m) above the seafloor for both SRWEC–OCS and SRWEC–NYS installation. This limited temporal effect over a relatively small area are not expected to interfere with sea turtle foraging success.

Based on the relatively low anticipated density of sea turtles within the SRWF and the expected short-term and localized increases in turbidity, impacts on sea turtles are expected to be short-term and minor.

Noise: Sea turtles may be adversely impacted by underwater noise produced during the construction of the SRWF. The main sources of noise during the construction phase would be G&G surveys, MEC/UXO surveys (requiring potential G&G to locate MEC/UXOs), pile driving activities, and vessel traffic. Underwater noise could result in physiological and/or behavioral effects to sea turtles, including potential auditory injuries, short-term disturbance or displacement, and possible startle or stress responses. A detailed explanation of predicted noise levels is provided in COP, Appendix I1 (Sunrise Wind 2021e).

Limited research was conducted on the physiological impacts of underwater sound on sea turtles, and very few data are available on the behavioral responses of sea turtles to noise; however, the data available suggest that sea turtles can detect acoustic stimuli and respond behaviorally (Dow Piniak et al. 2012). While general hearing sensitivities for all species are below 2 kHz, primary hearing frequency ranges of sea turtle vary by species and life stage (Bartol and Ketten 2006; Bartol et al. 1999; Dow Piniak et al. 2012; Martin et al. 2012; Piniak et al. 2016).

The studies available on underwater noise impacts to sea turtles examine the behavioral responses of loggerhead and green sea turtles to underwater noise produced by seismic guns. Behavioral responses observed during seismic surveys included avoiding the source of the sound (O'Hara and Wilcox 1990), startle reactions (DeRuiter and Doukara 2012), and increased swimming speeds (McCauley et al. 2000). Other possible behavioral responses could include increased surfacing time and decreased foraging. McCauley et al. (2000) reported that SPL of 166 dB re 1 μPa from seismic air-guns corresponded with observed behavioral reactions in sea turtles.

As explained in Sunrise Wind (2022a), BOEM and NOAA have adopted the sea turtle injury thresholds based on the dual criteria of L_{pk} and SEL recommended by Popper et al. (2014) and the U.S. Navy (Blackstock 2018) and adopted by NOAA Fisheries (GARFO 2020; GARFO 2020). Table 3.5.7-3 summarizes the agency-adopted acoustic thresholds for sea turtles, which are used to evaluate noise impacts to sea turtles from impulsive sounds from impact pile-driving and non-impulsive sounds generated by vessel traffic. Table 3.5.7-4 summarizes thresholds for underwater noise effects and the highest-modeled distances ($R_{95\%}$) to injurious and behavioral effects from both impulsive and intermittent non-impulsive construction-related underwater noise levels (Sunrise Wind 2022a). Potential effects were modeled over a range of potential construction schedules, and the results for the highest level of potential impacts among all the construction schedules are included in this document.

Table 3.5.7-4. Modeled Radial Distances ($R_{95\%}$) to Effect Thresholds for Elevated Underwater Noise from Project Pile Installations: OCS-DC Foundation and WTG Monopile Installation (up to four 12-meter monopiles and 4 pin piles installed in a day using impact hammer pile driving); 1.2-meter-diameter Casing Pile via Impact Hammer; and Goal Posts Sheet Piles via Vibratory Hammer for Cofferdam Installation

	Injurious Effects		Behavioral Effects
Noise Source	Distance to Lpk Single Strike Injury Threshold (mi; 232 dB re: 1 µPa)	Distance to SEL Injury Threshold (mi)[1]	Distance to SPL Behavioral Threshold (mi) (175 dB re: 1 µPa)
12-m Monopile and OCS–DC foundation[2] – impact installation (impulsive)	0	1.37	1.02
Casing Pipe (1.2-m dia) - impact installation	0	0.26	0.18
Goal Posts – vibratory sheet pile installation (non-impulsive noise)	0	0	>0.01

Notes: µPa = micropascal; μPa^2 = squared micropascal; dB = decibel(s); L_{pk} = peak sound pressure level; m = meter; mi = mile(s); OCS–DC = Offshore Converter Station; SEL = sound exposure level; SPL = sound pressure level

Source: COP, Appendix I1 (Sunrise Wind 2022a).

[1] Injury thresholds are different for impulsive (204 dB re 1 μPa^2/second) and non-impulsive (220 dB re 1 μPa^2/second) noise. See Table 3.5.7-3.

[2] Monopile foundation values reflect the maximum possible effect area from a difficult installation of a 12-m-diameter pile with 10-dB broadband attenuation.

3.5.7.5.1.2.1 Impulsive Noise – Geophysical Surveys

Short-term, localized G&G surveys during the construction period may include the use of multi-beam echosounders, side-scan sonars, shallow penetration sub-bottom profilers, medium penetration sub-bottom profilers and marine magnetometers. Site-specific verification was previously conducted for geophysical equipment sound sources deployed within the marine portions of the proposed Project Area. The survey equipment to be employed would be equivalent to the equipment utilized during the G&G survey campaigns associated with Lease Area OCS–A 0500 conducted in 2016, 2017, 2018, 2019, and 2020 and within Lease Area OCS–A 0487 conducted in 2018, 2019, and 2020 (Gardline 2021a; 2021b; Smultea Sciences 2020a; 2020b).

G&G surveys use a combination of sonar-based methods to map shallow geophysical features. The equipment is towed behind a moving survey vessel attached by an umbilical cable. G&G equipment operating are frequencies at or below 2,000 Hz (typically sub-bottom profilers) may be audible to sea turtles. Equipment such as echosounders and side-scan sonars operate at higher frequencies and have no effect on sea turtles. The equipment only operates when the vessel is moving along a survey transect, meaning that the ensonified area is intermittent and constantly moving. BOEM (2021) evaluated potential underwater noise effects on sea turtles from G&G surveys and concluded there is no possibility of PTS in sea turtles from G&G sound sources. Some G&G survey noise sources could exceed the behavioral effects threshold up to 300 ft (91.4 m) from the source, depending on the type of equipment used, but given the limited extent of potential noise effects and the APMs used in this Project (e.g., soft-start measures, shutdown procedures, protected species monitoring protocols, use of qualified and NOAA-approved PSOs), adverse impacts to sea turtles are unlikely to occur. BOEM (2021) concluded that planned G&G survey activities across the entire mid-Atlantic OCS are unlikely to cause PTS injury to sea turtles. While low-level behavioral exposures could occur, these would be limited in extent and short-term in duration. Therefore, underwater noise impacts from G&G surveys are expected to be short-term and minor.

3.5.7.5.1.2.2 Impulsive Sounds – MEC/UXO Clearance Surveys RARMS

As detailed in the COP, Section 3.3.3.4 (Sunrise Wind 2022b), prior to seafloor preparation, cable routing, and micro siting of all assets, Sunrise Wind would implement a MEC/UXO Risk Assessment with RARMS designed to evaluate and reduce risk in accordance with the ALARP risk mitigation principle. During Project construction, the likelihood of MEC/UXO encounters with sea turtles is very low due to low sea turtle presence in the proposed Project Area and monitoring and mitigation.

For all MEC/UXO clearance methods, mitigation measures include the use of noise attenuation to achieve a 10 dB reduction in sound levels, PSOs, pre-survey clearance monitoring, and the establishment of exclusion zones in which sound sources would be shut down when sea turtles are present (Appendix H). Pre-clearance zones would be monitored for 60 minutes prior to blasting, with clearance zones described in Table 3.5.7-5.

Table 3.5.7-5. Mitigation and Monitoring Zones Associated with Unmitigated UXO Detonation of Binned Charge Weights (adapted from PSMMP dated April 2022)

Species	UXO Charge Weight[1]				
	E4 (2.3 kg)	E6 (9.1 kg)	E8 (45.5 kg)	E10 (227 kg)	E12 (454 kg)
	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone[2] (m)
Sea Turtles	104	241	545	1,030	1,390

Notes: kg = kilograms; m = meters; PK = peak pressure level; SEL = sound exposure level.

[1] UXO charge weights are groups of similar munitions defined by the U.S. Navy and binned into five categories (E4-E12) by weight (equivalent weight in TNT). Four project sites (S1-S4) were chosen and modeled (see Hannay and Zykov (2022), Appendix C) for the detonation of each charge weight bin.

[2] Pre-start clearance zones were calculated by selecting the largest Level A threshold (the larger of either the PK or SEL noise metric) for marine mammals and the largest distance to the Permanent Threshold Shift (PTS) threshold for sea turtles. Auditory injury thresholds (PTS PK or SEL noise metrics) were larger than modeled distances to mortality and non-auditory injury criteria. The chosen values were the most conservative per charge weight bin across each of the four modeled sites.

Because the potential for effects from MEC/UXO clearance is extremely unlikely but, if required, could result in injury of a very low number of individuals, the effects to sea turtles would be negligible to minor and short-term.

3.5.7.5.1.2.3 Impulsive Noise – Impact Pile-Driving

Underwater noise generated by impact pile driving is considered one of the predominant IPFs that could result in potential physiological and behavioral impacts on sea turtles due to the relatively high source levels produced by impact pile driving and the large distances over which the noise is predicted to propagate. Up to 94 WTG foundations and 1 OCS–DC foundation with four legs would be installed. The typical SRWF WTG foundation pile installation would require approximately 4 to 6 hours of impact pile driving to a final embedment depth of 164 ft (50 m) below the seafloor, with some difficult installations potentially taking up to 12 hours to install due to more difficult substrate conditions. After installation, the WTG would be placed on top of the foundation pile and the vessels would be repositioned to the next site. Between 1 and 3 WTG monopile foundations may be installed per day. For the OCS–DC foundation, the jacket foundation would be placed first, with the pin pile placed through the jacket and driven to its penetration depth (295 ft [90 m]). Pile driving for a single jacket foundation may take up to 48 hours (see Section 3.3.5.2 in COP, Sunrise Wind 2022b). Because separate vessels are anticipated to be used for WTG and OCS–DC foundation installations, these activities may occur concurrently.

The potential significance of impulsive underwater noise is unclear because sea turtle sensitivity and behavioral responses to underwater noise are a subject of ongoing study. Potential behavioral impacts may include altered submergence patterns, short-term disturbance, startle response (diving or swimming away), and short-term displacement of feeding/migrating and a temporary stress response, if present within the ensonified area (NSF and USGS 2011; Samuel et al. 2005). The accumulated stress and energetic costs of avoiding repeated exposure to pile-driving noise over a season or a life stage could have long-term impacts on survival and fitness (DoN 2018). Conversely, sea turtles could become habituated to repeated noise exposure over time and not suffer long-term consequences (O'Hara and Wilcox 1990). This type of noise habituation was demonstrated even when repeated exposures were separated by several days (Bartol and Bartol 2011; DoN 2018).

Sea turtles migrating through the area when pile driving occurs are expected to adjust their course to avoid the area where received SPL is elevated above 175 dB re 1 µPa. Depending on how close the species is to the pile being driven, this could involve swimming up to 1.04 mi (1.68 km) (Sunrise Wind 2022a). Such behavioral alterations could cause turtles to cease foraging or expend additional effort and energy avoiding the area. Presumably, turtles could continue foraging activities outside the area of elevated noise levels as adjacent habitat provides similar foraging opportunities. The turtle may experience physiological stress during this avoidance behavior, but this stressed state is anticipated to dissipate over time once the sea turtle is outside the ensonified area. There have been no documented sea turtle mortalities associated with pile driving. Either a short-term or permanent reduction in hearing sensitivity could be harmful for sea turtles, but the potential significance is unclear because the role that hearing plays in sea turtle survival (e.g., for predator avoidance, prey capture, and navigation) is poorly understood (NSF and USGS 2011). The use of PSOs, exclusion and monitoring zones, and pile driving soft start measures (Table H-1, Appendix H) mitigates the risk of sea turtle exposure to elevated underwater noise levels. Because behavioral effects only last for the duration of active pile driving these effects are expected to last a short time, and sea turtles would return to normal behavior once outside of the harassment area or when pile driving stops (BOEM 2021).

Sea turtles that are close to impact pile driving could experience a temporary or permanent loss of hearing sensitivity. In theory, reduced hearing sensitivity could limit the ability to detect predators and prey or find potential mates, reducing the survival and fitness of affected individuals; however, the role and importance of hearing in these biological functions for sea turtles remain poorly understood (Lavender et al. 2014). As described in Section 4.4.2 of Sunrise Wind (2022a), COP Appendix I1, up to five leatherback sea turtles may experience TTS or PTS injury, while Kemp's ridley, green, and loggerhead sea turtles are expected to have less than one injury from impact pile driving each (Table 3.5.7-6). Up to 10 leatherback and 10 loggerhead sea turtles may experience behavioral harassment from impact pile driving, while Kemp's ridley and green sea turtles are expected to have less than one incident of behavioral harassment each. These estimates are maximum exposures based on density estimates and exposure ranges, and do not account for mitigation efforts related to observers or shutdown zones. A full description of the acoustic analysis of sea turtle exposures is contained in COP Appendix I1 (Sunrise Wind 2022a).

Table 3.5.7-6. Maximum Estimated Sea Turtle Exposures among All Modeled Construction Schedule Scenarios for WTG and OCS-DC Foundation Installation via Impact Pile Driving, Assuming A Minimum of 10 dB of Sound Attenuation

Species	Injury		Behavior
	L_E	L_{pk}	L_p
Kemp's ridley turtle	0.05	0	0.31
Leatherback turtle	4.30	0	9.57
Loggerhead turtle	0.50	0	9.30
Green turtle	0.10	0	0.29

Source: Sunrise Wind 2022 (Appendix I1), Tables 4.4-12 through 4.4-16.

As described in Appendix H, additional protection measures include noise attenuation technologies, soft starts for pile driving, the use of trained 6-8 PSOs for monopile installation, a 500- pre-clearance and exclusion zone for sea turtles, reduced visibility monitoring tools, adaptive vessel speed reductions, and utilization of software to share visual and acoustic detection data between platforms in real time. PSOs would perform pre-clearance monitoring of the area surrounding the construction site for 60 minutes prior to beginning pile driving. PSOs would also enforce shutdown zones when sea turtles are observed within the shutdown zones. Pile driving would not resume until individuals have left the shutdown zone of their own volition, and no turtles have been observed within the shutdown zone for at least 60 minutes. These measures are likely to reduce the risk of injury or exposure to sea turtles during daylight hours but are not expected to reduce risk for sea turtles during any nighttime pile driving.

Based on the combination of minimization measures mentioned above (e.g., sound reduction technology, soft starts, PSOs) and the low numbers of sea turtles expected in the SRWF and SRWEC, impacts to sea turtles from impact pile driving would be short-term and minor.

3.5.7.5.1.2.4 Non-Impulsive Noise – Vibratory Pile-Driving

Vibratory pile driving may be used during the construction phase of the SRWF for cofferdam installation at the export cable landing. Sea turtles may experience behavioral effects for received SPLs above 175 dB re 1 µPa. Vibratory noise levels are typically lower than for impact pile driving. Because of this, the radius at which behavioral impacts can be expected for sea turtles is less than 10 ft using the NMFS Multi-Species Pile Driving Calculator (Version 1.1, NMFS *Protected Species Division, Silver Spring, Maryland*). As shown in Table 3.5.7-3, vibratory pile-driving noise is not expected to exceed behavioral thresholds (Sunrise Wind 2022a).

Monitoring and mitigation for vibratory pile installation includes the use of two PSOs, pre-clearance and shutdown zones, and ramp up procedures during days with decrease visibility of the shutdown zone. The pre-clearance and shutdown zone would be 500 m for all sea turtles. The PSO would halt pile-driving if an individual enters the shutdown zone, and pile-driving would not resume until the individual has left the shutdown zone and no individuals have been observed for at least 15 minutes (dolphins, porpoises, and seals) or 30 minutes (whales). Appendix H describes the monitoring and mitigation for vibratory pile-driving in further detail.

Given the limited spatial extent of these potential effects, the minimization measures required, low densities of sea turtles in the SRWF and SRWEC, and short duration of pile-driving activities, the impacts from vibratory pile driving to sea turtles would be negligible.

3.5.7.5.1.2.5 Non-Impulsive Noise – Vessels

The relatively low frequency range of turtle hearing (100–1,200 Hz) (Ketten and Moein Bartol 2006; Lavender et al. 2014) overlaps the broad frequency spectrum of intermittent non-impulsive noise produced by vessels (10-1,000 Hz). Sea turtles could respond to vessel approach and/or noise with a startle response and a short-term stress response (NSF and USGS 2011); however, Hazel et al. (2007) suggested that turtles could habituate to vessel sounds in marine areas that experience regular vessel traffic. This could reduce the behavioral impacts of vessel noise but may increase the potential for vessel collision (refer to subsection on vessel traffic below). Underwater noise generated by construction vessels would not exceed injury thresholds for turtles, as noise levels produced by vessels in general are below levels that could cause potential auditory threshold shifts. Behavioral responses to vessels have been reported but are thought to be more associated with visual cues, as opposed to auditory cues (Hazel et al. 2007), although both senses likely play a role in avoidance. A conservative assumption is that construction and support vessels could elicit behavioral changes in individual sea turtles near the vessels. It is assumed that these behavioral changes would be limited to evasive maneuvers such as diving, changes in swimming direction, or changes in swimming speed to distance themselves from vessels. Overall, impacts to sea turtles from vessel noise would be negligible.

3.5.7.5.1.2.6 Non-Impulsive Noise – Aircraft

Fixed-wing aircraft may be used during construction for marine mammal monitoring, and helicopters may be used for crew transport to and from construction vessels. Monitoring aircraft would operate at an altitude of 1,000 ft (300 m) consistent with established guidance. Noise from crew transport helicopters would increase during approach and departure from vessel landing pads. Currently, no published studies describe the impacts of aircraft overflights on sea turtles, although anecdotal reports indicate that sea turtles respond to aircraft by diving (BOEM 2017). While helicopter traffic may cause some short-term and short-term non-biologically significant behavioral reactions, including startle responses (diving or swimming away), altered submergence patterns, and a short-term stress response (BOEM 2017; NSF and USGS 2011; Samuel et al. 2005), these brief responses are expected to dissipate once the aircraft leaves the area. Operating aircraft are anticipated to be close enough to the water surface to incur behavioral effects only on the order of minutes and only associated with takeoffs and landings. Combined with the relatively low number of aircraft operations, the potential effects of aircraft noise and disturbance on sea turtles are, therefore, expected to be negligible.

EMF: Because EMFs are generated by power production when WTGs are operating, no effects from the IPF are expected during construction of the offshore facilities.

Accidental releases – contaminants: During construction of the SRWF, there could be a short-term risk of sanitary and other waste fluids or fuels and other petrochemicals accidentally entering the water. If sea turtles were to be exposed to an oil spill or a discharge of waste material, studies indicate that respiration, skin, some aspects of blood chemistry and composition, and salt gland function could be significantly impacted in exposed species (Vargo 1986). Any non-routine spills or accidental releases that could result in negligible and short-term impacts to surface water resources would be avoided or minimized through the implementation of the proposed Project SPCC plan and other APMs (refer to Section 4.0 in COP, Appendix O, Sunrise Wind 2022). Impacts on sea turtles from accidental spills or releases of pollutants are considered negligible because of the low probability of the risk and APM implementation.

Accidental releases – trash and debris: Trash and debris that enter the water represent a risk factor to sea turtles because the turtles could ingest or become entangled in debris, causing lethal or injurious impacts. Pollution (e.g., plastic) is often mistaken for food such as jellyfish and ingested, which can block intestinal tracts, causing injury or mortality. Section 3.5.7.3 provides additional debris and entanglement information. Personnel working offshore would receive training on sea turtle and marine debris awareness (Section 4.0 in COP, Appendix O, Sunrise Wind 2022). Impacts on sea turtles from accidental deposits of trash or debris associated with the proposed Project would be minor because implementation of proposed APMs (Table H-1, Appendix H) lowers the probability of such risk.

Traffic: Changes in vessel traffic resulting from the Proposed Action are a potential source of adverse effects on sea turtles. Propeller and collision injuries from boats and ships are common in sea turtles and an identified source of mortality (Hazel et al. 2007; Shimada et al. 2017). Hazel et al. (2007) also reported that individuals may become habituated to repeated exposures over time that were not accompanied by an overt threat. Project construction vessels could collide with sea turtles, posing a short-term increase in the risk of injury or death to individual sea turtles; however, as stated in Section 3.6.6 *Navigation and Vessel Traffic*, the MARIPARS study area (an area encompassing the wind energy leases off Massachusetts and Rhode Island) supports high volumes of vessel traffic (13,000 to 46,900 annual vessel transits), and the Proposed Action is expected to result in only a small incremental increase in vessel traffic, with a peak during Project construction. Based on information provided by SRW, Project construction would require an estimated total of 50 vessel trips between the Port of New London, Connecticut, and the SRWF over the 2-year construction period, with an estimated maximum of six trips in any given month from United States ports outside of the RI-MA WEAs. Port traffic within the RI-MA WEAs would add an additional 127 one-way trips during WTG installation and 146 one-way trips during cable installation to the SRWF. Depending on the contractor selected, up to eight construction vessels could travel to the Lease Area from unspecified ports in Europe or elsewhere in the world.

Fishing vessels may be displaced during construction of WTGs and installation of the SRWEC. Up to 300 fishing vessels use the SRWF annually (Section 3.6.1 *Commercial Fisheries and For-Hire Recreation*) and might decide to avoid the SRWF once it is fully constructed. Potential for displacement of fishing vessels during SRWF operations is discussed further below under *Operations and Maintenance and Conceptual Decommissioning*. The increased collision risk in some areas is anticipated to be commensurate with the decreased risk within the SRWF, so changes in collision risk from relocated commercial and for-hire fishing vessels during construction of the SRWF would not be measurable from baseline. Relocation of fishing vessels during construction and installation is considered negligible to sea turtles.

Sea turtles are likely to be most susceptible to vessel collision in coastal foraging areas crossed by construction vessels traveling between the SRWF and offshore SRWEC and area ports. Hazel et al. (2007) indicated that sea turtles may not be able to avoid being struck by vessels at speeds exceeding 2 knots, and collision risk increases with increasing vessel speed. Habituation to noise may also increase the risk of vessel collision; however, avoidance behaviors observed suggest that a turtle's ability to detect an approaching vessel is more dependent on vision than sound, although both may play a role in eliciting behavioral responses. Construction vessel speeds could periodically exceed 10 knots during transits to and from area ports, posing an incremental increase in collision risk relative to baseline levels of vessel traffic. During construction, vessels generally either remain stationary when installing the monopiles and WTG/OSS equipment or move slowly (i.e., at less than 10 knots) when traveling between foundation locations. Cable-laying vessels move slowly on the order of 1 mile per day.

The Proposed Action APMs include mitigation and monitoring requirements that are fully detailed in Appendix H. Vessels related to project planning, construction, and operation shall travel at speeds in accordance with NOAA requirements or the agreed to adaptive management plan per to Project PSMMP when sea turtles are observed. Vessels would maintain a reasonable distance from sea turtles, as determined through site-specific consultations. Project-related vessels would be required to adhere to NMFS Regional Viewing Guidelines for vessel strike avoidance measures during construction and operation to minimize the risk of vessel collision with sea turtles. Operators would be required to undergo training on applicable vessel guidelines, the identification of protected species, and observation skills.

Green, loggerhead, and Kemp's ridley sea turtle populations have generally been increasing over the past few decades, while leatherback sea turtle populations have declined. Because the abundance of sea turtles is anticipated to be generally low with patchy distribution, and the proportional increase in vessel traffic also low, the number of sea turtles injured or killed by vessel strikes as a result of Project construction is expected be low and would not result in significant effects at the population level. Therefore, the potential effects of construction vessel collisions on sea turtles would be minor and short-term.

Gear utilization: The Fisheries and Benthic Research Monitoring Plan (FMP) for the Proposed Action has been developed in accordance with recommendations set forth in *Guidelines for Providing Information on Fisheries for Renewable Energy Development on the Atlantic Outer Continental Shelf* (BOEM 2019b). BOEM provides guidance related to specific survey gears that can be used to complete the fisheries monitoring including otter trawl, beam trawl, gillnet/trammel net, and ventless traps. BOEM guidelines stipulate that 2 years of pre-construction monitoring data are recommended, and that data should be collected across all four seasons. Consultations with BOEM and other agencies are encouraged during the development of fisheries monitoring plans.

The FMP may occur throughout any of the phases of the Proposed Action. The FMP would be revised through an iterative process, and survey protocols and methodologies have been and would continue to be refined and updated based on feedback received from stakeholder groups. Much of the research described in this plan would be performed on commercial fishing vessels that are contracted for this monitoring. Further, the field work described in the monitoring plan would be performed by an independent contractor (e.g., local university, research institution, or consulting firm). Chapter 2 describes the proposed activities in detail and is not repeated here. Effects of Project vessels, including the ones that would be used for survey and monitoring activities are considered above.

Any sampling that utilizes gear that may pose a risk to turtle species, including gillnet sampling, could be potentially hazardous to some vulnerable species. All sampling efforts would follow included BMPs to limit capture and entanglement risk.

The lessee must ensure that any buoys attached to the seafloor use buoys, lines (chains, cables, or coated rope systems), swivels, shackles, and anchor designs that prevent any potential entanglement of listed species while ensuring the safety and integrity of the structure or device. All mooring lines and ancillary attachment lines must use one or more of the following measures to reduce entanglement risk: shortest practicable line length, rubber sleeves, weak links, chains, cables, or similar equipment types that prevent lines from looping, wrapping, or entrapping protected species. Any equipment must be attached by a line within a rubber sleeve for rigidity. The length of the line must be as short as necessary to meet its intended purpose. All buoys must be properly labeled with lessee and contact information.

Trawl Surveys: The capture and mortality of sea turtles in bottom trawl fisheries is well documented (Henwood and Stuntz 1987; NMFS and USFWS 1991a; 1992; 2008; NRC (National Research Council) 1990). NOAA has prioritized reduction of sea turtle interactions with fisheries where these species occur. Finkbeiner et al. (2011) compiled sea turtle bycatch in U.S. fisheries and found that in the Atlantic, a mean estimate of 137,700 interactions, of which 4,500 were lethal, occurred annually since the implementation of bycatch mitigation measures; however, a vast majority of the interactions (98 percent) and mortalities (80 percent) occurred in the Southeast/Gulf of Mexico shrimp trawl fishery, although sampling inconsistencies and limitations should be considered when interpreting this data (NMFS 2014).

While sea turtles are capable of remaining submerged for long periods of time, they appear to rapidly consume oxygen stores when entangled and forcibly submerged in fishing gear (Lutcavage and Lutz 1997); however, the preponderance of available research (Epperly et al. 2002; Sasso and Epperly 2006) and anecdotal information from past trawl surveys indicates that limiting tow times to less than 30 minutes would likely eliminate the risk of death for incidentally captured sea turtles. The proposed trawls would be limited to 20 minutes of tow time. The tow begins when winches are locked and an acceptable net geometry is established. The relatively short tow duration is expected to minimize the potential for interactions with sea turtles and pose a negligible risk of mortality. The proposed mitigation measures would be expected to eliminate the risk of serious injury and mortality from forced submergence for sea turtles caught in the bottom otter trawl survey gear. While mortality is expected to be unlikely from either proposed otter trawl surveys, incidentally captured individuals would suffer stress and potential injury. Where possible, turtles are disentangled and if injured, may be brought back to rehabilitation facilities for treatment and recovery. This helps to reduce the rate of death from entanglement. We expect that incidental capture and entanglement of sea turtles would continue in the

Action Area at a similar rate over the life of the Proposed Action. Safe release, disentanglement protocols, and rehabilitation would help to reduce the severity of impacts of these interactions and these efforts are also expected to continue over the life of the project.

Very low density for presence of leatherback and green sea turtles and relatively small trawl sampling areas make it extremely unlikely that green sea turtles would be captured during trawl surveys. Based on the extremely low likelihood of incidental capture of leatherback and green sea turtles, the proposed action would have negligible impact on these species.

Because low numbers of loggerhead and Kemp's ridley sea turtles may be captured during trawl surveys, and capture would cause stress and may result in injury, and in rare cases, post capture mortality, surveys associated with the FMP would have minor impact on these species but would not have population level effects.

Structure-Associated Fishery Surveys: Chevron traps and BRUVs are stationary gear that pose a risk of entanglement for 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). While there is a theoretical risk of sea turtle entanglement, particularly for leatherbacks, in trap and pot gear, this considers the likelihood to be discountable given the limited, patchy distribution of sea turtles in the Action Area, BMPs required to reduce entanglement risk for deployed traps and buoys, the small number of vertical lines used in the surveys, the presence of the research vessel during deployment, and the limited duration of each survey event. Because of this, entanglement is extremely unlikely to occur and the potential for impacts to sea turtles is negligible.

Clam, Oceanographic, and Pelagic Fish Surveys: The equipment used in the clam, oceanography, and pelagic fish surveys pose minimal risk to sea turtles. Tows for the clam survey have a very short duration of 120 seconds, and the vessel is subject to mitigation measures similar to those for the trawl survey. Both the oceanography and pelagic fish surveys are non-extractive and also subject to the mitigation measures as the structure-associated fish surveys. Based on the included mitigation measures and analysis contained in the trawl survey section above, the potential for effects from the equipment used in clam, oceanography, and pelagic fish surveys on sea turtles is negligible.

Passive Acoustic Monitoring Surveys: The use of PAM buoys or autonomous PAM devices to monitor noise, marine mammals, passive acoustic telemetry tags, and the use of sound attenuation devices placed on the seafloor for mitigation during pile driving have been proposed by Sunrise Wind (Sunrise Wind 2022b).

Based on previous consultations, BOEM anticipates requiring that moored and autonomous PAM systems that may be used for monitoring would either be stationary (e.g., moored) or mobile (e.g., towed, autonomous surface vehicles [ASVs], or autonomous underwater vehicles [AUVs]), respectively. Moored PAM systems would use the best available technology to reduce any potential risks of entanglement. PAM system deployment would follow the same procedures as those described in the previous section to avoid and minimize impacts on ESA-listed species, as detailed in Appendices AA1 and AA2 of the COP (Sunrise Wind 2022c). The use of buoys for moored PAM systems, or any other intended purposes, would pose a discountable risk of entanglement to listed sea turtles.

Autonomous PAM systems could have hydrophone equipment attached that operates autonomously in a defined area. ASVs and AUVs in very shallow water can be operated remotely from a vessel or by line of sight from shore by an operator and in an unmanned mode. These autonomous systems are typically very small, lightweight vessels and travel at slow speeds. ASVs and AUVs produce virtually no self-generated noise and pose a negligible risk of injury to sea turtles from collisions due to their low mass, small size, and slow operational speeds. ASVs and AUVs are not expected to pose any reasonable risk of harm to listed species; therefore, the impacts of this type of survey equipment on sea turtles are negligible.

Gear Utilization and Fisheries Survey Impacts to Prey: Fisheries surveys are designed not to have measurable impacts to surveyed resources and are not anticipated to have any measurable impact on prey availability for sea turtles. All FMP survey efforts would affect only extremely small areas relative to available habitat in the action area. All bycatch is expected to be returned to the water alive, dead, or injured to the extent that the organisms would shortly die. Injured or deceased bycatch would still be available as prey for sea turtles, particularly loggerhead sea turtles, which are known to eat a variety of live prey as well as scavenge dead organisms. Given this information, any impacts on sea turtles from collection of potential sea turtle prey in the trap gear would be so small that they cannot be meaningfully measured, detected, or evaluated and would be negligible.

Lighting: Lights are required on vessels and heavy equipment during construction. Most scientific studies on lighting effects on sea turtles were conducted at nesting sites, which do not occur in the SRWF and SRWEC. Gless et al. (2008) reported that previous studies showed that previous studies showed that loggerhead turtles were attracted to lights from longline fishing vessels. Gless et al. (2008) conducted a laboratory study to see if juvenile leatherbacks responded to lights in the same way as loggerheads. Their study showed that leatherbacks either failed to orient or oriented at an angle away from the lights and concluded that there is no convincing evidence that marine turtles are attracted to vessel lights. Limpus (2006) indicates that navigation/anchor lights on top of vessel masts are not impactful but that bright deck lights should be shielded if possible, to reduce impacts to sea turtles. Project APMs (Table H-1, Appendix H) include construction vessel light shielding and operational restrictions to limit light use to required periods and minimize artificial lighting effects on the environment. Considering the APMs and the fact that construction vessel activity is unlikely to measurably alter baseline vessel light levels, construction lighting effects on sea turtles would be negligible.

3.5.7.5.2 Operations and Maintenance

3.5.7.5.2.1 Onshore Activities and Facilities

No regular sea turtle nesting occurs in the onshore portion of the proposed Project Area (refer to Section 3.5.7.1). Construction and operation of onshore facilities is not expected to have any direct impacts to sea turtles, and the potential for impacts is negligible.

3.5.7.5.2.2 Offshore Activities and Facilities

Construction impacts to sea turtles could occur from the following IPFs: seafloor disturbance, sediment suspension and deposition, noise, electric and magnetic fields, discharges and release, trash and debris, vessel traffic, and lighting, and visible structures. Unless noted otherwise, construction-related impacts would be short-term. The potential for these impacts to occur are discussed in detail in the following sections.

Seafloor disturbance: Impacts to sea turtles from seafloor disturbance during O&M of the proposed Project would be limited to the impacts expected on their benthic prey. Seafloor disturbing activities during O&M of the SRWEC–OCS and NYS are only expected during non-routine maintenance that may require uncovering and reburying the cables and/or the maintenance of the cable protection. These O&M activities are expected to result in similar impacts on benthic resources as those discussed for the SRWF and could therefore temporarily displace sea turtles due to decreased available forage; however, the extent of disturbance would be limited to specific areas along the SRWEC cable corridor centerline and the footprint of the SRWEC is relatively small when compared to the ample surrounding available benthic/prey habitat. Overall impacts of O&M activities would be negligible for sea turtles.

Sediment suspension and deposition: Any maintenance activities that requires exposing and reburying the IAC, and the use of vessel anchoring and jack-up may result in increases in sediment suspension and deposition, which may temporarily increase turbidity in the water column. These activities are expected to be non-routine events and are not expected to occur with any regularity. As discussed for the construction phase, sediment suspension and deposition could result in very short-term reductions in availability or detectability of sea turtle prey species and would have negligible impacts on prey species targeted for consumption by sea turtles in the SRWF and the overall foraging success of sea turtles.

Noise: Direct impacts to sea turtles associated with noise during O&M of the SRWEC may result from G&G Surveys and support vessel and aircraft noise during routine and non-routine maintenance trips and as a result of G&G surveys. Operational noise of wind turbines would not reach levels that could result in behavioral effects to sea turtles.

3.5.7.5.2.2.1 Impulsive Sound – Geophysical Surveys

Throughout the proposed operational life of the SRWEC, Sunrise Wind expects to use a variety of vessels to support O&M, including SOVs with deployable work boats (daughter craft), CTVs, jack-up vessels, and cable laying vessels. Project vessels would undergo routine maintenance trips between potential ports in NY and Rhode Island and the SRWEC. Noise impacts from vessel use during O&M would be similar to those described for construction. Individual sea turtles may experience direct, short-term, reversible behavioral disruptions due to the incremental and transient contribution of O&M vessels. G&G surveys performed during O&M would adhere to the same mitigation requirements described above for construction and installation and detailed in Appendix H. The limited nature of these effects and number of individuals affected would not be significant at stock or population levels. On this basis, the effects of G&G noise on sea turtles would be short-term and minor.

3.5.7.5.2.2.2 Non-Impulsive Sound –Vessel Traffic

During the O&M phase, maintenance vessels would intermittently be required to service the WTGs and OCS–DC. Additionally, recreational and commercial fishing vessel traffic is likely to increase near WTG foundations. Sea turtles have hearing abilities limited to low frequencies, and no injury or behavioral effects from vessel noise are anticipated for planned offshore wind projects. Although sea turtles could become habituated to repeated noise exposure over time (Hazel et al. 2007), vessel noise effects from the proposed action to be broadly similar to noise levels from existing vessel traffic in the region. Nonetheless, periodic localized, intermittent, and short-term behavioral impacts on sea turtles could occur. Based on sea turtle responses to other types of disturbance (e.g., Bevan et al. 2018), turtle behavior is expected to return to normal when vessel noise dissipates. Given limited turtle sensitivity to underwater noise produced by vessels, the short-term nature of any behavioral responses, and the patchy distribution of sea turtles in the GAA, the effects of vessel noise from vessel activities during O&M on sea turtles would be negligible.

3.5.7.5.2.2.3 Non-Impulsive Sound – Aircraft

Sunrise Wind expects to use a hoist-equipped helicopter, and unmanned aircraft systems may also be used to support O&M. The type and number of vessels and helicopters would vary over the operational lifetime of the Project. Impacts from aircraft use during O&M would be similar to those described for construction and would have negligible impacts on sea turtles.

3.5.7.5.2.2.4 Non-Impulsive Sound – WTG Operation

WTG operation is another source of continuous noise but is not expected to result in biologically significant effects on sea turtles. According to measurements at the Block Island Wind Farm, low-frequency noise generated by turbines reach ambient levels at 164 ft (50 m) (Miller and Potty 2017). Other studies observed noise levels ranging from 109 to 127 dB re 1 µPa at 46 and 65.6 ft (14 and 20 m), respectively, at operational wind farms (Tougaard et al. 2009). Operational noise and ambient noise both increase in conjunction with wind speed, meaning that WTG noise is only audible within a short distance from the source (Kraus et al. 2016; Thomsen et al. 2015). However, at no point is it expected that noise from WTG operation would approach or exceed the behavioral threshold for sea turtles. Therefore, operational noise from the Proposed Action would be negligible.

EMF: The proposed project would consist of two offshore electric transmission systems: 180 mi (290 km) of 161 kilovolt (kV) alternating current (AC) inter-array cables (IAC) and up to 106 mi (170 km) of 320 kV direct current (DC) Sunrise Wind export cables (SRWEC). These effects would be most intense at locations where the SRWEC cannot be buried and is laid on the bed surface covered by a stone or concrete armoring blanket. Approximately 2.97 mi (4.8 km) of the SRWEC cable and 2.1 mi (3.4 km) of the IAC could be unburied and would require surface armoring. Exponent Engineering, P.C. (COP, Appendix J1; Sunrise Wind 2021g) modeled anticipated EMF levels generated by the SRWEC and IAC. It estimated induced magnetic field levels ranging from 13.7 to 76.6 mG on the bed surface above the buried and exposed SRWEC cable and 9.1 to 65.3 mG above the IAC. Induced field strength would effectively decrease to 0 mG within 25 ft (7.6 m) of each cable.

Normandeau Associates Inc. et al. (2011) indicate that sea turtles are magnetosensitive and orient to the earth's magnetic field for navigation, but they are unlikely to detect magnetic fields below 50 mG. The majority of SRWEC and IAC would be buried 6 feet below the bed surface, reducing the magnetic field in the water column below levels detectable to turtles. The transmission cables could produce magnetic field effects above the 50-mG threshold at selected locations where full burial is not possible; these areas would be localized and limited in extent. Magnetic field strength at these locations would decrease rapidly with distance from the cable and drop to 0 mG within 25 ft (7.6 m). Peak magnetic field strength is below the theoretical 50-mG detection limit along the majority of cable length, only exceeding this threshold above the short-cable segments laid on the bed surface. Those EMF effects would dissipate below the 50-mG threshold within 1 to 2 ft (0.3 to 0.6 m) of the cable surface. This indicates that turtles would only be able to detect induced magnetic fields within 1 to 2 ft (0.3 to 0.6 m) of cable segments lying on the bed surface. These cable segments would be relatively short (less than 100 ft [30 m]) and widely dispersed. Exponent Engineering, P.C. (COP, Appendix J1; Sunrise Wind 2021g) concluded that the shielding provided by burial and the grounded metallic sheaths around the cables would effectively eliminate any induced electrical field effects detectable to turtles. Given the limited extent of measurable magnetic field levels and limited potential for mobile species like sea turtles to encounter field levels above detectable thresholds, the effects of Project-related EMF exposure on sea turtles would be negligible.

Accidental releases – cooling water: Seawater cooling is needed for the OCS– DC (see Section 3.3.6.1 in COP; Sunrise Wind 2022b). During operation, the OCS–DC would require continuous cooling water withdrawals and subsequent discharge of heated effluent back to the receiving waters. The maximum DIF and discharge volume is 8.1 million gallons per day with AIF and discharge volumes that are dependent on ambient source water temperature and facility output. Preliminary hydrodynamic modelling indicates that there would be some highly localized increases in water temperature in the immediate vicinity of the discharge location of the OCS–DC. The design, configuration, and operation of the CWIS for the OCS–DC would be permitted as part of an individual NPDES permit and additional details would be included in the permit application submitted to the EPA. This would include final results of the hydrodynamic modelling.

The OCS–DC would include three openings for intake pipes located approximately 30 ft (10 m) above the pre-installation seafloor grade. The water depth of the intake pipe openings was selected to minimize the potential of biofouling and entrainment of ichthyoplankton and to take advantage of the cooler water temperatures found at depth to maximize cooling potential of water withdrawn. The design intake velocity at the intake screens is <0.5 ft/s (<15.25 cm/s). This intake velocity estimate is below the threshold required for new facilities defined at 40 CFR §125.84(c) and is therefore protective against the impingement of juvenile and adult life stages of sea turtles. Therefore, it is anticipated that only egg and larval life stages of all species are at risk of entrainment.

Because of the included intake screens and relatively low intake velocities, sea turtles are not expected to be at risk for entrainment. Due to the extremely localized nature of temperature effects from cooling water discharge, the potential for impacts to sea turtles would be insignificant. Because sea turtles, at the sizes and life stages that may be present in the area are not expected to be at risk for entrainment, this effect is extremely unlikely to occur and would have **negligible** impact.

Impacts to Prey Species: To analyze potential prey impacts that may be affected by OCS–DC operations, one representative species of zooplankton was considered, as plankton are the most vulnerable to entrainment. *Calanus finmarchicus* is a heavy-bodied, planktonic copepod that is an important prey species for several organisms in the region, including the North Atlantic right whale. Although additional species of zooplankton within the vicinity of the OCS–DC may also be susceptible to entrainment, *C. finmarchicus* was selected as representative due to its trophic importance in the ecosystem. Using the approach described in COP Appendix N2 (Sunrise Wind 2022b), the entrainment of *C. finmarchicus* from the National Centers for Environmental Information density data was estimated to be 1.1 billion organisms annually. For context, assuming an even distribution of this species and an average depth of 148 ft (45 m), the total abundance of *C. finmarchicus* within Lease Area OCS–A 0487 (109,252 ac) would be close to 2 trillion, and the annual entrainment losses would represent less than 0.1 percent of the local population for this zooplankton species.

It is important to note that these potential estimates assume 100 percent mortality of entrained organisms. There is potential that entrained individuals would survive passage through the CWIS due to short residence time in the system and a maximum water temperature exposure of only 90°F (32°C). Entrainment survival studies at existing power plants do not include directly comparable facilities or environments, but Review of Entrainment Survival Studies: 1970–2000 (EPRI (Electric Power Research Institute) 2000) identifies 91.4°F (33°C) as an upper threshold discharge temperature for many organisms to survive entrainment in existing power plants located along the Hudson River in New York. These potential mechanisms for entrainment survival have not yet been applied to this analysis but could be considered when evaluating overall biological impacts of the OCS–DC operation.

Because the total entrained portion of the population of prey is less than 0.1 percent, and survival rates are likely higher than the assumed 100 percent mortality associated with entrainment in the cooling water system, the proportion of prey base that may be affected by the operation of the cooling water system is insignificant, and therefore may affect, but is not likely to adversely affect ESA-listed species.

Accidental releases – contaminants: The SRWF would undergo maintenance as needed, which would necessitate vessels and other equipment at the facility for the life of the proposed Project. This presents an opportunity for accidental discharge or spills of fuels and/or fluids during maintenance activities. Spill response APMs (Table H-1, Appendix H) employed during construction would be implemented during maintenance activities. These APMs are expected to avoid or minimize water quality impacts from accidental spills or releases of pollutants during O&M activities. Impacts on sea turtles from accidental spills or releases of pollutants are considered minor and short term because of the low probability of the risk and APMs (refer to Section 3.4.2 *Water Quality* for additional details).

Accidental releases – trash and debris: Impacts to sea turtles from disposal of trash and debris during O&M are expected to be similar to, but of lesser likelihood than during construction, as there would be fewer Project-related marine vessels during this phase, and regulatory requirements and preventative measures would still apply. The unanticipated marine disposal of trash and debris is considered an unpermitted, accidental event, and containment and good housekeeping practices would be implemented to minimize the potential.

Indirectly, there may be an increased number of commercial and recreational fishing vessels that operate around the SRWF, which could increase the occurrence of trash and debris from these vessels being released in the SRWF. This could also increase the potential entanglement risk from netted fishing gear, longlines, ropes, traps, or buoy lines. Although unlikely, there would be potential for entanglement or ingestion of line by sea turtles in the vicinity. Adverse impacts incurred from increased fishing activity in the SRWF are not anticipated, but in the event that a line or cable is lost, it could then present a higher risk of sea turtle entanglement. While such entanglements have the potential for a prolonged impact on the individual and may result in mortality, O&M of the SRWF is not expected to directly increase this risk. Therefore, the proposed Project impacts from trash and debris during O&M would be negligible.

Traffic: The potential impacts of vessel traffic would be similar, but less than, those identified for O&M of the SRWF. SRW has estimated that proposed Project O&M would involve up to seven vessel trips per month, or between 2,500 and 2,600 vessel trips over the lifetime of the Project. The majority of vessel trips (2,500) would originate from the Montauk O&M facility, with rare vessel trips (< one per month) originating from New London, Connecticut, or unspecified ports in Europe on an as-needed basis. The negligible increase in vessel traffic due to unplanned maintenance is not expected to lead to a large increase in risk of collision with sea turtles due to the low number of vessel transits and the low density of sea turtles in the SRWF and SRWEC. Project related vessel traffic during O&M would adhere to the same mitigation requirements described above for construction and installation and detailed in Appendix H. Due to the intermittent vessel activity during O&M and the implementation of vessel strike avoidance measures and environmental protection measures described below, maintenance vessel traffic would have a minor long-term impact on sea turtles.

Lighting: The SRWF would include a variety of operational lighting, including navigational lighting for mariners, obstruction lighting for aviators, and vessel/work lighting for maintenance and operations. 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) suggests that intermittent flashing lights with a very short “on” pulse and long “off” interval are non-disruptive to marine turtle behavior, irrespective of the color. Limpus (2006) also indicates that navigation/anchor lights on top of vessel masts are unlikely to adversely affect sea turtles but that bright deck lights should be shielded, if possible, to reduce impacts to sea turtles.

Sea turtles’ typical behavior of remaining predominantly submerged would additionally limit the exposure of individuals to operational lighting. Operational lighting would be limited to the minimum required by regulation and for safety (Table H-1, Appendix H), further minimizing the potential for exposure. Based on the available information, it is expected that the impact of operational lighting on sea turtles would be negligible.

Presence of structures: Structural elements of the SRWF would be present for the 25- to 35-year operational life of the proposed Project. Once WTGs and OCS–DC have foundations have been installed within the seafloor, the presence of the operating SRWF would have converted the existing open water habitat to one with increased hard bottom, making it comparable to an artificial reef-like habitat. The presence of the SRWF foundations, scour protection, and IAC protection would create three-dimensional hard bottom habitats resulting in a reef effect that is expected to attract numerous species of algae, shellfish, finfish, and sea turtles (Langhamer 2012; Reubens et al. 2013; Wilhelmsson et al. 2006). Sea turtles have been observed within the vicinity of offshore structures, such as oil platforms, foraging and resting under the platforms (Gitschlag and Herczeg 1994; National Research Council 1996). High concentrations of sea turtles have been reported around these oil platforms (Gitschlag and Herczeg 1994; National Research Council 1996).

As a result of the increased habitat and foraging opportunities at the new artificial reef-like habitat, sea turtles could potentially remain in areas longer than they normally would and could become susceptible to cold stunning or death; however, artificial habitat created by these offshore structures can provide multiple benefits for sea turtles, including foraging habitats, shelter from predation and strong currents, and methods of removing biological build-up from their carapaces (Barnette 2017; National Research Council 1996). It is estimated that offshore petroleum platforms in the Gulf of Mexico, provided an additional 2,000 mi^2 (5,180 km^2) of hard bottom habitat (Gallaway 1981). Wakes created by the presence of the foundations may influence distributions of drifting jellyfish aggregations; however, since other prey species available to sea turtles would not be affected by these wakes, impacts on sea turtle foraging are not expected to be substantial (Kraus et al. 2019).

On this basis, BOEM concludes that the presence of visible structures from O&M would have negligible direct effects on sea turtle movement and migration, and negligible to minor beneficial, long-term, indirect effects on the distribution, abundance, and availability of sea turtle prey and forage resources.

3.5.7.5.3 Conceptual Decommissioning

3.5.7.5.3.1 Onshore Activities and Facilities

No regular sea turtle nesting occurs in the onshore portion of the proposed Project Area (Refer to Section 3.5.7.1). Decommissioning of onshore facilities is not expected to have any direct impacts to sea turtles, and the potential for impacts is negligible.

3.5.7.5.3.2 Offshore Activities and Facilities

Proposed Project conceptual decommissioning of offshore components would require the use of construction vessels of similar number and class as used during construction. Decommissioning activities would produce similar short-term effects on sea turtles to those described above for proposed Project construction, including short-term displacement, behavioral alteration, and elevated TSS exposure. Underwater noise and disturbance levels generated during conceptual decommissioning are similar to those described above for construction, with the exception that pile driving would not be required. The monopiles would be cut below the bed surface for removal using a cable saw or abrasive waterjet. Noise levels produced by this type of cutting equipment are generally indistinguishable from engine noise generated by the associated construction vessel (Pangerc et al. 2016). Therefore, this decommissioning equipment would have significantly lower potential for noise effects compared to those already considered for construction vessel noise. Decommissioning activities would be required to obtain all appropriate federal permits and would be required to implement mitigation measures based on those permits and the best available information at that time. It is anticipated that those mitigation measures would be similarly effective as those required for construction and installation. The effects of proposed Project conceptual decommissioning on sea turtles would, therefore, range from negligible to minor.

3.5.7.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considers the impacts of the Proposed Action in combination with other ongoing and planned wind activities.

Ongoing and planned activities other than offshore wind development activities that may affect sea turtles include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities would contribute to the primary IPFs of noise, presence of structures, vessel strikes, incidental capture, and entanglement risk and could result in short-term or permanent displacement and injury to or mortality of individual sea turtles, but population-level effects would not be expected for most species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, the Proposed Action would contribute an incremental increase in effects from the primary IPFs for sea turtles.

3.5.7.5.5 Impacts of Alternative B – Proposed Action on ESA-Listed Species

Based on the information contained in this document, we anticipate that the reasonably foreseeable offshore wind activities are likely to adversely affect but not jeopardize the continued existence of leatherback, loggerhead, Kemp's ridley, or green sea turtles.

3.5.7.5.6 Conclusions

Impacts from the Proposed Action

Project construction and installation, O&M, and conceptual decommissioning would result in habitat disturbance, entrainment and impingement, underwater and airborne noise, water quality degradation, vessel traffic (strikes and noise), artificial lighting, and potential discharges/spills and trash. BOEM anticipates the impacts resulting from the Proposed Action alone would range from **negligible** to **minor** adverse impacts and could include potentially **minor beneficial** impacts. Adverse impacts are expected to result mainly from pile-driving noise and increased vessel traffic. Beneficial impacts are expected to result from the presence of structures.

Cumulative Impacts from the Proposed Action

In the context of other reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual IPFs would range from negligible to minor adverse and minor beneficial. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **moderate** adverse impacts to sea turtles and could include potentially **minor beneficial** impacts. The main drivers for impact ratings are pile-driving noise and associated potential for auditory injury, the presence of structures, ongoing climate change, and ongoing vessel traffic posing a risk of collision. The Proposed Action would contribute to the overall impact rating primarily through pile-driving noise and the presence of structures. BOEM made this decision because the overall effect would be detectable and measurable, but these impacts would not result in population-level effects.

While the significance level of impacts would remain the same between the No Action Alternative and the Proposed Action, BOEM could further reduce impacts from the Proposed Action to sea turtles with mitigation measures conditioned as part of the COP approval by BOEM that also includes the mitigation, monitoring, and reporting requirements required in the NMFS biological opinion (see Section 4.0 in COP, Appendix O; Sunrise Wind 2021h).

3.5.7.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Under Alternative C-1, the same number of turbine locations (94 WTGs) under the Proposed Action may be approved by BOEM; however, 8 WTG positions from Priority Areas 1, 2, 3 or 4 would be removed from consideration (Figure 2.1.3-2).

3.5.7.6.1 Construction and Installation

3.5.7.6.1.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.7.6.1.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.7.6.2 Operations and Maintenance

3.5.7.6.2.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the operations and maintenance of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the operation and maintenance of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.7.6.2.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the operations and maintenance methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the operations and maintenance of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.7.6.3 Conceptual Decommissioning

3.5.7.6.3.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the conceptual decommissioning of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to conceptual decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.7.6.3.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the conceptual decommissioning methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the conceptual decommissioning of the offshore activities or facilities other than what is described under the Proposed Action

3.5.7.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts of Alternative C-1 considers the impacts of this alternative in combination with other ongoing and planned wind activities.

Ongoing and planned activities other than offshore wind development activities that may affect sea turtles include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities would contribute to the primary IPFs of noise, presence of structures, vessel strikes, incidental capture, and entanglement risk and could result in short-term or permanent displacement and injury to or mortality of individual sea turtles, but population-level effects would not be expected for most species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, Alternative C-1 would contribute an incremental increase in effects from the primary IPFs for sea turtles.

3.5.7.6.5 Impacts of Alternative C-1 on ESA-Listed Species

All sea turtles that are likely to occur in the proposed Project Area are listed as threatened or endangered under the ESA, therefore the effects to these species would the same as described above. Based on the information contained in this document, we anticipate that Alternative C-1 for the SRWF Project is likely to adversely affect but not jeopardize the continued existence of leatherback, loggerhead, Kemp’s ridley, or green sea turtles.

3.5.7.6.6 Conclusions

Impacts from Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the Proposed Action (Alternative B).

Cumulative Impacts from Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action (Alternative B).

3.5.7.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

The primary effect of this alternative is the relocation of WTGs from priority areas to the eastern portion of the lease area. This proposed change would not significantly alter the construction methods, operations and maintenance, or conceptual decommissioning and would not result in additional impacts to sea turtles other than those described under the Proposed Action (Alternative B).

3.5.7.7.1 Construction and Installation

3.5.7.7.1.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.7.7.1.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the offshore activities or facilities other than what is described under the Proposed Action

3.5.7.7.2 Operations and Maintenance

3.5.7.7.2.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the operations and maintenance of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the operation and maintenance of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.7.7.2.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.7.7.3 Conceptual Decommissioning

None of the proposed changes from Alternative C-2 would significantly alter the operations and maintenance methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the operations and maintenance of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.7.7.3.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the conceptual decommissioning of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to conceptual decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.5.7.7.3.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the conceptual decommissioning methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the conceptual decommissioning of the offshore activities or facilities other than what is described under the Proposed Action.

3.5.7.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts of Alternative C-2 considers the impacts of this alternative in combination with other ongoing and planned wind activities.

Ongoing and planned activities other than offshore wind development activities that may affect sea turtles include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities would contribute to the primary IPFs of noise, presence of structures, vessel strikes, incidental capture, and entanglement risk and could result in short-term or permanent displacement and injury to or mortality of individual sea turtles, but population-level effects would not be expected for most species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, Alternative C-2 would contribute an incremental increase in effects from the primary IPFs for sea turtles.

3.5.7.7.5 Impacts of Alternative C-2 on ESA-Listed Species

All sea turtles that are likely to occur in the proposed Project Area are listed as threatened or endangered under the ESA, therefore the effects to these species would the same as described above. Based on the information contained in this document, we anticipate that Alternative C-2 for the SRWF Project is likely to adversely affect, but not jeopardize the continued existence leatherback, loggerhead, Kemp's ridley, or green sea turtles.

3.5.7.7.6 Conclusions

Impacts from Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the Proposed Action (Alternative B).

Cumulative Impacts from Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the cumulative impacts of the Proposed Action (Alternative B).

3.5.7.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall negligible to moderate adverse impacts and minor beneficial impacts on sea turtles. Table 3.5.7-7 provides an overall summary of alternative impacts.

Table 3.5.7-7. Comparison of Alternative Impacts on Sea Turtles'

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Sea Turtles	*Proposed Action*: BOEM anticipates the impacts resulting from the Proposed Action alone would range from **negligible** to **minor** adverse impacts and could include potentially **minor beneficial** impacts. Adverse impacts are expected to result mainly from pile-driving noise and increased vessel traffic. Beneficial impacts are expected to result from the presence of structures. *Cumulative Impacts of the Proposed Action:* Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **moderate** adverse impacts to sea turtles and could include potentially **minor beneficial** impacts. The main drivers for impact ratings are pile-driving noise and associated potential for auditory injury, the presence of structures, ongoing climate change, and ongoing vessel traffic posing a risk of collision.	*Alternative C-1*: Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the Proposed Action. *Cumulative Impacts of Alternative C-1*: Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action.	*Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the Proposed Action. *Cumulative Impacts of Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the cumulative impacts of the Proposed Action.

3.5.7.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to sea turtles.

3.5.8 Wetlands and Other Waters of the United States

3.5.8.1 Description of Affected Environment

This section discusses potential impacts on Wetlands and Other Waters of the United States (WOTUS) from the proposed Project, alternatives, and future offshore wind activities in the GAA (Appendix D, Figure D-10). The Wetlands and other WOTUS GAA as described in Appendix D, includes the terrestrial components of the Carmans River-Great South Bay watershed (HUC-0203020203) and Shinnecock Bay-Atlantic Ocean watershed (HUC-0203020206).

The National Wetlands Inventory (NWI) data was used to determine the potential presence of wetlands within the Proposed Project Area. The onshore portions of the project are located within the Carmans River-Great South Bay watershed (HUC-0203020203) and Shinnecock Bay-Atlantic Ocean watershed (HUC-0203020206), which are part of the Southern Long Island Subbasin (HUC-02030202). The Project landfall site begins at Smith Point County Park of Fire Island and crosses the William Floyd Parkway and the ICW to Smith Point Marina located on the mainland. Smith Point Park falls within Fire Island National Seashore and abuts the eastern end of the Otis Pike Fire Island High Dune Wilderness (Figure 3.5.8-2). This is the only federally designated wilderness area in New York state.

Within the GAA (Appendix D, Figure D-10), NWI data identified a variety of freshwater and tidal wetlands (Table 3.5.8-1). Freshwater forested/shrub wetland communities account for more than half of all the freshwater wetlands in the GAA (Figure 3.5.8-1 and Figure 3.5.8-2). Riverine wetlands in the GAA are exclusively associated with the Carmans River (Figure 3.5.8-1). Tidal wetlands include both estuarine and marine wetlands and are associated with the ICW and the Atlantic Ocean (Figure 3.5.8-2).

Table 3.5.8-1. NWI Wetlands in the Geographic Analysis Area

Wetland Type	Acres	Percent Total
Freshwater Wetlands		
Freshwater Emergent Wetland	271.1	8.1%
Freshwater Forested/Shrub Wetland	1,779.5	53.2%
Freshwater Pond	754.2	22.6%
Lake	505.7	15.1%
Riverine	29.7	0.9%
Palustrine Farmed [1]	4.0	0.1%
Total	**3,344.2**	**100%**
Tidal Wetlands		
Estuarine and Marine Wetland	9,130.7	3.1%
Estuarine and Marine Deepwater	287,750.0	96.9%
Total	**296,880.7**	**100%**

Source: (USFWS 2022)

[1] Farmed wetlands are defined as wetlands where "the soil surface has been mechanically or physically altered for production of crops, but where hydrophytes would become reestablished if the farming were discontinued.

Significant Natural Communities. Four wetland communities adjacent to the proposed onshore facilities were identified as significant natural communities by the NYNHP (see agency correspondence in

Appendix C of Appendix L of the COP, Sunrise Wind 2022). These community types include the red maple – blackgum swamp, the brackish tidal marsh, the marine back-barrier Lagoon, and the marine eelgrass meadow.

Red Maple-Blackgum Swamp. A red maple - blackgum swamp is present along the eastern side of the Carmans River south of the LIE Service Road. Dominant tree species include black tupelo (*Nyssa sylvatica*) and red maple (*Acer rubrum*) along with understory species such as clammy azalea (*Rhododendron viscosum*) and coastal sweet pepperbush (*Clethra alnifolia*) (NYSDEC 2008b). This freshwater wetland is located approximately 300 ft (91 m) south of the LIE Service Road. No impacts to this wetland are anticipated.

Brackish Tidal Marsh. A 214-acre (87 ha) brackish tidal marsh was identified along the Carmans River approximately 0.5 (0.8 km) south of the onshore transmission cable location. This community is dominated by graminoids including salt marsh bulrush (*Bolboschoenus robustus*), Olney three-square (*Schoenoplectus americanus*), and wild rice (*Zizania aquatica*) (NYSDEC 2008a). Due to the distance of this community to the proposed Project, no impacts to this wetland are anticipated.

Marine eelgrass meadow. Extensive eelgrass (*Zostera marina)* meadows are present in Narrow Bay between Smith Point County Park on Fire Island and Smith Point Marina on the mainland. The grass beds provide spawning and foraging habitat for mollusks, crustaceans, juvenile fish, and diving ducks and help stabilize sediments (NYSDEC 2008b; Edinger et al. 2014). Further discussion of SAV is provided in Section 3.5.2 (*Benthic Resources*).

Marine back-barrier lagoon. A large marine back-barrier lagoon occurs in parts of Great South Bay and Moriches Bay near the landfall/ICW work area, surrounded by developed lands. The protected shores of the lagoons support grass beds, mudflats, and salt marshes. The trenchless construction methods currently proposed to install the Onshore Transmission Cable would avoid and minimize potential impacts to this community type.

A wetland delineation was conducted in the proposed Landfall/ ICW work areas and along the proposed Onshore Transmission Cable Route (COP, Appendix L, Revision 1-October 28, 2021, Sunrise Wind 2022). Several tidal and freshwater wetlands were delineated during the field surveys for the proposed Project (Figure 3.5.8-1 and Figure 3.5.8-2). These wetlands included three tidal wetlands and two freshwater wetlands associated with the Landfall/ICW Area/Temporary Landing Structure on Fire Island, and two freshwater watercourses, two freshwater waterbodies, and five freshwater wetlands associated with the onshore transmission cable route (COP, Section 4.4.1.1, Sunrise Wind 2022).

Landfall/ICW Area/Temporary Landing Structure

Tidal wetlands occur along the low energy bay side of Fire Island. The three delineated tidal wetlands are characterized as estuarine, intertidal wetlands (E1SS/EM) and occur on sand and sandy loam soils. Common plant species include Jesuit's bark (*Iva frutescens*), common reed (*Phragmites australis*), rambler rose (*Rosa multiflora*), and groundsel tree (*Baccharis halimifolia*).

Both freshwater wetlands associated with Landfall/ICW Area are palustrine emergent wetlands (PEM) that occur in a man-made basin. These wetlands are dominated by common reed and soils range from sand to fine sandy loam soils.

Onshore Transmission Cable Route

The Onshore Transmission Cable would traverse NYSDEC-regulated freshwater wetlands at the Carmans River. The Carmans River may be used by New York rare, threatened, and endangered species including species of special concern such as the eastern box turtle (*Terrapene carolina carolina*) and osprey (*Pandion haliaetus*); New York threatened species including the pied-billed grebe (*Podilymbus podiceps*); and New York endangered species such as the peregrine falcon (*Falco peregrinus*) and eastern box turtle (*Terrapene carolina carolina*). Some segments of the river also support concentrations of sea-run brown trout (*Salmo trutta*) and wild brook trout (*Salvelinus fontinalis*) (NYSDEC 2008).

The Carmans River is impounded by a small dam at approximately 3.5 river miles upstream of the river mouth, resulting in a lacustrine waterbody (L1UBHh) north of Horseblock Road/ Victory Avenue. South of the dam, the Carmans River has been channelized (R2UBH) as a result of historic roadway construction. Field delineations identified a second perennial watercourse (R2UB2) flowing southeast from a freshwater pond (PUBHh) to the impounded lacustrine waterbody associated with the Carmans River.

One isolated palustrine scrub-shrub wetland (PSS1E) was identified south of the freshwater pond (Figure 3.5.8-1. This wetland occurs on mucky peat soils in a confined basin. Common vegetation includes clammy azalea, highbush blueberry (*Vaccinium corymbosum*), and skunk cabbage (*Symplocarpus foetidus*).

Four forested wetlands (PFO1E) were delineated during field surveys. Soils ranged from sand to mucky peat. Common vegetation includes red maple, black tupelo , American elm (*Ulmus americana*), highbush blueberry, clammy azalea, coastal sweet-pepperbush (*Clethra alnifolia*), smooth arrow-wood (*Viburnum recognitum*), maleberry (*Lyonia ligustrina*), lamp rush (*Juncus effusus*), cinnamon fern (*Osmundastrum cinnamomeum*), tussock sedge (*Carex stricta*), and skunk cabbage (COP, Section 3.2.3.3 and Appendix L, Revision 1- October 28, 2021, (Appendix D), Sunrise Wind 2022).

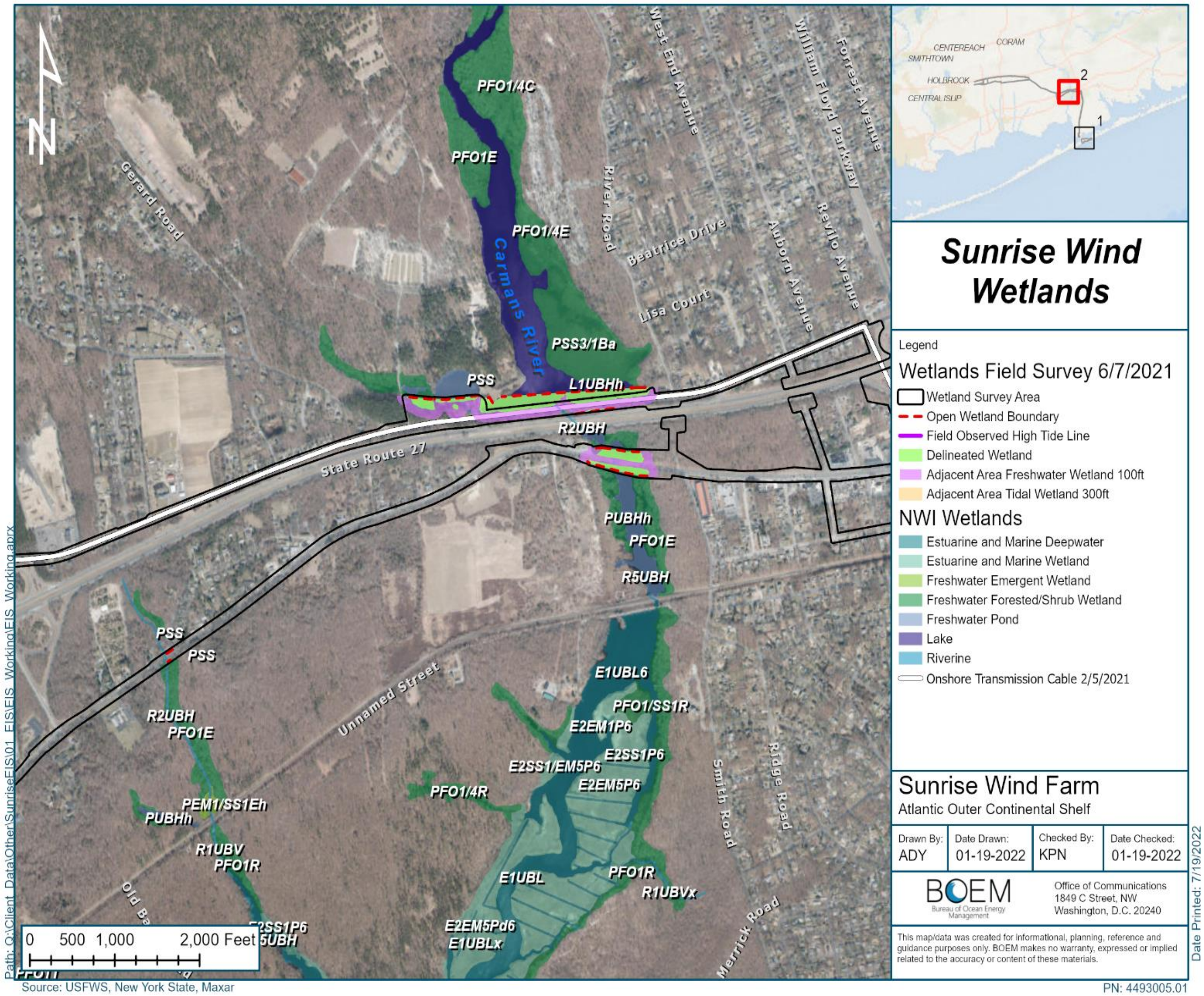


Figure 3.5.8-1. Delineated and NWI Wetlands in Project Area

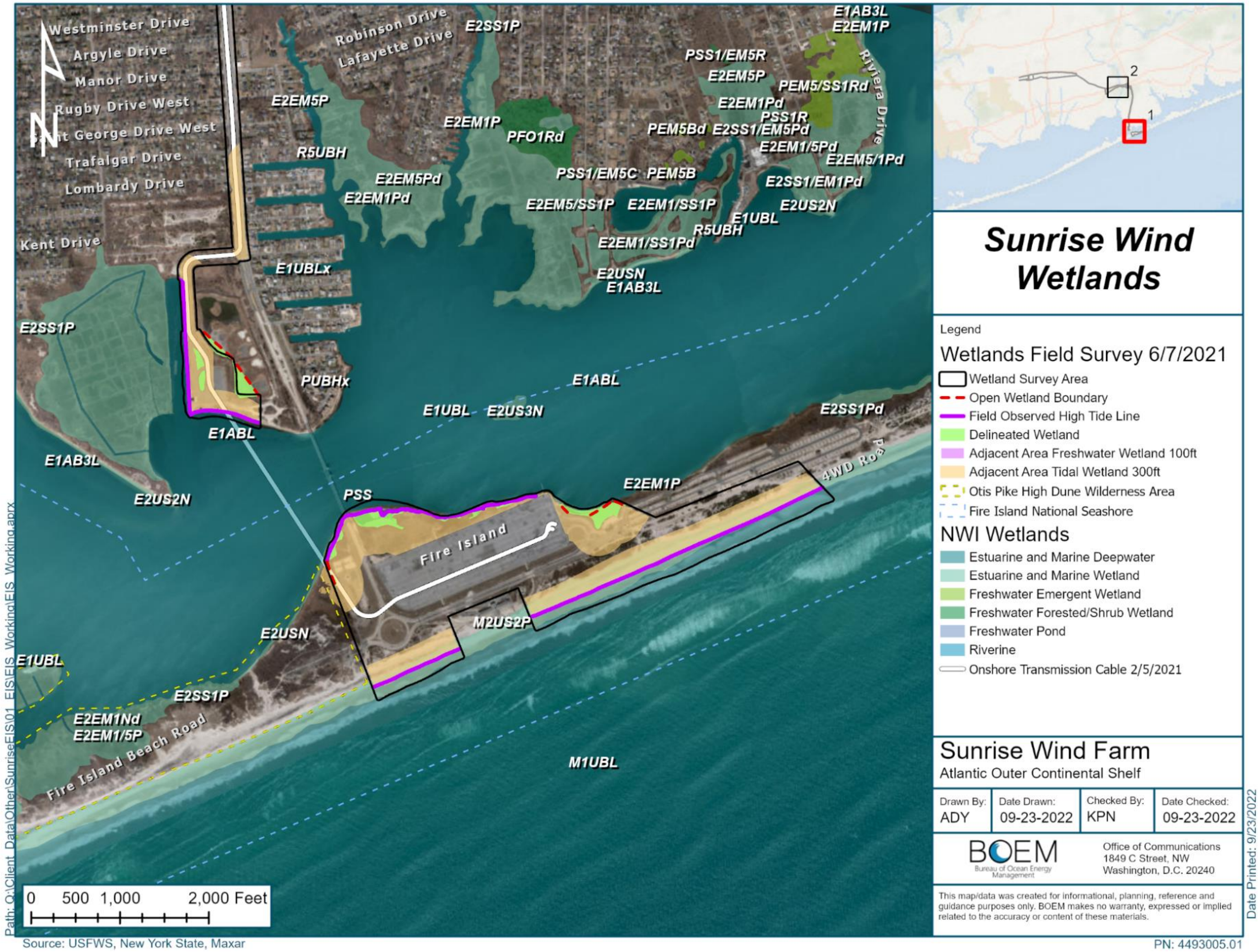


Figure 3.5.8-2. **Delineated and NWI Wetlands in Project Area**

3.5.8.2 Impact Level Definitions for Wetlands and Other Waters of the United States

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on wetlands and other WOTUS from the alternatives, including the Proposed Action. Table 3.5.8-2 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for wetlands and other WOTUS. Table G-12 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to wetlands and other WOTUS. Impacts are categorized as beneficial or adverse and may be short-term (temporary) or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur for long periods of time (e.g., decades or longer).

The USACE and NYDEC define wetland impacts differently than BOEM as defined under CWA Section 404. The USACE defines temporary impacts as those that occur when fill or cut impact occur in wetlands that are resorted to preconstruction contours when construction activities are complete. Conversion of a wetland type is considered a permanent impact.

Table 3.5.8-2. Definition of Potential Impact Levels for Wetlands and Other Waters of the Unites States

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Either no effect or no measurable impacts.	Either no effect or no measurable impacts
Minor	Small, measurable, adverse impacts to local wetland or other WOTUS extent, quality, or function; localized; could be avoided with mitigation; impacts that do occur are short-term or temporary in nature; complete recovery anticipated	Small and measurable effects that would increase the extent, quality, and functions of wetlands and other WOTUS in the proposed Project Area
Moderate	Notable and measurable adverse impacts to the extent, functions, or quality of wetlands or other WOTUS could occur, and the affected resource would recover completely with remedial or mitigating activities within a specified time frame.	Notable and measurable effects comprising an increase in the extent, functions, or quality of wetlands or other WOTUS in the proposed Project Area
Major	Measurable, long-term, and widespread (regional or population-level) adverse impacts to the extent, functions, or quality of wetlands or other WOTUS could occur, and full recovery not anticipated even with remediation or mitigation.	Measurable and widespread (regional or population-level) increase in extent, function, or quality of wetlands or other WOTUS.

3.5.8.3 Impacts of Alternative A - No Action on Wetlands and Other Waters of the United States

When analyzing the impacts of the No Action Alternative on WOTUS, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities, on the baseline conditions for WOTUS. 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 E, Planned Activities Scenario*.

3.5.8.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, impacts to wetlands would still be affected by IPFs from other ongoing activities and current environmental trends such as land use and climate change. Ongoing onshore development activities other than offshore wind within the GAA and climate change may contribute to impacts to wetlands or areas near wetlands. Onshore development activities may include visible infrastructure such as onshore wind turbines and cell towers, port development, other energy projects such as transmission and pipeline projects, and coastal development projects driven by population growth such as residential, commercial, and industrial development. Appendix E (Planned Activities Scenario) provides a description of ongoing activities that may have continuing temporary or permanent impacts to wetlands and areas adjacent to wetlands. Onshore construction activities may permanently (e.g., fill placement) and temporarily (e.g., vegetation removal, noise) impact wetland habitat, flora and fauna, water quality, and hydrological functions. All activities would be required to comply with federal, state, and local regulations protecting wetlands and other WOTUS, thereby avoiding or minimizing impacts. Mitigation would be anticipated for projects to compensate for wetland loss. Climate change is anticipated to continue to impact wetlands and other WOTUS. Sea level rise caused by climate change would result in the conversion of vegetated wetlands into open water which would result in a loss of wetland functions associated with vegetated wetlands. Although wetlands may migrate landward, onshore features such as steep slopes or developed landscapes may impede the transition. Rising sea levels may cause saltwater encroachment into freshwater wetlands which would result in a change in wetland plant communities, habitat, and wetland functions.

Ongoing offshore wind activities within the GAA that contribute to impacts on wetlands include:

- Continued O&M of the Block Island Project (5 WTGs) installed in State waters;
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and;
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Forks projects would affect wetlands through the primary IPFs of land disturbance, sediment suspension and deposition, discharges and releases, and noise. Ongoing offshore wind activities would have the same type of impacts from of land disturbance, sediment suspension and deposition, discharges and releases, and noise that are described in the following section for planned offshore wind activities.

3.5.8.3.2 Cumulative Impacts of the No Action Alternative

Future offshore wind activities may have impacts on wetlands and other WOTUS if onshore activities from these projects overlaps with the GAA. Appendix E provides additional information on other ongoing and planned actions considered in the planned activities scenario that contribute to the No Action baseline. Future offshore wind activities including projects proposed for development in Lease Area 0500 Bay State would likely have cable landings intersecting the GAA of the Proposed Action. Potential impacts of future offshore wind activities would likely be similar to those of the Proposed Action.

Land disturbance: Construction of onshore components for potential future offshore wind projects is anticipated to require vegetation clearing, excavating, trenching, filling, and grading. These activities may permanently or temporarily reduce, alter, or degrade wetland resources. Fill material permanently placed in wetlands during construction would result in the permanent loss of wetland habitat and functions, including flood and storage capacity and water quality functions, such as nutrient removal and sediment stabilization. Partially filling or fragmentation of a wetland may result in changes in wetland vegetation communities (e.g., forested wetland to herbaceous wetland). This could result in habitat loss or a change in natural hydrologic flow impeding a wetland's capacity to retain stormwater and floodwater. Permanent fill, fragmentation, or alteration in vegetation communities could drive out native, wetland species, and provide habitat for opportunistic edge and invasive species. Permanent wetland loss or alteration could affect wetlands within the watershed and reduce capacity of regional wetlands to provide wetland functions. Short-term impacts, such as rutting, compaction, and mixing of topsoil and subsoils during construction activities may temporarily affect the function of wetlands. Impacts from land disturbance on wetlands would be moderate because permanent wetland impacts would likely occur, and compensatory mitigation would be required under Section 404 of the Clean Water Act.

Sediment suspension and deposition: Sedimentation resulting from construction activities would increase the concentration of suspended solids in the water column which would affect water quality and wetland functions (e.g., smother sensitive vegetation, reduce water oxygen levels, or decrease the water storage capacity of the wetland) in adjacent or nearby wetlands or other WOTUS. The degree of impacts would depend on the type of construction activity, the extent of sediment loads, the duration of suspended sediment, and the proximity of the activities to the wetland. These impacts would be expected to be short-term and would occur largely during construction and decommissioning of the project (Refer to Section 3.4.3 *Water Quality*). However, sedimentation may occur during O&M if new ground disturbance is required during routine maintenance.

Discharges and releases: Spills or accidental releases of fuels, lubricants, or hydraulic fluids could occur during the construction of onshore components and could impact adjacent or nearby wetland or other WOTUs by reducing water quality and degrading habitat. Although a primary function of wetlands is to filter contaminants, a significant increase in the contaminate load could inhibit the wetland from performing water quality functions. Accidental spills are most likely to occur during construction and decommissioning but may occur during O&M to a lesser extent. However, due to construction and compliance measures, the frequency of spills and the volume of spilled materials are expected to be small. Compliance with applicable state and federal regulations related to oil spills and waste handing would minimize potential impacts from accidental spills. Trash and debris from onshore work area during construction of onshore components could have also have temporary effects on water quality and habitat in adjacent or nearby wetland or other WOTUS. With proper waste management procedures, the potential for trash or debris to be inadvertently introduced into wetland or other WOTUS is unlikely. Impacts for accidental releases and trash or debris are expected to be minor.

Noise: Noise from ongoing and planned offshore wind construction activities is not expected to be noticeable in onshore wetland habitats due to the distance to the offshore activities. However, noise from onshore activities and construction of other onshore facilities, would disturb and displace wetland fauna. Noise pollution is a reported threat to faunal groups such as amphibians, reptiles, and invertebrates, which are highly threatened (Sordello et al. 2020). Overall, noise is not anticipated to cause any meaningful change to coastal habitats and fauna, resulting in negligible impacts.

The extent of wetland impacts from these IPFs would depend on the type of construction activity and the proximity of these activities to wetlands. It is anticipated that these impacts would largely occur during construction and decommissioning. Impacts during O&M would likely occur in the event of a fault or failure and would be expected to be short-term and negligible. BOEM expects that onshore components for other offshore wind projects would be designed to avoid wetlands and other WOTUS to the extent feasible. This would include siting project components in previously disturbed areas (e.g., along existing roadways and right-of-ways). Offshore wind projects would be required to comply with federal, state, and local regulations related to the protection of wetlands and other WOTUS, thereby avoiding and minimizing impacts. This includes compliance with the New York State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges and an approved Stormwater Pollution Prevention Plan (SWPPP) to minimize impacts from disturbed sediments, and implementing good housekeeping measures to minimize trash and debris in the work areas. The in-water work would be required to be conducted in accordance with NYSDEC permits for Excavation and Fill in Navigable Waters and Tidal Wetlands (dredging permits), Clean Water Act (CWA) Section 404 Permit from USACE, and a Section 401 Water Quality Certification from NYSDEC. Mitigation for any lost wetlands or other WOTUS would be required if impacts could not be avoided or minimized.

3.5.8.3.3 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP and proposed Project construction and installation, O&M, and decommissioning would not occur. Therefore, any potential impacts on wetlands and other WOTUS associated with the proposed Project would not occur. However, ongoing activities and environmental trends in the region would have continuing impacts on wetlands and other WOTUS. Activities would be required to comply with federal, state, and local regulations protecting wetlands and other WOTUS, thereby avoiding or minimizing impacts. Mitigation would be anticipated to compensate for wetland loss if impacts could not be avoided or minimized. BOEM anticipates that the impact on wetlands resulting from ongoing activities associated with the No Action Alternative would be **moderate**.

Cumulative Impacts of the No Action Alternative

Planned activities other than offshore wind may also have impacts on wetlands including increased land disturbance from onshore construction. BOEM anticipates that the impact on wetlands resulting from planned activities associated with the No Action Alternative would be **moderate**.

Potential future offshore wind activities that would overlap the GAA could cause impacts similar to the impacts of the proposed Project. Activities would be required to comply with federal, state, and local regulations protecting wetlands and other WOTUS, thereby avoiding or minimizing impacts. If impacts would not be entirely avoided, mitigation would be anticipated for projects to compensate for the loss of wetlands. BOEM anticipates that the impact on wetlands resulting from potential future offshore wind activities associated with the No Action Alternative would be **moderate**.

Under the No Action Alternative, wetlands would continue to be impacted by environmental trends and activities associated with ongoing and planned activities, including offshore wind. BOEM anticipates that the overall impacts associated with Alternative A, the No Action Alternative, when combined with all other planned activities (including offshore wind) in the GAA would result in overall **moderate** impacts.

3.5.8.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on wetlands:

- The onshore transmission cable routing variants within the onshore Project area.

An alternate onshore transmission cable route with fewer wetlands or other WOTUS within or adjacent to the right-of-way would have less potential for direct and indirect impacts on wetlands.

3.5.8.5 Impacts of Alternative B - Proposed Action on Wetlands and Other Waters of the United States

The IPFs associated with the onshore facilities that could directly or indirectly impact wetlands or other WOTUS include land disturbance, sediment suspension and deposition, discharges and releases, and noise disturbance. These IPFs have the potential to affect temporarily or permanently the condition or function of sensitive resources previously identified.

3.5.8.5.1 Construction and Installation

3.5.8.5.1.1 Onshore Activities and Facilities

Land Disturbance: Construction and installation of onshore components may require excavation, grading, filling, and vegetation clearing and/or trimming. These activities may permanently or temporarily reduce, alter, or degrade wetland resources. The Onshore Transmission Cable route includes crossing the ICW and Carmans River to reach the OnCS-DC. Additionally, this route runs parallel to or intersects with delineated freshwater and tidal wetlands listed in Table 3.5.8-3. The trenchless construction methods currently proposed are expected to avoid direct impacts to surface waters and wetlands; therefore, no wetlands or other WOTUS are expected to be directly impacted by construction and installation of the proposed Project's onshore components. Additionally, most of the construction associated with the installation of the onshore proposed facilities would occur within existing roadways to minimize associated land disturbances or conversion of terrestrial wetland habitats (APM GEN-01, APM GEN-03). Installation technology was designed to minimize disturbances to sensitive habitats (i.e., wetlands) would be used to the extent practicable (APM GEN-08). Any disturbed areas in the proposed Project Area would be restored to preexisting contours (maintaining natural surface drainage patterns) and allow vegetation to become reestablished once construction activities are completed, to the extent practicable (APM GEN-13). Sunrise Wind is currently evaluating locations and facilities to provide O&M support to the Project. These sites include existing ports across New York, New England, and the Mid-Atlantic. It is anticipated that any O&M facility site that is used would also support other offshore wind or maritime industries on the East Coast. A major criterium for the location of the O&M facilities is the presence of existing infrastructure. Therefore, wetland impacts from the O&M facilities are expected to be avoided or minimized. A Temporary Landing Structure may be installed at Smith Point County Park to aid in the offloading of equipment and materials required for onshore construction. The Temporary Landing Structure may result in 0.01 acres of temporary impacts to tidal wetlands for the floating modules that would be grounded at low tide and for the installation of the spuds. If impacts occur during construction activities, they would be temporary, localized, and would be expected to recover completely (Sunrise Wind 2022). Table 3.5.8-3 provides a quantitative summary of anticipated impact to delineated wetlands and waterbodies by the Proposed Action component (COP Table 4.4.1-5 in Section 4.4.1.2 and Appendix L, Revision 1 - October 28, 2021, Sunrise Wind 2022). Potential adverse impacts on wetlands would be short term and localized. Due to the proposed construction methods and minimization measures, no permanent impacts to wetlands are anticipated and compensatory mitigation would likely not be necessary. The impact of land disturbance on wetlands resulting from the Proposed Action would be minor.

Table 3.5.8-3. Anticipated Impacts to Delineated Wetland and Waterbody Resources by Project Component

Project Component	Delineated Waterbody or Wetland Type/Number	Delineated Wetlands in Project Area (Acres)	Areal Extent of Potential Impact (Acres)	Areal Extent of Anticipated Impact (Acres)	Duration of Impact	Percent Impact Relative to Total Wetland Area
Landfall /ICW Area/Temporary Landing Structure	Estuarine/3	4.84	0.01	0.01	Temporary	0.20%
	Palustrine Emergent/2	0.69	0	0^	N/A	N/A
Onshore Transmission Cable Route	Lacustrine (Carmans River)/1	0.76	0	0^	N/A	N/A
	Riverine (Carmans River, unnamed perennial)/2	0.3	0.01	0*	N/A*	<0.01%
	Freshwater Pond/1	0.38	0	0^	N/A	N/A
	Palustrine Scrub Shrub/1	0.07	0	0^	N/A	N/A
	Palustrine Forested Wetland/4	0.74	0	0^	N/A	N/A
Total		**7.78**	**0.02**	**0.01**		

Source: (COP Table 4.4.1-5 in Section 4.4.1.2 and Appendix L, Revision 1-October 28, 2021, Sunrise Wind 2021).

Notes: * No impacts, installed via HDD.

Sediment Suspension and Deposition: As described above, the waterbodies crossed by the proposed Project (Carmans River and ICW) would likely be crossed using trenchless installation methods. These methods are expected to avoid direct impact to wetlands and other WOTUS. All earth disturbances from construction activities would be conducted in compliance with the New York SPDES for stormwater discharges which would further minimize impacts from disturbed sediments into waterbodies. Additionally, an SWPPP, including erosion and sedimentation control best management practice (BMPs) (APM GEN-11) and revegetation measures would be implemented to minimize potential water quality impacts from construction (APM GEN-13). Any impacts are expected to be localized and temporary with water quality returning to pre-existing conditions soon after the cessation of construction activities (COP, Section 4.4.1.2, Sunrise Wind 2022).

Discharges and Releases: Although no impacts for discharges and releases are anticipated, spill or accidental releases of fuels, lubricants, or hydraulic fluids could occur during construction activities. A Spill Prevention, Control, and Countermeasure (SPCC) Plan would be developed, and any discharges or release would be governed by NYS regulations (APM GEN-11). Additionally, where HDD is utilized, an Inadvertent Return Plan would be prepared and implemented to minimize the potential risks associated with release of drilling fluids (APM GEN-12). Any unanticipated discharges or releases within the onshore facilities during construction are expected to result in minor, temporary impacts; activities are heavily regulated, and discharges and releases are considered accidental events that are unlikely to occur (COP, Section 4.4.1.2, Sunrise Wind 2022). Good housekeeping practices would be implemented to minimize trash and debris in onshore work areas. These practices would include orderly storage of tools, equipment, and materials, as well as proper waste collection, storage, and disposal to keep work areas clean and minimize potential environmental impacts. All trash and debris returned to shore from offshore vessels would be properly disposed of or recycled at licensed waste management and/or recycling facilities. Disposal of any solid waste or debris in the water would be prohibited. With proper waste management procedures, the potential for trash or debris to be inadvertently introduced into wetland or other WOTUS is unlikely, and any impacts would be minor and temporary (COP, Section 4.4.1.2, Sunrise Wind 2022).

Noise: As described above, noise from offshore wind construction activities is not expected to be noticeable in onshore wetland habitats due to the distance to the offshore activities. However, noise from onshore activities, e.g., trenching and HDD of export cables and construction of other onshore facilities, would disturb and displace wetland fauna. Noise is anticipated intermittently during construction phases. Wildlife would be temporarily displaced but would have access to adjacent habitat and would repopulate work areas once construction ceases. However, noise pollution is a reported threat to wetland groups such as aquatic invertebrates (Hopson 2019:) and road noise is a reported threat to birds (Hirvonen 2001) Construction is anticipated to occur within established ROWs where wildlife is absent or have been habituated to human activity and noise. Noise is not anticipated to cause any meaningful change to coastal habitats and fauna due to existing traffic and recreational noise. Therefore, impacts to fauna would be temporary and short-term resulting in negligible to minor impacts.

3.5.8.5.1.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.5.8.5.2 Operations and Maintenance

3.5.8.5.2.1 Onshore Activities and Facilities

Normal O&M activities are not expected to involve further wetland alterations. The onshore interconnection cable route and associated facilities generally have no maintenance needs unless a fault or failure occurs; therefore, O&M is not expected to affect wetlands or other WOTUS. Any non-routine maintenance may cause limited land disturbance and noise disturbance for temporary access to assess damage and for repair or replacement of infrastructure, but any impact is expected to be short term and negligible.

3.5.8.5.2.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.5.8.5.3 Conceptual Decommissioning

3.5.8.5.3.1 Onshore Activities and Facilities

Decommissioning of the onshore proposed Project components are anticipated to be similar to or less adverse than those described for construction. If impacts do occur during decommissioning, they would be short-term and localized.

3.5.8.5.3.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.5.8.5.4 Cumulative Impacts of the Proposed Action

In context of reasonably foreseeable environmental trends, the impacts on wetlands under the Proposed Action may add to the impacts of ongoing and future land disturbance, sediment suspension and deposition, discharges and releases, and noise. Impacts due to onshore land use changes are expected to include a gradually increasing amount of wetland alteration and loss. The future extent of land disturbance from ongoing activities and future non-offshore wind activities over the next 35 years is not known with as much certainty as the extent of land disturbance that would be cause by the Proposed Action but based on regional trends is anticipated to be similar to or greater than that of the Proposed Action. If a future project were to overlap the GAA or even be co-located (partly or completely) within the same right-of-way corridor that the Proposed Action would use, then the impacts of those future projects on wetlands would be of the same type as those of the Proposed Action alone; the degree of impacts may increase, although the location and timing of future activities would influence this. For example, repeated construction in a single right-of-way corridor would be expected to have less impact on wetlands than construction in an equivalent area of undisturbed wetland. Offshore wind projects would be required to comply with federal, state, and local regulations related to the protection of wetlands and other WOTUS, thereby avoiding and minimizing impacts. This includes compliance with the New York State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges and an approved Stormwater Pollution Prevention Plan (SWPPP) to minimize impacts from disturbed sediments and implementing good housekeeping measures to minimize trash and debris in the work areas. The in-water work would be required to be conducted in accordance with NYSDEC permits for Excavation and Fill in Navigable Waters and Tidal Wetlands (dredging permits), Clean Water Act (CWA) Section 404 Permit from USACE, and a Section 401 Water Quality Certification from NYSDEC. Mitigation for any lost wetlands or other WOTUS would be required if impacts could not be avoided or minimized. Therefore, in context of reasonably foreseeable environmental trends, combined land disturbance, sediment suspension and deposition, discharges and releases, and noise impacts on wetlands from ongoing and planned activities, including the Proposed Action, would likely be minimal.

3.5.8.5.5 Conclusions

Impacts of the Proposed Action

The activities associated with the Proposed Action may result in short-term impacts to wetlands or other WOTUS from activities within or adjacent to these resources. Due to proposed design and construction methods (e.g., constructing within existing ROWs, trenchless construction) direct impacts to surface waters and wetlands are mostly avoided. Because of the proposed Project design which includes avoidance, minimization measures, and mitigation measures required under federal and state statutes, BOEM expects the impacts resulting for the Proposed Action alone would likely have **negligible** to **minor** impact on wetlands and other WOTUS.

Cumulative Impacts of the Proposed Action

In the context of other ongoing and planned activities, the incremental contribution of the Proposed Action to the impacts of individual IPFs would be **negligible** to **minor**. Considering all the IPFs together, BOEM expects that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **moderate** impacts to wetlands and other WOTUS. Measurable impacts from the Proposed Action would be small and contribute to the overall impact rating mainly through short-term impacts on wetlands from onshore construction activities adjacent to wetlands and other WOTUS. These resources would be expected to recover completely from these activities.

3.5.8.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.5.8.6.1 Construction and Installation

3.5.8.6.1.1 Onshore Activities and Facilities

All onshore Project components and construction and installation activities would be the same as the Proposed Action. As such, the impact of this alternative would be the same as the Proposed Action.

3.5.8.6.1.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.5.8.6.2 Operations and Maintenance

3.5.8.6.2.1 Onshore Activities and Facilities

All onshore Project components and O&M activities would be the same as the Proposed Action. As such, the impact of this alternative would be the same as the Proposed Action.

3.5.8.6.2.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.5.8.6.3 Conceptual Decommissioning

3.5.8.6.3.1 Onshore Activities and Facilities

All onshore proposed Project components and conceptual decommissioning activities would be the same as the Proposed Action. As such, the impact of this alternative would be the same as the Proposed Action.

3.5.8.6.3.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.5.8.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts of Alternative C-1 considered the impacts of Alternative C-1 in combination with other planned onshore wind and other offshore activities. Cumulative impacts would be similar to those described for the Proposed Action.

3.5.8.6.5 Conclusions

Impacts of Alternative C-1

Because changes in the WTGs arrangement would not impact onshore wetlands and other WOTUS, BOEM expects that the impacts resulting from Alternative C-1 alone would be the same as the Proposed Action: **negligible** to **minor**.

Cumulative Impacts of Alternative C-1

In the context of other ongoing and planned activities, the contribution of Alternative C-1 to the impacts of individual IPFs would be similar to the Proposed Action: **negligible** to **minor**. Considering all the IPFs together, the overall impacts of the alternatives when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action and result in **moderate** impacts to wetlands and other WOTUS.

3.5.8.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

3.5.8.7.1 Construction and Installation

3.5.8.7.1.1 Onshore Activities and Facilities

All onshore Project components and construction and installation activities would be the same as the Proposed Action. As such, the impact of this alternative would be the same as the Proposed Action.

3.5.8.7.1.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.5.8.7.2 Operations and Maintenance

3.5.8.7.2.1 Onshore Activities and Facilities

All onshore Project components and O&M activities would be the same as the Proposed Action. As such, the impact of this alternative would be the same as the Proposed Action.

3.5.8.7.2.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.5.8.7.3 Conceptual Decommissioning

3.5.8.7.3.1 Onshore Activities and Facilities

All onshore Project components and conceptual decommissioning activities would be the same as the Proposed Action. As such, the impact of this alternative would be the same as the Proposed Action

3.5.8.7.3.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.5.8.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts of Alternative C-2 considered the impacts of Alternative C-2 in combination with other planned onshore wind and other offshore activities. Cumulative impacts would be similar to those described for the Proposed Action.

3.5.8.7.5 Conclusions

Impacts of Alternative C-2

Since changes in the WTGs arrangement would not impact onshore wetlands and other WOTUS, BOEM expects that the impacts resulting from Alternative C-2 alone would be the same as the Proposed Action: **negligible** to **minor**.

Cumulative Impacts of Alternative C-2

In the context of ongoing and planned activities, the incremental contribution of Alternative C-2 to the impacts of individual IPFs would be similar to the Proposed Action: **negligible** to **minor**. Considering all the IPFs together, the overall impacts of the alternatives when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action and result in **moderate** impacts to wetlands and other WOTUS.

3.5.8.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall negligible to minor adverse impacts on wetlands. Table 3.5.8-4 provides an overall summary of alternative impacts.

Table 3.5.8-4. Comparison of Alternative Impacts on Wetlands and Other WOTUS

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C1)	Fisheries Habitat Minimization (Alternative C2)
Wetlands and Waters of the United States	*Proposed Action*: BOEM expects the impacts resulting for the Proposed Action alone would likely have	*Alternative C-1*: Because changes in the WTGs arrangement would not impact onshore wetlands and other WOTUS, BOEM expects that	*Alternative C-2*: Since changes in the WTGs arrangement would not impact onshore wetlands and other WOTUS, BOEM

	negligible to **minor** impact on wetlands and other WOTUS. *Cumulative Impacts of the Proposed Action:* Considering all the IPFs together, BOEM expects that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **moderate** impacts to wetlands and other WOTUS..	the impacts resulting from Alternative C-1 alone would be the same as the Proposed Action: **negligible** to **minor**. *Cumulative Impacts of Alternative C-1*: Considering all the IPFs together, the overall impacts of the alternatives when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action and result in **moderate** impacts to wetlands and other WOTUS.	expects that the impacts resulting from Alternative C-2 alone would be the same as the Proposed Action: **negligible** to **minor**. *Cumulative Impacts of Alternative C-2*: Considering all the IPFs together, the overall impacts of the alternatives when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action and result in **moderate** impacts to wetlands and other WOTUS.

3.5.8.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2; however for wetlands and other WOTUS, there are no measures currently proposed by BOEM. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to wetlands and other WOTUS.

3.6 Socioeconomic Conditions and Cultural Resources

3.6.1 Commercial Fisheries and For-Hire Recreational Fishing

This section discusses potential impacts on commercial fisheries and for-hire recreational fishing from the proposed Project, alternatives, and ongoing and planned activities in the commercial fisheries and for-hire recreational fishing GAA. The commercial fisheries and for-hire recreational fishing GAA, as shown on Figure 3.6.1-1, includes the waters managed by the New England Fishery Management Council (NEFMC) and Mid-Atlantic Fishery Management Council (MAFMC) for federal fisheries within the United States. Exclusive Economic Zone (from 3 nm to 200 nm [5.6 km to 370.4 km] from the coastline, plus the state waters out to 3 nm (5.6 km) from the coastline from Maine to North Carolina. The boundaries for the GAA were developed to consider impacts on federally permitted vessels operating in all fisheries in state and United States. Exclusive Economic Zone waters surrounding the proposed Project.

Due to size of the GAA, the analysis for this Draft EIS focuses on the commercial fisheries and for-hire recreational fishing that would likely occur in the proposed Project Area or be affected by Project-related activities, while providing context within the larger GAA. Figure D-11 (Appendix D) provides the geographic study area of ongoing non-offshore wind activities, planned non-offshore wind activities, and offshore wind activities.

3.6.1.1 Description of the Affected Environment and Future Baseline Conditions

3.6.1.1.1 Commercial Fisheries

This section provides an overview of commercial fisheries management and the economic value of fisheries in the region and the proposed Project Area.

The primary source for regional fisheries data (Mid-Atlantic and New England regions) was Vessel Trip Report data provided by NMFS (2021a). The summary Vessel Trip Report data included catch estimates by fishing location combined with NMFS estimates of revenue using ex-vessel price data drawn from commercial fisheries data dealer reports. The primary source of fisheries data within the Lease Area was NMFS's *Socioeconomic Impacts of Atlantic Offshore Wind Development* website (NMFS 2021b), which summarizes commercial fisheries data for each proposed WEA along the United States Atlantic coast. In addition, figures developed by BOEM based on NMFS Vessel Monitoring System (VMS) data provided by NMFS (2019) are included and provide additional information about fishing activities in the Lease Area.

To the extent that data are available, the commercial fishing described here includes federally permitted fishing activity in both state and federal waters. Data on the average annual revenue of federally permitted vessels by FMP fishery, gear type, and port of landing are summarized. In general, the data presented focus on those FMP fisheries, species, gear types, and ports that are relevant to commercial fishing activity in the Project Area.

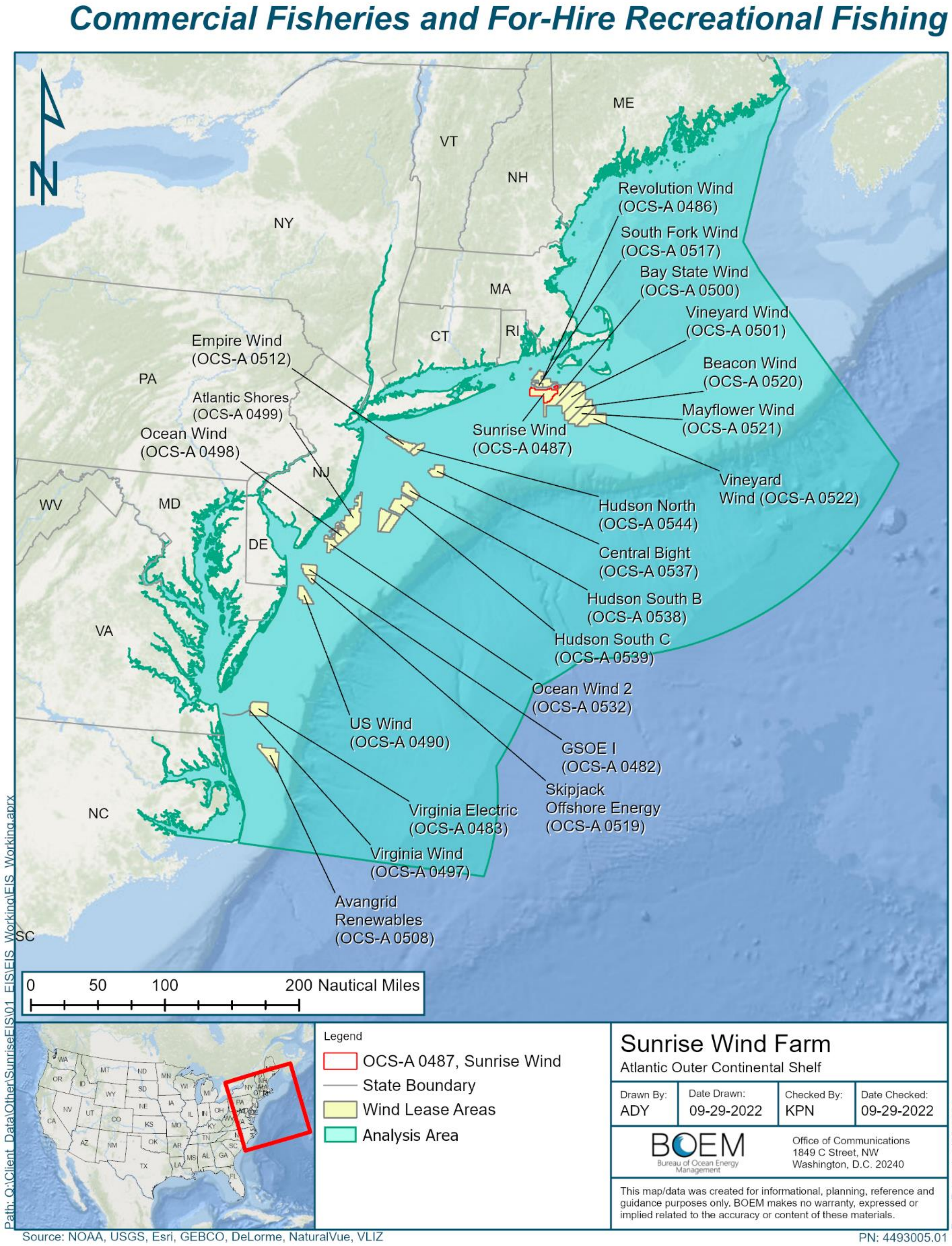


Figure 3.6.1-1. Commercial Fisheries and For-Hire Recreational Fishing Geographic Analysis Area

3.6.1.1.2 Regional Setting

Commercial fisheries in federal waters of the New England and Mid-Atlantic regions harvest a variety of finfish and shellfish species, including clams, crabs, groundfish, herring, lobster, squid, scallops, and skates. These species are harvested with a variety of fishing gear, including mobile gear (e.g., bottom trawl, midwater trawl, dredge) and fixed gear (e.g., demersal gillnet, lobster trap, crab trap, pots). The fishery resources are managed under numerous FMPs, including the Atlantic Herring FMP, Monkfish FMP, Northeast Multi-species (large- and small-mesh) FMP,[14] Red Crab FMP, Sea Scallop FMP, and Skate FMP (NEFMC 2021); Bluefish FMP, Mackerel/Squid/Butterfish FMP, Spiny Dogfish FMP, Summer Flounder/Scup/Black Sea Bass FMP, Surfclam/Ocean Quahog FMP, and Tilefish FMP (MAFMC 2021); Highly Migratory Species FMP (NMFS 2021c); and Atlantic Menhaden FMP, Lobster FMP, and Jonah Crab FMP (ASMFC 2021).

The predominant commercial fish and shellfish species in the GAA based on landed weight and ex-vessel revenue are summarized by species for the years 2010 through 2019 in Table 3.6.1-1 and Table 3.6.1-2 respectively. During this period, the species with the highest average annual landed weight included Atlantic menhaden, which represented 34 percent of the average landed weight, American lobster, Atlantic herring, blue crab, sea scallop, and surf clam. The most valuable species over this period were sea scallop and American lobster, which together represented 58 percent of the average annual ex-vessel revenue. Other valuable species harvested in state and federal waters included Atlantic herring, Atlantic menhaden, Atlantic surf clam, longfin and northern shortfin squid, summer flounder, and monkfish.

Commercial fisheries provide economic benefits to the coastal communities of New England and the Mid-Atlantic region by contributing to the income of vessel crews and owners and by creating demand for dockside services to process seafood products and maintain vessels. On average, commercial fishing activity in New England and the Mid-Atlantic generated approximately $1.2 billion in annual ex-vessel revenue from 2010 through 2019.

Table 3.6.1-3 summarizes the average annual revenue by port of landing from 2010 through 2019 for ports in the GAA. Landings in New Bedford, Massachusetts represented approximately 33 percent of the average annual commercial fishing revenue in the GAA. The ports with the next highest revenues—Cape May, New Jersey and the Hampton Roads area, Virginia—represented 6 percent and 5 percent, respectively.

[14] The Northeast Multi-species (large mesh) FMP includes Acadian redfish, American plaice, Atlantic cod, Atlantic haddock, Atlantic halibut, Atlantic wolffish, ocean pout, pollock, white hake, witch flounder, windowpane flounder, winter flounder, and yellowtail flounder. The Northeast Multi-species small-mesh FMP includes offshore hake, red hake, and silver hake.

Table 3.6.1-1. Commercial Fishing Landings of the Top 20 Species by Landed Weight within the Geographic Analysis Area, 2010–2019

Species [1]	FMP Fishery	Peak Annual Landings (millions of lbs.)	Average Annual Landings (millions of lbs.)	Percentage of Landings in Geographic Analysis Area
Atlantic menhaden	Atlantic Menhaden	504.8	430.3	33.6%
Atlantic herring	Atlantic Herring	206.1	146.5	11.4%
American lobster	American Lobster	159.4	141.1	11.0%
Blue crab	No federal FMP	119.3	74.1	5.8%
Sea scallop	Sea Scallop	60.5	49.3	3.8%
Atlantic surf clam	Surfclam/Ocean Quahog	44.6	38.0	3.0%
Skates	Skate	40.1	33.3	2.6%
Illex squid	Mackerel/Squid/Butterfish	58.2	27.7	2.2%
Loligo squid	Mackerel/Squid/Butterfish	40.1	25.3	2.0%
Monkfish	Monkfish	23.9	20.3	1.6%
Spiny dogfish	Spiny Dogfish	24.1	16.7	1.3%
Jonah crab	Jonah Crab	20.1	15.1	1.2%
Scup	Summer Flounder/Scup/Black Sea Bass	17.8	14.7	1.1%
Silver hake	Northeast Multispecies (small-mesh)	17.8	14.4	1.1%
Ocean quahog	Surfclam/Ocean Quahog	29.6	13.8	1.1%
Atlantic mackerel	Mackerel/Squid/Butterfish	21.7	12.7	1.0%
Haddock	Northeast Multi-species (large-mesh)	21.6	12.1	0.9%
Pollock	Northeast Multi-species (large-mesh)	15.9	9.7	0.8%
Acadian redfish	Northeast Multi-species (large-mesh)	11.7	8.7	0.7%
Summer flounder	Summer Flounder/Scup/Black Sea Bass	13.0	8.3	0.6%
All FMP species		724.7	645.3	50.3%
All species [2]		1,454.1	1,282.8	--

Source: NMFS 2021a.

[1] Species are sorted by average annual landings in descending order.

[2] Includes 250 species and taxonomic groups (e.g., drums, skates) for which there were recorded landings.

Table 3.6.1-2. Commercial Fishing Revenue of the Top 20 Most Valuable Species within the Geographic Analysis Area, 2010–2019

Species [1]	FMP Fishery	Peak Annual Revenue (millions of dollars)	Average Annual Revenue (millions of dollars)	Percentage of Revenue in Geographic Analysis Area
American lobster	American Lobster	$670.4	$541.3	30.2%
Sea scallop	Sea Scallop	$580.6	$501.5	28.0%
Blue crab	No federal FMP	$127.7	$97.8	5.5%
Eastern oyster [2]	No federal FMP	$102.6	$69.8	3.9%
Northern quahog [2]	No federal FMP	$57.2	$42.9	2.4%
Atlantic menhaden	Atlantic Menhaden	$45.3	$39.6	2.2%
Loligo squid	Mackerel/Squid/Butterfish	$50.1	$31.2	1.7%
Atlantic surf clam	Surfclam/Ocean Quahog	$32.2	$28.7	1.6%
Atlantic herring	Atlantic Herring	$31.8	$24.9	1.4%
Soft-shell clam	No federal FMP	$31.0	$23.9	1.3%
Summer flounder	Summer Flounder/Scup/Black Sea Bass	$27.4	$23.4	1.3%
Monkfish	Monkfish	$27.1	$19.7	1.1%
Striped bass	No federal FMP	$22.0	$18.3	1.0%
Haddock	Northeast Multi-species (large-mesh)	$21.7	$13.2	0.7%
Atlantic cod	Northeast Multi-species (large-mesh)	$32.6	$13.0	0.7%
Illex squid	Mackerel/Squid/Butterfish	$27.3	$11.9	0.7%
Jonah crab	Jonah Crab	$18.5	$11.8	0.7%
American eel	No federal FMP	$39.6	$11.3	0.6%
Ocean quahog	Surfclam/Ocean Quahog	$18.6	$10.5	0.6%
Silver hake	Northeast Multi-species (small-mesh)	$11.2	$10.1	0.6%
All FMP species		$1,497.4	$1,337.8	74.6%
All species [3]		$2,020.0	$1,793.0	--

Source: NMFS 2021a

[1] Species are sorted by revenue in descending order.

[2] Farmed.

[3] Includes 250 species and taxonomic groups (e.g., drums, skates) for which there were recorded landings.

Table 3.6.1-3. Commercial Fishing Landings and Revenue for the Top 30 Highest Revenue Ports in the Geographic Analysis Area, 2010–2019

Port and State [1]	Peak Annual Landings (millions lbs.)	Average Annual Landings (millions lbs.)	Peak Annual Revenue (millions dollars)	Average Annual Revenue (millions dollars)	Percentage of Revenue in Geographic Analysis Area
New Bedford, Massachusetts	143.0	123.3	$450.8	$371.4	32.1%
Cape May, New Jersey	101.6	60.2	$102.7	$74.3	6.4%
Hampton Roads Area, Virginia	18.3	15.1	$88.3	$61.9	5.4%
Stonington, Maine	25.4	19.2	$68.0	$54.7	4.7%
Gloucester, Massachusetts	88.8	67.6	$60.7	$52.2	4.5%
Point Judith, Rhode Island	57.3	47.4	$65.9	$50.1	4.3%
Vinalhaven, Maine	13.4	10.1	$42.3	$34.3	3.0%
Reedville, Virginia	426.1	357.9	$36.9	$33.5	2.9%
Portland, Maine	62.4	50.3	$38.1	$30.8	2.7%
Provincetown-Chatham, Massachusetts	26.5	19.6	$34.8	$29.7	2.6%
Point Pleasant, New Jersey	43.3	26.4	$35.4	$29.0	2.5%
Barnegat Light, New Jersey	8.9	7.5	$34.1	$27.0	2.3%
Wanchese-Stumpy Point, North Carolina	25.6	18.9	$26.6	$22.6	2.0%
Beals Island, Maine	8.1	6.6	$23.5	$19.9	1.7%
Friendship, Maine	9.1	5.9	$24.6	$19.9	1.7%
Atlantic City, New Jersey	29.9	25.5	$22.1	$19.3	1.7%
Newington, New Hampshire	4.7	4.1	$26.6	$19.3	1.7%
Montauk, New York	14.8	12.2	$21.2	$17.4	1.5%
Boston, Massachusetts	20.2	15.4	$19.3	$17.0	1.5%
Fairhaven, Massachusetts	7.5	5.3	$25.2	$16.7	1.4%
All New England and Mid-Atlantic ports [2]	**1,073.7**	**1,025.1**	**$1,384.1**	**$1,156.5**	**--**

Source: NMFS 2021a.

[1] Ports are sorted by revenue in descending order. Includes 54 ports within the New England and Mid-Atlantic region.

[2] Includes 54 ports within the New England and Mid-Atlantic region.

Table 3.6.1-4 depicts the average annual revenue of commercial fisheries in the GAA by gear type for the 2008–2019 period.[15] The most valuable gear type was scallop dredges, which generated $489.4 million in annual revenue, followed by bottom trawls ($187.2 million), pot-other gear ($115.1 million), and clam dredges ($61.3 million).

Table 3.6.1-4. Commercial Fishing Revenue by Gear Type in the Geographic Analysis Area (Mid-Atlantic and New England), 2008–2019

Gear Type [1]	Peak Annual Revenue (millions of dollars)	Average Annual Revenue (millions of dollars)	Percentage of Revenue in Geographic Analysis Area
Dredge-scallop	$615.2	$489.4	51.3%
Trawl-bottom	$229.2	$187.2	19.6%
Pot-other	$146.2	$115.1	12.1%
Dredge-clam	$65.8	$61.3	6.4%
Gillnet-sink	$44.6	$30.0	3.1%
Trawl-midwater	$26.6	$19.0	2.0%
Handline	$6.2	$4.8	0.5%
All other gear [2]	$62.4	$47.3	5.0%
All gear types	**$1,135.2**	**$954.1**	--

Source: BOEM 2021b

[1] Gear types are sorted by revenue in descending order.

[2] Includes revenue from federally permitted vessels using longline gear, seine gear, other gillnet gear, and unspecified gear.

Commercial fishing fleets are important to coastal communities in the Mid-Atlantic and New England regions. These fleets not only generate direct employment and income for vessel owners and crew, but contribute indirectly to the employment and revenue generated through products and services necessary to maintain and operate fishing vessels, seafood processors, wholesalers/distributors, and retailers. In 2019, total species landings in the Mid-Atlantic and New England regions were valued at $2.02 billion, including landings from non-federally permitted vessels. The Mid-Atlantic region contributed $498 million and the New England region $1.52 billion to the total landings (NMFS 2021c). The region is home to aquaculture production and research that provides employment and business opportunities for coastal communities. The seafood industry generated $3.8 billion in personal and proprietor income in the Mid-Atlantic region and $5.6 billion in New England (NMFS 2020). Table 3.6.1-5 shows the average annual revenue by port of landing in the Mid-Atlantic and New England regions for the period from 2008 through 2019. New Bedford, Massachusetts, had the highest revenue of the regional landings, accounting for approximately 40 percent of the total average annual commercial fishing revenue in the Mid-Atlantic and New England regions. Cape May, New Jersey, comparatively accounted for approximately 9 percent of the total average annual revenue.

[15] A 12-year period of 2008–2019 was used in the source for this summary table (BOEM 2021b).

Table 3.6.1-5 presents the level of commercial fishing engagement and reliance of the community in which the port is located. These rankings portray the level of dependence on commercial fishing in the community and are compiled by NMFS (NOAA 2022). As presented in the table, the rankings differ across communities. For example, Cape May, New Jersey, ranks high in both commercial fishing engagement and reliance and Point Pleasant, New Jersey, ranks low in the two indices. Information regarding the rankings determinations for each community is provided in the community profiles available from NMFS (NOAA 2022). These profiles present the most recent data available for these key indicators of New England and Mid-Atlantic fishing communities related to dependence on fisheries and other economic and demographic characteristics. Selected socioeconomic characteristics of communities with fishing ports that could be affected by the proposed Project are presented in Section 3.6.3 *Demographics, Employment, and Economics* and Section 3.6.4 *Environmental Justice*.

Table 3.6.1-5. Commercial Fishing Revenue of Federally Permitted Vessels in Mid-Atlantic and New England Fisheries and Level of Fishing Dependence by Port (2008–2019)

Port and State	Peak Annual Revenue ($1,000s)	Average Annual Revenue ($1,000s)	Commercial Fishing Engagement Categorical Ranking[1]	Commercial Fishing Reliance Categorical Ranking[2]
Chilmark/Menemsha, Massachusetts	$656.1	$753.4	Medium	Medium
Fairhaven, Massachusetts	$17,395.3	$11,282.5	High	Low
New Bedford, Massachusetts	$458,246.7	$378,792.6	High	Medium
Fall River, Massachusetts	$5,123.6	$1,135.6	Medium	Low
Westport, Massachusetts	$1,905.8	$1,305.2	Low	Low
New Shoreham, Rhode Island	$303.7	$99.9	Medium	Medium
Tiverton, Rhode Island	$1,603.1	$1,148.8	Medium	Low
Little Compton, Rhode Island	$3,007.4	$1,992.2	Medium	Medium
Newport, Rhode Island	$16,111.1	$8,896.3	High	Low
Point Judith, Rhode Island	$58,531.0	$46,076.7	High	Medium
New London, Connecticut	$11,117.1	$6,646.6	Medium-High	Low
Stonington, Connecticut	$11,946.4	$10,273.8	High	Low
Montauk, New York	$24,549.9	$18,496.4	High	Medium
Shinnecock/Hampton Bays, New York	$8,642.8	$6,819.1	High	Low
Cape May, New Jersey	$122,692.9	$83,159.7	High	High
Point Pleasant Beach, New Jersey	$37,321.9	$30,986.2	High	Medium-High
Hampton, Virginia	$19,482.0	$14,379.2	High	Low
Newport News, Virginia	$54,540.1	$30,970.8	High	Low
Beaufort, North Carolina	$5,210.8	$2,654.1	High	Medium
All New England/Mid-Atlantic Ports	**$858,387.7**	**$655,869.1**	**NA**	**NA**

Source: NMFS 2021a; 2022

Notes: Commercial fishing revenue data are for the 2008–2019 period; levels of fishing dependency are for 2018. Revenue is adjusted for inflation to 2019 dollars. Peak annual revenue and average annual revenue are calculated independently for all rows, including the All New England/Mid-Atlantic Ports row.

[1] Commercial fishing engagement measures the presence of commercial fishing through fishing activity as shown through permits, fish dealers, and vessel landings. A high rank indicates more engagement.

[2] Commercial fishing reliance measures the presence of commercial fishing in relation to the population size of a community through fishing activity. A high rank indicates more reliance.

NA = not applicable

Commercial Fisheries in the Lease Area

The commercial fisheries active in the Sunrise Wind Lease Area encompass a wide range of FMP fisheries, gears, and landing ports. Table 3.6.1-6 and Table 3.6.1-7 provide data on revenue and landings for 2008 through 2020 for commercial fisheries in the Lease Area. The top fisheries by revenue in the Lease Area were monkfish, sea scallop, skates, summer flounder/scup/black sea bass, and the All Others FMPs.[16] The top five FMP fisheries accounted for approximately 63 percent of total revenue generated commercially within the Lease Area from 2008 through 2020 and approximately 59 percent of all landings. Other high revenue generating FMPs include the Atlantic States Marine Fisheries Commission (ASMFC) FMP, Northeast Multi-species, and mackerel/squid/butterfish, which all averaged over $100,000 annually during the 2008-2020 period. While the Sea Scallop FMP fishery only accounted for roughly 1.6 percent of the total landings, it was the second highest revenue producer, accounting for approximately 17 percent of the total revenue produced within the Lease Area, behind only monkfish, which accounted for 23 percent of the revenue produced in the Lease Area. In total, the Lease Area accounted for approximately 0.16 percent of the total revenue across all FMP fisheries in the Mid-Atlantic and New England regions, when comparing average annual revenue.

Many of the following tables provide data from the period between 2008 and 2020, and it should be noted that the data from 2020 may not be indicative of historic or future operations. Both harvesters and other businesses reliant on fishing were affected by changes in fishing patterns due to the COVID-19 pandemic, associated responses and restrictions in some cases. An overwhelming majority of commercial fishing and for-hire recreational vessel operators and seafood processing and distribution sectors experienced significant impacts to their operations during the 2020 operating year, with half the vessel operators indicating they stopped fishing for more than three months and nearly 90 percent of the operators reporting revenue losses (Glazier et al. 2020). In the interest of being comprehensive and providing the most recent and relevant data for analysis, the 2020 data is included in the following tables; however, the entirety of the thirteen-year period being is utilized in assessing potential impacts.

[16] The All Others FMP refers to FMP fisheries with fewer than three permits or dealers affected to protect data confidentially.

Table 3.6.1-6. **Commercial Fishing Revenue of Federally Permitted Vessels in Lease Area by FMP Fishery (2008–2020)**

FMP Fishery	Average Annual Revenue	Total Annual Revenue	Average Annual Revenue as Percentage of Total Revenue from the Mid-Atlantic and New England Regions [1]	Average Annual Number of Vessels in the Lease Area	Average Annual Number of Vessel Trips in the Lease Area
Monkfish	$345,692	$4,494,000	1.7%	169	2,032
Sea Scallop	$246,923	$3,210,000	0.0%	69	503
Skates	$187,462	$2,437,000	2.5%	124	1,784
Summer Flounder, Scup, Black Sea Bass	$161,077	$2,094,000	0.4%	173	2,135
ASMFC FMP [2]	$159,769	$2,077,000	NA	130	1,873
Northeast Multispecies	$142,154	$1,848,000	0.2%	86	783
Mackerel, Squid, and Butterfish	$107,462	$1,397,000	0.2%	113	1,402
Small-Mesh Multispecies	$67,308	$875,000	0.6%	97	1,165
Atlantic Herring	$20,692	$269,000	0.1%	16	56
Surfclam, Ocean Quahog	$18,308	$238,000	NA	1	13
Spiny Dogfish	$12,846	$167,000	0.4%	46	283
No Federal FMP	$10,154	$132,000	NA	122	908
Bluefish	$3,231	$42,000	0.3%	107	823
Tilefish	$2,077	$27,000	0.0%	38	75
Highly Migratory Species	$1,769	$23,000	0.1%	26	89
SERO FMP [3]	$77	$1,000	NA	20	60
All Others [4]	NA	<$500	NA	NA	NA
All FMP Fisheries	**$1,487,001**	**$19,330,500**	**0.2%**	**1,337**	**13,984**

Source: Developed using data from NMFS 2022a

Note: Numbers are in 2020 dollars and Total Revenue is rounded to nearest $1,000 and are sorted by revenue in descending order. NA indicates data not available to perform calculations. Differences in totals are due to rounding.

[1] Regional comparison is relative to the individual species noted, not all species combined.

[2] Atlantic States Marine Fisheries Commission (ASMFC)

[3] SERO FMP is NOAA's Southeast Regional Office Fishery Management Plan.

[4] All Others refers to FMP fisheries with fewer than three permits or dealers affected to protect data confidentially.

Table 3.6.1-7. Commercial Fishing Landings (pounds) of Federally Permitted Vessels in the Lease Area (2008–2020)

FMP Fishery	Average Annual Landings (Pounds)	Total Landings (Pounds)
Skates	497,231	6,464,000
Monkfish	224,000	2,912,000
Atlantic Herring	142,615	1,854,000
Small-Mesh Multispecies	124,077	1,613,000
Summer Flounder, Scup, Black Sea Bass	116,769	1,518,000
Mackerel, Squid, and Butterfish	106,769	1,388,000
Spiny Dogfish	64,231	835,000
ASMFC FMP	63,308	823,000
Northeast Multispecies	60,308	784,000
Surfclam, Ocean Quahog	26,615	346,000
Sea Scallop	22,769	296,000
No Federal FMP	7,000	91,000
Bluefish	4,308	56,000
Highly Migratory Species	1,923	25,000
Tilefish	538	7,000
SERO FMP	--	<500
All Others	--	<500
All FMP Fisheries	**1,462,461**	**19,011,00**

Source: NMFS 2022a

Notes: Data are for vessels issued federal fishing permits by the NMFS Greater Atlantic Region. Total landings rounded to nearest 1,000. Differences in totals are due to rounding.

Table 3.6.1-8 and Table 3.6.1-9 provide the revenue (average annual and total) and landings in pounds (average annual and total) in the Lease Area by gear type for the 2008–2020 period. Together, gillnet-sink, trawl-bottom, all others, dredge-clam, dredge-scallop and pot-lobster accounted for over 98 percent of the total revenue generated by commercial fishing activity in the Lease Area. The area accounted for approximately 0.67 percent of all others' total revenue in the Mid-Atlantic and New England regions, which was the highest percent of total of the gear times. Next highest was dredge-claim, where the Lease Area accounts for 0.32 percent of the total revenue for the Mid-Atlantic and New England regions.

Table 3.6.1-8. Commercial Fishing Revenue of Federally Permitted Vessels in the Lease Area by Gear Type (2008–2020)

Gear Type	Average Annual Revenue	Total Revenue	Average Annual Revenue in Lease Area as a Percentage of Average Total Revenue from the Mid-Atlantic and New England Regions [1]
Gillnet-Sink	$516,385	$6,713,000	0.17%
Trawl-Bottom	$509,923	$6,629,000	0.27%
All Others[2]	$316,154	$4,110,000	0.67%
Dredge-Scallop	$245,615	$3,193,000	0.05%
Dredge-Clam	$196,154	$2,550,000	0.32%
Pot-Lobster	$158,308	$2,058,000	NA
Trawl-Midwater	$14,154	$184,000	0.07%
Pot-Other	$11,385	$148,000	0.01%
Handline	$6,462	$84,000	0.14%
Longline-Bottom	$1,615	$21,000	NA
All Gear Types	**$1,976,155**	**$25,690,000**	**1.7%**

Source: Developed using data from NMFS 2022a

Notes: Revenue is in 2020 dollars, with total revenue rounded to nearest thousand. Differences in totals are due to rounding.

[1] Regional comparison is relative to the gear type noted, not all gear types combined.

[2] All Others refers to FMP fisheries with fewer than three permits or dealers affected to protect data confidentially and includes Seine-Purse.

Table 3.6.1-9. Commercial Fishing Landings (pounds) of Federally Permitted Vessels in the Lease Area by Gear Type (2008–2020)

Gear Type	Average Annual Landings (Pounds)	Total Landings (Pounds)
Trawl-Bottom	662,462	8,612,000
Gillnet-Sink	566,615	7,366,000
All Others[1]	419,154	5,449,000
Dredge-Clam	263,462	3,425,000
Trawl-Midwater	109,231	1,420,000
Pot-Lobster	65,385	850,000
Dredge-Scallop	23,538	306,000
Pot-Other	4,615	60,000
Handline	1,846	24,000
Longline-Bottom	615	8,000
All Gear Types	**2,779,385**	**36,132,000**

Source: NMFS 2022a

Notes: Revenue is in 2020 dollars, with total revenue rounded to nearest thousand. Differences in totals are due to rounding.

[1] All Others refers to FMP fisheries with fewer than three permits or dealers affected to protect data confidentially and includes Seine-Purse.

Table 3.6.1-10 provides the average number of vessel trips and average number of vessels fishing in the Lease Area by port for the period 2008 through 2020. Table 3.6.1-11 provides a ranking of ports by revenue of fishing vessels in the Lease Area from 2008 through 2020, as well as the level of commercial fishing engagement and reliance of the community in which the port is located. As noted earlier, these rankings portray the level of dependence of the community on commercial fishing and are compiled by NMFS (NOAA 2022). Sixty-seven percent of the trips of fishing vessels that operate within the Lease Area originate from either New Bedford, Massachusetts or Point Judith, Rhode Island. New Bedford and Point Judith receive the highest value of landings of any ports, with respective totals of $6.6 million and $10.6 million for 2008 through 2020. These ports contribute just over 67 percent of the total revenue for the Lease Area. The commercial fishing engagement and reliance differ across communities that engage in commercial fishing within the Lease Area. For example, Cape May and Point Judith rank high in the commercial fishing engagement and they rank in the middle in commercial fishing reliance, but the city of Newport, Rhode Island generates over $1 million in revenue from the Lease Area, ranks high in fishing engagement but low in the community's reliance on commercial fishing. Information regarding the ranking determinations for each community is provided in the community profiles available from NMFS (NOAA 2022). These profiles present the most recent data available for these key indicators of New England and Mid-Atlantic fishing communities related to dependence on fisheries and other economic and demographic characteristics. Selected socioeconomic characteristics of communities with fishing ports that could be affected by the proposed Project are presented in Section 3.6.3 *Demographics, Employment, and Economics* and Section 3.6.4 *Environmental Justice*.

Table 3.6.1-10. Commercial Fishing Trips and Vessels in the Lease Area by Port (2008–2020)

Port and State	Average Annual Trips[1]	Average Annual Vessels
Barnstable, Massachusetts	<1	<1
Beaufort, North Carolina	16	11
Belford, New Jersey	1	<1
Boston, Massachusetts	12	2
Cape May, New Jersey	5	3
Chatham, Massachusetts	14	3
Chincoteague, Virginia	<1	<1
Chilmark, Massachusetts	135	5
Davisville, Rhode Island	1	<1
Fairhaven, Massachusetts	36	5
Fall River, Massachusetts	20	2
Gloucester, Massachusetts	2	1
Hampton Bay, New York	1	<1
Hampton, Virginia	15	9
Harwichport, Massachusetts	5	1
Hyannis, Massachusetts	2	<1
Little Compton, Rhode Island	289	12
Menemsha, Massachusetts	125	5
Montauk, New York	218	31
New Bedford, Massachusetts	775	84
New London, Connecticut	37	5
New Shoreham, Rhode Island	36	4
Newport News, Virginia	9	6
Newport, Rhode Island	296	13
Point Judith, Rhode Island	2,537	110
Point Pleasant, New Jersey	21	8
Sandwich, Massachusetts	3	<1
Shinnecock, New York	1	1
Stonington, Connecticut	60	12
Tiverton, Rhode Island	77	4
Wanchese, North Carolina	1	1
Westport, Massachusetts	154	9
Woods Hole, Massachusetts	11	1
Total	**4913**	**346**

Note: Data are for vessels issued federal fishing permits by the NMFS Greater Atlantic Region. Differences in totals are due to rounding.

[1] Trips were not necessarily made in every year, but all ports had at least one year where trips were made. Ports with only one year where trips to the Lease Area were made include Barnstable, Massachusetts (2008); Belford, New Jersey (2016); Chincoteague, Virginia (2018); Hyannis, Massachusetts (2015); and Sandwich, Massachusetts (2009).

Table 3.6.1-11. **Commercial Fishing Revenue of Federally Permitted Vessels in the Lease Area by Port (2008–2020)**

Port and State	Average Annual Revenue	Total Revenue for the 13-Year Period	Commercial Fishing Engagement Categorical Ranking[1]	Commercial Fishing Reliance Categorical Ranking[2]
New Bedford, Massachusetts	$817,000	$10,621,000	High	Medium
Point Judith, Rhode Island	$510,385	$6,635,000	High	Medium
Little Compton, Rhode Island	$228,000	$2,964,000	Medium	Medium
Newport, Rhode Island	$125,231	$1,628,000	High	Low
Westport, Massachusetts	$43,692	$568,000	Medium-High	Low
Montauk, New York	$37,923	$493,000	High	Medium-High
Tiverton, Rhode Island	$34,769	$452,000	Medium	Low
Stonington, Connecticut	$18,538	$241,000	High	Low
Fairhaven, Massachusetts	$16,538	$215,000	High	Low
New London, Connecticut	$7,000	$91,000	Medium-High	Low
Chatham, Massachusetts	$6,538	$85,000	High	High
Menemsha, Massachusetts	$6,077	$79,000	Medium	Medium
Hampton, Virginia	$5,923	$77,000	High	Low
North Kingstown, Rhode Island	$5,538	$72,000	High	Low
Gloucester, Massachusetts	$5,077	$66,000	High	Medium
Woods Hole, Massachusetts	$4,769	$62,000	Medium	Medium
Chilmark, Massachusetts	$4,077	$53,000	Medium	Medium
Newport News, Virginia	$3,692	$48,000	High	Low
Point Pleasant Beach, New Jersey	$3,692	$48,000	High	Medium-High
Beaufort, North Carolina	$3,000	$39,000	High	Medium
Fall River, Massachusetts	$3,000	$39,000	Medium	Low
Davisville, Rhode Island	$2,692	$35,000	High	Low
South Kingstown, Rhode Island	$1,846	$24,000	Medium-High	Low
Chincoteague, Virginia	$1,538	$20,000	Medium	Medium
Boston, Massachusetts	$1,538	$20,000	High	Low
Harwichport, Massachusetts	$1,385	$18,000	Medium	Medium
Hyannis, Massachusetts	$1,385	$18,000	High	Low
Cape May, New Jersey	$1,385	$18,000	High	High
New Shoreham, Rhode Island	$692	$9,000	Medium	Medium
Falmouth, Massachusetts	$615	$8,000	Medium	Low
Wanchese, North Carolina	$615	$8,000	High	Medium-High
Sandwich, Massachusetts	$538	$7,000	Medium-High	Low
Barnegat, New Jersey	$385	$5,000	High	High
Shinnecock, New York	$308	$4,000	High	Low
Barnstable, Massachusetts	$308	$4,000	High	Low
Hampton Bay, New York	$231	$3,000	High	Low
Ocean City, Maryland	$231	$3,000	High	Medium
Belford, New Jersey	$231	$3,000	High	Medium
Morehead City, North Carolina	$154	$2,000	Medium-High	Low
Greenport, New York	$77	$1,000	Low	Low
Manasquan, New Jersey	NA	<$500	Low	Low
Vineyard Haven, Massachusetts	NA	<$500	Medium	Low
All Others[3]	$69,462	$903,000	NA	NA

Source: Developed using data from NMFS 2022a; 2022

Notes: Revenue is in 2020 dollars with total revenue rounded to nearest thousand.

[1] Commercial fishing engagement measures the presence of commercial fishing through fishing activity as shown through permits, fish dealers, and vessel landings. A high rank indicates more engagement. Rankings are for 2018, the latest year data are available.

Commercial fishing reliance measures the presence of commercial fishing in relation to the population size of a community through fishing activity. A high rank indicates more reliance. Rankings are for 2018, the latest year data are available.

Ports did not have vessel trips with more than three permits or dealers during all 13 years.

NA = not applicable

To analyze differences in the economic importance of fishing grounds in the Lease Area across the commercial fishing fleet, the NMFS analyzed the percentage of each permit's total commercial fishing revenue attributed to catch within the Lease Area during 2008 through 2020 (NMFS 2022a).

The vessel-level annual revenue percentages were divided into quartiles, which were created by ordering the data from lowest to highest percentage value and then dividing the data into four groups of equal size. The first quartile represents the lowest 25 percent of ranked percentages, while the fourth quartile represents the highest 25 percent.

The distribution of the vessel-level annual revenue percentages for the Lease Area is provided in the boxplot on Figure 3.6.1-2. The boxplot begins at the first quartile, or the value beneath which 25 percent of all vessel-level revenue percentages fall. A thick line within the box identifies the median, the observation that 50 percent of vessel-level revenue percentages are above or beneath. The box ends at the third quartile, or the vessel-level revenue percentage beneath which 75 percent of observations fall. Nonparametric estimates of the minimum and maximum values are indicated by the "whiskers" (dashed line terminating in a vertical line) that jut out from each side of the box. Any points outside of these whiskers are vessel-level revenue percentages that are considered outliers. In the context of this analysis, an outlier is a vessel that derived an exceptionally high proportion of its annual revenue from the Lease Area in comparison to other vessels that fished in the area.[17]

[17] Technically, an outlier in a boxplot distribution is an observation that is more than 1.5 times the length of the box away from either the first quartile (Q1) or third quartile (Q3). Specifically, if an observation is less than Q1 – (1.5 × IQR) or greater than Q3 + (1.5 × IQR), it is an outlier; where IQR = interquartile range = Q3 – Q1.

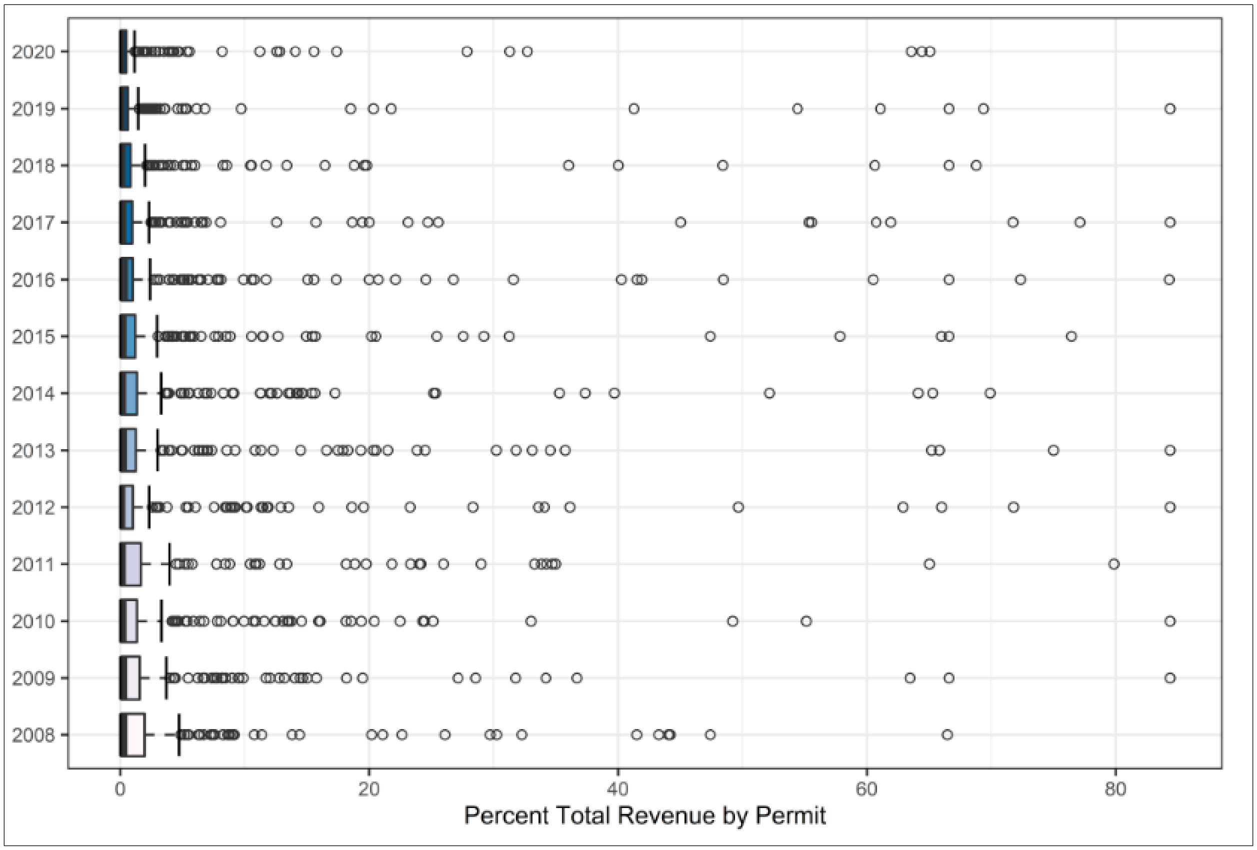


Figure 3.6.1-2. Percentage of Total Commercial Fishing Revenue of Federally Permitted Vessels Derived from the Lease Area by Vessel (2008–2020)

Source: NMFS 2022a

Table 3.6.1-12 presents the minimum, first quartile, median, third quartile, and maximum values for the Lease Area from 2008 through 2020. Table 3.6.1-13 presents the number of outliers by year.

Table 3.6.1-12. Analysis of 13-year Permit Revenue Boxplots for the Lease Area (2008–2020)

Minimum Revenue Percentage Value	First Quartile	Median	Third Quartile	Maximum Revenue Percentage Value[1]
0	0.04	0.20	1	84

Source: Developed using data from NMFS 2022a.

[1] Maximum value is inclusive of outliers.

Table 3.6.1-13. Number of Federally Permitted Vessels in the Lease Area (2008–2020)

Year	Number of Vessels	Number of Outliers	Number of Outliers as a Percentage of Total Vessels
2020	305	46	15%
2019	294	45	15%
2018	262	40	15%
2017	286	41	14%
2016	327	43	13%
2015	297	39	13%
2014	325	43	13%
2013	321	40	12%
2012	300	38	13%
2011	270	31	11%
2010	276	41	15%
2009	322	42	13%
2008	333	37	11%
Average	**301**	**40**	**13%**

Source: Developed using data from NMFS 2022a

A total of 75 percent of the permitted vessels that fished in the Lease Area derived less than 1 percent of their total annual revenue from the area (NMFS 2022a). The highest percentage of total annual revenue attributed to catch within the Lease Area was 84 percent in 7 different years during the 2008-2020 timeframe. Although outliers derived a high proportion of their annual revenue from the Lease Area in comparison to other vessels that fished in the area, Figure 3.6.1-2 shows that, in any given year, the revenue percentage for the majority of outliers was below 20 percent. As such, while some vessels depended heavily on the Lease Area for their commercial fishing revenue, most derived a much smaller percentage of their total annual revenue from the area.

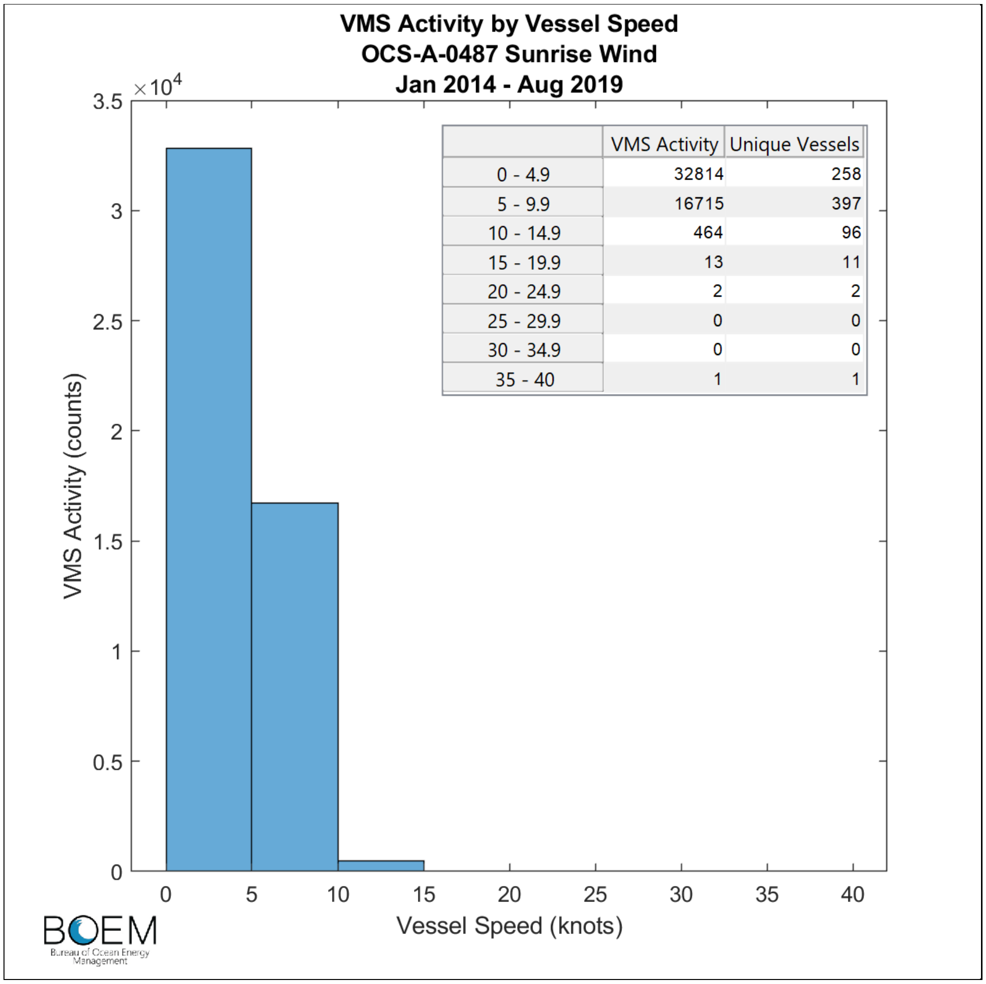
Commercial fishing regulations include requirements for VMS which is a satellite surveillance system that monitors the location and movement of commercial fishing vessels. Therefore, it is a good data source for understanding the spatial distribution of fishing vessels engaged in FMP fisheries in the Northeast region. In 2018 there were 912 VMS-enabled vessels operating in the Northeast across all fisheries. These 912 vessels represented a substantial portion (71 to 87 percent) of summer flounder, scup, black sea bass, and skate landings, and greater than 90 percent of landings for scallops, squid, monkfish, herring, mackerel, large mesh multispecies, whiting, surfclams, and ocean quahogs. VMS vessels represented less than 20 percent of highly migratory species and 10 percent of lobster/Jonah crab landings (NMFS 2020, pers. comm.). Of these vessels, approximately 67 percent fished or transited in all reasonably foreseeable project areas, and 29 percent (262 vessels) fished or transited in the Lease Area in 2018 (NMFS 2019).

Using VMS data conveyed in individual position reports (pings) from January 2014 to August 2019, BOEM compiled information about fishing activities within the Lease Area. From the VMS data, it is interpreted that vessels with speeds less than 5 knots (2.6 meters per second [m/s]) are actively engaged in fishing, although vessels may use slower speeds to transit or be engaged in other activities such as processing at sea. Vessels traveling faster than 5 knots (2.6 m/s) are generally interpreted to be transiting. Figure 3.6.1-3 indicates that approximately 34 percent of the 765 unique vessels identified operating in the Lease Area during the above-referenced period were actively fishing. BOEM developed polar histograms using the VMS data that show the directionality of VMS-enabled vessels operating in the Project Area and the targeted FMP fishery (Figure 3.6.1-4 through Figure 3.6.1-8). The larger bars in the polar histograms represent a greater number of position reports showing fishing vessels moving in a certain direction within the Project Area. The polar histograms differ with respect to their scales.

Figure 3.6.1-4 illustrates that for all activities (transiting and fishing combined), most of the 414 unique vessels participating in a VMS fishery generally operated in an east-west pattern with a secondary north-south pattern, while approximately 201 of the unique vessels participating in a non-VMS fishery[18] generally operated in a north-south pattern with a secondary east-west pattern. Figure 3.6.1-5 illustrates that VMS fishery vessels transiting the Lease Area followed primarily a north-south pattern with a secondary pattern of northwest-southeast and non-VMS fishery vessels also generally transited in a north-south pattern, with a secondary pattern of east-west. Figure 3.6.1-6 illustrates that most of the unique VMS fishery vessels fishing in the Lease Area followed a slightly northeast-southwest fishing pattern and those non-VMS fishery vessels actively fishing in the Lease Area followed a similar pattern.

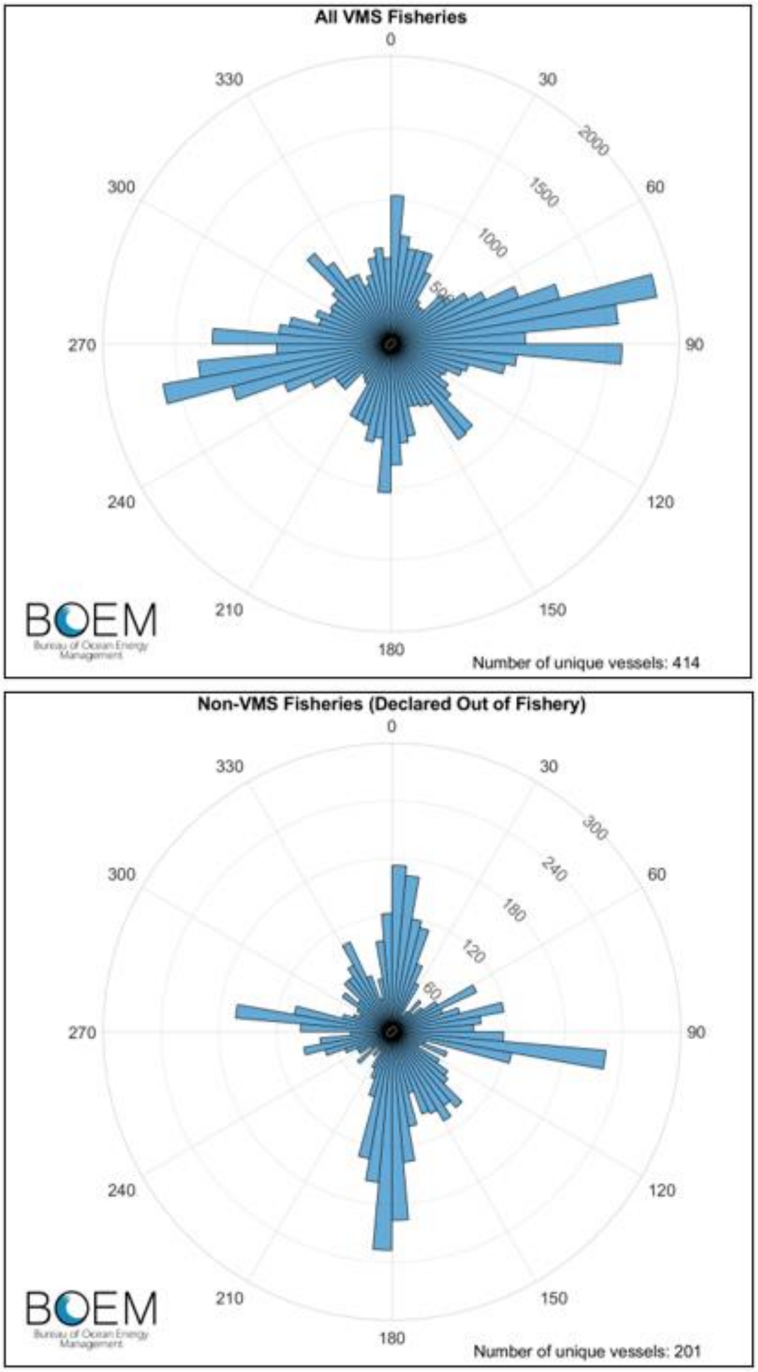
[18] These are fishing vessels that are transmitting VMS data after having declared themselves as participating in a non-VMS fishery (e.g., lobster, river herring).

Figure 3.6.1-7 confirms that the orientation of vessels transiting the Lease Area varies amongst FMP fisheries with those in the Monkfish FMP fishery generally following a north-south pattern, the Surfclam/Ocean Quahog FMP fishery followed a southwest-northeast pattern, the Herring FMP fisher followed a north-west to south-east pattern and the Northeast Multi-species FMP fisher being variable. Figure 3.6.1-8 provides the orientation of vessels actively fishing within the Lease Area varied by FMP fishery, with associated patterns. While the Herring FMP and Surfclam/Ocean Quahog FMP fisheries did not have a pattern, both the Monkfish FMP and Northeast Multispecies FMP fisheries followed a slightly south-west to north-east pattern.



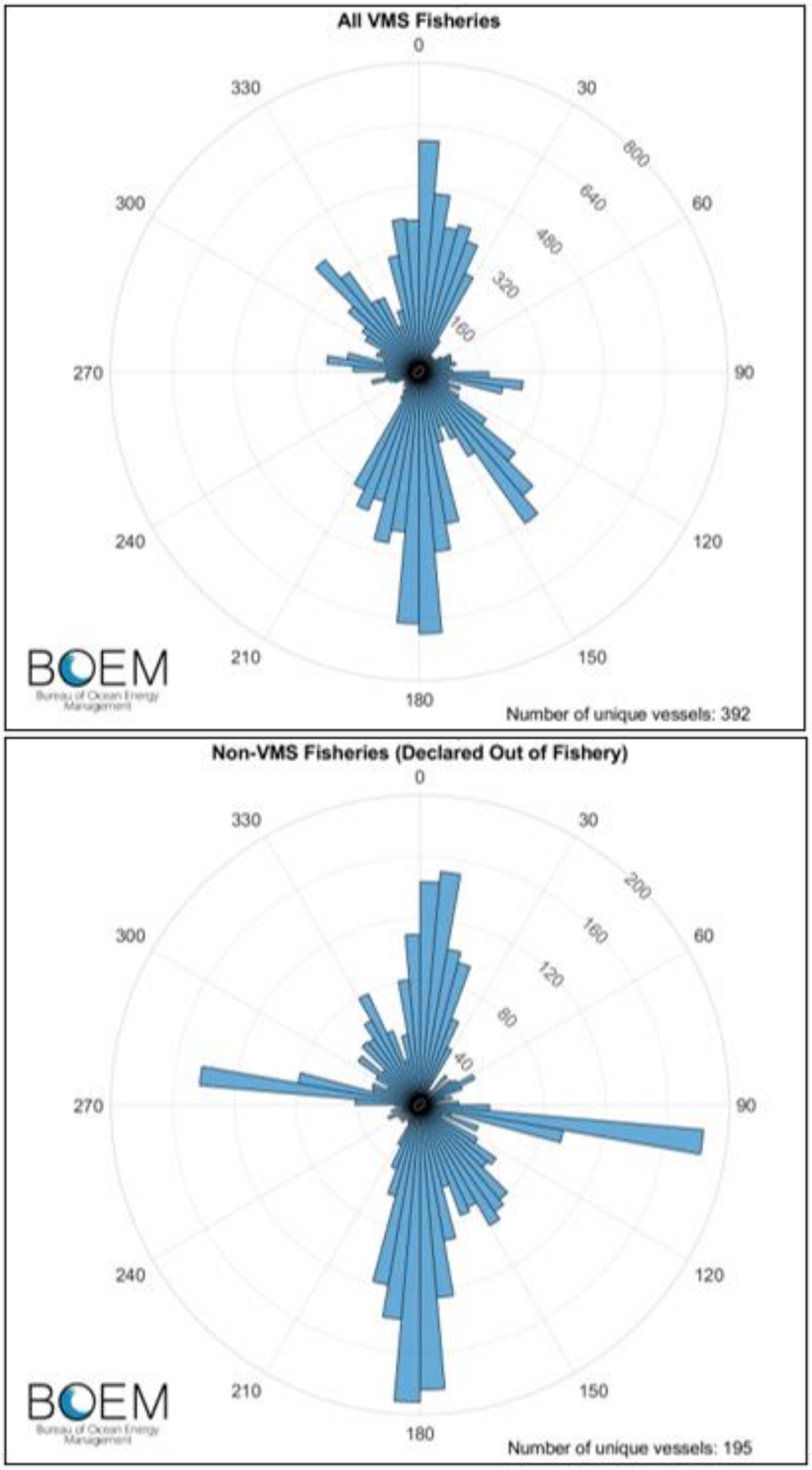
Source: Developed by BOEM using VMS data provided by NMFS (2019).

Figure 3.6.1-3. VMS Activity and Unique Vessels Operating in the Lease Area, January 2014–August 2019



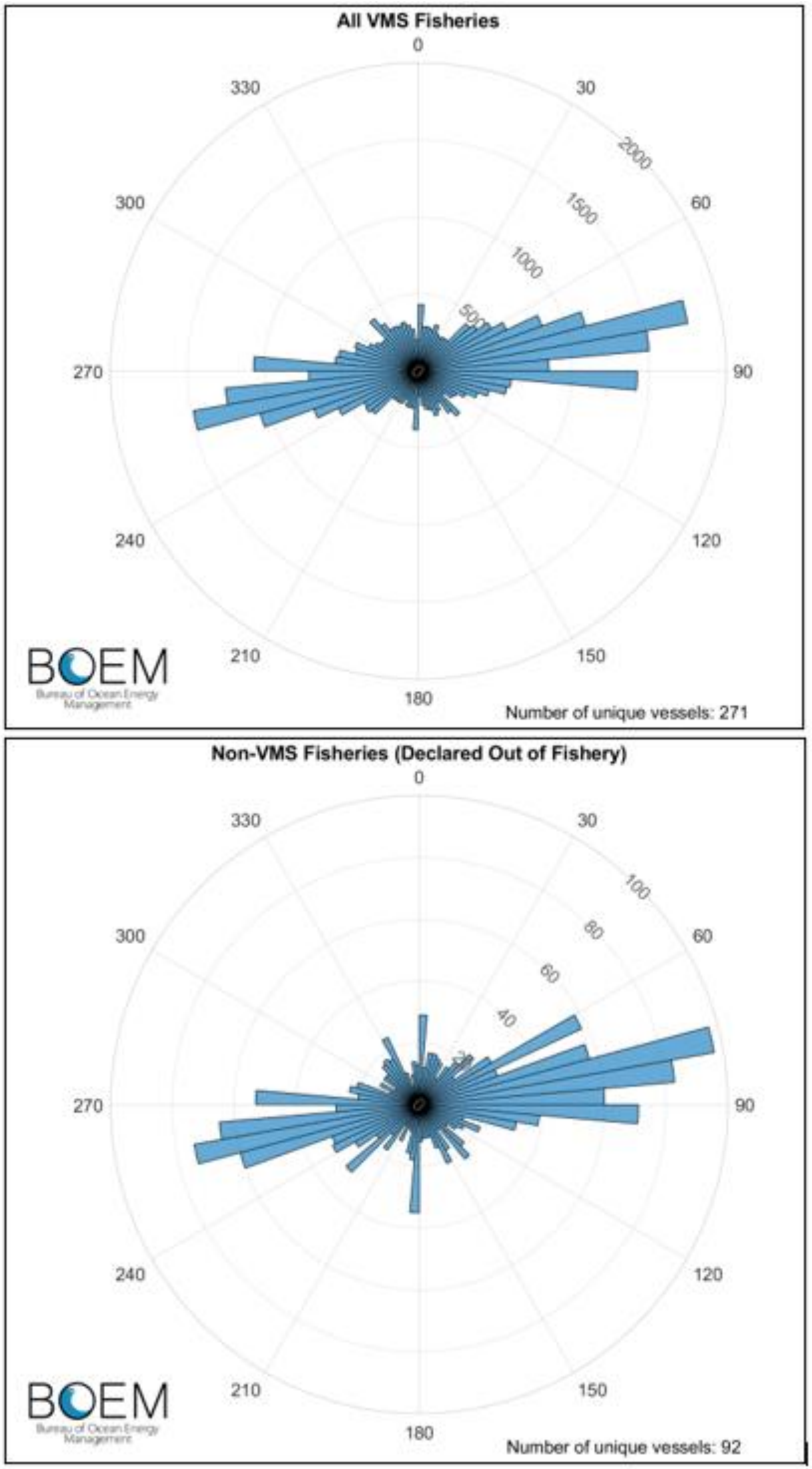
Source: Developed by BOEM using VMS data provided by NMFS (2019).

Figure 3.6.1-4. VMS Bearings for All Activity of VMS and Non-VMS Fisheries within the Lease Area, January 2014–August 2019



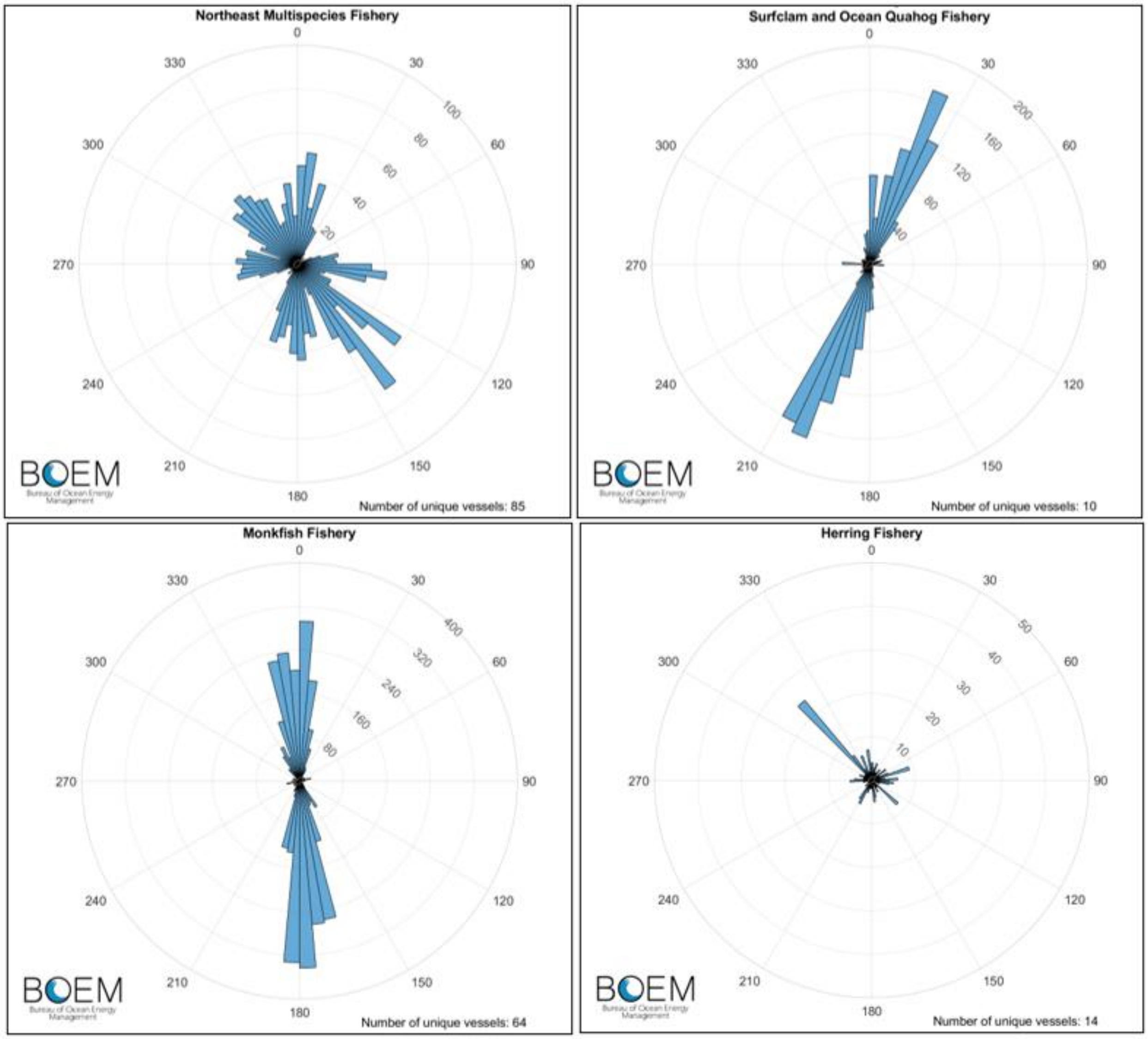
Source: Developed by BOEM using VMS data provided by NMFS (2019).

Figure 3.6.1-5. VMS Bearings for Transiting VMS and Non-VMS Fishery Vessels within the Lease Area, January 2014–August 2019



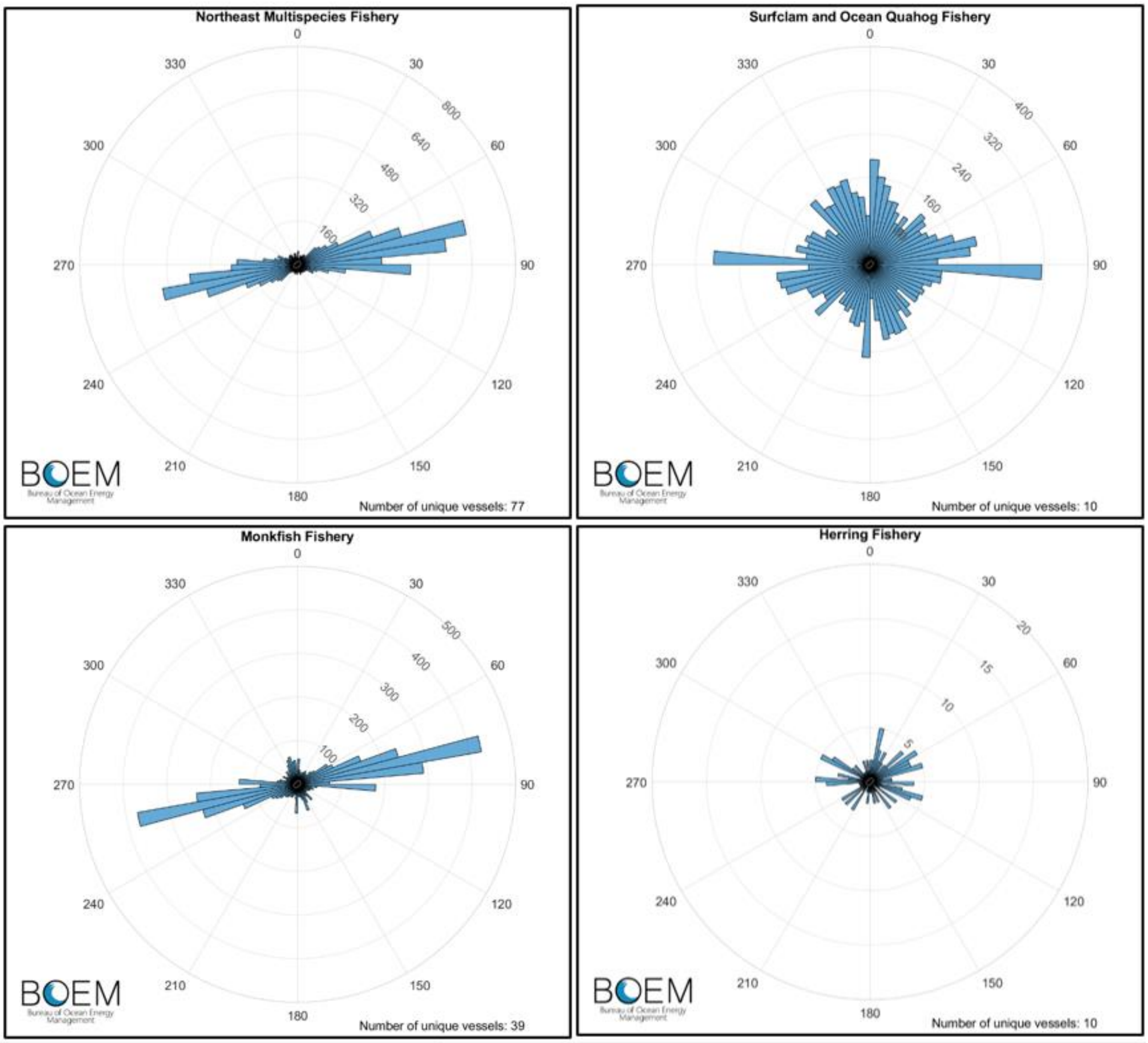
Source: Developed by BOEM using VMS data provided by NMFS (2019).

Figure 3.6.1-6. VMS Bearings for Fishing Activity by VMS and Non-VMS Fishery Vessels within the Lease Area, January 2014–August 2019



Source: Developed by BOEM using VMS data provided by NMFS (2019).

Figure 3.6.1-7. VMS Bearings of Vessels Transiting the Lease Area by FMP Fishery, January 2014–August 2019



Source: Developed by BOEM using VMS data provided by NMFS (2019).

Figure 3.6.1-8. VMS Bearings of Vessels Actively Fishing in the Lease Area by FMP Fishery, January 2014–August 2019

For-Hire Recreational Fishing

As with the commercial fishing industry, the for-hire recreational fishing fleets contribute to the economy through direct employment, income, and gross revenues of the for-hire businesses, as well as through purchasing products and services to maintain and operate their vessels, triggering further indirect multiplier effects that are dependent upon the initial demands of the for-hire fleet (Steinback and Brinson 2013). For-hire recreational fishing boats are operated by licensed captains for businesses that sell recreational fishing trips to anglers. These boats include both party (head) boats, defined as boats on which fishing space and privileges are provided for a fee, and charter boats, defined as boats operating under charter for a price and time, whose participants are part of a preformed group of anglers (NMFS 2021d).

NOAA works with state and local partners to monitor the recreational fishery catch and effort through the Marine Recreational Information Program (MRIP). The MRIP integrates a coast-wide angler intercept survey throughout the year to estimate recreational fishing effort (COP V1 June 2021, Appendix V, Section 2.2.8). The for-hire recreational fishing effort and catch data reported for New York, Connecticut, Massachusetts, New Jersey, and Rhode Island, which are the five states most likely to have anglers utilizing the Lease Area, are presented in Figure 2.2-21 of COP V1 June 2021 Appendix V, Section 2.2.8. It indicates that recreational fishing effort is seasonal, with the highest activity from March through August, reaching its peak intensity in July and August for shore fishing and fishing in both federal and state waters by private or for-hire/charter vessel.

The MRIP data can be used to qualitatively understand relative angler effort for those states with coastlines/ports relatively close to the Lease Area; however, there is no spatial information within the MRIP data. Therefore, there is no way to determine where the actual fishing trips took place relative to the Lease Area. Therefore, these values are meant to categorize general angler efforts by mode and by location and capture the seasonal changes in activity.

As noted in COP V1 June 2021 Appendix V, Section 2.2.8, overall, across the five states that would most likely utilize fishing areas around the Lease Area, New York had the highest number of trips, followed by New Jersey and Massachusetts. The majority of the trips were typically within state waters and from shore. For fishing trips in federal waters, the majority of trips were using private boats and the balance utilizing charters.

In addition to the MRIP data, additional information was available through NMFS related to annual revenue of for-hire recreational fishing trips, as well as trips by port/location.

Table 3.6.1-14 presents the annual revenue from the for-hire recreational fishery operating in the Lease Area from 2008 to 2020; however, the data is suppressed for several of the years due to confidentiality. Based upon the years that are available, the annual revenue varied considerably, ranging from a low of $7,000 (rounded to the nearest thousand dollars) in 2019 to a high of $101,000 in 2008, while totaling $1,485,000 during the entire period. It also should be noted that even for years where data is presented, it may not reflect the highest values within the dataset, but rather the highest values that can be shared. Therefore, the annual revenue and ranges may be greater than what can be surmised from this table.

Table 3.6.1-14. Total For-Hire Recreational Fishing Revenue by Year for Lease Area, 2008–2020

Year	Revenue
2008	$101,000
2009	Suppressed
2010	Suppressed
2011	Suppressed
2012	Suppressed
2013	Suppressed
2014	Suppressed
2015	Suppressed
2016	Suppressed
2017	Suppressed
2018	Suppressed
2019	$7,000
2020	$27,000
Total	**$135,000**

Table 3.6.1-15. Total Number of Party/Charter Boat Trips by Port and Year for Lease Area, 2008–2020

Port	200	200	201	201	201	201	201	201	201	201	201	201	202
Montauk, NY	25	33	67	79	18	15	13	0	7	0	11	18	0
Point Judith,	32	29	37	37	29	59	41	17	15	77	5	0	4
Other Ports,	1	5	7	6	5	0	60	94	96	82	0	2	3
Other Ports,	0	1	1	0	0	0	1	2	0	6	1	0	0
Other Ports,	0	1	2	0	0	0	0	7	0	3	1	0	67
Other Ports,	0	0	1	0	0	0	0	0	1	0	0	0	0
No Port Data	0	0	0	0	0	0	0	0	0	0	0	1	1
Total	**58**	**69**	**115**	**122**	**52**	**74**	**115**	**120**	**119**	**168**	**18**	**21**	**75**

Source: NMFS 2022a.

Note: The “Other Ports” category refers to ports with fewer than three permits to protect data confidentiality.

Table 3.6.1-16. Total Number of Angler Trips by Port and Year for Lease Area, 2008–2020

Port	2008	2009	2010	2011	201	201	2014	201	2016	2017	201	201	202
Montauk, NY	293	766	1,30	1,51	82	185	181	0	94	0	166	74	0
Point Judith,	859	597	1,01	646	580	667	524	259	497	981	107	0	23
Other Ports, RI	2	28	36	41	26	0	355	541	543	429	0	11	18
Other Ports,	0	4	2	0	0	0	6	6	0	15	3	0	0
Other Ports,	0	4	22	0	0	0	0	27	0	22	4	0	334
Other Ports,	0	0	62	0	0	0	0	0	16	0	0	0	0
No Port Data	0	0	0	0	0	0	0	0	0	0	0	6	3
Total	**1,15**	**1,39**	**2,44**	**2,20**	**688**	**852**	**1,06**	**833**	**1,15**	**1,44**	**280**	**91**	**378**

Source: NMFS 2022a.

Note: The “Other Ports” category refers to ports with fewer than three permits to protect data confidentiality.

To understand the relative importance of the Lease Area to the regional for-hire recreational fishing industry, Table 3.6.1-18 compares the landings reported in the Lease Area for the top five species to the entire Northeast region by year during the 2008–2020 period. Table 3.6.1-17 provides the 13-year fish count and percentage of the total for the Northeast region for the top five species.

Table 3.6.1-17. Annual Party Vessel Trips, Angler Trips, and Number of Vessels in Lease Area as a Percentage of the Total Northeast Region, 2008–2020

Year	Vessel Trips as % of Total	Angler Trips as % of Total	Number of Vessels as % of Total
2008	0.21%	14.18%	1.08%
2009	0.25%	6.43%	2.77%
2010	0.35%	5.60%	3.55%
2011	0.38%	4.70%	3.62%
2012	0.17%	6.02%	2.07%
2013	0.26%	4.35%	1.82%
2014	0.42%	4.01%	2.88%
2015	0.46%	6.58%	2.62%
2016	0.48%	4.77%	2.51%
2017	0.71%	14.07%	2.88%
2018	0.09%	1.82%	2.46%
2019	0.11%	19.44%	0.99%
2020	0.36%	17.03%	1.47%

Source: NMFS 2022a

Table 3.6.1-18. Year Fish Count for Top Five Fish Species Landed by For-Hire Recreational Fishing in the Lease Area as a Percentage of the Total Northeast Region, 2008–2020

Species	13-Year Fish Count (Number of Fish)	Fish Count as % of Total
Cod	32,861	2.47%
Black Sea Bass	14,273	0.32%
Scup	13,775	0.17%
Summer Flounder	8,768	0.94%
All Others[1]	2,369	27.87%

Source: NMFS 2022a.

[1] "All Others" refers to species with fewer than three permits to protect data confidentiality.

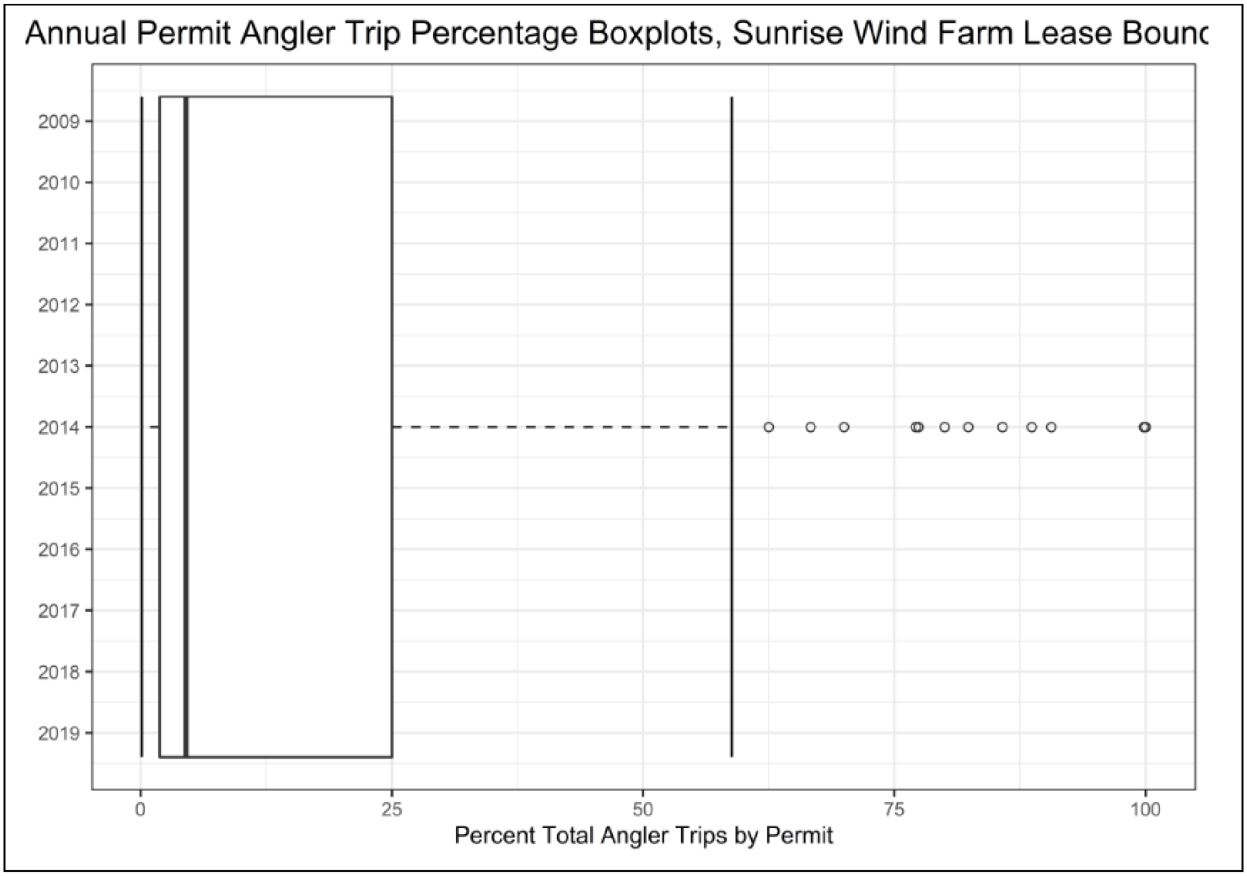
To analyze differences in the importance of fishing grounds in the Lease Area for the for-hire recreational fishery, NMFS analyzed the percentage of each permit's total angler trips in the Lease Area from 2008 through 2019 (NMFS 2022a). Results are presented on Figure 3.6.1-9, which displays the data in a boxplot. A description of the meaning of the quartiles and other information for the boxplot can be found in the previous commercial fisheries discussion within this section, in the text associated with Figure 3.6.1-9. Table 3.6.1-19 presents the minimum, first quartile, median, third quartile, and maximum values for the Lease Area from 2008 through 2020.

Table 3.6.1-19. Analysis of 13-year Summary of Permit Angler Trip Percent Boxplots for the Lease Area (2008–2020)

Minimum	1st Quartile	Median	3rd Quartile	Maximum Revenue Percentage Value[1]
0.12%	2%	6%	22%	100%

Source: Developed using data from NMFS 2022a.

[1] Maximum value is inclusive of outliers.



Source: NMFS 2022a.

Figure 3.6.1-9. Annual Permit Angler Trip Percentage Boxplots for the Lease Area, 2008–2019

A total of 75 percent of the permitted vessels that fished in the Lease Area derived less than 22 percent of their total annual revenue from the area (NMFS 2022a). The highest percentage of total annual angler trips attributed to the Lease Area was 100 percent in 2014 but varied from year to year. Although outliers made a high proportion of their annual angler trips to the Lease Area in comparison to other vessels that fished in the area, in any given year, the trip percentage for the majority of for-hire recreational fishers was below 25 percent (Figure 3.6.1-8).

3.6.1.2 Impact Level Definitions for Commercial Fisheries and For-Hire Recreational Fishing

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on commercial fisheries and for-hire recreational fishing from the alternatives, including the Proposed Action. Table 3.6.1-20 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for commercial fisheries and for-hire recreational fishing. Table G-13 (Appendix G) identifies potential IPFs, issues, and indicators to assess impacts to commercial fisheries and for-hire recreational fishing. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of 1 year or less. Long-term impacts may occur throughout the duration of a project. Short-term effects extend potentially for several months but not several years or longer (assume 1-2 years). Long-term effects last for several years or longer.

Table 3.6.1-20. Impact Level Classifications

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	No measurable impacts would occur.	No measurable impacts would occur.
Minor	Adverse impacts would not disrupt the normal or routine functions of the affected activity or community. Once the impacting agent is eliminated, the affected activity or community would return to condition with no measurable effects.	A small and measurable benefit to related to commercial fishing and for-hire recreational fishing could occur.
Moderate	The affected activity or community would have to adjust somewhat to account for disruptions due to impacts of the Project. Once the impacting agent is eliminated, the affected activity or community would return to a condition with no measurable effects if proper remedial action is taken.	A notable and measurable benefit related to commercial fishing and for-hire recreational fishing could occur.
Major	The affected activity or community would experience substantial disruptions, and, once the impacting agent is eliminated, the affected activity or community could retain measurable effects indefinitely, even if remedial action is taken.	A large local, or notable regional benefit to related to commercial fishing and for-hire recreational fishing could occur.

3.6.1.3 Impacts of Alternative A - No Action on Commercial Fisheries and For-Hire Recreational Fishing

When analyzing the impacts of the No Action Alternative on commercial fisheries and for-hire recreational fishing, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities, on the baseline conditions for commercial fisheries and for-hire recreational fishing. 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 E*, Planned Activities Scenario*.

3.6.1.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for commercial fisheries and for-hire recreational fishing described in Section 3.6.1, Affected Environment would continue to follow current regional trends and respond to IPFs introduced by ongoing non-offshore wind and offshore wind activities.

Ongoing non-offshore wind activities within the GAA that have impacts on commercial and for-hire recreational fisheries are generally associated with climate change and fisheries use and management and also activities that limit areas where fishing can occur. These activities include things such as tidal energy projects, military uses, and dredging activities. Dredging, port improvements, marine transportation, oil and gas activities, and offshore construction activities can increase risk for collisions or allisions to occur. Additionally, gear entanglement can occur from activities such as undersea transmission lines, gas pipelines, and other submarine cables.

Ongoing impacts of climate change include increased magnitude or frequency of storms, shoreline changes, ocean acidification, and water temperature changes. Risks to fisheries associated with these events include the ability to safely conduct fishing operations (e.g., because of storms) and climate-related habitat or distribution shifts in targeted species. Fish and shellfish species are expected to exhibit variation in their responses to climate change, with some species benefiting from climate change and others being adversely affected (Hare et al. 2016). To the extent that impacts of climate change on targeted species result in a decrease in catch or increase in fishing costs, the profitability of businesses engaged in commercial fisheries and for-hire recreational fishing would be adversely affected. Ongoing activities of NMFS and fishery management councils affect commercial and for-hire recreational fisheries through stock assessments, setting quotas, and implementing FMPs to ensure the continued existence of species at levels that would allow commercial and for-hire recreational fisheries to occur. Fishery management measures affect fishing operations differently for each fishery and are intended to achieve long-term sustainable fisheries populations which should have long-term benefits to fisheries and fishing communities.

Ongoing offshore wind activities within the GAA that contribute to impacts on commercial fisheries and for-hire recreational fishing include:

- Continued O&M of the Block Island project (five WTGs) installed in State waters;
- Continued O&M of the Coastal Virginia Offshore Wind project (two WTGs) installed in OCS-A 0497; and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island and Coastal Virginia Offshore Wind projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect commercial fisheries and for-hire recreational fishing through the primary IPFs of noise, presence of structures, port utilization, anchoring, and vessel traffic. Ongoing offshore wind activities would have the same type of impacts from these IPFs that are described in detail in the following section for planned offshore wind activities but the impacts would be of lower intensity.

3.6.1.3.2 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 Proposed Action).

Planned non-offshore wind activities within the GAA that contribute to cumulative impacts on commercial fisheries and for-hire recreational fishing include new submarine cables and pipelines, oil and gas activities, marine minerals extraction, port expansions, and future marine transportation and fisheries use. Some of these activities may result in disruptions to fishing vessel traffic, bottom disturbance or habitat conversion, and injury or mortality of fish and shellfish that are targeted in fisheries.

Fishery management measures that are likely to be implemented in the future include measures to reduce the risk of interactions between fishing gear and the North Atlantic right whale (NARW) by 60 percent (McCreary and Brooks 2019). This measure would likely have a have an adverse impact on fishing effort in the lobster and Jonah crab fisheries in the GAA. See Table E.A1-6 for a summary of potential impacts associated with ongoing and planned non-offshore wind activities by IPF for commercial and for-hire recreational fisheries.

Planned offshore wind activities include offshore wind energy development activities on the Atlantic OCS other than the Proposed Action determined by BOEM to be reasonably foreseeable (see Section E-1 and Attachment 2 in Appendix E for a complete description of planned offshore wind activities). BOEM expects planned offshore wind activities to affect commercial and for-hire recreational fisheries through the following primary IPFs.

Anchoring: Excluding the Proposed Action, BOEM estimates that approximately 2,677 acres (10.8 km^2) of seabed would be disturbed by anchoring associated with all other offshore wind activities. Anchoring vessels used in the construction of offshore wind energy projects would pose a navigational hazard to fishing vessels. All impacts would be localized (within a few hundred meters of anchored vessel) and short-term (hours to days in duration). Although anchoring impacts would occur primarily during Project construction, some impacts could occur during O&M and conceptual decommissioning. Therefore, the adverse effects of offshore wind energy–related anchoring on commercial fisheries and for-hire recreational fishing are expected to be long term and moderate, though periodic in nature.

Noise: Future offshore wind activities would generate noise include G&G surveys, pile driving, cable laying, vessels, and WTG operations. These noise sources have the potential to temporarily affect fish and shellfish, which may indirectly affect commercial and for-hire recreational fisheries. The potential impacts associated with each noise source are discussed separately in the following paragraphs.

G&G surveys would be conducted for site assessment and characterization activities associated with offshore wind facilities and are expected to occur intermittently over a 2- to 10-year period at locations throughout the GAA. Site characterization surveys for offshore wind farms typically use sub-bottom profiler technologies that generate sound waves that are similar to common deep-water echosounders. These survey methods produce less-intense sound waves compared to seismic surveys used in oil and gas exploration. Noise from G&G surveys may cause localized and short-term behavioral changes in some fish species, which could affect the catch efficiency of some fishing gears (e.g., hook and line). However, the noise from G&G surveys is not anticipated to affect reproduction and recruitment of fish stocks. Although schedules for many future offshore wind activities are still being developed, noise impacts on fish and shellfish might be minimized by sequentially scheduling site assessment and characterization surveys to avoid overlapping noise from different surveys.

Future offshore wind activities would generate impulsive pile-driving noise during foundation installation. Pile driving is expected to occur for 2 to 3 hours per foundation as additional WTGs and OSS/electric service platforms (ESP) are constructed between 2023 and 2030 (see Appendix E). One or more projects may install more than one foundation per day, either concurrently or sequentially over the 6- to 10-year construction period. Noise transmitted through water and the seabed can cause injury to or mortality of fish over a small area around each pile and can cause short-term stress and behavioral changes over a larger area. Because of the relatively small footprint of injurious sound and the ability for most fish to swim away from noise sources, injurious noise from pile driving is not expected to cause stock-level changes that would adversely affect fisheries. It is expected that behavioral responses to noise may cause some displacement of fish, thereby temporarily reducing the quality of fishing in affected areas and causing fishers to seek alternative fishing areas (Skalski et al. 1992). Displacement of fishing activity may result in increased conflict among the fishing industry, increased operating costs for vessels, and lower revenue. Furthermore, pile-driving noise may cause spawning behavior changes. To the extent that changes in spawning behavior result in reduced reproductive success and subsequent recruitment, this could potentially result in long-term effects on populations and harvest levels. However, the risk of reduced recruitment from pile-driving noise is low because the behavioral impacts would only occur over the duration of noise. Behavioral impacts would be localized to the ensonified area and short-term, as fish behavior is expected to return to pre-construction levels following the completion of pile driving (Jones et al. 2020; Shelledy et al. 2018).

Several activities associated with cable laying would produce noise, including route identification surveys, trenching, jet plowing, backfilling, and installation of cable protection. Modeling based on noise data collected during cable laying for European wind farms has estimated that underwater noise levels would exceed 120 dB in a 98,842-acre area surrounding the source (Bald et al. 2015; Nedwell and Howell 2004; Taormina et al. 2018), which is well below the 150-dB threshold for behavioral responses in fish (Andersson et al. 2007; Mueller-Blenkle et al. 2010; Purser and Radford 2011; Wysocki et al. 2007). As was described for pile-driving noise above, fish that are exposed to cable-laying noise may experience short-term stress and behavioral changes, which could indirectly cause displacement of fishing activity. However, because the cable-laying vessel and equipment would be continually moving and the ensonified area would move with it, a given area would not be ensonified for more than a few hours. Therefore, any behavioral responses to cable-laying noise are expected to be short-term and localized and are not expected to result in fishery-level impacts.

Vessels generate low-frequency, non-impulsive noise that could cause short-term stress or behavioral responses in fish. Vessel activity from future offshore wind activities is expected to peak in 2024 when up to XXX vessels could be involved in construction of offshore wind facilities (BOEM 2019). This increase in vessel activity could cause repeated, intermittent behavioral responses in fish, which could indirectly cause displacement of fishing activity. Because behavioral responses to vessel noise would be localized and short-term, dissipating once the vessel leaves the area, they are not expected to result in fishery-level impacts.

Operating WTGs generate non-impulsive underwater noise that is audible to some fish. However, operating WTGs are expected to produce noise levels that are below recommended thresholds for fish injury and behavioral effects, and noise levels are expected to reach ambient levels within a short distance of turbine foundations. Therefore, noise from operating WTGs is not expected to result in fishery-level impacts.

BOEM expects that underwater noise associated with future offshore wind activities would cause short-term, localized, minor to moderate impacts on commercial and for-hire recreational fisheries, depending on the timing and overlap of construction activities. Impacts are expected to primarily result from pile-driving noise during the installation of foundations for WTGs and OSS. Section 3.5.5 provides a full description of noise impacts on fish and invertebrates.

Port utilization: Construction of offshore wind energy projects would require port facilities for staging and installation vessels, including crew transfer, dredging, cable lay, pile driving, survey vessels, and, potentially, feeder lift barges and heavy lift barges. All of these activities would add vessel traffic to port facilities and would require berthing. Port expansion would likely be needed to accommodate the increased vessel traffic and increased vessel sizes associated with future offshore wind activities. At least two proposed offshore wind projects are considering port expansion, and other ports along the Atlantic coast may be expanded as well. Major fishing ports in the GAA (see Table 3.6.1-3, above) that have been identified as potential ports to support offshore wind energy construction and operations include Atlantic City, Hampton Roads, Montauk, and New Bedford (BOEM 2021a). Port expansions would likely occur over the next 6 to 10 years and would result in increased vessel traffic, which would peak during construction. Increased vessel traffic may cause delays or restrictions in access to ports for commercial and for-hire fishing vessels. Furthermore, maintenance dredging of shipping channels may be required to support port expansion, which could cause additional delays or restrictions in access to port for fishing vessels, as well as increased vessel noise and increased suspended sediment concentrations, two factors that may cause short-term and localized displacement of fish. Port expansions could also increase competition for dockside services, which could affect fishing vessels. Port expansion is expected to have impacts on commercial and for-hire fishing vessels that are localized to ports used for both fishing and offshore wind projects and are short term, with impacts primarily occurring during the construction period. BOEM expects that increased port utilization associated with future offshore wind activities would cause localized, minor impacts on commercial and for-hire recreational fisheries resulting from increased vessel traffic at ports and increased competition for dockside services.

Vessel traffic: The installation of offshore components for offshore wind energy projects and the presence of construction vessels could temporarily restrict fishing vessel movement and thus transit and harvesting activities within offshore wind lease areas and along the cable routing areas. To safeguard mariners from the hazards associated with installation of these offshore components, it is expected that most, if not all, offshore wind energy projects would create safety zones around construction areas. For example, for the Block Island Wind Farm, a 500-yard (457-meter) safety zone around the individual wind turbine locations was implemented during construction (BOEM 2018). When safety zones are in effect, fishing vessels could either forfeit fishing revenue or relocate to other fishing locations and continue to earn revenue. However, vessels that chose to relocate could incur increased operating costs such as increased fuel costs due to longer transit times to and from more distant fishing grounds and additional crew compensation due to more days at sea, among other factors. Commercial and for-hire recreational vessel operators could experience lower revenue due to fishing potentially less productive fishing grounds, potentially having to switch to less-valuable species, and potentially encountering more competition for a given resource.

Once offshore wind projects are completed, some commercial fishermen may avoid the offshore wind lease areas if large numbers of recreational fishermen are drawn to the areas by the prospect of higher catches. WTG foundations and associated scour protection may produce an artificial reef effect, potentially increasing fish and invertebrate abundance within a facility’s footprint (Refer to Section 3.5, *Finfish, Invertebrates, and Essential Fish Habitat*). According to Brink and Dalton (2018), the influx of recreational fishermen into the BIWF caused some commercial fishermen to cease fishing in the area because of vessel congestion and gear conflict concerns. If these concerns cause commercial fishermen to shift their fishing effort to areas not routinely fished, conflict with existing users could increase as other areas are encroached. In general, the potential for conflict among commercial fishermen due to fishing displacement may be higher for fishermen engaged in fisheries that have regulations that constrain where fishermen can fish, such as the lobster fishery. However, the potential for vessel congestion and gear conflict may increase if mobile species targeted by commercial fishermen, such as Atlantic herring, Atlantic mackerel, squid, tuna, and groundfish, are attracted to offshore wind energy facilities by the artificial reef effect, and fishermen targeting these species concentrate their fishing effort in offshore wind lease areas as a result. Overall, the adverse impacts from vessel traffic would be long-term and moderate.

Presence of structures: The presence of structures can lead to impacts on commercial fisheries and for-hire recreational fishing through allisions, entanglement or gear loss/damage, fish aggregation, habitat conversion, navigation hazards (including transmission cable infrastructure), and space use conflicts. These impacts may arise from buoys, meteorological towers, foundations, scour/cable protection, and transmission cable infrastructure. Using the assumptions in Appendix E, future offshore wind energy projects under the No Action Alternative would include up to 3,524 WTGs, 4,427 acres (17.92 km^2) of seabed disturbance due to foundation and scour protection, and 1,756 acres (7.11 km^2) of new hard protection atop cables. Projects may install more buoys and meteorological towers. BOEM anticipates that structures would be added intermittently over an assumed 10-year period and that they would remain until conceptual decommissioning of each facility is complete.

The presence of the WTG foundations and associated scour protection would convert existing sand or sand with mobile gravel habitat to hard bottom, which, in turn, would reduce the habitat for target species that prefer softbottom habitat (e.g., surfclams, sea scallops, squid, summer flounder) and increase the habitat for target species that prefer hard-bottom habitat (e.g., lobster, striped bass, black sea bass, cod). Where WTG foundations and associated scour protection produce an artificial reef effect and attract finfish and invertebrates, the aggregation of species could increase the catchability of target species (Kirkpatrick et al. 2017). Although species that rely on soft-bottom habitat would experience a reduction in favorable conditions, the impacts from structures are not expected to result in population-level impacts (Refer to Section 3.5, *Finfish, Invertebrates, and Essential Fish Habitat*). Decommissioning of each wind farm would then have the opposite impact, wherein the species dependent on hard-bottom or reef habitat would experience a reduction in favorable conditions, although some hard-bottom protection measures would remain, while removal of WTGs and their foundations would favor the increase of targeted species that prefer soft-bottom habitat.

The United States Coast Guard (USCG) stated that it does not plan to create exclusionary zones around offshore wind facilities during their operation (BOEM 2018). However, because of the height of wind turbines above the ocean surface, the turbines would be visually detectable at a considerable distance during the day and easily detected by vessels equipped with radar regardless of the time of day. To further ensure navigational safety, all structures would have appropriate markings and lighting in accordance with USCG, BOEM and International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) guidelines, and NOAA would chart wind turbine locations and could include a physical or virtual Automatic Identification System (AIS) at each turbine. Some fishing vessels operating in or near offshore wind facilities may experience radar clutter and shadowing. Most instances of interference can be mitigated through the proper use of radar gain controls (DNV-GL 2021). Refer to Section 3.6.6, *Navigation and Vessel Traffic*.

Notwithstanding these safety measures, some fishermen have commented that, because of safety considerations, they would not enter an offshore wind array during inclement weather, especially during low-visibility events (Kirkpatrick et al. 2017); during interviews with commercial fishermen, Brink and Dalton (2018) found that fishermen had concerns that low visibility, wind, or crew exhaustion could lead to vessels hitting WTGs. Moreover, mechanical problems, such as loss of steerage, could result in an allision with a WTG as the vessel drifts during repair (DNV-GL 2021).

In addition, a potential effect of the presence of the offshore cables and wind turbines associated with offshore wind energy development is the entanglement and damage or loss of commercial and recreational fishing gear. Economic impacts on fishing operations associated with gear damage or loss include the costs of gear repair or replacement, together with the fishing revenue lost while gear is being repaired or replaced. In addition, comments from the fishing industry have included concerns that fishing vessel insurance companies may not cover claims for incidents within a WEA resulting in gear damage or loss, or they may increase premiums for vessels that operate within these areas. Given that mobile fishing gear is actively pulled by a vessel over the seafloor, the chance of snagging this gear type on project infrastructure is much greater than if—as in the case of fixed gear—the gear was set on the infrastructure or waves or currents pushed the gear into the infrastructure. The risk of damage or loss of deployed gear as a result of offshore wind development could affect mobile and fixed gear commercial fisheries and for-hire recreational fishing. While the depth to which offshore power cables are buried is specific to individual projects, standard commercial practice is to bury cables 3 to 10 ft (0.9 to 3.0 m) deep in waters shallower than 6,562 ft (2,000 m) to protect them from external hazards such as fishing gear and anchors (BOEM 2018). Fishing gear does not typically penetrate that deep into the sediment and would normally not snag or become entangled in the cable. However, due to underlying geology, cables may not be able to be buried to the minimum target depth along their entire distance. It is assumed that where feasible, cables will be installed at adequate depths to avoid long-term interactions with bottom-tending gears and that the use of secondary cable protection along the export cable route will be limited or as-needed. Cable burial depth of less than six feet would increase the probability of gear interactions. BOEM assumes less than 10 percent of the cables may not achieve the target burial depth and would require cable protection in the form of rock placement, concrete mattresses, or half-shell (BOEM 2021a). While cables are typically marked on nautical charts to aid in avoidance, mobile bottom-tending gear (trawl and dredge gear) could get snagged on these cable protection measures and cause damage or gear loss. Economic impacts on fishing operations associated with gear damage or loss include the costs of gear repair or replacement plus the fishing revenue lost while gear is being repaired or replaced, although the cost of these impacts would vary depending on the extent of damage to the fishing gear. To avoid these economic impacts, some vessel operators may not trawl or dredge over inter-array or export cables, but this could result in increased operating costs (e.g., additional fuel to arrive at more distant locations; additional crew compensation due to more days at sea) or lower revenue (e.g., fishing in a less productive area or for a less-valuable species).

With respect to fishing vessel maneuverability restrictions (including risk of allisions) within offshore wind lease areas, fishermen have expressed concerns about fishing vessels operating trawl gear that may not be able to safely deploy and operate in an offshore wind lease area given the size of the gear, the spacing between the WTGs, and the space required to safely navigate, especially with other vessels present and during poor weather conditions. Trawl and dredge vessel operators have commented that less than 1 nm (1.9 km) spacing between WTGs may not be enough to operate safely due to maneuverability of fishing gear and gear not directly following in line with vessel orientation. Clam industry representatives (Atlantic surfclam and ocean quahog fisheries) state that their operations require a minimum distance of 2 nm (3.7 km) between WTGs, in alignment with the bottom contours, for safe operations (BOEM 2021b; RODA 2021). Navigating through the offshore wind lease areas would not be as problematic for for-hire recreational fishing vessels, which tend to be smaller than commercial vessels and do not use large external fishing gear (other than hook and line) that makes maneuverability difficult. However, trolling for highly migratory species (e.g., bluefin tuna, swordfish) may involve deploying many feet of lines and hooks behind a vessel and then following large pelagic fish once they are hooked, which poses additional navigational and maneuverability challenges around WTGs (BOEM 2021b).

Fishing vessel operators unwilling or unable to travel through areas where offshore wind facilities are located or to deploy fishing gear in those areas may be able to find suitable alternative fishing locations and continue to earn revenue. This could result in increased operating costs (e.g., additional fuel to arrive at more distant locations; additional crew compensation due to more days at sea), lower revenue (e.g., fishing in a less-productive area, fishing for a less-valuable species, or increased competition for the same resource), or both. However, if, at times, a fishery resource is only available within the offshore wind lease area, some fishermen, primarily those using mobile gear, may lose the revenue from that resource for the time that the resource is inaccessible. These impacts could remain until decommissioning of each facility is complete, although the magnitude of the impacts would diminish over time if fishing practices adapt to the presence of structures.

An accurate assessment of the extent of the effects of planned offshore wind energy projects on commercial fisheries and for-hire recreational fishing would depend on project-specific information that is unknown at this time, such as the actual location of offshore activities within offshore wind lease areas and the arrangement of WTGs. However, it is possible to estimate the amount of commercial fishing revenue that would be “exposed” as a result of offshore wind energy development. Estimates of revenue exposure quantify the value of fishing that occurs in the footprint areas of individual offshore wind farms. Therefore, these estimates represent the fishing revenue that would be foregone if fishing vessel operators opt to no longer fish in these areas and cannot capture that revenue in a different location. Revenue exposure estimates should not be interpreted as measures of actual economic impact. Actual economic impact would depend on many factors—foremost, the potential for continued fishing to occur within the footprint of the wind farm, together with the ecological impact on target species residing within the project areas. Economic impacts depend on a vessel operator’s ability to adapt to changing where fishing could occur. For example, if alternative fishing grounds are available nearby and could be fished at no additional cost, the economic impact would be lower. In addition, it is important to note that there may be cultural and traditional values to fishermen related to fishing in certain areas that go beyond expected monetary profit. For example, some fishermen may gain utility from fishing in locations that are known to them and fished by their peers; the presence of other boats in the area can contribute to the fishermen’s sense of safety.

Table 3.6.1-21 provides the percentage of annual commercial fishing revenue exposed to offshore wind energy development in the Mid-Atlantic and New England regions by FMP fishery from 2020 through 2030. The amount of revenue at risk increases as proposed offshore wind energy projects are constructed and come online according to the timeline set forth in Appendix E and would continue beyond 2030 during the continued operational phases of the offshore wind energy projects. Please note that many of the project areas are outdated and do not reflect the most recent project areas under consideration. NOAA Fisheries is working with BOEM and developers to acquire the most accurate project areas to update these reports. These updated reports as soon as updated project areas are available and can be analyzed. NOAA Fisheries recommends caution when interpreting these reports and does not recommend using them for any quantitative analysis until they can be updated. The largest impacts in terms of percentage of exposed revenue are expected to be in the Skate, Surfclam/Ocean Quahog, Monkfish, and Multi-species (small mesh) FMPs. In general, fisheries do not have a high relative revenue intensity within the offshore wind lease areas compared with nearby waters because offshore wind lease areas were chosen to reduce potential use conflicts between the wind energy industry and fishermen (Ecology and Environment, Inc. 2013).

With respect to impacts on individual fishing operations, long-term, minimal, adverse impacts would occur for vessels that derive a small percentage of their total revenue from areas where offshore wind facilities would be located or are able to find suitable alternative fishing locations. Long-term, considerable adverse impacts would occur for fishing vessels that derive a large percentage of their total revenue from areas where offshore wind facilities would be located, if they choose to avoid these areas once the facilities become operational and are unable to find suitable alternative fishing locations. NMFS (2021d) determined, for each federally permitted commercial fishing vessel that fished in New England/Mid-Atlantic offshore wind lease areas, the percentage of the vessel's total fishing revenue that was derived from within each area during the 2008–2019 period. It is estimated that over that period, only 0.9 percent of the vessels that fished in one or more of the offshore wind lease areas generated more than 50 percent of their total fishing revenue for the year from one or more of the areas. According to the data presented, in each offshore wind lease area there was one or more vessels that earned a substantial (more than 5 percent) portion of their revenue from fishing in the area. Some vessels derived more than half of their revenue from fishing in a particular offshore wind lease area. However, 75 percent of the vessels fishing in any given offshore wind lease area derived less than 0.9 percent of their total revenue from the area. Given that a majority of fishing vessels derive a small percentage of their total revenue from any one offshore wind lease area or that they would relocate to other fishing locations, the overall adverse impact of offshore wind energy development on fishing access by commercial fishing vessels is expected to be long-term and moderate.

Table 3.6.1-21. Percentage of Commercial Fishing Revenue Exposed to Offshore Wind Energy Development in the Mid-Atlantic and New England Regions under the No Action Alternative by FMP (2020-2030)

	Percentage of Total Annual Revenue										
Species	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030[1]
Atlantic Herring	0.00%	0.05%	0.29%	0.46%	0.50%	0.74%	0.74%	0.74%	0.74%	0.74%	0.74%
Bluefish	0.00%	0.08%	0.47%	0.64%	0.69%	1.01%	1.20%	1.20%	1.20%	1.20%	1.20%
Golden Tilefish	0.00%	0.03%	0.06%	0.39%	0.48%	1.06%	1.06%	1.06%	1.06%	1.06%	1.06%
Highly Migratory Species	0.00%	0.00%	0.04%	0.07%	0.07%	0.08%	0.10%	0.10%	0.10%	0.10%	0.11%
Mackerel/Squid/Butterfish	0.00%	0.45%	0.83%	1.48%	1.51%	2.43%	2.47%	2.47%	2.47%	2.47%	2.49%
Monkfish	0.00%	0.29%	2.58%	3.06%	3.07%	4.58%	4.62%	4.62%	4.62%	4.62%	4.70%
Multispecies Large Mesh	0.00%	0.04%	0.29%	0.32%	0.32%	0.45%	0.45%	0.45%	0.45%	0.45%	0.45%
Multispecies Small Mesh	0.00%	0.39%	1.54%	2.39%	2.39%	4.22%	4.22%	4.22%	4.22%	4.22%	4.22%
River Herring	0.00%	0.01%	0.06%	0.12%	0.13%	0.16%	0.18%	0.18%	0.18%	0.18%	0.18%
Sea Scallop	0.00%	0.01%	0.11%	0.60%	0.61%	0.67%	0.74%	0.74%	0.74%	0.74%	0.77%
Skate	0.00%	0.45%	4.26%	4.75%	4.78%	6.98%	7.03%	7.03%	7.03%	7.03%	7.07%
Spiny Dogfish	0.00%	0.10%	1.33%	1.42%	1.69%	1.97%	2.10%	2.10%	2.10%	2.10%	2.12%
Summer Flounder/Scup/Black Sea Bass	0.00%	0.16%	0.92%	1.50%	1.59%	2.45%	2.56%	2.56%	2.56%	2.56%	2.65%
Surfclam/Ocean Quahog	0.00%	0.20%	1.33%	1.54%	1.55%	2.36%	5.17%	5.17%	5.17%	5.17%	5.28%
Red Crab	0.00%	0.00%	0.03%	0.11%	0.15%	0.24%	0.25%	0.25%	0.25%	0.25%	0.27%
Other FMPs, non-disclosed species, and non-FMP fisheries[2]	0.00%	0.05%	0.38%	0.51%	0.58%	1.03%	1.08%	1.08%	1.08%	1.08%	1.19%

Source: Developed from construction schedule data in Appendix E and fishing revenue data from NMFS 2021e.

Notes: Revenue estimates combine the 10-year average of inflation-adjusted revenues from commercial fisheries in Atlantic offshore wind energy lease areas (exclusive of the Sunrise Wind Lease Area). Revenue is adjusted for inflation to 2019 dollars and is estimated based on the annual average revenue by FMP from 2008 through 2019.

Offshore wind development and the presences of structures could also influence regulated fishing effort by affecting NMFS's scientific surveys on which management measures are based. If NMFS's scientific survey methodologies are not adapted to sample within WEAs, there could be increased uncertainty in scientific survey results, which would increase uncertainty in stock assessments and quota-setting processes. Future spatial management measures may change in response to changes in fishing behavior due to the presence of structures. Impacts on management processes would in turn have short-term or long-term impacts on commercial and for-hire recreational fisheries' operations.

New cable emplacement/maintenance: Displacement of fishing vessels and disruption of fishing activities could occur, though this disruption would not occur all at the same time. Installation of offshore cables for each offshore wind energy facility would require short-term rerouting of all vessels, including commercial and for-hire recreational fishing vessels, away from areas of active construction.

Construction activities related to offshore wind energy development that disturb the seabed, together with activities that reduce water quality, increase underwater noise, or introduce artificial lighting, could result in a behavioral response from some target species. In turn, these responses could decrease catchability for a fishery, due to factors such as fish not biting at hooks or changes in swim height. For any given offshore wind energy project, the impacts of behavioral responses on target species catch in commercial and for-hire recreational fisheries are expected to be confined to a small area, and to end shortly after construction activities end. Benthic species such as sea scallops and ocean quahogs would be expected to repopulate cable areas once the offshore cables are installed and buried. Cable inspection and repair activities would result in types of impacts similar to those resulting from construction activities, such as short-term displacement or other behavioral responses of target species. The impacts are expected to be small and short-term in nature, only occurring during cable placement or maintenance activities. Impacts related to gear entanglement from interactions with cables is discussed in Presence of Structures. Details regarding potential lighting and noise impacts on finfish and invertebrates are described in Section 3.5.5.

Climate change: Impacts on commercial fisheries and for-hire recreational fishing are expected to result from climate change events such as increased magnitude or frequency of storms, shoreline changes, ocean acidification, and water temperature changes. Risks to fisheries associated with these events include the ability to safely conduct fishing operations (e.g., due to storms) and habitat or distribution shifts in targeted species, disease incidence, and risk of invasive species. If these risk factors result in a decrease in catch or increase in fishing costs (e.g., transiting time), the profitability of businesses engaged in commercial fisheries and for-hire recreational fishing would be adversely affected. The catch potential for the temperate Northeast Atlantic is projected to decrease between now and the 2050s (Barange et al. 2018). Hare et al. (2016) predict that climate change would affect Northeast fishery species differently. For approximately half of the 82 species assessed, the authors report that overall climate vulnerability is high to very high; diadromous fish and benthic invertebrate species, including surfclam, ocean quahog, and scallops, exhibit the greatest vulnerability. In addition, most species included in the assessment have a high potential for a change in distribution in response to projected changes in climate. Adverse effects of climate change are expected for approximately half of the species assessed, while Hare et al. (2016) anticipate that, for approximately 17 percent of the species, including inshore longfin squid, butterfish, and Atlantic croaker, fisheries would see some beneficial impacts. The intensity of the impacts of climate change on commercial fisheries and for-hire recreational fishing is anticipated to qualify as minor to major for fishing operations that target species adversely affected by climate change, and the beneficial impacts are anticipated to qualify as minor to major for fishing operations targeting fishery species that may benefit fishing operations due to climate change effects.

The economies of communities reliant on marine species that are vulnerable to the effects of climate change could be adversely affected. If the distribution of important fish stocks changes, it could affect where commercial and for-hire recreational fisheries are located. Furthermore, coastal communities with fishing businesses that have infrastructure near the shore could be adversely affected by sea level rise (Colburn et al. 2016; Rogers at al. 2019). Because offshore wind facilities would produce lower GHG emissions than fossil fuel–powered generating facilities with similar capacities, the reduction in GHG emissions per kW of electricity produced from other offshore wind projects, as opposed to equivalent energy production powered by fossil fuels, would result in long-term, beneficial impacts on fishing operations that target species adversely affected by climate change. However, the benefits would be negligible. Section 3.4.1, *Air Quality*, describes the expected contribution of offshore wind development to climate change.

Regulated fishing effort: "Regulated fishing effort" refers to fishery management measures necessary to maintain maximum sustainable yield under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). This includes quota and effort allocation management measures. Future offshore wind development could influence fishery management by affecting fisheries' independent surveys used to inform management measures and by changing patterns of fishing activity. Fisheries managers may need to revise the sampling design of fisheries surveys to include sampling within WTAs to account for uncertainty in stock assessments that may accompany offshore wind development. Increased uncertainty in stock assessments could lead to more conservative quotas and resulting revenue losses in the fishing industry, which was also discussed under the presence of structures IPF. Changes in fishing behavior from offshore wind development may necessitate new management measures, which would in turn have short-term or long-term impacts on commercial and for-hire recreational fisheries. BOEM expects that changes in regulated fishing effort in response to future offshore wind activities would cause long-term, widespread, moderate impacts on commercial and for-hire recreational fisheries as management adapts to changing fishing patterns, data availability, and management options.

3.6.1.3.3 Conclusions

Impacts of the No Action Alternative

Under the No Action alternative, ongoing activities would have continuing impacts on commercial fisheries and for-hire recreational fishing, primarily through port use, vessel activity, other offshore development, climate change, and fisheries use and management.

BOEM anticipates that the impacts of ongoing activities on commercial fisheries and for-hire recreational fishing would be **minor** to **major**. The major impact rating for some fisheries and fishing operations is primarily driven by regulated fishing effort and climate change associated with ongoing activities.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and planned non-offshore wind activities, including port expansions, new cable emplacement and maintenance, and future marine transportation and fisheries use, would contribute to impacts on commercial fisheries and for-hire recreational fishing. Planned offshore wind activities would affect commercial fisheries and for-hire recreational fishing through the primary IPFs of anchoring, cable emplacement and maintenance, noise, port utilization, presence of structures, and traffic.

BOEM anticipates that the cumulative impact of the No Action Alternative would result in a **moderate** to **major** adverse impact on commercial fisheries and **minor** to **moderate** adverse impacts on for-hire recreational fishing. This impact rating would primarily result from future fisheries use and management, the increased presence of offshore structures and climate change.

3.6.1.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in Appendix C would result in impacts similar to or less than those described in the sections below. The following is a summary of proposed relevant design parameters and potential variances (details provided in Appendix C) that would influence the magnitude of the impacts to commercial fisheries and for-hire recreational fishing:

- The number, size, and location of WTGs;
- Per turbine characteristics, such as the minimum lower and maximum upper blade tip heights and maximum rotor diameter;
- Turbine foundation characteristics, such as the diameter of structure, scour protection, drill spoil volume, seabed penetration and installation – both per turbine and maximum total impacts);
- The location of the export cable landfall may affect nearshore fishing areas during construction;
- Offshore converter substation characteristics, including the number and dimensions of the substations and the number and size of the foundation structures, as well as the number of piles and seabed disturbance and the piled jacket foundations associated with the substations;
- Array cable characteristics, including the total length, voltage, burial depth, as well as the corridor dimensions and associated disturbance to the seabed;
- Converter substation interconnector cable characteristics, including the number of cables, cable size, and voltage, along with associated seabed disturbance and cable protection;
- Offshore export cable characteristics, including the cable size and voltage, along with the maximum impacts of seabed disturbance associated with clearing the corridor, cable protection, and crossings;
- Wind turbine vessel trips associated with construction of both the wind turbine foundation and structure installation;
- Vessels required for converter substation installation, array cable installation, substation interconnection cable installation, and offshore export cable installation;

- O&M activities related to wind turbine foundation and OSS painting, cleaning, repair and replacement; and
- O&M activities related to offshore array cable, substation interconnector cable, offshore export cable and Holbrook export cable remedial burial and cable fault maintenance.

Sunrise Wind has committed to measures to minimize impacts on commercial fisheries and for-hire recreational fishing such as developing and implementing a Fisheries Communication and Outreach Plan (COP V1 October 28, 2021 Appendix B – Fisheries Communication Plan) and working with commercial and recreational fishing entities to ensure the Project would minimize potential conflict.

Sunrise Wind has also committed to collaborative science with commercial and recreational fishing industries prior to, during, and following construction of the proposed Project, including development of a Fisheries and Benthic Monitoring Plan (COP V2 April 2022 Appendix AA1 – Fisheries and Benthic Monitoring Plan) to assess the impacts associated with the proposed Project on economically and ecologically important fisheries resources.

3.6.1.5 Impacts of Alternative B - Proposed Action on Commercial Fisheries and For-Hire Recreational Fishing

The following text summarizes the potential impacts of the Proposed Action (Alternative B) on commercial fisheries and for-hire recreational fishing during the various phases of the proposed Project. Routine activities would include construction and installation, O&M, and conceptual decommissioning of the onshore and offshore components of the proposed Project, as described in Chapter 2, *Alternatives*.

3.6.1.5.1 Construction and Installation

3.6.1.5.1.1 Onshore Activities and Facilities

The primary impacts relative to commercial fisheries and for-hire recreational fishing by their nature are associated with offshore activities and facilities. However, changes in, or the availability of, certain onshore infrastructure could have an impact on commercial fishing and for-hire recreational fishing. This could include port changes, port expansion and construction activities, impacts to the cost or availability of shoreside support services that could disrupt offloading, provisioning, repair services, and seafood distribution. Therefore, some onshore activities related to offshore wind development could adversely impact commercial fishing and for-hire recreational fishing; however, the majority of impacts are related to offshore activities.

3.6.1.5.1.2 Offshore Activities and Facilities

Anchoring: Anchoring involves both anchoring of a vessel involved in the Project and the attachment of a structure to the sea bottom by use of an anchor or mooring. Anchoring vessels and other structures used in construction of the Project would pose a navigational hazard to fishing vessels. All impacts would be localized (within a few hundred meters of anchored vessels) and short-term (hours to days in duration). Although anchoring impacts would primarily occur during Project construction, some impacts could occur during O&M and conceptual decommissioning. Therefore, the adverse effects of offshore wind energy–related anchoring on commercial fisheries and for-hire recreational fishing are expected to be long-term though periodic in nature, and minor.

Noise: Noise impacts associated with offshore construction activities for 94 WTGs within 102 overall potential positions, including pile-driving, trenching for cable placement, O&M activities, G&G investigations, and vessels, could cause indirect impacts on commercial and for-hire recreational fisheries within the Proposed Project Area through their direct impacts on species targeted by the commercial and for-hire fisheries. Section 3.5 provides a full description of noise impacts on fish and invertebrates. Most noise impacts on species would be short-term and behavioral in nature, with most finfish species avoiding the noise-affected areas, while invertebrates may exhibit stress and behavioral changes such as discontinuation of feeding activities. The greatest impact would be from pile-driving and the impulse noise impacts it would create, as pile-driving is the only human-made, non-blasting sound source that has killed or caused hearing loss in fish in the natural environment (Kirkpatrick et al. 2017). Impulse noise from pile-driving may exceed physiological sound thresholds for some species, resulting in injury or mortality, especially for affected species in the immediate vicinity (less than 164 ft [50 m]), although many studies found no statistically significant change in direct mortality, even at distances of less than 33 ft (10 m) (Kirkpatrick et al. 2017). To reduce potential impacts from pile-driving, Sunrise Wind has committed to APMs which include using ramp-up/soft-start procedures to allow mobile species to leave the area prior to experiencing the full noise impact of pile-driving, time-of-year in-water restrictions would be employed to the extent feasible to avoid or minimize direct impacts to species, and available noise attenuation technologies would be employed to further reduce impacts of construction in-water (Sunrise Wind 2022).

Noise from trenching of inter-array and export cables would occur during construction and would likely be limited to dispersal of species, including commercially targeted species, from the area. These disturbances would be short-term and localized and extend only a short distance beyond the emplacement corridor but would have only minor fishery-level impacts.

Port utilization: Construction of the proposed Project would require a range of both construction and support vessels, including vessels for transferring crew, transporting heavy cargo, and conducting heavy lifts, as well as multipurpose vessels and barges. All of these vessels would add traffic to port facilities and would require berthing. For the proposed Project, construction vessels would travel between the Wind Farm Area and the following ports that are expected to be used during construction: Albany and/or Coeymans, New York, as foundation scope, Port of New London, Connecticut, as WTG scope, and Port of Davisville-Quonset Point, Rhode Island, as construction management base. Other back-up options for construction support include Port of New York-New Jersey, New York, the New Bedford Marine Commerce Terminal, Massachusetts, Sparrow’s Point, Maryland, Paulsboro Marine Terminal, New Jersey, Port of Providence, Rhode Island, and Port of Norfolk, Virginia. It should also be noted that there may be indirect impacts to ports not specifically being used as a construction mobilization port for the proposed Project, as other ports that are in relatively close proximity may experience an influx of vessels relocating due to traffic in the ports listed above.

Based on information provided by Sunrise Wind, construction activities (including offshore installation of WTGs, substations, array cables, interconnection cable, and export cable) would require a variety of vessels and helicopters, as noted in COP Table 3.3.10-3. In total, the Proposed Action would generate approximately 126 vessel trips during the construction and installation phase (Appendix C). The construction vessels to be used for Project construction are described in Section 3.3.10.1 and Tables 3.3.10-2 and 3.3.10-3 of the COP (Sunrise Wind 2022). Typical large construction vessels used in this type of project range from 325 to 350 ft (99 to 107 m) in length, from 60 to 100 ft (18 to 30 m) in beam, and draft from 16 to 20 ft (5 to 6 m) (Denes et al. 2021).

Some of the ports that would be used by Sunrise Wind are also used by commercial fishing vessels and for-hire recreational fishing vessels. Of the main ports considered, Port of New London averaged $7,000 in annual revenue over the period of 2008-2019 from commercial fishing in the Lease Area, which is tenth among those listed in Table 3.6.1-11. However, other back-up ports such as New Bedford have a much higher average annual revenue of $817,000 from commercial fishing in the Lease Area, which ranked highest among those listed in Table 3.6.1-11. The additional vessel volume in the ports associated with Project operations could cause vessel traffic congestion, difficulties with navigating, and an increased risk for collisions, together with reduced access to high-demand port services (e.g., fueling and provisioning) by existing port users, including commercial and for-hire recreational fishing vessels. However, Sunrise Wind developed a Fisheries Communication and Outreach Plan (COP V1 October 28, 2021 Appendix B, Sunrise Wind 2022) as well as several other APMs to inform all mariners, including commercial and recreational fishing vessel, of construction related activities and Project-related vessel movements. Communication would be facilitated through a Project website, public notices to mariners and vessel float plans, and a Fisheries Liaison. Sunrise Wind would submit information to the USCG to issue Local Notice to Mariners during offshore installation activities. The adverse impact on commercial fisheries and for-hire recreational fishing would be short-term during the construction period, which would include more vessel traffic than during the O&M phase.

Traffic: The installation of offshore components for the Project and the presence of construction vessels and O&M vessels could temporarily restrict fishing vessel movement and thus transit and harvesting activities within the Project Lease Area and along the cable routing areas. It could lead to traffic congestion and an increased risk for collisions. Sunrise Wind would request, and it is expected the USCG would establish, short-term safety zones around each WTG, the OSC-DC and each cable-laying vessel during construction. Regardless of whether safety zones are in effect, fishing vessels would likely steer clear of construction vessels to avoid potential collisions and damage to their fishing gear. In doing so, fishing vessels could either forfeit fishing revenue or relocate to other fishing locations and continue to earn revenue. However, vessels that choose to relocate could incur increased operating costs such as increased fuel costs due to longer transit times to and from more distant fishing grounds, wear on equipment and additional crew compensation due to more days at sea, among other factors. They could also experience lower revenue due to fishing potentially less-productive fishing grounds, potentially having to switch to less-valuable species, and potentially encountering more competition for a given resource.

After construction is complete, WTG foundations and associated scour protection may produce an artificial reef effect, potentially increasing fish and invertebrate abundance within a facility’s footprint (Refer to Section 3.5.5, *Finfish, Invertebrates, and Essential Fish Habitat*), as well as recreational fishing use. Some commercial fishermen may avoid the Wind Farm Area if large numbers of recreational fishermen are drawn to the area by the prospect of higher catches (ten Brink and Dalton 2018). If these congestion concerns cause commercial fishermen to shift their fishing effort to areas outside of the Wind Farm Area to areas not routinely fished, conflict with existing users could increase as other areas are encroached upon. In general, the potential for conflict among commercial fishermen due to fishing displacement may be higher for fishermen engaged in fisheries that have regulations that constrain where fishermen can fish, such as the lobster fishery. However, the potential for vessel congestion and gear conflict may increase if mobile species targeted by commercial fishermen, such as Atlantic herring, Atlantic mackerel, squid, tuna, and groundfish, are attracted to offshore wind energy facilities by the artificial reef effect, and fishermen targeting these species concentrate their fishing effort in the Wind Farm Area as a result. Overall, the adverse effects of vessel traffic on commercial and for-hire fishing vessels are expected to be moderate and long-term.

Presence of structures: The presence of structures could lead to impacts on commercial fisheries and for-hire recreational fishing through navigation hazards (including transmission cable infrastructure) and allisions (collisions with stationary objects), entanglement or gear loss/damage, fish aggregation, habitat conversion, and space use conflicts.

Impacts and considerations relative to the presence of structures is discussed thoroughly under O&M for offshore activities and facilities.

During the construction of the project, up to two wave buoys would be deployed to support the SRWF installation stage with one wave buoy within the SRWF proximate to the WTGs in the eastern region of the windfarm and one wave buoy deployed nearshore along the SRWEC–NYS near the HDD exit pit location. The wave buoys would be temporary during construction and would collect information about the wave and current information to be transmitted in real time to the installation vessel(s) for monitoring the safety of operations and also to feed into a forecasting system for real time calibration and accuracy improvement of the local forecast. Impacts related to the presence of the wave buoys would be short-term and negligible. Additional details related to the wave buoys is presented in Section 2.1.2.2.4.

Cable emplacement and maintenance: The Proposed Action would install approximately 286 mi (460 km) of new submarine cable, including 180 mi (305.8 km) of inter-array cables and 106 mi (290 km) of offshore export cables. As described in the COP (Sunrise Wind 2022) and summarized in Appendix E, Sunrise Wind proposes to bury all cables to a target depth of 3 to 7 ft (1 to 2 m). Cable burial depth of less than six feet would increase the probability of gear interactions. Cable-laying activities, including preparatory boulder and sand wave clearance activities, would directly disrupt commercial and for-hire recreational fishing activities in areas of active construction, although disruption in any given area would be short-term. Boulder removal would be performed using a combination of a boulder grab or boulder plow, while sand wave leveling would potentially be undertaken through use of a suction hopper dredger (Sunrise Wind 2022).

Boulder clearance, sand wave clearance, and cable laying disturbs the seabed and can reduce water quality through resuspension of sediment, increase underwater noise, or introduce artificial lighting, and can result in a behavioral response from mobile finfish species and injury or death of less-mobile species or benthic infauna such as scallops, surfclams, and ocean quahogs, as well as alter the seabed profile (Section 3.5.5). In turn, these responses could decrease catchability for a fishery, such as by changing the species composition where seabed profiles are changed or due to disturbances causing fish to not bite at hooks or changing swim height. The maximum impacts for boulder and sand wave clearance would be 1,259 acres (5.1 km^2), assuming a 98-ft- (30-m-) wide corridor along 100 percent of the cable route within both the Wind Farm Area and the export cable route (Appendix C), even though the actual clearance area is likely to be less than the assumed maximum area. New cable emplacement and maintenance are estimated to affect up to 1,259 acres (5.1 km^2) of seafloor within the export cable route. The relocation of boulders also could increase the risk of gear stags, as uncharged or unknown obstructions could result in damage to equipment, lost revenue and potential safety impacts. Behavioral responses of target species in commercial and for-hire recreational fisheries are expected to be confined to a small area at any one time, and to end shortly after construction activities end. Benthic species such as sea scallops and ocean quahogs would be expected to readily repopulate cable areas once the offshore cables are installed and buried. Cable inspection and repair activities would result in types of impacts similar to those of construction activities, with short-term disturbance, displacement, injury, or mortality of target species. To mitigate impacts to commercial and for-hire recreational fisheries, Sunrise Wind would install mobile gear-friendly cable protection measures (i.e., not introduce new hangs for mobile fishing gear, meaning new features could have tapered/sloped edges). This APM would ensure that seafloor cable protection does not introduce new hangs for mobile fishing gear. Areas of impact would be expected to be minor and the duration of impacts to be short-term during the time of construction and/or repair and maintenance. The area around the Lease Area as well as the cable corridor is a very diverse area in terms of the types of fishing as well as the species found in the area – generally speaking, the areas to the west of the Lease area would have more skates and monkfish, as well as ground fish species. In addition, the skate bait fishery primarily operates in the area where the cable corridor is generally located and includes harvesting larger volumes of low-value fish typically used for lobster bait.

Climate change: Impacts and considerations relative to climate change are discussed under O&M for offshore activities and facilities.

Regulated fishing effort: Impacts and considerations relative to regulated fishing effort are discussed under O&M for offshore activities and facilities.

3.6.1.5.2 Operations and Maintenance

3.6.1.5.2.1 Onshore Activities and Facilities

As noted in Section 3.6.1.6.1., the primary impacts relative to commercial fisheries and for-hire recreational fishing by their nature are associated with offshore activities and facilities. However, changes in, or the availability of, certain onshore infrastructure could have an impact on commercial fishing and for-hire recreational fishing. This could include port changes, port expansion and construction activities, impacts to the cost or availability of shoreside support services that could disrupt offloading, provisioning, repair services, and seafood distribution. Therefore, some onshore activities related to offshore wind development could adversely impact commercial fishing and for-hire recreational fishing; however, the majority of impacts are related to offshore activities.

3.6.1.5.2.2 Offshore Activities and Facilities

Anchoring: Anchoring involves both anchoring of a vessel involved in the Project and the attachment of a structure to the sea bottom by use of an anchor or mooring. As noted under construction and installation, anchoring vessels and other structures would pose a navigational hazard to fishing vessels;

however, all impacts would be localized (within a few hundred meters of anchored vessels) and short-term (hours to days in duration). Although anchoring impacts would primarily occur during Project construction, some impacts could occur during O&M. Therefore, the adverse effects of offshore wind energy-related anchoring on commercial fisheries and for-hire recreational fishing are expected to be long-term, though periodic in nature, and minor.

Noise: While noise associated with operational WTGs may be audible to some finfish and invertebrates, this would only occur at relatively short distances from the WTG foundations, and there is no information to suggest that such noise would negatively affect commercial fisheries (English et al. 2017). Therefore, impacts on commercial and for-hire recreational fisheries would be unlikely.

Sunrise Wind would conduct G&G surveys to inspect or monitor cable routes during the construction and O&M phases of the Project, or both. Noise from G&G surveys of the cable route could disturb finfish and invertebrates in the immediate vicinity of the investigation and could cause short-term behavioral changes; however, the noise is not anticipated to affect reproduction and recruitment of commercial fish stocks into the fishery. Noise impacts from surveys could have short-term, localized impacts during the short-term survey period. Impacts on commercial fisheries and for-hire recreational fishing are anticipated to be short-term and minor given the small impact area and short-term nature of the impact.

Throughout the construction and O&M phases, vessel traffic associated with the Project would likely result in behavior responses from several species, including species targeted by fisheries. However, noise from vessels would be considered low intensity and would not be expected to affect species on a fisheries level; therefore, impacts on commercial and for-hire recreational fisheries would be minor.

For all of the above noise-generating activities, once the activity ceases, most fish and invertebrate species would be expected to return to or recolonize the affected area. Therefore, impacts from noise-generating activities on commercial and for-hire recreational fisheries would be short-term and minor.

Port utilization: The O&M phase of the proposed Project would require a range of equipment, vehicles and vessels, including vessels for transferring crew, transporting heavy cargo, and conducting heavy lifts, as well as multipurpose vessels and barges. All of these vessels would add traffic to port facilities and would require berthing. Although no final decision has been made on which port(s) would be used for O&M activities, the following ports are being considered: Brooklyn, New York, Montauk, New York, Port Jefferson, New York, Port Galilee, Rhode Island, and Quonset, Rhode Island. The vessels utilizing ports would be less in number than during the construction phase but do have the potential to disrupt regular users of these port facilities, potentially causing certain commercial fishing and for-hire recreational vessels to relocate to different ports. Utilizing a different port that is potentially farther from their desired fishing grounds could increase costs incurred by these vessels.

The Project would use a variety of vessels to support O&M, including crew transfer vessels, service operation vessels, jack-up vessels, and supply vessels (including helicopters).

Traffic: Safety zones may be established around O&M activities on a case-by-case basis in coordination with the USCG. In context of reasonably foreseeable environmental trends, the incremental contributions of the Proposed Action to the combined vessel traffic impacts on commercial fisheries and for-hire recreational fishing from ongoing and planned activities would likely cause an increase in vessel traffic during the O&M activities, resulting in short-term and long-term moderate impacts.

Presence of structures: The presence of structures can lead to impacts on commercial fisheries and for-hire recreational fishing through navigation hazards (including transmission cable infrastructure) and allisions (collisions with stationary objects), entanglement or gear loss/damage, fish aggregation, habitat conversion, displacement, and space use conflicts.

Under current regulations, USCG is responsible for determining any type of safety or exclusionary zone around any structure placed in the open ocean. USCG stated that it does not plan to create exclusionary zones around offshore wind facilities, with the exception of possibly implementing safety zones during construction and conceptual decommissioning, to be determined on a project-by-project basis (BOEM 2018). However, the presence of the Project's WTGs could result in the area essentially becoming an exclusion area for fishing if fishing vessel operators are not—or perceive that they are not—able to safely navigate the area around the WTGs.

Under the Proposed Action, Sunrise Wind proposes to install up to 94 WTGs at 102 potential locations, extending up to 787 ft (240 m) above mean lower low water (MLLW) with spacing of 1.15-mi by 1.15-mi, or 1-nm by 1-nm (1.85-km by 1.85-km) between WTGs in a uniform east-west/north-south grid.

The presence of WTG arrays may restrict fishing vessel maneuverability (including risk of allisions) within the Wind Farm Area. Fishermen have expressed specific concerns about fishing vessels operating trawl gear that may not be safely deployed and operated in an offshore wind lease area given the size of the gear, the spacing between the WTGs, and the space required to safely navigate, especially with other vessels present and during poor weather conditions. Trawl and dredge vessel operators have commented that spacing less than 1 nm (1.9 kms) between WTGs may not be enough to operate safely due to maneuverability of fishing gear and gear not directly following in line with vessel orientation. Clam industry representatives (Atlantic Surfclam and Ocean Quahog Fisheries) state that their operations require a minimum distance of 2 nm (3.7 km) between WTGs, in alignment with the bottom contours, for safe operations (BOEM 2021a; RODA 2021). Navigating through the Wind Farm Area would not be as problematic for the for-hire recreational fishing vessels, which tend to be smaller than commercial vessels and do not use large external fishing gear (other than hook and line) that makes maneuverability difficult. However, trolling for highly migratory species (e.g., bluefin tuna, swordfish) may involve deploying many feet of lines and hooks behind the vessel and then following large pelagic fish once they are hooked, which poses additional navigational and maneuverability challenges around WTGs (BOEM 2021a).

Sunrise Wind's *Navigation Safety Risk Assessment* (NSRA) (COP V1, June 2021, Appendix X, Sunrise Wind 2022) examined many aspects of the proposed Project's WTG layout. Using their analysis along with feedback received from commercial fishing stakeholders, the Project plans an array with three lines of orientation, east/west, north/south and diagonals in intercardinal directions, and a minimum of 1 nm (1.85 km) separation between towers to provide the ability to transit the Lease Area in multiple directions as safely as possible. BOEM is cognizant that maneuverability within the Wind Farm Area may vary depending on many factors, including vessel size, fishing gear or method used, and environmental conditions such as wind, sea state, current, and visibility. In addition, BOEM recognizes that even when it is feasible to fish within the Wind Farm Area, some fishermen may not consider it safe to do so.

Furthermore, operating within the Wind Farm Area with other vessels and gear types present may restrict vessel maneuverability.

Because of the height of WTGs above the ocean surface, they would be visually detectable at a considerable distance during the day and easily detected by vessels equipped with radar regardless of the time of day. To further ensure navigational safety, all WTGs and OSS would be lit and marked in accordance with USCG, BOEM, and IALA guidelines, and WTG locations would be charted by NOAA and could include protocols for sound signals, radar beacons, and AIS, which would be finalized with consideration for other such private aids to navigation (PATON) in the area (i.e., foghorns) in coordination with USCG. Some fishing vessels operating in or near the Wind Farm Area may experience radar clutter and shadowing. Most instances of interference could be mitigated through the proper use of radar gain controls (DNV-GL 2021) refer to Section 3.6.6, *Navigation and Vessel Traffic*.

Notwithstanding these safety measures, some fishermen have commented that, because of safety considerations, they would not enter an offshore wind array during inclement weather, especially during low-visibility events (Kirkpatrick et al. 2017). During interviews with commercial fishermen, ten Brink and Dalton (2018) found that fishermen had concerns that low visibility, wind, or crew exhaustion could lead to vessels hitting WTGs. Moreover, mechanical problems, such as loss of steering, could result in an allision with a WTG as the vessel drifts during repair (DNV-GL 2021). Aside from these potential navigational issues, some commercial fishermen may avoid the Wind Farm Area if large numbers of recreational fishermen are drawn to the area by the prospect of higher catches. According to ten Brink and Dalton (2018), the influx of recreational fishermen into the BIWF in Rhode Island caused some commercial fishermen to cease fishing in the area because of vessel congestion and gear conflict concerns. In addition, if these concerns cause commercial fishermen to shift their fishing effort to areas not routinely fished, conflict with existing users could increase as other areas are encroached. In general, the potential for conflict among commercial fishermen due to fishing displacement may be higher for fishermen engaged in fisheries that have regulations that constrain where fishermen can fish, such as the lobster fishery. However, the potential for vessel congestion and gear conflict may increase if mobile species targeted by commercial fishermen, such as Atlantic herring, Atlantic mackerel, squid, tuna, and groundfish, are attracted to the Wind Farm Area, and fishermen targeting these species concentrate their fishing effort in the proposed Project Area as a result.

Whether fishermen continue to fish in the Wind Farm Area is determined by cultural and traditional values that go beyond expected profit. For example, it is advantageous for fishermen to fish in locations that are known to them and fished by their peers. In addition, the presence of other boats in the area can contribute to the fishermen’s sense of safety. Some fishermen may choose to not fish in the area due to their perception of risk. Impacts on commercial fisheries may affect the economic health, the cultural identity, and values, and therefore the wellbeing, of individuals and communities that identify as “fishing” communities. Impacts on cultural and traditional values are not quantifiable, but are qualitatively considered when assessing the impacts of the Proposed Action.

Fishing vessel operators unwilling or unable to travel through or deploy fishing gear in the Wind Farm Area would be displaced. They may find suitable alternative fishing locations and continue to earn revenue, although it is difficult to predict the ability of fishing operations displaced by the Project to locate alternative fishing grounds that would allow them to maintain revenue targets while continuing to minimize costs. However, the available data suggest the presence of alternative productive fishing grounds in proximity to the Wind Farm Area, especially for the two highest revenue-producing FMP species within the Wind Farm Area: surfclam/ocean quahog and monkfish. Section 2.2.2 of COP Appendix V (COP Appendix V1, June 2021 Sunrise Wind 2022) shows maps of vessel intensity associated with the SRWF and SRWEC Fisheries Study Corridor. Figures 2.2-7 in the COP, Appendix V1, shows vessel intensity for monkfish fishing from 2011 to 2014 and Figure 2.2-8 shows monkfish fishing vessel intensity for 2015 and 2016. Both figures show high-to-very high vessel intensity in the Lease Area, as well as areas to the north, northwest, west and south of the Lease Area. COP V1 June 2021 Appendix V Figure 2.2-17 provides a revenue-intensity raster map for monkfish fishing from 2013 to 2017, which shows high-level of revenue is generated within the Lease Area. Similarly, for surfclam/ocean quahog, COP V1 June 2021 Appendix V, Figures 2.2-9 and 2.2-10 show vessel intensity for surfclam/ocean quahog fishing from 2012 to 2014 and 2015 and 2016, respectively, and indicate there are high concentrations of vessels in and around the Lease Area targeting surfclam/ocean quahog. Figure 2.2-19 shows revenue-intensity raster map for clam dredge fishing from 2013 to 2017, which indicates concentrations of revenue generated within the Lease Area, but also large areas to the southwest where high concentrations of revenue are generated.

The location of the proposed wind project may affect the accessibility and availability of fish for commercial and for-hire recreational fishing. In particular, the location of the proposed infrastructure and the Lease Area could impact transit corridors and access to preferred fishing locations. Although the figures in the COP (V2 April 2022 Sunrise Wind 2022) indicate that there is high vessel intensity and revenue generated within the Lease Area, it shows that there are many surrounding areas where the fishing level efforts and revenue generated are comparable or higher than those within the Lease Area and the SRWEC Fisheries Studies Corridor. While comparable fishing grounds may exist in proximity to the Wind Farm Area, shifting locations could result in increased operating costs operating costs (e.g., additional fuel to arrive at more distant locations; additional crew compensation due to more days at sea), lower revenue (e.g., fishing in a less-productive area, fishing for a less-valuable species, or increased competition for the same resource), or both. Fishers that switch target species or gear types used may also lose revenue from targeting a less-valuable species and increased costs from switching gear type. Switching species could also cause fishers to land their catch in different ports (Papaioannou et al. 2021), which could result in increased operational costs depending on where the port is located.

In addition, if, at times, a fishery resource is only available within the Wind Farm Area, some fishermen, primarily those using mobile gear, may lose the revenue from that resource for the time the resource is inaccessible. These impacts could remain until decommissioning of the Project is complete, although the magnitude of the impacts would diminish over time if fishing practices adapt to the presence of structures. In addition, there may be some additional expense incurred on fishing vessels that choose to detour around the Wind Farm Area to other fishing areas. However, instead of transiting in the most direct route and alternative route is used that may result in additional time, fuel usage and equipment/vessel wear and potential safety hazards.

It is acknowledged that proposing fishermen find alternative fishing grounds to earn revenue is a complex issue with many factors, including the familiarity of traditional fishing grounds. Fishing communities may also have a difficult time with climate adaptation. Historically, warming (and cooling) events have affected the abundance of species targeted, prevalence of invasives, and physical access to target species. Fishing communities historically viewed cooling waters twice as negatively as warming waters, as they were associated with a decrease in fishing opportunity due to storms, while warmer waters were associated with the potential for new fisheries. However, recent warming trends were viewed as strongly negative, associated with disease, reductions in target species and shifts of fish distributions across jurisdictional lines (McClenachan et al. 2019).To evaluate the potential costs associated with reduced fishing revenues that may result from construction and O&M activities in the Wind Farm Area, BOEM obtained information from NMFS on fisheries revenue sourced from within the Lease Area. From these data, it is possible to estimate the amount of commercial fishing revenue that would be exposed as a result of the Proposed Action. The estimate of revenue exposure quantifies the value of fishing that occurs in the Lease Area. Therefore, these estimates represent the fishing revenue that would be foregone if fishing vessel operators opt to no longer fish in these areas and cannot capture that revenue in a different location. Revenue exposure estimates should not be interpreted as measures of actual economic impact. Actual economic impact would depend on many factors—foremost, the loss of the potential for continued fishing to occur within the Wind Farm Area, together with the ecological impact on target species residing within the Project area. Economic impacts of these factors are lessened with a vessel's ability to adapt to changing where it fishes. For example, if alternative fishing grounds are available nearby and could be fished at no additional cost, the economic impact would be lower. There is the potential to fish the boundary of the Wind Farm Area. If fish stocks increase within the Wind Farm Area due to reduced fishing efforts, stocks may increase in areas immediately adjacent to the Wind Farm Area and, if fished, these adjacent areas may generate revenue similar to that of the Wind Farm Area. In addition, it should be noted, as mentioned within the Climate Change IPF under Alternative A, ocean acidification driven by climate change is projected to change the Northeast fishery species and where they may be present in the future. Therefore, the estimated revenue noted within this analysis is based upon historic data but could in fact change over time as the water temperature increases. Adverse effects of climate change are expected for approximately half of the species assessed, while Hare et al. (2016) anticipate that, for approximately 17 percent of the species, including inshore longfin squid (*Doryteuthis pealeii* [formerly *Loligo pealeii*]), butterfish, and Atlantic croaker, fisheries would see some beneficial impacts.

To evaluate the potential loss of commercial fishing revenue that may result from the Proposed Action, BOEM estimated the amount of commercial fishing revenue that would be exposed in the Lease Area. However, these estimates of revenue exposure should not be interpreted as measures of actual economic impact, which would depend on many factors, including the potential for continued fishing to occur within the footprint of the WEAs, the ecological impact on target species residing within the Project area, and the ability of fishers to find alternative fishing grounds. Table 3.6.1-22. Depicts the average annual revenue exposure in the Lease Area by FMP fishery based upon data from 2007 through 2018. The amount of commercial fishing revenue that would be exposed annually for the life of the Project is estimated to be $1.52 million across all FMP and non-FMP fisheries and represents approximately 0.16 percent of the total average annual revenue of the FMP and non-FMP fisheries in the Mid-Atlantic and New England regions. The largest impacts in terms of exposed revenue as a percentage of total revenue in the Mid-Atlantic and New England regions would be in the Skate FMP fishery, followed by the Monkfish FMP fishery. From a peak and average annual revenue basis, the largest impacts would be to the surfclam/ocean quahog and monkfish FMPs.

The amount of fishing activity that could be affected within the Lease Area is a small fraction of the amount of fishing activity in the New England and Mid-Atlantic regions as a whole. However, for fishing vessels that choose to avoid the Wind Farm Area, have historically derived a large percentage of their total revenue from the area, and are unable to find suitable alternative fishing locations, the adverse impacts would be long-term and major. While a small number of commercial fishing vessels fish heavily in the Lease Area, the highest percentage of total annual revenue attributed to catch within the Lease Area was 84 percent in multiple years from 2009 to 2019. However, three quarters of the vessels fishing in the area derived less than 1 percent of their total revenue from the area in 2008 through 2019 (refer to Table 3.6.1-12, Figure 3.6.1-2 and associated text). In short, some vessels depend very heavily on the Lease Area, but most vessels derive a small percentage of their total annual revenue from the area. In both cases, the impacts could be long-term if the respective vessels choose to avoid the Lease Area, but the level of impact for vessels deriving only a small percentage of their revenue from the area would be substantially less than for vessels that derive a large portion of their revenue from the Lease Area. Considering the low revenue risk across ports, together with the small number of vessels and fishing activity that would be affected by the Project, the impacts on other fishing industry sectors, including seafood processors and distributors and shoreside support services, would be long-term and minor to moderate, depending on the fishery in question.

Table 3.6.1-22. Annual Average Commercial Fishing Revenue Exposed to the Wind Farm Area by FMP Fishery Based on Annual Average Revenue 2007–2018

FMP Fishery	Peak Annual Revenue	Average Annual Revenue	Average Annual Exposed Revenue as a Percentage of Total Revenue from the Mid-Atlantic and New England Regions
Atlantic Herring	$44,790.27	$15,658.26	0.02%
Bluefish	$5,629.55	$2,262.71	0.18%
Golden Tilefish	$2,732.61	$1,031.33	0.02%
Highly Migratory Species	$4,385.53	$464.26	0.02%
Mackerel/Squid/Butterfish	$259,909.48	$70,244.97	0.14%
Monkfish	$374,935.11	$293,264.51	1.42%
Multispecies Large Mesh	$214,932.37	$112,677.14	0.15%
Multispecies Small Mesh	$210,430.64	$64,616.75	0.57%
River Herring	$87.64	$8.08	NA
Sea Scallop	$358,169.36	$138,508.07	0.03%
Skate	$316,540.45	$161,979.54	2.17%
Spiny Dogfish	$31,401.83	$11,781.89	0.40%
Summer Flounder/Scup/Black Sea Bass	$237,462.05	$115,609.82	0.29%
Surfclam/Ocean Quahog	$1,370,522.80	$423,248.98	NA
Red Crab[1]	$98.04	$32.68	NA
None: Unmanaged[2]	$171,078.79	$109,039.18	NA

FMP Fishery	Peak Annual Revenue	Average Annual Revenue	Average Annual Exposed Revenue as a Percentage of Total Revenue from the Mid-Atlantic and New England Regions
All FMP and non-FMP Fisheries	$2,611,468.97	$1,520,403.66	0.16%

Sources: Developed using FMP Revenue Exposure Analysis – 2020 to 2030 calculations data provided by BOEM (2021).

Notes: Revenue is in nominal dollars and is estimated based on the annual average revenue by FMP from 2007 through 2018.

[1] Red Crab: data only encompass 2016, 2017, and 2018.

[2] Includes revenues from all species not assigned to an FMP.

Annual exposure of revenue for for-hire recreational fishing in the Lease Area is not available. Based on the information provided in Table 3.6.1-15 and Table 3.6.1-16 the vast majority of for-hire recreational fishing in the Wind Farm Area originates from New York or Rhode Island ports—namely, Montauk and "other ports" in New York, or Point Judith and "other ports" in Rhode Island, with other ports having fewer than three permits.

As provided in Table 3.6.1-14, there is a wide range of annual for-hire recreational fishing revenue for the Wind Farm Area from 2008 through 2018, with the data from many years being suppressed. However, based upon the total, an average annual revenue would be approximately $115,000; therefore, the exposed revenue as it relates to the Wind Farm Area would be smaller than the noted percentages.

A potential effect of the offshore cables and WTGs is the entanglement and damage or loss of commercial and recreational fishing gear. Economic impacts on fishing operations associated with gear damage or loss include the costs of gear repair or replacement, together with the fishing revenue lost while gear is being repaired or replaced.

The Proposed Action would install approximately 286 mi (460 km) of new submarine cable, including 180 mi (305.8 km) of inter-array cables and 106 mi (290 km) of offshore export cables. As described in the COP (Sunrise Wind 2022) and summarized in Appendix E, Sunrise Wind proposes to bury all cables to a target depth of 3 to 7 ft (1 to 2 m). Three to seven feet is well below the typical depth to which bottom trawls penetrate the ocean floor. In a study of seabed depletion and recovery from bottom trawl disturbance, Hiddink et al. (2017) determined that hydraulic dredges penetrated the ocean floor the deepest at 6.3 inches (in) (16.1 centimeters [cm]). However, it is common practice for dredging vessels to fish the same or similar tow path on multiple occasions during the same fishing trip. This could increase the overall depth penetration beyond the 6.3 inches from one dredge tow. Therefore, while it is possible that cables could become uncovered during extreme storm events or other natural processes, burial to the target depth would reduce the risk of exposure and potential damage to fishing gear and a burial depth of less than six feet would increase the probability of gear interactions.

In areas where seabed conditions might not allow for cable burial, other methods of cable protection would be employed, such as rock placement, concrete mattress placement, front mattress placement, rock bags, or seabed spacers. It is anticipated that up to 5 percent of the offshore cable may require additional cable protection where burial depth may be less than 3 ft (1 m). In addition to cable armoring, the Project would install approximately 106 acres (0.43 km^2) of scour protection for the 95 installed foundations (WTGs and OCS-DC). The scour protection would have a radial extension of approximately five times the monopile radius and a height of approximately 6.5 ft (2 m) and, similar to cable armoring, would pose a risk to entanglement and gear loss for commercial fishers, as well as gear loss for for-hire recreational fishers because trolling, bait fishing, and shark fishing could be more challenging, as the fish could use foundations and the scour protection to break free.

Cable, WTG, and OCS-DC locations would be indicated on nautical charts, helping to reduce the potential for fishing gear interactions. Additionally, while Sunrise Wind does not currently plan to establish formal exclusion/safety zones around construction vessels during the laying of cables, USCG may implement safety zones. In addition, Sunrise Wind developed a Fisheries Communication and Outreach Plan (COP V1 October 28, 2021 Appendix B) as well as several other APMs to inform all mariners, including commercial and recreational fishing vessel, of construction related activities and Project-related vessel movements. Communication would be facilitated through a Project website, public notices to mariners and vessel float plans, and a Fisheries Liaison. Sunrise Wind would submit information to the USCG to issue Local Notice to Mariners during offshore installation activities. The adverse impact on commercial fisheries and for-hire recreational fishing would be short-term during the construction period, which would include more vessel traffic than during the O&M phase, and would help reduce potentially moderate adverse impacts for commercial fisheries to minor impacts.

Impacts due to entanglement and gear damage/loss would persist for the duration of Project operations. During conceptual decommissioning of the Project, all foundations for WTGs and OCS-DC would be removed to 15 ft- (4.6 m) below the mudline. BOEM would most likely require that the scour protection be removed in accordance with 30 CFR 585.902(a), eliminating the opportunities for entanglement and gear damage/loss. However, if left in place, the scour protection would continue to pose an indefinite threat for entanglement and gear damage/loss. Offshore cables may be either left in place or removed depending on the regulatory requirements at the time of decommissioning, although it is assumed that all inter-array cables would be removed. Any scour protection or materials (e.g., concrete mattresses) that were used to protect exposed cables permitted to be left in-situ would continue to affect bottom trawl fisheries as well as for-hire recreational fishing due to possible entanglement and gear loss.

In addition to posing hazards to fishing gear, the presence of the WTG foundations and associated scour protection, as well as cable protection, would convert existing sand or sand with mobile gravel habitat to hard bottom, which, in turn, would reduce the habitat for target species that prefer soft-bottom habitat (e.g., surfclams, sea scallops, squid, summer flounder) and increase the habitat for target species that prefer hard-bottom habitat (e.g., lobster, striped bass, black sea bass, Atlantic cod). Where WTG foundations, scour, and cable protection produce an artificial reef effect and attract finfish and invertebrates, the aggregation of species could increase the catchability of target species (Kirkpatrick et al. 2017). Although species that rely on soft-bottom habitat would experience a reduction in favorable conditions, the impacts from structures are not expected to result in population-level impacts (Refer to Section 3.5.5, *Finfish, Invertebrates, and Essential Fish Habitat*) and changes to species biomass are not expected to be significant enough to affect total quotas.

The habitat changes would likely benefit for-hire recreational fishing due to increased fishing opportunities around the infrastructure, which is what ten Brink and Dalton (2018) found occurred at the BIWF. Impacts from habitat conversion would last throughout the life span of the Project and, in areas where scour and cable protection are left in place after decommissioning, would last indefinitely, although the scale of impact would not be known until decommissioning and the actual acreage of scour and cable protection to be left in place is known. The presence of structures would also prohibit existing NMFS marine resource survey operations from being conducted within the Lease Area, likely leading to increased uncertainty in stock assessments, which would result in lower fishery quotas based on existing fishery management council control rules. The types of impacts described for the No Action Alternative would occur under the Proposed Action (Section 3.6.1.5) and include precluding NMFS's scientific surveys from the approximately 113,079-acre (458-km^2) Wind Farm Area. If NMFS's scientific survey methodologies are not adapted to sample within wind energy facilities, the Proposed Action could increase uncertainty in scientific survey results, which would increase uncertainty in stock assessments and quota setting. This uncertainty could lead to changes in quotas, resulting in impacts on commercial and for-hire recreational fisheries, although the exact nature of any changes is not known at this time. While the direct impact on NMFS's surveys and the resultant uncertainty in data would be relatively small given the footprint of the Project Area in the larger context of the overall area managed by MAFMC and NEFMC, it would contribute to the overall impacts resulting from the 30-plus proposed offshore wind projects along the East Coast (Appendix E), resulting in more substantial short- and long-term impacts on management processes and, subsequently, impacts on commercial and for-hire recreational fisheries' operations, as fishing regulations may have less flexibility in area-based management due to the Proposed Action, and offshore wind may change the distribution of fishing effort in ways not considered in FMPs.

Upon decommissioning of the Project, NMFS's and other scientific surveys could resume, as surface navigation obstacles would be removed from within the Wind Farm Area. Upon decommissioning, all foundations for WTGs and OSS would be removed to 15-ft- (4.57-m) below the mudline (Sunrise Wind 2022), BOEM would most likely require that the scour protection be removed in accordance with 30 CFR 585.902(a), eliminating surface navigation obstacles. This would allow NMFS and other scientific surveys to resume unimpeded. However, if left in place, the scour protection would continue to pose a long-term impact on the ability to perform bottom-trawl surveys in the Lease Area.

The Proposed Action is expected to add up to 95 foundations and 106 acres (0.43 km^2) of scour/cable protection. Foundations and scour/cable protection would remain for the life of the Project. This could tend to slow migration. However, water temperature is expected to be a bigger driver of habitat occupation and species movement (Fabrizio et al. 2014; Moser and Shepherd 2009; Secor et al. 2018). Migratory animals would likely proceed from structures unimpeded. Therefore, the introduction of hard-bottom habitat may result in long-term, adverse, beneficial, or mixed impacts, depending on the species and location.

The previously described impacts from the presence of structures under the Proposed Action, including navigational hazards and increased risk of damage or loss of fishing gear, are likely to cause some displacement of fishing activity from traditional fishing grounds. Commercial fishing vessels have well-established and mutually recognized traditional fishing locations, and the displacement of fishing activity outside of the Project area may result in space-use conflicts among those in the fishing industry as other areas are encroached upon. BOEM expects that space-use conflicts would be higher in fisheries that target less-mobile species, such as crab, lobster, scallop, and surfclam, and in fisheries where regulations constrain where vessels can fish. Because of constraints on these fisheries, economic losses caused by displacement from traditional fishing grounds would not necessarily be compensated for by revenue earned on alternative fishing grounds. However, although important fisheries, other than scallops, these less-mobile species were not among the top fisheries by revenue in the SRW Lease Area (Table 3.6.1-6). Finally, as described above, fish aggregation around the vertical habitat provided by the WTGs and resulting increases in recreational fishing effort around the WTGs could contribute to space-use conflicts with the commercial fisheries within these WEAs. Collectively, space-use conflicts that would result from the Proposed Action are expected to have long-term, adverse impacts on commercial and for-hire recreational fisheries.

Cable emplacement and maintenance: Impacts and considerations relative to the cable emplacement and maintenance are discussed under *Construction and Installation for Offshore Activities and Facilities*.

Climate change: The types of impacts from global climate change on commercial fisheries and for-hire recreational fisheries described for the No Action Alternative would occur under the Proposed Action (refer to Section 3.6.1.5). The Proposed Action could contribute to a long-term net decrease in GHG emissions due to its use of renewable energy. While this decrease may not be measurable, it would be expected to help reduce climate change to some degree, although any negligible benefit would only last until the Project is decommissioned.

Regulated fishing effort: Regulated fishing effort refers to fishery management measures necessary to maintain maximum sustainable yield under the MSA. The types of impacts described for the No Action Alternative would occur under the Proposed Action (Section 3.6.1.5) and include potentially precluding NMFS's scientific surveys from the approximately 113,079-acre (458-km^2) Wind Farm Area. If NMFS's scientific survey methodologies are not adapted to sample within wind energy facilities, the Proposed Action could increase uncertainty in scientific survey results, which would increase uncertainty in stock assessments and quota setting. This uncertainty could lead to changes in quotas, resulting in impacts on commercial and for-hire recreational fisheries, although the exact nature of any changes is not known at this time. While the direct impact on NMFS's surveys and the resultant uncertainty in data would be relatively small given the footprint of the Project Area in the larger context of the overall area managed by MAFMC and NEFMC, it would contribute to the overall impacts resulting from the 30-plus proposed offshore wind projects along the East Coast (Appendix E), resulting in more substantial short- and long-term impacts on management processes and, subsequently, impacts on commercial and for-hire recreational fisheries' operations, as fishing regulations may have less flexibility in area-based management due to the Proposed Action, and offshore wind may change the distribution of fishing effort in ways not considered in FMPs.

Upon decommissioning of the Project, NMFS's and other scientific surveys could resume, as surface navigation obstacles would be removed from within the Wind Farm Area. Upon decommissioning, all foundations for WTGs and OSS would be removed to 15-ft- (4.57-m) below the mudline (Sunrise Wind 2022), BOEM would most likely require that the scour protection be removed in accordance with 30 CFR 585.902(a), eliminating surface navigation obstacles. This would allow NMFS and other scientific surveys to resume unimpeded. However, if left in place, the scour protection would continue to pose a long-term impact on the ability to perform bottom-trawl surveys in the Lease Area.

3.6.1.5.3 Conceptual Decommissioning

3.6.1.5.3.1 Onshore Activities and Facilities

As noted in Section 3.6.1.6.1., the primary impacts relative to commercial fisheries and for-hire recreational fishing by their nature are associated with offshore activities and facilities. However, changes in, or the availability of, certain onshore infrastructure could have an impact on commercial fishing and for-hire recreational fishing. This could include port changes, port expansion and construction activities, impacts to the cost or availability of shoreside support services that could disrupt offloading, provisioning, repair services, and seafood distribution. Therefore, some onshore activities related to offshore wind development could adversely impact commercial fishing and for-hire recreational fishing; however, the majority of impacts are related to offshore activities.

3.6.1.5.3.2 Offshore Activities and Facilities

Anchoring: Anchoring involves both anchoring of a vessel involved in the Project and the attachment of a structure to the sea bottom by use of an anchor or mooring. As noted under construction and installation, anchoring vessels and other structures would pose a navigational hazard to fishing vessels; however, all impacts would be localized (within a few hundred meters of anchored vessels) and short-term (hours to days in duration). Although anchoring impacts would primarily occur during Project construction, some impacts could occur during conceptual decommissioning. Therefore, the adverse effects of offshore wind energy–related anchoring on commercial fisheries and for-hire recreational fishing are expected to be long-term, though periodic in nature, and minor.

Noise: Noise impacts during decommissioning of the Project would be similar to those during the construction and O&M phases, although there would be no pile-driving activities.

Port utilization: Port utilization impacts during decommissioning of the Project would be similar to those during the construction phase, as similar ports are being considered for supporting decommissioning activities.

Traffic: It is likely that short-term safety zones would be established during conceptual decommissioning activities in the same fashion as during original construction of the proposed Project and would be performed in coordination with the USCG. Therefore, similar impacts would occur during decommissioning of the Project. Once fully decommissioned, vessel traffic impacts would likely revert to current conditions.

Presence of structures: The presence of structures is discussed within the O&M offshore activities and facilities, as that is the period during which they would have the most impact on commercial fisheries and for-hire recreational fishing. The associated impacts would be present through the activities related to conceptual decommissioning; however, once Project infrastructure is removed from the Project area the area would return to its original state.

Cable emplacement and maintenance: Impacts and considerations relative to the cable emplacement and maintenance is discussed under O&M for offshore activities and facilities. Upon conceptual decommissioning, once Project infrastructure is removed from the Project Area, the area would return to its original state.

Climate change: Impacts and considerations relative to climate change is discussed under O&M for offshore activities and facilities. Upon decommissioning, climate change related beneficial impacts related to reduction in GHG emissions would not be present.

Regulated fishing effort: Impacts and considerations relative to regulated fishing effort is discussed under O&M for offshore activities and facilities. Upon conceptual decommissioning, it is assumed the area would return to its original state and regulated fishing impacts would return to pre-Project conditions.

3.6.1.5.4 Cumulative Impacts of the Proposed Action

This section outlines the cumulative impacts of the Proposed Action considered in combination with other ongoing and planned wind activities.

In context of reasonably foreseeable environmental trends, the incremental contributions of the Proposed Action to the combined anchoring impacts on commercial fisheries and for-hire recreational fishing from ongoing and planned activities would result in localized, short-term, minor impacts on commercial fisheries and for-hire recreational fishing, including navigational hazards to fishing vessels, especially if projects overlap in the same area as fishing or transiting fishing vessels.

The incremental contributions of the Proposed Action to the combined noise impacts on commercial fisheries and for-hire recreational fishing from ongoing and planned activities would depend on the timing and overlap of disturbance areas and could rise to a moderate level, with a vast majority of the contribution coming from pile-driving activities.

In the context of reasonably foreseeable environmental trends, the incremental contributions of the Proposed Action to the combined port utilization impacts on commercial fisheries and for-hire recreational fishing from ongoing and planned activities would be minor.

The Proposed Action would contribute a noticeable increment to the combined presence of structure impacts on commercial fisheries and for-hire recreational fishing from ongoing and planned activities including offshore wind. The increased number of structures would increase the risk of highly localized and periodic impacts on commercial fisheries that could be major, and impacts on for-hire recreational fishing that could be minor for those trolling for highly migratory species or beneficial due to the increase fishing opportunities for other for-hire recreational fisheries.

The incremental contributions of the Proposed Action to the combined vessel traffic impacts on commercial fisheries and for-hire recreational fishing from ongoing and planned activities would likely cause an increase in vessel traffic during the construction timeframe resulting in short-term and moderate impacts.

For new cable emplacement and maintenance, in context of reasonably foreseeable environmental trends, the incremental contributions of the Proposed Action on commercial fisheries and for-hire recreational fishing from ongoing and planned activities would be localized, short-term and minor.

In context of reasonably foreseeable environmental trends, the incremental contributions of the Proposed Action to the combined regulated fishing effort impacts on commercial fisheries and for-hire recreational fishing from ongoing and planned activities including offshore wind would be minor during the life of the Project.

3.6.1.5.5 Conclusions

Impacts of the Proposed Action

Project construction and installation, O&M, and conceptual decommissioning could affect port and fishing access, as well as transit and harvesting activities, fishing gear interactions, and target species catch. BOEM anticipates that the adverse impacts of the Proposed Action on commercial fisheries and for-hire recreational fishing would vary by fishery and fishing operation due to differences in target species abundance in the Project Area, gear type, and predominant location of fishing activity. It is conceivable that some of the small number of fishing operations that derive a large percentage of their total revenue from areas where Project facilities would be located would choose to avoid these areas once the facilities become operational. In the event that these specific fishing operations are unable to find suitable alternative fishing locations, they could experience long-term, major disruptions. However, it is estimated that the majority of vessels would only have to adjust somewhat to account for disruptions due to impacts. In addition, the impacts of the Proposed Action could include long-term, **minor beneficial** impacts for some for-hire recreational fishing operations due to the artificial reef effect. Therefore, BOEM expects that the impacts resulting from the Proposed Action would be range from **minor** to **major**, depending on the fishery and fishing operation, with the overall impact on commercial fisheries and for-hire recreational fishing being **moderate**.

Cumulative Impacts of the Proposed Action

In the context of reasonably foreseeable environmental trends in the area, the contribution of the Proposed Action to the impacts of individual IPFs resulting from ongoing and planned activities would range from **minor** to **moderate**. Considering all the IPFs together, BOEM anticipates that the contribution of the Proposed Action to the impacts from ongoing and planned activities would result in **major** impacts on commercial fisheries and for-hire recreational fishing because some commercial and for-hire recreational fisheries and fishing operations would experience substantial disruptions indefinitely, even with APMs. This impact rating is primarily driven by climate change and the presence of offshore structures. The majority of offshore structures in the GAA would be attributable to the offshore wind industry. However, given the array of measures available to mitigate impacts of offshore wind projects on commercial fisheries and for-hire recreational fishing, this impact rating is driven mostly by reduced stock levels from ongoing fishing mortality because of regulated fishing effort, changes in the abundance and distribution of fish and invertebrates associated with ongoing climate change, and permanent impacts from the presence of structures associated with planned offshore wind projects.

3.6.1.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.6.1.6.1 Construction and Installation

3.6.1.6.1.1 Onshore Activities and Facilities

Under Alternative C-1, for the construction and installation of onshore facilities, the potential impacts to commercial fisheries and for-hire recreational fishing are anticipated to be the same as described under the Proposed Action (Alternative B).

3.6.1.6.1.2 Offshore Activities and Facilities

Under Alternative C-1, for the construction and installation of offshore facilities, the potential impacts to commercial fisheries and for-hire recreational fishing would be the same or very similar to those described under the Proposed Action (Alternative B). There would be the same overall number of WTGs installed (94 WTGs); however, in an effort to provide fisheries habitat impact minimization, the layout would remove potential locations from Priority Areas. Therefore, this is discussed in more detail under the presence of structures IPF under O&M. There is not expected to be a significant difference under the anchoring, noise, port utilization, traffic, cable emplacement and maintenance, climate change or regulated fishing effort IPFs.

3.6.1.6.2 Operations and Maintenance

3.6.1.6.2.1 Onshore Activities and Facilities

Under Alternative C-1, for the O&M of onshore facilities, the potential impacts to commercial fisheries and for-hire recreational fishing are anticipated to be the same as described under the Proposed Action (Alternative B).

3.6.1.6.2.2 Offshore Activities and Facilities

Under Alternative C-1, for the O&M of offshore facilities, the potential impacts to commercial fisheries and for-hire recreational fishing relative to most IPF are anticipated to be similar to those described under the Proposed Action (Alternative B). There would be the same overall number of WTGs installed (94 WTGs); however, in an effort to provide fisheries habitat impact minimization, the layout would remove potential locations from priority areas. Therefore, this is discussed in more detail under the presence of structures IPF, and there is not expected to be a significant difference under the anchoring, noise, port utilization, traffic, cable emplacement and maintenance, climate change or regulated fishing effort IPFs.

Presence of structures: The main differentiation between Alternative B (Proposed Action) and Alternative C-1 is the removal of 8 WTG positions from Priority Areas. The overall number of WTGs and size of the Lease Area would not change.

However, the Lease Area is in a dynamic fisheries area and it is noted to be in a transition zone between various fisheries with many FMPs are represented. There are noted differences between the areas within and immediately surrounding the Lease Area in terms of the types and quantities of fish species found. Skates and monkfish are the predominant species found, but can be found in slightly higher concentrations to the western portion of the Lease Area. However, even within that generalization, there are nuanced differences within the Lease Area, such as in Priority Area 3 there would most likely be more monkfish than skates. There are even differences within the same fishery – such as skates. There is the winged skate fishery that are larger and destined for the seafood market, and then there is a smaller skate fishery that is cut up and used as bait (NMFS 2022b).

Areas to the west and north (around Cox Ledge) would have more northeast multi-species. Lobsters are spread out and can most likely be found throughout the Lease Area. Scallops and surfclams would be more to the south and eastern portion of the Lease Area (NMFS 2022b).

Therefore, the removal of 8 potential WTG locations from Priority Areas 1, 2, 3, or 4 would most likely have a beneficial effect on certain fisheries – namely monkfish, skate and surfclam/ocean quahog, as well as reducing the potential impacts to cod spawning habitat.

Minimizing impacts to even certain select fisheries would have a beneficial impact to both commercial fisheries and for-hire recreational fishing. The extent of this benefit would depend on and vary between the many fisheries present, along with the which potential WTG locations were removed from consideration from development. In addition, commercial fishing access to the interior areas of the Lease Area would still be dependent on many factors and despite certain potential WTG locations not being developed, certain vessels may choose to not fish within the Lease Area for other reasons, while it is more likely that for-hire recreational fishing activities would occur within the Lease Area due to smaller vessels being utilized and no concerns about deployment of mobile gear.

3.6.1.6.3 Conceptual Decommissioning

3.6.1.6.3.1 Onshore Activities and Facilities

Under Alternative C-1, for the conceptual decommissioning of onshore facilities, the potential impacts to commercial fisheries and for-hire recreational fishing are anticipated to be the same as described under the Proposed Action (Alternative B).

3.6.1.6.3.2 Offshore Activities and Facilities

Under Alternative C-1, for the conceptual decommissioning of offshore facilities, the potential impacts to commercial fisheries and for-hire recreational fishing would be the same or very similar to those described under the Proposed Action (Alternative B). There would be the same overall number of WTGs installed (94 WTGs); however, in an effort to provide fisheries habitat impact minimization, the layout would remove potential locations from priority areas. Therefore, this is discussed in more detail under the presence of structures IPF under O&M. There is not expected to be a significant difference under the anchoring, noise, port utilization, traffic, cable emplacement and maintenance, climate change or regulated fishing effort IPFs.

3.6.1.6.4 Cumulative Impacts of Alternative C-1

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on commercial fisheries and for-hire recreational fishing would be similar to or slightly less than those described under the Proposed Action, which were noticeable to moderate, depending on the IPF.

3.6.1.6.5 Conclusions

Impacts of Alternative C-1

Project construction and installation, O&M, and conceptual decommissioning under Alternative C-1 could affect port and fishing access, as well as transit and harvesting activities, fishing gear interactions, and target species catch, similar to the Proposed Action (Alternative B). Alternative C-1 proposes installing the same number of WTGs as the Proposed Action (Alternative B); however, the layout would locate certain WTG locations away from priority areas in an effort to minimize habitat impacts. Therefore, the impacts to commercial fishing and for-hire recreational fishing would be expected to be similar to those discussed under Alternative B; however, slightly less due to the habitat minimization layout.

BOEM also anticipates that the adverse impacts of Alternative C-1 on commercial fisheries and for-hire recreational fishing would vary by fishery and fishing operation due to differences in target species abundance in the Project Area, gear type, and predominant location of fishing activity. It is conceivable that some of the small number of fishing operations that derive a large percentage of their total revenue from areas where Project facilities would be located would choose to avoid these areas once the facilities become operational. In the event that these specific fishing operations are unable to find suitable alternative fishing locations, they could experience long-term, major disruptions. However, it is estimated that the majority of vessels would only have to adjust somewhat to account for disruptions due to impacts. In addition, the impacts of Alternative C-1 could include long-term, **minor beneficial** impacts for some for-hire recreational fishing operations due to the artificial reef effect. Therefore, BOEM expects that the impacts resulting from Alternative C-1 would range from **minor** to **major**, depending on the fishery and fishing operation, with the overall impact on commercial fisheries and for-hire recreational fishing being **moderate**.

Cumulative Impacts of Alternative C-1

In context of reasonably foreseeable environmental trends in the area, the contribution of Alternative C-1 to the impacts of individual IPFs resulting from ongoing and planned activities would range from **minor** to **moderate**. Considering all the IPFs together, BOEM anticipates that the contribution of Alternative C-1 to the impacts from ongoing and planned activities would result in **major** impacts on commercial fisheries and for-hire recreational fishing because some commercial and for-hire recreational fisheries and fishing operations would experience substantial disruptions indefinitely, even with APMs. This impact rating is primarily driven by climate change and the presence of offshore structures. The majority of offshore structures in the GAA would be attributable to the offshore wind industry. However, given the array of measures available to mitigate impacts of offshore wind projects on commercial fisheries and for-hire recreational fishing, BOEM expects that climate change would continue to be the most impactful IPFs controlling the sustainability of commercial and for-hire recreational fisheries in the area.

3.6.1.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

3.6.1.7.1 Construction and Installation

3.6.1.7.1.1 Onshore Activities and Facilities

As noted in Section 3.6.1.6.1., the primary impacts relative to commercial fisheries and for-hire recreational fishing by their nature are associated with offshore activities and facilities. However, changes in, or the availability of, certain onshore infrastructure could have an impact on commercial fishing and for-hire recreational fishing. This could include port changes, port expansion and construction activities, impacts to the cost or availability of shoreside support services that could disrupt offloading, provisioning, repair services, and seafood distribution. Therefore, some onshore activities related to offshore wind development could adversely impact commercial fishing and for-hire recreational fishing; however, the majority of impacts are related to offshore activities.

3.6.1.7.1.2 Offshore Activities and Facilities

Under Alternative C-2, the potential impacts from construction and installation activities to commercial fisheries and for-hire recreational fishing are anticipated to be similar to, but slightly less adverse than those described under Alternative C-1. Both Alternative C-1 and C-2 include the exclusion of 8 WTGs from Priority Areas and the only difference between the alternatives is the relocation of an additional 12 WTGs to the eastern side of the Lease Area under Alternative C-2. By relocating an additional 12 WTGs away from Priority Areas, it would have a benefit to the local fisheries in the area where these WTGs are being removed. This would create less obstruction and a more open area that would facilitate transiting and fishing by both commercial fishing and recreational fishing vessels because there would be fewer obstructions. Overall, this could result in an incremental improvement to overall commercial fisheries and for-hire recreational fishing industries.

3.6.1.7.2 Operations and Maintenance

3.6.1.7.2.1 Onshore Activities and Facilities

As noted in Section 3.6.1.6.1., the primary impacts relative to commercial fisheries and for-hire recreational fishing by their nature are associated with offshore activities and facilities. However, changes in, or the availability of, certain onshore infrastructure could have an impact on commercial fishing and for-hire recreational fishing. This could include port changes, port expansion and construction activities, impacts to the cost or availability of shoreside support services that could disrupt offloading, provisioning, repair services, and seafood distribution. Therefore, some onshore activities related to offshore wind development could adversely impact commercial fishing and for-hire recreational fishing; however, the majority of impacts are related to offshore activities.

3.6.1.7.2.2 Offshore Activities and Facilities

Under Alternative C-2, the potential impacts from O&M to commercial fisheries and for-hire recreational fishing are anticipated to be similar to, but slightly less adverse than those described under Alternative C-1. Both Alternative C-1 and Alternative C-2 include the exclusion of 8 WTGs from Priority

Areas and the only difference between the alternatives is the relocation of an additional 12 WTGs to the eastern side of the Lease Area under Alternative C-2. By relocating an additional 12 WTGs away from Priority Areas, it would have a benefit to the local fisheries in the area where these WTGs are being removed. This would create less obstruction and a more open area that would facilitate transiting and fishing by both commercial fishing and recreational fishing vessels because there would be fewer obstructions. Overall, this could result in an incremental improvement to overall commercial fisheries and for-hire recreational fishing industries.

3.6.1.7.3 Conceptual Decommissioning

3.6.1.7.3.1 Onshore Activities and Facilities

As noted in Section 3.6.1.6.1., the primary impacts relative to commercial fisheries and for-hire recreational fishing by their nature are associated with offshore activities and facilities. However, changes in, or the availability of, certain onshore infrastructure could have an impact on commercial fishing and for-hire recreational fishing. This could include port changes, port expansion and construction activities, impacts to the cost or availability of shoreside support services that could disrupt offloading, provisioning, repair services, and seafood distribution. Therefore, some onshore activities related to offshore wind development could adversely impact commercial fishing and for-hire recreational fishing; however, the majority of impacts are related to offshore activities.

3.6.1.7.3.2 Offshore Activities and Facilities

Under Alternative C-2, the potential impacts from conceptual decommissioning to commercial fisheries and for-hire recreational fishing are anticipated to be similar to, but slightly less adverse than those described under Alternative C-1. Both Alternative C-1 and C-2 include the exclusion of 8 WTGs from Priority Areas and the only difference between the alternatives is the relocation of an additional 12 WTGs to the eastern side of the Lease Area under Alternative C-2. There would be the same overall number of WTGs installed (94 WTGs). The conceptual decommissioning and removal of all WTGs from the Lease Area along with associated facilities and Project features would eventually return the Lease Area to preexisting conditions and it is presumed that there would be an overall improvement to commercial fisheries and for-hire recreational fishing industries due to the removal of structures.

3.6.1.7.4 Cumulative Impacts of Alternative C-2

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 to the cumulative impacts on commercial fisheries and for-hire recreational fishing would be similar to or slightly less than those described under the Proposed Action, which were noticeable to moderate, depending on the IPF. The relocation of 12 WTG positions to the eastern portion of the SRWF Lease Area for the purposes of habitat impact minimization would lessen the impacts under certain IPFs but would not substantially change the incremental contribution to cumulative impacts.

3.6.1.7.5 Conclusions

Impacts of Alternative C-2

Alternative C-2 would exclude 8 WTGs from Priority Areas and relocate an additional 12 WTG positions to the eastern portion of the SRWF Lease Area for the purposes of habitat impact minimization; however, the same overall number of WTGs (94) would be installed and operated. In addition, there would be no change to the onshore facilities and components. The impacts resulting from individual IPFs associated with Alterative C-2 would be similar to, but slightly less adverse than those described under Alternative C-1 (as well as Alternative B). The overall impact magnitudes under Alternative C-2 are anticipated to range from **minor** to **major**, depending on the fishery and fishing operation, with the overall impact on commercial fisheries and for-hire recreational fishing being **moderate**. Although impacts related to Alternative C-2 are anticipated to be slightly less adverse than Alternative B or C-1, the actual difference is dependent on many variables, as discussed above, and has not been quantified.

Cumulative Impacts of Alternative C-2

Impacts related to Alternative C-2 combined with ongoing and planned activities would result in similar, but slightly less adverse impacts than as described in the Proposed Action (and Alternative C-1), which would range from **minor** to **moderate**. Considering all the IPFs together, BOEM anticipates that the contribution of Alternative C-2 to the impacts from ongoing and planned activities would result in **major** impacts on commercial fisheries and for-hire recreational fishing because some commercial and for-hire recreational fisheries and fishing operations would experience substantial disruptions indefinitely, even with APMs.

3.6.1.8 Comparison of Alternatives

As noted above, most alternatives alone are effectively identical in terms of the level of impact on demographics, employment, and economics. The relocation of WTG positions associated with Alternatives C-1 and C-2 could have fewer adverse impacts as it relates to fishing industries supported by the local economy, due to locating WTGs away from popular and productive fishing areas and sensitive habitats. Despite these slightly varied impacts, BOEM anticipates that impacts to demographics, employment and economics would range from adverse **negligible** to **minor** and **negligible** to **minor beneficial** for all evaluated action alternatives.

Adverse impacts would result from construction activity (onshore and offshore), port utilization and vessel traffic, noise/lighting, and presence of structures, while beneficial impacts would result primarily from construction activity, job creation, and port infrastructure investment. In combination with reasonably foreseeable trends for the analysis area, impacts to demographics, employment and economics from all evaluated action alternatives and other offshore activity would range from **negligible** to **minor** adverse and **negligible** to **moderate beneficial**. Table 3.6.1-23 provides a comparison for each alternative.

Table 3.6.1-23. Comparison of Alternative Impacts on Commercial Fisheries and For-Hire Recreational Fishing

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Commercial Fisheries and For-Hire Recreational Fishing	*Proposed Action*: In the event that these specific fishing operations are unable to find suitable alternative fishing locations, they could experience long-term, **major** disruptions. However, it is estimated that the majority of vessels would only have to adjust somewhat to account for disruptions due to impacts. The impacts of the Proposed Action could include long-term, **minor beneficial** impacts for some for-hire recreational fishing operations due to the artificial reef effect. Therefore, BOEM expects that the impacts resulting from the Proposed Action would be range from **minor** to **major**, depending on the fishery and fishing operation, with the overall impact on commercial fisheries and for-hire recreational fishing being **moderate**. *Cumulative Impacts of the Proposed Action:* In the context of reasonably foreseeable environmental trends in the area, the contribution of the Proposed Action to the impacts of individual IPFs resulting from ongoing and planned activities would range from **minor** to **moderate**. Considering all the IPFs together, BOEM anticipates that the contribution of the Proposed Action to the	*Alternative C-1*: The impacts to commercial fishing and for-hire recreational fishing would be expected to be similar to those discussed under Alternative B; however, slightly less due to the habitat minimization layout. BOEM expects that the impacts resulting from Alternative C-1 would range from **minor** to **major**, depending on the fishery and fishing operation, with the overall impact on commercial fisheries and for-hire recreational fishing being **moderate**. *Cumulative Impacts of Alternative C-1*: In context of reasonably foreseeable environmental trends in the area, the contribution of Alternative C-1 to the impacts of individual IPFs resulting from ongoing and planned activities would range from **minor** to **moderate**. Considering all the IPFs together, BOEM anticipates that the contribution of Alternative C-1 to the impacts from ongoing and planned activities would result in **major** impacts on commercial fisheries and for-hire recreational fishing because some commercial and for-hire recreational fisheries and fishing	*Alternative C-2*: The impacts resulting from individual IPFs associated with Alterative C-2 would be similar to, but slightly less adverse than those described under Alternative C-1 (as well as Alternative B). The overall impact magnitudes under Alternative C-2 are anticipated to range from **minor** to **major**, depending on the fishery and fishing operation, with the overall impact on commercial fisheries and for-hire recreational fishing being **moderate**. Although impacts related to Alternative C-2 are anticipated to be slightly less adverse than Alternative B or C-1. *Cumulative Impacts of Alternative C-2*: Impacts related to Alternative C-2 combined with ongoing and planned activities would result in similar, but slightly less adverse impacts than as described in the Proposed Action (and Alternative C-1), which would range from **minor** to **moderate**. Considering all the IPFs together, BOEM anticipates that the contribution of Alternative C-2 to the impacts from ongoing and planned activities

	impacts from ongoing and planned activities would result in **major** impacts on commercial fisheries and for-hire recreational fishing because some commercial and for-hire recreational fisheries and fishing operations would experience substantial disruptions indefinitely, even with APMs.	operations would experience substantial disruptions indefinitely, even with APMs.	would result in **major** impacts on commercial fisheries and for-hire recreational fishing because some commercial and for-hire recreational fisheries and fishing operations would experience substantial disruptions indefinitely, even with APMs.

3.6.1.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to commercial fisheries and for-hire recreational fishing.

These measures, if adopted, would have the effect of reducing the overall moderate to major impact of the Proposed Action on commercial fisheries to minor to moderate. This is driven largely by compensatory on mitigation that would mitigate “indefinite” impacts to a level where the fishing community would have to adjust somewhat to account for disruptions due to impacts, but income losses would be mitigated. Other measures could also alleviate some impacts associated with the Proposed Action. The impact levels for Alternatives B and C-1, C-2a, C-2b, C-2c, C-2d would also reflect an overall reduction in impacts similar to under the Proposed Action. BOEM anticipates that the cumulative impacts on commercial fisheries and for-hire recreational fishing associated with the Proposed Action when combined with impacts from ongoing and planned activities including offshore wind would be unchanged (major) because some commercial and for-hire recreational fisheries and fishing operations could experience substantial disruptions indefinitely, even with these Project-specific mitigation measures.

3.6.2 Cultural Resources

This section evaluates the potential impacts on cultural resources from the Proposed Action, alternatives, and future offshore wind activities in the geographical analysis area (Appendix D, Figure D-12). Cultural resources include a wide variety of heritage resources defined in federal laws, such as NEPA and the NHPA, and Executive Orders. Based on the definitions provided in the NEPA, NHPA, and their respective implementing regulations, for the purpose of this analysis, cultural resources have been divided into three broad categories: terrestrial and marine archaeological sites, historic above-ground resources, and traditional cultural properties (TCPs).

Terrestrial and marine archaeological sites are areas where past human activity has occurred and contain the physical remains of past human activity (e.g., artifacts). Examples of terrestrial archaeological sites include the remains of a pre-contact Native American village site or a post-contact grist mill ruin. Marine archaeological sites include shipwrecks, downed aircraft, or submerged pre-contact Native American sites on the Outer Continental Shelf. Historic above-ground resources include districts, buildings, structures, objects, and sites possessing historic or architectural significance. Traditional cultural properties are places, landscape features, or locations associated with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community.

Both NEPA and the NHPA require Federal agencies to "stop, look, and listen" before making decisions that could negatively impact cultural resources (CEQ and ACHP 2013). NEPA requires Federal agencies to assess the impacts or effects of a proposed Federal action to the human environment, including historic and cultural effects/impacts (40 C.F.R. § 1500-1508). Historic and cultural impacts/effects are assessed by determining the significance of potential impacts to cultural resources. Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties (36 C.F.R. § 800.1). BOEM has determined that approval, approval with modification, or disapproval of the SRWF COP constitutes an undertaking as defined in 36 C.F.R. § 800.16 (y) and is therefore subject to an NHPA Section 106 review. For the purposes of the NHPA Section 106 review, the undertaking is defined as a combination of NEPA Alternative B (the Proposed Action), and the Fisheries Habitat Impact Minimization Alternative C. A detailed description of the Proposed Action and Alternatives can be found in Section 2.1.

For the purposes of Section 106 of the NHPA, historic properties are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP), including artifacts, records, and remains that are related to and located within such properties and properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization that meet the National Register criteria (36 C.F.R. § 800.16 (l)(1). To be listed in or eligible for listing in the NRHP, a property must meet criteria of age and significance and also retain sufficient integrity to convey its significance. Generally, a cultural resource must be 50 years of age or older to be considered for NRHP eligibility and must meet one or more of the National Register Criteria for Evaluation A through D:

- Criteria A: That are associated with events that have made a significant contribution to the broad patterns of our history; or
- Criteria B: That are associated with the lives of significant persons in our past; or
- Criteria C: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

- Criteria D: That have yielded or may be likely to yield, information important in history or prehistory.

In addition to meeting the age and significance criteria, a property must also retain sufficient historic integrity to convey its significance. A property's integrity is based on the property's physical features and how they relate to the property's significance. Integrity is characterized in seven aspects: association, location, setting, feeling, design, materials, and workmanship. A property does not need to retain high levels of integrity in every aspect, but rather those aspects that are key to conveying its significance.

Both the implementing regulations for NEPA (40 C.F.R. § 1500-1508) and the NHPA (36 CFR § 800) encourage federal agencies to integrate/coordinate NEPA and NHPA compliance reviews and consultations. 36 C.F.R. § 800.8 (c) authorizes Federal agencies to use the procedures and documentation required for the preparation of an EIS and ROD to comply with Section 106 in lieu of the procedures in 36 C.F.R. § 800.3 through § 800.6 of the Section 106 regulations (i.e., Initiation of the Section 106 Process, Identification of Historic Properties, Assessment of Adverse Effects, and Resolution of Adverse Effects). This process, referred to as the "NEPA substitution process" allows certain NEPA process, meetings, and documentation to substitute for various aspects of review otherwise required under the NHPA.

In the NOI to Prepare an EIS for the Proposed Sunrise Wind Farm Project on the Northeast Atlantic Outer Continental Shelf (86 FR 48763), BOEM stated it had chosen to use the NEPA substitution process to fulfill its obligations under the NHPA. This decision was taken to improve the efficiency of its reviews, promote transparency and accountability, and support a broadened discussion of potential effects that a project could have on the human environment. As a result, this section and Appendices H, J, and O are intended to fulfill the majority of BOEM's NHPA Section 106 compliance responsibilities for documentation under 36 C.F.R. § 800.8(c), including the following:

- The definition of the undertaking and its area of potential effects;
- A description of the steps taken to identify historic properties;
- A description of the affected historic properties, including information on the characteristics that qualify them for the National Register of Historic Places;
- A discussion of the undertaking's effects on historic properties;
- An explanation of why the criteria of adverse effect were found applicable or inapplicable; and
- Future actions to avoid, minimize, or mitigate adverse effects on historic properties.

3.6.2.1 Description of the Affected Environment and Future Baseline Conditions

The cultural resources NEPA affected environment is defined in terms of the existing cultural resources that could be affected by the Proposed Action as well as the alternatives. A description of the Proposed Action and Alternatives can be found in Section 2.1 of this document. The geographic area analyzed (Appendix D, Figure D-12) to identify existing cultural resources for the NEPA review, the affected environment, is equivalent to the proposed Sunrise Wind Farm Project Area of Potential Effects (APE). 36 C.F.R. § 800.16(d) defines the APE as "the geographic area or areas within which an undertaking may directly or indirectly cause alteration in the character or use of historic properties, if any such properties exist." Based on this definition, BOEM (2020) has defined three APEs for offshore renewable energy projects:

- Terrestrial APE: the depth and breadth of terrestrial areas potentially impacted by any ground disturbing activities;
- Marine APE: the depth and breadth of the seabed potentially impacted by any bottom-disturbing activities; and
- Visual APE: the viewshed from which renewable energy structures, whether located offshore or onshore, would be visible.

Detailed descriptions of the terrestrial, marine, and visual APEs can be found in the terrestrial archaeological resource assessment (COP, Appendices S1 and S2; Sunrise Wind 2022), marine archaeological resources assessment (COP, Appendix R; Sunrise Wind 2022) and historic resources visual effects assessment (COP, Appendices T and U; Sunrise Wind 2022) submitted as part of the Sunrise Wind COP.

The significance of cultural resource types is best understood and evaluated within their regional cultural-historical context. Table 3.6.2-1 provides a summary of the pre-Contact and post-Contact cultural-historical context of southern New England and Long Island.

Table 3.6.2-1. Southern New England Cultural Context

Period	Description
Paleoindian Period (Prior to 10,000 B.P.)	Earliest scientifically documented evidence of human occupation of southern New England. Small highly nomadic family groups of hunter-gatherers inhabited both southern New England and portions of the Outer Continental Shelf which were exposed land at this time due to lower sea levels associated with the last Ice Age.
Archaic Period (10,000-3,000 B.P.)	The Archaic Period is typically divided into three sub-periods: Early (10,000−8,000 B.P.), Middle (8,000−6,000 B.P.), and Late Archaic (6,000−3,000 B.P.). During the Early Archaic, archaeological evidence suggests populations in southern New England continued to practice a highly mobile, nomadic hunter-gather lifestyle. During the Archaic Period, the climate shifted toward modern conditions, becoming more stable and reducing the need for Archaic peoples to be as mobile as their Paleoindian ancestors evidenced by an increase in semi-nomadic settlements concentrated on locations near tidal bays and the increased shellfish procurement. A Middle Archaic expansion of site distributions throughout Rhode Island and Massachusetts suggests a large population increase during this period. The Late Archaic marked by stabilization in both sea level rise and climate, which aided the development of social structures suggested by the repeated reoccupying of site locations. Archaeologists believe tribal-level societies emerged at this time with a capacity for labor organization and long-distance trade.
Woodland Period (3,000-400 B.P.)	The Woodland/Ceramic period is traditionally marked by the adoption of ceramic technology, evidence of small-scale horticultural activities, the establishment of sedentary life, including palisaded and un-palisaded villages, and increased sociocultural complexity and ceremonialism. The archaeological record suggests increasing site density and presumably population through the Woodland period. Late Woodland peoples actively exploited riverine ecosystems and waterways and were skilled seafarers. Native American oral traditions demonstrate that the Tribes relied heavily on the Atlantic Ocean, numerous rivers, and small tributaries for seafood and trade. The coastal waters surrounding southern New England, and the passage between Block Island and Martha's Vineyard, was heavily used and revered by Native Americans. Local marine resources remained important to local peoples even after the introduction of crops such as maize, beans, and squash during the Late Woodland.
European Exploration (A.D. 1000-1692)	Viking settlement in Newfoundland, Canada at L'Anse aux Meadows in A.D. 1021. Concerted European exploration of the waters off the coast of southern New England in the mid-16th through 17th centuries. The Native American population was drastically reduced during the early seventeenth century as European fisherman introduced diseases that spread throughout the indigenous populations. Europeans began to colonize southern New England in the first half of the seventeenth century. The Dutch established a trading post at Bourne in the early 1620s, and the English followed suit at Plymouth. These were followed by settlements at Barnstable (1638), Yarmouth (1639), and Eastham (1644). In the late seventeenth and early eighteenth centuries, merchants along the Cape Cod region of Massachusetts sold fish across the Atlantic in Europe, as well as down the coast and in the West Indies.
European Colonial Period (A.D. 1692-1775)	New towns were founded during the eighteenth century southern New England due to the expanding maritime economy based on fishing, whaling, and coastal trading. Commercial fishing, and the production and distribution of dried cod was the single most valuable export in New England between 1768 and 1772. Maritime traffic connected the seaside towns of the region with Salem, Boston, Newport, and New York. European colonization of interior New England progressed throughout the period resulting in the removal, forced migration, and/or extermination of Native American populations across the region. European colonial powers fought numerous wars in North America during the 18th century, culminating in the Seven Years' War between England, France, and their respective colonies.

Period	Description
Early National Period (A.D. 1775-1815)	The period is marked by the American Revolution (1775-1783) which ended English colonial rule in southern New England and led to the founding of the United States of America. At the beginning of the American Revolutionary War, the British blockaded Massachusetts Bay, which forced blockade running by colonial privateers to transport outgoing or incoming supplies. The commercial fishery transitioned to serve the American war effort. Fishing routes became military supply lines, fishing vessels became warships, and fishermen joined the ranks of America's first navy. Following the war, the maritime economy expanded to include more land-based industries, such as fish processing and shipbuilding, leading many inland inhabitants to abandon agriculture. Whaling came to dominate Nantucket Island from the main port of Nantucket Harbor in the late 18th through early 19th centuries. The War of 1812 disrupted maritime activity across southern New England due to British disruption of American trade and impressment of American sailors into the British Navy.
Early Industrial Period (A.D. 1815-1865)	The 19th century is marked by population growth and rapid industrialization across New England as well as the continued growth and success of maritime-related industries. Ship fitting, salt making, and whale oil processing employed many inhabitants of the region, while fishing voyages continued to operate from the ports of the region. The 19th century was also the "Golden Age" of Southern New England whaling industry with ports such as New Bedford, New London, and Nantucket the centers of the global whale oil industry. Industrial output increased during the mid-19th century and through the Civil War.
Late Industrial and Modern Periods (A.D. 1865-1960)	The late 19th and early 20th centuries were a period of decline in the merchant marine and whaling industries across Southern New England. In addition, American westward expansion and the rise of mid-west industrial centers precipitated a general decline in the industrial output and population of New England. The tourism industry on Martha's Vineyard, Nantucket, Cape Cod, and across southern New England expanded rapidly during the early and mid-20th century, including the recreational fishing industry and maritime tourism.

3.6.2.1.1 Marine Cultural Resources

Sunrise Wind conducted a marine archaeological resources assessment (MARA) to identify historic properties within the APE that might be impacted by project activities (Table 3.6.2-2). BOEM defines the APE for the marine resources GAA (or APE for marine resources) as the depth and breadth of the seabed potentially impacted by bottom-disturbing activities. The MARA, conducted by Sunrise Wind's Qualified Marine Archaeologist (QMA), consisted of an analysis of High-Resolution Geophysical (HRG) data collected by Sunrise Wind's marine survey contractor (COP, Appendix R; Sunrise Wind 2022). The HRG survey included collection of gradiometer, side-scan sonar, sub-bottom profiler, single-channel ultra-high-resolution seismic, and multi-beam echo sounder data within submerged portions of the APE. For purposes of the MARA, the APE consisted of the SRWEC, located in both federal and New York state waters; and the SRWF located in federal waters in Lease Area OCS-A 0487 and which includes up to 94 WTGs, an offshore converter station, and IACs.

The identification of potential marine archaeological resources was further informed by the Project's geotechnical investigations, which served to characterize the surface and subsurface of the marine APE. The MARA also included the collection and analysis of geoarchaeological cores in areas of the APE that exhibited potential to yield information on submerged ancient landforms. Copies of the report, redacted to remove confidential archaeological site location information, can be found in Appendix R of the SRWF COP (Sunrise Wind 2022).

Table 3.6.2-2. Summary of Marine Archaeological Investigations

Type of Investigation	Survey Report Title	Report Date	Description and Key Findings
Phase I	Phase I Marine Archaeological Resources Assessment for the Sunrise Offshore Wind Farm (SRW01) Located on the Outer Continental Shelf Block OCS-A 487, and Offshore New York. Appendix R, Sunrise Wind Farm Construction and Operations Plan.	January 2022	R. Christopher Goodwin & Associates, Inc. (RCG&A) performed a marine archaeological resources assessment (MARA) of the submerged portions of the PAPE. The MARA utilized geotechnical and high-resolution geophysical data collected by Fugro USA Marine, Inc. and Gardline during survey campaigns from 2019 to 2021. The MARA also included a review of shipwreck databases and previous surveys. The analysis was conducted to identify potential marine archaeological resources that might be impacted by the project.

The MARA identified eight possible historic period marine archaeological resources through analysis of HRG data. The HRG data suggest that the eight resources are potential shipwrecks or debris fields; six are located within the SRWEC corridor and two are located within the SRWF (Table 3.6-25). The historic resources may be older than 50 years and may thus be eligible for listing in the NRHP. The MARA also identified 43 preserved ancient submerged landforms within the APE; thirteen (13) are located within the SRWEC corridor and thirty (30) are located within the SRWF (COP, Appendix R; Sunrise Wind 2022). The ancient submerged landforms represent landscapes that may have supported human occupation before being submerged during marine transgression. The MARA indicated that the eight historic resources and all but one ancient submerged landform could be avoided by seabed disturbance during the various phases of the Project. To avoid or minimize impacts to marine archaeological resources, the authors referenced development of a Cultural Resource Avoidance Minimization Mitigation Plan, which would include implementation of an Unanticipated Discovery Plan for any unidentified archaeological resources encountered during dredging and/or construction activities (COP, Appendix R; Sunrise Wind 2022). For additional details on the potential marine archaeological resources identified within the marine APE, please see Schmidt et al. (2022) in Appendix R to the COP (Sunrise Wind 2022).

Table 3.6.2-3. Marine Archaeological Resources Summary Table

Contact Number	Project Component	Resource Type	Description
ERC01	SRWEC	Potential shipwreck	Cluster of four magnetic anomalies indicative of a potential shipwreck
ERC02	SRWEC	Potential shipwreck	High amplitude, long duration dipolar magnetic anomaly indicative of a potential shipwreck
ERC03	SRWEC	Potential shipwreck	Cluster of nine magnetic anomalies and three acoustic contacts representative of a marine archaeological resource
ERC04	SRWEC	Potential shipwreck	Cluster of three magnetic anomalies and one acoustic contact indicative of a deteriorated wooden hull
ERC05	SRWEC	Debris field	Two acoustic contacts representative of a marine archaeological resource
ERC06	SRWEC	Potential shipwreck	Single acoustic contact that is indicative of a potential historic watercraft
WEA01	SRWF	Potential shipwreck	Magnetic anomaly and acoustic contact representative of a marine archaeological resource
WEA02	SRWF	Potential shipwreck	Two magnetic anomalies and two acoustic contacts representative of a marine archaeological resource
ECR_P2	SRWEC	Ancient submerged landform	Preserved levee along channel margin
ECR_P3-A	SRWEC	Ancient submerged landform	Preserved levee along channel margin
ECR_P3-B	SRWEC	Ancient submerged landform	Preserved levee along channel margin
ECR_P4-A	SRWEC	Ancient submerged landform	Preserved levee along channel margin
ECR_P4-B	SRWEC	Ancient submerged landform	Preserved levee along channel margin
ECR_P4-C	SRWEC	Ancient submerged landform	Preserved levee along channel margin
ECR_P5-A	SRWEC	Ancient submerged landform	Preserved levee along channel margin
ECR_P5-B	SRWEC	Ancient submerged landform	Preserved levee along channel margin
ECR_P5-C	SRWEC	Ancient submerged landform	Preserved levee along channel margin
ECR_P5-D	SRWEC	Ancient submerged landform	Preserved levee along channel margin
ECR-P1	SRWEC	Ancient submerged landform	Preserved levee along channel margin
ECR-P6	SRWEC	Ancient submerged landform	Preserved levee along channel margin
ECR-P7	SRWEC	Ancient submerged landform	Preserved levee along channel margin

Contact Number	Project Component	Resource Type	Description
WEA_P-01-A	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-01-B	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-01-C	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-01-D	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-02-A	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-02-B	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-02-C	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-02-D	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-03-A	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-03-B	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-04	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-05	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-06	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-07	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-08	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-09	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-10	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-11	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-12	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-13-A	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-13-B	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-14	SRWF	Ancient submerged landform	Preserved levee along channel margin

Contact Number	Project Component	Resource Type	Description
WEA_P-15	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-16	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-17	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-18	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-19	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-20	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-21	SRWF	Ancient submerged landform	Preserved levee along channel margin
WEA_P-22	SRWF	Ancient submerged landform	Preserved levee along channel margin

Source: Schmidt et al. (2022); pp. 71-90; Tables VI-1 and VI-2 in Appendix R to the COP (Sunrise Wind 2022).

3.6.2.1.2 Terrestrial Archaeological Resources

Sunrise Wind conducted two terrestrial archaeological investigations in support of the SRWF COP submission (Table 3.6.2-4). Summary information about these investigations can be found in Sunrise Wind Farm Project: Phase IA Archaeological Survey, Sunrise Wind Onshore Facilities Report, and the Sunrise Wind Farm Project: Phase IB Archaeological Survey, Sunrise Wind Onshore Facilities Report. Copies of these two reports, redacted to remove confidential archaeological site location information, can be found in Appendices S1 and S2 of the SRWF COP (Sunrise Wind 2022).

Table 3.6.2-4. Summary of Terrestrial Archaeological Investigations

Type of Investigation	Survey Report Title	Report Date	Description and Key Findings
Phase Ia	Sunrise Wind Farm Project: Phase IA Archaeological Survey, Sunrise Wind Onshore Facilities	December 2020	The purpose of the Phase IA archaeological survey was to determine whether previously identified terrestrial archaeological resources were located in the terrestrial archaeology Preliminary Area of Potential Effect (PAPE), and to evaluate the potential for previously unidentified terrestrial archaeological resources to be located within the PAPE. This desktop study determined that the mapped boundaries of two Native American sites overlap with portions of the PAPE and an additional 10 sites have been previously recorded within 0.25 miles (0.4 kilometers) of the Preliminary APE: four Native American sites, four historic-period sites, and two multiple component Native American and historic-period sites.
Phase Ib	Sunrise Wind Farm Project: Phase IB Archaeological Survey, Sunrise Wind Onshore Facilities	May 2022	The purpose of the Phase IB Archaeological Survey was to determine the presence or absence of previously unidentified terrestrial archaeological resources located within the Project's Preliminary Area of Potential Effect (PAPE) through infield investigations, including the excavation of 1,575 shovel test pits covering a total of 39,036 ft (11,086898 m) of Linear PAPE and 40.05 acres (9.0216.21 ha) of non-linear or "block" PAPE. One archaeological resource, Native American site EDR-SRW-001, was identified but was determined to be located outside of the PAPE. No other archaeological sites or isolated archaeological artifacts were recovered from any of the other Project locations assessed as part of the Phase IB survey. Site EDR-SRW-001 would not be disturbed by Onshore Facilities and no mitigation or avoidance measures are proposed, and no further archaeological work is recommended. The report recommends the project develop and implement an Unanticipated Discoveries Plan (UDP) during construction activities.

The Phase Ia report determined that the APE for the onshore components of the project passed through the mapped boundaries of two Native American archaeological areas, NYSM 4897 and NYSM 7550 (COP Appendix S1, Section 2.3; Sunrise Wind 2022). The preferred onshore transmission cable corridor route passed through the boundaries of NYSM 4897 while the Montauk Highway off-route variation passed through the boundaries of NYSM 7550. In New York, Native American archaeological areas are considered areas of elevated archaeological sensitivity but are not considered equivalent to a formally tested and delineated archaeological site. In both areas the proposed onshore transmission cable corridor is co-located along existing paved roadways, the William Floyd Parkway (NYSM 4897) and the Montauk Highway (NYSM 7550). Subsequent Phase Ib excavations adjacent to the William Floyd Parkway within the mapped boundaries of NYSM 4897 did not recover any archaeological materials.

The Phase Ib terrestrial archaeological investigations identified one previously undiscovered archaeological site located along the Montauk Highway off-route variation within the mapped boundaries of Native American archaeological area NYSM 7550. This site, referred to as EDR-SRW-001 in the Phase Ib report, is described as a medium density Native American lithic scatter (COP, Appendix S2, Section 3.3.1; Sunrise Wind 2022). A total of 52 artifacts, consisting of 39 pieces of quartz debitage, 12 pieces of thermally altered quartz, and one quartz cobble core were recovered from shovel test pits. The report authors interpreted the site as a short-term camp where the Native American occupants produced stone tools. After the Phase Ib investigations at the site the PDE was modified to exclude the Montauk Highway off-route variation from consideration for the onshore cable route. As a result, the site is located outside SRWF terrestrial APE and would not be impacted by the construction, operation, and/or decommissioning of the proposed project. Due to the final route selection avoiding the site, no measures to avoid, minimize, or mitigate impacts were recommended.

The report authors recommended that the Sunrise Wind Farm Project develop and implement an Unanticipated Discovery Plan (UDP) to address any previously undiscovered archaeological resources that could be encountered during ground disturbing activities (COP Appendix S2, Section 4.0; Sunrise Wind 2022).

3.6.2.1.3 Above Ground Cultural Resources

In support of the SRWF COP submission, Sunrise Wind conducted identification and reconnaissance surveys of known and previously recorded above-ground cultural resources within the proposed Project viewshed that might be impacted by Project activities. Summary of these investigations is found in Table 3.6.3-5 below. These surveys consisted of on-line (desk-top) searches of architectural and historic data bases maintained by the NRHP; state historic preservation offices (SHPOs) in New York, Connecticut, Rhode Island, and Massachusetts; and statewide/local historic preservation groups and were conducted by Sunrise Wind's historic resources contractor EDR (COP, Appendix T; Sunrise Wind 2022).

BOEM defines the APE for viewshed historic resources as the geographic areas from which the onshore and offshore Project components could be seen. The APE was established using an initial study area of one (1)-mile radius around all onshore Sunrise Wind structures and a forty (40)-mile radius around the 122 WTGs and an offshore converter station in Lease Area OCS-A 0487 (Figure 1.3.2 of SRWF COP Appendix T; Sunrise Wind 2022) [19]. The 1-mile and 40-mile radii represent the maximum limit of theoretical visibility for each respective Project component. Within these radii, a viewshed analysis was completed to define all geographic areas of visibility within the onshore and offshore study areas. The viewshed model considered screening by vegetation, buildings/structures, landscape features, and the curvature of the Earth to delineate those areas from which the onshore and offshore Project components could be seen. For the offshore components, a maximum WTG blade tip height of 968 ft (295 m) above mean sea level (AMSL) (blade tips in the upright position), which represent the tallest

[19] The Project's proposed alternatives include a selection of up to 94 WTGs at 102 possible positions within the Lease Area. These 122 WTGs were extrapolated from a PDE that included 122 WTGs and a single OCS-DC or 120 WTGs and three OCS-DCs, as presented in the VIA. The VIA asserts that the distinction between the counts of WTGs and OCS-DCs is not anticipated to change the overall results of the VIA in this instance. BOEM considers the evaluation of these more numerous and larger WTGs to represent a reasonable and good faith effort to identify potential effects to cultural resources and historic properties, and that analysis based on these evaluations is sufficient for the purposes of evaluating impacts to cultural resources under NEPA and adverse effects to historic properties under the NHPA because it evaluates a larger, more impactful scenario, and as such, the PAPE described in the applicable studies encompasses and exceeds the APE for the NHPA undertaking or NEPA study area.

structures of the SRWF, was used in the viewshed analysis[20]. The viewshed analysis results determined that the visual APE for the offshore components was limited to areas within the coastal mainland and islands in New York, a small portion of Connecticut, Massachusetts, and Rhode Island. For the onshore components, the tallest structures within the OnCS-DC are anticipated to be the lightning masts with a maximum height of 100 ft (30 m). The viewshed analysis determined that the visual character within the OnCS–DC APE is generally made up of a mix of high-density development, ranging from industrial to residential, and major transportation facilities, which are anticipated to significantly screen potential views of the OnCS–DC beyond 1 mi (COP, Section 4.5.1; Appendices T and U; Sunrise Wind 2022).

In support of the COP, EDR prepared a Historic Resources Viewshed Effects Analysis (HRVEA) that assesses the proposed Project's potential visual effects on the qualities that qualify above-ground historic resources for the NRHP. Desktop research conducted for the HRVEA for the WTGs and Onshore Converter Station (OCS-DC) identified 307 previously identified above-ground historic resources within the APE for viewshed resources. Of these 307 resources, 10 are National Historic Landmarks (NHLs), 59 are NRHP-listed districts or individual properties, 179 properties considered potential above-ground historic properties without formal designations or determinations of NRHP eligibility, and three are traditional cultural properties (TCPs). The geographic breakdown for these 307 historic properties includes seven resources in New York, three in Connecticut, 147 in Massachusetts, and 150 in Rhode Island. The 307 historic properties are summarized and enumerated by state in Table 3.1-1 of the HRVEA (COP, Appendix T; Sunrise Wind 2022).

Within the 307 previously identified historic properties in the APE, Sunrise Wind internally defined nine thematic/historic property types and their settings to support the viewshed analysis. These property types can be used to determine the potential for visual effects and develop an appropriate methodology to assess visual effects. Similarities among the identified above-ground historic properties in terms of historic setting, significance, and spatial relationship to the Atlantic Ocean and surrounding landscape provided a framework by which to define these thematic property types. The nine above-ground historic property types within the APE include: 1) Native American Sites, Historic Districts, and Traditional Cultural Properties (TCPs); 2) Historic Buildings and Structures; 3) Lighthouses and Navigational Aids; 4) Recreational Properties; 5) Historic Cemeteries and Burial Grounds; 6) Maritime Safety and Defense Facilities; 7) Estates and Estate Complexes; 8) Agricultural Properties; and 9) Historic Battlefields. A description of each of the internally defined above-ground historic property types and the characteristics that may qualify each property for listing in the NRHP is included in Section 3.2 of the HRVEA (COP, Appendix T; Sunrise Wind 2022).

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20 The Project's proposed alternatives include the selection of an 11 MW WTG. The 11 MW turbine was selected as the Project's nameplate wind turbine size (see Alternative Considered but dismissed from further analysis table# for rationale) and consists of a nacelle height of 459 ft (140m), a rotor diameter of 656 ft (200 m), and a maximum blade tip height of 787 ft (240 m). Visual impacts described in the Cultural Resources section consider up to 122 WTGs with a nacelle height of 574 ft (175 m), a 787 ft (240 m) rotor diameter, and a maximum blade tip height of 968 ft (295 m). The WTG specifications evaluated in the visual impact analysis reports represent the Project's original Project Design Envelope (PDE) dated August 2020, which included a wider range of turbine size (8- 15 MWs) and included up to 122 WTGs.

The identification of potential historic viewshed resources was further informed by an on-site field survey and visual analysis conducted by an SOI-qualified cultural resources investigator within the 1-mile APE of the Project's onshore facilities. These facilities include the onshore transmission cable, fiber optic cable co-located with the onshore transmission and onshore interconnection cables, and an OnCS-DC. The onshore facilities would be located in the Town of Brookhaven, Suffolk County, New York. Online research identified no NRHP-listed resources and one NRHP-eligible resource in the APE, the Waverly Cemetery located 0.7 miles away from the proposed OnCS-DC site in the hamlet of Holbrook. The field survey did not identify any additional NRHP-eligible resources. A description of the field survey methodology and results of the survey for the OnCS-DC site can be found in COP Appendix U (Sunrise Wind 2022).

Table 3.6.2-5. Summary of Above Ground Cultural Resources Investigations

Type of Investigation	Survey Report Title	Report Date	Description and Key Findings
Desktop Analysis	Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C (EDR) (2022). Sunrise Wind Farm Project: Appendix T, Historic Resources Visual Effects Assessment. Report prepared for Sunrise Wind by Environmental Design & Research. Appendix T, Sunrise Wind Farm Construction and Operations Plan.	2022	Desktop research conducted for the HRVEA for the WTGs and OCS-DC identified 307 previously identified above-ground historic resources within the PAPE for viewshed resources. Of these 307 resources, 10 are National Historic Landmarks (NHLs), 59 are NRHP-listed districts or individual properties, 179 properties considered potential above-ground historic properties without formal designations or determinations of NRHP eligibility, and 3 are traditional cultural properties. The geographic breakdown for these 307 resources includes 7 resources in New York, 3 in Connecticut, 147 in Massachusetts, and 150 in Rhode Island.
Desktop Analysis, Field Reconnaissance	Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C (EDR) (2021). Sunrise Wind Farm Project: Appendix U, Onshore Above-ground Historic Properties Report. Report prepared for Sunrise Wind by Environmental Design & Research. Appendix U, Sunrise Wind Farm Construction and Operations Plan.	2021	Desktop research conducted for the OCS-DC confirmed there are no above-ground resources listed in or determined eligible for listing in the NRHP within the 1-mile PAPE for viewshed resources. The research identified one (1) previously identified above-ground historic resource within the 1-mile PAPE. The Waverly Cemetery, located within the hamlet of Holbrook, Town of Brookhaven has not previously been evaluated for NRHP eligibility; for the purposes of the Project, BOEM considers the Waverly Cemetery NRHP-eligible under Criterion A. An SOI-qualified professional conducted an on-site field reconnaissance survey and viewshed analysis of the PAPE for the OnCS-DC on June 17, 2020. The survey evaluated any other historic-age (50 years or older) resources located in the PAPE for potential NRHP eligibility based on their visible exterior. No additional potential historic properties were identified during the field survey.

3.6.2.2 Impact Level Definitions for Cultural Resources

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on cultural resources from the alternatives, including the proposed action. Table 3.6.2-6 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for cultural resources. Table G-14 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to cultural resources. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project.

Table 3.6.2-6. Definition of Potential Impact Levels for Cultural Resources

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	No historic properties affected, as defined at 36 CFR 800.4(d)(1).	N/A
Minor	No adverse effects on historic properties could occur, as defined at 36 CFR 800.5(b).	N/A
Moderate	Adverse effects on historic properties, as defined at 36 CFR 800.5(a)(1) could occur but would be avoided or minimized using a less impactful scenario contemplated under the PDE.	N/A
Major	Adverse effects on historic properties, as defined at 36 CFR 800.5(a)(1) could occur; at least some would require mitigation to resolve.	N/A

The cultural resources impact levels are linked to the determination of potential adverse effects to historic properties within the affected environment for each alternative being considered. Under Section 106, a federal agency determines whether an undertaking would have no effect, no adverse effect, or an adverse effect on historic properties. To determine whether effects to historic properties are adverse or not, the lead federal agency applies the Criteria of Adverse Effects as defined in 36 C.F.R. § 800.5 (a) (1). An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association. Consideration is given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property’s eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.

The NHPA also includes additional federal agency responsibilities in Section 110(f) when a National Historic Landmark (NHL) may be directly and adversely affected by an undertaking. Specifically, the head of a Federal agency shall “to the maximum extent possible, undertake such planning and actions as may be necessary to minimize harm to such landmark, and ACHP a reasonable opportunity to comment on the undertaking.”

The following sections assess the impacts of the alternatives under consideration (Alternative A-No Action Alternative; Alternative B-Proposed Action; and Alternative C-Fisheries Habitat Impact

Minimization Alternative). Impacts are assessed in terms of IPFs. These IPFs identify the cause-and-effect relationships between actions and relevant cultural resources, defining the ways in which an action or activity affects cultural resources. In addition to an assessment of impacts through the analysis of specific IPFs, the following sections include summary information regarding adverse effects on historic properties from each alternative being considered. More detailed information regarding BOEM's Finding of Adverse Effect on historic properties from the Proposed Action can be found in Appendix J.

3.6.2.3 Impacts of Alternative A - No Action on Cultural Resources

When analyzing the impacts of the No Action Alternative on cultural resources, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities on the baseline conditions for cultural resources. 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 E, Planned Activities Scenario.

3.6.2.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for cultural resources described in Section 3.6.2, Affected Environment would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities.

Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on cultural resources include:

- Continued O&M of the Block Island project (5 WTGs) installed in State waters
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island project and ongoing construction of the Vineyard Wind 1 and South Forks projects would affect cultural resources through the primary IPFs of accidental releases, gear utilization and dredging, new cable emplacement and maintenance, climate change, port utilization, land disturbance, light, presence of structures. Ongoing offshore wind activities would have the same type of impacts from of accidental releases, gear utilization and dredging, new cable emplacement and maintenance, climate change, port utilization, land disturbance, light, presence of structures that are described in the following section for planned offshore wind activities.

Under the No Action Alternative, cultural resources would continue to be affected by regional commercial, industrial, and recreational activities. Ongoing activities within the GAA that contribute to impacts on cultural resources include ground-disturbing activities and the introduction of intrusive visual elements, while the primary sources of offshore impacts include dredging, cable emplacement, and activities that disturb the seafloor. Onshore and offshore construction activities and associated impacts are expected to continue at current trends, range in severity from minor to major, and have the potential to affect cultural resources. Other future non-Project activities other than offshore wind development that may affect cultural resources include new submarine cables and pipelines, increasing onshore construction, marine minerals extraction, port expansions, and installation of new structures on the OCS (See Appendix E for a description of ongoing and planned activities). Appendix I provides additional information on seascape, landscape, and viewer impacts associated with ongoing and planned activities.

3.6.2.3.2 Cumulative Impacts of the No Action Alternative

BOEM assumes that each of the reasonably foreseeable offshore wind projects would be subject to NEPA and NHPA reviews and, as a result, the project proponents would conduct terrestrial and marine archaeological and above ground historic resource investigations to identify historic properties within their respective APEs and assess potential adverse effects. The results of these investigations, however, are not yet available. As a result, the No Action Alternative assumes that the same types of cultural resources identified within the APEs for the proposed action are present within the APEs of the reasonably foreseeable projects.

The following section is an assessment of the potential impacts on these types of cultural resources from reasonably foreseeable offshore wind and other ongoing developments, excluding the Proposed Action. BOEM assumes that if project-specific cultural resource investigations identify historic properties within a given undertaking's APE and determines that the project would adversely affect those historic properties, the lead federal agency for the undertaking would require the project to develop treatment plans to avoid, minimize, and/or mitigate effects in order to comply with the NHPA.

Onshore cultural resource investigations in the northeastern United States have identified a wide variety of archaeological resources, historic structures, and TCPs that could be adversely affected by development projects, including future offshore wind projects. Terrestrial archaeological resources known to occur across the region include pre-Contact Period Native American campsites, villages, resource procurement sites, and ceremonial sites. Post-contact, European-American residential, agricultural, battlefield sites, fortifications, and industrial sites dating to the 17th through 20th century sites have been found throughout the region (BOEM 2019). A wide variety of historic standing structures dating from the 17th through 20th centuries are present across the northeastern United States, including residential, commercial, military, and industrial buildings, structures, infrastructure. Potential TCPs in the region include geographic landscape features and historic locations associated with the history, cultural practices, traditions, beliefs, lifeways, arts, crafts, and/or social institutions of Native American, European-American, and other living communities (BOEM 2019).

A similarly wide variety of marine archaeological resources have been identified in the waters off the coast of the eastern United States. Pre-Contact period formerly subaerially exposed landscapes on the OCS, which likely contain Native American archaeological sites, were inundated and buried as sea levels rose at the end of the last Ice Age have been identified along much of the Atlantic coast. All the proposed offshore wind lease areas off southern New England and New York are considered to be high probability areas for containing these submerged landform features (TRC 2012). In addition to their archaeological potential, Native American Tribes and/Tribal Nations in the region have repeatedly informed BOEM that they consider these submerged landscape features to be TCP resources, due to their cultural significance as the lands once occupied by their ancestors.

Post-Contact period European-American marine cultural resources known to be present off the coast of southern New England and New York include shipwrecks, downed aircraft, and related debris fields dating to the 16th through 20th centuries. Based on known historic and modern maritime activity in the region, all of the proposed offshore wind lease areas are in areas with a high probability for containing shipwrecks, downed aircraft, and related debris fields (TRC 2012).

The sections below summarize the potential impacts of planned offshore wind activities on cultural resources during construction, O&M, and decommissioning of the projects.

3.6.2.3.2.1 Marine Cultural Resources

Under the No Action Alternative, impacts to marine cultural resources could result from accidental releases, vessel anchoring, gear utilization and dredging, new cable emplacement/maintenance, and the effects of climate change. Construction and installation, operations and maintenance, and conceptual decommissioning activities of reasonably foreseeable offshore projects could adversely impact potentially significant submerged cultural resources. However, offshore energy developers are required by federal law to conduct cultural resource surveys and assess impacts to potential submerged cultural resources in areas of proposed seafloor disturbance. Based on the results of those surveys and assessments, future offshore wind activities could be designed to avoid impacting known submerged cultural resources or minimize impacts to varying degrees. Repeated or multiple impacts from a combination of reasonably foreseeable offshore projects to submerged cultural resources, or the larger submerged landforms within which they are identified, would result in cumulative impacts to these resources. Under the No Action alternative, reasonably foreseeable future projects could result in minor to major impacts to these marine cultural resources. Offshore wind activities may affect marine cultural resources through the following primary IPFs.

Accidental releases: Submerged cultural resources could be impacted by accidental releases of fuel, fluids, and hazardous materials, as well as trash and debris. The No Action alternative assumes the development of adjacent offshore wind farms, construction of which may result in accidental releases that impact cultural resources within the geographical area of analysis. However, most releases would not measurably contribute to resource impacts because of the low probability of occurrence, low persistence time, and Environmental Protection Measures (EPMs) implemented to prevent releases. Although not expected, a large-scale accidental release and associated cleanup could result in permanent, geographically extensive, and large-scale impacts on marine archaeological resources.

Anchoring: Anchoring associated with ongoing commercial or recreational marine activities and development of offshore wind projects could cause adverse impacts on marine archaeological resources. Deploying and repositioning anchors and seafloor gear with associated wire rope, cable, and chain could impact the bottom surface and potentially disturb shipwrecks and other marine archaeological resources resulting in the irreversible loss of historical and archaeological data. BOEM estimates that development of offshore wind along the OCS along the eastern United States would result in 1,326 acres of seafloor disturbance due to anchoring activities. Although BOEM would be able to employ EPMs for future offshore wind projects, the potential for permanent, minor to major impacts on submerged cultural resources to result from future commercial and/or recreational activities through anchoring remains.

Gear utilization and dredging: Gear utilization and dredging activities could similarly impact marine resources. The damage or destruction of submerged archaeological sites or other underwater cultural resources from these activities would result in the permanent and irreversible loss of scientific or cultural value and would be considered major impacts. The scale of impacts on shipwreck and debris field cultural resources would depend on the number of wreck and debris field sites within the offshore wind lease areas. The potential for impacts would be mitigated, however, by existing federal and state requirements to identify and avoid marine cultural resources. Specifically, as part of its compliance with the NHPA, BOEM requires offshore wind developers to conduct geophysical remote sensing surveys of proposed development areas to identify cultural resources and implement plans to avoid, minimize, or mitigate impacts on these resources. As a result, impacts on marine cultural resources from gear utilization and dredging are considered unlikely and would only affect a small number of individual marine cultural resources if they were to occur, resulting in long-term, localized, adverse impacts. The scale of any impacts on individual resources (the proportion of the resource damaged or removed) would vary on a case-by-case basis and could range from minor to major.

New cable emplacement/maintenance: New offshore cable placement may impact marine resources within the geographical area of analysis. In addition to general horizontal acreage of seabed disturbance, the extent of potential impacts to marine resources increases with depth of disturbance into the seabed. Installation of new cables in conjunction with development of adjacent offshore wind farms could result in up to 895 acres of seabed disturbance from export and inter-array cable trenching. Additionally, reasonably foreseeable offshore wind projects located in adjacent offshore wind farms would add an estimated 1,000 in-water structures with foundations in the seabed. As described herein and Appendix E, the Lease Area and the APE for marine resources contain a number of shipwrecks, related debris fields, and ancient submerged landform features, which future offshore construction activities could impact. BOEM and relevant SHPO's would require projects to avoid known resources through the creation of avoidance buffers around identified shipwrecks or remote-sensing magnetic anomalies or acoustic targets that could represent shipwreck resources. These measures would avoid or minimize impacts to submerged cultural resources. However, in some cases, the number, extent, and dispersed character of ancient submerged landform features could make avoidance impossible. Consequently, offshore construction could result in permanent, minor to major impacts on sensitive ancient submerged landform features, if present.

Climate change: Factors related to climate change, including sea level rise, increased storm severity/frequency, increased sedimentation and erosion, and ocean acidification, could also result in long-term and permanent impacts on cultural resources. Some archaeological sites on the OCS have already experienced the effects of climate change because they were inundated when the last ice age ended (TRC 2012). Ocean acidification could accelerate the rate of decomposition and corrosion of shipwrecks, aircraft, and other marine archaeological resources on the seafloor. Conversely, the incremental contribution of offshore wind energy projects on reducing global warming and climate change–related impacts could help minimize these climate change impacts.

3.6.2.3.2.2 Terrestrial Archaeological Resources

Under the No Action Alternative, impacts to terrestrial archaeological resources could result from ground disturbing activities associated with port utilization/expansion projects, land disturbance as part of onshore construction activities, and climate change. Offshore wind activities may affect terrestrial archaeological resources through the following primary IPFs.

Port utilization/expansion: Ports along the east coast of the United States are being expanded and/or modified for a variety of reasons including to support the offshore wind industry. Major regional commercial hubs are being enlarged to accommodate increasing vessel traffic and larger vessel sizes as the maritime shipping industry adapts to ever expanding global supply chains. These larger ports as well as smaller, local port facilities may be expanded or modified to support a variety of maritime industry and projects such as construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); marine minerals use and ocean-dredged material disposal; military use; marine transportation; and fisheries use and management (BOEM 2019). Ports are also going through continual upgrades and maintenance such as building maintenance, demolition, building new structures, and dredging waterways to maintain port access or increase the size of vessels able to access the port. Without the development of the offshore wind industry, port expansion would follow historic trends and continue at current rates with major regional shipping ports expanding while development at smaller ports would remain static or be redeveloped for alternative uses (residential, commercial, industrial, etc.) (BOEM 2019).

The development of the offshore wind industry along the east coast of the United States has led to the proposed expansion and/or redevelopment of a number of small, medium, and large ports to support and attract the offshore wind industry. The Sunrise Wind COP indicates that ports such as the ports of Albany and Coeymans, NY; Port of New London, CT; Port of Davisville-Quonset Point, RI; Port of Providence, RI; Port of New Bedford, MA; Sparrows Point, MD; and the Port of Norfolk, VA are all undergoing some form of port expansion or modification to support the construction and operation of offshore wind facilities (COP Section 3.5.5; Sunrise Wind 2022). Ground disturbing activities associated with new construction or site redevelopment during port expansion projects could result in impacts to terrestrial archaeological resources and TCPs.

BOEM assumes that any port expansions to support ongoing actions or future offshore wind projects would adhere to applicable state and federal regulations for evaluating and addressing impacts on cultural resources. If historic properties are present and would be adversely affected by these projects, compliance with state and federal cultural laws and regulations would require the development of plans to avoid, minimize, and/or mitigate impacts to cultural resources, reducing the level of potential impacts. As a result, ongoing port expansion projects, both for ongoing activities and the development of the offshore wind industry, would likely result in a range of impacts, from no historic properties affected to adverse effects to historic properties requiring mitigation. As a result, BOEM anticipates that ongoing or offshore wind driven port expansion activities would result in impacts on localized, long-term, negligible to major impacts on terrestrial cultural resources.

Land disturbance/onshore construction: Onshore construction activities associated with residential, commercial, military and/or infrastructure development or redevelopment can impact archaeological and TCP resources by physically disturbing and/or removing resources. Without the development of the offshore wind industry, BOEM anticipates that onshore construction would follow historic trends and continue at current rates. Construction of the onshore components of offshore wind projects, such as underground or above ground electrical transmission cables, DC/AC converter stations, interconnection points, substations, etc., could result in impacts on previously recorded and/or undiscovered cultural resources. The number of cultural resources and/or historic properties impacted, the scale and extent of impacts, and the severity of impacts would depend on the location of specific project components relative to recorded and undiscovered cultural resources and the scale and extent of direct impacts.

BOEM assumes that compliance with applicable state and federal requirements to identify, assess, avoid, and/or mitigate impacts on cultural resources as part of NEPA and the NHPA would limit the extent and scale of impacts on cultural resources. BOEM assumes that ongoing and future offshore wind construction activities would be subject to existing federal and state requirements to identify cultural resources, assess impacts/adverse effects, and implement measures to avoid, minimize, and/or mitigate impacts/adverse effects. While these actions would reduce the significance of impacts to specific resource, onshore construction under the No Action Alternative would likely result in a range of impacts to cultural resources, from no historic properties affected to adverse effects to historic properties requiring mitigation, resulting in localized, long-term, negligible to major impacts on terrestrial cultural resources.

Climate change: The effects of climate change could result in a wide range of impacts to cultural resources. Increased storm frequency and severity would result in damage to and/or destruction of coastal and inland archaeological sites and TCPs from increased erosion. Sea level rise would increase the frequency and intensity of erosion-related impacts to coastal archaeological and TCP resources as well as resources along rivers and streams as increased storm frequency and intensity leads to more frequent and intense flooding episodes and erosion. Sea level rise would inundate coastal archaeological and TCP resources leading to damage or the loss of these resources. The installation of protective measures such as barriers and sea walls to mitigate the effects of climate change could impact coastal and shallow water terrestrial/marine archaeological resources during associated ground/seafloor disturbing activities. Altered habitats/ecological systems and changing migratory animal patterns related to warming seas, sea level rise, and global warming would impact the ability of Native Americans and other communities to use maritime TCPs for traditional subsistence practices such as fishing, shell fishing, and fowling activities. Impacts to or the loss of culturally sensitive marine mammal, fish, and shellfish species that play an important role in Native American traditions, cosmology, and history due to altered habitats/ecology caused by climate change could have significant impacts on Native Americans.

If climate change continues unabated, impacts to cultural resources would result in a range of impacts, from no historic properties affected to adverse effects to historic properties requiring mitigation, resulting in localized, long-term, negligible to major impacts on cultural resources. The effect of future offshore wind projects on slowing or stopping global warming and climate change would result in in beneficial impacts on terrestrial cultural resources by reducing or limiting sea level rise, storm severity/intensity, habitat/ecosystem changes, changes to migratory patterns, the need for protective measures, and sediment erosion/deposition.

3.6.2.3.2.3 Above Ground Cultural Resources

Under the No Action Alternative, impacts to above-ground cultural resources could result from activities associated with port utilization/expansion projects, lighting of vessels and structures, presence of structures within the viewshed, and climate change. Offshore wind activities may affect above ground cultural resources through the following primary IPFs.

Port utilization/expansion: Port modification and expansion projects could affect historic structures within or near port facilities. Port expansion or redevelopment projects could result in modifications to or demolition of historic port buildings and infrastructure, resulting in adverse effects on above ground historic properties. The construction of new infrastructure (docks, office buildings, loading/unloading cranes) could introduce new visual elements into historic port settings, resulting in adverse effects to the integrity of above ground historic properties within or adjacent to ports. BOEM anticipates, however, that compliance with state and federal requirements to identify and assess impacts on cultural resources/historic properties as part of NEPA and the NHPA and the requirements to avoid, minimize, and/or mitigate adverse effects/ impacts on cultural resources would ultimately result in localized, long-term, negligible to major impacts to cultural resources.

Light (vessels and structures): Development of future offshore wind projects would increase the amount of offshore anthropogenic light from vessels, area lighting during construction and decommissioning of projects (to the degree that construction occurs at night) and use of aircraft and vessel hazard/warning lighting on WTGs and OSS during operation. Construction and decommissioning lighting would be most noticeable if construction activities occur at night. Construction lighting from any project would be short-term, lasting only during nighttime construction, and could be visible from shorelines and elevated locations. Aircraft and vessel hazard lighting systems would be in use for the entire operational phase of each future offshore wind project, resulting in long-duration impacts. The intensity of these impacts would be relatively low, as the lighting would consist of small, intermittently flashing lights at a significant distance from the resources. The impacts of construction and operational lighting would be limited to cultural resources on the coastline for which a dark nighttime sky is a contributing element to historical integrity. This excludes resources that are closed to stakeholders at night, such as historic buildings, lighthouses, and parks, as well as resources that generate their own nighttime light, such as historic districts. The intensity of lighting impacts would be limited by the distance between resources and the nearest lighting sources. The intensity of lighting impacts would be further reduced by atmospheric and environmental conditions such as clouds, fog, and waves that could partially or completely obscure or diffuse sources of light. As a result, nighttime construction and decommissioning lighting would have short-term, intermittent, and localized adverse impacts on a limited number of cultural resources. Operational lighting would have longer-term, continuous, and localized adverse impacts on a limited number of cultural resources. Lighting impacts would be reduced if ADLS is used to meet FAA aircraft hazard lighting requirements. As such, lighting impacts on cultural resources would range from minor to major.

Presence of structures (viewshed): The development of future offshore wind projects would introduce new, modern, and intrusive visual elements to the viewsheds of cultural resources along the coastlines of New York, Connecticut, Massachusetts, and Rhode Island. Impacts on above-ground cultural resources from the presence of structures would be limited to those cultural resources from which future offshore wind projects would be visible, which would typically be limited to historic buildings, structures, objects, districts, and TCPs relatively close to shorelines and on elevated landforms near the coast. The magnitude of impacts from the presence of structures would be greatest for cultural resources for which a maritime view, free of permanent modern visual elements, is an integral part of their historic integrity and contributes to their eligibility for NRHP listing. Due to the distance between the reasonably foreseeable wind development projects and the nearest cultural resources, WTGs of individual projects would appear relatively small on the horizon, and the visibility of individual structures would be further affected by environmental and atmospheric conditions such as vegetation, clouds, fog, sea spray, haze, and waves. While these factors would limit the intensity of impacts, the presence of visible WTGs from future offshore wind activities would have long-term, continuous, major impacts on cultural resources if the presence of the structures resulted in adverse effects to historic properties which required mitigation to be resolved.

Climate change: Increased storm frequency and severity would result in damage to and/or destruction of coastal and inland above ground historic resources from increased erosion. Sea level rise would increase the frequency and intensity of erosion-related impacts to coastal architectural resources as well as resources along rivers and streams as increased storm frequency and intensity leads to more frequent and intense flooding episodes and erosion. The installation of protective measures such as barriers and sea walls may help to mitigate the effects of climate change on these resources. The effect of future offshore wind projects on slowing or stopping global warming and climate change would result in limited to no impacts and could result in minor beneficial impacts on cultural resources by reducing or limiting sea level rise and increases in storm severity and frequency which drastically impact above ground resources sited on shorelines or exposed rock formations.

3.6.2.3.3 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, BOEM expects ongoing activities to have continuing short-term, long-term, and permanent impacts on cultural resources. The geographic extent of impacts from ongoing activities would include southern New England and Long Island as well as the adjacent state and federal waters. The primary source of onshore impacts from ongoing activities would include ground-disturbing activities and the introduction of intrusive visual elements, while the primary source of offshore impacts or those activities that disturb the seafloor, such as anchoring, new cable emplacement, and installation/presence of structures. BOEM anticipates that the cultural resource impacts as a result of ongoing activities associated with the Alternative A - No Action of ongoing activities would be **negligible** to **major**.

Cumulative Impacts of the No Action Alternative

The construction and operation of the reasonably foreseeable offshore wind projects could result in the same types of short-term, long-term, and permanent impacts on onshore and offshore cultural resources described for ongoing activities. The geographic extent of impacts from reasonably foreseeable offshore wind projects would be limited to the terrestrial, marine, and visual APEs of each offshore wind project. The duration of impacts would range from short-term to permanent, while the extent and frequency of impacts would be largely dependent on the unique characteristics of individual cultural resources. BOEM anticipates that the overall impacts associated with Alternative A, the No Action Alternative, when combined with all other planned activities (including offshore wind) in the GAA would result in overall **negligible** to **major** impacts on individual onshore and offshore cultural resources depending on the scale and extent of impacts and the unique characteristics of individual resources.

The construction and operation of reasonably foreseeable offshore wind projects would also have **negligible** to **minor beneficial** impacts on individual onshore and offshore cultural resources as these projects would make incremental contributions to arresting the pace of global warming and climate change and associated impacts on cultural resources from sea level rise, increased storm severity/frequency, and increased erosion/deposition of sediments.

While impacts on cultural resources could range from **minor** to **major**, BOEM anticipates that implementation of existing state and federal cultural resource laws and regulations would reduce the magnitude of overall impacts on cultural resources due to requirements to avoid, minimize, or mitigate Project-specific impacts on cultural resources. These state and federal requirements may not be able to reduce the severity of impacts on some cultural resources due to the unique character of specific resources but would reduce the severity of potential impacts in a majority of cases, resulting in overall **moderate** impacts (i.e., adverse effects on historic properties could occur but would be avoided or minimized using a less impactful scenario). In some cases, however, ongoing activities and reasonably foreseeable offshore wind projects would result in **major** impacts to cultural resources where activities result in adverse effects on historic properties requiring mitigation to resolve those effects.

3.6.2.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than those described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on cultural resources:

- Physical impacts on terrestrial cultural resources (e.g., archaeological sites), depending on the location of onshore ground-disturbing activities;
- Physical impacts to underwater cultural resources (e.g., shipwrecks and submerged ancient submerged landforms) would vary according to the areas in which bottom-disturbing activities would occur. Such variances include the sitting of the WTGs and OSS within the SRWF and the ultimate route of the SRWEC; and
- Visual impacts on cultural resources (e.g., historic buildings, structures, sites, objects, and districts, which could include landscapes and TCPs), depending on the design, height, number, and distance of WTGs visible from these resources.

Variability of the proposed Project design exists as outlined in Appendix C. Below is a summary of potential variances in impacts:

- <u>WTG and OSS number, size, and location</u>: If marine cultural resources cannot be avoided, impacts can be minimized with fewer WTGs and substation footprints, smaller footprints, and the selection of footprint locations in areas of lower archaeological or ancient submerged landform sensitivity.
- <u>WTG and substation lighting</u>: Arrangement and type of lighting systems could affect the degree of nighttime visibility of WTGs onshore and decrease visual impacts on cultural resources for which a dark nighttime sky is a contributing element to historical integrity.
- <u>Size of scour protection around foundations</u>: If marine cultural resources cannot be avoided, a smaller size of scour protection around foundations can minimize disturbance or destruction of marine cultural resources.

- Offshore cable (inter-array, substation interconnector) burial location, length, depth of burial, and burial method: If marine cultural resources cannot be avoided entirely, specific location, length, and depth of burial could minimize disturbance or destruction of marine cultural resources. Cable burial method such as jetting tool, vertical injection, pre-trenching, scare plow, trenching (including leveling, mechanical cutting), plowing, and controlled-flow excavation could have varying degrees of potential to disturb or destroy marine cultural resources.
- Onshore export cable width and burial depth: Reduced width and burial depth to reduce overall volume of excavation in the export cable construction corridor could decrease potential for unanticipated disturbance of terrestrial archaeology.

3.6.2.5 Impacts of Alternative B – Proposed Action on Cultural Resources

The Proposed Action would result in the construction of the SRWF and SRWEC as described in Section 2.1.2 of this document. It would include the construction of up to 94 WTGs at 102 possible positions with a nameplate capacity of 11-MW, a single OCS-DC, and a system of inter-array cables to connect WTGs to the OCS-DC within federal water approximately 16.4 nm (18.9 miles, 30.4 km) south of Martha's Vineyard, Massachusetts; approximately 26.5 nm (30.5 miles, 48.1 km) east of Montauk, New York; and approximately 14.5 nm (16.7 miles, 26.8 km) from Block Island, Rhode Island. The SRWEC would consist of a single, 104.7 mi (168.5 km) long, 320-kV Dc export cable bundle buried to a target depth of 3 to 7 ft (1 to 2 m) under the seafloor which would connect the OCS-DC to the landfall site. Onshore project components would include construction of approximately 17.5 mi (28.2 km) of onshore transmission cable requiring a short-term disturbance corridor of 30 ft (9.1 m) and maximum duct bank target burial depth of 6 ft (1.8 m) to install the 6-inch (152 mm) diameter cable; an OnCS-DC with an operational footprint of 6 ac (2.4 ha); and an onshore interconnection cable to connect to the Holbrook Substation.

3.6.2.5.1 Construction and Installation

3.6.2.5.1.1 Onshore Activities and Facilities

Under the Proposed Action Alternative, adverse construction and installation impacts to terrestrial archaeological resources could result from ground disturbing activities associated with port utilization/expansion projects and land disturbance/onshore construction. Selection of the Proposed Action Alternative would, however, result in beneficial impacts on cultural resources by contributing to slowing or arresting the effects of climate change.

Port utilization/expansion: The project proponent is evaluating the potential use of several existing port facilities located in New York, Connecticut, and Rhode Island to support offshore construction, assembly and fabrication, crew transfer and logistics (COP Section 3.5.5; Sunrise Wind 2022). At this time no final determination has been made concerning the specific locations of these activities. The project proponent has stated, however, that if port expansion or modifications occur at any of the port facilities under consideration, those works would either be permitted and undertaken by port owners/operators and/or governmental or private-public partnerships entities in conjunction with state economic development initiatives to attract and support elements of the US offshore wind industry; evaluated as part of BOEM's review of other projects being developed by Sunrise Wind's fellow subsidiaries of North

East Offshore, LLC (i.e., the Sunrise Wind Farm and/or the Revolution Wind Farm); or part of a separate government approval subject to an independent NHPA Section 106 review (Sunrise Wind 2022). As a result, the Proposed Action as defined would not result in or contribute to direct impacts on cultural resources due to port utilization/expansions.

The Proposed Action does not include any port expansion or modification activities and, as a result, would not contribute to any direct impacts to cultural resources when combined with present and reasonably foreseeable offshore wind activities. The development of the offshore wind industry, including the Proposed Action, would however, contribute cumulative indirect impacts on cultural resources. While the Proposed Action and individual, reasonably foreseeable offshore wind projects may not include port expansion projects as part of their COP, states, municipal governments, and private entities are redeveloping and expanding port facilities with the goal of attracting offshore wind construction jobs, supply chains, and associated economic activity. While these expansion projects are not a direct result of the Proposed Action or individual, reasonably foreseeable offshore wind projects, the development of the offshore wind industry as a whole is inducing or making these port expansion activities possible. As a result, the Proposed Action and reasonably foreseeable offshore wind projects would result in geographically extensive, long-term, negligible to major indirect impacts on cultural resources from port utilization/expansion projects.

Land disturbance/onshore construction: Ground disturbing activities conducted during construction of onshore facilities have the potential to impact terrestrial archaeological resources. To avoid impacts to intact archaeological resources, the onshore facilities are primarily sited within previously disturbed and developed areas (e.g., roadways, ROWs, developed industrial/commercial areas) to the extent feasible, to minimize impacts to potential archaeological resources. In addition, facilities were sited using guidance from previous cultural resources surveys and input from Native American tribes to avoid or minimize impacts to historic properties. Desktop and infield archaeological investigations conducted in undisturbed portions of the project did not identify any previously known or undiscovered archaeological resources within the Proposed Action APE (COP Section 4.6.2, Sunrise Wind 2022). As a result of these activities, BOEM anticipates that the Proposed Action would have negligible impacts on previously recorded terrestrial archaeological resources.

Archaeological investigations have not been conducted in proposed laydown areas located within archaeologically sensitive areas and, as a result, there may be undiscovered archaeological sites that could be located within these uninvestigated portions of the terrestrial APE. The potential also exists for undiscovered archaeological resources to be present within the previously disturbed portions of the project area and areas previously investigated for cultural resources. BOEM is, however, of the opinion that based on the results of the project sponsored terrestrial archaeological investigations, there is a low potential for encountering undiscovered archaeological sites within the terrestrial APE. If undiscovered archaeological resources are present, project impacts could range from negligible to major depending on the characteristics of individual resources and the scale and extent of any impacts. BOEM is of the opinion, however, that based on the results of the terrestrial archaeological resource assessments conducted for the COP it is unlikely that significant undiscovered terrestrial archaeological resources would be encountered within the terrestrial APE.

Onshore construction associated with the Proposed Action would incrementally add to land disturbance relative to ongoing activities and reasonably foreseeable offshore wind projects. BOEM anticipates conducting NHPA Section 106 reviews for all of reasonably foreseeable offshore wind projects in federal waters, including requirements to identify historic properties within onshore project component areas, assess any potential adverse effects on any identified properties, and require project proponents to develop plans to avoid, minimize, and/or mitigate any adverse effects. Compliance with the NHPA Section 106 review process as described in its implementing regulations (36 C.F.R. 800) should reduce the extent and scale of adverse effects to terrestrial archaeological resources from the reasonably foreseeable offshore wind projects with impacts to specific resources ranging from negligible to major. Based on the results of terrestrial archaeological investigations conducted by the project proponent, land disturbance caused by the Proposed Action would not impact any recorded terrestrial archaeological resources and therefore would not contribute to any cumulative impacts to these resources.

The Proposed Action could incrementally add to direct cumulative impacts on undiscovered archaeological sites if cultural resources are encountered during future phased identification efforts or as unanticipated discoveries during onshore construction. BOEM required the project proponents for the Vineyard Wind 1 and Sunrise Wind offshore wind farm projects to complete efforts to identify historic properties prior to construction and implement a UDP during project construction and operations as conditions of COP approval and anticipates requiring all of the reasonably foreseeable offshore wind projects to comply with similar conditions. BOEM expects that completion of the NHPA Section 106 review and implementation of unanticipated discovery/post-review discovery plans would reduce the potential number, scale, and extent of cumulative impacts from offshore wind projects on terrestrial archaeological resources. The resulting cumulative impacts to undiscovered terrestrial archaeological resources would range from negligible to major depending on the characteristics of individual resources and whether adverse effects can be avoided, minimized, or require mitigation.

Climate change: The Proposed Action would incrementally contribute to slowing or arresting global warming and associated climate change and sea level rise. These incremental benefits would contribute to avoiding or minimizing climate change induced impacts on cultural resources. As a result, the Proposed Action would have long-term, widespread, negligible to minor beneficial impacts on cultural resources.

The Proposed Action and other reasonably foreseeable offshore wind projects would incrementally contribute to slowing or arresting global warming and associated climate change and sea level rise. These incremental benefits would contribute to avoiding or minimizing climate change induced impacts on cultural resources. As a result, the Proposed Action and other reasonably foreseeable offshore wind projects would have long-term, widespread, negligible to minor beneficial impacts on cultural resources.

Future actions to avoid, minimize, or mitigate adverse effects: In order to address potential impacts to undiscovered archaeological historic properties in previously uninvestigated areas and/or undiscovered historic properties encountered during construction, Sunrise Wind has committed to the following APMs:

- Performing additional phased archaeological identification and evaluation investigations within previously inaccessible portions of the APE prior to any ground disturbing activities. This process of phased identification and evaluation would be aligned with the requirements in 36 C.F.R. 800.4 (b)(2). If historic properties are identified during these investigations, the project proponent would develop plans to avoid, minimize, and/or mitigate any adverse effects in consultation with NHPA Section 106 consulting parties. If impacts to historic properties cannot be avoided, the project proponent would develop a treatment plan to resolve adverse effects in consultation with BOEM, the relevant state historic preservation office, federally recognized Tribes, and other NHPA Section 106 consulting parties (COP Section 4.6.2.3, Sunrise Wind 2022).

- Develop and implement an UDP, including stop-work and notification procedures, during all ground disturbing activities associated with construction of the Proposed Action. If archaeological historic properties are discovered during construction, the project proponent would develop and implement treatment plans to avoid, minimize, and/or mitigate impacts that are aligned with relevant New York cultural resource standards and the NHPA. All treatment plans would be developed in consultation with BOEM, the NY SHPO, federally recognized Tribes, and other NHPA Section 106 consulting parties (COP Section 4.6.2.3, Sunrise Wind 2022).

The commitments to conduct archaeological investigations within the remaining uninvestigated portions of the APE and to implement a UDP would reduce the scale and extent of any impacts to undiscovered archaeological historic properties. These commitments would allow for the identification of historic properties, either through investigation or UDP implementation, and, if resources are identified, provide for the assessment of adverse effects and the development of measures to avoid, minimize, and/or mitigate effects aligned with the procedures outlined in 36 C.F.R. 800. If because of these actions, no historic properties are affected the Proposed Action would have negligible to minor impacts on previously undiscovered cultural resources. However, if impacts cannot be avoided but could be minimized, the Proposed Action would result in moderate impacts to cultural resources. If mitigation is necessary to resolve adverse effects, the Proposed Action would have major impacts on cultural resources. As a result, the Proposed Action could result in localized, long-term negligible to major impacts on undiscovered cultural resources depending on the characteristics of individual resources and the ability of the project proponent to avoid or minimize impacts.

3.6.2.5.1.2 Offshore Activities and Facilities

Under the Proposed Action Alternative, impacts to cultural resources could occur from several of the IPFs during construction and installation, including anchoring, new cable emplacement, and presence of structures. Selection of the Proposed Action Alternative would, however, result in beneficial impacts on cultural resources by contributing to slowing or arresting the effects of climate change.

Accidental releases: Accidental release of fuel, fluids, hazardous materials, and trash or debris, if any, could affect marine cultural resources. The Proposed Action would install up to 94 WTG foundations at 102 possible positions and one OSS foundation, which could result in transport and storage of thousands of gallons of fuel required for operation of the WTGs and OSS. The volume of materials released is unlikely to require cleanup operations that would permanently affect cultural resources, however. As a result, the impacts of accidental releases from the Proposed Action alone on cultural resources would be short term, localized, and negligible to minor.

Anchoring: Construction of the Proposed Action and other offshore wind projects would result in anchoring occurring within the GAA that would likely impact marine cultural resources. One ancient submerged landform is expected to be disturbed from anchoring or jacked-up vessels utilized for installation of the nearby WTG foundation (WTG 94) (see COP Appendix R, Sunrise Wind 2022). Impact to the submerged ancient landform would be considered an adverse effect requiring mitigation and thus the impact would be considered, long-term and major. Three additional ancient submerged landforms have been identified within the APE that could also be impacted; however, Sunrise Wind intends to avoid impacts to these resources during construction and installation. If Sunrise Wind can successfully avoid impacts to the ancient, submerged landforms during construction and installation under the Proposed Action, then the adverse effect would be considered negligible to minor. Therefore, anchoring or jacked-up vessels would produce moderate to major, long-term impacts on marine cultural resources if they cannot be avoided during construction activities under the Proposed Action.

Gear utilization and dredging: Gear utilization and dredging could impact cultural resources within the APE. Identification of potential marine cultural resources through HRG survey and analysis should enable the developer to restrict gear utilization and dredging to areas where resources are not extant. As a result, BOEM does not anticipate that gear utilization and dredging activities associated with the Proposed Action would result in impacts to known shipwrecks, submerged aircraft, debris fields, and ancient submerged landforms. Therefore, impacts from gear utilization and dredging during construction and installation would be negligible to minor, unless an identified or newly discovered resource cannot be avoided, which would result in moderate to major impacts.

Presence of structures: The presence of structures, including foundations and scour protection for WTGs and OSS, could affect marine cultural resources. Depending on the type of foundation, the installation of WTGs and OSSs possess greater potential to disturb marine cultural resources due to the increased depth of impacts during installation. However, the Proposed Action has committed to locating the structures to avoid the 43 ancient, submerged landforms and eight historic period archaeological resources identified in the SRWF and SRWEC during construction and installation. Due to these commitments, BOEM does not anticipate impacts on known shipwrecks, submerged aircraft, debris fields, and ancient submerged landforms from development of the Proposed Action. As a result, the presence of structures under the Proposed Action would have minor impacts on marine cultural resources. More substantial impacts could occur if the final Project design cannot avoid known resources or if previously undiscovered resources are discovered during construction, in which case the impacts would be long-term and moderate to major.

The Project's effect on a given above-ground historic property would be a change in the above-ground historic property's visual setting. During the construction phase, the increased flow of ships across the horizon could result in short-term visual effects, drawing attention to the modern vessels as they move toward the proposed Project site. This would have the secondary effect of drawing attention toward the WTGs as they are being erected. However, the presence of seagoing vessels on the horizon is a common feature on the seascape within the APE and potential increases would be short-term in nature. Therefore, although there may be potential effects during the construction of SRWF, it is not anticipated that marine traffic in itself would result in a significant visual effect on above-ground historic properties. As a result, the Proposed Action would be short-term and negligible**.**

The presence of structures, including foundations and **scour** protection for WTGs and OSS, could affect marine cultural resources. Depending on the type of foundation, the installation of WTGs and OSSs possess greater potential to disturb marine cultural resources due to the increased depth of impacts during installation. However, the Proposed Action has committed to locating the structures to avoid the 43 ancient submerged landforms and 8 historic period archaeological resources identified in the SRWF and SRWEC during construction and installation. Developers of nearby offshore wind farms are required by BOEM and the relevant SHPOs to conduct investigations to identify potential historic properties that could be impacted during construction and installation of their proposed projects. These measures enable developers to limit or avoid impacts from construction and installation activities during development. Implementation of EMPs and other mitigation treatment plans, similar to those proposed for Sunrise Wind, may serve to resolve or lessen adverse effects to marine cultural resources resulting from development of future offshore wind projects. Nevertheless, the cumulative impacts to marine archaeological resources would range from negligible to major depending on the characteristics of individual resources and whether adverse effects can be avoided, minimized, or require mitigation.

New cable emplacement/maintenance: The installation of array cables and offshore export cables would include site preparation activities (e.g., sand wave clearance, boulder removal) and cable installation via jet plow, mechanical plow, or mechanical trenching, which could affect cultural resources. However, the Proposed Action has committed to avoiding the 43 ancient submerged landforms and eight potential historic period resources identified in the SRWF and SRWEC during new cable emplacement. Due to these commitments, BOEM does not anticipate impacts on marine cultural resources from new cable emplacement during development of the Proposed Action. As a result, new cable emplacement and maintenance would have negligible to minor impacts on marine cultural resources. More substantial impacts could occur if the final Project design cannot avoid known resources or if previously undiscovered resources are discovered during construction.

Light (vessels and structures): Construction of the Proposed Action would increase the amount of offshore anthropogenic light from vessels, area lighting during construction and decommissioning of projects (to the degree that construction occurs at night) and use of hazard/warning lighting on WTGs during operations. The susceptibility and sensitivity of cultural resources to lighting impacts from the Proposed Action would vary based on the unique characteristics of individual cultural resources that qualify them for NRHP listing. Nighttime lighting impacts would be restricted to cultural resources for which a dark nighttime sky is a contributing element to their historic integrity, cultural resources stakeholders use at night, and resources that do not generate a substantial amount of their own light pollution. Of the 342 historic properties reviewed in the offshore visual APE, it is expected that at least some resources, such as lighthouses and resources that are ocean-facing, meet these conditions.

Construction of the Proposed Action may require nighttime vessel and construction area lighting. The lighting impacts would be short term, as they would be limited to the construction phase of the Proposed Action. The intensity of nighttime construction lighting from the Proposed Action would be limited to the active construction area at any given time. Impacts would be further reduced by the distance between the nearest construction area (i.e., the closest line of WTGs) and the nearest cultural resources on the Block Island, Rhode Island and Martha's Vineyard, Massachusetts Coasts. The intensity of lighting impacts would be further reduced by atmospheric and environmental conditions such as clouds, fog, and waves that could partially or completely obscure or diffuse sources of light. As previously stated, these impacts would be limited to cultural resources for which a dark nighttime sky is a contributing element to their historic integrity and resources used by stakeholders at night, limiting the scale of impacts on cultural resources. Given that of the 307 historic properties reviewed in the offshore visual APE, it is expected that at least some resources, such as lighthouses and resources that are ocean-facing, meet these conditions. As short-term impacts during construction, the lights would be visible, but would not rise to the level of an adverse effect. Nighttime vessel and construction area lighting from the Proposed Action alone would have minor impacts on cultural resources.

Table 3.6.2-7. **Adverse Effects to Marine Cultural Resources**

Historic Property	NRHP Designation	NRHP Eligible Criteria	Impact Level
WEA_P-02-D	Eligible	Ancient submerged landform	Negligible to minor
WEA_P-11	Eligible	Ancient submerged landform	Negligible to minor
WEA_P-17	Eligible	Ancient submerged landform	Negligible to minor
WEA_P-22	Eligible	Ancient submerged landform	Moderate to major

Future actions to avoid, minimize, or mitigate adverse effects: Sunrise Wind has committed to the following EPMs to avoid, minimize, or mitigate impacts to marine archaeological resources. For ancient submerged landforms identified within the APE, Sunrise Wind proposes the following measure to avoid or minimize impacts (COP Appendix Z, Sunrise Wind 2022):

- Avoidance of the recommended 164-foot (50-meter) buffer around ASLF based on high-resolution geophysical (HRG) survey data and geotechnical data collected for the COP surveys.
- Selection of feasible construction methods that minimize the extent of seabed disturbance associated with SRWEC or IAC construction to avoid adverse physical effects to buried ASLF. Sunrise Wind anticipates avoiding forty-two of the forty-three ASLFs and would continue to evaluate options to avoid or minimize disturbance to the remaining ASLF.
- If avoidance of a target or the recommended 164-foot (50-meter) buffer is not feasible then feasible siting options and construction methods that minimize the extent of seabed disturbance within each ASLF would be evaluated.

In those instances where impacts to ancient submerged landforms cannot be avoided or minimized, the following mitigation alternatives have been proposed:

- Consultations with BOEM and Native American Tribes to identify specific research questions and goals that can be addressed through geotechnical investigations of the affected ASLF.
- Development of specific protocols for field investigations, laboratory analyses, and interpretations that reflect the priorities of Native American Tribes for whom ASLF have traditional cultural significance.
- Development of specific protocols for the appropriate dissemination of data and interpretations that mutually support the protection of ASLF and associated indigenous knowledge and the scientific research of ancient indigenous interactions with Pleistocene-age landscapes.
- Geotechnical sampling of the affected sections of ASLF within the APE. Sampling methods may include collecting up to four vibracores or using other methods to obtain intact physical samples of preserved paleosols or other deposits for analyses.
- Collaborative laboratory analyses of geotechnical samples with direct participation of Native American Tribe representatives and researchers with the QMA staff and Project representatives.
- Data aggregation and sharing via a non-proprietary, open-source GIS-format that allows for the incorporation of Sunrise Wind datasets with other relevant data collected from the Rhode Island (RI)/Massachusetts (MA) and Massachusetts WEA.

Reporting of mitigation investigations to document the results of analyses and incorporation of the Sunrise Wind data with available datasets from other recent paleoenvironmental and archaeological investigations of the OCS.

Although Sunrise Wind is committed to avoiding impacts to the eight historic resources identified within the APE, in those instances where impacts cannot be avoided the following measures are proposed to mitigate adverse effects considered by BOEM to be NRHP-eligible:

- Consultation with BOEM and other parties to determine significance (NRHP eligibility).
- If NRHP-eligible, consultations to develop a data recovery research design and/or alternative mitigation.
- Data recovery accomplished through targeted diver and/or remotely operated vehicle (ROV)-supported documentation. A broad range of approaches may be appropriate depending on the specific nature of the resource and the scope of disturbance expected; or
- Alternative mitigation in lieu of data recovery. Examples could include archival research or geophysical survey designed to locate at-risk shipwrecks of high public value, financial contributions to existing shipwreck preservation efforts in the region, or compilation of recent datasets and discoveries to expand and update SHPO inventories of potentially significant submerged archaeological resources.

The project does not include plans to physically alter or demolish any aboveground historic properties but would result in visual impacts. There are no anticipated visual impacts to historic properties resulting from construction or operation of the onshore facilities. However, adverse visual impacts are anticipated from the offshore infrastructure. Sunrise Wind has committed to the following measures to avoid or minimize potential adverse impacts to historic properties within the visual effects APE:

- WTGs would have uniform design, height, and rotor diameter, thereby mitigating visual clutter;
- The WTGs would be painted no lighter than Pure White (RAL 9010) and no darker than Light Grey (RAL 7035) as recommended by BOEM and the Federal Aviation Administration (FAA). Turbines of this color white generally blend well with the sky at the horizon and eliminate the need for daytime warning lights or red paint marking of the blade tips;
- Sunrise Wind would use an aircraft detection lighting system (ADLS) or related means (e.g., dimming or shielding) to limit visual impact, pursuant to approval by the FAA and BOEM, commercial and technical feasibility at the time of FDR/FIR approval, and dialogue with stakeholders.
- The Onshore Transmission Cable and Onshore Interconnection Cable would not include any overhead utility poles, thus minimizing potential visual impacts to adjacent properties.
- The OnCS–DC is sited near an existing substation on a parcel zoned for commercial and industrial/utility use.
- Screening would be implemented at the OnCS–DC to the extent feasible, to reduce potential visibility and noise.
- Non-reflective paints and finishes would be used to the extent practicable on Onshore Facilities to minimize reflected glare.

- Lighting at the OCS–DC would be kept to the minimum necessary to comply with navigation safety requirements and safe operating conditions.
- WTGs would be aligned and spaced consistently with other offshore wind facilities in the RI/MA WEA, reducing potential for visual clutter.

Sunrise Wind has committed to the following measures to mitigate impacts to aboveground historic resources subject to adverse visual effects (COP Appendix Z, Sunrise Wind 2022). The mitigation measures are conceptual, pending further engagement with consulting parties. Attachment C of COP Appendix Z (Sunrise Wind 2022) individually assigns conceptual mitigation to individual resources depending on type.

- Support for oral history projects to document Native American traditions associated with culturally significant marine and terrestrial species at risk due to climate change and/or the significance of economic practices and traditions associated with historic properties.
- Support for scholarships and/or professional training programs for Native American Tribal Members for marine sciences, marine construction, geophysics, geology, history, anthropology, environmental sciences, or indigenous studies.
- Support for planning, feasibility assessments, prioritization, and implementation of coastal resilience measures to minimize sea level and storm hazards, retention or appropriate adaptive re-use of historic shoreline features, and/or habitat restoration that contribute to historic maritime settings or Traditional Cultural Properties.
- Repair or restoration work to maintain the physical integrity of affected historic properties, including buildings, structures, and landscape features that contribute to historic maritime settings.
- Preparation of National Register nominations and/or historic resources surveys to increase public awareness and appreciation of coastal historic properties and their association with historic maritime landscapes, evolving land use patterns, and the historical development of the affected communities.
- Support for public interpretation of risks, challenges, and potential solutions for coastal historic properties due to climate change, sea-level rise, changing shorelines, and the historical relationship of shorelines and ocean views to the affected properties.

3.6.2.5.2 Operations and Maintenance

3.6.2.5.2.1 Onshore Activities and Facilities

BOEM does not anticipate operation and routine maintenance activities would result in impacts to terrestrial archaeological resources. Operation of the onshore components of the Proposed Action would not require any additional ground disturbing activities that could impact known or previously undiscovered archaeological resources. Routine maintenance of above ground components would similarly not require any additional ground disturbance that could impact terrestrial archaeological resources. Ground disturbing activities could be required to maintain or repair buried onshore project components, such as substation equipment and the onshore transmission or interconnection cables. BOEM anticipates, however, that any ground disturbing activity to access subsurface project components would be conducted within areas previously disturbed during construction and installation of the subsurface components. If undiscovered archaeological resources had been present in those areas, it is likely they would be discovered during construction/installation and subject to the previously described UDP. As a result, BOEM anticipates that the operation and maintenance of the Proposed Action would have negligible long-term impacts on archaeological cultural resources.

Under the Proposed Action Alternative, negative impacts to above-ground historic resources could result from construction activities associated with port utilization/expansion projects. There would be negligible impacts to above ground historic resources from construction of onshore facilities at the Holbrook, New York site. Selection of the Proposed Action Alternative would result in beneficial impacts on cultural resources by contributing to slowing or arresting the effects of climate change.

Onshore construction: BOEM does not anticipate the construction, operation and routine maintenance activities associated with the proposed onshore facilities on Long Island, New York would result in impacts to above ground historic properties. Onshore project components would include construction of approximately 17.5 mi (28.2 km) of onshore transmission cable; an OnCS-DC; and an onshore interconnection cable to connect to the Holbrook Substation. Construction of the OnCS-DC would result in the demolition of two non-historic buildings at the Union Street site in Holbrook. There are no above ground historic properties in the footprint of any of these facilities and thus there would be no direct impacts to historic above ground resources. Based on online research of the New York SHPO's Cultural Resource Information System conducted in support of the SRWF COP, there is one previously identified resource within the 1-mile radius for assessing effects in the viewshed of the OnCS-DC. The Waverly Cemetery is located 0.7 miles from the proposed OnCS-DC site. Although a formal determination of the Waverly Cemetery's NRHP eligibility has not been made, BOEM considers the Waverly Cemetery NRHP-eligible under Criterion A. An on-site field survey and viewshed analysis conducted in June 2021 did not identify any additional NRHP-eligible historic properties in the APE. The field survey also determined that due to distance and intervening buildings and foliage, the OnCS-DC is only minimally visible from the Waverly Cemetery and would have no adverse effect on those characteristics that qualify the Waverly Cemetery for listing in the NRHP. As a result, BOEM anticipates that the construction, operation and maintenance of the Proposed Action would have negligible long-term impacts on cultural resources.

Port utilization/expansion: The project proponent is evaluating the potential use of several existing port facilities located in New York, Connecticut, and Rhode Island to support offshore construction, assembly and fabrication, crew transfer and logistics (COP Section 3.5.5, Sunrise Wind 2022). At this time no final determination has been made concerning the specific locations of these activities. The project proponent has stated, however, that if port expansion or modifications occur at any of the port facilities under consideration, those works would either be permitted and undertaken by port owners/operators and/or governmental or private-public partnerships entities in conjunction with state economic development initiatives to attract and support elements of the US offshore wind industry; evaluated as part of BOEM's review of other projects being developed by Sunrise Wind's fellow subsidiaries of North East Offshore, LLC (i.e., the Sunrise Wind Farm and/or the Revolution Wind Farm); or part of a separate government approval subject to an independent NHPA Section 106 review (COP Section 3.3.10, Sunrise

Wind 2022). Therefore, because there are no port utilization or expansion activities associated with the Proposed Action it would result in negligible impacts on cultural resources.

3.6.2.5.2.2 Offshore Activities and Facilities

Operation and maintenance activities associated with the Proposed Action would likely not impact marine archaeological resources. Any impacts that might be sustained would probably result from accidental releases and anchoring. Nevertheless, the EMPs instituted to avoid or minimize impacts to marine resources during construction and installation would similarly diminish or eliminate the likelihood of impacts. As a result, BOEM anticipates that the operation and maintenance of offshore facilities would have negligible short-term impacts on marine cultural resources, unless a resource cannot be avoided, in which case the impacts would be considered major and long-term.

Operations and maintenance activities associated with the Proposed Action would likely impact above-ground historic properties through the introduction of new structures and lighting on those structures in the viewshed of historic properties. The EMPs instituted to avoid or minimize impacts to above-ground historic resources during operations and maintenance would diminish impacts but cannot be fully avoided. As a result, BOEM anticipates that the operations and maintenance of offshore facilities would have negligible to major long-term impacts on above ground historic resources.

Accidental releases: The impacts associated with accidental releases during operations and maintenance are similar to those that may arise during construction and installation, although the likelihood of a release occurring is diminished due to the decreased scope of activities. As a result, impacts from an accidental release would be considered short-term, localized, and negligible to minor.

Anchoring: Potential impacts from anchoring or jack-up vessels are unlikely considering that marine cultural resources present in the SRWF and SRWEC would have already been identified and could likely be avoided. However, a resource might sustain impacts if anchoring occurs in an area not previously assessed to identify potential submerged cultural resources. Additionally, a non-routine operation and maintenance activity could impact a known marine cultural resource if the nature of the emergency did not allow for proper avoidance measures to be implemented. Nevertheless, impacts from anchoring should be considered unlikely and would be localized and range from negligible to minor.

Light (vessels and structures): The simulated nighttime conditions illustrated in the HRVEA (COP Appendix T, Sunrise Wind 2022) assume that the aviation obstruction lights (AOLs) would be on during the nighttime, which could be considered overly conservative since SRWF would utilize Aircraft Detection Lighting System (ADLS), if approved by FAA/BOEM to minimize the amount of time the AOLs would be activated (i.e., only when aircraft enter the airspace of the SRWF). If successfully implemented, ADLS would limit the activation of the AOLs to approximately 1.4 hours per year (Capitol Airspace, 2020 in COP, Appendix T; Sunrise Wind 2022), thus substantially limiting the nighttime visibility and visual impact of the SRWF. As a result, BOEM anticipates that the lighting of offshore facilities and structures would have negligible to moderate, long-term impacts on above ground historic resources.

During the construction phase, vessel lighting associated with the increased flow of ships across the horizon could result in short-term visual effects, drawing attention to the modern vessels as they move toward the Project site. This would have the secondary effect of drawing attention toward the WTGs as they are being erected. However, the presence of seagoing vessels on the horizon is a common feature on the seascape within the APE and potential increases would be short-term in nature. Therefore, although there may be potential effects during the construction of SRWF, it is not anticipated that marine traffic in itself would result in a significant long-term visual effect on above-ground historic properties. BOEM anticipates that the lighting of vessels during construction would have negligible to moderate short-term impacts on above ground historic resources.

Presence of structures (viewshed): The Project's effect on a given above-ground historic property would be a change (resulting from the introduction of wind turbines and an OSS) in the above-ground historic property's visual setting. The Project would be visible and would result in the greatest potential effects on the visual setting of above-ground historic properties located along the shoreline. The Project's overall impact on the visual settings associated with above ground historic properties would persist for the period of operation.

For the purposes of this analysis, all inventoried properties located within the APE were considered potentially eligible for listing in the NRHP and were considered for analysis of potential visual impacts. The majority of above ground historic properties that fall within the SRWF viewshed would have somewhat obstructed views of the SRWF due to screening provided by intervening topography, vegetation, and/or buildings and structures. The proposed turbines are located between 12.8 miles (20.6 km) to 40.5 miles (65.2 km) away from the above-ground historic properties located within the APE. Visual simulations prepared for the SRWF show that in some cases views of the ocean would be disrupted by the presence of the WTGs. The introduction of new vertical elements along the horizon line would create a pattern of visual disturbance of the natural seascape. Distance may be a mitigating factor in some cases. However, even at distances of 20 miles (32.2 km) away, WTGs spread across such a wide swath of the horizon would be apparent to viewers from the shore, and the effect of "stacking" can cause multiple individual WTGs to appear as a larger, more substantial form.

The potential visibility of the SRWF from the individual above-ground historic properties within the APE is summarized in Attachment A and depicted in Figure 3.1-1 of the SRWF HRVEA (COP Appendix T, Sunrise Wind 2022). Applying the Criteria of Adverse Effect per Section 106 § 800.5, of the 307 above ground historic properties located within the APE assessed for potential visual effects, the SRWF would have an adverse effect on a total of 44 above-ground historic properties (approximately 14 percent). Applying the Criteria of Adverse Effect per Section 106 § 800.5, the SRWF is not anticipated to have a potential adverse effect on the remaining 263 inventoried properties within the APE. As a result, the Proposed Action would have long-term, widespread, minor to major impacts on cultural resources. The 263 inventoried properties would be subject to minor impacts because, although the WTGs would be visible, the impact would be insufficient to result in an adverse effect. The visual impacts on the remaining 44 historic properties would be major as the visual impacts are significant enough to require mitigation to resolve the adverse effect.

Climate change: The Proposed Action and other reasonably foreseeable offshore wind projects would incrementally contribute to slowing or arresting global warming and associated climate change and sea level rise. These incremental benefits would contribute to avoiding or minimizing climate change induced impacts on cultural resources. As a result, the Proposed Action and other reasonably foreseeable offshore wind projects would have long-term, widespread, negligible to minor beneficial impacts on cultural resources.

Future Actions to Avoid, Minimize, or Mitigate Adverse Effects on Historic Properties: The Project has been designed to minimize impacts to historic and cultural properties to the extent feasible. Construction of the Project would not require the demolition or physical alteration of any historic buildings or other above-ground historic properties. No adverse visual effects to historic properties from construction or operation of the proposed onshore facilities are anticipated. The Project's effects on a given above-ground historic property would be a change (resulting from the introduction of WTGs/OCS–DC) in the historic property's visual setting. As part of the COP submittal, Sunrise Wind has proposed measures to avoid or minimize potential adverse effects to identified properties within the Visual Effects APE. These measures are described more fully in Section 4.0 of SRWF COP (Appendix Z; Sunrise Wind 2022). Sunrise Wind anticipates that unavoidable adverse effects to historic and cultural properties would remain despite implementation of the above-referenced design measures. Proposed measures to mitigate these adverse effects are described in Sections 4.1 and 4.2 of the SRWF COP (Appendix Z, Sunrise Wind 2022) and in Attachment C of the afore-mentioned document: "Proposed Mitigation Measures for Adverse Visual Effects to Specific Historic Properties". The final minimization and mitigation of adverse effects would be determined through BOEM's NHPA Section 106 consultation process and included as conditions of COP approval.

3.6.2.5.3 Conceptual Decommissioning

3.6.2.5.3.1 Onshore Activities and Facilities

Decommissioning of the Proposed Action could result in land disturbance associated with the removal of underground onshore project components such as onshore converter station foundations and equipment and the onshore transmission and interconnection cables and associated infrastructure. BOEM anticipates, however, that any ground disturbing activity during removal of subsurface project components would be performed within areas previously disturbed during construction and installation of those components. If undiscovered archaeological resources had been present in those areas, it is likely they would be discovered during construction/installation and subject to the previously described UDP. As a result, BOEM anticipates that the conceptual decommissioning of the Proposed Action would have negligible impacts on cultural resources.

3.6.2.5.3.2 Offshore Activities and Facilities

Decommissioning of offshore infrastructure would necessitate seabed disturbance that could impact cultural resources. BOEM anticipates, however, that any seabed disturbing activity during removal of project components would be performed within areas previously assessed. Therefore, it is unlikely that unidentified marine archaeological resources would be encountered during decommissioning.

Moreover, EPMs instituted to minimize or mitigate impacts to archaeological resources during decommissioning would minimize any potential impacts to cultural resources within the areas where removal of offshore facilities would occur. As a result, BOEM anticipates that the conceptual decommissioning of the Proposed Action would have negligible impacts on marine cultural resources.

Conceptual decommissioning of the Proposed Action would contribute similar lighting impacts from nighttime vessel and construction area lighting as anticipated during construction and installation. Impacts may include light associated with decommissioning vessel traffic. Lighting from the Proposed Action could have negligible to minor impacts on cultural resources depending on the scale and intensity, largely determined by the number of visible lights and their proximity to resources, of the impacts and the unique characteristics of individual historic properties.

3.6.2.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities.

3.6.2.5.4.1 Onshore Activities and Facilities

Port utilization/expansion: The development of the offshore wind industry, including the Proposed Action, would however, contribute cumulative indirect impacts on cultural resources. While the Proposed Action and individual, reasonably foreseeable offshore wind projects may not include port expansion projects as part of their COP, states, municipal governments, and private entities are redeveloping and expanding port facilities with the goal of attracting offshore wind construction jobs, supply chains, and associated economic activity. While these expansion projects are not a direct result of the Proposed Action or individual, reasonably foreseeable offshore wind projects, the development of the offshore wind industry as a whole is inducing or making these port expansion activities possible. As a result, the Proposed Action and reasonably foreseeable offshore wind projects would result in geographically extensive, long-term, negligible to major indirect impacts on cultural resources from port utilization/expansion projects.

Land disturbance/onshore construction: The Proposed Action could incrementally add to direct cumulative impacts on undiscovered archaeological sites if cultural resources are encountered during future phased identification efforts or as unanticipated discoveries during onshore construction. BOEM required the project proponents for the Vineyard Wind 1 and Sunrise Wind offshore wind farm projects to complete efforts to identify historic properties prior to construction and implement a UDP during project construction and operations as conditions of COP approval and anticipates requiring all of the reasonably foreseeable offshore wind projects to comply with similar conditions. BOEM expects that completion of the NHPA Section 106 review and implementation of unanticipated discovery/post-review discovery plans would reduce the potential number, scale, and extent of cumulative impacts from offshore wind projects on terrestrial archaeological resources. The resulting cumulative impacts to undiscovered terrestrial archaeological resources would range from negligible to major depending on the characteristics of individual resources and whether adverse effects can be avoided, minimized, or require mitigation.

Climate change: The Proposed Action and other reasonably foreseeable offshore wind projects would incrementally contribute to slowing or arresting global warming and associated climate change and sea level rise. These incremental benefits would contribute to avoiding or minimizing climate change induced impacts on cultural resources. As a result, the Proposed Action and other reasonably foreseeable offshore wind projects would have long-term, widespread, negligible to minor beneficial impacts on cultural resources.

3.6.2.5.4.2 Offshore Activities and Facilities

Accidental releases: Cumulative impacts from the Proposed Action and the reasonably foreseeable future offshore wind projects would be similar to those of the Proposed Action but could affect a larger area. In the context of reasonably foreseeable trends, the contribution of the Proposed Action to the combined impacts of accidental releases from ongoing and planned activities would result in a low risk of a leak of fuel, fluids, or hazardous materials from any of the WTGs and OSS, which would include storage of these substances. The overall impacts on cultural resources from accidental releases from the Proposed Action when combined with ongoing and planned activities would be short term and minor.

Anchoring: Cumulative impacts from anchoring during future wind farm development would be similar to those of the Proposed Action but could affect a larger area. The Proposed Action would result in major impacts to marine resources because of the unavoidable impact to one of the identified ancient submerged landforms. Future wind farm projects may also be unable to avoid impacts to marine resources during anchoring, which would similarly result in major impacts to marine resources. Accordingly, the overall impacts on cultural resources from anchoring from the Proposed Action when combined with ongoing and planned activities would be major and could be localized or widespread.

New cable emplacement/maintenance: Future offshore wind projects would result in construction of IAC systems and offshore export cable corridors. As with the Proposed Action, future offshore wind projects would likely be able to avoid impacts marine cultural resources due to their relatively small, discrete size. In contrast to the Proposed Action, other projects may be unable to avoid impacts on all ancient submerged landforms. The combined cable emplacement impacts on cultural resources from the Proposed Action combined with ongoing and planned activities would be localized, long term, and minor for shipwrecks, downed aircraft, and debris fields; and long term, widespread, and moderate to major for submerged ancient submerged landforms. Sunrise Wind has committed to avoiding submerged ancient submerged landforms during cable emplacement and thus the combined impact on ancient submerged landforms would mostly result from other projects that may be unable to avoid these areas. Implementation of EMPs and other mitigation treatment plans, similar to those proposed for Sunrise Wind, may serve to resolve or lessen adverse effects to marine cultural resources resulting from development of future offshore wind projects. However, the magnitude of these impacts would remain moderate to major, due to the permanent, irreversible nature of the impacts, unless these ancient submerged landforms can be avoided.

Light (vessels and structures): Construction of other offshore wind projects in the GAA would contribute similar lighting impacts from nighttime vessel and construction area lighting as under the Proposed Action. Impacts may include light associated with construction vessel traffic, which may slightly increase with construction of the Proposed Action. Lighting from the Proposed Action combined with ongoing and planned activities could have negligible to minor impacts on cultural resources depending on the scale and intensity, largely determined by the number of visible lights and their proximity to resources, of the impacts and the unique characteristics of individual historic properties.

3.6.2.5.5 Conclusions

Impacts of the Proposed Action

Based on the preceding IPF analysis, BOEM has determined that the Proposed Action would likely result in **negligible** to **major** impacts on cultural resources. Impacts from the Proposed Action would be reduced through implementation of mitigation measures to resolve adverse effects to historic properties developed through the NHPA Section 106 consultation process. Without the pre-construction NHPA requirements to identify historic properties, assess potential effects, and develop treatment plans to resolve effects through avoidance, minimization, or mitigation the Proposed Action would result in more significant impacts, ranging from **moderate** to **major**. In addition, the analysis of impacts is based on a maximum-case scenario and BOEM anticipates that impacts would be reduced by implementation of a less-impactful construction or infrastructure development scenario within the PDE. BOEM expects that NHPA requirements to identify historic properties and resolve adverse effects would similarly reduce the significance of potential impacts on historic properties from future offshore wind projects as they complete the NHPA Section 106 review process.

The NHPA-required, “good-faith” efforts to identify historic properties and resolve adverse effects resulted in or contributed to Sunrise Wind committing to reduce the magnitude of impacts on cultural resources through the following APMs (COP Appendix Z, Sections 2-5, Sunrise Wind 2022):

- Using ADLS hazard lighting to limit visual impact, pursuant to approval by the FAA and BOEM, commercial and technical feasibility at the time of FDR/FIR approval, and dialogue with stakeholders;
- Using non-reflective pure white and light gray paint no lighter than Pure White (RAL 9010) and no darker than Light Grey (RAL 7035) on offshore structures;
- Screening would be implemented at the OnCS–DC to the extent feasible, to reduce potential visibility and noise. Non-reflective paints and finishes would be used to the extent practicable on Onshore Facilities to minimize reflected glare. Lighting at the OCS–DC would be kept to the minimum necessary to comply with navigation safety requirements and safe operating conditions;
- Support for oral history projects to document Native American traditions associated with culturally significant marine and terrestrial species at risk due to climate change and/or the significance of economic practices and traditions associated with historic properties;

- Support for scholarships and/or professional training programs for Native American Tribal Members for marine sciences, marine construction, geophysics, geology, history, anthropology, environmental sciences, or indigenous studies;
- Support for planning, feasibility assessments, prioritization, and implementation of coastal resilience measures to minimize sea level and storm hazards, retention or appropriate adaptive re-use of historic shoreline features, and/or habitat restoration that contribute to historic maritime settings or Traditional Cultural Properties;
- Repair or restoration work to maintain the physical integrity of affected historic properties, including buildings, structures, and landscape features that contribute to historic maritime settings;
- Preparation of National Register nominations and/or historic resources surveys to increase public awareness and appreciation of coastal historic properties and their association with historic maritime landscapes, evolving land use patterns, and the historical development of the affected communities;
- Support for public interpretation of risks, challenges, and potential solutions for coastal historic properties due to climate change, sea-level rise, changing shorelines, and the historical relationship of shorelines and ocean views to the affected properties;
- Define avoidance areas surrounding known marine archaeological resources to reduce the chances of accidental disturbance. The minimum recommended size and configuration of these areas are individually based on characterization of the site and delineation of the site's horizontal and vertical boundaries;
- Avoidance of the recommended 164-foot (50-meter) buffer around ancient submerged landform features;
- If avoidance of a feature or the recommended 164-foot (50-meter) buffer is not feasible as a result of micro-siting challenges or engineering design development, selection of feasible construction methods that minimize the extent of seabed disturbance associated with SRWEC or IAC construction to avoid adverse physical effects to ancient submerged landform features;
- For those ancient submerged landforms that cannot be avoided, develop treatment plans with NHPA Section 106 consulting parties to resolve adverse effects to historic properties;
- Performing additional phased archaeological identification and evaluation investigations within previously inaccessible portions of the APE prior to any ground disturbing activities;
- Develop and implement marine and terrestrial Unanticipated Discovery Plans (UDPs), including stop-work and notification procedures, during all ground and seafloor disturbing activities associated with construction of the Proposed Action.

Even with these commitments, the Proposed Action would still result in adverse visual effects on above ground historic properties and adverse physical effects to ancient submerged landform feature historic properties which would require mitigation to resolve those adverse effects. Therefore, the overall impacts on historic properties from the Proposed Action would qualify as **major** as it would result in adverse effects on historic properties, as defined at 36 CFR 800.5(a)(1), that would require mitigation to resolve.

Considering all the IPFs together, BOEM anticipates that the cumulative impacts on cultural resources from the Proposed Action and the reasonably foreseeable offshore wind projects would range from **negligible** to **major** due to the long-term or permanent and irreversible impacts on 47 NRHP-listed/eligible historic above ground properties as listed in Attachment C of Appendix Z of the SRWF COP (Sunrise Wind 2022). Additionally, impacts to the submerged ancient submerged landform located in the SRWF cannot be either avoided or minimized and thus the Proposed Action would result in a **major** impact to marine archaeological resources in the SRWF.

Cumulative Impacts from the Proposed Action

Construction impacts from the Proposed Action and reasonably foreseeable offshore wind projects could result in cumulative **negligible** to **major** negative impacts and **negligible** to **minor beneficial** impacts on cultural resources. Port utilization/expansion associated with or induced by the growth of the offshore wind industry could result in indirect, **negligible** to **major** impacts on cultural resources. Onshore land disturbance from the Proposed Action and reasonably foreseeable offshore wind projects could result in **negligible** to **major** depending on the characteristics of individual resources and whether adverse effects can be avoided, minimized, or require mitigation. Cumulative impacts from marine accidental releases and lighting impacts from the Proposed Action and reasonably foreseeable offshore wind projects could result in **negligible** to **minor** impacts on cultural resources. Anchoring, new cable emplacement, and the construction of new offshore infrastructure (presence of structures) could result in **negligible** to **major** cumulative construction phase impacts on cultural resources depending on whether adverse effects to historic properties can be avoided, minimized, or require mitigation. The Proposed Action and present and reasonably foreseeable offshore wind project would also result in **negligible** to **minor beneficial** impacts to terrestrial, marine, and aboveground resources by slowing or arresting the effects of climate change.

Impacts from operations and maintenance activities from the Proposed Action and reasonably foreseeable offshore wind projects could result in cumulative **moderate** to **major** impacts to marine resources if a resource, whether previously identified or discovered during activities, cannot be avoided. Seafloor disturbance from operations and maintenance activities, which may impact marine resources, are generally less intrusive and widespread as those occurring during construction and installation. Furthermore, implementation of EPMs for Sunrise Wind and future wind farm projects would likely minimize or eliminate impacts to marine resources during operations and maintenance. Consequently, the cumulative impacts to marine resources from operations and maintenance would likely be **negligible** to **minor**.

Cumulative impacts to marine resources during decommissioning could result in major impacts to the resource if it cannot be avoided during activities required for removal of offshore facilities. Nevertheless, similar to cumulative impacts associated with operations and maintenance, potential impacts to marine resources during decommissioning would likely be **negligible** to **minor**. Conceptual decommissioning of other offshore wind projects in the GAA would contribute similar lighting impacts from nighttime vessel and construction area lighting as under the Proposed Action. Impacts may include light associated with decommissioning vessel traffic, which may slightly increase with decommissioning of the Proposed Action. Lighting from the Proposed Action combined with ongoing and planned activities could have **negligible** to **minor** impacts on cultural resources depending on the scale and intensity, largely determined by the number of visible lights and their proximity to resources, of the impacts and the unique characteristics of individual historic properties.

3.6.2.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Under the Fisheries Habitat Impact Minimization Alternative C-1, the construction, operation, maintenance, and eventual decommissioning of the 11-MW WTGs and an OSS within the proposed Project Area and associated IAC and SRWEC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, to potentially reduce impacts to complex fisheries habitats that are the most vulnerable to long-term impacts as compared to the Proposed Action, 8 WTG positions in the Priority Areas would be excluded from development (only 94 WTGs are needed to reach maximum capacity of up to 1,034 MW). The 8 WTG positions would be removed from Priority Areas 1, 2, 3, and/or 4 to minimize impacts to fisheries habitat.

3.6.2.6.1 Construction and Installation

3.6.2.6.1.1 Onshore Activities and Facilities

The onshore construction and installation activities proposed under Alternative C-1 are the same as those of the Proposed Action. Therefore, impacts to terrestrial and aboveground resources would be the same as those of the Proposed Action.

3.6.2.6.1.2 Offshore Activities and Facilities

Under the Proposed Action, construction of the proposed Project could result in potential adverse effects to one ASLF, WEA_P-22, as a result of potential seafloor disturbance by a jack-up vessel during the installation of the foundation system of a proposed WTG. Under the Proposed Action, construction of the project would result in moderate to major impacts to historic property WEA_P-22. WEA_P-22 is located outside of Priority Areas 1, 2, 3, and 4 and, as a result, relocating WTG positions from these areas would not resolve the potential adverse effect to this historic property. As such, Alternative C-1 would result in the same moderate to major impacts to historic property WEA_P-22. The offshore construction and installation activities proposed under Alternative C-1 would have the same visual impact as the Proposed Action. As a result, the impact to aboveground resources would be the same as the Proposed Action.

3.6.2.6.2 Operations and Maintenance

3.6.2.6.2.1 Onshore Activities and Facilities

The onshore operations and maintenance activities proposed under Alternative C-1 are the same as those of the Proposed Action. Therefore, impacts to terrestrial and aboveground resources would the same as those of the Proposed Action.

3.6.2.6.2.2 Offshore Activities and Facilities

The offshore operations and maintenance activities proposed under Alternative C-1 are the same as those of the Proposed Action. Therefore, impacts to marine archaeological resources would the same as those of the Proposed Action.

Excluding development of 8 WTG positions from the Priority Areas even when combined with other proposed activities and measures to reduce WTG visibility would be insufficient to resolve adverse effects to historic properties. Since construction of the SRWF under Alternative C-1 would result in adverse effects on historic properties, as defined at 36 CFR 800.5(a)(1), that would require mitigation to resolve, approval of Alternative C-1 would have major impacts on cultural resources.

3.6.2.6.3 Conceptual Decommissioning

3.6.2.6.3.1 Onshore Activities and Facilities

The onshore decommissioning activities proposed under the Alternative C-1 are the same as those of the Proposed Action. Therefore, impacts to terrestrial and aboveground resources would be the same as those of the Proposed Action.

3.6.2.6.3.2 Offshore Activities and Facilities

The offshore operations and maintenance activities proposed Alternative C-1 are the same as those of the Proposed Action. Therefore, impacts to marine archaeological resources and aboveground resources would be the same as those of the Proposed Action.

3.6.2.6.4 Cumulative Impacts of Alternative C-1

Cumulative impacts to cultural resources under Alternative C-1 would similar to those described under the Proposed Action.

3.6.2.6.5 Conclusions

Impacts of Alternative C-1

Alternative C-1 would result in the same **negligible** to **major** impacts on marine and terrestrial cultural resources as the Proposed Action.

Cumulative Impacts of Alternative C-1

Alternative C-1 would result in the same **negligible** to **major** impacts on marine and terrestrial cultural resources as the cumulative impacts of the Proposed Action. Additionally, Alternative C-1 and present and reasonably foreseeable offshore wind projects would also result in negligible to minor beneficial impacts to terrestrial, marine, and aboveground resources by slowing or arresting the effects of climate change.

3.6.2.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

Under the Fisheries Habitat Impact Minimization Alternative C-2, the construction, operation, maintenance, and eventual decommissioning of the 11-MW WTGs and an OSS within the proposed Project Area and associated IAC and SRWEC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, to potentially reduce impacts to complex fisheries habitats that are the most vulnerable to long-term impacts as compared to the Proposed Action, 8 WTG positions would be excluded from development, and 12 WTG positions would be relocated to currently unoccupied positions along the eastern side of the Lease Area. The 20 WTG positions (8 removed + 12 relocated) would be removed from Priority Areas 1, 2, 3, and/or 4 to minimize impacts to fisheries habitat.

3.6.2.7.1 Construction and Installation

3.6.2.7.1.1 Onshore Activities and Facilities

The onshore construction and installation activities proposed under Alternative C-2 are the same as those of the Proposed Action. Therefore, impacts to previously recorded terrestrial resources and aboveground resources would be the same as those of the Proposed Action.

3.6.2.7.1.2 Offshore Activities and Facilities

Under the Proposed Action, construction of the proposed Project could result in potential adverse effects to one ASLF, WEA_P-22, as a result of potential seafloor disturbance by a jack-up vessel during the installation of the foundation system of a proposed WTG. Under the Proposed Action, construction of the project would result in moderate to major impacts to historic property WEA_P-22. WEA_P-22 is located outside of priority areas 1, 1 extended, 2, 3, and 4 so removing or relocating WTG positions from these areas would not resolve the potential adverse effect to this historic property. As a result, Alternative C-2 would result in the same moderate to major impacts to historic property WEA_P-22.

Geophysical survey data is currently being collected for the unoccupied WTG positions along the eastern side of the Lease Area where 12 WTGs would be relocated under Alternative C-2. If undiscovered marine historic properties (ASLFs, shipwrecks, downed aircraft, etc.) are present in un-surveyed areas, selection of this alternative could increase the number of historic properties adversely effected by the proposed Project. Additional marine archaeological investigations would be necessary in these areas to determine if selection of Alternative C-2 would result in additional adverse effects to historic properties. If historic properties are present and cannot be avoided, BOEM would be required to complete NHPA Section 106 review and consultation to determine if the proposed undertaking would result in adverse effects to those properties. If no historic properties are affected, impacts would be negligible to minor. BOEM anticipates that if historic properties are present and cannot be avoided that the Project would be required to implement measures to minimize and/or mitigate adverse effects. If the adverse effects could be minimized by using a less impactful scenario contemplated under the PDE, then the resulting impacts would be moderate. If mitigation would be required to resolve adverse effects, the resulting impacts would be major.

The offshore construction and installation activities proposed under Alternative C2 would have the same visual impact as the Proposed Action. As a result, the impact to aboveground resources would be the same as the Proposed Action.

3.6.2.7.2 Operations and Maintenance

3.6.2.7.2.1 Onshore Activities and Facilities

The onshore operations and maintenance activities proposed under Alternative C2 are the same as those of the Proposed Action. Therefore, impacts to terrestrial and aboveground resources would be the same as those of the Proposed Action.

3.6.2.7.2.2 Offshore Activities and Facilities

The offshore operations and maintenance activities proposed under the Alternative C2 are the same as those of the Proposed Action. Therefore, impacts to marine archaeological resources would be the same or less than the Proposed Action.

While excluding development 8 WTG positions in the Priority Areas could reduce the number of WTGs visible from onshore historic properties, the total reduction even when combined with other proposed activities and measures to reduce WTG visibility would be insufficient to resolve adverse effects to historic properties. Relocating 12 WTG positions from Priority Areas 1 and/or 2 to the eastern portion of the Lease Area would likely reduce the total number of WTGs visible from historic properties on Block Island, mainland Rhode Island, and mainland Massachusetts. However, the total number would be relatively low compared to the total number of WTGs (a roughly 12% reduction) and relocating these WTGs to the eastern end of the Lease Area could increase the number of WTGs visible from historic properties on Martha's Vineyard, including a large Native American TCP. Since construction of the SRWF under Alternative C-2 would result in adverse effects on historic properties, as defined at 36 CFR 800.5(a)(1), that would require mitigation to resolve, approval of Alternative C-2 would have major impacts on cultural resources

3.6.2.7.3 Conceptual Decommissioning

3.6.2.7.3.1 Onshore Activities and Facilities

The onshore decommissioning activities proposed under Alternative C2 are the same as those of the Proposed Action. Therefore, impacts to terrestrial and aboveground resources would be the same as those of the Proposed Action.

3.6.2.7.3.2 Offshore Activities and Facilities

The offshore decommissioning activities proposed Alternative C2 are the same as those of the Proposed Action. Therefore, impacts to marine archaeological resources and aboveground resources would be the same or less than the Proposed Action.

3.6.2.7.4 Cumulative Impacts of Alternative C-2

Cumulative impacts to cultural resources under Alternative C-2 would be the similar to those described under the Proposed Action.

3.6.2.7.5 Conclusions

Impacts from Alternative C-2

Alternative C-2 would result in the same **negligible** to **major** impacts on marine and terrestrial cultural resources as the Proposed Action.

Cumulative Impacts from Alternative C-2

Alternative C-2 would result in the same **negligible** to **major** impacts on marine and terrestrial cultural resources as the cumulative impacts of the Proposed Action. Additionally, Alternative C-2 and present and reasonably foreseeable offshore wind projects would also result in negligible to minor beneficial impacts to terrestrial, marine, and aboveground resources by slowing or arresting the effects of climate change.

3.6.2.8 Comparison of Alternatives

BOEM has compared the impacts resulting from individual IPFs under Alternatives C to the Proposed Action (Alternative B) and determined that the impacts on terrestrial cultural resources for each alternative would be similar to those of the Proposed Action. The onshore construction and installation activities proposed under Alternative C-1 and C-2 are the same as those of the Proposed Action and, as a result, the physical impacts to terrestrial archaeological resources would be the same as those of the Proposed Action. BOEM anticipates the Proposed Action and Alternatives C-1 and C-2 would have negligible impacts to previously identified archaeological resources and, if undiscovered resources are encountered, could have negligible to major impacts depending on the extent and scale of impacts, the characteristics of individual resources, and whether adverse effects can be avoided, minimized, or require mitigation.

Impacts to marine archaeological resources under Alternative C-1 and C-2 would be the same as those under the Proposed Action. Under the Proposed Action, construction of the proposed Project could result in potential adverse effects to one ASLF, WEA_P-22, due to potential seafloor disturbance by a jack-up vessel during the installation of the foundation system of a proposed WTG. Under the Proposed Action, construction of the project would result in moderate to major impacts to historic property WEA_P-22. WEA_P-22 is located outside of Priority Areas 1, 2, 3, and 4 so removing or relocating WTGs from these areas would not resolve the potential adverse effect to this historic property. Viewshed impacts on historic properties under Alternative C-1 and C-2 would also be the same as those under the Proposed Action. Excluding placement of WTGs in the northwest corner of the Lease Area could reduce impacts to resources on Block Island and in Rhode Island.

Geophysical survey data is currently being collected for the unoccupied WTG positions along the eastern side of the Lease Area where WTGs would be relocated under Alternatives C-2. If undiscovered marine historic properties are present in un-surveyed areas, selection of this alternative could increase the number of historic properties adversely effected by the Project. Additional marine archaeological investigations are necessary in these areas to determine if selection of Alternatives C-2 would result in additional adverse effects to historic properties. If historic properties are present and cannot be avoided, Alternative C-2 would increase the number of adversely effected historic properties. The duration any impacts would be permanent while the level of impact would depend on horizontal and vertical extent of impacts and the unique characteristics of the resources.

Based on the results of environmental reviews for previous offshore wind projects in the region, BOEM would anticipate that any unavoidable impacts would result in moderate to major impacts on marine cultural resources. If additional historic properties are present along the eastern edge of the Lease Area where WTGs would be relocated under Alternatives C-2, and they cannot be avoided by the proposed Project then Alternative C-2 would result in a greater number of moderate to major impacts to cultural resources compared to the Proposed Action. If no historic properties are present along the eastern edge of the Lease Area or if historic properties are present but can be avoided, Alternative C-2 would result in the same impacts to marine cultural resources as the Proposed Action Table 3.6.2-8 provides a comparison across each alternative.

Table 3.6.2-8. Comparison of Alternative Impacts on Cultural Resources

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Cultural Resources	*Proposed Action*: Based on the preceding IPF analysis, BOEM has determined that the Proposed Action would likely result in **negligible to major** impacts on cultural resources. The Proposed Action would still result in adverse visual effects on above ground historic properties and adverse physical effects to ancient submerged landform feature historic properties which would require mitigation to resolve those adverse effects. Therefore, the overall impacts on historic properties from the Proposed Action would qualify as **major** as it would result in adverse effects on historic properties, as defined at 36 CFR 800.5(a)(1), that would require mitigation to resolve. Considering all the IPFs together, BOEM anticipates that the cumulative impacts on cultural resources from the Proposed Action and the reasonably foreseeable offshore wind projects would range from **negligible** to **major** due to the long-term or permanent and irreversible impacts on 47 NRHP-listed/eligible historic above ground properties *Cumulative Impacts of the Proposed Action:* Construction impacts from the Proposed Action and reasonably foreseeable offshore wind projects could result in cumulative **negligible to major** negative impacts and **negligible to minor beneficial** impacts on cultural resources. Impacts from operations and maintenance activities from the Proposed Action and reasonably foreseeable offshore wind projects could result in cumulative **moderate** to **major** impacts to marine resources.	*Alternative C-1*: Alternative C-1 would result in the same **negligible** to **major** impacts on marine and terrestrial cultural resources as the Proposed Action. *Cumulative Impacts of Alternative C-1*: Alternative C-1 would result in the same **negligible** to **major** impacts and **negligible to minor beneficial** impacts on marine and terrestrial cultural resources as the cumulative impacts of the Proposed Action.	*Alternative C-2*: Alternative C-2 would result in the same negligible to major impacts on marine and terrestrial cultural resources as the Proposed Action. *Cumulative Impacts of Alternative C-2*: Alternative C-2 would result in the same **negligible** to **major** impacts and **negligible to minor beneficial** impacts on marine and terrestrial cultural resources as the cumulative impacts of the Proposed Action.

3.6.2.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to cultural resources.

The Proposed Action would be expected to have negligible to major impacts due to the long-term or permanent and irreversible impacts on 47 NRHP-listed/eligible historic above ground properties depending on the ability of Sunrise Wind to avoid, minimize, or mitigate impacts. More substantial impacts could occur if the final Project designs cannot avoid known resources or if previously undiscovered resources are discovered during construction. BOEM will use a Memorandum of Agreement to establish commitments to implementing measures to avoid, minimize, or mitigate impacts on cultural resources prior to construction. See the draft Memorandum of Agreement as an attachment to Appendix J

3.6.3 Demographics, Employment, and Economics

This section discusses potential impacts on demographics, employment, and economics from the proposed Project, alternatives, and ongoing and planned activities in the GAA (Appendix D, Figure D-13). In the COP, it is not indicated that any single state or county would be the primary recipient of the Project's economic impacts, adverse or beneficial. Therefore, the Analysis Area used to evaluate the demographic, employment, and economic impacts of the proposed Project include the states, counties, and communities that are in the vicinity of the proposed Project, include a port that may support a phase of the proposed Project, or be within the viewshed of the proposed Project.

Table 3.6.3-1 lists the communities, including the associated county/borough, where proposed onshore infrastructure and potential port cities are located, as well as the counties in closest proximity to the SRWF Lease Area. These are also assigned to an analysis area, either Primary or Expanded, depending on how potential Project impacts would be evaluated for that community. The Primary Analysis Area for demographics, employment, and economics is defined as the area where the Project would occur and where potential ports are located, which includes the states of New York, Connecticut, Maryland, Massachusetts, New Jersey, Rhode Island, and Virginia. The Expanded Analysis Area includes the communities within the potential viewshed of the SRWF. The potential for effects on property values and recreation/tourism are considered in the Expanded Analysis Area.

Table 3.6.3-1. States, Counties, and Communities within the Demographics, Employment and Economics Analysis Area

County/Borough	Communities	Analysis Area Primary	Analysis Area Expanded
New York			
Suffolk	Town of Brookhaven Port Jefferson Village Fire Island CDP Shirley CDP Mastic Beach CDP Brookhaven CDP Medford CDP North Bellport CDP North Patchogue CDP East Patchogue CDP Yaphank CDP Holtsville CDP Holbrook CDP	X	
	Town of East Hampton Montauk CDP	X	X
	Town of Southold		X
Albany	City of Albany Town of Coeymans Town of Bethlehem	X	
Kings County	Borough of Brooklyn	X	
New York County	New York City	X	
Connecticut			
New London	City of New London	X	
	Town of North Stonington Town of Stonington		X
Maryland			
Baltimore	Sparrows Point CDP (Edgemere) [a]	X	
Massachusetts			
Barnstable	Town of Falmouth Town of Mashpee		X
Bristol	City of New Bedford	X	X
	Town of Dartmouth Town of Fairhaven City of Fall River Town of Westport		X
Dukes	Town of Aquinnah Town of Chilmark Edgartown Community Town of Gosnold Town of Oak Bluffs Town of Tisbury Town of West Tisbury		X
Nantucket	Town of Nantucket		X
Plymouth	Town of Mattapoisett		X

County/Borough	Communities	Analysis Area Primary	Analysis Area Expanded
New Jersey			
Gloucester	Paulsboro (borough) [b]	X	
Rhode Island			
Kent	East Greenwich West Greenwich		X
Newport	Jamestown Little Compton Middleton Newport Portsmouth Tiverton		X
Providence	City of Providence	X	
Washington	Village of Galilee Village of Point Judith Quonset Point Community	X	
	Town of Charleston Town of Exeter Town of Hopkinton Town of New Shoreham Town of Richmond Town of South Kingstown Town of Westerly		X
	Town of Narragansett Town of North Kingstown	X	X
Virginia			
City of Norfolk	City of Norfolk [c]	X	

Notes:

[a] Edgemere, MD is the (geographically) closest residential area to Sparrow's Point. This area is an unincorporated community and census-designated place (CDP) in Baltimore County.

[b] This study used the Borough of Paulsboro for census data. The Borough of Paulsboro includes the community of Billingsport, NJ.

[c] This study used the City of Norfolk and Norfolk International Terminals (NIT) as the locations for this community and port, respectively. The City of Norfolk is considered a county-equivalent area according to the U.S. Census Bureau (USCB).

The Primary Analysis Area includes existing ports that are being evaluated to support construction and O&M of the Project, which are listed along with potential project port activities in Table 3.6.3-2. The COP (Sunrise Wind 2022) states that "no final determination has been made concerning the specific location(s) of these activities, which could take place at various locations and are expected to serve multiple offshore wind projects and potentially multiple offshore wind-related and other maritime industries."

Table 3.6.3-2. Potential Port Facilities

State	Port	City/Town, County	Summary of Potential Activities				
			WTG Tower, Nacelle, and Blade Storage, Pre-Commissioning, and Marshalling	Foundation Marshalling and Advanced Foundation Component Fabrication	O&M Activities	Construction Base	Electrical Activities and Support
Connecticut	Port of New London	New London, New London County	X				
Massachusetts	New Bedford Marine Commerce Terminal	New Bedford, Bristol County	X				
Maryland	Sparrows Point	Sparrows Point, Baltimore County		X			
New Jersey	Paulsboro Marine Terminal	Paulsboro, Gloucester County		X			
New York	Port of Albany	Albany, Albany County		X			
	Port of Brooklyn	Brooklyn, Kings County			X		
	Port of Coeymans	Coeymans, Albany County		X			
	Port Jefferson	Port Jefferson Village, Suffolk County			X		
	Port of New York	New York City, New York County					X
	Port of Montauk	Montauk, Suffolk County			X		
Rhode Island	Port of Providence	Providence, Providence County	X	X			X
	Port of Davisville and Quonset Point	North Kingstown, Washington County			X	X	
	Port of Galilee	Narragansett, Washington County			X		
Virginia	Port of Norfolk	Norfolk, Norfolk County	X				

3.6.3.1 Description of the Affected Environment and Future Baseline Conditions

Demographic Characteristics within the Primary Analysis Area

This section describes the demographic characteristics and trends in the Primary Analysis Area. Table 3.6.3-3 describes each potentially affected State, County, and City/Town by the following metrics: square miles; population in 2000, 2010, and 2018; population density; population change from 2000-2018; and median age.

Among the counties within the Primary Analysis Area, Kings County (Brooklyn), NY had the largest population in 2018 (approximately 2.6 million), followed by New York County (Manhattan) with approximately 1.6 million, and then by Suffolk County (approximately 1.5 million). Among the municipalities (cities and towns), aside from New York City, the Town of Brookhaven, NY had the largest population (484,671) (USCB 2018a). New York City (including Brooklyn and Manhattan) has by far the highest population density with 28,111 persons per mi^2, followed by the City of Providence, RI with 9,747 persons per mi^2. Albany, NY; North Patchogue, NY; New London, CT; New Bedford, MA; and Norfolk, VA also have significant population densities, each with between approximately 3,800 and 4,800 persons per mi^2.

Table 3.6.3-4 also lists the percent change between the decennial census taken in 2000 and the 2014 to 2018 ACS 5-Year Estimates and shows the changes in population over the same time period. Since 2000, for areas in New York, the change in population within the Primary Analysis Area ranges from a decrease of 20 percent in Fire Island, NY to an increase of 29 percent in North Bellport, NY. Albany County and North Bellport, NY experienced the most dramatic population changes for this period (27 and 29 percent increase, respectively). The median age throughout the Primary Analysis Area ranges from a low of 30 in the City of Providence, RI and 31 in Albany, NY, New London, CT, and Norfolk, VA to a high of 54 in Montauk, NY.

The median age across these municipalities ranged from the low 30s in some of the more urban areas and cities (i.e., Albany, New London, Providence) to the low-to-mid 50s in areas on the eastern end of Long Island where there are more retirees (i.e., Montauk and East Hampton).

Table 3.6.3-3. Demographic Characteristics within the Primary Analysis Area

Entity	Land Area in miles^2 (km^2) [a]	Decennial Census Population Count (2000)	Decennial Census Population County (2010)	ACS Population Estimate (2018)	Population Density per mi^2 (2018) [b]	% Population Change (2000 – 2018)	ACS Median Age (2018)
New York	47,126 (122,059)	18,976,457	19,378,102	19,618,453	416	3	39
Suffolk County	912 (2,363)	1,419,369	1,493,350	1,487,901	1,632	5	41
Town of Brookhaven	259 (671)	448,248	486,040	484,671	1,869	8	40
Port Jefferson Village	3 (8)	7,837	7,750	7,871	2,574	0	46
Fire Island CDP	9 (23)	310	292	249	27	-20	42
Shirley CDP	11 (28)	25,395	27,854	28,698	2,502	13	36
Mastic Beach CDP	5 (13)	11,543	12,930	11,953	2,532	4	39
Brookhaven CDP	6 (16)	3,570	3,451	3,531	609	-1	50
Medford CDP	11 (28)	21,985	24,142	24,247	2,245	10	41
North Bellport CDP	5 (13)	9,007	11,545	11,593	2,367	29	33
North Patchogue CDP	2 (5)	7,825	7,246	7,561	3,832	-3	38
East Patchogue CDP	8 (21)	20,824	22,469	22,637	2,720	9	42
Yaphank CDP	14 (36)	5,025	5,945	6,390	468	27	38
Holtsville CDP	7 (18)	17,006	19,714	19,365	2,724	14	44
Holbrook CDP	7 (18)	27,512	27,195	26,286	3,664	-4	42

Entity	Land Area in miles² (km²) [a]	Decennial Census Population Count (2000)	Decennial Census Population County (2010)	ACS Population Estimate (2018)	Population Density per mi² (2018) [b]	% Population Change (2000 – 2018)	ACS Median Age (2018)
Town of East Hampton	74 (192)	19,719	21,457	21,903	295	11	52
Montauk CDP	18 (47)	3,851	3,326	3,655	209	-5	54
Albany County	523 (1,355)	294,565	304,204	307,426	588	4	38
City of Albany	21 (54)	95,658	97,856	97,889	4,574	2	31
Town of Coeymans	50 (129)	8,151	7,418	7,363	147	-10	43
Town of Bethlehem	49 (127)	31,304	33,656	34,888	712	11	43
New York County	23 (60)	1,537,195	1,585,873	1,632,480	72,053	6	37
New York City	300 (777)	8,008,278	8,175,133	8,443,713	28,111	5	37
Kings County	68 (179)	2,465,326	2,504,700	2,600,747	27,490	5	35
Connecticut	**4,842 (12,540)**	**3,405,565**	**3,574,097**	**3,581,504**	**740**	**5**	**41**
New London County	665 (1,722)	259,088	274,055	268,881	404	4	41
City of New London	6 (16)	25,671	27,620	27,032	4,809	5	31
Maryland	**9,711 (25,151)**	**5,296,486**	**5,773,552**	**6,003,435**	**618**	**13**	**39**
Baltimore County	598 (1,549)	754,292	805,029	827,625	1,383	10	39
Sparrows Point (Edgemere CDP)	11 (28)	9,248	8,669	8,633	795	-7	46

Entity	Land Area in miles^2 (km^2) [a]	Decennial Census Population Count (2000)	Decennial Census Population County (2010)	ACS Population Estimate (2018)	Population Density per mi^2 (2018) [b]	% Population Change (2000 – 2018)	ACS Median Age (2018)
Massachusetts	**7,801 (20,205)**	**6,349,097**	**6,547,629**	**6,830,193**	**876**	**8**	**39**
Bristol County	553 (1,432)	534,678	548,285	558,905	1,011	5	41
City of New Bedford	20 (52)	93,768	95,072	95,117	4,757	1	37
New Jersey	**7,354 (19,047)**	**8,414,350**	**8,791,894**	**8,881,845**	**1,208**	**6**	**40**
Gloucester County	895 (2,318)	254,673	288,288	290,852	903	14	40
Borough of Paulsboro	2 (5)	6,160	6,097	5,937	3,085	-4	45
Rhode Island	**1,034 (2,678)**	**1,048,319**	**1,052,567**	**1,056,611**	**1,022**	**1**	**40**
Providence County	410 (1,062)	621,602	626,667	634,533	1,550	2	37
City of Providence	18 (47)	173,618	178,042	179,435	9,747	3	30
Washington County	329 (852)	123,546	126,979	126,242	383	2	45
Town of Narragansett	14 (36)	16,361	15,868	15,550	1,122	5	46
Town of North Kingston	43 (111)	26,326	26,486	26,207	607	-0.5	46
Virginia	**39,482 (102,258)**	**7,078,515**	**8,001,024**	**8,413,774**	**213**	**19**	**38**
City of Norfolk [c]	53 (137)	234,403	242,803	245,592	4,610	5	31

Sources: USCB 2000, 2010, 2018a, 2019

USCB = U.S. Census Bureau; ACS = American Community Survey; CDP = Census Designated Place; km^2 = square kilometers

Notes:

[a] Rounded to the nearest mi^2

[b] Values from USCB and may not be computed from table due to rounding.

[c] Norfolk is a county-equivalent area according to the USCB.

Additional demographic characteristics for the municipalities in the Primary Analysis Area are presented under employment and economics within this section, as well as within Section 3.6.4, *Environmental Justice*, as it relates to race/ethnicity and low-income characteristics.

Employment Characteristics within the Primary Analysis Area

Employment characteristics for states and counties in the Primary Analysis Area are summarized in Table 3.6.3-4. Among the counties, Kings County, NY has the largest labor force with approximately 1.2 million workers (as of 2018), while Washington County, RI has the smallest labor force with approximately 69,000 workers (BLS 2020). Unemployment rates are low throughout the Primary Analysis Area (excluding states) and range from 3.6 percent in the Washington County, RI and the City of Norfolk, VA to a high of 4.4 percent in Providence County, RI. Per capita personal income in 2017 ranged from $40,094 in Norfolk, VA to $65,758 in Suffolk County, NY (excluding New York County [Manhattan], which had the highest per capita personal income at $175,960) (BEA 2018). At the state level, the labor force is largest in New York (more than 9.5 million workers) and smallest in Rhode Island (557,000 workers).

Table 3.6.3-4. Employment Characteristics for States and Counties within the Primary Analysis Area

Entity	Labor Force (2018)	Employment (2018)	Unemployment (2018)	Unemployment Rate (%) (2018)	Per Capita Personal Income ($) (2017)
New York	**9,542,000**	**9,147,000**	**395,000**	**4.1**	**64,540**
Albany County	157,500	151,700	5,800	3.7	58,048
Kings County	1,201,400	1,149,800	51,600	4.3	48,758
New York County	914,200	880,100	34,100	3.7	175,960
Suffolk County	777,784	747,832	29,952	3.9	65,758
Connecticut	**1,898,000**	**1,819,000**	**79,000**	**4.1**	**71,823**
New London County	137,463	132,032	5,431	4.0	56,725
Maryland	**3,184,000**	**3.051,000**	**132,000**	**4.2**	**60,847**
Baltimore County	450,366	432,164	18,202	4.0	59,130
Massachusetts	**3,823,000**	**3,693,000**	**130,000**	**3.4**	**67,630**
Bristol County	302,918	289,955	12,963	4.3	51,298
New Jersey	**4,418,000**	**4,232,000**	**186,000**	**4.2**	**64,537**
Gloucester County	147,175	140,940	6,235	4.2	52,506
Rhode Island	**557,000**	**534,000**	**23,000**	**4.1**	**52,786**
Providence County	325,587	311,259	14,328	4.4	46,470
Washington County	69,005	66,529	2,476	3.6	62,357
Virginia	**4,352,000**	**4,224,000**	**127,000**	**2.9**	**55,105**
City of Norfolk [a]	111,524	107,496	4,028	3.6	40,094

Sources: BEA 2018; BLS 2019, 2020; Connecticut Department of Labor 2018; Rhode Island Department of Labor and Training 2019a, b, c; New York State Department of Labor 2019; Massachusetts Executive Office of Labor and Workforce Development 2019.

Note:

[a] Norfolk is a county-equivalent area according to the U.S. Census Bureau.

Housing Characteristics within the Primary Analysis Area

The areas along the coast, which includes many of the jurisdictions within the Primary Analysis Area oftentimes have tourism and visitor-centric economies, and also have seasonal housing that may be present. Therefore, the population during certain times of the year may increase with seasonal visitors to these homes or vacation rentals. This is especially true in areas of eastern Long Island, such as the municipalities of Montauk and Town of East Hampton but includes several other areas and jurisdictions as well. Table 3.6.3-5 presents housing data for the Primary Analysis Area, and includes total housing units, vacant units (for both owner-occupied and rentals) and median house values and median gross rent.

Table 3.6.3-5. Housing Characteristics within the Primary Analysis Area

Entity	Housing Units	Vacant Housing Units	Homeowner Vacancy Rate (%)	Rental Vacancy Rate (%)	Median Value ($)	Median Gross Rent ($)
New York	**8,287,087**	**970,550**	**1.7**	**4.3**	**302,200**	**1,240**
Suffolk County	575,162	87,181	1.4	5.7	386,800	1,698
Town of East Hampton	22,035	13,029	0.8	14.6	850,000	1,867
Montauk CDP	4,631	3,251	0.8	50.9	890,200	2,302
Town of Brookhaven	175,772	15,170	1.3	4.7	338,800	1,736
Port Jefferson Village	3,230	200	0.0	0.0	501,700	1,794
Brookhaven CDP	1,242	118	0.7	0.0	421,200	1,352
Holbrook CDP	9,353	499	0.0	5.2	364,700	1,906
Holtsville CDP	6,843	289	0.5	6.1	355,800	1,642
East Patchogue CDP	8,641	393	0.5	1.5	321,200	1,407
Fire Island CDP	3,473	3,397	2.9	0.0	425,000	N/A
Mastic Beach CDP	4,915	798	4.7	2.0	212,200	1,791
Medford CDP	8,328	372	0.6	0.0	311,200	1,965
North Bellport CDP	3,830	300	0.0	6.1	277,000	2,143
North Patchogue CDP	2,484	87	2.3	0.0	300,400	1,541
Shirley CDP	9,150	744	2.6	0.0	259,900	2,088
Yaphank CDP	2,063	69	0.0	5.1	311,300	2,125
Albany County	140,830	14,822	1.7	4.7	218,100	993
City of Albany	48,625	7,418	3.6	5.8	173,300	951
Town of Bethlehem	14,830	727	0.6	5.9	269,900	1,185
Town of Coeymans	3,458	400	2.8	7.8	178,700	854
New York City	3,472,354	318,251	1.9	3.4	570,500	1,396
Kings County	1,035,746	84,890	1.7	3.4	665,300	1,374
New York County	874,237	116,104	2.6	4.6	944,600	1,682
Connecticut	**1,512,305**	**144,931**	**1.8**	**6.5**	**272,700**	**1,156**
New London County	123,001	15,599	2.6	5.1	239,000	1,099
City of New London	12,645	1,670	4.7	5.2	181,300	958
Maryland	**2,437,740**	**245,222**	**1.7**	**6.2**	**305,000**	**1,357**
Baltimore County	336,554	23,641	1.7	6.7	255,400	1,263
Sparrows Point (Edgemere CDP)	3,539	281	1.8	1.1	274,400	1,322
Massachusetts	**2,882,739**	**280,825**	**1.0**	**3.8**	**366,800**	**1,225**
Bristol County	234,458	17,840	1.2	4.8	290,100	872
City of New Bedford	43,262	4,020	1.5	6.5	218,100	819
New Jersey	**3,605,401**	**392,039**	**1.7**	**5.2**	**327,900**	**1,295**
Gloucester County	113,024	8,437	1.3	6.8	216,700	1,186
Borough of Paulsboro	3,137	585	0.0	8.9	112,700	1,039
Rhode Island	**467,412**	**56,527**	**1.8**	**5.8**	**249,800**	**981**
Providence County	265,991	27,820	2.1	6.1	223,600	945
City of Providence	72,860	11,222	3.0	7.3	192,100	972
Washington County	63,737	14,626	1.6	5.8	328,300	1,100
Town of Narragansett	10,156	3,478	2.7	4.4	418,600	1,532
Town of North Kingston	11,513	1,101	0.9	4.7	340,600	983

Entity	Housing Units	Vacant Housing Units	Homeowner Vacancy Rate (%)	Rental Vacancy Rate (%)	Median Value ($)	Median Gross Rent ($)
Virginia	**3,491,091**	**362,676**	**1.6**	**5.7**	**264,900**	**1,202**
City of Norfolk [a]	97,257	9,102	2.9	6.4	199,400	1,031

Sources: USCB 2018c

Note: [a] Norfolk is a county-equivalent area according to the USCB.

As shown in Table 3.6.3-5 above, median home values in the communities within the Primary Analysis Area range from approximately $173,300 in Albany, NY and $179,000 in Coeymans, NY to $890,000 in Montauk, NY and $944,600 in Manhattan. At $192,100, the median home value in the City of Providence, RI is similar to that in the City of New London, CT ($181,300), while the Towns of North Kingstown and Narragansett in Rhode Island have median home values ($340,600 and $418,600, respectively) nearly or more than double that of the City of New London, CT. New Bedford, MA and Norfolk VA, had slightly higher median home values compared to the City of Providence, RI and the City of New London, CT. These trends are similar with regard to median gross rent, with Montauk, NY having the highest value ($2,302) and Coeymans, NY the lowest value ($854). The City of Providence, RI ($972) and New London, CT ($958) also have similar values, and the Towns of Narragansett and North Kingstown in Rhode Island ($1,352 and $983, respectively) have higher values (USCB 2018a). The median reported gross rent is slightly higher in the Town of East Hampton, NY compared to the Town of Brookhaven, NY ($1,867 and $1,736, respectively). Property values within the Primary and Expanded Analysis Area are further discussed below.

The vacancy status provides insight into the overall housing market and the analysis area's ability to accommodate non-local construction workers with short-term, rental accommodations. Table 3.6.3-6 provides additional housing statistics, specific to vacant housing units and their type of vacancy, which would allow for identification of units that could be available to non-local construction or O&M workers by state and county. This table illustrates the key role that "seasonal, recreational, or occasional use" and "other vacant" units play in the local housing supply. For the Primary Analysis Area, these two occupancy uses comprise of more than half the vacant units in nearly all of the counties (exceptions being Baltimore County, MD and the City of Norfolk, VA). For certain counties, such as Suffolk County, NY and Washington County, RI, it accounts for the vast majority of the vacant units, at 86-percent and 90-percent, respectively. Both "seasonal, recreational, or occasional use" and "other vacant" uses are associated with seasonal tourism or secondary vacation homes, with other vacant units often being used by a caretaker or janitor. As a result, the availability of seasonal units in many of these communities would typically be very limited during peak summer construction periods.

For communities with ports identified to support the O&M phase of the project, it would be expected that there would be fewer non-local construction workers in the area than other potential port locations.

As indicated in the table, the number of rental vacancies that may be available for migrant workers is limited, other housing options would be short-term accommodations, such as hotel and motel rooms and sites for recreational vehicles, and the need would primarily be associated with the communities around staging ports supporting construction activities, as well as construction of onshore facilities (as noted in the COP, much of the workforce for offshore construction would be housed offshore; Sunrise Wind 2022).

Table 3.6.3-6. Vacant Housing Statistics within the Primary Analysis Area

Entity	Total Vacant Units [a]	For Rent	For Sale Only	For Seasonal, Recreational or Occasional Use	For Migrant Workers	Other Vacant
New York	**890,510**	**152,802**	**68,359**	**342,825**	**2,331**	**324,193**
Suffolk County	82,703	5,878	5,615	53,539	405	17,266
Suffolk County % Distribution [b]	–	*7*	*7*	*65*	*<1*	*21*
Albany County	13,157	2,690	1,237	1,707	0	7,523
Albany County % Distribution [b]	–	*20*	*9*	*13*	*0*	*57*
Kings County	84,890	23,723	4,942	9,230	49	36,267
Kings County % Distribution [b]	–	*28*	*6*	*11*	*0*	*43*
New York County	116,104	27,668	4,929	45,970	195	23,736
New York County % Distribution [b]	–	*24*	*4*	*40*	*0*	*20*
Connecticut	**131,961**	**31,889**	**16,808**	**29,855**	**93**	**53,316**
New London County	14,399	1,932	1,877	5,083	0	5,507
New London County % Distribution [b]	–	*13*	*13*	*35*	*0*	*38*
Maryland	**229,303**	**48,476**	**25,716**	**59,900**	**211**	**95,000**
Baltimore County	21,607	7,755	3,591	1,170	31	9,060
Baltimore County % Distribution [b]	–	*36*	*17*	*5*	*0*	*42*
Massachusetts	**254,652**	**39,087**	**16,817**	**127,508**	**84**	**71,156**
Bristol County	16,597	4,062	1,702	2,836	23	7,974
Bristol County %Distribution [b]	–	*21*	*20*	*24*	*2*	*34*
New Jersey	**366,466**	**63,742**	**35,674**	**135,527**	**231**	**131,272**
Gloucester County	7,634	1,507	1,132	271	0	4,724
Gloucester County % Distribution [b]	–	*20*	*15*	*4*	*0*	*62*
Rhode Island	**52,004**	**10,059**	**4,620**	**17,699**	**0**	**19,626**
Providence County	24,820	7,161	2,716	1,297	0	13,646
Providence County % Distribution [b]	–	*29*	*11*	*5*	*0*	*55*
Washington County	14,189	769	580	11,129	0	1,711

Entity	Total Vacant Units [a]	For Rent	For Sale Only	For Seasonal, Recreational or Occasional Use	For Migrant Workers	Other Vacant
Washington County % Distribution [b]	–	*5*	*4*	*78*	*0*	*12*
Virginia	**329,152**	**63,404**	**33,483**	**88,357**	**370**	**143,538**
Norfolk	8,420	3,426	1,150	438	0	3,406
Norfolk % Distribution [b]	–	*41*	*14*	*5*	*0*	*40*

Sources: USCB 2018c

Notes:

[a] Not including those rented or sold.

[b] Percent distribution reflects the distribution of the total number of vacant units in each county by type of vacancy (e.g., tenure).

Property Values within the Expanded Analysis Area

The Expanded Analysis Area has a substantial geographic reach when considering potential project impacts. This seven-state area also has a wide range of housing characteristics, including property values. The median home values in the communities within the Primary Analysis Area were presented in Table 3.6.3-5, and Table 3.6.3-7 below presents additional information with respect to both the Primary Analysis Area and the Expanded Analysis Area. As noted in Section 3.6.3.1, the Expanded Analysis Area is being considered mostly as it relates to potential visual impacts and the correlation to property values. Therefore, this additional information is being provided on the Expanded Area of Analysis. Table 3.6.3-7 presents the range of home values in 2018 and the percent distribution of homes within those ranges.

Among the counties within the Primary and Expanded Analysis Area, each has less than 10 percent of their owner-occupied housing unit values between $0 and $99,999 (USCB 2018c). Conversely, the percentage of units valued at $500,000 or greater spanned a much larger range from three percent in Gloucester County, NJ to 90 percent in Nantucket County, MA (USCB 2018c), indicating some counties are wealthier than others. At the state level, as noted in Table 4.7.1-9 of the COP (Sunrise Wind 2022), New York and Massachusetts have a quarter or more of their owner-occupied housing unit values at greater than $500,000. Maryland, New Jersey, and Virginia each have about one-fifth of their owner-occupied housing units in that highest category, indicating similar wealth of the housing stock. Connecticut and Rhode Island have lesser percentages of their units valued at greater than $500,000 (17 and 11 percent, respectively) (USCB 2018c).

Table 3.6.3-7. Housing Values and Percent Distribution within the Counties in the Primary and Expanded Region of Interest

	Albany, NY	Kings, NY	New York, NY	Suffolk, NY	New London, CT	Baltimore, MD	Barnstable, MA	Bristol, MA	Dukes, MA	Nantucket, MA	Plymouth, MA	Gloucester, NJ	Kent, RI	Newport, RI	Providence, RI	Washington, RI	Norfolk, VA
Total Number of Owner-Occupied Housing Units	71,253	285,330	182,949	390,897	71,459	205,641	74,991	135,377	4,930	2,576	141,482	83,845	48,097	21,849	127,394	36,608	38,029
$0 to $99,999 (%)	9	4	4	3	7	6	2	4	1	1	4	7	6	4	6	3	8
$100,000 to $124,999 (%)	5	1	1	1	5	4	1	2	<1	<1	1	5	4	2	4	2	8
$125,000 to $149,999 (%)	7	1	<1	1	5	5	1	2	<1	1	1	8	6	1	7	1	9
$150,000 to $174,999 (%)	11	1	1	2	11	9	2	5	0	<1	3	13	12	3	13	3	13
$175,000 to $199,999 (%)	11	1	<1	2	9	8	2	6	<1	<1	3	11	13	2	11	4	13
$200,000 to $249,999 (%)	21	3	1	6	17	18	7	18	2	1	11	19	21	10	21	14	18
$250,000 to $299,999 (%)	13	3	2	11	15	13	12	18	1	1	13	15	13	11	13	17	10
$300,000 to $399,999 (%)	15	9	5	29	17	17	28	24	11	3	27	15	15	23	15	27	9
$400,000 to $499,999 (%)	5	11	10	19	7	9	17	12	14	3	15	4	6	15	6	12	5
$500,000 to $749,999 (%)	3	27	18	17	5	9	17	8	32	17	15	2	4	16	4	11	5
$750,000 to $999,999 (%)	1	17	14	6	2	2	6	2	21	19	5	<1	2	6	1	4	2
$1,000,000 to $1,499,999 (%)	<1	13	14	2	1	1	3	1	8	23	2	<1	<1	4	<1	2	1
$1,500,000 to $1,999,999 (%)	<1	5	8	1	<1	<1	1	<1	4	9	1	<1	<1	1	<1	1	<1
$2,000,000 or more (%)	<1	6	24	1	<1	<1	1	<1	7	22	1	<1	<1	2	<1	1	<1
$500,000 or more (%)	4	68	79	27	8	12	29	11	72	90	24	3	6	30	6	19	8

Source: USCB 2018a

Note: Norfolk is a county-equivalent area according to the USCB.

Economic Characteristics within the Primary Analysis Area

The Gross Domestic Project (GDP) represents the market value of goods and services produced by the labor and property located within a geographic area and is influenced to a large degree by the size of that area. GDP serves as a relative indicator of the size of the economies within the region, particularly when viewed as a percentage of the overall national economy. Table 3.6.3-8 summarizes the GDP for all states within the Analysis Area for the most recent years for which data are available. New York has the highest GDP of all the states in the Analysis Area. Maryland, Massachusetts, New Jersey, and Virginia have relatively similar GDPs that are all less than New York, while Connecticut and Rhode Island have the smallest GDPs of all states within the Analysis Area (BEA 2022).

Table 3.6.3-8. Current-Dollar Gross Domestic Product by State for 2020 and 2021

	GDP (in millions of current dollars)			Percent of the US GDP	
Entity	2020	2021 (Preliminary Statistics)	2020 – 2022 % Change	2020	2021
United States	**20,893,746**	**22,996,086**	**10.1%**	**-**	**-**
New York	1,724,759	1,853,926	**7.5%**	8.3%	8.1%
Connecticut	276,423	296,498	7.3%	1.3%	1.3%
Maryland	410,675	438,235	6.7%	2.0%	1.9%
Massachusetts	582,477	636,514	9.3%	2.8%	2.8%
New Jersey	618,579	672,089	8.7%	3.0%	2.9%
Rhode Island	60,556	65,939	8.9%	0.3%	0.3%
Virginia	549,536	591,851	7.7%	2.6%	2.6%

Source: BEA 2022

Table 3.6.3-9. Percent Employed Civilian Population by Industry in the States in the Primary Region of Interest

Industry	Percent Employed										
	Albany, NY	Suffolk, NY	NYC, NY	New London, CT	Baltimore, MD	Bristol, MA	Gloucester, NJ	Newport, RI	Providence, RI	Washington, RI	Norfolk, VA
Agriculture, forestry, fishing, hunting, mining	<1	1	<1	1	<1	<1	1	1	<1	1	<1
Construction	4	8	5	6	6	7	7	7	5	6	8
Manufacturing	5	7	3	13	5	11	8	7	12	10	7
Wholesale trade	2	3	2	2	2	3	4	2	2	2	2
Retail trade	10	12	9	11	11	13	11	9	13	11	12
Transportation and warehousing, and utilities	4	6	6	4	5	4	6	3	4	3	5
Information	2	3	4	2	2	2	2	2	2	1	2
Finance and insurance, real estate, rental and leasing	7	7	10	5	8	6	7	7	7	6	6
Professional, scientific, management, and administrative and waste management services	11	12	14	9	13	9	11	12	10	10	11
Education services, and health care and social assistance	28	27	27	24	27	27	28	27	27	28	23
Arts, entertainment, recreation, food services, accommodation	9	7	11	15	8	9	7	13	10	13	13
Other services, except public administration	5	4	5	4	5	4	4	6	5	4	5
Public administration	12	5	4	5	8	4	5	5	4	4	9

Source: USCB 2018b

Notes:

[a] Includes Kings and New York Counties.

[b] Norfolk is considered a county-equivalent area according to the USCB.

BOEM identified coastal counties (and in several cases, hotspots within particular counties) along the US East Coast, from Maine to Georgia, as a function of their potential to experience socioeconomic impacts, both beneficial and detrimental, associated with each phase (planning, construction, and decommissioning) of wind facility development (ICF 2012).

Criteria used to rank and evaluate the potential sensitivity of coastal areas of interest to offshore wind development included counties where:

- Ocean recreation and tourism account for a sizable percentage of the location's tourism economy;
- Ocean recreation and tourism account for a sizable percentage of the location's marine economy;
- Tourism accounts for a large percentage of the location's economy;
- The location has a large number of establishments related to coastal and water recreation;
- The location has a high percentage of natural or historic and cultural areas; and
- The location has significant development along the coast (ICF 2012).

Of the 113 geographic areas (i.e., counties and hotspots within particular counties) originally identified for analysis, 14 coincided with counties that were either in the Primary or Expanded Analysis Area for this Project. The three that were not included in BOEM's original list included Baltimore County, MD, Gloucester County, NJ, and Albany County, NY. Based on the methodology presented by ICF (2012), the recreation and tourism industries in these counties are less likely to be sensitive to offshore wind development as compared to those included in BOEM's assessment, likely because they are located further inland from the coast, or were not located in proximity to an area considered for offshore wind development.

Ultimately, a scorecard analysis was performed on the original 113 geographies identified, and the highest ranked 70 were chosen to move forward and analyze with community profiles. Those that were also counties within the Primary and/or Expanded Analysis Area included Suffolk, Kings, and New York counties, NY; New London County, CT; Barnstable, Bristol, Dukes, Nantucket, and Plymouth counties, MA; and Kent, Newport, Providence and Washington counties, RI, and the community profiles are included in Appendix E of the ICF 2012 report.

Information relative to the "ocean economy" is also available and tracked via NOAA's Office for Coastal Management – DIGITALCOAST program. The Economics: National Ocean Watch (ENOW) tool streamlines obtaining and comparing data for the six sectors depended on the ocean and Great Lakes, which includes: 1) living resources, 2) marine construction, 3) marine transportation, 4) offshore mineral resources, 5) ship and boat building, and 6) tourism and recreation (ENOW 2022).

Table 3.6.3-10 summarizes the significance of the ocean economy, including ocean-related tourism and recreation, to each geography within the Expanded Analysis Area. Gloucester County, NJ had the lowest percentage of ocean-related tourism jobs (27.5 percent), followed by New London County, CT (36.2

percent), while Nantucket County, MA had the highest percentage of ocean-related tourism jobs (99.5 percent) (with relatively few establishments). The number of employees per ocean-related establishment was far higher in Gloucester and New London Counties (approximately 43 and 38, respectively) than in the other counties within the Expanded Analysis Area (ranging from approximately 9 in Dukes County, MA to 23 in Washington County, RI) (ICF 2012). In terms of ocean-related GDP from tourism and recreation, the total value of goods produced and services provided in the ocean-related tourism and recreation economy was most significant in Suffolk County, NY ($1.9 billion), followed by $1.1 billion in Barnstable County, MA, and least significant in Gloucester County, NJ ($52.3 million). Collectively, the counties of had a combined GDP of nearly $1.8 billion. Additional recreation and tourism details are provided in Section 3.6.8 *Recreation and Tourism*.

Table 3.6.3-10. Summary of Ocean-Related Tourism Indicators within the Expanded Analysis Area (2018)

County in the Expanded Analysis Area	Ocean Jobs Related to Tourism and Recreation (%)	Ocean Establishments Related to Tourism and Recreation	Ocean-related Establishments/ Employment	Ocean-related GDP from Tourism and Recreation (in millions of $)
New York				
Albany County	N/A	N/A	38/625	N/A
Kings County	91.9	3,759	3,997/38,536	1,800
New York County	99.1	9,621	9,782/221,081	22,200
Suffolk County	87.9	2,741	3,032/43,138	1,900
Connecticut				
New London County	36.2	490	541/20,673	374.3
Maryland				
Baltimore County	60.2	391	483/9,350	209.4
Massachusetts				
Barnstable County	94.0	1,222	1,356/19,247	1,100
Bristol County	48.9	193	509/6,964	105.8
Dukes County	97.5	167	183/1,587	120.1
Nantucket County	99.5	134	142/1,739	159.7
Plymouth County	87.5	642	741/11,192	400.9
New Jersey				
Gloucester County	27.5	85	130/5,579	52.3
Rhode Island				
Kent County	96.4	373	388/7,842	321.8
Newport County	82.0	421	462/8,847	444.1
Providence County	92.1	873	928/16,541	700.0
Washington County	53.5	441	513/11,896	327.6
Virginia				
Norfolk [a]	56.6	487	561/16,073	311.6

Source: NOAA, Office for Coastal Management, DigitalCoast, ENOW Explorer, 2018.

Notes:

N/A = Not Available

[a] Norfolk is a county-equivalent area according to the USCB.

3.6.3.2 Impact Level Definitions for Demographics, Employment, and Economics

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on demographics, employment and economics from the alternatives, including the proposed action. Table 3.6.3-11 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for Demographics, Employment and Economics. Table G-15 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to Demographics, Employment and Economics. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of the Project or beyond Project operations and decommissioning.

Table 3.6.3-11. Definitions of Potential Adverse and Beneficial Impact Levels Classifications

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	No measurable impacts would occur.	No measurable impacts would occur.
Minor	Adverse impacts would not disrupt the normal or routine functions of the affected activity or geographic place.	A small and measurable benefit to related to demographics, employment and economics could occur.
Moderate	The affected activity or geographic place would have to adjust somewhat to account for disruptions due to impacts of the Project.	A notable and measurable benefit to related to demographics, employment and economics could occur.
Major	The affected activity or geographic place would experience unavoidable disruptions to a degree beyond what is normally acceptable.	A large local or notable regional benefit to related to demographics, employment and economics could occur.

3.6.3.3 Impacts of Alternative A - No Action on Demographics, Employment, and Economics

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

3.6.3.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, the demographics, employment, and economics described in Section 3.6.3, Affected Environment would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities.

Activities that would remain important to the region’s economy would include tourism, recreation, and marine industries (e.g., fishing). Ongoing non-offshore wind activities within the GAA that would contribute to impacts on demographics, employment, and economics, include ocean-based industries, including tourism and recreation, commercial fishing, marine transportation, ongoing port maintenance and upgrades, maintenance of existing structures (e.g., seawalls, piers), and climate change. There would likely be adverse economic impacts from activities like climate change, that could adversely impact businesses, employment, and wages. Ongoing and planned activities like port maintenance and commercial shipping generate economic activity and would likely benefit the local economy.

Ongoing offshore wind activities within the GAA that contribute to impacts on demographics, employment and economics include:

- Continued O&M of the Block Island project (five WTGs) installed in State waters;
- Continued O&M of the Coastal Virginia Offshore Wind project (two WTGs) installed in OCS-A 0497; and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island and Coastal Virginia Offshore Wind projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect demographics, economics and employment through the primary IPFs of energy security/generation, land disturbance, lighting, noise, port utilization, presence of structures, and traffic. Ongoing offshore wind activities would have the same type of impacts from these IPFs that are described in detail in the section below for planned offshore wind activities but the impacts would be of lower intensity.

3.6.3.3.2 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 Proposed Action).

Future activities without the Proposed Action include residential, commercial, and industrial development of onshore utility projects, land-based wind energy projects, and other offshore wind projects (excluding the Sunrise Wind project). Offshore projects other than offshore wind would support the existing marine industries and workforce. Ocean-based industries, including tourism and recreation, commercial fishing, and marine transportation, would continue to be important to the economies of many of the counties within the Primary Analysis Area.

The demographic, employment, and economics of the Primary Analysis Area would continue to follow current regional trends and respond to IPFs introduced by other current, ongoing or planned offshore wind development projects, and other coastal and ocean-based projects.

Offshore wind could become a new industry for the Atlantic states and The Nation. Several recent reports provide national estimates of employment and economic activity. These studies acknowledge that offshore wind component manufacture and installation capacity exists primarily outside the United States; however, domestic capacity is anticipated to increase. This Draft EIS uses available data, analysis, and projections to make reasoned conclusions on potential economic and employment impacts within the GAA.

Expected job creation from the development of the offshore wind industry in the Northeast was recently described in the report *U.S. Job Creation in Offshore* Wind, which was prepared for NYSERDA and represented a collaboration with members of the Massachusetts Department of Energy Resources, the Massachusetts Clean Energy Center (MassCEC) and the Rhode Island Office of Energy Resources (BVG 2017). This study estimated that during the initial implementation of offshore wind projects along the U.S. northeast coast, a base level of 35 percent of jobs, with a high probability of up to 55 percent of jobs, would be sourced from within the United States. The proportion of jobs filled within the United States would increase as the offshore wind energy industry grows, due to growth of a supply chain and supporting industries along the east coast, as well as a growing number of local operations and maintenance jobs for established wind facilities. By 2030 and continuing through 2056, approximately 65 to 75 percent of jobs associated with offshore wind are projected to be within the United States. Overseas manufacturers of components and specialized ships based overseas that are contracted for installation of foundations and WTGs would fill jobs outside of the United States (BVG 2017). As an example of the mix of local, national, and foreign job creation, for the 5-turbine Block Island Wind Farm, turbine blade manufacturing occurred in Denmark, generator and nacelle manufacturing occurred in France, tower component manufacturing occurred in Spain, and foundation manufacturing occurred in Louisiana (Gould and Cresswell 2017).

The American Wind Energy Association (AWEA) estimates that the offshore wind industry would invest between $80 and $106 billion in U.S. offshore wind development by 2030, of which $28 to $57 billion would be invested within the United States. This figure depends on installation levels and supply chain growth, as other investment would occur in countries manufacturing or assembling wind energy components for U.S. -based projects. While most economic and employment impacts would be concentrated in Atlantic coastal states where offshore wind development would occur—there are over $1.3 billion of announced domestic investments in wind energy manufacturing facilities, ports, and vessel construction—there would be nationwide effects as well (AWEA 2020). The AWEA report analyzes base and high scenarios for offshore wind direct impacts, turbine and supply chain impacts, and induced impacts. The base scenario assumes 20 GW of offshore wind power by 2030 and domestic content increasing to 30 percent in 2025 and 50 percent in 2030, while the high scenario assumes 30 GW of offshore wind power by 2030 and domestic content increasing to 40 percent in 2025 and 60 percent in 2030. Offshore wind energy development would support $14.2 billion in economic output and $7 billion in value added by 2030 under the base scenario. Offshore wind energy development would support $25.4 billion in economic output and $12.5 billion in value added under the high scenario. It is unclear where in the U.S. supply chain growth would occur.

The University of Delaware projects that offshore wind power would generate 30 GW along the Atlantic coast through 2030. This initiative would require capital expenditures of $100 billion over the next 10 years (University of Delaware 2021). Although the industry supply chain is global and foreign sources would be responsible for some expenditures, more U.S. suppliers are expected to enter the industry.

Compared to the $14.2 to $25.4 billion in offshore wind economic output (AWEA 2020), the 2019 annual GDP for states with offshore wind projects (Connecticut, Massachusetts, Rhode Island, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina) ranged from $63.5 billion in Rhode Island to $1.73 trillion in New York (BEA 2020) and totaled nearly $5.0 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 study estimates offshore wind would support 45,500 (base scenario) to 82,500 (high scenario) jobs—full-time equivalent (FTE) jobs at a given point in time—in the year 2030 nationwide, including direct, supply chain, and induced jobs. Most offshore wind jobs are created during the short-term construction phase. About 60 percent of jobs would be short-term (development and construction) and 40 percent would be long-term (operations and maintenance). A 2020 study commissioned by RODA estimated that offshore wind projects through 2030 would generate 55,989 to 86,138 job-years (a FTE job lasting 1 year) for construction and 5,003 to 6,994 long-term jobs for operations and maintenance (Georgetown Economic Services 2020). These estimates are generally consistent with the AWEA study in total jobs supported, although the Georgetown Economic Services study concludes that a greater proportion of jobs would be in the construction phase. As with the AWEA estimates of economic output, the RODA study assumed that offshore wind energy jobs would be focused in states hosting offshore wind projects, but would also be generated in other states where manufacturing and other supply chain activities occur.

The Primary Analysis Area for this Draft EIS is geographically large. In 2018, employment in the seven-state Primary Analysis area was a combined was 27.8 million (Table 3.6.3-9). Because projected offshore wind jobs could be located anywhere in the United States, the extent of impacts on the GAA cannot be clearly foreseen; however, a substantial portion of the workforce for planned Massachusetts, Rhode Island, New York, and other northeast and mid-Atlantic States offshore wind projects would likely be drawn from, or would relocate to, areas within commuting distance of one of the several ports being considered for offshore wind staging, construction and operations.

Some local economic activity has already begun in preparation for the anticipated offshore wind industry. Planned offshore wind activities include offshore wind energy development activities on the Atlantic OCS other than the Proposed Action determined by BOEM to be reasonably foreseeable (see Section E-1 and Attachment 2 in Appendix E for a complete description of planned offshore wind activities). BOEM expects planned offshore wind activities to affect demographics, employment and economics through the following primary IPFs.

Energy security/generation: Once built, offshore wind energy projects could produce energy at long-term fixed costs. These projects could provide reliable prices once built compared to the volatility of fossil fuel prices. Appendix E outlines the estimated electricity planned for offshore wind activities along the East Coast. The economic impacts of future offshore wind activities (including associated energy storage and capacity projects) on energy generation and energy security cannot be quantified but could be long term and beneficial.

Cable emplacement and maintenance: Offshore cable emplacement for future offshore wind projects would temporarily impact commercial fishing and for-hire recreational fishing businesses, static gear fishing vessels, and recreational vessels based in the GAA during cable installation and maintenance. Cable emplacement supporting offshore wind activities would occur offshore from the GAA for demographics, employment, and economics, resulting in seafloor disturbance, and fishing vessels may not have access to impacted areas during active construction. The disruption from cable installation may occur concurrently or sequentially, with similar impacts on commercial fishery resources. Disruption may result in conflict over other fishing grounds, increased operating costs for vessels, and lower revenue (e.g., if the substituted fishing area is less productive or supports less valuable species). Short-term productivity reductions would also affect seafood processing and wholesaling businesses that depend upon the fishing industry.

Assuming other projects use installation procedures similar to those proposed in the Sunrise Wind COP Section 3.3 (Sunrise Wind 2022), the duration and extent of impacts would be limited. Commercial fishing and for-hire recreational fishing and the related processing industries represent a small portion of the employment and economic activity in the GAA. The economic impact of cable emplacement and maintenance on commercial fishing and for-hire recreational fishing businesses is covered in more detail in Section 3.6.1, *Commercial Fisheries and For-Hire Recreational Fishing*, and would be localized and short-term.

Land disturbance: Offshore wind development would require onshore cable installation, substation construction or expansion, and possibly expansion of shore-based port facilities. Depending on siting, land disturbance could result in localized, short-term disturbances of businesses near cable routes and construction sites for substations and other electrical infrastructure, and could consist of increased noise, traffic, and road disturbances. The activities would be similar in character and duration to other common construction projects, such as utility installations, road repairs, and industrial site construction. Impacts on employment would be localized, short-term, and both beneficial (jobs and revenues to local businesses that participate in onshore construction) and adverse (potentially lost revenue due to construction disturbances).

Lighting: Aviation obstruction warning lights (AOWLs) are required for offshore WTGs and would be visible from some beaches and coastlines and could have effects on economic activity in certain locations if the lighting influences visitors in selecting coastal locations to visit, or potential residents in selecting residences. At night, required aviation obstruction lighting on the WTGs would consist of red lights on the nacelle flashing 30 times per minute, as well as mid-tower red lights flashing at the same frequency. Depending on the location of the other offshore wind projects, some may be more visible than others from land viewpoints. However, a University of Delaware study evaluating the impacts of visible offshore WTGs on beach use found that WTGs visible more than 15 miles (24.1 kilometers) from the viewer would have negligible impacts on businesses dependent on recreation and tourism activity (Parsons and Firestone 2018). The vast majority of the WTG positions envisioned offshore of the GAA would be more than 15 miles (24.1 kilometers) from coastal locations with views of the WTGs. These lights would be incrementally added over the construction period and would be visible for the operating lives of future offshore wind activities. Distance from shore, topography, and atmospheric conditions would affect light visibility.

ADLSs are an emerging technology that, if implemented at offshore wind projects, would only activate aviation warning lighting on WTGs when aircraft enter a predefined airspace. If implemented, ADLS would reduce the amount of time that WTG lighting is visible. Visibility would depend on distance from shore, topography, and atmospheric conditions. Such systems would likely reduce impacts on demographics, employment, and economics associated with lighting.

Nighttime construction and maintenance of offshore wind projects would require lighting for vessels in transit and at offshore construction work areas. Vessel lighting would enable commercial shipping and commercial fishing operations to safely navigate around the vessels and work areas and would be visible from coastal locations, primarily while the vessels are in transit. Vessel lighting is not anticipated to impact the volume of business at visitor-oriented businesses or other businesses. Impacts of vessel lighting would be localized, short-term, intermittent, and possibly adverse.

Noise: Noise from site assessment G&G survey activities, operations and maintenance, pile-driving, trenching, and vessels could result in short-term, impacts on employment and economics via the impacts on marine businesses (e.g., commercial fishing and for-hire recreational fishing, and recreational sightseeing).

Noise (especially site assessment G&G surveys and pile-driving) would affect fish populations, with effects on commercial fishing and for-hire recreational fishing. As discussed in Section 3.6.1 *Commercial Fisheries and For-Hire Recreational Fishing,* increased noise could temporarily affect the availability of fish within work areas, causing fishing vessels to relocate to other fishing locations in order to continue to earn revenue. This could potentially lead to increased conflict in relocation areas, increased operating costs for vessels, and lower revenue. The severity of such impacts would depend on the overlap of construction activities, where construction activities occur in relation to preferred fishing locations, and how exactly the commercial fishing industry responds to future construction activities.

Overall, offshore wind-generated noise could result in visitor-oriented services avoiding areas of noise and impacts on marine life important for fishing and marine sightseeing businesses (i.e., marine mammal tours offshore, etc.). Section 3.6.1 *Commercial Fisheries and For-Hire Recreational Fishing*, provides details on potential economic impacts on commercial fishing and for-hire recreational fishing businesses. Section 3.6.8 *Recreation and Tourism*, provides details on potential impacts to recreation and tourism. Both types of impacts would be localized and short-term, occurring during surveying and construction, with only periodic, short-term impacts during the O&M phase of the project. Noise impacts during surveying and construction would be more widespread when multiple offshore wind projects are under construction at the same time in the marine area off the coast of the GAA.

Onshore construction noise could possibly result in a short-term reduction of economic activity for businesses near installation sites for onshore cables or substations, temporarily inconveniencing workers, residents, and visitors. Because the location of onshore improvements is not known and cannot be determined until specific projects are proposed, the magnitude of noise associated with onshore construction and the number of businesses and homes affected cannot be determined. Impacts on demographics, employment, and economics from noise would be, intermittent and short-term, similar to other onshore utility construction activity.

Port utilization: Offshore wind installation would require port facilities for berthing, staging, O&M and loadout. Development activities would bolster port investment and employment while also supporting jobs and businesses in supporting industries. Future offshore wind development would also support planned expansions and modifications at ports in the GAA. While simultaneous construction or decommissioning (and, to a lesser degree, O&M) activities for multiple offshore wind projects in the GAA could stress port capacity, it would also generate considerable economic activity and benefit the regional economy and infrastructure investment.

Port utilization 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. Improvements to existing ports and channels would be beneficial to other port activity, including commercial fishing and for-hire recreational fishing, and other marine businesses. Port utilization in the GAA would occur primarily during development and construction projects, anticipated to occur primarily between 2023 and 2030. Ongoing O&M activities would sustain port activity and employment at a lower level after construction.

Offshore wind activities and associated port investment and usage would have long-term, beneficial impacts on employment and economic activity by providing employment and industries such as marine construction, ship construction and servicing, and related manufacturing. The greatest benefits would occur during offshore wind project construction between 2023 and 2030. If offshore wind construction results in competition for scarce berthing space and port service, port usage could potentially have short- to medium-term adverse impacts on commercial shipping.

Presence of structures: Appendix E outlines the offshore wind activities expected in the U.S. Atlantic Coast under the No Action Alternative and outlines the number of offshore wind structures (WTGs) expected. The offshore export cables and hard protection associated with these offshore wind farm developments would increase the risk of gear loss connected with cable mattresses and structures along the East Coast. Fisheries using bottom gear may be permanently disrupted, which would increase economic impacts on the commercial fishing and for-hire recreational fishing industries. These offshore facilities would also pose allision and height hazard risks, creating obstructions and navigational complexity for marine vehicles, which would impose fuel costs, time, and risk and require adequate technological aids and trained personnel for safe navigation. In the event of an allision, vessel damage and spills could result in both direct and indirect costs for commercial/for-hire recreational fishing.

The potential for additional offshore wind energy structures within the GAA could encourage fish aggregation and generate reef effects that attract recreational fishing vessels. Fish aggregation could increase human fishing activities, but this attraction would likely be limited to the minority of recreational fishing vessels that already travel as far from the shore as the wind energy facilities. Fish aggregation could potentially result in broad changes in recreational fishing practices if these effects are widespread enough to encourage more participants to travel farther from shore.

The increase in hard coverage for future offshore wind foundations could create foraging opportunities for harbor and gray seals, sea turtles, bats, northern gannets, loons, and peregrine falcons, possibly attracting private or commercial recreational sightseeing vessels. As a result, the presence of new habitat could increase economic activity associated with offshore sightseeing. New structures would be added intermittently between 2023 and 2030 and could benefit structure-oriented species as long as the structures remain.

As a result of fish aggregation and reef effects associated with the presence of offshore wind structures, there would be long-term impacts on commercial fishing operations and support businesses such as seafood processing. The fishing industry is expected to be able to adapt its fishing practices over time in response to these changes. These effects could simultaneously provide new business opportunities such as fishing and tourism. Overall, the presence of offshore wind structures would have continuous, long-term impacts on demographics, employment, and economics.

The offshore structures would also necessitate alterations in the routes of for-hire recreational fishing, recreational tour boat businesses, sailing races, and HMS angling. Some offshore wind structures would provide new business opportunities due to fish aggregation and reef effects—which could attract fish valued for recreational fishing—and the possibility of tours for visitors interested in a close-up view of the wind structures, as has occurred for the Block Island Wind Farm.

The views of offshore WTGs could have impacts on certain businesses serving the recreation and tourism industry. Impacts could be adverse for particular locations if visitors and customers avoid certain businesses (i.e., hotels or rental dwellings) due to views of the WTGs; impacts could be neutral or beneficial if views do not affect visitor decisions or influence some visitors beneficially. Section 3.6.9, *Scenic and Visual Resources*, discusses visibility of WTGs from beaches and coastal areas in the GAA for demographics, employment, and economics.

A joint research study of the University of Connecticut and Lawrence Berkeley National Laboratory titled *Relationship between Wind Turbines and Residential Property Values in Massachusetts,* found no net effects from WTGs on property values in Massachusetts (Atkinson-Palombo and Hoen 2014). The study examined impacts of 41 onshore WTGs located 0.25 to 1 mile (0.4 to 1.6 kilometers) from residences. The study noted weak evidence linking the announcement of new WTGs to adverse impact on home prices and found that those effects were no longer apparent after the start of WTG operations. The offshore wind structures would be different from the report data in that offshore WTGs would be much larger than the onshore WTGs but located much further from residences and appear small on the horizon. Additionally, a 2017 study found that when placed more than 8 mi (7 nm; 13 km) 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 mi (9 km) offshore (Jensen et al. 2018). Therefore, it is unlikely that the development of offshore wind farms and the presence of structures would have an impact on property values of homes onshore.

Overall, the presence of offshore wind structures would have a continuous, long-term impact on employment and economics in commercial fishing and for-hire recreational fishing, marine recreation and coastal recreation and tourism.

Traffic: Offshore wind construction and decommissioning and, to a lesser extent, offshore wind operations would generate increased vessel traffic. This additional traffic would support increased employment and economic activity for marine transportation and supporting businesses, investment in the ports which are being considered as staging points for this Project and investment in other ports outside of the GAA. Increased vessel traffic would have continuous, beneficial impacts during all project phases, with stronger impacts during construction and decommissioning.

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. As stated in Section 3.6.3, future offshore wind projects would result in a small incremental increase in vessel traffic, with a short-term peak during construction. 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 could 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.

The magnitude of increased vessel traffic is described in more detail in Section 3.6.6, *Navigation and Vessel Traffic*, and would depend upon the vessel traffic volumes generated by each offshore wind project, the extent of concurrent or sequential construction of wind energy projects, and the ports selected for each project. Increased vessel traffic congestion and collision risk would have continuous, short-term impacts during all project phases, with stronger impacts during construction and decommissioning.

Climate change: Climate change could affect demographics, employment, and economics in the GAA. Sea level rise and increased storm frequency and severity could result in property or infrastructure damage, increase insurance cost, and reduce 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. It is anticipated that there would be a net reduction in GHG emissions that contribute to climate change, and no collective adverse impact on climate change as a result of offshore wind projects.

3.6.3.3.3 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, the GAA would continue to be influenced by regional demographic and economic trends. Ongoing activities, future non-offshore wind activities, and future offshore wind activities would continue to sustain and support economic activity and growth within the GAA based on anticipated population growth and ongoing development of businesses and industry. Tourism and recreation would continue to be important to the economies of the coastal areas. Marine industries such as commercial fishing and shipping would continue to be active and important components of the regional economy. Counties in the GAA would continue to seek to diversify their economies—including maintaining or increasing their year-round population and protect environmental resources.

BOEM anticipates that ongoing activities in the GAA (continued commercial shipping and commercial fishing; ongoing port maintenance and upgrades; periodic channel dredging; maintenance of piers, pilings, seawalls, and buoys; and the use of small-scale, onshore renewable energy) would have **minor** adverse and **minor beneficial** impacts on demographics, employment, and economics.

Planned activities for coastal and marine activity, other than offshore wind, include development of diversified, small-scale, onshore renewable energy sources; ongoing onshore development at or near current rates; continued increases in the size of commercial vessels; potential port expansion and channel-deepening activities; and efforts to protect against potential increased storm damage and sea level rise. BOEM anticipates that there would be **minor** adverse and **minor beneficial** impacts on demographic, employment, and economics from these planned activities. BOEM expects the combination of ongoing and planned non-offshore wind activities to result in minor adverse impacts and minor beneficial impacts on ocean-based employment and economics, driven primarily by the continued operation of existing marine industries, especially commercial fishing, recreation/tourism, and shipping; increased pressure for environmental protection of coastal resources; the need for port maintenance and upgrades; and the risks of storm damage and sea level rise. Increased investment in land and marine ports, shipping, and logistics capability is an expected result of the project, along with component laydown and assembly facilities, job training, and other services and infrastructure necessary for offshore wind construction and operations. Additional manufacturing and servicing businesses would result either in the GAA or other locations in the United States if supply chains develop as expected. While it is not possible to estimate the extent of job growth and economic output within the GAA specifically, there would be notable and measurable benefits to employment, economic output, infrastructure improvements, and community services, especially job training, because of offshore wind development.

BOEM recognizes that many jobs generated by offshore wind are short-term construction jobs, lasting for a year or less. The long-term benefit of offshore wind projects is the medium-term (10 to 20 years) job market for offshore wind construction; long-term O&M jobs (25 to 35 years); long-term tax revenues; long-term economic benefits of improved ports and other industrial land areas; diversification of marine industries, especially in areas currently dominated by recreation and tourism; and growth in a skilled marine construction workforce. Therefore, BOEM anticipates that there would be overall **minor beneficial** impacts from future offshore wind activities in the GAA, combined with ongoing activities and planned activities other than offshore wind.

Cumulative Impacts of the No Action Alternative

BOEM anticipates that the No Action Alternative, when combined with all planned activities (including other offshore wind activities), would result in **minor** adverse and **moderate beneficial** impacts due primarily to the impacts on commercial fishing and for-hire recreational fishing businesses and marine recreational businesses (tour boats, marine suppliers) primarily through cable emplacement, noise and vessel traffic during construction, and the presence of offshore structures during operations. These IPFs would temporarily disturb marine species and displace commercial or for-hire fishing vessels, which could cause conflicts over other fishing grounds, increased operating costs, and lower revenue for marine industries and supporting businesses. The long-term presence of offshore wind structures would also lead to increased navigational constraints and risks and potential gear entanglement and loss. Beneficial impacts would result from increase employment and economic activity associated with multiple offshore wind projects being developed and operated in the region.

3.6.3.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in Appendix C would result in impacts similar to or less than those described in the sections below. The following proposed PDE and potential variances (Appendix C) that would influence the magnitude of the impacts to demographics, employment and economics:

- The number, size, and location of WTGs;
- During construction phase, the amount of helicopter support required;
- Related to onshore export cable route and construction (Holbrook Construction Areas and Volumes), the length of onshore cable route, cable trenches, corridor width, and corridor area;
- Related to onshore substation (Holbrook), the permanent site area and short-term construction workspace;
- Related to overhead Transmission Line (Holbrook), the maximum length of onshore interconnection cable route, landfall type, the HDD noise levels, and number of personnel.

The size of the proposed Project would affect the overall investment and economic impacts associated with the proposed Project and alternatives outlined below. An adjustment in the number or type of WTG installed would be changes in the amount of materials purchased, number of vessels required, and amount of labor and equipment required. Beneficial economic impacts within the GAA would depend on the number of workers, materials, vessels, equipment, and services required for the WTGs purchased and layout, and the overall proportion that can be locally sourced and the specific ports used by the proposed Project.

3.6.3.5 Impacts of Alternative B - Proposed Action on Demographics, Employment, and Economics

The Proposed Action's beneficial impacts on demographics, employment and economics depend on the proportion of workers, materials, vessels, equipment, and services that can be locally sourced. A study conducted by BW Research Partnership on behalf of E2, a national, nonpartisan group of advocates for policies that benefit both the economy and environment, evaluated the potential spending impacts across five states on the East Coast, including New York, New Jersey, and Virginia, which are in the Primary Analysis Area for this proposed Project. The study indicated that for every $1.00 spent building an offshore wind farm is estimated to generate $1.72, $1.83, and $1.73 for New York, New Jersey, and Virginia's state economies (E2 2018). It is presumed that the other states within the Primary Analysis Area would fall in a similar range but is dependent on the amount of locally sourced labor and project components noted above.

Sunrise Wind's economic impact study includes an assessment of job creation based on the widely recognized Jobs and Economic Development Impact (JEDI) Offshore Wind Model, developed by the National Renewable Energy Laboratory, and most recently updated in 2021. That analysis found that the construction of the Project would support an estimated 1,843 direct U.S. job-years (full-time equivalent jobs multiplied by the number of construction years) during the construction phase and approximately 189 additional annual direct US jobs during the operations phase (COP, December 1, 2020, Appendix W – *Economic Modeling Report*).

Direct employment refers to jobs created by the direct hiring of workers. Indirect employment refers to jobs created through increased demand for materials, equipment, and services. Induced employment refers to jobs created at businesses where offshore wind industry workers would spend their incomes. This direct U.S. job creation as a result of the Sunrise Wind project, noted above, would also result in indirect and induced job creation. Overall, including consideration of both direct (onsite) jobs and those generated indirectly from supply chain and support services, as well as induced jobs supported by worker spending, construction of the Project would support an estimated 16,193 U.S. job-years (full-time equivalent jobs multiplied by the number of construction years) during the construction phase and approximately 635 additional annual U.S. jobs during the operations phase. The geographic location of these jobs would be dependent on the phase of the proposed Project, the ports chosen to support the staging, construction, O&M and decommissioning of the proposed Project, among other variables.

The Proposed Action would support a range of positions for professionals such as engineers, environmental scientists, financial analysts, administrative personnel; trade workers such as electricians, technicians, steel workers, welders, and ship workers; and other construction jobs during construction and installation of the Proposed Action. O&M would create jobs for maintenance crews, substation and turbine technicians, and other support roles. The decommissioning phase would also generate professional and trade jobs and support roles. Therefore, all phases of the Proposed Action would lead to local employment and economic activity.

Assuming that conditions are similar to those of the Vineyard Wind project, job compensation (including benefits) is estimated to average between $88,000 and $96,000 for the construction phase, with occupations including engineers, construction managers, trade workers, and construction technicians. O&M occupations would consist of turbine technicians, plant managers, water transportation workers, and engineers, with average annual compensation of approximately $99,000 (BOEM 2021). A study from the New York Workforce Development Institute provided estimates of salaries for jobs in the wind energy industry that concur with Vineyard Wind's projections. The expected salary range for trade workers and technicians ranges from $43,000 to $96,000, $65,000 to $73,000 for ships' crew and officers, and $64,000 to $150,000 for managers and engineers (Gould and Cresswell 2017).

The hiring of local workers would stimulate economic activity through increased demand on housing, food, transportation, entertainment, and other goods and services. Seasonal housing units are available in the vicinity of the proposed Project; however, many of these may be second homes and vacation rentals that may not be reliable as rentals. In addition, during the summer, competition for short-term accommodations may arise, leading to higher rents. However, this effect would be short-term during the active construction period and could be reduced if construction is scheduled outside the busy summer season. Permanent workers are expected to reside locally; there is adequate housing supply to accommodate the increase in the local workforce (Table 3.6.3-5). As indicated previously, where feasible workers would be hired from the local workforce to meet labor needs of the proposed Project's construction, O&M, and decommissioning.

Tax revenues for state and local governments would increase as a result of Project expenditures. Equipment, fuel, and some construction materials would likely be purchased from local or regional vendors. These purchases would result in short-term impacts on local businesses by generating additional revenues and contributing to the tax base. Once the Project is operational, property taxes would be assessed on the value of the Sunrise Wind facilities. The increased tax base during operations would be a long-term, beneficial impact on local governments in the proposed Project Area.

In addition, Sunrise Wind has committed to invest more than $400 million in New York in accordance with the OREC agreement for the proposed Project and this agreement includes several commitments. Sunrise Wind is committed to working with minority and women-owned businesses so that the developing offshore wind supply chain is inclusive and diverse. Sunrise Wind is also providing $10 million in seed funding to create a National Offshore Wind Training Center in Suffolk County. Together with partners from labor, academia, and the environmental community, the National Offshore Wind Training Center would feature specialized facilities and programming that is essential to offshore work, aiming to cement Suffolk County's role as an integral part of the emerging offshore wind industry. Suffolk County Community College would serve as the academic arm of this initiative. Finally, Sunrise Wind has also committed to performing secondary steel fabrication in the New York Capital Region and funding the Upper Hudson Valley Work Force Initiative. These initiatives would ensure residents throughout New York have access to this opportunity and the training needed to succeed in the offshore wind industry.

Sunrise Wind is also entering negotiations with New York contractors and trade labor organizations on a Project Labor Agreement to cover construction activities for the proposed Project and committing to paying prevailing wages. Sunrise Wind is also working with the Town of Brookhaven to establish a Host

Community Benefits Agreement, which would benefit Brookhaven residents directly, in addition to the taxable income from the infrastructure itself.

The reasonably foreseeable environmental trends and impacts of the Proposed Action are described by IPFs below.

3.6.3.5.1 Construction and Installation

3.6.3.5.1.1 Onshore Activities and Facilities

Cable emplacement and maintenance: Onshore cable related construction includes installation of the Onshore Transmission Cable and Onshore Interconnection Cable. Construction would primarily occur within existing public road and utility ROWs and the construction activities would be similar to other construction projects, where there may be additional noise and/or traffic impacts in certain areas, which could disrupt business activities in those areas. These disruptions would be short-term, adverse impacts, but mitigated through implementation of mitigation and environmental protection measures. APMs to minimize impacts from cable emplacement and maintenance include conducting construction of the Landfall and ICW HDD outside of the summer tourist season, which is generally between Memorial Day and Labor Day, the construction of the remaining onshore facilities (such as the cables) would be designed to minimize impacts to the local communities to the extent feasible, and where feasible, local workers would be hired to meet labor needs for the Proposed Action. In addition, the Onshore Transmission Cable and Onshore Interconnection Cable would not include any overhead utility poles, thus minimizing potential impacts to adjacent properties.

Cable emplacement and maintenance for onshore activities and facilities would create short-term, jobs during the construction period, which would be a beneficial impact, and where feasible, local workers would be hired to meet labor needs for proposed Project construction.

Land disturbance: Construction of the Proposed Action would require construction of the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable. Installation of the cables would occur within a short-term construction corridor, which are mostly within existing roadways and rights-of-way. Landfall would occur at Smith Point County Park, and the cables would then traverse north and west to terminate at the OnCS-DC and ultimately connect to the Holbrook Substation (Figure 2.1.2-3). The employment and economic impact of the Proposed Action caused by disturbance of businesses near the onshore cable route and substation construction site would result in localized, short-term, minor impacts. The Proposed Action’s impact to land disturbance impacts on demographics, employment, and economics from ongoing and planned activities would be short-term and minor due to the short-term and localized disruption of onshore businesses.

Lighting: Lighting in this context primarily refers to aviation safety lighting for the offshore WTGs, and there is not anticipated to be additional lighting for onshore activities and facilities outside of perhaps some lights during the construction period, as needed. The impact of any onshore lighting related to the Proposed Action would be short-term and negligible.

Noise: Noise onshore may be present from the construction and installation of the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable, including construction-related vehicle noise (i.e., dump trucks, backhoes, concrete saws, air compressors and portable generators), noise from areas requiring HDD, site preparation, and general vehicular traffic. The noise generated during construction and installation of onshore facilities would be short-term, and short-term, and may have a minor impact on adjacent land uses; however, mitigation measures would be implemented, and the proposed Project would be designed to minimize impacts to the local communities to the extent feasible, including Sunrise Wind committing to screening at the OnCS-DC to the extent feasible, to reduce potential visibility and noise.

Presence of structures: Presence of structures in this context primarily refers to the WTGs and other support facilities offshore; therefore, there would be no impact related to onshore activities and facilities. Most of the onshore facilities would be buried (i.e., the cables), but the OnCS-DC would be above-ground construction; however, already in a heavily industrial area and impacts would be long-term and negligible.

Traffic: Traffic in this context refers to land-based vehicular traffic related to the construction of onshore facilities, including the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable. Sunrise Wind has proposed an APM of coordinating with local authorities to develop a MPT plan as part of the Project's EM&CP to minimize potential traffic impacts during construction to help minimize impact from construction. However, construction activities may require some detours and/or additional congestion during the period of construction of the onshore facilities along the roadways where the cable would be installed but be similar to a routine construction project. This could result in temporarily disruption to business activities in adjacent land uses; however, would be short-term and short-term nature and considered to be minor.

3.6.3.5.1.2 Offshore Activities and Facilities

Cable emplacement and maintenance: The Proposed Action's cable emplacement would generate vessel anchoring and dredging at the worksite, requiring other vessels to avoid and navigate around the worksites and resulting in short-term disturbance to species important to commercial and recreational fishing, other forms of recreation and tourism, with potential adverse effects on employment and income. The SRWEC includes a corridor length of up to 104.7 mi (168.5 km) where cable emplacement would be conducted, as well as IAC amongst the WTGs within the SRWF.

The maximum seafloor disturbance associated with construction and operation of the SRWEC and IAC is summarized in Appendix C. This seafloor disturbance would result in a disruption of fish stocks, and concrete mattresses covering cables in hard-bottom areas could hinder commercial trawlers/dredgers, potentially reducing income and increasing costs for affected businesses over the long term. Cable installation would have localized, short-term, minor impacts on demographics, employment, and economics, while maintenance of the Proposed Action and other existing submarine cables would have intermittent, long-term, negligible impacts.

Lighting: Lighting in this context refers primarily to the aviation hazard lighting on the WTGs but could also include minor to moderate effects from nighttime lighting associated with vessels and other construction and installation related equipment. The impacts would be primarily to the recreational and commercial fishing, pleasure, and tour boating community. Impacts would be short-term and negligible, and the impacts to potential fishing, recreating or other marine-related businesses would be minor.

Noise: Noise from the offshore facilities component of the Proposed Action construction (primarily pile-driving) could temporarily affect fish and marine mammal populations, hindering fishing and sightseeing near construction activity within the SRWF, which could discourage some businesses from operating in these areas during pile-driving (see Sections 3.6.1, *Commercial Fisheries and For-Hire Recreational Fishing*). This would result in a localized, short-term, minor impact on these marine-related businesses and therefore demographics, employment, and economics, but would return to normal conditions following the completion of construction activities.

In addition, trenching and/or HDD for cable emplacement activities emit noise. This noise could temporarily disrupt commercial fishing, marine recreational businesses, and onshore recreational businesses. Noise from trenching and trenchless technology would affect marine life populations, which would in turn affect commercial and recreational fishing businesses. Impacts on marine life would also affect onshore recreational businesses due to noise near public beaches, parks, residences, and offices. The use of trenchless technology at natural and sensitive landfall locations where possible would minimize direct impacts, as well as the intent to perform construction at the landfall outside the summer tourist season, which is generally between Memorial Day and Labor Day. Cable laying, trenching, and HDD would have localized, intermittent, short-term, and negligible impacts on demographics, employment, and economics.

Vessel noise could affect marine species relied upon by commercial fishing businesses, marine recreational businesses, recreational boaters, and marine sightseeing activities. Vessel traffic would occur between ports (outside the recreational and tourism GAA) and offshore wind work areas. Most vessel traffic would travel to the WTG installation area, with fewer vessels needed along the cable installation routes. Noise from vessels would have short-term, intermittent, negligible impacts on demographics, employment, and economics.

Noise generated by the Proposed Action's staging operations at ports would produce some noise; however, these are existing ports in industrial areas. Several ports are being considered to support construction and installation of offshore facilities. Depending upon the specific ports selected to support construction, noise from the Proposed Action, in combination with ongoing and planned activities, would have a variable, short-term, negligible to minor impact on demographics, employment, and economics.

Port utilization: The Proposed Action would require port facilities for berthing, staging, and loadout to support the construction and installation of offshore facilities. The activities at ports would support port investment and employment and would also support jobs and businesses in supporting industries and commerce. There are 10 ports identified for consideration that could support construction and installation activities for offshore facilities (Table 3.6.3-2). 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 when the most jobs and most economic activity at ports supporting the Proposed Action would occur. These jobs related to construction and installation of offshore facilities would be short-term and are outlined at the beginning of this section (see Section 3.6.3.5). As a result of this activity, and offshore wind development in general, investments are being made at many of these ports, which would benefit other port users, including maintenance and dredging of shipping channels. The Proposed Action would have a minor to moderate beneficial impact on demographics, employment, and economics from port utilization due to greater economic activity and increased employment at ports used by the Proposed Action.

Traffic: In this context, traffic is referring to vessel traffic generated during construction of the offshore facilities as part of the Proposed Action. The Proposed Action would generate vessel traffic in the proposed Project Area and to and from the ports supporting project construction of offshore facilities. Increased vessel traffic would increase the use of port and marine businesses, including tug services, dockage, fueling, inspection/repairs, and provisioning. The vessel traffic generated by the Proposed Action alone would result in increased business for marine transportation and supporting services in the GAA with continuous, short-term, and minor beneficial impacts during construction.

Vessel traffic associated with the Proposed Action could also result in short-term, periodic congestion within and near ports, leading to potential delays and an increased risk for collisions between vessels, which would result in economic costs for vessel owners. As a result of potential delays from increased congestion and increased risk of damage from collisions and/or allisions, the Proposed Action would have continuous, short-term, and minor impacts during construction

3.6.3.5.2 Operations and Maintenance

3.6.3.5.2.1 Onshore Activities and Facilities

Land disturbance: During the O&M phase of the project, the onshore transmission cable infrastructure, including cable landfall sites and onshore cables, would be underground and primarily within roads and utility rights-of-way, while the substation would operate within an industrial area. As a result, operations and occasional maintenance or repair operations from the Proposed Action alone would have negligible and long-term impacts.

Lighting: Lighting in this context primarily refers to aviation safety lighting for the offshore WTGs. There is not anticipated to be lighting for onshore activities and facilities during the O&M phase of the project, beyond perhaps some lights during a specific repair or maintenance activity, as needed during non-daylight hours. The impact of any onshore lighting related to O&M and the Proposed Action on demographics, employment and economics would be negligible.

Noise: Noise onshore may be present from O&M activities related to the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable. This would include operation of the OnCS-DC, which would be a new noise source and limited noise from routine maintenance that may require short-term use of equipment to facilitate inspections and repairs. Sunrise Wind proposes to implement screening at the OnCS-DC, an APM that is intended to reduce potential noise and visibility.

The OnCS-DC is located in an already industrial area and noise generated from O&M activities would be minimal, ongoing, and long-term for operation of the OnCS-DC and therefore would have a negligible impact on demographics, employment, and economics.

Traffic: Traffic in this context primarily refers to land-based vehicular traffic during the O&M phase for onshore facilities. Once the onshore facilities are constructed, there would be minimal long-term traffic impacts. There could be routine or as-needed maintenance along the cable routes or at the OnCS-DC; however, this would be negligible in the context of the surrounding area.

3.6.3.5.2.2 Offshore Activities and Facilities

Energy security/generation: The Proposed Action would install 94, 11-MW WTGs within 102 positions that would expect to produce up to 1,034 MW of electricity, or 3 percent of the estimated 35 GW of reasonably foreseeable offshore wind generation potential for the U.S. East Coast. Offshore wind energy projects could produce energy at long-term fixed costs, which could provide stability against fossil fuel price volatility once built. Therefore, the Proposed Action would provide long-term contributions to energy security and resilience through a stable supply of energy. In context of reasonably foreseeable environmental trends, future offshore wind activities would have similar contributions to energy generation and security as the Proposed Action but on a larger scale. Impacts related to energy generation and security would have long-term, regional, and minor beneficial impacts on demographics, employment, and economics.

Cable emplacement and maintenance: O&M activities related to the offshore cable emplacement for the Proposed Action would temporarily affect commercial fishing and for-hire recreational fishing businesses, marine recreation, and subsistence fishing during infrequent maintenance; however, would be less than during construction and installation and considered negligible.

Lighting: As described in Section 3.6.9, *Scenic and Visual Resources*, nighttime aviation safety lighting on all of the Proposed Action's WTGs could be visible from coastal and elevated locations (depending on vegetation, topography, weather, and atmospheric conditions). Sunrise Wind has committed to voluntarily implement ADLS or related means (e.g., dimming or shielding) to limit visual impact as an APM to limit visual impacts. ADLS would activate the Proposed Action's WTG lighting only when aircraft approach the Sunrise Wind Project WTGs, as compared to standard continuous FAA hazard lighting.

Aviation hazard lighting from 94 WTGs associated with the Proposed Action could potentially be visible from coastal locations. Related impacts could include recreational and commercial fishing, pleasure, and tour boating community would experience major adverse effects in foreground views, while onshore viewers would experience minor to moderate effects from nighttime lighting associated with O&M activities. ADLS reduces nighttime impact significance from major to moderate and moderate to minor, due to substantially limited hours of lighting.

In addition, as noted in Section 3.6.3, studies have shown that there is little evidence to indicate the construction and operation of WTGs in offshore areas at the distance the SRWF would be located would have an impact on property values. Therefore, it is unlikely that the development of offshore wind farms and the presence of structures, and associated lighting, would have an impact on property values of homes onshore, so impacts on demographics, employment, and economics would be negligible.

Noise: Noise impacts related to the Proposed Action's O&M activities for offshore facilities would take two forms. In the offshore environment, noise from vessel traffic would affect commercial fishing businesses and recreational businesses due to impacts on species important to commercial fishing and for-hire fishing, recreational fishing, and marine sightseeing activities and noise from maintenance and repair operations that make the wind energy facilities less attractive to fishing operators and recreational boaters. Noise from O&M activities would have localized, intermittent, long-term, negligible impacts on demographics, employment, and economics.

The Proposed Action would also consider the use of five ports for support during offshore O&M activities. These ports have other industrial and commercial sites, as well as major roads, which generate ongoing noise. Therefore, noise from vessels or O&M mobilizing activities from the Proposed Action alone would have variable, negligible impacts on demographics, employment and economics.

Port utilization: The Proposed Action would require port facilities to support O&M activities related to offshore facilities. Five ports are being considered for supporting offshore O&M activities (see Table 3.6.3-2). 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. Long-term job creation related to offshore O&M activities are noted at the beginning of this section (see Section 3.6.3.5), and to the extent feasible would be hired from the local labor force.

The Proposed Action would have a long-term, minor beneficial impact due to greater economic activity and increased employment at the ports in the GAA, although to a lesser extent during the O&M phase than during construction. The Proposed Action would also have minor beneficial impacts on through long-term increased job availability and investment in port facilities supporting other marine-related businesses.

Presence of structures: The Proposed Action would add up to 95 offshore wind structures (94 WTGs and 1 OCS-DC) along with an offshore export cable. The presence of structures could have both adverse and beneficial effects as outlined below.

The presence of these structures could affect marine-based businesses (i.e., commercial fishing and for-hire recreational fishing businesses, offshore recreational businesses, and related businesses) through impacts such as entanglement and gear loss/damage, navigational hazard and risk of allisions, fish aggregation, habitat alteration, and space use conflicts. These structures may cause vessel operators to reroute, which would affect their fuel costs, operating time, and revenue. Due to the risk of gear entanglement, fisheries using bottom gear may be permanently disrupted, which would increase economic impacts on the commercial fishing and for-hire recreational fishing industries. This would have continuous, long-term, and minor impacts on demographics, employment, and economics.

Offshore wind structures could encourage fish aggregation and generate reef effects that attract recreational fishing vessels. These effects would only affect the minority of recreational fishing vessels that reach the wind energy facilities. This would have long-term, negligible benefits on demographics, employment, and economics. Proposed Action structures could increase economic activity associated with offshore sightseeing because these structures create foraging opportunities for harbor and gray seals, sea turtles, bats, northern gannets, loons, and peregrine falcons. Some offshore wind structures would provide the possibility of tours for visitors interested in a close-up view of the wind structures, as has occurred for the BIWF. This would have long-term, negligible beneficial impacts on demographics, employment, and economics.

Views of WTGs could have impacts on businesses serving the recreation and tourism industry. The presence of offshore wind structures could affect shore-based activities, surface water activities, wildlife and sightseeing activities, diving/snorkeling, and recreational boating (see Sections 3.6.8, *Recreation and Tourism*, and Section 3.6.9, *Scenic and Visual Resources*, for additional discussion of related impacts). In addition, as noted previously in this section, studies have shown that there is little evidence to indicate the construction and operation of WTGs in offshore areas at the distance the SRWF would be located would have an impact on property values (Atkinson-Palombo and Hoen 2014). Therefore, it is unlikely that the development of offshore wind farms and the presence of structures would have an impact on property values of homes onshore.

The development of offshore wind and presence of offshore structures in general would affect employment and economics by affecting marine-based businesses. Presence of structures would have both beneficial impacts, such as by providing sightseeing opportunities and fish aggregation that benefit recreational businesses, and adverse effects, such as by causing fishing gear loss, navigational hazards, and viewshed impacts that could affect business operations and income. The Proposed Action would have a long-term, moderate impact on demographics, employment, and economics, due to impacts on commercial fishing and for-hire recreational fishing, for-hire recreational boating, and associated businesses.

Traffic: The Proposed Action would generate vessel traffic in the proposed Project Area and to and from the ports supporting offshore project O&M activities. Increased vessel traffic would increase the use of port and marine businesses, including tug services, dockage, fueling, inspection/repairs, and provisioning. The vessel traffic generated by the Proposed Action alone would result in increased business for marine transportation and supporting services in the GAA with continuous, short-term, and negligible beneficial impacts during the O&M phase. Vessel traffic associated with the Proposed Action could also result in short-term, periodic congestion within and near ports, leading to potential delays and an increased risk for collisions between vessels, which would result in economic costs for vessel owners. As a result of potential delays from increased congestion and increased risk of damage from collisions, the Proposed Action would have continuous, short-term, and negligible impacts during operations.

Climate change: Climate models predict climate change if current trends continue. Climate change has adverse implications for demographics and economic health of coastal communities, due in part to the costs of resultant damage to property and infrastructure, fisheries, and other natural resources, among other factors. It is anticipated that there would be a net reduction in GHG emissions that contribute to climate change, and no collective adverse impact on climate change as a result of offshore wind projects. To the degree that offshore wind facilities contribute to the overall effort to limit climate change, these projects would reduce the socioeconomic impacts associated with the effects of climate change. The Proposed Action would have long-term, negligible beneficial impacts on demographics, employment, and economics from these IPFs due to the small reduction in or avoidance of emissions from power generation. Future offshore wind activities would have similar contributions as the Proposed Action but at a larger scale. The contribution of the Proposed Action to the combined impacts from ongoing and planned activities would have a long-term, minor benefit.

3.6.3.5.3 Conceptual Decommissioning

3.6.3.5.3.1 Onshore Activities and Facilities

Cable emplacement and maintenance: Onshore cable decommissioning would be similar in nature to the construction and installation related impacts. Impacts during cable decommissioning would be similar to other construction type projects, and could include air emissions, noise, and traffic impacts, as well as visual impacts. However, the decommissioning would be short-term and even shorter-term than construction and is considered a negligible impact.

Land disturbance: The decommissioning phase for onshore activities and facilities would be similar to, or of lesser intensity, than during the construction and installation phase and would occur for a shorter period of time. Potential impacts related to land disturbance would be similar to, or less than under the construction and installation phase, and also short-term, and therefore considered a negligible impact.

Lighting: Lighting in this context primarily refers to aviation safety lighting for the offshore WTGs, and there is not anticipated to be additional lighting for onshore activities and facilities outside of perhaps some lights during the decommissioning period, as needed. The impact of any onshore lighting related to the Proposed Action would be short-term and negligible.

Noise: Noise onshore may be present from the decommissioning activities of the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable, which may include similar activities as during construction and installation. This would include construction-related vehicle noise (i.e., dump trucks, backhoes, concrete saws, air compressors and portable generators), site rehabilitation, and general vehicular traffic. The noise generated during decommissioning of onshore facilities would be short-term, and impacts would be negligible to minor.

Traffic: Traffic in this context primarily refers to land-based vehicular traffic related to the decommissioning of onshore facilities, including the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable, which is assumed to be similar to construction and installation. This may require some detours and/or additional congestion during the period of decommissioning of the onshore facilities along the roadways where the cable would be installed but be similar to a routine construction project. Traffic pattern changes or congestion could affect business activities in the vicinity of the onshore facilities, but impacts would be short-term nature and considered negligible to minor.

3.6.3.5.3.2 Offshore Activities and Facilities

Cable emplacement and maintenance: The decommissioning of offshore cable for the Proposed Action would temporarily affect commercial fishing and for-hire recreational fishing businesses, marine recreation, and subsistence fishing during cable installation, in a similar manner as during construction and installation but to a lesser degree. Decommissioning activities would have a short-term, localized, minor impact on marine businesses (commercial fishing or recreation businesses). Decommissioning activities could affect fish and mammals of interest for fishing and sightseeing through dredging and turbulence, although species would recover upon completion and removal of the cable. Decommissioning of offshore components for the Proposed Action could therefore have a short-term, minor impact.

Lighting: Lighting in this context refers primarily to the aviation hazard lighting on the WTGs but could also include minor to moderate effects from nighttime lighting associated with vessels and other decommissioning related equipment. The impacts would be primarily to the recreational and commercial fishing, pleasure, and tour boating community. The impact from visual impacts associated with lighting from offshore facility decommissioning would be negligible and the impacts from potential marine related businesses being impacted would be short-term and minor.

Noise: Noise from decommissioning offshore facilities associated with the Proposed Action could temporarily affect fish and marine mammal populations, hindering fishing and sightseeing near decommissioning activity within the SRWF Lease Area, which could discourage some businesses from operating in these areas (see Sections 3.6.1, *Commercial Fisheries and For-Hire Recreational Fishing*). It is assumed noise generated during decommissioning would be similar to that experienced during construction. This would result in a localized, short-term, negligible impact on marine-related businesses and therefore demographics, employment and economics, but would return to normal conditions following the completion of decommissioning activities.

Port utilization: The Proposed Action would require port facilities for decommissioning activities related to offshore facilities. It is assumed that the same 10 ports identified for construction and installation would support decommissioning activities. Similar to construction, 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.

These jobs related to decommissioning of offshore facilities would be short-term. As a result of this activity, and offshore wind development in general, investments are being made at many of these ports, which would benefit other port users, including maintenance and dredging of shipping channels. The Proposed Action would have a minor beneficial impact on demographics, employment, and economics from port utilization during decommissioning activities.

Traffic: In this context, traffic is referring to vessel traffic generated during decommissioning of offshore facilities related to the Proposed Action. It is assumed that vessels supporting the decommissioning would originate or terminate at one of the same ten ports being considered to support the proposed Project during the construction and installation phase. Vessel traffic impacts during decommissioning would be similar to, or less than the impacts during construction and installation and be considered negligible to minor.

3.6.3.5.4 Cumulative Impacts of the Proposed Action

This section outlines the cumulative impacts of the Proposed Action considered in combination with other ongoing and planned wind activities.

In context of reasonably foreseeable environmental trends, the incremental contributions of the Proposed Action to the combined energy security/generation impacts from ongoing and planned activities including offshore wind. Impacts related to energy generation and security would have long-term, regional, and minor beneficial impacts on demographics, employment, and economics.

The exact extent of land disturbance associated with other projects would depend on the locations of landfall, onshore transmission cable routes, and onshore substations for offshore wind energy projects. Therefore, in context of reasonably foreseeable environmental trends, the incremental impacts contributed by the Proposed Action to the combined land disturbance impacts from ongoing and planned activities including offshore wind would be short term and noticeable due to the short-term and localized disruption of onshore businesses.

WTG lighting in ongoing and planned offshore wind activities would be visible from the same locations as the Proposed Action. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined lighting impacts from ongoing and planned activities including offshore wind, which would be negligible.

In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined cable emplacement and maintenance impacts on demographics, employment, and economics from ongoing and planned activities including offshore wind, which would be short term and minor.

There are several wind projects adjacent to or in close proximity to the SRWF lease area, and the Proposed Action is anticipated to overlap with construction of these offshore wind projects, potentially contributing to increased noise impacts during simultaneous construction activity (Appendix E). While operational activity would overlap, noise impacts during operations would be far less than during construction. Therefore, in context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined noise impacts on demographics, employment, and economics from ongoing and planned activities including offshore wind, which would be short term and negligible.

Other offshore wind energy activity would provide support (either construction support, O&M or both) at the same ports as the Proposed Action as well as other ports within the GAA. Port investments are ongoing and planned in response to offshore wind activity. Maintenance and dredging of shipping channels are expected to increase, which would benefit other port users. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the impacts from other ongoing and planned activities, which would be long term, moderate, and beneficial on port utilization and the associated trained and skilled offshore wind workforce that would contribute economic activity in port communities and the region as a whole.

Offshore structures, including those of the Proposed Action, would affect employment and economics by affecting marine-based businesses. Presence of structures would have both beneficial impacts, such as by providing sightseeing opportunities and fish aggregation that benefit recreational businesses, and adverse effects, such as by causing fishing gear loss, navigational hazards, and viewshed impacts that could affect business operations and income. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute an undetectable increment to the combined impacts on demographics, employment, and economics from other ongoing and planned activities including offshore wind, which would be long term and moderate due to impacts on commercial and for-hire recreational fishing, for-hire recreational boating, and associated businesses.

In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined impacts on vessel traffic from ongoing and planned activities including offshore wind, which would be minor during construction and decommissioning and negligible during operations. Increased vessel traffic would produce demand for supporting marine services, with beneficial impacts on employment and economics during all project phases, including minor to moderate beneficial impacts during construction and decommissioning and negligible beneficial impacts during operations. The increased vessel traffic congestion and collision risk would also have long-term, continuous impacts on marine businesses during all project phases, with minor impacts during construction and decommissioning and negligible impacts during operations.

3.6.3.5.5 Conclusions

Impacts of the Proposed Action

BOEM anticipates that the Proposed Action would have **negligible** impacts on demographics within the analysis area. While it is likely that some workers would relocate to the area due to the Proposed Action, this volume of workers would not be substantial compared to the current population and housing supply in the analysis area. In addition, where feasible, as presented within the COP, Section 4.7.1.3 (Sunrise Wind 2022), to the extent feasible local workers would be hired to meet labor needs for the proposed Project. The Proposed Action would affect employment and economics through job creation, expenditures on local businesses, tax revenues, grant funds, and support for additional regional offshore wind development, which would have **minor beneficial** impacts. Construction would have a **minor beneficial** impact on employment and economics due to jobs and revenue creation over the short duration of the construction period. The beneficial impact of employment and expenditures during O&M would less than during construction and have a modest magnitude over the 35-year duration of the proposed Project. Although tax revenues and grant funds would be modest in magnitude compared to other economic activity in the region, they also would provide a beneficial impact on public expenditures and local workforce and supply chain development for offshore wind. If the Proposed Action becomes decommissioned, the impacts on demographics, employment, and economics would be **minor** and **beneficial** due to the construction activity necessary to remove wind facility structures and associated equipment both onshore and offshore. After decommissioning, the Proposed Action would no longer affect employment or produce other offshore wind-related revenues.

While the Proposed Action's 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, land disturbance, and the long-term presence of offshore lighting and structures would have **negligible** to **minor** adverse impacts on demographics, employment, and economics. This would include impacts during construction, and to a lesser degree during O&M, to the commercial fishing and for-hire recreational fishing industry and other marine-related businesses that depend on local seafood production. Overall, the impacts on commercial fishing and onshore seafood businesses would have **minor** impacts on demographics, employment, and economics for this component of the GAA's economy. Although commercial fishing is a relatively small component of the regional economy, it is important to the identity of local communities within the region and analysis area. The IPFs associated with the Proposed Action would also result in impacts on certain recreation and tourism businesses (see also Section 3.6.8, *Recreation and Tourism*) that range from **negligible** to **minor**, with an overall **minor** impact on employment and economic activity for this component of the analysis area's economy.

Cumulative Impacts of the Proposed Action

In context of other reasonably foreseeable environmental trends, the contribution of the Proposed Action to the impacts of individual IPFs resulting from ongoing and planned activities would range from **negligible** to **moderate** adverse impacts and **negligible** to **moderate beneficial** impacts. Overall, BOEM anticipates that the Proposed Action and ongoing and planned activities would result in **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment, and economics in the GAA. 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 (i.e., ports, etc.) improvements, while the **minor** adverse effects would result from aviation hazard lighting on WTGs, new cable emplacement and maintenance, the presence of structures, vessel traffic and collisions during construction, and land disturbance. Impacts on commercial and for-hire recreational fishing are anticipated to be **moderate** on an individual basis, but only one component of the overall impacts. Because they are not expected to disrupt normal demographic, employment, and economic trends, the overall impacts in the geographical analysis area likely would be **minor**. In addition, in context of reasonably foreseeable environmental trends, the Proposed Action and ongoing and planned activities would have a notable and measurable benefit from construction and operations-phase employment and would have **moderate beneficial** impacts on demographics, employment, and economics.

3.6.3.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.6.3.6.1 Construction and Installation

3.6.3.6.1.1 Onshore Activities and Facilities

Under Alternative C-1, the potential impacts to demographics, employment and economics from the construction and installation of onshore activities and facilities are anticipated to be the same as described under the Proposed Action.

3.6.3.6.1.2 Offshore Activities and Facilities

Under Alternative C-1, the construction of the 11-MW WTGs, OCS-DC, and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Removal of 8 WTG positions from Priority Areas would not change the overall number of WTGs associated with the Project. Therefore, the potential impacts from the construction and installation of offshore activities and facilities on demographics, employment and economics are anticipated to be the same as described under the Proposed Action.

3.6.3.6.2 Operations and Maintenance

3.6.3.6.2.1 Onshore Activities and Facilities

Under Alternative C-1, the potential impacts to demographics, employment and economics are anticipated to be the same as described under the Proposed Action.

3.6.3.6.2.2 Offshore Activities and Facilities

Under Alternative C-1, the construction of the 11-MW WTGs, OCS-DC, and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Removal of 8 WTG positions from Priority Areas would not change the overall number of WTGs associated with the Project. Therefore, the potential impacts from the operations and maintenance of offshore activities and facilities on demographics, employment and economics are anticipated to be the same as described under the Proposed Action.

3.6.3.6.3 Conceptual Decommissioning

3.6.3.6.3.1 Onshore Activities and Facilities

Under Alternative C-1, the potential impacts to demographics, employment and economics are anticipated to be the same as described under the Proposed Action.

3.6.3.6.3.2 Offshore Activities and Facilities

Under Alternative C-1, the construction of the 11-MW WTGs, OCS-DC, and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Removal of 8 WTG positions from Priority Areas would not change the overall number of WTGs associated with the Project. Therefore, the potential impacts from the conceptual decommissioning of offshore activities and facilities on demographics, employment and economics are anticipated to be the same as described under the Proposed Action.

3.6.3.6.4 Cumulative Impacts Alternative C-1

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on demographics, employment, and economics would be essentially the same as those described under the Proposed Action, which were noticeable to moderate, depending on the IPF.

3.6.3.6.5 Conclusions

Impacts of Alternative C-1

Alternative C-1 would exclude from development 8 WTG positions in the Priority Areas for the purposes of habitat impact minimization; however, the same overall number of WTGs (94) as the Proposed Action would be installed and operated, along with the same onshore facilities and components. The impacts resulting from individual IPFs associated with Alterative C-1 would result in no change to the overall impact magnitudes to demographics, employment and economics as compared to the Proposed Action. These are anticipated to range from **negligible** to **minor** adverse impacts and **negligible** to **minor beneficial** impacts on demographics, employment, and economics.

Cumulative Impacts of Alternative C-1

Overall, Alternative C-1 combined with ongoing and planned activities would result in the same impacts as described in the Proposed Action, which include **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment and economics in the GAA.

3.6.3.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

3.6.3.7.1 Construction and Installation

3.6.3.7.1.1 Onshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics for onshore activities and facilities are anticipated to be the same as described under the Proposed Action and Alternative C-1. The relocation of 12 WTG positions away from Priority Areas would not change the overall impacts.

3.6.3.7.1.2 Offshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics are anticipated to be the same as described under Alternative C-1. Both Alternative C-1 and C-2 include the exclusion of 8 WTG positions from Priority Areas and the only difference between the alternatives is the relocation of an additional 12 WTGs to the eastern side of the Lease Area under Alternative C-2, which would not substantially change impacts.

3.6.3.7.2 Operations and Maintenance

3.6.3.7.2.1 Onshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics for O&M onshore activities and facilities are anticipated to be the same as described under the Proposed Action and Alternative C-1. The exclusion of 8 WTG positions from Priority Areas and the relocation of an additional 12 WTGs would not change the overall impacts.

3.6.3.7.2.2 Offshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics are anticipated to be the same as described under Alternative C-1. Both Alternative C-1 and C-2 include the exclusion of 8 WTG positions from Priority Areas and the only difference between the alternatives is the relocation of an additional 12 WTG positions to the eastern side of the Lease Area under Alternative C-2, which would not substantially change impacts.

3.6.3.7.3 Conceptual Decommissioning

3.6.3.7.3.1 Onshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics for decommissioning of onshore facilities are anticipated to be the same as described under the Proposed Action and Alternative C-1. The exclusion of 8 WTG positions from Priority Areas and the relocation of an additional 12 WTG positions would not change the overall impacts.

3.6.3.7.3.2 Offshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics due to decommissioning of offshore facilities are anticipated to be the same as described under Alternative C-1. Both Alternative C-1 and C-2 include the exclusion of 8 WTG positions from Priority Areas and the only difference between the alternatives is the relocation of an additional 12 WTG positions to the eastern side of the Lease Area under Alternative C-2, which would not substantially change impacts.

3.6.3.7.4 Cumulative Impacts of Alternative C-2

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 to the cumulative impacts on demographics, employment and economics would be similar to or slightly less than those described under the Proposed Action, which were noticeable to moderate, depending on the IPF. The relocation of 12 WTG positions to the eastern portion of the SRWF Lease Area for the purposes of habitat impact minimization would lessen the impacts under certain IPFs but would not substantially change the incremental contribution to cumulative impacts.

3.6.3.7.5 Conclusions

Impacts of Alternative C-2

Alternative C-2 would include the exclusion of development of 8 WTG positions from Priority Areas and the relocation of an additional 12 WTG positions to the eastern portion of the SRWF Lease Area for the purposes of habitat impact minimization; however, the same overall number of WTGs (94) as the Proposed Action would be installed and operated. In addition, there would be no change to the onshore facilities and components. The impacts resulting from individual IPFs associated with Alterative C-2 would be the same as Alternative C-1. The overall impact magnitudes under Alternative C-2 are anticipated to range from **negligible** to **minor** adverse impacts and **negligible** to **minor beneficial** impacts on demographics, employment, and economics.

Cumulative Impacts of Alternative C-2

Impacts related to Alternative C-2 combined with ongoing and planned activities would result in the same impacts as described in the Proposed Action (and Alternative C-1), which include **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment and economics in the GAA.

3.6.3.8 Comparison of Alternatives

As noted above, most alternatives alone are effectively identical in terms of the level of impact on demographics, employment, and economics. The relocation of WTGs associated with Alternatives C-1 and C-2 could have fewer adverse impacts as it relates to fishing industries supported by the local economy, due to locating WTGs away from popular and productive fishing areas and sensitive habitats. Despite these slightly varied impacts, BOEM anticipates that impacts to demographics, employment and economics would range from **minor** adverse to **minor beneficial** for all evaluated action alternatives.

Adverse impacts would result from construction activity (onshore and offshore), port utilization and vessel traffic, noise/lighting, and presence of structures, while beneficial impacts would result primarily from construction activity, job creation, and port infrastructure investment. In combination with reasonably foreseeable trends for the analysis area, impacts to demographics, employment and economics from all evaluated action alternatives and other offshore activity would range from minor adverse to **minor** to **moderate beneficial**. Table 3.6.3-12 provides an overall summary of alternative impacts.

Table 3.6.3-12. Comparison of Alternative Impacts on Demographics, Employment and Economics

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Demographics, Employment, and Economics	*Proposed Action*: BOEM anticipates that the Proposed Action would have **negligible** impacts on demographics within the analysis area. Short-term increases in noise during construction, cable emplacement, 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 impacts on commercial fishing and onshore seafood businesses would have **minor** impacts on demographics, employment, and economics for this component of the GAA's economy. The IPFs associated with the Proposed Action would also result in impacts on certain recreation and tourism businesses that range from **negligible** to **minor**, with an overall **minor** impact on employment and economic activity for this component of the analysis area's economy.	*Alternative C-1*: The impacts resulting from individual IPFs associated with Alterative C-1 would result in no change to the overall impact magnitudes to demographics, employment and economics as compared to the Proposed Action. These are anticipated to range from **negligible** to **minor** adverse impacts and **negligible** to **minor beneficial** impacts on demographics, employment, and economics. *Cumulative Impacts of Alternative C-1*: Overall, Alternative C-1 combined with ongoing and planned activities would result in the same impacts as described in the Proposed Action, which include **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment and economics in the GAA.	*Alternative C-2*: The impacts resulting from individual IPFs associated with Alterative C-2 would be the same as Alternative C-1. The overall impact magnitudes under Alternative C-2 are anticipated to range from **negligible** to **minor** adverse impacts and **negligible** to **minor beneficial** impacts on demographics, employment, and economics. *Cumulative Impacts of Alternative C-2*: Impacts related to Alternative C-2 combined with ongoing and planned activities would result in the same impacts as described in the Proposed Action (and Alternative C-1), which include **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment and economics in the GAA.

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
	Cumulative Impacts of the Proposed Action: Overall, BOEM anticipates that the Proposed Action and ongoing and planned activities would result in **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment, and economics in the GAA. 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 (i.e., ports, etc.) improvements, while the **minor** adverse effects would result from aviation hazard lighting on WTGs, new cable emplacement and maintenance, the presence of structures, vessel traffic and collisions during construction, and land disturbance.		

3.6.3.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2; however for demographics, employment, and economics, there are no measures currently proposed by BOEM. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to demographics, employment, and economics.

3.6.4 Environmental Justice

This section discusses EJ impacts from the proposed Project, alternatives, and ongoing and planned activities in the GAA. The GAA for EJ, as shown in Figure D-14 in Appendix D, includes the counties where proposed onshore infrastructure and potential port cities are located, as well as the counties closest to the WTA, and/or counties immediately adjacent to counties with ports: Suffolk County, Albany County, Rensselaer County, Kings County and New York County, New York; New London County, Connecticut; Baltimore County and the city of Baltimore, Maryland; Bristol County, Barnstable County, Dukes County, Nantucket County, and Plymouth County, Massachusetts; Gloucester County, New Jersey; Providence County, Washington County, Kent County and Newport County, Rhode Island; and the city of Norfolk, Virginia. These counties (or cities) are the most likely to experience beneficial or adverse EJ impacts from the proposed Project related to onshore and offshore construction and use of port facilities.

EJ impacts are characterized for each IPF as negligible, minor, moderate, or major using the four-level classification scheme outlined in Section 3.6.4.3. A determination of whether impacts are "disproportionately high and adverse" in accordance with Executive Order 12898 is provided in the conclusion sections for the Proposed Action and action alternatives.

3.6.4.1 Description of the Affected Environment and Future Baseline Conditions

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires that "each Federal agency shall make achieving EJ part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations" (Subsection 1-101). When determining whether environmental effects are disproportionately high and adverse, agencies are to consider whether there is or would be an impact on the natural or physical environment that significantly and adversely affects a minority population, low-income population, or Indian tribe, including ecological, cultural, human health, economic, or social impacts; and whether the effects appreciably exceed those on the general population or other appropriate comparison group (CEQ 1997). Beneficial impacts are not typically considered EJ impacts; however, this section identifies beneficial effects on EJ populations, where appropriate, for completeness.

Executive Order 12898 directs federal agencies to consider the following with respect to EJ as part of the NEPA process (CEQ 1997):

- The racial and economic composition of affected communities;
- Health-related issues that may amplify Project effects on minority or low-income individuals; and
- Public participation strategies, including community or tribal participation in the NEPA process.

According to USEPA guidance, EJ analyses must address disproportionately high and adverse impacts on minority populations (i.e., who are non-white, or who are white but have Hispanic ethnicity) when minority populations represent over 50 percent of the population of an affected area or when the percentage of minority or low-income populations in the affected area is "meaningfully greater" than the minority percentage in the "reference population"—defined as the population of a larger area in which the affected population resides (i.e., a county, state, or region depending on the geographic extent of the analysis area). Low-income populations are those that fall within the annual statistical poverty thresholds from the U.S. Department of Commerce, Bureau of the Census, Population Reports, Series P-60 on Income and Poverty (USEPA 2016).

To evaluate the potential for a disproportionately high and adverse health or environmental impact on an EJ community (defined as minority and/or low-income), it is necessary to identify whether an EJ community is present within the GAA (as shown in Appendix D) for the proposed Project. Recent and relevant data is collected and measured against a community of comparison (or reference population) to determine the presence of EJ communities. To have a comprehensive and transparent approach to EJ community identification, a two-prong approach was implemented whereby EJ communities were identified using both the federal Council on Environmental Quality (CEQ) guidance as well as the state-specific guidance, where available. The Federal CEQ guidance, and state-specific information relative to EJ is presented in the following text and Table 3.6.4-1 as well as methodology and EK community identification.

<u>Federal CEQ Environmental Justice Guidance</u>

Based upon CEQ's EJ guidance under NEPA, race includes minorities, which are groups that include American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. Minority populations are defined where either (a) the minority population of the impacted area exceeds 50 percent or (b) the minority population of the impacted area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997).

CEQ and USEPA guidance do not define *meaningfully greater* in terms of a specific percentage or other quantitative measure. As such, this analysis defines an EJ population as a census block group that either (1) meets USEPA's "50 percent" criterion for race, or (2) is in the 80th or higher percentile for minority or low-income status as compared to the state population in which it is located. USEPA EJ Screening and Mapping Tool (EJSCREEN) data were used to assess the 50 percent criterion for race and the 80th percentile criterion for minority and low-income status (USEPA 2022b).

<u>State Environmental Justice Guidance</u>

In addition to Executive Order 12898, CEQ EJ guidance and other federal guidance, several states within the GAA also have EJ-specific guidance that should be considered. Depending on the state this may range from a discussion of how EJ impacts should be considered within different types of analyses to providing enhanced EJ thresholds and geographic information system (GIS) datasets of EJ communities through their own self-identification methodologies. State-specific EJ guidance, policies, and resources for those states within the GAA is presented in Table 3.6.4-1, followed by additional information on how this information was accounted for in the EJ analysis.

Table 3.6.4-1. Environmental Justice Offices, Policies and Resources for States in the Geographic Analysis Area

State	State Agency/Department and EJ Policies	Description	State Definitions of an Environmental Justice Community	Source
Connecticut	Connecticut Department of Energy & Environmental Protection (CT DEEP), EJ Program Connecticut Department of Economic and Community Development (DECD) maintains a list of "distressed municipalities."	CT DEEP EJ policy, effective in 1993, incorporates EJ principals into its program development, policy making, and regulatory activities. CT DEEP maintains a digital map of EJ communities on its website. CT law Section 22a-20a of the Connecticut General Statutes, effective in 2020, defines "EJ Community" and provides additional procedures for permit applicants and CT DEEP to follow (analysis, public participation, and more) when evaluating permit applications located in EJ communities.	Per CT law – General Statutes 22a-20a: EJ community is defined as (1) a U.S. census block group where 30% or more of the population has an income below 200% of the federal poverty level; or (2) on the DECD distressed municipality list.	CT DEEP. 1993. CT DEEP. 2022. CT DEEP. 2021.
Maryland	Maryland Department of the Environment (MDE) Commission on EJ and Sustainable Communities (CEJSC), advises the state government regarding EJ issues.	The CEJSC was established in 2001 by Executive Order and codified into Maryland law in 2003 (Section 1-701 of the Environment Article of the Md. Ann. Code). CEJSC is broadly tasked with reviewing and analyzing Maryland laws and policies pertaining to EJ issues, including state agency programs and permits. According to its 2020-2021 annual report, CEJSC is developing criteria to identify vulnerable communities and prioritizing action strategies toward the identified areas of the state that need immediate attention.	There are no required EJ identification methods or tools identified. The MDE maintains a webpage of EJ identification tools referencing EPA methods: https://mde.maryland.gov/programs/crossmedia/EnvironmentalJustice/Pages/webtools.aspx	Maryland Commission on EJ and Sustainable Communities. 2021.
Massachusetts	Executive Office of Energy and Environmental Affairs (EEA), EJ Policy of the EEA (2021).	The EEA updated its 2002 EJ policy in 2021 and codified its definition of EJ neighborhoods. It maintains a map of EJ populations online. Mass DEP's EJ Strategy and Public Involvement Plan is in development.	One or more of the following are true: 1. The annual median household income is not more than 65% of the statewide income.	EEA. 2021. EEA. 2020.

State	State Agency/Department and EJ Policies	Description	State Definitions of an Environmental Justice Community	Source
	Massachusetts Department of Environmental Protection (MassDEP)	Passed in 2021, Massachusetts' new climate law requires MassDEP to incorporate new EJ requirements into its Massachusetts Environmental Policy Act (MEPA) processes for issuing permits.	2. Minorities comprise 40% or more of the population. 3. 25% or more of households lack English language proficiency. 4. Minorities comprise 25% or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150% of the statewide annual median household income.	
New Jersey	New Jersey Department of Environmental Protection (DEP) – Office of EJ	DEP's Office of EJ aims to empower residents andcommunities who are often outside of the decision-making process of government, address environmental concerns to improve the quality of life in New Jersey's overburdened communities, and guidestate agencies and the DEP's program areas in incorporating EJ. On September 18, 2020, the Governor signed the New Jersey's EJ Law which defines the criteria by which an overburdened community are identified.	New Jersey's EJ Law criteria: 1. At least 35 percent of the households qualify as low-income households (at or below twice the poverty threshold as determined by the United States Census Bureau) 2. At least 40 percent of the residents identify as minority or as members of a state recognized tribal community 3. At least 40 percent of the households have limited English proficiency (without an adult that speaks English "very well" according to the United States Census Bureau).	New Jersey DEP Office of EJ. 2022.

State	State Agency/Department and EJ Policies	Description	State Definitions of an Environmental Justice Community	Source
New York	New York State Department of Environmental Conservation (NYSDEC) is the NY agency focused on EJ, but NYSERDA, the NY Power Authority, and others are involved. NYSDEC Commissioner Policy 29, EJ and Permitting (2003)	NYSDEC provides guidance for incorporating EJ concerns into its permitting processes. Policy 29 is from 2003 and aimed at effective public participation and providing opportunities for communities and project sponsors to resolve issues of concern to affected potential EJ areas. NYSDEC maintains a webpage dedicated to "Maps and GIS Tools for EJ" and designates potential EJ areas (PEJAs) using relevant race and income Census data on an online map. Note: the NY Climate Justice Working Group is currently developing criteria and a definition of "disadvantaged communities" for purposes of implementing the 2019 NY Climate Justice and Community Protection Act. This may impact the identification of EJ communities in the future, but as of February 2022, this work is meant to direct funding towards disadvantaged communities and no official NYSDEC EJ policies have changed.	Policy 29 identifies minority and low-income communities (i.e., census block groups or contiguous area with multiple census block groups) at 51.1 % for minority communities in an urban area and 23.59 % for low-income communities. NYSDEC Maps and GIS Tools for EJ webpage and map thresholds: - At least 52.42% minority community in an urban area. - At least 26.28% minority community in a rural area. - At least 22.82% of the population in an urban or rural area had household incomes below the federal poverty level.	NYSDEC. 2003. NYSDEC. 2022. NYSERDA. 2021.
Rhode Island	Rhode Island Department of Environmental Management (RIDEM) Policy for Considering EJ in the Review of Investigation and Remediation of ContaminatedProperties (2009)	Requires proactive consideration of EJ issues relative to site investigations and property site remediation projects. RIDEM mapped the locations of EJ focus areas, which provide the basis for minimum notice requirements for the investigation and clean-up of contaminated sites.	RIDEM follows EPA EJ identification guidelines when designated EJ Focus Areas but compares the block groups on a state-wide basis instead of a regional one. RIDEM also mapped areas where the percent of the block group that is minority or low-income are high enough to rank in the top 15% of block groups state-wide.	RIDEM. 2009. RIDEM. 2022.

State	State Agency/Department and EJ Policies	Description	State Definitions of an Environmental Justice Community	Source
Virginia	Virginia Council on EJ (VCEJ), formed in 2019 by Executive Order. Virginia Department of Environmental Quality (VADEQ). VADEQ established an Office of EJ in April 2021 and an Interagency EJ Work Group in August 2021.	In 2019, Virginia Governor Northam issued EO-29 and the VCEJ, which aims to address consistency in how EJ issues are evaluated at the state level. The 2020 Virginia General Assembly underscored the Commonwealth's and VADEQ's commitment to EJ by passing the EJ Act. As of February 2022, Virginia agencies (and the VADEQ in particular) are in the process of rolling out new EJ policies.	Virginia does not have an official EJ identification policy at this time (February 2022), but that would change as the VADEQ and VCEJ establish concrete EJ policies that they are currently in the process of creating.	VADEQ. 2020.

Table Key:

CEJSC – Commission on EJ and Sustainable Communities

CT DEEP – Connecticut Department of Energy & Environmental Protection
DECD – (Connecticut) Department of Economic and Community Development

DEP – Department of Environmental Protection (New Jersey)

MassDEP – Massachusetts Department of Environmental Protection

MDE – Maryland Department of the Environment

MEPA – Massachusetts Environmental Policy Act

NYSDEC – New York State Department of Environmental Conservation

RIDEM – Rhode Island Department of Environmental Management

VADEQ – Virginia Department of Environmental Quality

VCEJ – Virginia Council on EJ

3.6.4.1.1 New York

New York identifies an EJ community, as a Potential EJ Areas (PEJA) which are U.S. Census block groups that meet one of more of the following criteria (NYSDEC 2022): (1) at least 52.42 percent of the minority community is in an urban area, (2) at least 26.28 percent of the minority community is in a rural area, and (3) at least 22.82 percent of the population in an urban or rural area has household incomes below the federal poverty level.

NYSDEC's specific data set PEJA was utilized for this analysis. PEJA has the same general meaning as EJ community. The specific GIS dataset from NYSDEC provides identification of PEJA at the census block group level.

EJ communities in New York's portion of the GAA census block groups that meet criteria of a PEJA are clustered around larger cities and towns near both the potential cable landing sites onshore and potential ports in Suffolk, Albany, Kings, New York and Rensselaer counties (Table 3.6.4-3, Table 3.6.4-4, Figure 3.6.4-1, Figure 3.6.4-2, Figure 3.6.4-3, Figure 3.6.4-4, and Figure 3.6.4-5).

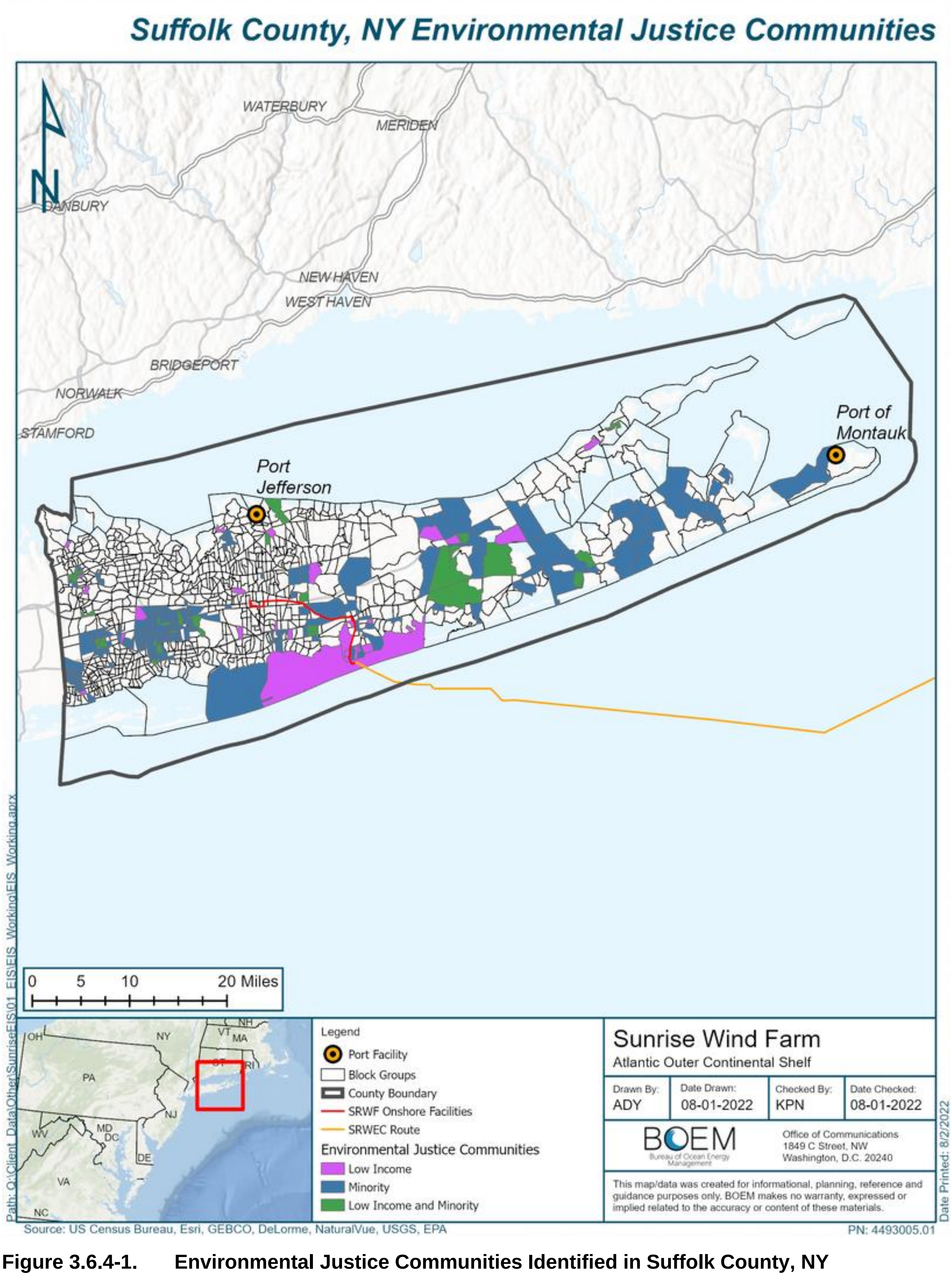

Figure 3.6.4-1. Environmental Justice Communities Identified in Suffolk County, NY

Albany County, NY Environmental Justice Communities

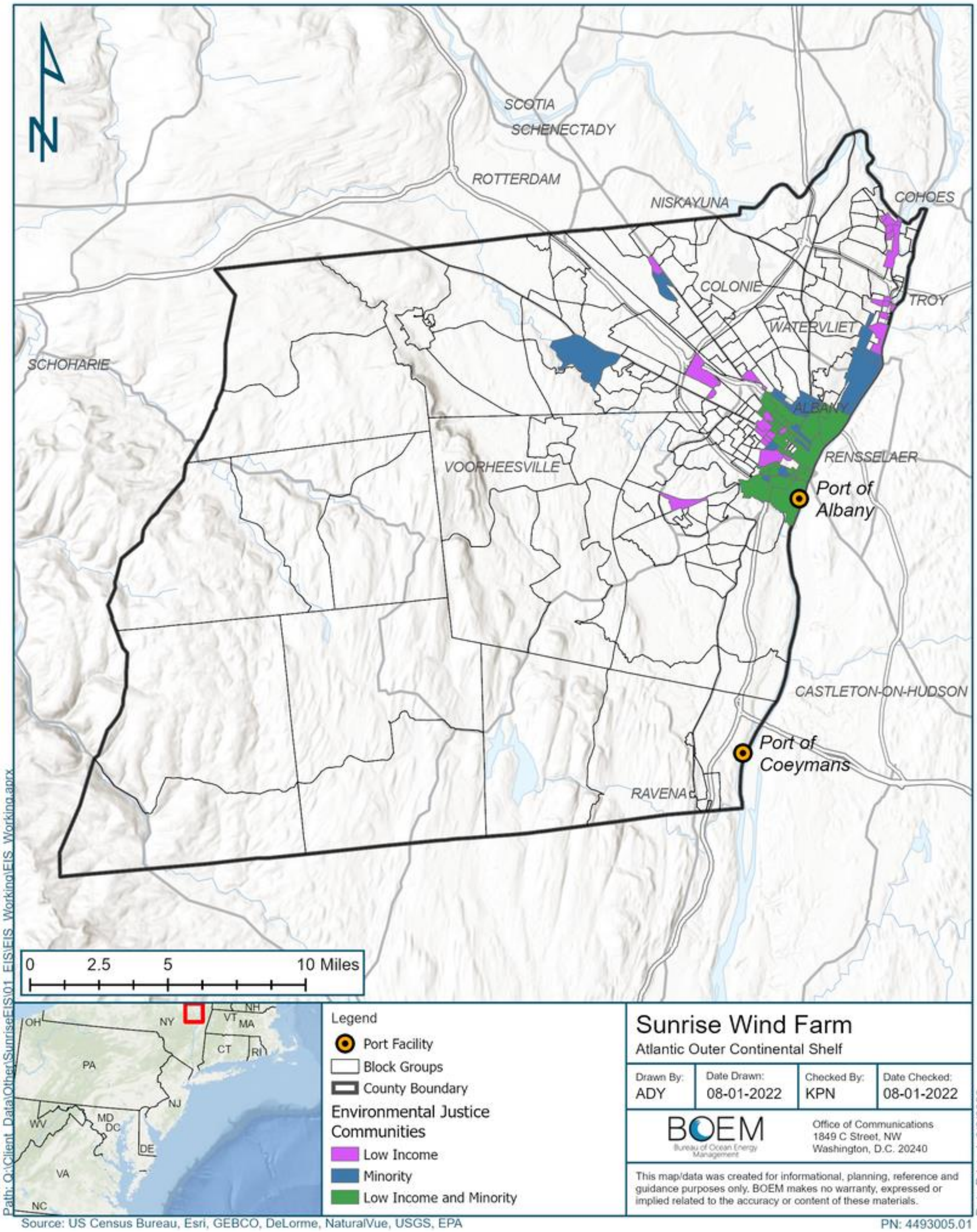

Figure 3.6.4-2. Environmental Justice Communities Identified in Albany County, NY

Kings County, NY Environmental Justice Communities

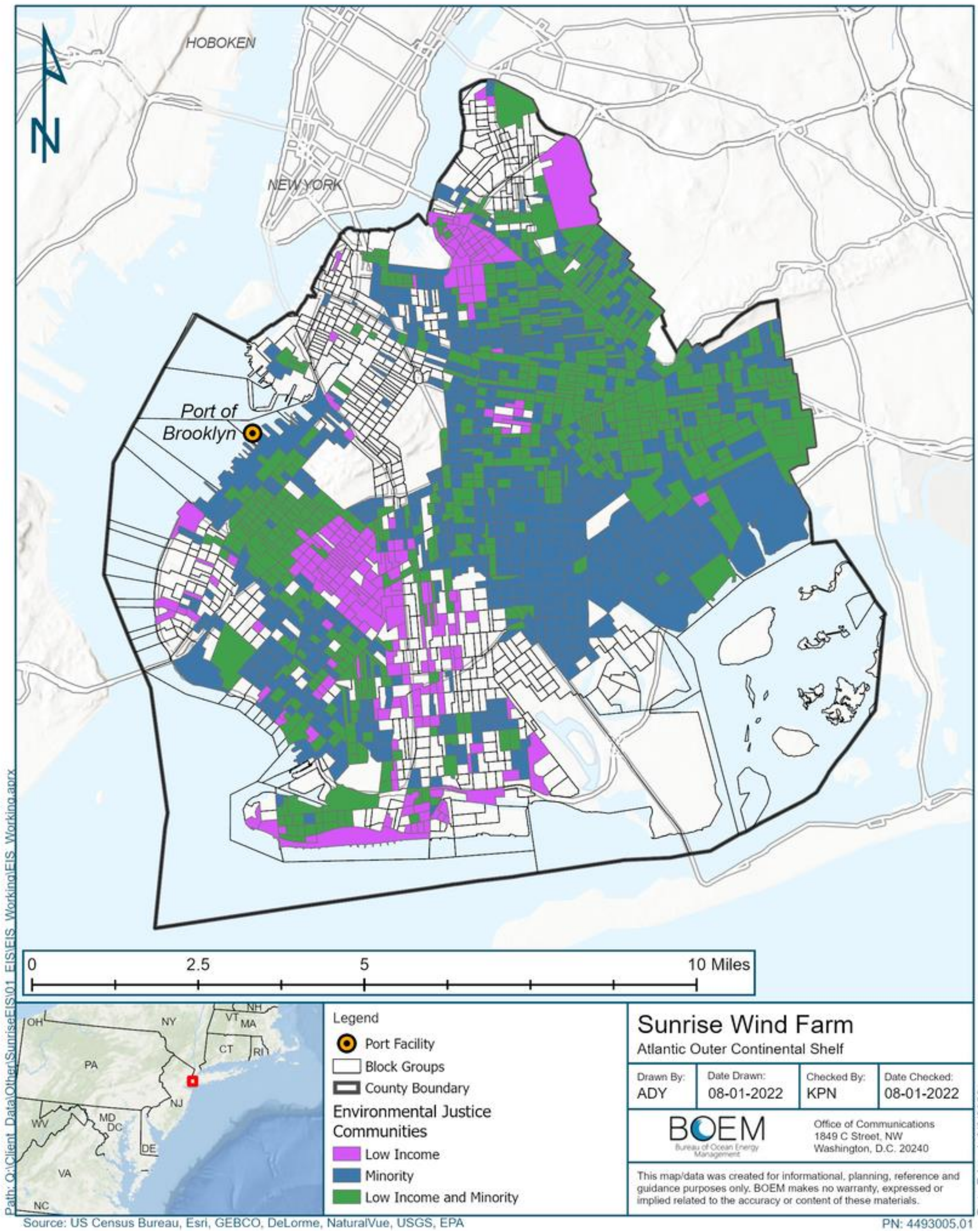

Figure 3.6.4-3. Environmental Justice Communities Identified in Kings County, NY

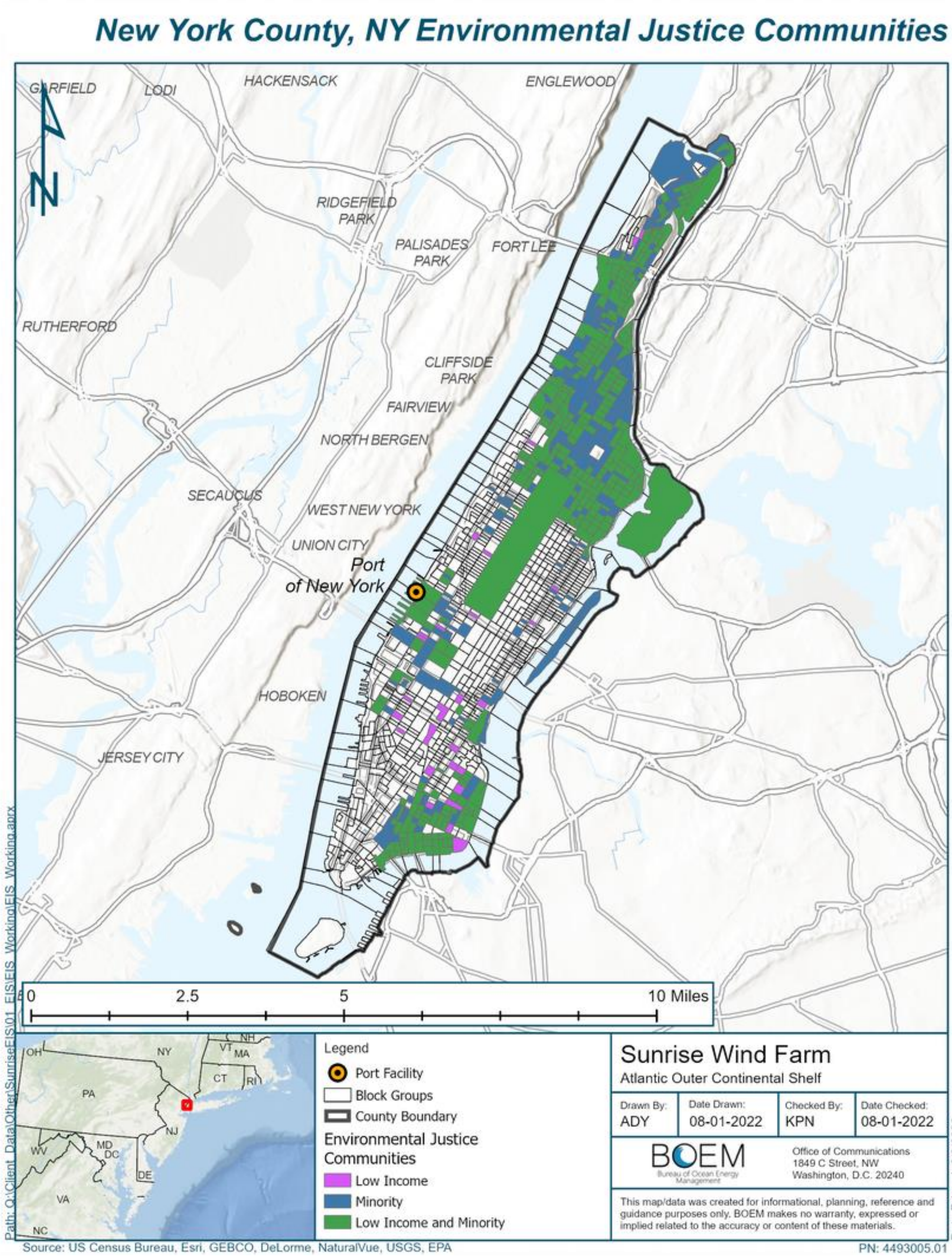

Figure 3.6.4-4. Environmental Justice Communities Identified in New York County, NY

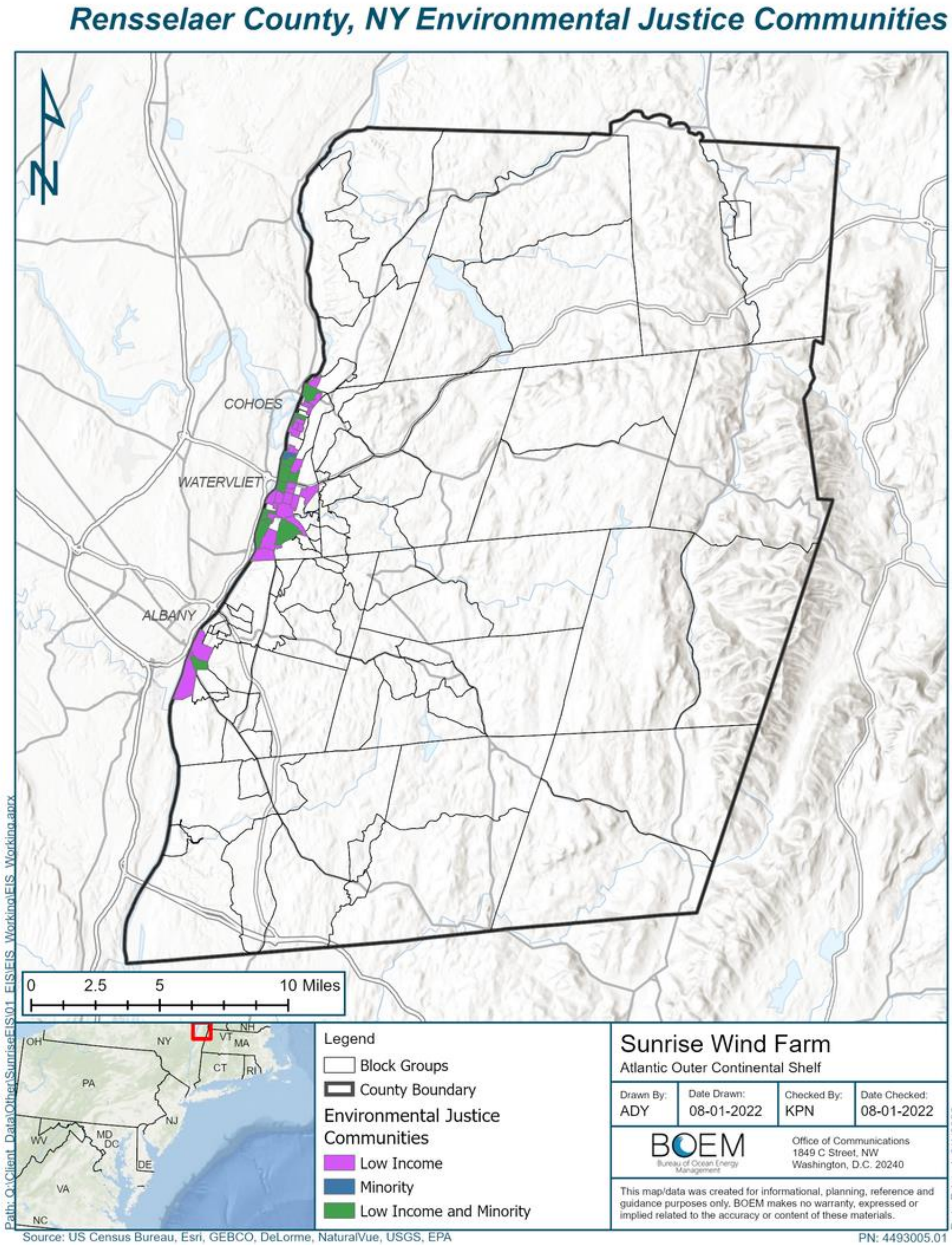

Figure 3.6.4-5. Environmental Justice Communities Identified in Rensselaer County, NY

3.6.4.1.2 New Jersey

New Jersey identifies an EJ community as an Overburdened Community (OBC), which are U.S. Census block groups that utilize low-income, composition of minority or state recognized tribal communities, and limited English proficiency as part of its criteria (EJ Law, N.J.S.A. 13:1D-157).

An OBC, as defined by the New Jersey's EJ Law, is any census block group, as determined in accordance with the most recent United States Census, in which:

- at least 35 percent of the households qualify as low-income households (at or below twice the poverty threshold as determined by the United States Census Bureau);
- at least 40 percent of the residents identify as minority or as members of a State recognized tribal community; or
- at least 40 percent of the households have limited English proficiency (without an adult that speaks English "very well" according to the United States Census Bureau).

For this analysis, the specific dataset from the NJDEP for OBCs was obtained, which provides identification of OBCs at the census block group level.

EJ communities in New Jersey's portion of the GAA that meet criteria for OBCs are clustered around larger cities and towns near the potential ports in Gloucester County (Table 3.6.4-3, Table 3.6.4-4, and Figure 3.6.4-6).

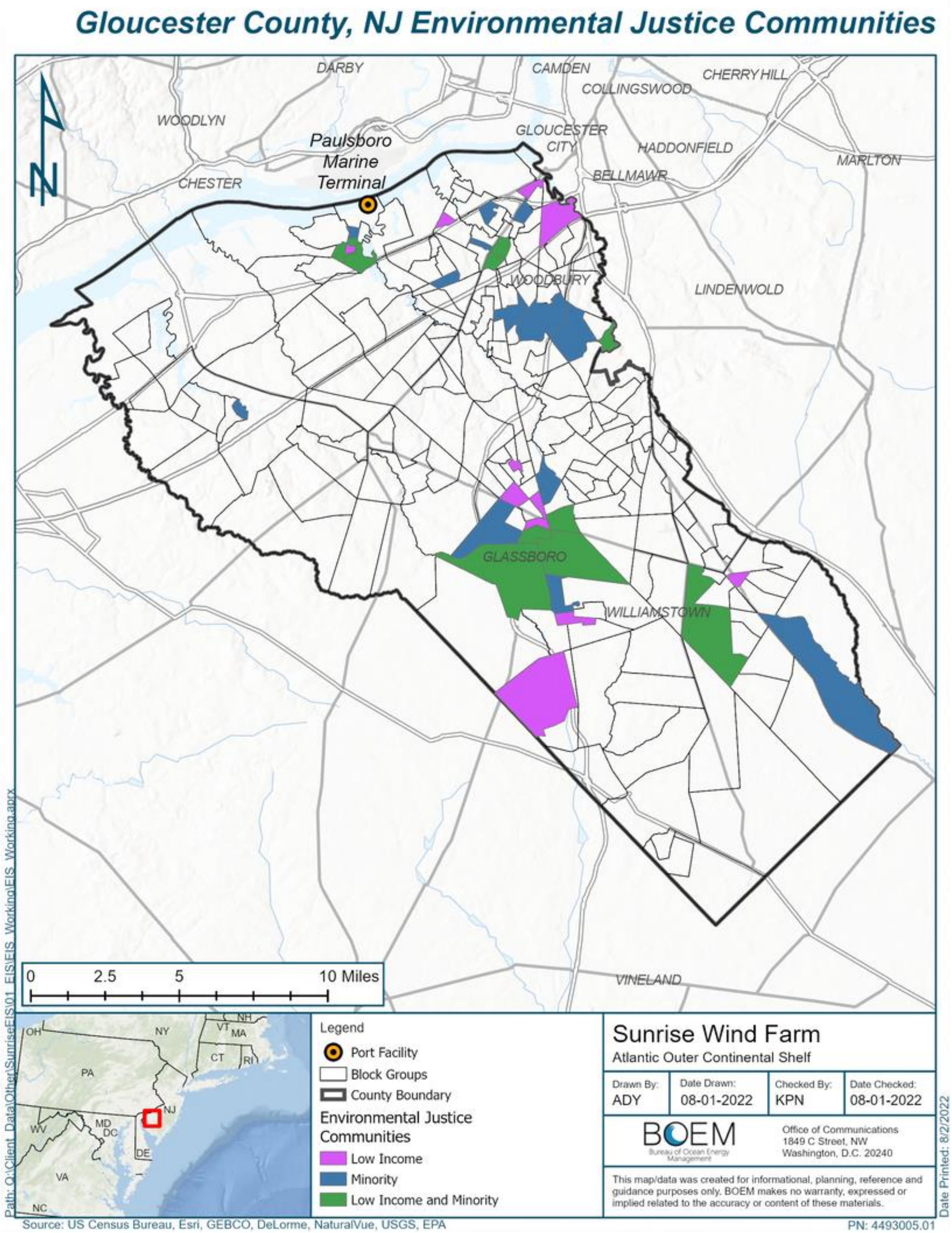

Figure 3.6.4-6. Environmental Justice Communities Identified in Gloucester County, NJ

3.6.4.1.3 Connecticut

Connecticut's state law Section 22a-20a, defines an EJ community as a community located in a municipality on the Connecticut Department of Economic and Community Development (DECD) list of distressed municipalities or in a census block group that is not in a distressed municipality in which 30 percent or more of the population lives below 200 percent of the federal poverty level (FPL). The law provides additional procedures for permit applicants and CT DEEP to follow (analysis, public participation, and more) when evaluating permit applications located in EJ communities.

For this analysis, the EJ community data set at the census block group level was obtained and utilized. However, this dataset did not differentiate between race/ethnicity and income, and for the purposes of this analysis have been grouped into other EJ communities.

EJ communities in Connecticut's portion of the GAA census block groups that meet criteria for an EJ community are clustered around larger cities and towns near the potential ports in New London County (Table 3.6.4-3, Table 3.6.4-4, and Figure 3.6.4-7).

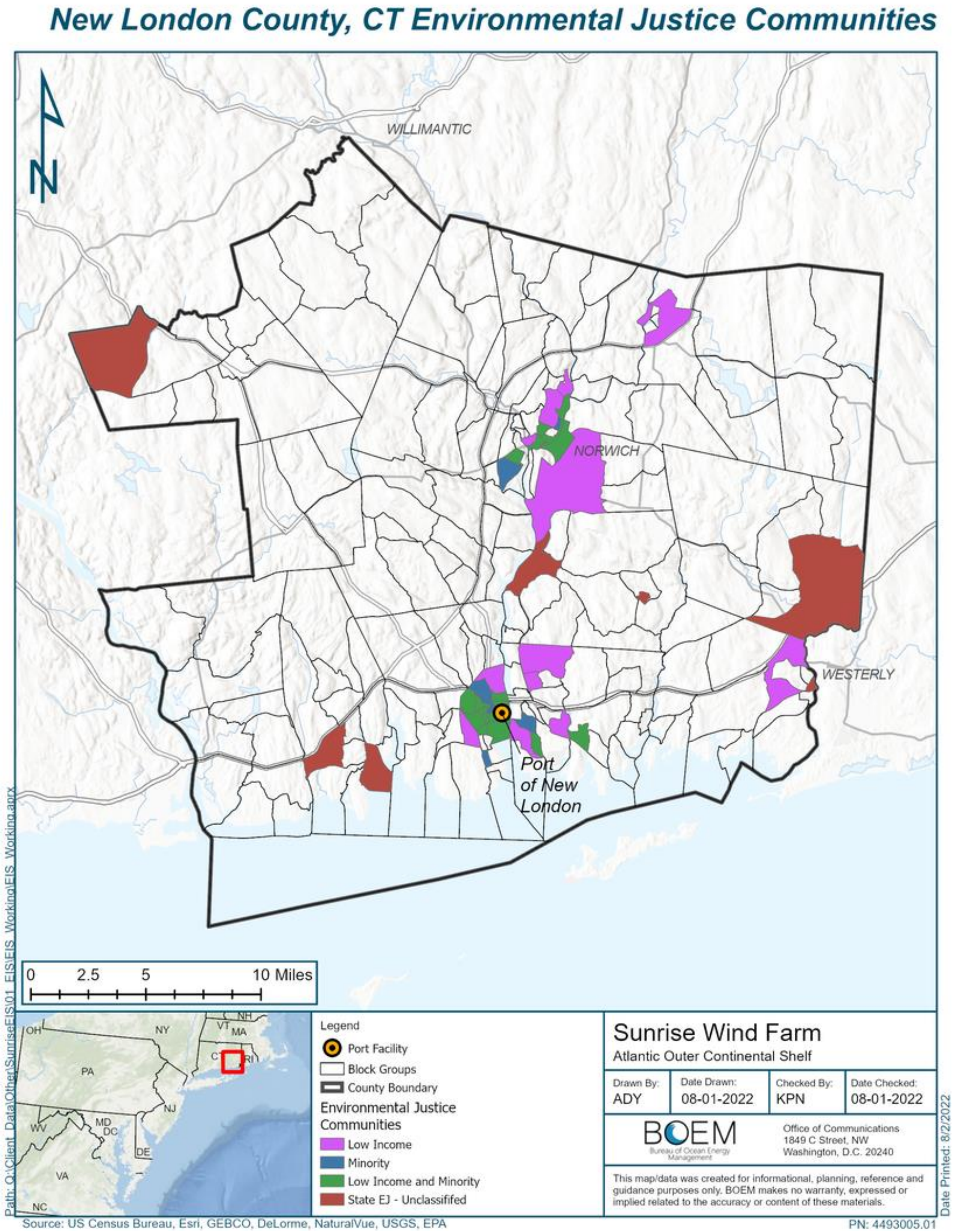

Figure 3.6.4-7. Environmental Justice Communities Identified in New London County, CT

3.6.4.1.4 Massachusetts

Massachusetts identifies an EJ community as U.S. Census block groups based upon household income, composition of minority population, and English language proficiency at the census block group level. Massachusetts' Executive Office of Energy and Environmental Affairs (EEA) issued an EJ Policy of the Executive Office of Energy and Environmental Affairs in June 2021 and maintains a map of EJ populations, which was utilized for this analysis (Massachusetts EEA 2022).

As defined by the EEA, EJ population means:

- (A) neighborhood that meets one or more of the following criteria:
  - (i) the annual median household income is not more than 65 percent of the statewide annual median household income;
  - (ii) minorities comprise 40 per cent or more of the population;
  - (iii) 25 percent or more of households lack English language proficiency; or
  - (iv) minorities comprise 25 percent or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 percent of the statewide annual median household income; or
- (B) a geographic portion of a neighborhood designated by the Secretary as an EJ population in accordance with law.

EJ communities in the Massachusetts' portion of the GAA census block groups that meet criteria for an EJ population are clustered around larger cities and towns near the potential ports in Bristol, Barnstable, Dukes, Nantucket and Plymouth counties (Table 3.6.4-3, Table 3.6.4-4, and Figure 3.6.4-8 through Figure 3.6.4-12).

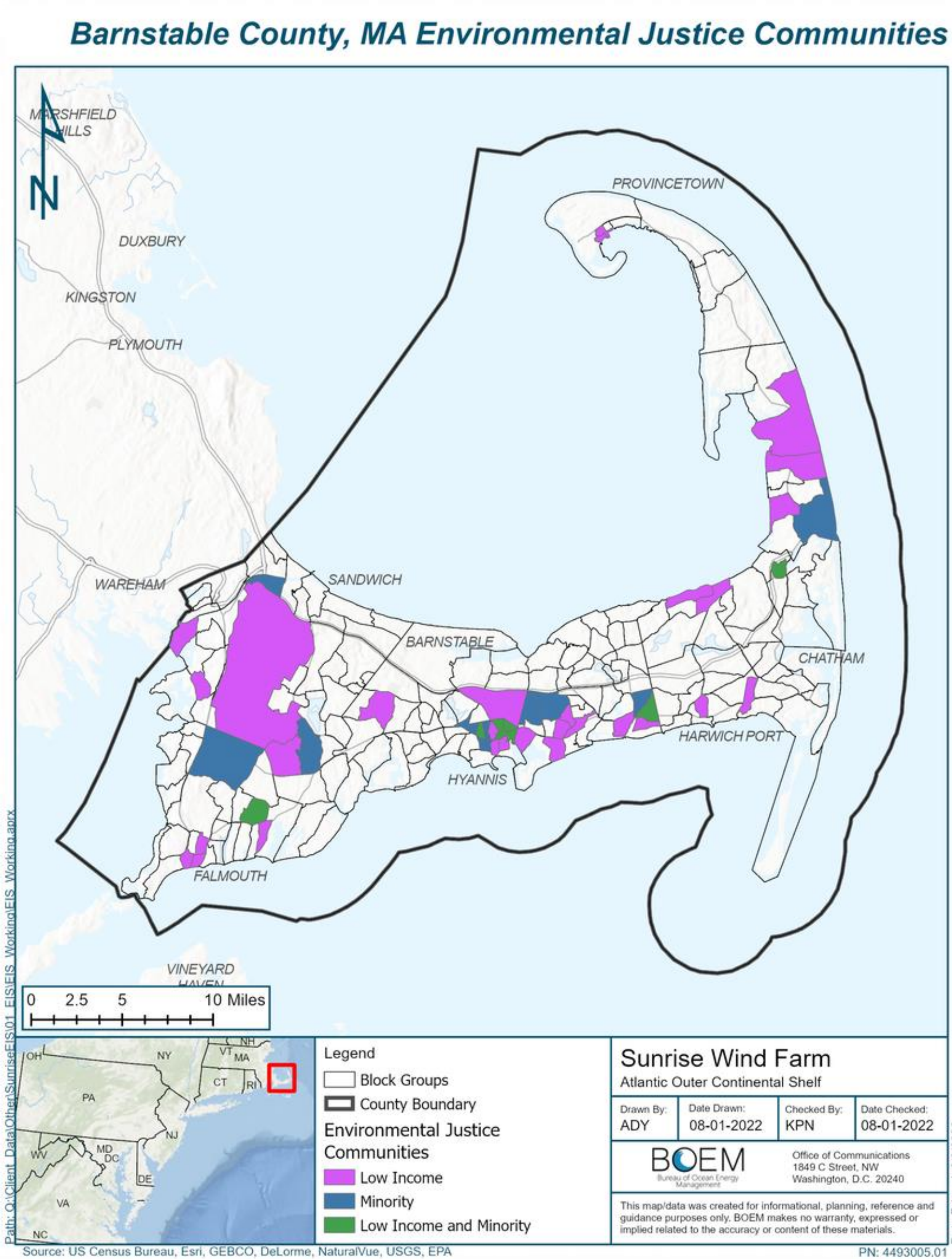

Figure 3.6.4-8. Environmental Justice Communities Identified in Barnstable County, MA

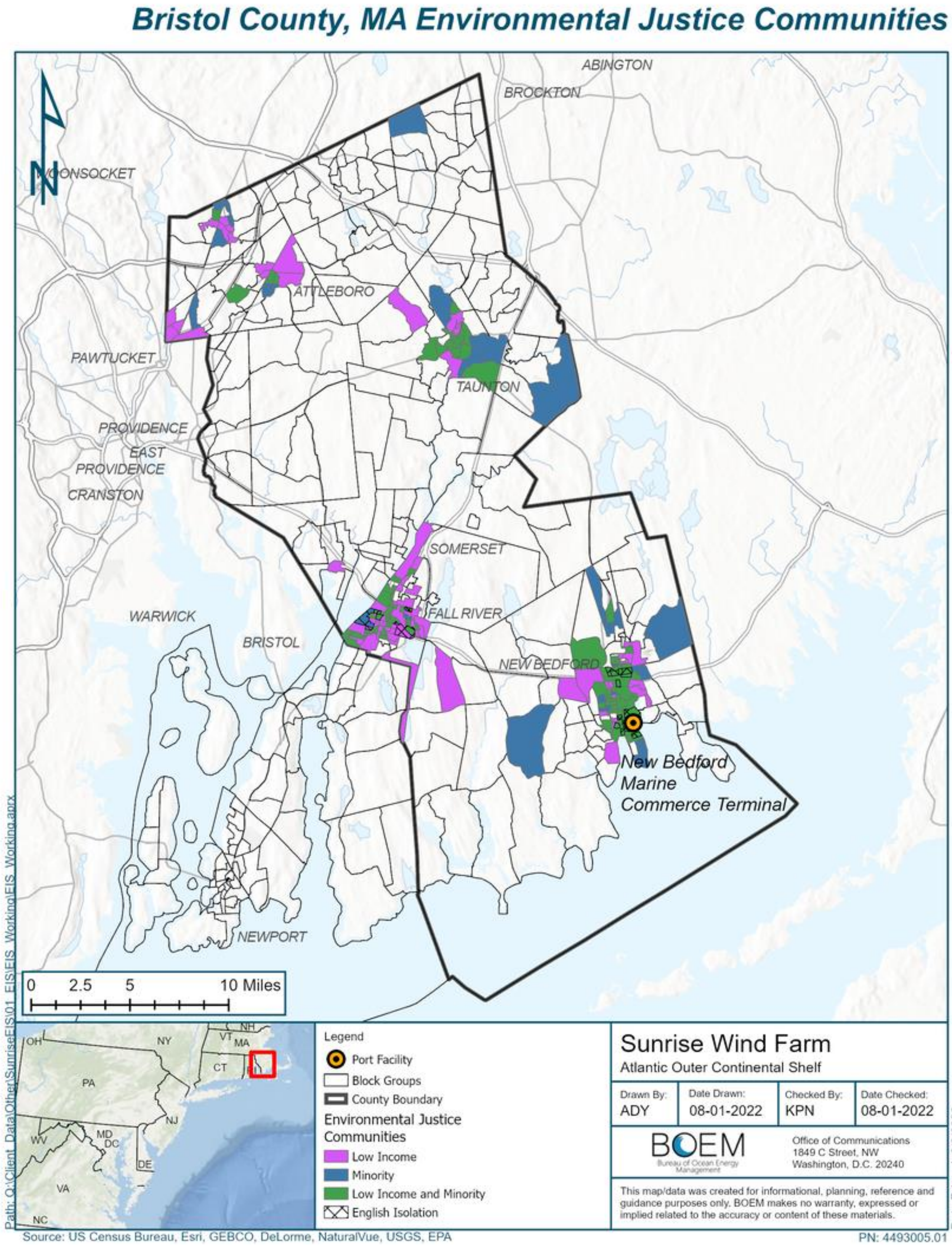

Figure 3.6.4-9. Environmental Justice Communities Identified in Bristol County, MA

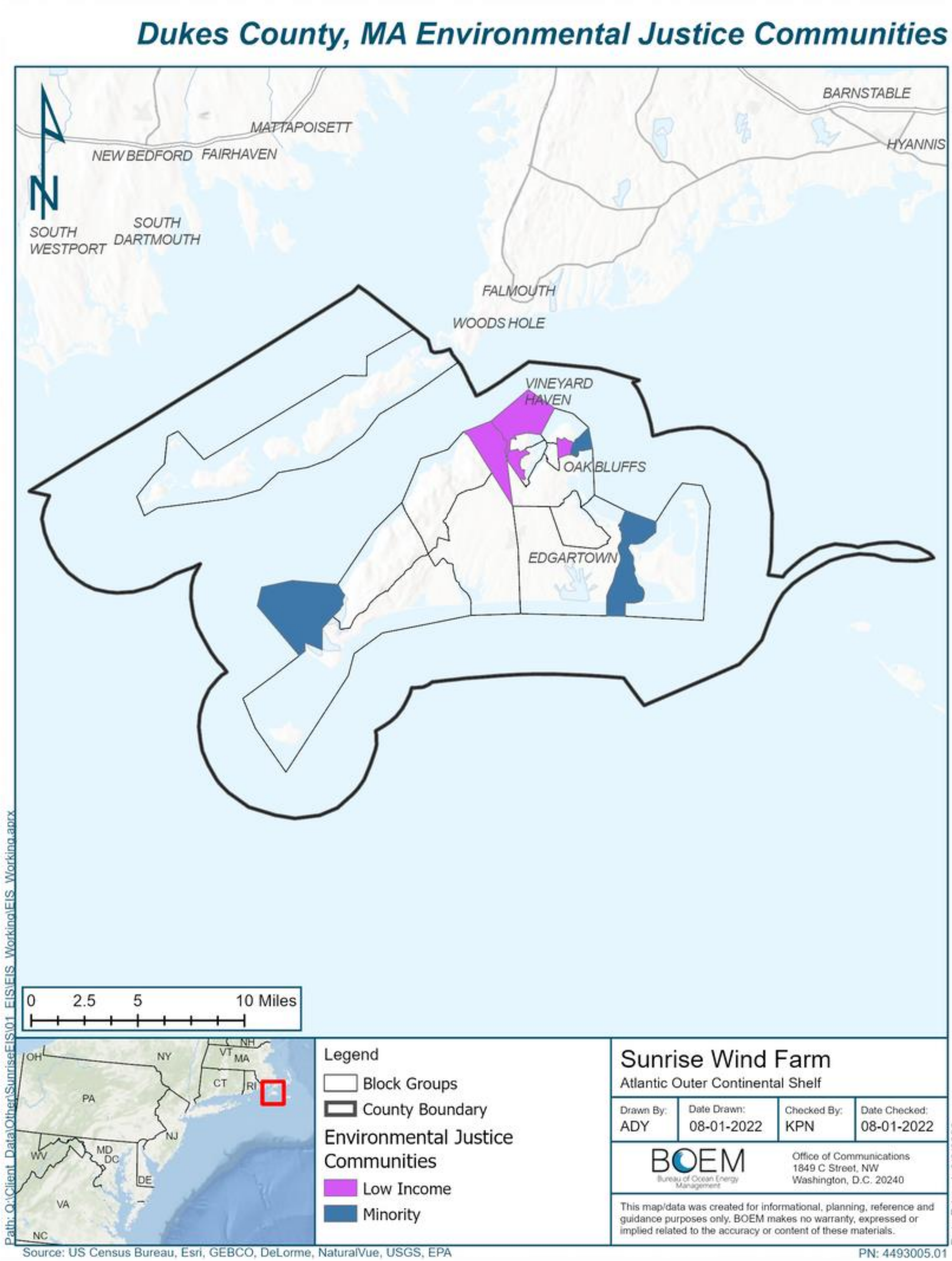

Figure 3.6.4-10. Environmental Justice Communities Identified in Dukes County, MA

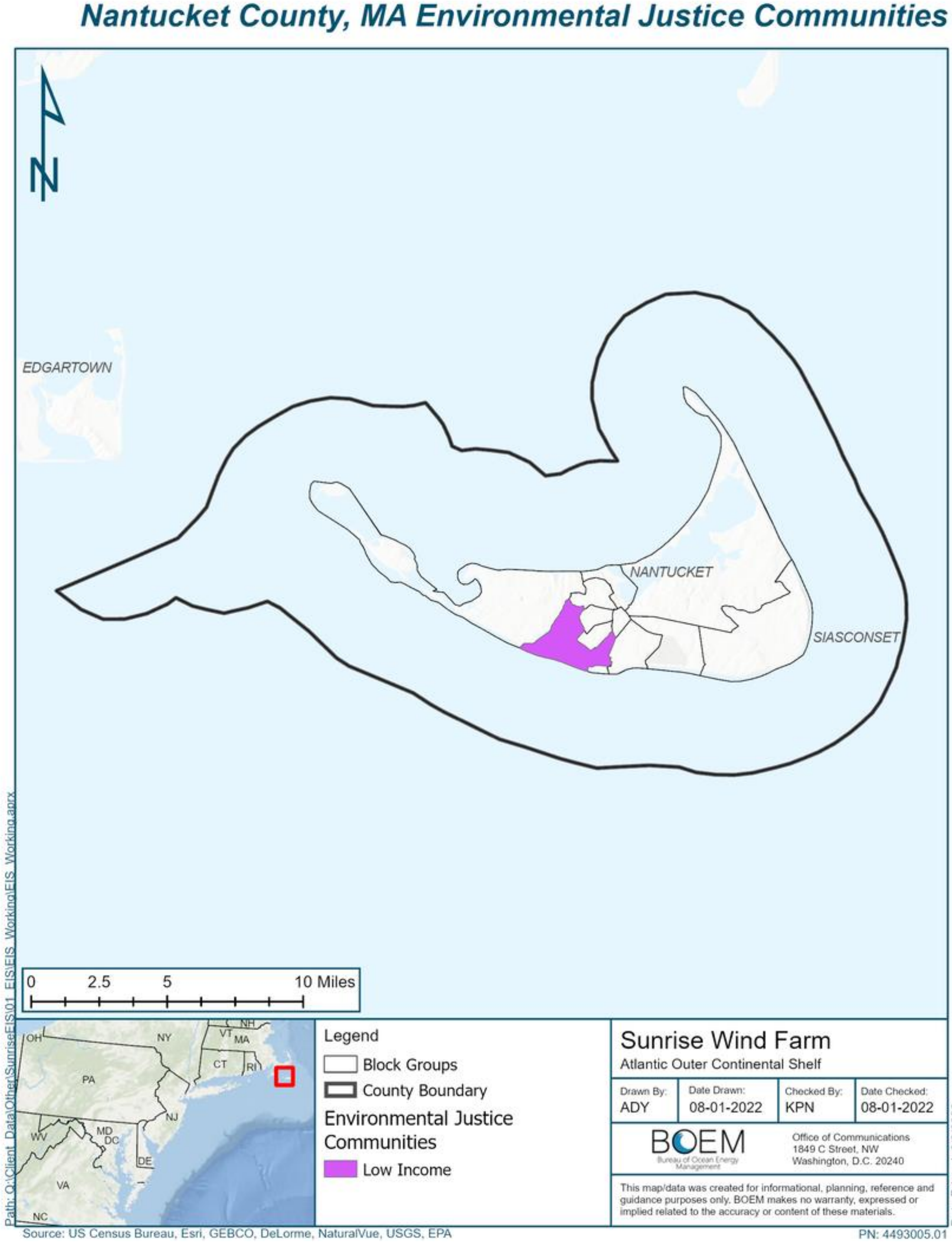

Figure 3.6.4-11. Environmental Justice Communities Identified in Nantucket County, MA

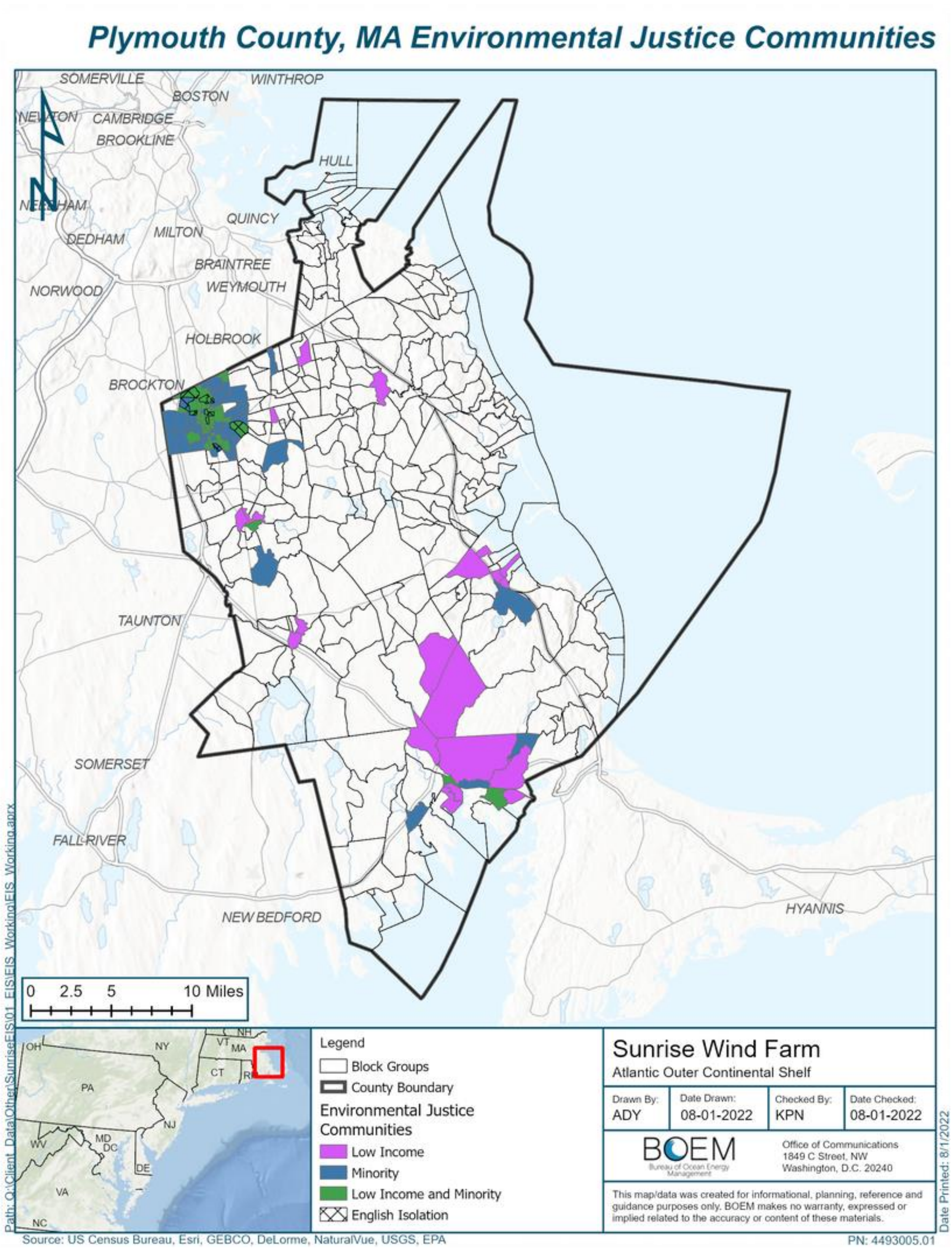

Figure 3.6.4-12. Environmental Justice Communities Identified in Plymouth County, MA

3.6.4.1.5 Rhode Island

The Rhode Island Department of Environmental Management (RIDEM) identifies an EJ community based on minority or low-income thresholds and provides mapped areas of EJ communities at the census tract level, which is referred to as EJ Focus Areas (RIDEM 2022).

EJ focus area refers to a census tract that meets one or more of the following criteria:

- (i) Annual median household income is not more than 65 percent of the statewide annual median household income;
- (ii) Minority population is equal to or greater than 40 percent of the population;
- (iii) 25 percent or more of the households lack English language proficiency; or
- (iv) Minorities comprise 25 percent or more of the population and the annual median household income of the municipality in the proposed area does not exceed 150 percent of the statewide annual median household income.

EJ communities in the Rhode Island portion of the GAA census block groups that meet criteria for EJ Focus Areas are clustered around larger cities and towns near the potential ports in Kent, Newport, Providence, and Washington counties (Table 3.6.4-3, Table 3.6.4-4, and Figure 3.6.4-13 through Figure 3.6.4-16).

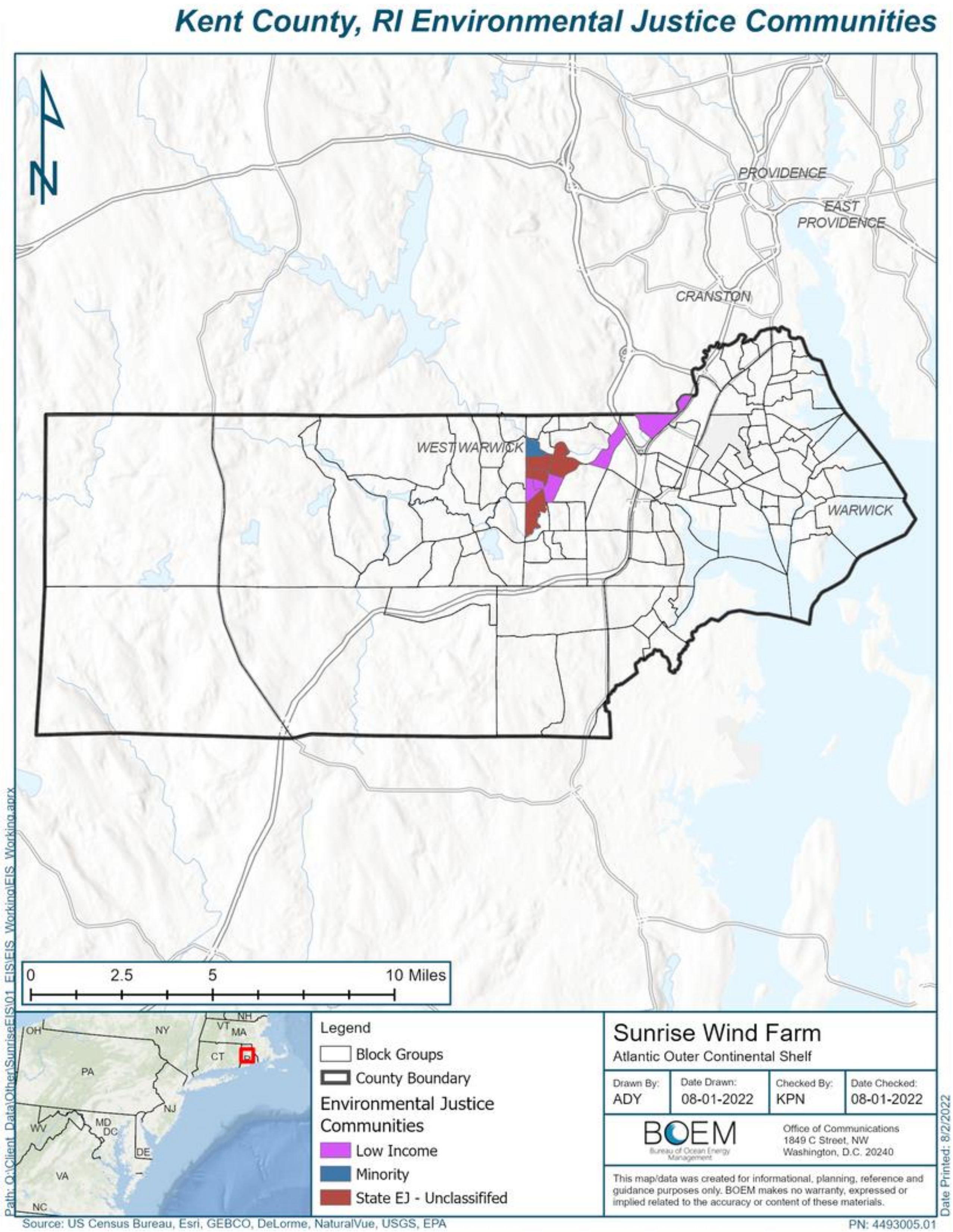

Figure 3.6.4-13. Environmental Justice Communities Identified in Kent County, RI

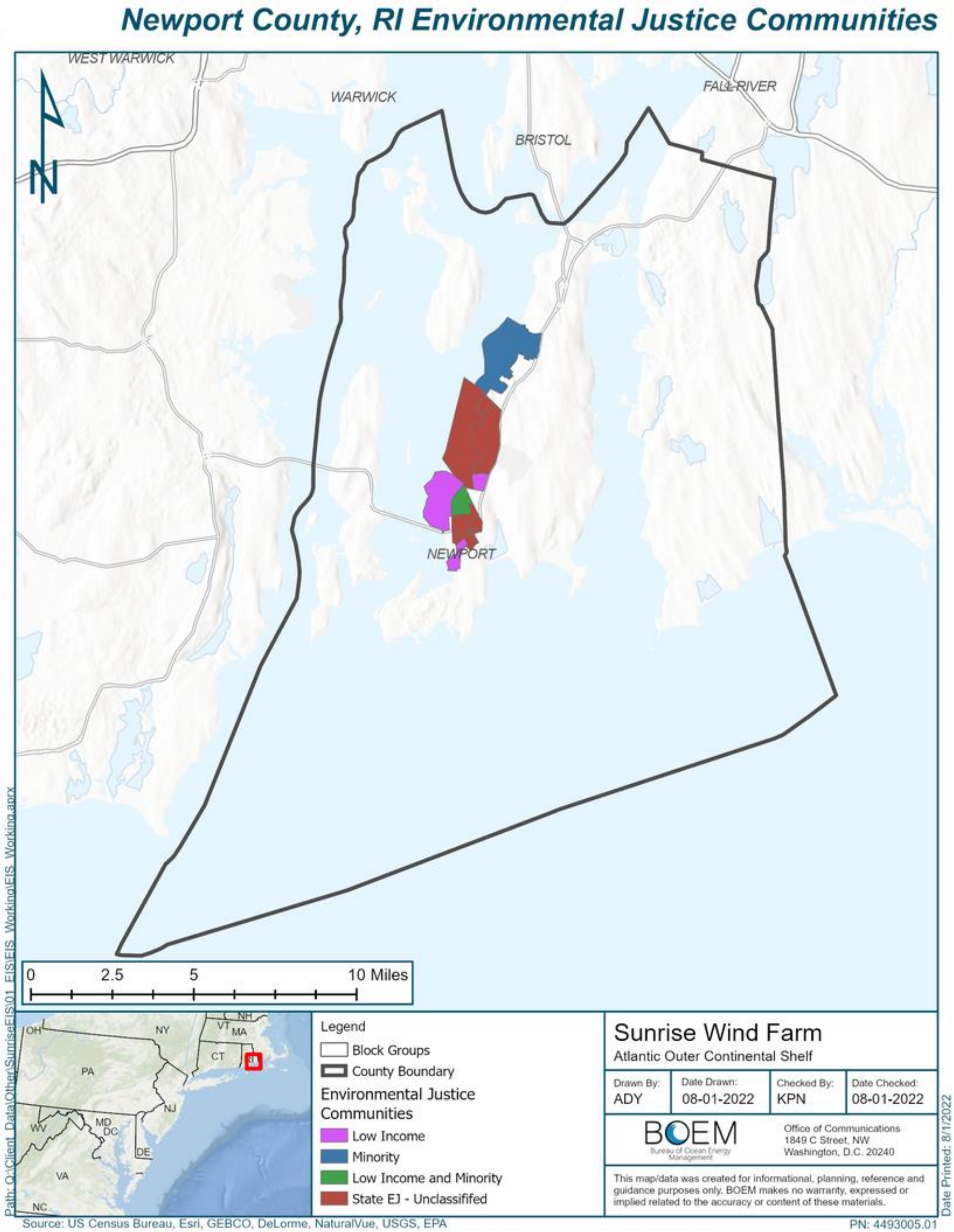

Figure 3.6.4-14. Environmental Justice Communities Identified in Newport County, RI

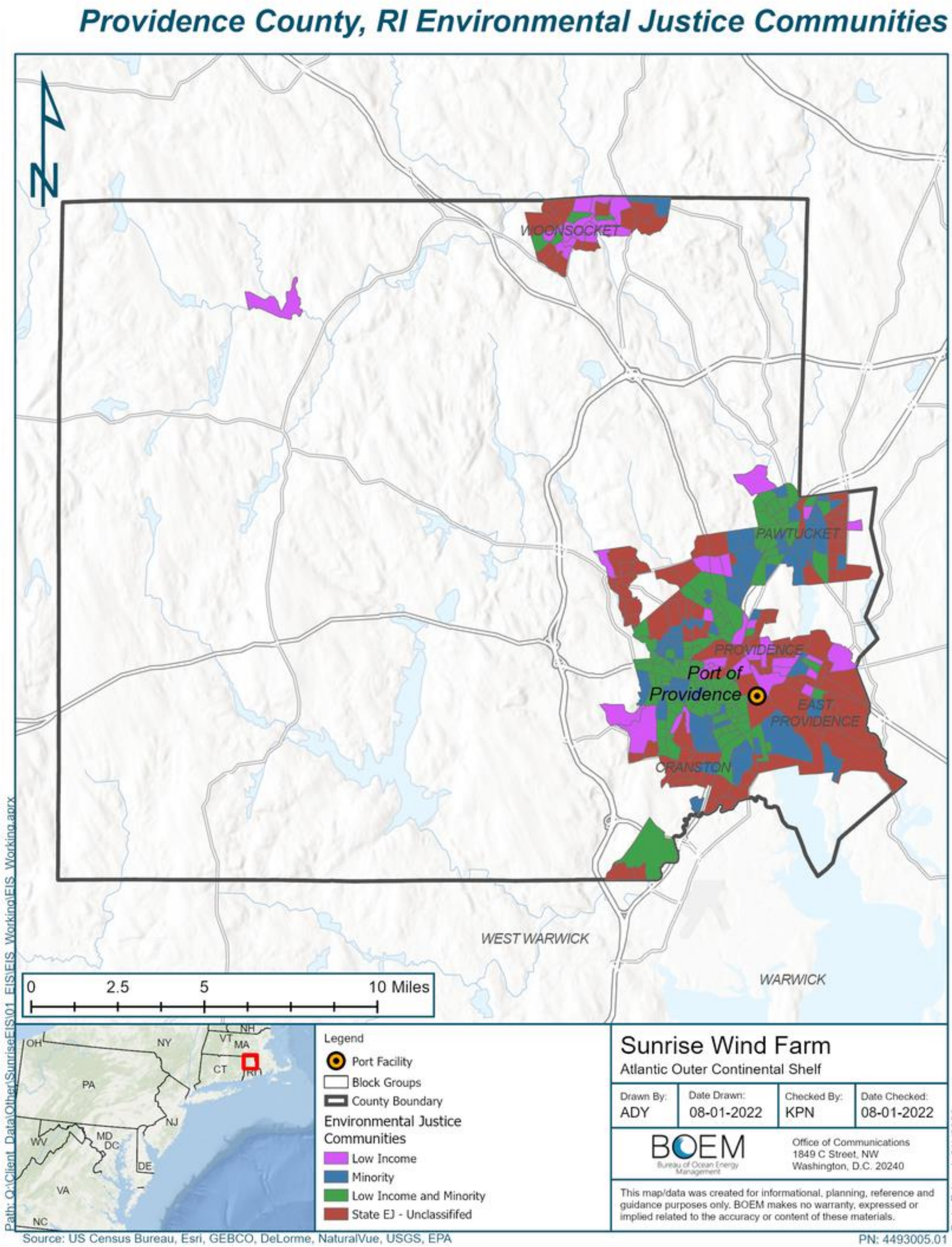

Figure 3.6.4-15. Environmental Justice Communities Identified in Providence County, RI

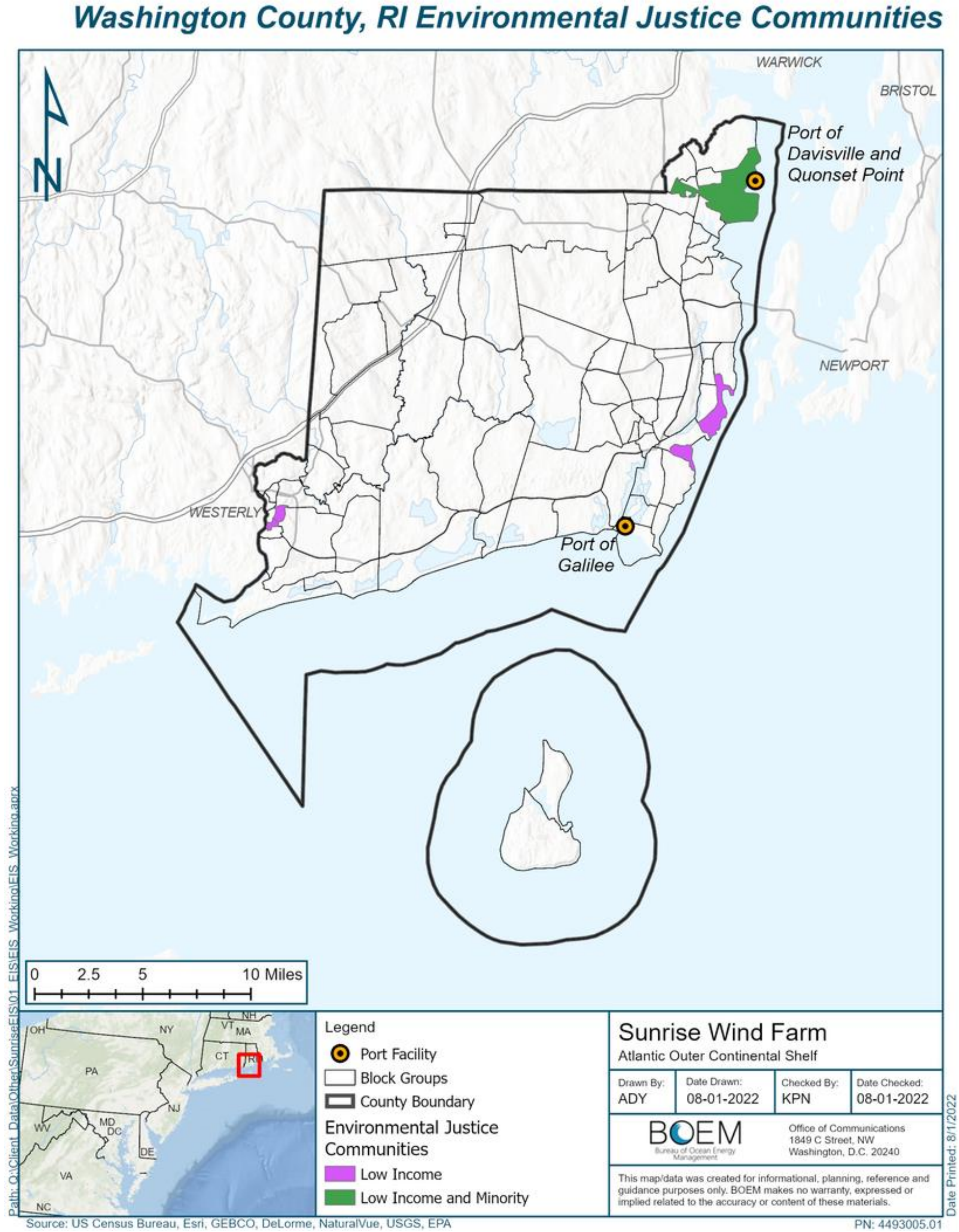

Figure 3.6.4-16. Environmental Justice Communities Identified in Washington County, RI

3.6.4.1.6 Other States

For other states within the GAA (Maryland and Virginia) that may have EJ policies, but do not have state-specific thresholds or identified EJ communities; the thresholds used for identifying EJ communities are based on CEQ guidance.

EJ communities in the Maryland portion of the GAA census block groups that meet the criteria for an EJ community are clustered around larger cities and towns near the potential ports in Baltimore County and the city of Baltimore (Tables 3.6.4-3 and 3.6.4-4; Figure 3.6.4-17, and Figure 3.6.4-18).

EJ communities in the Virginia portion of the GAA census block groups that meet the criteria for an EJ community are clustered around larger cities and towns near the potential ports in the city of Norfolk (Table 3.6.4-3, Table 3.6.4-4, and Figure 3.6.4-19).

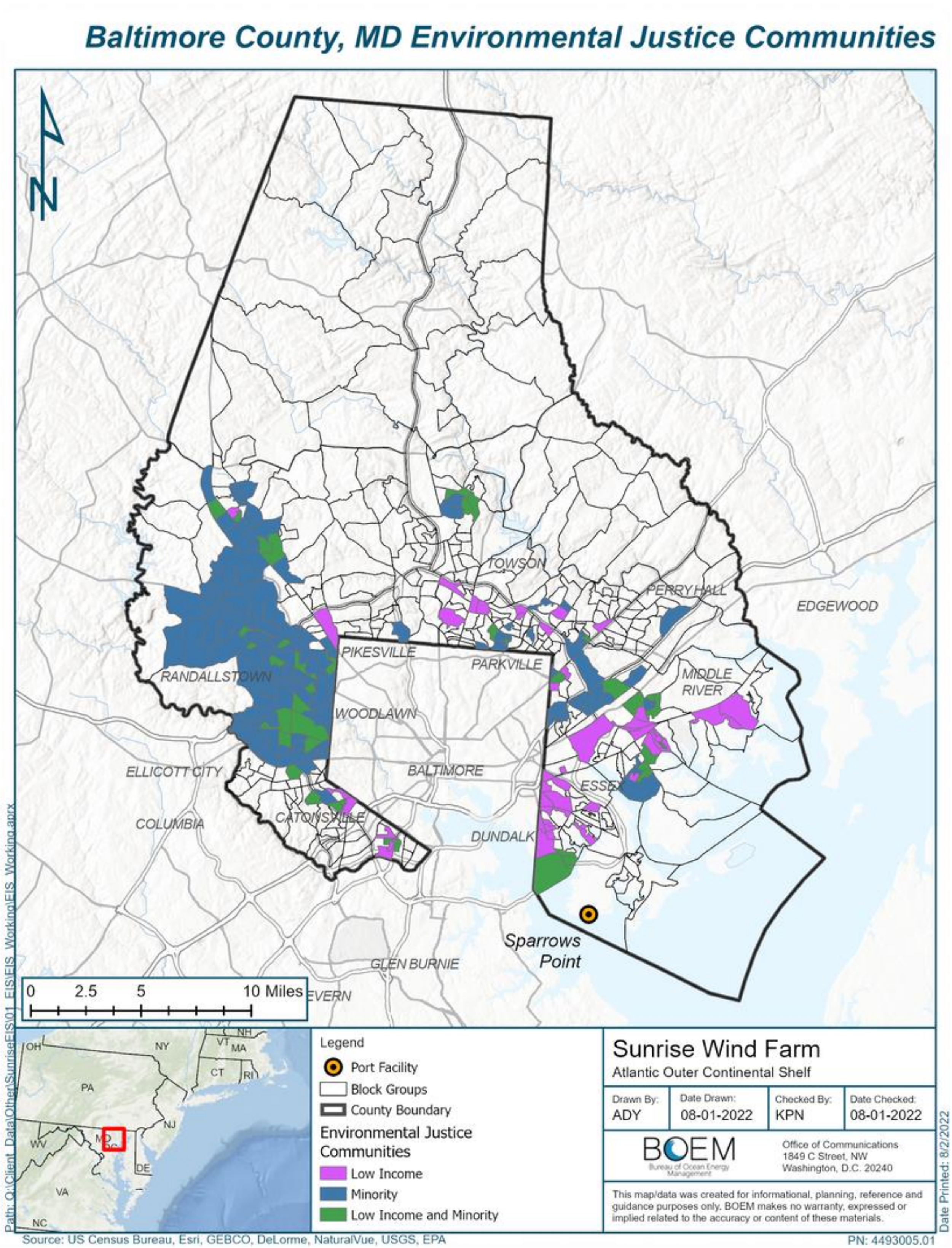

Figure 3.6.4-17. Environmental Justice Communities Identified in Baltimore County, MD

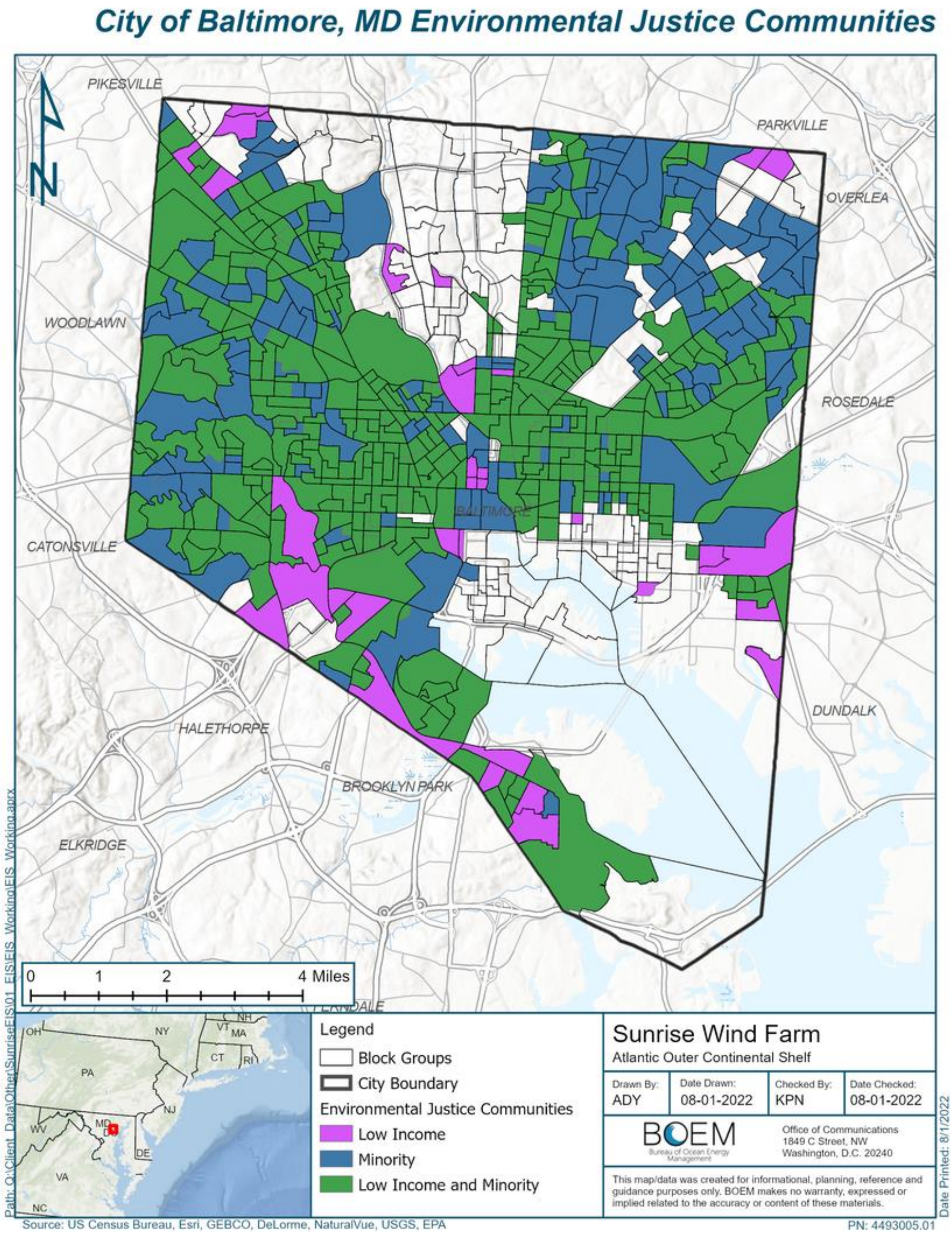

Figure 3.6.4-18. Environmental Justice Communities Identified in City of Baltimore, MD

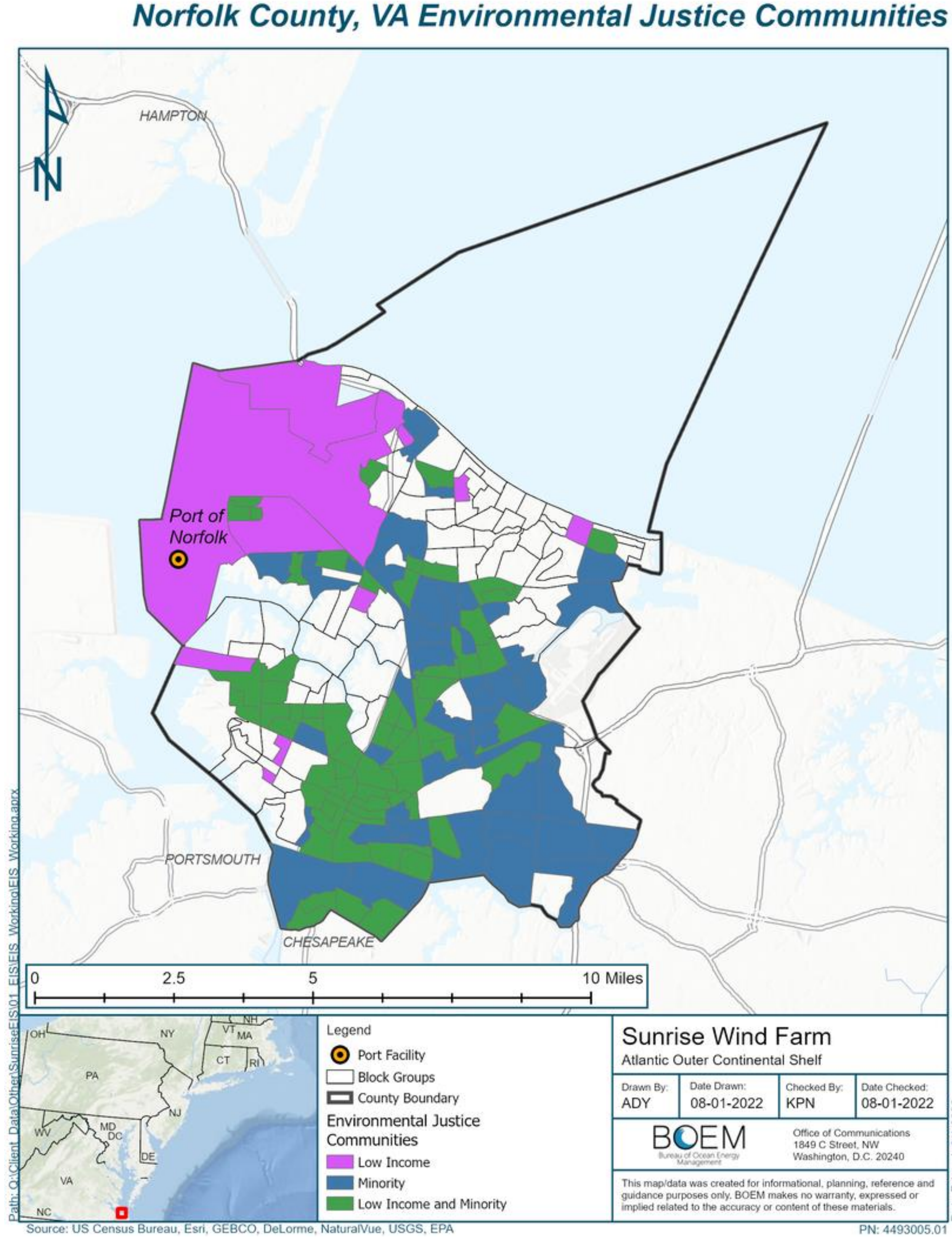

Figure 3.6.4-19. Environmental Justice Communities Identified in Norfolk County, VA

Table 3.6.4-2 summarizes trends for non-white populations and the percentage of residents with household incomes below the federally defined poverty line in the counties studied in the GAA.

Table 3.6.4-2. Environmental Justice Characteristics of Cities/Towns, Counties and States within the Geographic Analysis Area (2020)

Municipality	Population for Whom Poverty is Determined	Percent of Population [b]			
		With Income Below Poverty Level [a]	Hispanic or Latino	Minority, Not Hispanic or Latino	Total Minority [c]
New York	7,417,224	13.5%	19.1%	25.8%	44.8%
Suffolk County	489,301	6.7%	19.3%	13.1%	32.4%
Albany County	126,540	11.4%	6.0%	21.9%	27.8%
New York County	759,460	14.9%	25.8%	27.3%	53.1%
Kings County	958,567	19.6%	19.0%	44.6%	63.6%
Rensselaer County	64,906	10.7%	4.9%	11.9%	16.8%
Connecticut	1,385,437	10.0%	16.4%	17.5%	34.0%
New London County	107,827	9.3%	10.6%	13.8%	24.3%
Maryland	2,230,527	8.9%	10.3%	39.6%	49.8%
Baltimore County	313,519	8.7%	5.4%	37.3%	42.7%
City of Baltimore	239,116	20.0%	5.3%	67.2%	72.5%
Massachusetts	2,646,980	10.6%	10.3%	17.2%	27.4%
Bristol County	217,912	11.9%	8.0%	10.7%	18.7%
Barnstable County	94,323	6.8%	3.1%	7.6%	10.7%
Dukes County	6,765	6.5%	3.6%	10.8%	14.4%
Nantucket County	3,713	5.6%	4.2%	10.7%	14.8%
Plymouth County	187,460	8.3%	3.9%	15.4%	19.4%
New Jersey	3,272,224	9.8%	20.4%	24.9%	45.3%
Gloucester County	104,908	7.3%	6.2%	15.3%	21.5%
Rhode Island	414,730	12.3%	15.9%	12.7%	28.6%
Providence County	32,549	22.0%	22.8%	16.4%	39.2%
Washington County	49,102	8.9%	3.2%	5.9%	9.1%
Kent County	69,422	8.9%	5.0%	6.7%	11.7%
Newport County	34,777	9.7%	5.7%	8.5%	14.2%
Virginia	3,184,121	9.9%	9.5%	29.3%	38.8%
Norfolk [d]	88,353	17.4%	8.0%	48.5%	56.6%

Source: USCB 2022.

Notes:

[a] Poverty status used Census Reference Table B17017.

[b] Percentages may not add to totals due to rounding.

[c] Total minority includes Hispanic or Latino, Black or African American, Native American and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, and persons of some other race (not including White) or two or more races.

[d] Norfolk and the city of Baltimore are a county equivalent area according to the USCB.

To further evaluate the presence of EJ communities on smaller geographic scales to understand potential impacts related to the Project, an examination was conducted at the census block group level. In addition, the assessment provided below utilizes both the application of federal CEQ guidelines, as well as state self-identified EJ communities using their own criteria and datasets. Table 3.6.4-3 provides the number of census block groups within the geographic area of analysis that were identified as EJ, along with a percentage of total census block groups in that county and the population of those census block groups where an EJ community is present. For states with specific EJ guidance relative to thresholds for EJ community identification, those thresholds were utilized. For states without specific threshold guidance, the federal thresholds were utilized.

To provide a comprehensive and complete identification of potential EJ communities within the GAA, an extensive data collection and collation effort was conducted using both CEQ guidance and state-specific guidance and datasets, where available. Table 3.6.4-1 as well as the state-specific discussion outlined above presents the data sets used for states, where available. Essentially, any census block group that was identified as an EJ community using *either* the federal CEQ guidance or the state-specific guidance was included in this analysis. The reason is because there were instances where certain census block groups may be in the state dataset but would not be included if using the federal guidance (or vice versa); therefore, to be as comprehensive as possible, a thorough analysis was conducted for every census block group within the counties of the GAA to establish if they met either the state or federal criteria. The results are summarized in Table 3.6.4-3, and a detailed and complete table listing all census block groups with an EJ community are presented in Appendix B (*Supplemental Information and Additional Figures and Tables*).

Of the 8,120 census block groups in the GAA, 3,998 (or 49.2 percent) were identified as an EJ community under either federal or state guidance (Table 3.6.4-3). Baltimore, Maryland was one of the counties/municipalities with the highest percentage of census block groups that are considered EJ communities Kent County, Rhode Island was considered the lowest. The county with the highest population within EJ communities was Kings County and the county with the lowest population was Nantucket County, Massachusetts. In Suffolk County, ports as well as onshore land-based features associated with the Project that would be utilized, had 23.9 percent of the census block groups within the county identified as EJ communities.

Table 3.6.4-3. Summary of Environmental Justice Census Block Groups Identified in the Geographic Analysis Area Using Both Federal and State Guidance

Municipality/County	Total Number of Block Groups in County	Census Block Groups that are Considered Environmental Justice Communities		
		No. of Block Groups	% of Block Groups	Total Population in Block Groups
New York				
Suffolk County	999	239	23.9%	395,613
Albany County	235	67	28.5%	76,953
Kings County	2,085	1,516	72.7%	1,997,194
New York County	1,170	504	43.1%	837,174
Rensselaer County	125	36	28.8%	37,666
Connecticut				
New London County	188	44	23.4%	69,887
Maryland				
Baltimore County	529	207	39.1%	376,517
City of Baltimore	653	530	81.2%	490,541
Massachusetts				
Bristol County	390	191	49.0%	234,316
Barnstable County	196	21	10.7%	20,764
Dukes County	21	4	19.0%	2,434
Nantucket County	12	1	8.3%	871
Plymouth County	360	85	23.6%	102.547
New Jersey				
Gloucester County	191	35	18.3%	42,077
Rhode Island				
Providence County	499	313	62.7%	380,386
Washington County	94	5	5.3%	6,089
Kent County	122	10	8.2%	12,734
Newport County	62	14	22.6%	16,515
Virginia				
Norfolk	189	119	63.0%	169,033
Totals	**8,120**	**3,998**	**49.2%**	**5,332,950**

Sources: USEPA 2022, NYSDEC 2022, NJDEP 2022, Massachusetts EEA 2022, RIDEM 2022, Connecticut DEEP 2022.

It should be noted that some census block groups may have concentrations of either minority populations, or low-income populations, and also have populations that experience language isolation (i.e., limited English proficiency) or other characteristics defined by the individual states that result in the block being considered an EJ community. Table 3.6.4-3 presents the information aggregated by county within the GAA. To better understand whether the census block groups identified within these counties were identified using federal CEQ guidance or identified with at the state-level, Table 3.6.4-4 provides a further breakdown of these statistics.

It should be noted that some census block groups are included under either the federal identification dataset or the state identification dataset, and in other cases, they may be identified under both criteria. Therefore, the summation of these numbers would not equal the aggregate numbers provided Table 3.6.4-3 but need to be viewed individually and are provided to offer more context and detail to the analysis.

Table 3.6.4-4. Details of Census Block Group Identification of Environmental Justice Communities within the Geographic Analysis Area Using Both Federal and State Guidance

Municipality/County	Federal EJ Guidelines		State EJ Guidelines			
	Total Minority	Total Low-Income	Total Minority	Total Low-Income	Total Limited English	Total Other EJ
New York [a]						
Suffolk County	169	30	195	48	n/a	n/a
Albany County	42	46	40	45	n/a	n/a
Kings County	1,264	612	1,235	706	n/a	n/a
New York County	463	217	447	272	n/a	n/a
Rensselaer County	10	37	8	39	n/a	n/a
Connecticut [b]						
New London County	24	30	n/a	n/a	n/a	10
Maryland [c]						
Baltimore County	162	88	n/a	n/a	n/a	n/a
City of Baltimore	500	386	n/a	n/a	n/a	n/a
Massachusetts [d]						
Bristol County	44	130	122	149	19	n/a
Barnstable County	1	20	19	29	0	n/a
Dukes County	1	3	3	3	0	n/a
Nantucket County	0	1	1	0	0	n/a
Plymouth County	70	51	95	50	10	n/a
New Jersey [e]						
Gloucester County	15	17	24	22	0	n/a
Rhode Island [f]						
Providence County	167	144	n/a	n/a	n/a	307
Washington County	1	5	n/a	n/a	n/a	0
Kent County	1	5	n/a	n/a	n/a	8
Newport County	2	5	n/a	n/a	n/a	12
Virginia [g]						
Norfolk	109	72	n/a	n/a	n/a	n/a
Totals	**3,045**	**1,899**	**2,189**	**1,363**	**29**	**327**

Sources: USEPA 2022, NYSDEC 2022, NJDEP 2022, Massachusetts EEA 2022, RIDEM 2022, Connecticut DEEP 2022.

n/a – This dataset is not available within this state. If the dataset is available, but no census block groups are present that meet those criteria, it is noted with a "0."

Notes:

[a] New York data is from NYS DEC Office of EJ.

[b] Connecticut data is from CT DEEP.

[c] Maryland utilizes the federal USEPA EJ guidance, as there is no state specific data available.

[d] Massachusetts data is from Massachusetts EEA.

[e] New Jersey data is from NJDEP.

[f] Rhode Island data is from RIDEM.

[g] Virginia utilizes the federal USEPA EJ guidance, as there is no state specific data available.

Figure 3.6.4-1 through Figure 3.6.4-19 present the locations of the census block groups collated in Table 3.6.4-4 that are within the seven states and the respective counties within the GAA. The census block groups that are indicated within the figures meet either the federal or state-specific EJ criteria to be considered an EJ community. Note, states nomenclature may differ when referencing the EJ communities (e.g., Overburdened Communities for New Jersey); however, for the purposes of this document, they are all referred to as EJ communities.

Low-income and minority workers may be employed in commercial fishing and supporting industries that provide employment on commercial fishing vessels, at seafood processing and distribution facilities, and in trades related to vessel and port maintenance, or operation of marinas, boat yards, and marine equipment suppliers and retailers.

3.6.4.1.7 Social Indicator Characteristics

NOAA social indicator mapping (NOAA 2022b) was used to identify EJ populations in the GAA that have a high level of fishing engagement or fishing reliance. The fishing engagement and reliance indices portray the importance or level of dependence of commercial or recreational fishing to coastal communities.

- Commercial fishing engagement is measured by fishing activity (e.g., permits, fish dealers, and vessel landings). A high rank indicates more engagement.
- Commercial fishing reliance measures are based on the population size of a community through fishing activity. A high rank indicates more reliance.
- Recreational fishing engagement measures are based on the presence of recreational fishing through fishing activity estimates. A high rank indicates more engagement.
- Recreational fishing reliance measures the presence of recreational fishing in relation to the population size of a community. A high rank indicates increased reliance.

The categorical rankings for the home ports for vessels that use the lease area are provided in Section 3.6.1, *Commercial Fishing and For-Hire Recreational Fishing*, within Table 3.6.1-10. There are over 40 ports listed in the table; however, the ports that have the highest average and total revenue include New Bedford, Massachusetts, Point Judith, Rhode Island, Little Compton, Rhode Island, and Newport, Rhode Island. Three of the four of these ports had a high commercial fishing engagement ranking, and three out of four had a medium commercial fishing reliance ranking. Table 3.6.1-10 provides additional details for the other ports within the GAA.

Within these four port communities that have a high level of commercial fishing engagement or reliance, all four are determined to either be located within EJ populations or adjacent to census block groups considered EJ populations. As provided in Figure 3.6.4-1 through Figure 3.6.4-19, there are numerous EJ populations in and around the port facilities that may be utilized during construction and/or operation of SRWF.

NOAA developed social indicator mapping related to gentrification pressure (NOAA 2022b) which is an indicator related to housing disruption, retiree migration and urban sprawl. The gentrification pressure indicators measure factors that, over time, may indicate a threat to the viability of a commercial or recreational working waterfront.

- Housing disruption represents factors that indicate a fluctuating housing market where some displacement may occur due to rising home values and rents including changes in mortgage values. A high rank means more vulnerability for those in need of affordable housing and a population more vulnerable to gentrification.
- Retiree migration characterizes communities with a higher concentration of retirees and the elderly population including households with inhabitants over 65 years old, population receiving social security or retirement income, and the level of participation in the work force. A high rank indicates a population more vulnerable to gentrification as retirees seek the amenities of coastal living.
- Urban sprawl describes areas experiencing gentrification through increasing population density, proximity to urban centers, home values, and the cost of living. A high rank indicates a population more vulnerable to gentrification.

Gentrification mapping indices confirm high to medium/high and medium levels of housing disruption and retiree migration in coastal communities in Suffolk County, New York, where the onshore facilities would be located. High to medium/high gentrification was confirmed in the coastal port areas of Rhode Island and Massachusetts; the ports with the highest utilization of the SRWF lease area would be located. Suffolk County, New York, the proposed location of onshore facilities, has many areas that are rated high to medium/high due to both retiree migration and urban sprawl (NOAA 2022b).

EJ analyses must also address impacts on Native American tribes. Federal agencies should evaluate "interrelated cultural, social, occupational, historical, or economic factors that may amplify the natural and physical environmental effects of the proposed agency action," and "recognize that the impacts within Indian tribes may be different from impacts on the general population due to a community's distinct cultural practices" (CEQ 1997). Factors that could lead to a finding of significance for EJ populations include loss of significant cultural or historical resources and the impact's relation to other cumulatively significant impacts (USEPA 2016). Occupation of the OCS prior to early Holocene sea-level rise would have been limited to ancestral indigenous communities and many northeastern tribes retain deep cultural connections to the now submerged lands upon which their ancestors once lived.

BOEM invited the following tribes to participate in government-to-government consultations on the proposed Project: the Mashantucket Pequot Tribal Nation, the Mashpee Wampanoag Tribe, The Delaware Nation, the Shinnecock Nation, and the Wampanoag Tribe of Gay Head (Aquinnah) (Appendix A).

3.6.4.2 Scope of the Environmental Justice Analysis

To define the scope of the EJ analysis, BOEM reviewed the impact conclusions for each resource analyzed in this Draft EIS Section 3.4 through Section 3.6 to assess whether the Proposed Action and action alternatives would result in major impacts that would be considered high and adverse and whether major impacts had the potential to affect EJ populations given the geographic extent of the impact relative to the locations of EJ populations. Major impacts that had the potential to affect EJ populations were further analyzed to determine if the impact would be disproportionately high and adverse. Although the EJ analysis considers impacts of other ongoing and planned activities, including other future offshore wind projects, determinations as to whether impacts on EJ populations would be disproportionately high and adverse are made for the Proposed Action and action alternatives alone.

The onshore Project infrastructure including cable landfalls, onshore export cable routes, onshore substations, and points of interconnection are within or adjacent to several Census Block Groups with EJ populations identified to be impacted by Project activities. Because onshore construction would affect EJ populations identified in the GAA, impacts associated with construction, O&M, and decommissioning of onshore Project components are carried forward for further analysis of disproportionately high and adverse effects within the EJ analysis. Based on the geographic extent of onshore construction impacts relative to the location of EJ populations, BOEM concludes that EJ populations would experience disproportionately high and adverse effects related to construction, O&M, and decommissioning of onshore infrastructure.

Sunrise Wind has identified the following locations for ports that could support construction or O&M for the Project: Port of New London, Connecticut; New Bedford Marine Commerce Terminal, Massachusetts; Sparrows Point, Maryland; Paulsboro Marine Terminal, New Jersey; Port of Albany, Port of Brooklyn, Port of Coeymans, Port Jefferson, Port of New York, Port of Montauk, New York; Port of Providence, Port of Davisville and Quonset Point, Port of Galilee, Rhode Island; and Port of Norfolk, Virginia. The Port of Montauk, Port of Albany, Port of Brooklyn, Port of New York, Port of New London, New Bedford Marine Commerce Terminal, Port of Providence, Port of Davisville and Quonset Point, Sparrows Point and the Port of Norfolk are all in or immediately adjacent to Census Block Groups where EJ populations have been identified. Therefore, port utilization is carried forward for analysis of disproportionately high and adverse effects in this EJ analysis under the port utilization and air emission IPFs.

Construction, O&M, and decommissioning of offshore structures (WTGs and OSS) could have major impacts on some commercial fishing operations that use the Lease Area, with potential for indirect impacts on employment in related industries that could affect EJ populations. Cable emplacement and maintenance and construction noise would contribute to impacts on commercial fishing. The long-term presence of offshore structures (WTGs and OSS) would have major impacts on scenic and visual resources and viewer experience from some onshore viewpoints that could affect EJ populations. Therefore, impacts of construction, O&M, and decommissioning of offshore Project components is carried forward for analysis of disproportionately high and adverse effects in this EJ analysis under the IPFs for presence of structures, cable emplacement and maintenance, and noise.

Section 3.6.2, *Cultural Resources*, determined that construction of offshore wind structures and cables could result in major impacts on ancient submerged landforms if the final Project design cannot avoid known resources or if previously undiscovered resources are discovered during construction. BOEM has committed to working with the lessee, other NHPA Section 106 consulting parties, federally recognized

Native American tribes, and the New York SHPO to develop specific treatment plans to address impacts on ancient submerged landforms that cannot be avoided. Development and implementation of Project-specific treatment plans, agreed to by all consulting parties, would likely reduce the magnitude of unmitigated impacts on ancient submerged landforms; however, the magnitude of these impacts would remain moderate to major due to the permanent, irreversible nature of the impacts, unless these ancient submerged landforms can be avoided. The tribal significance of ancient submerged landforms identified in the Lease Area and cable corridors has not yet been determined, and consultation with tribes via NHPA Section 106 consultation and government-to-government consultation is ongoing. No other tribal resources such as cultural landscapes, traditional cultural properties, burial sites, archaeological sites with tribal significance, treaty-reserved rights to usual and accustomed fishing or hunting grounds, or other potentially affected tribal resources have been identified to date. BOEM will continue to consult with Native American tribes throughout development of the EIS and will consider impacts on tribal resources identified through consultation in the EJ analysis if they are discovered.

Other resource impacts that concluded less-than-major impacts for the Proposed Action and action alternatives or were unlikely to affect EJ populations were excluded from further analysis of EJ impacts. This includes impacts related to bats; benthic resources; birds; coastal habitat and fauna; finfish, invertebrates, and EFH; land use and coastal infrastructure; marine mammals; navigation and vessel traffic; recreation and tourism; sea turtles; water quality; and wetlands. Table ES-2 provides a summary of impact levels determined for each of these resource topics.

3.6.4.3 Impact Level Definitions for Environmental Justice

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on EJ populations from the alternatives, including the Proposed Action. Table 3.6.4-5 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for EJ. Table G-16 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to EJ. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project.

Table 3.6.4-5. Impact Level Classifications

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	No measurable impacts would occur.	No measurable impacts would occur.
Minor	Adverse impacts to the affected EJ population could be avoided with EPMs or would be unavoidable but not disproportionately high and adverse.	A small and measurable benefit to affected EJ populations could occur.
Moderate	Adverse impacts to the affected EJ population could be avoided with EPMs or would be unavoidable but not disproportionately high and adverse.	A notable and measurable benefit to affected EJ populations could occur.
Major	The affected EJ population would experience disproportionately high and adverse effects due to: (1) impacts on the natural or physical environment; (2) impacts that appreciably exceed or are expected to appreciably exceed those on the general population or other appropriate comparison group; or (3) impacts that occur or would occur in a minority or low-income population, or Native American tribe affected by cumulative or multiple adverse exposures from environmental hazards.	A large local, or notable regional benefit to affected EJ populations could occur.

3.6.4.4 Impacts of Alternative A - No Action on Environmental Justice

When analyzing the impacts of the No Action Alternative on EJ, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities on the baseline conditions. 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 E*, Planned Activities Scenario*.

3.6.4.4.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for EJ described in Section 3.6.4, Affected Environment 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 that have the potential to affect EJ populations include onshore development and land uses; utilization of ports, marinas, and working waterfronts; port improvements or expansions; and commercial fishing operations. These activities support beneficial employment and generate sources of air emissions, noise, lighting, and vehicle and vessel traffic that can adversely affect the quality of life in affected communities.

Coastal development that leads to gentrification of coastal communities may create space-use conflicts and reduce access to coastal areas and working waterfronts that communities rely on for recreation, employment, and commercial or subsistence fishing. Gentrification can lead to increased tourism and recreational boating and fishing that provide employment opportunities in recreation and tourism. As described in Section 3.6.4.1, NOAA's social indicator mapping tool for gentrification pressure shows medium high to high levels of housing disruption and retiree migration in many of the coastal communities within the GAA, including Suffolk County, New York; the location where the onshore project components are located, as well as coastal port areas of Rhode Island and Massachusetts where the ports historically have had the highest utilization of the SRWF lease area. Typically, the more inland areas of the states within the GAA have lower gentrification pressure. Housing disruption caused by rising home values and rents can displace affordable housing, with disproportionate effects for low-income populations.

Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on EJ include:

- Continued O&M of the Block Island project (5 WTGs) installed in State waters,
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect EJ through the primary IPFs of air quality, land disturbance, lighting, noise, port utilization, presence of structures, and traffic. Ongoing offshore wind activities would have the same type of impacts from noise, presence of structures, and land disturbance that are described in detail in the section below for planned offshore wind activities but the impacts would be of lower intensity.

3.6.4.4.2 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 Proposed Action).

Future activities without the Proposed Action include residential, commercial, and industrial development of onshore utility projects, land-based wind energy projects, and other offshore wind projects (excluding the Sunrise Wind project). Offshore projects other than offshore wind would support the existing marine industries and workforce. Ocean-based industries, including tourism and recreation, commercial fishing, and marine transportation, would continue to be important to the economies of many of the counties within the EJ GAA.

BOEM expects future offshore wind activities to affect EJ populations through the following primary IPFs, noted in Table G-16 in Appendix G.

Planned non-offshore wind activities that may affect EJ populations include port utilization and expansion, construction and maintenance of coastal infrastructure (marinas, docks, and bulkheads), and onshore coastal development that can lead to gentrification of coastal communities and working waterfronts (Refer to Appendix E for a description of ongoing and planned activities).

Planned non-offshore wind activities would have impacts similar to those of the ongoing non-offshore wind activities and would range from minor to moderate adverse to minor beneficial. BOEM expects that most impacts of ongoing and planned activities would be minor because while they would be measurable, they would not disrupt the normal or routine functions of the affected population. Impacts of gentrification are expected to be moderate because low-income populations would need to adjust somewhat in response to housing disruptions caused by rising home values and rents. These changes would be long-term, but the intensity would vary across the wide GAA, with higher intensity in coastal communities with waterfront access and lower intensity in more inland areas. BOEM expects that improvements related to employment for ongoing and planned activities would be measurable but small and minor beneficial, Appendix E, provides a summary of potential impacts associated with ongoing and planned non-offshore wind activities by IPF for EJ.

Air Quality: Emissions at offshore locations would have regional impacts, with no disproportionate impacts on EJ communities. However, EJ communities near ports could experience disproportionate air quality impacts depending upon the ports that are used, ambient air quality, and the increase in emissions at any given port. Onshore, some industrial waterfront locations would continue to lose industrial uses, with no new industrial development to replace it. The conversion of traditionally industrial uses in these waterfront areas has the potential to reduce air emissions if the municipalities encourage redevelopment to uses such as passive and active recreation or other uses that would result in lower air emissions proximal to EJ communities.

Appendix E identifies 31 future offshore wind projects other than the Proposed Action that could be constructed in the Massachusetts/Rhode Island, New York/New Jersey, Delaware/Maryland, and Virginia/North Carolina Lease Areas, which may utilize the same ports during construction as the Proposed Action. Possible overlapping construction periods, as estimated in Appendix E, could result in up to seven projects under construction at one time. All ten of the proposed ports that could support Sunrise Wind construction are either located within or are in close proximity of EL communities (Table 3.6.3-2 outlines the ports supporting different phases of Project activities, and their location). As stated in Section 3.4.1 *Air Quality*, during the construction phase, total emissions of criterial pollutants and ozone precursors from offshore wind projects other than Sunrise Wind proposed within the air quality GAA, summed over all construction years, are estimated to be 4,077 tons CO; 17,881 tons NO_x; 137 tons SO_2, 433 tons VOC; 624 tons PM_{10}; 600 tons $PM_{2.5}$; and 1,169,089 tons of CO_2. This area is larger than the EJ geographic area; therefore, a large portion of the emissions would be generated along the vessel transit routes and the offshore work areas. Only the New England Wind Project is expected to have an overlapping construction schedule with the Proposed Action in 2024. The magnitude of emissions and resulting impacts would vary spatially and temporally during the construction phase.

Emissions would vary spatially and temporally during construction phases even for overlapping projects. Emissions from vessels, vehicles, and equipment operating in ports could affect EJ communities adjacent or close to those ports. Emissions attributable to the No Action Alternative affecting any neighborhood have not been quantified; however, it is assumed that emissions from the No Action Alternative at ports would contribute a small proportion of total emissions from those facilities. Therefore, air emissions during construction would have small, short-term, variable impacts on EJ communities due to short-term increases in air emissions. The air emissions impacts would be greater if multiple offshore wind projects simultaneously use the same port for construction staging. If construction staging is distributed among several ports, the air emissions would not be concentrated near certain ports and impacts on proximal EJ communities would be lower.

As explained in Section 3.4.1, *Air Quality*, O&M activities under the No Action Alternative within the air quality GAA would generate air emissions, although less than during construction activities. Estimated O&M phase emissions are 86 tons CO; 341 tons NO_x; 1.3 tons SO_2; 8.9 tons VOCs; 11.6 tons PM_{10}; 11.4 tons $PM_{2.5}$; and 28,496 tons CO_2. Emissions could result from routine or non-routine maintenance activities and repairs involving marine vessels carrying crew and materials, on-vessel equipment, and emergency diesel generators. Overall, operation of future offshore wind projects would produce negligible emissions because wind turbines do not emit pollutants. Operational emissions would overall be intermittent and widely dispersed throughout the GAA and would generally contribute to small and localized air quality impacts. Only the portion of those emissions resulting from ship engines and port-based equipment operating within and near the ports identified above would affect EJ communities. Therefore, during operations of offshore wind projects, the air emissions volumes resulting from port activities are not anticipated to be large enough to have impacts on EJ communities.

The power generation capacity of offshore wind development could potentially lead to lower regional air emissions by displacing fossil fuel plants for power generation, resulting in a potential reduction in regional GHG emissions, as analyzed in further detail in Section 3.4 *Air Quality*. A 2019 study found that nationally, exposure to fine particulate matter from fossil fuel electricity generation in the United States varied by income and by race, with average exposures highest for black individuals, followed by non-Hispanic white individuals. Exposures for other groups (i.e., Asian, Native American, and Hispanic) were somewhat lower. Exposures were higher for lower-income populations than for higher-income populations, but disparities were larger by race than by income (Thind et al. 2019). Exposure to air pollution is linked to health impacts, including respiratory illness, increased health care costs, and mortality. A 2016 study for the Mid-Atlantic region found that offshore wind could produce measurable benefits related to health costs and reduction in loss of life due to displacement of fossil fuel power generation (Buonocore et al. 2016). EJ populations tend to have disproportionately high exposure to air pollutants, likely leading to disproportionately high adverse health consequences. Accordingly, offshore wind generation analyzed under the No Action Alternative would have potential benefits for EJ populations through reduction or avoidance of air emissions and concomitant reduction or avoidance of adverse health impacts. or avoidance of adverse health impacts at a regional level.

Cable emplacement and maintenance: Cable emplacement and maintenance for future offshore wind projects described in Appendix E would result in seafloor disturbance and short-term increases in turbidity. Cable emplacement and maintenance could displace other marine activities temporarily within cable installation areas. As described in Section 3.6.1 *Commercial Fisheries and For-Hire Recreational Fishing*, cable installation and maintenance would have localized, short-term impacts on the revenue and operating costs of commercial and for-hire fishing businesses. Commercial fishing operations may temporarily be less productive during cable installation or repair, resulting in reduced income and leading to short-term reductions in business volumes for seafood processing and wholesaling businesses that depend upon the commercial fishing industry. Although commercial and for-hire fishing businesses could temporarily adjust their operating locations to avoid revenue loss, impacts would be greater if multiple cable installation or repair projects are underway offshore of the EJ GAA at one time. Business impacts could affect EJ populations due to the potential loss of income or jobs by low-income workers in the commercial fishing industry. In addition, cable installation and maintenance could temporarily disrupt subsistence fishing, resulting in short-term, localized impacts on low-income residents and tribal members who rely on subsistence fishing as a food source, as well as tribal members for whom fishing and clamming is also a cultural practice.

As noted in Section 3.6.2 *Cultural Resources*, cable emplacement could damage submerged ancient landforms that may have cultural significance to Native American tribes as part of ancient and ongoing tribal practices, and as portions of a landscape occupied by their ancestors. Disturbance and destruction of even a portion of an identified submerged landform could degrade or even eliminate the value of these resources as potential repositories of archaeological knowledge and cultural significance to tribes. If these landforms are disturbed during offshore cable emplacement, the impact on the cultural resource would be permanent, resulting in a disproportionately high and adverse impact on the affected Native American tribes.

Land disturbance: Offshore wind development would require onshore cable installation, substation construction or expansion, and possibly expansion of shore-based port facilities. Depending on siting, land disturbance could result in short-term, localized, variable disturbances of neighborhoods and businesses near cable routes and construction sites due to typical construction impacts such as increased noise, dust, traffic, and road disturbances. Potential short-term, variable impacts on EJ communities could result from land disturbance, depending upon the location of onshore construction for each offshore wind project.

Lighting: The view of nighttime aviation warning lighting required for offshore wind structures could have impacts on economic activity in locations where lighting is visible by affecting the decisions of tourists or visitors in selecting coastal locations to visit. Service industries that support tourism are a source of employment and income for low-income workers. Impacts on tourism are anticipated to be localized, not industry-wide (Section 3.6.8 *Recreation and Tourism*), therefore would have little impact on EJ populations. Lighting on WTGs could affect cultural and historic resources, including views of night sky and the ocean that are important to Native American tribes. Section 3.6.2 *Cultural Resources* and Section 3.6.9 *Scenic and Visual Resources* evaluate visual impacts on historic and cultural resources.

As additional offshore wind projects become operational, the nighttime lighting would be visible from a greater number of coastal locations. The aviation hazard lighting from offshore wind farm WTGs could potentially be visible from beaches and coastal areas in the GAA, depending on vegetation, topography, weather, and atmospheric conditions. Aviation hazard lighting is evaluated as part of the discussion of scenic and visual resources in Section 3.6.9 *Scenic and Visual Resources*, and briefly discussed in Section 3.6.8 *Recreation and Tourism*. The impacts on recreation and tourism-related economic activity, if any, would be long-term and continuous and could, in turn, have impacts on EJ populations, specifically low-income employees of tourism-related businesses.

Lighting impacts would be reduced if the emerging technology of aircraft detection lighting system (ADLS) is used. ADLS lighting would be activated only when an aircraft approaches (Section 3.6.9 *Scenic and Visual Resources*). Depending on exact location and layout of offshore wind projects, ADLS would likely limit the frequency of WTG aviation warning lighting use. This technology, if used, would significantly reduce the impacts of lighting.

Noise: As described in greater detail in Sections 3.6.1 and 3.6.3 *Commercial Fishing and For-Hire Recreational Fishing* and *Demographics, Employment and Economics*, respectively, noise from site assessment G&G survey activities, pile-driving, trenching, and vessels is likely to result in short-term revenue reductions for commercial fishing and marine recreational businesses that operate in the areas offshore from the GAA, which could impact EJ populations who may be employed in these industries. Construction noise, especially site assessment G&G surveys and pile-driving, would affect fish and marine mammal populations, with impacts on commercial and for-hire fishing and marine sightseeing businesses. There would be noise generated from helicopter activity both during construction and O&M phases of the Project. The severity of impacts would depend on the proximity and temporal overlap of offshore wind survey and construction activities, and the location of noise generating activities in relation to preferred locations for commercial/for-hire fishing and marine tours.

The localized impacts of offshore noise on fishing could affect subsistence fishing by low-income residents. In addition, noise would affect some for-hire fishing businesses or marine sightseeing businesses, as these visitor-oriented services are likely to avoid areas where noise is generated due to the disruption for the customers.

Impacts of offshore noise on marine businesses would be short-term and localized, occurring during surveying and construction, with no noticeable impacts during operations and only periodic, short-term impacts during maintenance. Noise impacts during surveying and construction would be more widespread when multiple offshore wind projects are under construction at the same time. The projects within offshore areas of the East Coast from the GAA for EJ could have 3,015 offshore WTGs and 3,075 OSSs installed by 2030 (Appendix E). The impacts of offshore noise on marine businesses and subsistence fishing would have short-term, localized impacts on low-income workers in marine-dependent businesses as well as residents who practice subsistence fishing and clamming, resulting in impacts on EJ populations. Therefore, commercial fisheries and for-hire recreational fishing activities, along with other recreation and tourism activities (e.g., marine sightseeing businesses) that are most active in the summer months would likely be more impacted than those active during the winter months.

Onshore construction noise would temporarily inconvenience visitors, workers, and residents near sites where onshore cables, substations, or port improvements are installed to support offshore wind development. Impacts would depend upon the location of onshore construction in relation to businesses or EJ communities and could be short term and intermittent, similar to those of other onshore utility construction activity.

Noise generated by offshore wind staging operations at ports would potentially have impacts on EJ communities if the port is near such communities. Within the GAA for EJ populations, the port cities in various states noted in Table 3.6.3-2 (Refer to COP Figure 3.3.10-1; Sunrise Wind 2022), are within or near EJ communities. The noise impacts from increased port utilization would be short-term and variable, limited to the construction period, and would increase if a port is used for multiple offshore wind projects during the same time period. Noise impacts would be reduced if intervening buildings, roads, or topography lessen the intensity of noise in nearby residential neighborhoods, or if noise-reduction measures are used for motorized vehicles and equipment.

Port utilization: Offshore wind project installation would require port facilities for berthing, staging, and loadout with offshore development supporting planned expansions and modifications at ports in the GAA. Offshore wind projects that utilize ports in or near EJ communities (e.g., the port cities in various states noted in Table 3.6.3-2) (Refer to COP Figure 3.3.10-1; Sunrise Wind 2022), may contribute to adverse impacts on these communities from increased air emissions and noise generated by port utilization or expansion (Refer to discussions in the air emissions and noise sections). Port use and expansion would have beneficial impacts on employment at ports. Port utilization for offshore wind would have short-term, beneficial impacts for EJ populations during construction and decommissioning, resulting from employment opportunities, support for other local businesses by port-related businesses, and employee expenditures. Beneficial impacts would result from port utilization during offshore wind operations, but these impacts would be of lower magnitude.

Presence of structures: As described in Sections 3.6.1 *Commercial Fisheries and For-Hire Recreational Fishing*, Section 3.6.2 *Cultural Resources*, Section 3.6.6, *Navigation and Vessel Traffic*, and Section 3.6.8 *Recreation and Tourism*, the offshore structures required for offshore wind projects, including WTGs, OSSs, and offshore cables protected with hardcover, would affect employment and economic activity generated by marine-based businesses.

Commercial fishing businesses would want to adjust routes and fishing grounds to avoid offshore work areas during construction and to avoid WTGs and OSSs during operations. Concrete cable covers and scour protection could result in gear loss and would make some fishing techniques unavailable in locations where the cable coverage exists. For-hire recreational fishing businesses would want to avoid construction areas and offshore structures. A decrease in revenue, employment, and income within commercial fishing and marine recreational industries is likely to affect low-income workers, resulting in impacts on EJ populations. The impacts during construction would be short-term and would increase in magnitude when multiple offshore construction areas exist at the same time. The projects within the offshore areas of the East Coast of the United States are outlined in Appendix E. Impacts during operations would be long-term and continuous but may lessen in magnitude as business operators adjust to the presence of offshore structures and as any short-term marine safety zones needed for construction are no longer needed.

In addition to the potential impacts on marine activity and supporting businesses, WTGs are anticipated to provide new opportunities for subsistence and recreational fishing through fish aggregation and reef effects, and to provide attraction for recreational sightseeing businesses, potentially benefitting subsistence fishing and low-income employees of marine-dependent businesses.

Views of offshore WTGs could have impacts on individual locations and businesses serving the recreation and tourism industry, based on visitor decisions to select or avoid certain locations. Because the service industries that support tourism are a source of employment and income for low-income workers, impacts on tourism would result in impacts on EJ populations. As stated in Section 3.6.9 *Scenic and Visual Resources*, portions of WTGs associated with offshore wind farm development and the No Action Alternative could potentially be visible from shorelines, depending on vegetation, topography, weather, and atmospheric conditions. While WTGs could be visible from some shoreline locations in the GAA, WTGs would not dominate offshore views, even when weather and atmospheric conditions allow views. The impact of visible WTGs on recreation and tourism is likely to be limited to individual decisions by some visitors and is unlikely to affect most shore-based tourism businesses or the GAA's tourism industry (Section 3.6.8 *Recreation and Tourism*). Therefore, views of offshore WTGs are not anticipated to result in impacts on EJ populations, specifically low-income employees of tourism-related businesses.

The development of future offshore wind projects would introduce new, modern, and intrusive visual elements to the viewsheds of cultural resources along the coastlines of New York, Connecticut, Massachusetts, and Rhode Island. Impacts on above-ground cultural resources from the presence of structures would be limited to those cultural resources from which future offshore wind projects would be visible, which would typically be limited to historic buildings, structures, objects, districts, and traditional cultural properties (TCPs) relatively close to shorelines and on elevated landforms near the coast. BOEM consulted with Native American tribes for whom these views are culturally important, as part of the review under the National Historic Preservation Act (NHPA) Section 106. Section 3.6.2 *Cultural Resources* provides evaluations of visual impacts on historic and cultural resources.

Traffic: Offshore wind construction and decommissioning and, to a lesser extent, offshore wind operation would generate increased vessel traffic. The anticipated offshore wind projects within the areas of the East Coast of the United States are outlined in Appendix E. Vessel traffic for each project is not known; however, it is assumed that several of these projects would utilize ports and areas similar to Sunrise Wind.

The volume of vessel traffic during construction would complicate marine navigation in the offshore construction areas and create the potential for vessel congestion and reduced capacity within and near the ports that support offshore construction, with potential competition for berths and docks. The short-term impacts on commercial fishing or recreational boating would affect all local boaters and would not have disproportionate impacts on residents or businesses within areas identified as EJ communities; however, the impact may be of greater magnitude for individuals who fish for subsistence or members of EJ communities who depend on jobs in commercial/for-hire fishing or marine recreation for their livelihood. Simultaneous development of multiple offshore wind projects could increase port-related vessel congestion. However, the impacts could be reduced by appropriate port planning and preparation.

Accordingly, vessel traffic generated by offshore wind project construction would have short-term, variable impacts on EJ communities due to the impacts on jobs, income, and subsistence fishing resulting from impacts on marine businesses, port congestion, and availability of berths. The magnitude of impact would depend upon the navigation patterns and the extent of facility preparation and planning at the port. In addition to the short-term impacts related to navigation and port availability, the increased need for marine transportation to support offshore wind development could have beneficial impacts on EJ populations through the provision of jobs and support of businesses.

It is expected that offshore wind development may increase onshore traffic to some extent due to accessing of ports during construction and O&M phases for employees, supplies, equipment, and mobilization. Many of these ports are located in cities and other population centers and a certain amount of port-related traffic is routine. It is recommended that individual projects would have a traffic management plan to understand and mitigate periods where traffic may negatively impact the surrounding communities. However, due to the geographic spread of the analysis area, along with the multiple different ports supporting the various offshore activities, specific and localized impacts cannot be predicted.

3.6.4.4.3 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, EJ population within the GAA would continue to be influenced by regional environmental, demographic, and economic trends. However, while the proposed Project would not be built under the No Action Alternative, BOEM expects ongoing activities would persist in the Lease Area and have short-term to long-term impacts on EJ populations through the following trends, including: ongoing population growth and new development; resulting traffic increases and industrial development, possibly increasing emissions near EJ communities; gentrification of coastal communities; ongoing commercial fishing, seafood processing, and tourism industries that provide job opportunities for low-income residents; and construction-related air pollutant emissions and noise when these occur near EJ communities. BOEM anticipates that the EJ impacts as a result of ongoing activities associated with the Alternative A - No Action of these ongoing activities would be **minor** to **moderate** adverse to **minor beneficial**.

Cumulative Impacts of the No Action Alternative

Reasonably foreseeable trends affecting EJ populations, other than offshore wind, include changes in the commercial fishing and seafood processing industries due to climate change and environmental stress; growing recreational and tourism industries for coastal economies; new development that would result in increased motor vehicle emissions; historically industrial waterfront locations redeveloping; and continued pressure to balance development pressure and coastal activity with protection of air and water quality. BOEM anticipates that the impacts of these trends and planned activities on EJ populations would be **minor**. BOEM expects the combination of ongoing and planned activities other than offshore wind to result in **minor** impacts on EJ populations, driven primarily by the continued operation of existing marine industries, especially commercial fishing, recreation/tourism, and shipping; increased pressure for environmental protection of coastal resources; and the loss of industry in historically industrial port areas.

Considering all the IPFs, BOEM anticipates that the overall impacts associated with future offshore wind activities in the GAA combined with ongoing activities and reasonably foreseeable activities other than offshore wind would result in overall **minor** to **moderate**. This reflects short-term impacts on minority and low-income communities from cable emplacement, lighting, construction-phase noise and vessel traffic, and the long-term presence of offshore structures, which could affect marine-dependent businesses, thereby potentially resulting in job losses for low-income workers. Construction-related port activities could have impacts on EJ communities near ports through air emissions, traffic, and/or noise. This rating reflects the potentially adverse impacts on tribes resulting from long-term impacts on culturally important ocean views and permanent impacts on submerged ancient landforms or other resources of importance to the values and practices of certain Native American Tribes (Section 3.6.2 *Cultural Resources*).

BOEM anticipates that the impacts associated with future offshore wind activities in the GAA would result in **minor beneficial** effects on minority and low-income populations through economic activity and job creation. Additional beneficial effects may result from reductions in air emissions if offshore wind displaces energy generation using fossil fuels, and minor beneficial employment benefits associated with future offshore wind construction and O&M, increased port utilization, and improved opportunities for for-hire recreational fishing. Beneficial effects are mentioned here for completeness but are not part of an EJ review under federal guidelines (CEQ 1997); therefore, are not assigned a level of significance.

3.6.4.5 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in Appendix C would result in impacts similar to or less than those described in the sections below. The following proposed relevant design parameters and potential variances (Appendix C) that would influence the magnitude of the impacts to EJ populations:

- The number, size, and location of WTGs;

- During construction phase, the amount of helicopter support required;
- Related to onshore export cable route and construction (Holbrook Construction Areas and Volumes), the length of onshore cable route, cable trenches, corridor width, and corridor area;
- Related to onshore substation (Holbrook), the permanent site area and short-term construction workspace;
- Related to overhead Transmission Line (Holbrook), the maximum length of onshore interconnection cable route, landfall type, the HDD noise levels, and number of personnel.

3.6.4.6 Impacts of Alternative B - Proposed Action on EJ

Impacts on EJ communities would occur when the Proposed Action's adverse effects on other resources, such as air quality, water quality, employment and economics, cultural resources, recreation and tourism, commercial fishing, or navigation, are felt disproportionately within EJ communities, due either to the location of these communities in relation to the Proposed Action or to their higher vulnerability to impacts.

The impacts of the Proposed Action in addition to ongoing activities, future non-offshore wind activities, and other future offshore wind activities are listed by IPF in Appendix G. The most impactful IPFs would likely include cable emplacement, vessel traffic during construction, and the presence of offshore structures because of the potential impacts of these IPFs on submerged landforms (and associated cultural resource impacts), marine businesses (fishing and recreational), views of WTGs, and subsistence fishing. Beneficial economic effects would result from port utilization and reduction in air emissions because of displacement of fossil fuel electricity generation. Beneficial economic effects would result from port utilization and reduction in air emissions, resulting from displacement of fossil fuel electricity generation. Impacts are characterized by onshore and offshore activities during each period of the project (Construction and Installation, Operations and Maintenance, and Conceptual Decommissioning).

3.6.4.6.1 Construction and Installation

3.6.4.6.1.1 Onshore Activities and Facilities

Air quality: Construction and installation activities onshore could have an adverse and disproportionate impact on EJ communities present in the vicinity of the proposed facilities. During construction of the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable, there would be a variety of road and non-road engines in use that would produce emissions. Construction-related emissions associated with these engines during construction of the Onshore Facilities would be short-term and would cease when construction is completed. Impacts would be similar to other construction projects, and air emissions are noted in Section 3.4.1 *Air Quality*. In addition to air emissions, a localized increase in fugitive dust may result during onshore construction activities. To minimize potential emissions of fugitive dust during construction, the Project would develop a dust control plan including a robust dust control program that would be required as part of contract specifications.

The OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable are located within, adjacent to, or within the vicinity of several Census Block Groups that are considered EJ communities (as shown Figure 3.6.4-1), and therefore have an adverse disproportionate impact on these communities; however, these activities would be short-term nature and are considered to be a minor disproportionate, adverse impact.

Cable emplacement and maintenance: Construction of onshore facilities includes installation of the onshore cable, primarily within public road and utility ROWs, and substation construction within a designated industrial area. The Onshore Transmission Cable and Onshore Interconnection Cable are located within, immediately adjacent to, or in the vicinity of several EJ communities (Figure 3.6.4-1). Impacts during cable installation would be similar to other construction type projects. Impacts could include air emissions from vehicle and equipment usage and an increase in particulate matter related to dust (see Section 3.4.1 *Air Quality*), along with potential noise and traffic impacts during the construction period. Noise and traffic impacts would be mitigated to the extent possible through APMs and the development of a Maintenance and Protection of Traffic (MPT) plan as part of the Project's EM&CP. In addition, outreach efforts and stakeholder engagement activities have contacted adjacent residences with respect to notifications for fieldwork and surveys. Overall, the construction of onshore facilities would be short-term in nature and are considered to be a minor disproportionate, adverse impact.

Land disturbance: The OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable are located within, immediately adjacent to, or in the vicinity of several EJ communities, this includes the census block group where landfall would occur at Smith Point County Park (Figure 3.6.4-1). Construction of the onshore export cable route would temporarily disturb neighboring land uses through construction noise, vibration, and dust and other air emissions, and cause delays in travel along the affected roads (as discussed individually throughout this section), but would have only short-term, variable, minor impacts on EJ communities. Installation of the cables would occur within a temporary construction corridor, along existing roadway and utility rights-of-way (e.g., William Floyd Parkway and Transmission Line ROW, Long Island Railroad [LIRR], Sunrise Highway). The route siting evaluating potential routes and constraints evaluated various factors, local stakeholder engagement, adjacent land uses, and proximity to environmental and cultural resources. The established route does traverse census block groups that are EJ communities.

From a cultural resource perspective, ground disturbing activities conducted during construction of onshore facilities have the potential to impact terrestrial archaeological resources. To avoid impacts to intact archaeological resources, the onshore facilities are primarily sited within previously disturbed and developed areas (e.g., roadways, ROWs, developed industrial/commercial areas) to the extent feasible, to minimize impacts to potential archaeological resources. In addition, facilities were sited using guidance from previous cultural resources surveys and input from Native American tribes to avoid or minimize impacts to historic properties. Desktop and infield archaeological investigations conducted in undisturbed portions of the project did not identify any previously known or undiscovered archaeological resources within the Proposed Action APE (COP Section 4.6.2, Sunrise Wind 2022). As a result of these activities, BOEM anticipates that the Proposed Action would have negligible impacts on previously recorded terrestrial archaeological resources.

The Proposed Action's onshore land disturbance activities are not anticipated to overlap in location with other offshore wind projects. If land disturbance overlaps with other offshore wind projects, in context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the combined onshore land disturbance impacts on EJ populations from ongoing and planned activities would likely be short-term, variable, and negligible to minor.

Lighting: Lighting in this context primarily refers to aviation safety lighting for the offshore WTGs, and there is not anticipated to be additional lighting for onshore activities and facilities outside of perhaps some lights during the construction period, as needed. The impact of any onshore lighting related to the Proposed Action on EJ populations would be short-term and negligible and not considered to be a disproportionate, adverse impact.

Noise: Noise onshore may be present from the construction and installation of the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable, including construction-related vehicle noise (i.e., dump trucks, backhoes, concrete saws, air compressors and portable generators), noise from areas requiring HDD, site preparation, and general vehicular traffic (note, port noise is discussed in the next section under Offshore Activities and Facilities). The OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable are located within, immediately adjacent to, or in the vicinity of several EJ communities. The noise generated during construction and installation of onshore facilities would be short-term and would have a minor disproportionate impact on EJ communities.

Port utilization: Port utilization in this context primarily refers to vessel support related to the construction, O&M and decommissioning of offshore facilities. Therefore, there would be no impact related to onshore activities and facilities.

Presence of structures: Presence of structures in this context primarily refers to the WTGs and other support facilities offshore; therefore, there would be no impact related to onshore activities and facilities. With respect to viewshed of WTGs from onshore historic resources, Table 3.6.2-5 in Section 3.6.2 *Cultural Resources*, outlines the number and type of above-ground historic resources within the PAPE for viewshed resources. This includes 342 resources, of which 11 are National Historic Landmarks (NHLs), 66 are NRHP-listed districts or individual properties, 61 are NRHP-eligible properties, and 3 are traditional cultural properties. Previously identified resources not evaluated for the NRHP are considered NRHP-eligible by BOEM for the purposes of this project and include 38 Rhode Island Historic Preservation and Heritage Commission Resources, 140 resources inventoried by the Massachusetts Historical Commission (MHC), and 23 Rhode Island Historical Cemeteries. The geographic breakdown for these 342 resources includes 7 resources in New York, 3 in Connecticut, 168 in Massachusetts, and 164 in Rhode Island.

Traffic: Traffic in this context primarily refers to land-based vehicular traffic related to the construction of onshore facilities, including the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection

Cable. This may require some detours and/or additional congestion during the period of construction of the onshore facilities along the roadways where the cable would be installed but be similar to a routine construction project. The OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable are located within, adjacent to, or within the vicinity of several Census Block Groups that are considered EJ communities, and therefore have an impact on these communities; however, these traffic-related activities would be short-term in nature and through the development of an MPT plan as part of the Project's EM&CP, it would minimize potential traffic impacts and associated impacts are considered to be a minor disproportionate, adverse impact.

3.6.4.6.1.2 Offshore Activities and Facilities

Air quality: Emissions during construction and installation of facilities at offshore locations would have regional impacts, with no disproportionate impacts on EJ communities. However, EJ communities near ports could experience disproportionate air quality impacts, depending upon the ports that are used. The Proposed Action's contributions to increased air emissions at the 14 ports being considered for this action (with four ports only identified for O&M activities and one port supporting both construction and O&M), which are predominately, or adjacent to, EJ communities, are not specifically evaluated. Air emissions during the offshore O&M phase could occur during periodic marine vessel or helicopter use to transport material and personnel to the SRWF, OCS-DC, SRWEC, or IAC for regular inspections and maintenance practices and from on-vessel equipment used for repairs or maintenance; however, a smaller number of vessels would be needed during the O&M phase as compared to the construction phase. The ten ports are being considered for use during the construction and installation of the Proposed Action are across seven states and geographically dispersed. Increased short-term and variable emissions from Proposed Action construction and operations would have negligible to minor disproportionate, adverse impacts on the communities near the ports.

The total estimated emissions during O&M of the OCS sources are 76.3 tpy CO, 183.8 tpy NO_x, 4.3 tpy VOCs, 0.2 tpy SO_2, 3.4 tpy $PM_{2.5}$, and 3.4 tpy PM_{10} (69.2 metric tpy CO, 166.7 metric tpy NO_x, 3.9 metric tpy VOCs, 0.18 metric tpy SO_2, 3.1 metric tpy $PM_{2.5}$, and 3.1 metric tpy PM_{10}). Overall air emissions impacts would be minor during the Proposed Action construction, operations, and decommissioning, with the greatest quantity of emissions produced in the Lease Area and by vessels transiting from ports to the Lease Area (see Section 3.4.1 *Air Quality* for additional details).

As noted previously, other offshore wind projects using ports within the GAA for EJ populations would overlap with the Project's construction phase, and associated short-term air quality impacts, which would be likely to vary from minor to moderate significance levels. The impacts at specific ports close to EJ communities cannot be evaluated because port usage has not been identified; however, most air emissions would occur at offshore locations rather than at the ports.

As noted under Alternative A, offshore wind within the various east coast Lease Areas would result in greater potential displacement of fossil fuel power generation. Net reductions in air pollutant emissions resulting from the Proposed Action alone would result in long-term benefits to communities (regardless of EJ status) by displacing emissions from fossil-fuel-generated power plants. As explained in Section

3.4.1 *Air Quality*, by displacing fossil fuel power generation, once operational, the Proposed Action would result in annual avoided emissions estimated to range between 1,179 and 1,474 tons of NO_X, 377 to 471 tons of $PM_{2.5}$, 1,227 to 1,534 tons of SO_2, and 2.1 to 2.6 million tons of CO_2 (Section 3.4.1, Table 3.4.1-4). Minority and low-income populations are disproportionately affected by emissions from fossil fuel power plants nationwide and by higher levels of air pollutants. Therefore, the Proposed Action alone could benefit EJ communities by displacing fossil fuel power-generating capacity within or near the GAA.

Cable emplacement and maintenance: Offshore cable emplacement for the Proposed Action would temporarily affect commercial fishing and for-hire recreational fishing businesses, marine recreation, and subsistence fishing during cable installation. As noted in Sections 3.6.1 *Commercial Fisheries and For-Hire Recreational Fishing* and Section 3.6.8 *Recreation and Tourism*, installation of the Proposed Action's cables would have short-term, localized, minor impacts on marine businesses (commercial fishing or recreation businesses) and subsistence fishing. Cable installation could affect fish and mammals of interest for fishing and sightseeing through dredging and turbulence, although species would recover upon completion of installation activities. Installation and construction of offshore cable components for the Proposed Action could therefore have a short-term, minor impact on low-income workers in marine businesses.

The Proposed Action would require export that cables cross up to 104.7 mi (168.5 km) from the landfall location to the Lease Area (COP Section 1.1). In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the combined offshore cable emplacement impacts on EJ populations from ongoing and planned activities would likely be short term and minor, resulting from the impact on subsistence fishing and employment and income from marine businesses, which may employ low-income individuals.

As noted in Section 3.6.2 *Cultural Resources*, cable emplacement could damage submerged ancient landforms that may have cultural significance to Native American tribes as part of ancient and ongoing tribal practices, and as portions of a landscape occupied by their ancestors. As noted in Section 3.6.2.1, *Cultural Resources*, a survey identified 43 preserved ancient submerged landforms within the APE; thirteen (13) are located within the SRWEC corridor and thirty (30) are located within the SRWF (COP, Appendix R; Sunrise Wind 2022). Disturbance and destruction of even a portion of an identified submerged landform could degrade or even eliminate the value of these resources as potential repositories of archaeological knowledge and cultural significance to tribes. If these landforms are disturbed during offshore cable emplacement, the impact on the cultural resource would be permanent, resulting in a disproportionately high and adverse impact on the affected Native American tribes.

Land disturbance: In this context, land disturbance refers to onshore components of the Proposed Action; therefore, there would be no impacts to EJ communities related to construction and installation of offshore facilities.

Lighting: Lighting in this context refers primarily to the aviation hazard lighting on the WTGs but could also include minor to moderate effects from nighttime lighting associated with vessels and other construction and installation related equipment. The impacts would be primarily to the recreational and commercial fishing, pleasure, and tour boating community, which may employ low-income individuals within the marine business industry. The impact to EJ communities from visual impacts associated with lighting from offshore facility construction and installation would be negligible, and the impacts from potential marine related businesses being impacted would be minor.

Noise: Noise from the offshore facilities component of the Proposed Action construction (primarily pile-driving) could temporarily affect fish and marine mammal populations, hindering fishing and sightseeing near construction activity within the Lease Area, which could discourage some businesses from operating in these areas during pile-driving (see Sections 3.6.1 *Commercial Fisheries and For-Hire Recreational Fishing*). This would result in a localized, short-term, negligible impact on low-income jobs supported by these businesses, as well as on subsistence fishing, but would return to normal conditions following the completion of construction activities.

Noise generated by the Proposed Action's staging operations at ports would potentially affect EJ communities if the port is near such communities. The Proposed Action is considering 10 ports for support during construction activities related to offshore facilities, most of which are in or adjacent to predominantly EJ communities. These ports have other industrial and commercial sites, as well as major roads, which generate ongoing noise. Therefore, although the additional noise from the Proposed Action alone has not been determined, it is unlikely to produce noise beyond what is already observed in the EJ communities near the ports. The noise impacts from increased port utilization would increase if a port were used for more than one offshore wind project. Depending upon the specific ports selected to support construction, noise from the Proposed Action, in combination with ongoing and planned activities, would have a variable, short-term, negligible to minor impact on EJ communities.

Port utilization: The Proposed Action would require port facilities for berthing, staging, and loadout to support the construction and installation of offshore facilities. Air emissions and noise generated by the Proposed Action's activities would potentially affect EJ communities at ports in or near these communities (as discussed elsewhere within this section), although these effects are anticipated to be both short-term in nature, and negligible to minor impacts.

The Proposed Action would potentially have a beneficial impact on EJ from port utilization due to greater economic activity and increased employment at the ports in the GAA, primarily during construction and decommissioning and to a lesser extent during operations. The Proposed Action would have minor beneficial impacts on EJ through increased job availability.

Presence of structures: Presence of structures in this context primarily refers to the WTGs and other support facilities offshore. Therefore, during the construction and installation phase there would not necessarily be structures permanently in place. The impacts surrounding the presence of structures is discussed in more detail under O&M.

Traffic: In this context, traffic is referring to vessel traffic generated during construction of the offshore facilities as part of the Proposed Action. Construction vessel trips would originate or terminate at one of the 10 ports being considered to support the Project during the construction and installation phase. Most of these ports are in predominantly EJ communities (see Figure 3.6.4-1 through Figure 3.6.4-19). Vessel traffic during construction is likely to have a short-term, minor impact on members of EJ communities who rely on subsistence fishing or employment and income from commercial fishing, for-hire recreational fishing and marine recreation, due to increased vessel traffic near ports and potential displacement from berths and docks.

3.6.4.6.2 Operations and Maintenance

3.6.4.6.2.1 Onshore Activities and Facilities

Air quality: O&M activities onshore would be minimal upon installation of the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable. The OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable are located within, immediately adjacent to, or in the vicinity of several Census Block Groups that are considered EJ communities (Figure 3.6.4-1 through Figure 3.6.4-19). Although onshore O&M activities would occur throughout the life of the project, activities would be limited to monitoring, vegetation maintenance, repairs and related tasks, some on a recurring basis, others on an as-needed basis. Therefore, the Proposed Action's operations and maintenance of the onshore activities and facilities would have a negligible impact to EJ communities.

Onshore Cable maintenance: Onshore facilities O&M for the Onshore Transmission Cable and Onshore Interconnection Cable are located within, immediately adjacent to, or in the vicinity of several EJ communities. However, O&M activities would be limited to monitoring and as-needed repairs during the useful life of the project. Therefore, the Proposed Action's operation and maintenance of the onshore cables would have a negligible impact to EJ communities.

Land disturbance: During the O&M phase of the project, the onshore transmission cable infrastructure, including cable landfall sites and onshore cables, would be underground and primarily within roads and utility rights-of-way, while the substation would operate within an industrial area. As a result, operations and occasional maintenance or repair operations from the Proposed Action would have negligible impacts and despite various portions of the roads and rights-of-way being within, immediately adjacent to, or in the vicinity of EJ communities, O&M would not result in disproportionate impacts on EJ communities.

Underground transmission cables and substations for other offshore wind development are anticipated to use cable routes and substation locations that comply with local land use regulations, and these improvements are not likely to be close enough to the Proposed Action to affect the same neighboring land uses. Accordingly, in context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the combined impacts of land use changes on EJ populations from ongoing and planned activities would likely be negligible.

Lighting: Lighting in this context primarily refers to aviation safety lighting for the offshore WTGs. It is not anticipated that there would be lighting for onshore activities and facilities during the O&M phase of the project, beyond perhaps some lights during a specific repair or maintenance activity, as needed during non-daylight activities. The impact of any onshore lighting related to O&M and the Proposed Action on EJ populations would be negligible.

Noise: Noise onshore may be present from O&M activities related to the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable. This would include operation of the OnCS-DC, which would be a new noise source and limited noise from routine maintenance that may require short-term use of equipment to facilitate inspections and repairs.

Based upon modeling of in-air noise (see COP Appendix I2; Sunrise Wind 2022), the OnCS-DC located at the Union Avenue Site indicated that operational noise at the nearest NSR would range from 28 to 67 dB, and the project sound level at the closest residence would be 42 dB, which is an increase of 0 dB over existing conditions. The Project would install appropriate, proposed mitigative measures and also comply with all specified regulatory criteria from the U.S. EPA, NYS DEC, and the Town of Brookhaven. As noted in Table 1.5-1 of the COP (Sunrise Wind 2022), there has been extensive community outreach and stakeholder engagement conducted to-date, including communication with the Town of Brookhaven and Suffolk County, New York where the onshore facilities are primarily located. In addition, communication has been made to residences abutting the corridor regarding fieldwork and surveys, and several open houses have been held about the project.

Therefore, although the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable are located within, immediately adjacent to, or in the vicinity of several EJ communities, noise generated from O&M activities would be minimal, ongoing and long-term for operation of the OnCS-DC and minimal and short-term when they do occur for routine maintenance. It is anticipated that Project-related noise would have a negligible to minor disproportionate impact on EJ communities.

Port utilization: Port utilization in this context primarily refers to vessel support related to the construction, O&M and decommissioning of offshore facilities. Therefore, there would be no impact related to onshore activities and facilities.

Presence of structures: Presence of structures in this context primarily refers to the WTGs and other support facilities offshore; therefore, there would be no impact related to onshore activities and facilities.

Traffic: Traffic in this context primarily refers to land-based vehicular traffic during the O&M phase for onshore facilities. Once the onshore facilities are constructed, there would be minimal long-term traffic impacts. There could be routine or as-needed maintenance along the cable routes or at the OnCS-DC; however, this would negligible in the context of the surrounding area. The OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable are located within, adjacent to, or within the vicinity of several Census Block Groups that are considered EJ communities, and therefore could have an impact on these communities; however, O&M traffic-related activities would be considered a negligible disproportionate, adverse impact.

3.6.4.6.2.2 Offshore Activities and Facilities

Air quality: O&M activities onshore would include routine maintenance and/or survey activities related to both transmission facilities and WTG and offshore converter station foundations and WTGs themselves. O&M activities would be conducted through utilization of a variety of vessels and operate out of up to five identified ports across New York and Rhode Island, including the Port of Brooklyn, Port Jefferson, and Port of Montauk, New York and/or the Port of Davisville and Quonset Point and Port of Galilee, Rhode Island (also noted in Table 3.6.3-2). EJ communities near ports could experience disproportionate air quality impacts, depending upon the ports that are used for O&M. The Proposed Action's contributions to increased air emissions at the five ports being considered for O&M support for this action are predominately, or adjacent to, EJ communities. Specific air emissions related to the Proposed Action's O&M activities per port are not specifically evaluated. However, as stated in Section 3.4.1*, Air Quality*, overall air emissions impacts would be minor during the Proposed Action O&M, with the greatest quantity of emissions produced in the Lease Area and by vessels transiting from ports to the Lease Area.

As noted previously, other offshore wind projects using ports within the GAA for EJ populations would overlap with the Project's O&M phase and associated air quality impacts, which would be likely to vary from minor to moderate significance levels. The impacts at specific ports close to EJ communities cannot be evaluated because port usage has not been identified; however, most air emissions would occur at offshore locations rather than at the ports.

Cable emplacement and maintenance: O&M activities related to the offshore cable emplacement for the Proposed Action would temporarily affect commercial fishing and for-hire recreational fishing businesses, marine recreation, and subsistence fishing during infrequent maintenance; however, would be less than during construction and installation. Impacts on EJ populations from O&M activities would likely be short term and minor, resulting from the impact on subsistence fishing and employment and income from marine businesses, which may employ low-income individuals.

Land disturbance: In this context, land disturbance refers to onshore components of the Proposed Action; therefore, there would be no impacts to EJ communities related to O&M of offshore facilities.

Lighting: Aviation hazard lighting from 94 WTGs associated with the Proposed Action could potentially be visible from coastal locations. Sunrise Wind has committed to voluntarily implement ADLS or related means (e.g., dimming or shielding) to limit visual impact. ADLS would activate the Proposed Action's WTG lighting only when aircraft approach the Sunrise Wind Project WTGs, as compared to standard continuous FAA hazard lighting.

As described in Section 3.6.9 *Scenic and Visual Resources*, nighttime aviation safety lighting on all of the Proposed Action's WTGs could be visible from coastal and elevated locations (depending on vegetation, topography, weather, and atmospheric conditions). Impacts could include recreational and commercial fishing, pleasure, and tour boating community would experience major adverse effects in foreground views. Onshore viewers would experience minor to moderate effects from nighttime lighting associated with O&M activities.

As a result, the lighting of offshore structures would result in a long-term, continuous, negligible impact on EJ communities as a result of the negligible impact on views important to the recreation/tourism economic sector that provides employment for low-income workers.

Noise: Noise generated by the Proposed Action's ports that would support O&M activities would potentially affect EJ communities if the port is near such communities. The Proposed Action is considering five ports for support during construction activities related to offshore facilities, most of which are in or adjacent to predominantly EJ communities. These ports have other industrial and commercial sites, as well as major roads, which generate ongoing noise. Therefore, noise from the Proposed Action alone would have variable, negligible impacts on EJ communities near the ports. The noise impacts from increased port utilization would increase if a port were used for more than one offshore wind project. Depending upon the specific ports selected to support O&M activities, noise from the Proposed Action would have a negligible impact on EJ communities.

Port utilization: The Proposed Action would require port facilities to support O&M activities related to offshore facilities. Five ports are being considered for supporting offshore O&M activities (Table 3.6.3-2). Air emissions and noise generated by the Proposed Action's activities would potentially affect EJ communities at ports in or near these communities (as discussed elsewhere within this section), although these effects are anticipated to be negligible to minor impacts.

The Proposed Action would have a beneficial impact on EJ from port utilization due to greater economic activity and increased employment at the ports in the GAA, although to a lesser extent during the O&M phase than during construction. The Proposed Action would have minor beneficial impacts on EJ through increased job availability.

Presence of structures: The establishment of offshore structures under the Proposed Action includes up to 94 WTGs, an offshore converter station (OCS-DC), as well as associated foundations and cables, which would result in both adverse and beneficial impacts on marine businesses (i.e., commercial fishing and for-hire recreational fishing businesses, offshore recreational businesses, and related businesses) and subsistence fishing. Beneficial impacts would be generated by the reef effect of offshore structures, providing additional opportunity for subsistence fishing, tour boats, and for-hire recreational fishing businesses. Impacts would result from navigational complexity within the Lease Area, disturbance of customary routes and fishing locations, and the presence of scour protection and cable hardcover, leading to possible equipment loss and limiting certain commercial fishing methods.

Overall, the presence of structures in the offshore environment from the Proposed Action would have minor to moderate impacts on marine businesses (Sections 3.6.1 *Commercial Fisheries and For-Hire Recreational Fishing* and Section 3.6.8 *Recreation and Tourism*), resulting in long-term, continuous, minor impacts on EJ populations due to the impact on low-income workers in marine industries and low-income residents who rely on subsistence fishing.

In addition, as described in Section 3.6.9 *Scenic and Visual Resources*, all of the Proposed Action's WTGs could be visible from coastal locations, depending upon vegetation, topography, and atmospheric conditions. The impact of visible WTGs on recreation and tourism is anticipated to be minor, and the impact is unlikely to meaningfully affect the recreation and tourism industry as a whole. Views of WTGs associated with the Proposed Action are therefore anticipated to have a negligible impact on EJ populations based upon the minimal anticipated impact on low-income employees of the recreation and tourism economic sector.

Traffic: In this context, traffic is referring to vessel traffic generated during the O&M phase of the Proposed Action for offshore facilities. O&M vessel trips would originate or terminate at one of the five ports being considered to support the Project during the construction and installation phase. Most of these ports are in predominantly EJ communities. Vessel traffic would be limited during the O&M phase and would have a long-term, negligible impact on EJ communities.

Non-routine activities associated with the Proposed Action could include response to spills from maintenance or repair vessels or activities requiring repair of WTGs, equipment, or cables that would generally require intense, short-term activity associated with oil spill response or to address emergency conditions. The presence of unexpectedly frequent vessel activity in ports, in offshore locations or near individual WTGs, could temporarily prevent or deter subsistence, commercial fishing or for-hire recreational fishing, or tourist activities near the site of a given non-routine event. The impacts of non-routine activities resulting from the Proposed Action on EJ populations would be minor.

3.6.4.6.3 Conceptual Decommissioning

3.6.4.6.3.1 Onshore Activities and Facilities

Air emissions: The decommissioning phase for onshore activities and facilities would be similar to, or of lesser intensity, than during the construction and installation phase and would occur for a shorter period of time; however, the location of the onshore facilities is within, adjacent to, or in the vicinity of EJ communities. The potential impacts to EJ populations related to air emissions would be similar to or less than under the construction and installation phase, and also short-term, and therefore are expected to have a minor, disproportionate impact on EJ populations.

Cable emplacement and maintenance: Onshore cable decommissioning would be similar in nature to the construction and installation related impacts. The Onshore Transmission Cable and Onshore Interconnection Cable are located within, immediately adjacent to, or in the vicinity of several EJ communities. Impacts during cable decommissioning would be similar to other construction type projects, and could include air emissions, noise, and traffic impacts, as well as visual impacts. However, the decommissioning would be short-term and even shorter-term than construction and are considered to be a minor disproportionate, adverse impact.

Land disturbance: The decommissioning phase for onshore activities and facilities would be similar to, or of lesser intensity, than during the construction and installation phase and would occur for a shorter period of time; however, the location of the onshore facilities is within, adjacent to, or in the vicinity of EJ communities. The potential impacts to EJ communities related to land disturbance would be similar to, or less than under the construction and installation phase, and also short-term, and therefore are expected to have a minor, disproportionate impact on EJ populations.

Lighting: Lighting in this context primarily refers to aviation safety lighting for the offshore WTGs, and there is not anticipated to be additional lighting for onshore activities and facilities outside of perhaps some lights during the decommissioning period, as needed. The impact of any onshore lighting related to the Proposed Action on EJ populations would be short-term and negligible.

Noise: Noise onshore may be present from the decommissioning activities of the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable, which may include similar activities as during construction and installation. This would include construction-related vehicle noise (i.e., dump trucks, backhoes, concrete saws, air compressors and portable generators), site rehabilitation, and general vehicular traffic. The OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable are located within, immediately adjacent to, or in the vicinity of several EJ communities. The noise generated during decommissioning of onshore facilities would be short-term and would have a minor disproportionate impact on EJ communities.

Port utilization: Port utilization in this context primarily refers to vessel support related to the construction, O&M and decommissioning of offshore facilities. Therefore, there would be no impact related to onshore activities and facilities.

Presence of structures: Presence of structures in this context primarily refers to the WTGs and other support facilities offshore; therefore, there would be no impact related to onshore activities and facilities.

Traffic: Traffic in this context primarily refers to land-based vehicular traffic related to the decommissioning of onshore facilities, including the OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable, which is assumed to be similar to construction and installation. This may require some detours and/or additional congestion during the period of decommissioning of the onshore facilities along the roadways where the cable would be installed but be similar to a routine construction project. The OnCS–DC, Onshore Transmission Cable and Onshore Interconnection Cable are located within, adjacent to, or within the vicinity of several Census Block Groups that are considered EJ communities, and therefore have an impact on these communities; however, these traffic-related activities would be short-term nature and through the development of a MPT plan as part of the Project's EM&CP, similar to the construction phase, potential traffic impacts would be minimized and associated impacts and considered to be a minor disproportionate, adverse impact.

3.6.4.6.3.2 Offshore Activities and Facilities

Air emissions: The decommissioning phase for the offshore facilities would be similar to the construction and installation phase but occur for a shorter period of time. Activities would include removing the structure and foundations of the SRWF, OCS-DC, and SRWEC. There would be a short-term increase in marine vessel and helicopter traffic. It is expected that similar equipment would be used as during construction, but emissions are expected to be less because of improved emission control technology and more stringent emission standards 25-35 years in the future. Decommissioning is expected to be completed within two years and any emissions would cease after decommissioning is complete. The potential impacts to EJ populations would be similar to or less than under the construction and installation phase, and also short-term, and therefore are expected to have a minor, disproportionate impact on EJ populations.

Cable emplacement and maintenance: The decommissioning of offshore cable for the Proposed Action would temporarily affect commercial fishing and for-hire recreational fishing businesses, marine recreation, and subsistence fishing during cable installation, in a similar manner as during construction and installation but to a lesser degree. Decommissioning activities would have a short-term, localized, minor impact on marine businesses (commercial fishing or recreation businesses) and subsistence fishing. Decommissioning activities could affect fish and mammals of interest for fishing and sightseeing through dredging and turbulence, although species would recover upon completion and removal of the cable. Decommissioning of offshore components for the Proposed Action could therefore have a short-term, minor impact on low-income workers in marine businesses.

Therefore, impacts to EJ populations would likely be short term and minor, resulting from the impact on subsistence fishing and employment and income from marine businesses, which may employ low-income individuals.

Land disturbance: In this context, land disturbance refers to onshore components of the Proposed Action; therefore, there would be no impacts to EJ communities related to decommissioning of offshore facilities.

Lighting: Lighting in this context refers primarily to the aviation hazard lighting on the WTGs but could also include minor to moderate effects from nighttime lighting associated with vessels and other decommissioning related equipment. The impacts would be primarily to the recreational and commercial fishing, pleasure, and tour boating community, which may employ low-income individuals within the marine business industry. The impact to EJ communities from visual impacts associated with lighting from offshore facility decommissioning would be negligible, and the impacts from potential marine related businesses being impacted would be minor.

Noise: Noise from decommissioning offshore facilities associated with the Proposed Action could temporarily affect fish and marine mammal populations, hindering fishing and sightseeing near decommissioning activity within the Lease Area, which could discourage some businesses from operating in these areas (see Sections 3.6.1 *Commercial Fisheries and For-Hire Recreational Fishing*). It is assumed noise generated during decommissioning would be similar to that experienced during construction. This would result in a localized, short-term, negligible impact on low-income jobs supported by these businesses, as well as on subsistence fishing, but would return to normal conditions following the completion of decommissioning activities.

Noise generated by the Proposed Action's operations at ports supporting decommissioning would potentially affect EJ communities if the port is near such communities. It is assumed the Proposed Action would utilize a combination of the same 10 ports for decommissioning as were utilized during construction activities, most of which are in or adjacent to predominantly EJ communities. These ports have other industrial and commercial sites, as well as major roads, which generate ongoing noise. Therefore, noise from the Proposed Action alone would have short-term, variable, negligible impacts on EJ communities near the ports. The noise impacts from increased port utilization would increase if a port were used for more than one offshore wind project. Depending upon the specific ports selected to support decommissioning, noise from the Proposed Action, in combination with ongoing and planned activities, would have a variable, short-term, negligible to minor impact on EJ communities.

Port utilization: The Proposed Action would require port facilities for decommissioning activities related to offshore facilities. Air emissions and noise generated by the Proposed Action's activities would potentially affect EJ communities at ports in or near these communities (as discussed elsewhere within this section), although these effects are anticipated to be even shorter-term than during construction and installation and considered negligible to minor impacts.

Presence of structures: Presence of structures in this context primarily refers to the WTGs and other support facilities offshore. Therefore, during the decommissioning phase the structures would be in the process of being removed. Therefore, the offshore Lease Area environment would generally return to preexisting conditions and impacts, whether adverse or beneficial, related to the Project would no longer be present.

Traffic: In this context, traffic is referring to vessel traffic generated during decommissioning of offshore facilities related to the Proposed Action. It is assumed that vessels supporting the decommissioning would originate or terminate at one of the same ten ports being considered to support the Project during the construction and installation phase. Most of these ports are in predominantly EJ communities. Vessel traffic impacts during decommissioning would be similar to the impacts during construction and installation.

3.6.4.6.4 Cumulative Impacts of the Proposed Action

This section outlines the cumulative impacts of the Proposed Action considered in combination with other ongoing and planned wind activities.

As noted in Appendix E, other offshore wind projects using ports within the GAA would overlap with the Project's construction and O&M phases. Short-term air quality impacts during the construction phase would be likely to vary from minor to moderate levels and to a lesser degree there would be long-term negligible impacts from O&M. The impacts at specific ports close to EJ populations cannot be evaluated because port usage has not been identified; however, most air emissions would occur at offshore locations rather than at the ports. Generation of offshore wind energy within offshore wind lease areas for future offshore wind projects would result in greater potential displacement of fossil fuel power generation than the Proposed Action alone. In context of reasonably foreseeable environmental trends, the incremental impacts contributed by the Proposed Action to the combined air quality impacts on EJ populations from ongoing and planned activities including future offshore wind would likely be negligible to minor, due to short-term emissions near ports during construction and decommissioning, or at the O&M facility during operations. The proposed Project could also have beneficial effects for environmental justice populations, due to long-term reduction in air emissions from fossil fuel power generation.

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by the Proposed Action to the combined offshore cable emplacement impacts on EJ populations from ongoing and planned activities including future offshore wind would likely be short term and minor, resulting from the impact on subsistence fishing and reduced employment and income of workers employed in industries supporting commercial fishing. Because impacts of Proposed Action cable emplacement on EJ populations would be short term and minor, BOEM has determined that impacts of this IPF on EJ populations would not be “high and adverse” for the purpose of the EJ analysis.

Ongoing activities and future non-offshore wind activities would occasionally generate additional pile-driving noise near ports and marinas, some of which may be near EJ populations. Future offshore wind activities would have similar contributions as the Proposed Action over a wider area and longer time period. The increased impacts would affect commercial fishing and for-hire recreational fishing and supporting marine businesses, resulting in impacts on employment and income, which may include EJ populations. In context of reasonably foreseeable trends, the incremental impacts contributed by the Proposed Action to the combined pile driving impacts on EJ populations from ongoing and planned activities including future offshore wind would be negligible to minor, based on the assessment of potential impacts of pile driving on boating, fisheries, and supporting marine businesses. Because impacts of Proposed Action noise on environmental justice populations would be negligible to minor, BOEM has determined that impacts of this IPF on environmental justice populations would not be “high and adverse” for the purpose of the EJ analysis.

The Proposed Action in combination with other offshore wind energy projects would result in a greater number of offshore structures affecting larger offshore areas. This could have an adverse impact on commercial fisheries, but potentially a slight benefit to recreational fishing due to the artificial reef effect. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined impacts on EJ populations that may support commercial fishing, for-hire recreational fishing and/or other marine businesses from ongoing and planned activities, which are anticipated to range from minor to moderate adverse to minor beneficial.

3.6.4.6.5 Conclusions

Impacts of the Proposed Action

In summary, BOEM anticipates that the impacts of individual IPFs from the Proposed Action alone would be **negligible** to **moderate** on EJ populations within the GAA. During both construction and operations, the impacts on low-income employees of marine industries and supporting businesses (commercial fishing, support industries, marine recreation, and tourism) from all IPFs would range from **negligible** to

minor. The **minor** impacts would result from disruption of marine activities during offshore cable installation and the impacts on commercial and for-hire fishing resulting from the long-term presence of offshore structures. The Proposed Action would result in **minor** to **moderate** impacts on EJ communities due to air emissions and noise at onshore construction sites and ports, but this would be short-term during construction and less during the O&M phase of the project because of less overall vessel activity. Potentially beneficial impacts on EJ populations would result from port utilization and increased vessel traffic, and the resulting employment and economic activity. Beneficial impacts could also result if the Proposed Action displaces fossil fuel energy generation in locations that improve air quality and health outcomes for EJ populations. Net reductions in air pollutant emissions resulting from the Proposed Action alone would result in long-term benefits to communities (regardless of EJ status) by displacing emissions from fossil-fuel generated power plants. As explained in Section 3.4.1 *Air Quality*, by displacing fossil fuel power generation, once operational, the Proposed Action would result in annual avoided emissions ranging between 1,179 and 1,474 tons of NO_X, 377 to 471 tons of $PM_{2.5}$, 1,227 to 1,534 tons of SO_2, and 2.1 to 2.6 million tons of CO_2. Minority and low-income populations are disproportionately affected by emissions from fossil fuel power plants nationwide and by higher levels of air pollutants. Therefore, the Proposed Action alone could benefit EJ communities by displacing fossil fuel power generating capacity within or near the GAA.

Considering the combined impacts of all IPFs, BOEM anticipates that the Proposed Action would have overall **negligible** to **moderate** impacts on all EJ populations, and therefore BOEM determined that impacts of the Proposed Action on low-income and minority populations would not be disproportionately high and adverse and could be avoided or reduced with AMPs or would be unavoidable but not disproportionately high and adverse.

In addition, **negligible** to **minor beneficial** effects to EJ populations may result from reductions in air emissions if offshore wind displaces energy generation using fossil fuels, as well as beneficial effects from economic activity and job creation.

Cumulative Impacts of the Proposed Action

The Proposed Action in combination with other offshore wind energy projects would result in a greater number of offshore structures affecting larger offshore areas, and additional onshore construction and port utilization within the GAA. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined impacts on EJ populations from ongoing and planned activities, which are anticipated to be **moderate** overall. In addition, **negligible** to **minor beneficial** effects to EJ populations may result from reductions in air emissions if offshore wind displaces energy generation using fossil fuels, as well as beneficial effects from economic activity and job creation.

3.6.4.7 Impacts of Alternative C-1 Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.6.4.7.1 Construction and Installation

3.6.4.7.1.1 Onshore Activities and Facilities

Impacts of Alternative C-1

Under Alternative C-1, the potential impacts from the construction and installation of onshore activities and facilities on EJ communities are anticipated to be the same as described under the Proposed Action.

Cumulative Impacts of Alternative C-1

In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined impacts on EJ populations from ongoing and planned activities, which are anticipated to be **moderate** overall.

3.6.4.7.1.2 Offshore Activities and Facilities

Under Alternative C-1, the construction of the 11-MW WTGs, OCS-DC, and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Removal of 8 WTG positions from Priority Areas 1, 2, 3 and/or 4 would not change the overall number of WTGs associated with the Project. Therefore, the potential impacts from the construction and installation of offshore activities and facilities on EJ communities are anticipated to be the same as described under the Proposed Action.

3.6.4.7.2 Operations and Maintenance

3.6.4.7.2.1 Onshore Activities and Facilities

Under Alternative C-1, the potential impacts from the operations and maintenance of onshore activities and facilities on EJ communities are anticipated to be the same as described under the Proposed Action.

3.6.4.7.2.2 Offshore Activities and Facilities

Under Alternative C-1, the operations and maintenance of the 11-MW WTGs, OCS-DC, and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Removal of 8 WTG positions from Priority Areas would not change the overall number of WTGs associated with the Project that would need to be operated and maintained. Therefore, the potential impacts from the operations and maintenance of offshore activities and facilities on EJ communities are anticipated to be the same as described under the Proposed Action.

3.6.4.7.3 Conceptual Decommissioning

3.6.4.7.3.1 Onshore Activities and Facilities

Under Alternative C-1, the potential impacts from the conceptual decommissioning of onshore activities and facilities on EJ communities are anticipated to be the same as described under the Proposed Action.

3.6.4.7.3.2 Offshore Activities and Facilities

Under Alternative C-1, the conceptual decommissioning of the 11-MW WTGs, OCS-DC, and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Removal of 8 WTG positions from Priority Areas would not change the overall number of WTGs associated with the Project that would need to be decommissioned. Therefore, the potential impacts from the conceptual decommissioning of offshore activities and facilities on EJ communities are anticipated to be the same as described under the Proposed Action.

3.6.4.7.4 Cumulative Impacts of Alternative C-1

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on EJ populations would be essentially the same as those described under the Proposed Action, which were noticeable to moderate, depending on the IPF.

3.6.4.7.5 Conclusions

Impacts of Alternative C-1

Alternative C-1 would include the removal of 8 WTG positions from Priority Areas 1, 2, 3, and/or 4 of the SRWF Lease Area for the purposes of habitat impact minimization; however, the overall number of WTGs (94) would remain the same and the onshore facilities and components would remain as described under the Proposed Action. The impacts resulting from individual IPFs associated with Alterative C-1 would be the same for both offshore activities and facilities and onshore activities and facilities. Therefore, the overall impact magnitudes to EJ populations would be impacted to the same degree when compared to the Proposed Action. These are anticipated to range from **negligible** to **moderate** adverse impacts and **negligible** to **minor beneficial** impacts on EJ populations.

Cumulative Impacts of Alternative C-1

Overall, Alternative C-1 combined with ongoing and planned activities would result in the same impacts as described in the Proposed Action, which include **negligible** to **moderate** adverse impacts and **negligible** to **minor beneficial** impacts on EJ populations in the GAA.

3.6.4.8 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

3.6.4.8.1 Construction and Installation

3.6.4.8.1.1 Onshore Activities and Facilities

Under Alternative C-2, the potential impacts from the construction and installation of onshore activities and facilities on EJ communities are anticipated to be the same as described under the Proposed Action and Alternative C-1.

3.6.4.8.1.2 Offshore Activities and Facilities

Under Alternative C-2, the construction of the 11-MW WTGs, OCS-DC, and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Removal of 8 WTG positions from Priority Areas 1, 2, 3 and/or 4 and relocation of 12 WTG positions to the eastern side of the Lease Area would not change the overall number of WTGs associated with the Project. Therefore, the potential impacts from the construction and installation of offshore activities and facilities on EJ communities are anticipated to be the same as described under the Proposed Action and Alternative C-1.

3.6.4.8.2 Operations and Maintenance

3.6.4.8.2.1 Onshore Activities and Facilities

Under Alternative C-2, the potential impacts from the O&M of onshore activities and facilities on EJ communities are anticipated to be the same as described under the Proposed Action and Alternative C-1.

3.6.4.8.2.2 Offshore Activities and Facilities

Under Alternative C-2, the O&M of the 11-MW WTGs, OCS-DC, and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Removal of 8 WTG positions from Priority Areas and relocation of 12 WTG positions to the eastern side of the Lease Area would not change the overall number of WTGs associated with the Project that would need to be operated and maintained. Therefore, the potential impacts from the operations and maintenance of offshore activities and facilities on EJ communities are anticipated to be the same as described under the Proposed Action and Alternative C-1.

3.6.4.8.3 Conceptual Decommissioning

3.6.4.8.3.1 Onshore Activities and Facilities

Under Alternative C-2, the potential impacts from the conceptual decommissioning of onshore activities and facilities on EJ communities are anticipated to be the same as described under the Proposed Action and Alternative C-1.

3.6.4.8.3.2 Offshore Activities and Facilities

Under Alternative C-2, the conceptual decommissioning of the 11-MW WTGs, OCS-DC, and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Removal of 8 WTG positions from Priority Areas and relocation of 12 WTG positions to the eastern side of the Lease Area would not change the overall number of WTGs associated with the Project that would need to be decommissioned. Therefore, the potential impacts from the conceptual decommissioning of offshore activities and facilities on EJ communities are anticipated to be the same as described under the Proposed Action and Alternative C-1.

3.6.4.8.4 Cumulative Impacts of Alternative C-2

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 to the cumulative impacts on EJ populations would be similar to or slightly less than those described under the Proposed Action, which were noticeable to moderate, depending on the IPF. The relocation of 12 WTG positions to the eastern portion of the SRWF Lease Area for the purposes of habitat impact minimization would lessen the impacts under certain IPFs but would not substantially change the incremental contribution to cumulative impacts.

3.6.4.8.5 Conclusions

Impacts of Alternative C-2

Alternative C-2 would include the exclusion of 8 WTGs from Priority Areas and the relocation of an additional 12 WTG positions to the eastern portion of the SRWF Lease Area for the purposes of habitat impact minimization; however, the same overall number of WTGs (94) as the Proposed Action would be installed and operated. In addition, there would be no change to the onshore facilities and components. The impacts resulting from individual IPFs associated with Alterative C-2 would be essentially the same the Proposed Action for both offshore activities and facilities and onshore activities and facilities. Therefore, the overall impact magnitudes to EJ populations would be impacted to the same degree when compared to the Proposed Action and Alternative C-1. These are anticipated to range from **negligible** to **moderate** adverse impacts and **negligible** to **minor beneficial** impacts on EJ populations.

Cumulative Impacts of Alternative C-2

Overall, Alternative C-2 combined with ongoing and planned activities would result in the same impacts as described in the Proposed Action and Alternative C-1, which include **negligible** to **moderate** adverse impacts and **negligible** to **minor beneficial** impacts on EJ populations in the GAA.

3.6.4.9 Comparison of Alternatives

Adverse impacts would result from construction activity (onshore and offshore), air emissions, traffic, and noise, while beneficial impacts would result primarily from construction activity and job creation. In combination with reasonably foreseeable trends for the analysis area, impacts to EJ populations from all evaluated action alternatives and other offshore activity would range from negligible to moderate adverse and negligible to minor beneficial. Table 3.6.4-6 provides an overall summary of alternative impacts.

Table 3.6.4-6. Comparison of Alternative Impacts Environmental Justice

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Environmental Justice	*Proposed Action*: BOEM anticipates that the impacts of individual IPFs from the Proposed Action alone would be **negligible** to **moderate** on EJ populations within the GAA. Considering the combined impacts of all IPFs, BOEM anticipates that the Proposed Action would have overall **negligible** to **moderate** impacts on all EJ populations. In addition, **negligible** to **minor beneficial** effects to EJ populations may result from reductions in air emissions if offshore wind displaces energy generation using fossil fuels, as well as beneficial effects from economic activity and job creation. *Cumulative Impacts of the Proposed Action:* The Proposed Action in combination with other offshore wind energy projects would result in a greater number of offshore structures affecting larger offshore areas, and additional onshore construction and port utilization within the GAA. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined impacts on EJ populations from ongoing and planned activities, which are	*Alternative C-1*: The impacts resulting from individual IPFs associated with Alterative C-1 would be the same for both offshore activities and facilities and onshore activities and facilities. Therefore, the overall impact magnitudes to EJ populations would be impacted to the same degree when compared to the Proposed Action. These are anticipated to range from **negligible** to **moderate** adverse impacts and **negligible** to **minor beneficial** impacts on EJ populations. *Cumulative Impacts of Alternative C-1*: Overall, Alternative C-1 combined with ongoing and planned activities would result in the same impacts as described in the Proposed Action, which include **negligible** to **moderate** adverse impacts and **negligible** to **minor beneficial** impacts on EJ populations in the GAA.	*Alternative C-2*: The impacts resulting from individual IPFs associated with Alterative C-2 would be essentially the same the Proposed Action for both offshore activities and facilities and onshore activities and facilities. Therefore, the overall impact magnitudes to EJ populations would be impacted to the same degree when compared to the Proposed Action and Alternative C-1. These are anticipated to range from **negligible** to **moderate** adverse impacts and **negligible** to **minor beneficial** impacts on EJ populations. *Cumulative Impacts of Alternative C-2*: Overall, Alternative C-2 combined with ongoing and planned activities would result in the same impacts as described in the Proposed Action and Alternative C-1, which include **negligible** to **moderate** adverse impacts and **negligible** to **minor beneficial** impacts on EJ populations in the GAA.

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
	anticipated to be **moderate** overall. Additionally, **negligible** to **minor beneficial** impacts may result from reductions in air emissions, as well as beneficial effects from economic activity and job creation.		

3.6.4.10 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2; however for environmental justice, there are no measures currently proposed by BOEM. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to environmental justice.

3.6.5 Land Use and Coastal Infrastructure

Under the Proposed Action, onshore infrastructure would be located in the Town of Brookhaven, Suffolk County, New York, on the south shore of Long Island. The SRWEC would meet landfall at the Smith Point County Park located within the Fire Island National Seashore. An Onshore Interconnection Cable and Onshore Transmission Cable would connect the landfall site to the existing Holbrook substation located within the Town of Brookhaven. The GAA for land use and coastal infrastructure includes the Town of Brookhaven, New York, resources adjacent to the landfall construction area, including land within the Fire Island National Seashore boundary, Smith Point County Park boundary, and Otis Pike Wilderness boundary, 1,000 feet into the Atlantic Ocean, and 4,000 feet into Great South Bay that is located within the boundary of the Fire Island National Seashore, and the ports potentially used for Project construction, O&M, and conceptual decommissioning. Please see Appendix D, Figure D-15 for a detailed overview of the GAA.

3.6.5.1 Description of the Affected Environment and Future Baseline Conditions

Brookhaven is the most populous of the 10 towns in Suffolk County and is the only one that stretches from the north shore to the south shore of Long Island (NYS 2022). The town is characterized by unique hamlets, villages, and communities; two world renowned research centers, Stony Brook University and Brookhaven National Laboratory; popular beaches; and recreation areas (Brookhaven 2022). The western half of the town has a much higher concentration of development, with the eastern half having a much higher area of preserved recreation and open space (Suffolk County 2016). Commercial, industrial, and institutional land uses predominantly occur directly adjacent to transportation and roadways. Town land use predominantly consists of preserved recreation and open space (43 percent of the acreage of town lands), low-density and medium-density residential areas (21 percent of the acreage of town lands), and vacant land (10 percent of the acreage of town lands) (Suffolk County 2020). There are eight harbors located in Brookhaven on both the north shore and south shore of Long Island, including two on Fire Island: Corey North, Corey South, Davis Park, Forge River, Great Gun, Mt. Sinai, Port Jefferson, and Sandspit (Brookhaven 2022).

The Smith Point County Park is located within the Fire Island National Seashore in the town of Brookhaven. While Smith Point County Park is not owned by the federal government, it is within the boundaries of Fire Island National Seashore. The park is accessible by car via the William Floyd Parkway, and parking is available at the fee-based public Smith Point County Park parking lot (Suffolk County Parks 2018). Public access at the site includes beach access, camping facilities, showers, a playground, and staff present, including lifeguards (Suffolk County Park 2018). The landing site is proposed to occur in the southeast corner of the public parking lot.

The Fire Island National Seashore is a 26-mile-long (41.8-km) protected section of the approximately 30-mile-long (48.2-km-long) Fire Island, separated from Long Island by the Great South Bay. The Fire Island National Seashore was established "[f]or the purpose of conserving and preserving for the use of future generations certain relatively unspoiled and undeveloped beaches, dunes, and other natural features within Suffolk County, New York, which possess high values to the Nation as examples of unspoiled areas of great natural beauty in close proximity to large concentrations of urban population" (16 U.S.C. § 459e(a)). The Otis Pike Fire Island High Dune Wilderness Act (enacted December 23, 1983) designated approximately 1,363 acres of the Fire Island National Seashore as federally designated wilderness (Otis Pike Wilderness Area) and later expanded the wilderness area to an additional 18 acres. The Otis Pike Wilderness area is the smallest wilderness area managed by the National Park Service and the only federally designated wilderness area in New York State. Figure 3.6.5-1 denotes the location of the Fire Island National Seashore and Otis Pike Wilderness Area. The Otis Pike Wilderness is located directly west of Smith County Park, and in an area where, per enabling legislation for the Fire Island National seashore, "every effort shall be exerted to maintain and preserve" this area of the seashore "in as nearly [its] present state and condition as possible" (16 U.S.C. § 459e-6(b)).

This area is characterized by dynamic barrier island beaches, an ancient maritime forest, and historic resources, and contains 17 communities and the Otis Pike Wilderness Area (National Park Foundation 2022). The Fire Island National Seashore has communities, the wilderness area, natural areas, and historical and cultural resources within its boundaries. More than three-quarters of Fire Island National Seashore is marine or estuarine habitat, with 14,644 acres of the park consisting of open water. The Seashore boundary extends 1,000 feet into the Atlantic Ocean from Moriches Inlet to Robert Moses State Park, and up to 4,000 feet into the Great South Bay, and Bellport, Narrow and Moriches Bay (NPS 2022). Two bridges connect the island to the mainland where cars can access the island but cannot drive from one end to the other, and the majority of people arrive on the island via ferry or private boat (NPS 2021). Fire Island is a popular tourism destination and day-trip location for recreationalists and beachgoers. The Fire Island Wilderness Visitor Center is located at the southernmost end of the William Floyd Parkway, adjacent to the Smith County Park. The Otis Pike Wilderness Area is accessible year-round, and parking is available at the Smith County Park.

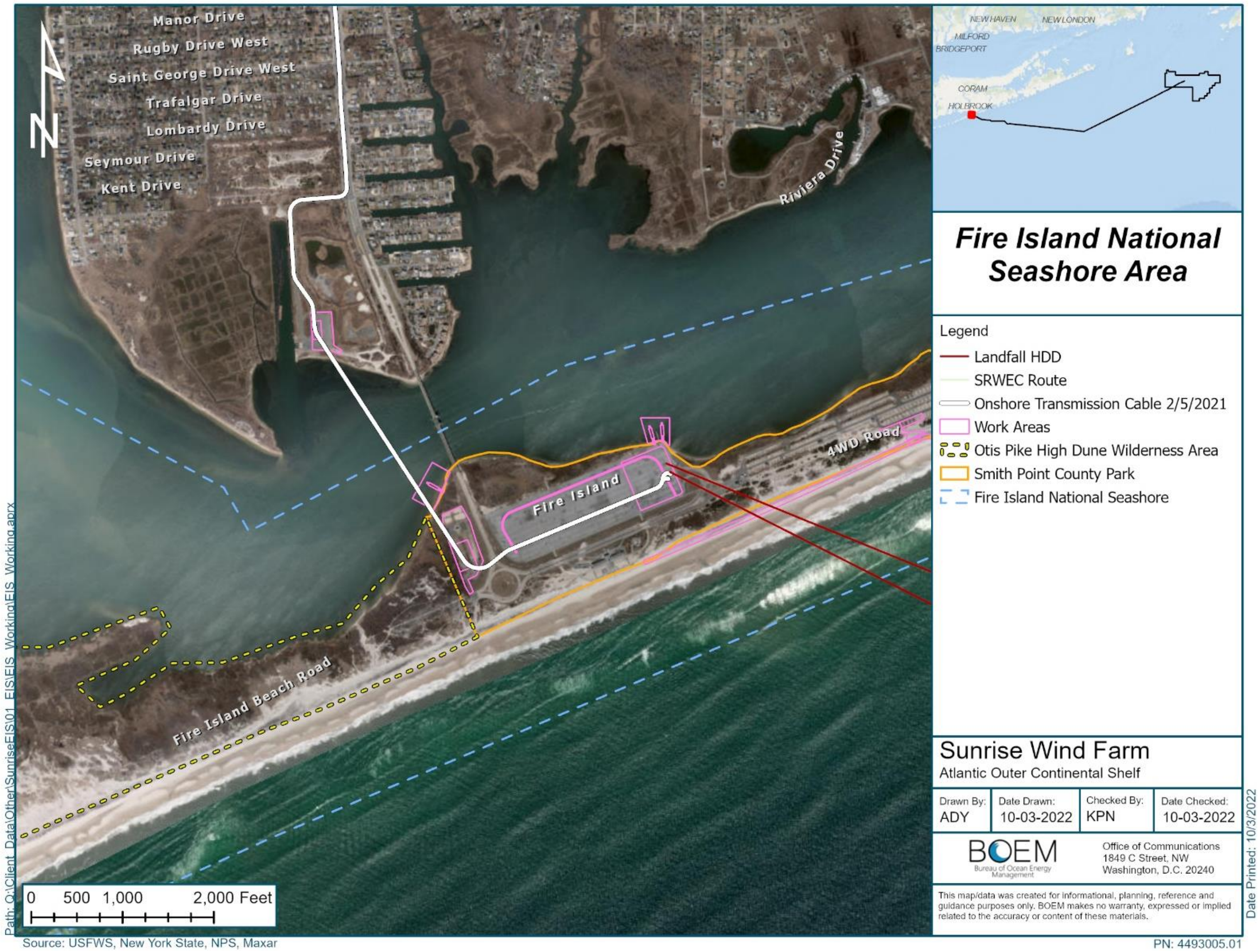

Figure 3.6.5-1. Fire Island National Seashore Area

Sunrise Wind considered six landfall sites along southern Long Island: Smith Point County Park, located in the Town of Brookhaven; Village of Quogue Beach, located in the Town of Southampton; Coopers Beach, located in the Town of Southampton; Rogers Beach, located in the Town of Westhampton; Bellport Bay, located in the Town of Brookhaven; and Bluepoint Marina/Corey Beach located in the Town of Brookhaven (COP Figure 2.2-2; Sunrise Wind 2022). Through evaluation, it was identified that using the village of Quogue Beach, Coopers Beach, and Rogers Beach as landfall sites would result in potential conflicts with existing uses and that using these sites would result in higher levels of terrestrial and/or seabed disturbance as the transmission route would have to be significantly longer. The Village of Quogue Beach was excluded from further consideration based on limited areas available for temporary work areas, the presence of floodplains, significant coastal fish and wildlife habitat, and the extended length of Onshore Transmission Line. Coopers Beach was excluded from further consideration based on potential conflicts with existing sand borrow areas and recreational boating activity, the proximity of the beach to cultural and historic resources, and extended length of the Onshore Transmission Cable. Rogers Beach was excluded from further consideration based on the close proximity to residential areas, limited area available for temporary work areas, and potential conflicts with existing sand borrow areas and recreational boating activity (COP Table 2.2-2; Sunrise Wind 2022). Through stakeholder and regulatory communication, it was identified that the Bellport Bay and the Bluepoint Marina/Corey Beach could negatively impact recreational and commercial fishing within Great South Bay and could have potential negative impacts to the federally designated Otis Pike Wilderness area. Subsequent to this analysis, the Project proposed to use the Smith Point County Park as the landfall site for the SRWEC.

The Smith County Park site was chosen as the landfall site as it provides sufficient area to accommodate onshore HDD operations within developed areas, with minimal disruption to adjacent land uses, and minimizes direct disturbance to natural or cultural resources in the nearshore, coastal, and intracoastal areas. The Smith Point County Park landfall site would result in the least disturbance to recreational and commercial fisheries, recreational boating, and impacts to designated wilderness areas and federal navigation channels, as compared to the other alternatives evaluated, resulting in it being selected over the other five potential options. Access to the Landfall Work Area would be through Smith County Park and would not traverse the Otis Pike Wilderness area or other NPS managed portions of the Fire Island National Seashore.

From the landing site, the Onshore Transmission Cable would parallel to Fire Island Beach Road within the paved Smith Point County parking lot within the Fire Island National Seashore, crossing under the William Floyd Parkway to a recreational area located to the west of the William Floyd Parkway. The cable would then be routed across the ICW, where it would then run north along East Concourse, north along William Floyd Parkway and Surrey circle, and cross the LIRR via trenchless crossing. The route then would turn west along Mastic Boulevard, north along Francine Places, and cross the Montauk Highway to Revilo Avenue, where it would continue north crossing Sunrise Highway. Then, the LIE Service Road Route turns west along Victory Avenue, where a crossing at Carmans River occurs, until it turns northwest along Horseblock Road. The cable would then cross the LIRR at Manor Road to Long Island Avenue, turn west along the LIE South Service Road, and continue to Waverly Avenue, where it turns south. From Waverly Avenue, the cable would turn west to Long Island Avenue and continue west to Union Avenue, where it would reach the OnCS-DC (see also Figure 2.1.2-3). Land use adjacent to the existing ROW varies.

The OnCS-DC for the Project is proposed to be constructed at the intersection of the Long Island Expressway and Route 97 at the Union Avenue South site in the town of Brookhaven. The OnCS-DC would convert DC power from the Onshore Transmission Cable to AC power at 138 kV. The site includes two parcels, approximately 7 acres (2.8 ha) in size, that would be improved as a common development. This facility would be constructed to support interconnection to the existing Holbrook Substation. This site is in close proximity to the Holbrook Station, approximately 1.0 mile (1.6 km) away, and is currently being utilized for industrial/commercial purposes. The site is maintained, contains gravel and paved locations, multiple buildings, and facilities associated with various commercial developments. This facility would include all equipment and safety features necessary to connect the SRWFEC with the NYISO transmission system (see Figure 2.2-1 in COP; Sunrise Wind 2022).

The Onshore Interconnection Cable would connect the OnCS-DC to the existing Holbrook Substation (see Figure 3.3.1-1 in COP; Sunrise Wind 2022). This cable would be installed underground within a duct bank to the Holbrook Substation and would convey AC power. The number of 138 kV onshore interconnection cables would be 12, with the potential for up to 2 fiber optic cables under the maximum design scenario.

Additionally, the Project would need to utilize various ports for construction, installation, O&M, and decommissioning activities. Sunrise Wind is evaluating several existing port facilities to support construction activities, located in New York, Connecticut and Rhode Island. At the majority of ports being evaluated, upgrades would not be required. At existing ports where upgrades or modifications would be needed for the Project to proceed, upgrades would either be permitted and undertaken by port owners/operators and/or governmental entities or upgrades would occur in conjunction with other planned offshore wind projects that would be under construction before the SRWF. The primary construction ports expected to be used include Albany and/or Coeymans, New York; Port of New London, Connecticut; and Port of Davisville-Quonset Point, Rhode Island. It is expected that Sunrise would utilize ports that are industrial in nature and have the facilities needed to accommodate decommissioning activities, and that based on current conditions, the ports that would be considered would be the same as those considered for construction activities.

The Port of Albany is in the city of Albany, New York and is a modern, industrial port on the Hudson River. The port is located 124 nautical miles (229.6 km) north of New York Harbor and is upstate New York’s largest public port (Port of Albany 2019). Marmen/Welcon, the first Offshore Wind Tower Manufacturer, is located at the Port of Albany, making it a potentially key area for construction of offshore wind projects. The port has more than 400 acres of land and deep-water facilities and is a major port of entry in the United States. The Port of Albany is located at the crossroads of Interstates 90 and I-87 and two class 1 rail services have access to the port, making it a convenient location to distribute goods from (Port of Albany 2019).

The Port of Coeymans is a port located in Coeymans, New York on the Hudson River, 100 miles (160.9 km) north of New York City and 10 miles (16.1 km) South of Albany. The port is industrial and commercial, and the services are centered around large construction projects, small manufacturing, marine construction, aggregates, and disaster recovery projects (Carver Companies 2022). The Port of Coeymans has dock capacity for ships up to 750 feet (228.6 m) in length and has sites set-up for storage, fabrication, or final assembly before being loaded on to a ship (Carver Companies 2022).

The Port of New London is an industrial port located in New London, Connecticut near the mouth of the Thames River on the north side of Block Island Sound. The port is one of Connecticut's three deepwater ports and is located at the intersection of maritime access and distribution networks (Connecticut Port Authority 2021). On February 11, 2020, the Connecticut Port Authority, the state's quasi-public agency who coordinates development of the port, Orsted, and Eversource finalized a harbor agreement to redevelop the State Pier in New London into a facility that would facilitate heavy lifting to help support the offshore wind industry (Connecticut Port Authority 2021). The improvements would allow for the port to accommodate heavy-lift cargo and is expected to be completed by 2023. Following this, the Orsted and Eversource joint venture company would enter into a 10-year lease agreement that would allow for WTG pre-assembly and staging to occur at the State Pier.

Quonset Point houses the industrial port of Davisville that consists of two piers, a bulkhead, on-dock rail, and laydown and terminal storage located near the mouth of Narragansett Bay in Rhode Island (Quonset Business Park 2022). Quonset Point played a key role in the development of Deepwater Wind's Block Island Project and served as the principal port for the project's heavy installation (Quonset Business Park 2022). In the summer of 2012, the Port of Davisville invested almost $30 million to improve its facilities, with the principal investment going toward the installation of a 150 metric tonne (330,693.4 pounds) mobile harbor crane to assist with a wide range of project cargoes (Quonset Business Park 2022).

Port facilities in Connecticut, Massachusetts, Maryland, New Jersey, New York, Rhode Island, and Virginia could potentially support construction and O&M of the SRWF facilities and the SRWFEC (see Figure 3.3.10-1 in of COP; Sunrise Wind 2022). The ports are characterized as commercial and industrial in nature, and are generally adjacent to areas where the major land uses are commercial, industrial, or transportation related. Before construction activities begin, SRWF would finalize plans at the major port facilities. For further information on recreational vessel and commercial fishing activities relevant to these ports, see Section 3.6.1 *Commercial Fisheries and For-Hire Recreational Fishing*, Section 3.6.3 *Demographics, Employment, and Economics*, and Section 3.6.8 *Recreation and Tourism*.

3.6.5.2 Impact Level Definitions for Land Use and Coastal Infrastructure

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on Land Use and Coastal Infrastructure from the alternatives, including the proposed action. Table 3.6.5-1 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for on Land Use and Coastal Infrastructure. Table G-17 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to on Land Use and Coastal Infrastructure. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project.

Table 3.6.5-1. Definition of Potential Adverse and Beneficial Impact Levels for Land Use and Coastal Infrastructure

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	No measurable/detectable change to area land use would occur.	No measurable/detectable change to area land use would occur
Minor	Impacts would be detectable but would be short term and localized.	Beneficial 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.	A detectable and broad-based benefit that would be short term and would not result in long-term change.
Major	Impacts would be detectable, long-term, extensive, and result in permanent land use change.	A detectable, long-term, extensive benefit that would result in permanent land use change.

3.6.5.3 Impacts of Alternative A - No Action on 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 as 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 wind and offshore wind activities. The Description of the Affected Environment and Baseline Conditions section provides an overview of information on trends from past and present activities on existing land use and coastal infrastructure. The analysis area (Figure D-15, Appendix D) is within developed communities that would experience potential impacts from development of planned activities and the existence of ongoing activities.

3.6.5.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for land use and coastal infrastructure in the GAA described in Section 3.6.5, Affected Environment, would continue to be affected by ongoing non-offshore wind activities and offshore wind activities. Ongoing non-offshore wind activities within the GAA that contribute to impacts on land use and coastal infrastructure include beach, dune, and berm construction; breach response plans; port expansion; onshore development projects; underwater improvement projects such as dredging; upgrades to roads. The GAA lies within communities that already are highly developed, and it would be expected that construction activities would occur in areas that have previously had development activities occur. However, there is the potential for some development to occur on land that is not already development. It is expected that impacts to land use and coastal infrastructure in the GAA from ongoing activities would be minimal, as the area is already developed and zoning measures in place would help determine which activities would be allowed to occur, and that activities within the GAA that activities and associated impacts are expected to continue are current trends and have the potential to affect land use and coastal infrastructure through land disturbance, lighting, port utilization, noise, and presence of structures.

Ongoing offshore wind activities within the GAA that contribute to impacts on land use and coastal infrastructure include:

- Continued O&M of the Block Island project (5 WTGs) installed in state waters,
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork Wind Project (12 WTGS and 1 OSS) in OCS0A.

The GAA for land use and coastal infrastructure includes ports that are used for the continued O&M and ongoing construction of wind projects. Ongoing O&M of Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect land use and coastal infrastructure through the primary IPFs of accidental releases and discharges, land disturbance, lighting, port utilization, presence of structure, traffic, and noise. Ongoing offshore wind activities would have the same type of impacts from the primary IPFs that are described in detail in the following section for planned offshore wind activities, but the impacts would be of lower intensity.

3.6.5.3.2 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 Proposed Action). BOEM expects planned future offshore wind development activities to affect land use and coastal infrastructure through the following primary IPFs.

Accidental releases and discharges: Discharges and releases of liquids and solid wastes could increase due to future offshore wind activities. The risk would be highest during construction activities, but there would still be the possibility of accidental releases and discharges occurring during operation and decommissioning of offshore wind facilities. Releases and discharges would be minimized with vessels complying with USCG regulations. Land use and coastal infrastructure would be dependent upon the location that the release or discharge occurs, and the locations of landfall, substations, cable routes, and ports that would be necessary to support offshore wind projects. However, any impacts other than very large spills, would generally be minor, short-term and localized.

Land disturbance: The installation of onshore transmission cable transmission infrastructure would be required to support future offshore wind projects. This could lead to potential impacts to adjacent properties during construction activities and the potentially during maintenance activities. Impacts would be anticipated to be negligible to minor, localized and short-term during construction or maintenance activities and would be dependent upon the locations of both landfall and offshore transmission cable routes.

Lighting: Offshore WTGs would be equipped with permanent aviation warning lighting that would be visible from some beaches and coastlines. The visibility of the lighting would result in localized, continuous, long-term impacts, but would be dependent upon the distance from shore, topography, and atmospheric conditions. Impacts from lighting could have effects on property values, recreation, and tourism. A University of Delaware study evaluated the impact of approximately 574-foot-tall (175-m-tall) WTGs visible more than 15 miles (24.1 km) from the viewer to beach use and found that impacts would be negligible to tourism and recreation activity (Parsons and Firestone 2018). As currently proposed, the majority of WTG positions for future offshore wind projects in the analysis area would be located greater than 15 miles (24.1 km) from coastal viewpoints. See Section 3.6.9 *Visual Resources*, for further discussion on impacts of aviation hazard lighting.

Lighting on the WTGs would come from either standard continuous, medium-intensity red strobe light aircraft warning systems or from short-duration synchronized flashing of the Aircraft Detection Lighting Systems (ADLS). ADLS would activate aviation warning lights on the WTGs when aircraft approach them and would have less nighttime visual impacts than standard warning lights. Sunrise Wind has proposed to implement ADLS as an APM, which would result in less impacts to land use from WTG lighting.

Lighting from onshore infrastructure, including new substations, could affect adjacent property use and residential development. However, it is likely that future offshore projects would construct new substations or expand existing substations near existing energy infrastructure in areas where land use regulations allow for such developments. This would lead to negligible to minimal adverse impacts on land uses, dependent upon the location of proposed substations. Generally, impacts would be localized, constant, and long term.

Port utilization: Future offshore wind projects would utilize various ports to support construction, operation, and decommissioning activities. Some ports would require improvements to occur within existing port facilities and would likely lead to beneficial impacts from greater economic activity and increased employment due to increased port utilization. Increased employment would stem from demand for vessel maintenance services, vessel berthing, loading and unloading activities, warehousing and fabrication facilities for offshore wind components, and other business activity related to offshore wind. Future offshore wind projects may result in dredging and other improvement projects in the analysis area. Impacts from these activities would be minimized by state and local agencies through managing port resources and traffic control to ensure continued access to ports and adjacent land uses.

There is the possibility that the construction of multiple offshore wind projects occurring at the same time and relying on the same ports and resources. If this occurs, there could potentially be increases in marine and road traffic, noise, and air pollution in the area, along with the potential for port resources to be stressed. The overall impacts on port utilization would have constant, long-term, beneficial impacts on port utilization due to port improvements and productive uses of the ports. However, there would also be the potential for localized, short-term adverse impacts if individual ports are stressed due to multiple construction activities occurring at the same time.

Presence of structures: Coastal locations in the GAA could have impacts during operations from the presence of offshore WTGs. The presence of structures could have impacts on recreation, tourism, and property values. Some WTGs could be visible from some coastal areas and beaches depending upon distance, vegetation, topography, and atmospheric conditions. See Section 3.6.9 *Visual Impacts*, for further discussion on the visual impacts of the presence of WTGs. Impacts to visibility from the presence of structures would be localized, constant, and long-term.

Future offshore wind development would also result in the presence of onshore transmission cable infrastructure and substations. It is expected that new substations or expanded existing substations would occur in locations near existing energy infrastructure in areas where land use regulations allow for such development. It is also anticipated that cable conduits associated with future offshore wind projects would be primarily underground and to the extent possible, co-located with roads or other utilities. This would minimize the impacts to land use and would not affect the established and planned land uses of the area.

Traffic: There could be increased road traffic that could impact land use and coastal infrastructure from the development of future offshore wind projects. There is the potential for occasional disruptions to road traffic during construction, repairs, and maintenance activities of onshore cables. The extent of the impacts on traffic from future offshore wind projects would be dependent upon the locations of onshore transmission cable routes, locations of landfall, and management plans developed by offshore wind energy developers with local governments.

Noise: Future offshore wind projects would generate noise that could impact land use and coastal infrastructure, primarily through construction activities associated with substation construction and onshore cable trenching. It is not expected that noise from offshore wind farm construction would be loud enough in magnitude to reach shores, and therefore, would not have impacts in the GAA. Noise from onshore construction activities and onshore cable trenching could impact residents', businesses', and tourists' choices of where to live, spend time, and visit. Ongoing noise from human activities, including construction projects and transportation, occurs frequently in the developed areas in the GAA. The intensity and extent of this noise varies depending upon the activity occurring but impacts from this noise are local and short-term. Noise from ongoing and planned onshore construction activity is expected to be similar to noise from other ongoing projects in the GAAs, with impacts to land use and coastal infrastructure being short-term and minor.

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. Ongoing activities are expected to have continued short-term and permanent impacts on land use and coastal infrastructure. The identified IPFs relevant to land use and coastal infrastructure from ongoing non-offshore wind and offshore wind activities include accidental releases and discharges, lighting, land disturbance, presence of structures, noise, traffic, and port utilization. The No Action Alternative would result in **minor beneficial** and **minor adverse** impacts on land use and coastal infrastructure.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and land use and coastal infrastructure would be affected by the relevant identified IPFs. The identified IPFS relevant to land use and coastal infrastructure include accidental releases and discharges, lighting, land disturbance, presence of structures, noise, traffic, and port utilization. Ongoing development and operation of offshore wind projects would support the region's diverse mix of land uses and provides supported for continued maintenance and improvement of coastal infrastructure. There are potential adverse impacts from future offshore wind to land use and coastal infrastructure through accidental releases and discharges during onshore construction, land disturbance during installation of onshore cables and substations, the presence of WTGs on the viewshed, nighttime lighting on WTGs and from onshore construction, and the presence of other structures. Potential beneficial impacts to land use and coastal infrastructure would result from the expansion and productive utilization of ports and associated infrastructure that would be utilized for future offshore wind activity. BOEM anticipates that the cumulative impacts of the No Action Alternative would be both **minor beneficial** and **minor** adverse in the GAA.

3.6.5.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on land use and coastal infrastructure:

- The time of year which construction occurs. Tourism and recreational activities in the GAA tend to be higher from May through September, particularly from June through August (Parsons and Firestone 2018). If Project construction were to occur during this season, impacts on traffic and land uses during the busy tourist season would be exacerbated.
- Location of the onshore transmission facilities, including sites for OnCS-DC, sites for landfall, and routes for the Onshore Transmission Cable.
- Construction Alternatives utilized for the installation methods of the Onshore Transmission Cable and Onshore Interconnection Cable.
- Port selected for the Sunrise Wind Farm Project O&M facility.

Changes to the turbine design capacity or layout would not alter the maximum potential impacts on land use and coastal infrastructure for the Proposed Action and other alternatives because the capacity or number of turbines would not affect onshore infrastructure or port utilization.

3.6.5.5 Impacts of Alternative B - Proposed Action on Land Use and Coastal Infrastructure

The Proposed Action would result in the construction of the SRWF. The proposed SRWF would have the potential to result in localized impacts; however, it is not anticipated to change the overall land use and infrastructure within the analysis area. The IPFs that are anticipated to have the largest impacts on land use and coastal infrastructure would occur from the presence of offshore WTGs within the viewshed, the utilization of ports, and the land disturbance that would occur during the installation of the onshore cable. Other IPFs, such as noise and accidental releases, would potentially result in impacts on land use and coastal infrastructure, but of a lesser and/or short-term extent. These IPFs would occur primarily during construction, with the potential for some to occur during O&M activities and decommissioning.

3.6.5.5.1 Construction and Installation

3.6.5.5.1.1 Onshore Activities and Facilities

Accidental releases and discharges: Accidental releases and discharges from the Proposed Action from onshore construction activities could include release of fuel/fluids/hazardous materials from the installation of onshore cables and improvements to the substation. Accidental releases and discharges would potentially have negative impacts on land use to the Fire Island National Seashore waters and onshore Otis Pike Wilderness Area. Releases and discharges could result in disruptions to land use in these areas by potentially causing for areas utilized by visitors to be temporarily closed due to the presence of fuel/fluids/hazardous materials and negatively influencing the wilderness area by polluting the area. All onshore construction activities would be completed in compliance with the New York SPDES General permit. The OnCS-DC would require mineral oils and sulfur hexafluoride to support safe and efficient operation of the facility equipment. To help mitigate the risk of accidental releases and discharges, Sunrise would implement the following APMs related to accidental releases and discharges. Equipment would be mounted on concrete foundations with a concrete secondary oil containment designed in accordance with industry and local utility standards. In addition to this, Sunrise Wind would develop a Spill Prevention, Control, and Countermeasure Plan to help minimize any potential impacts during construction (COP Table 4.8.3-1, Page 4-661; Sunrise Wind 2022). The installation of the Onshore Transmission Cable could result in potential accidental releases and discharges. The SRWEC would reach the landfall location via HDD methodology, which involves using drilling heads and reaming tools of various sizes that have drilling fluid comprised of bentonite, drilling additives, and water pumped to the drilling head during operation. If the geology and site is suitable, Sunrise Wind would use a casing pipe to contain and collect drilling fluid and minimize releases and discharges that could impact land use (COP Section 3.3.3.3; Sunrise Wind 2022). Sunrise would prepare and implement an Inadvertent Return Plan where HDD is utilized to minimize the potential risks associated with release of drilling fluids. With the necessary mitigation steps that Sunrise Wind is proposing to take to help minimize impacts, accidental releases and discharges from the Proposed Action from the construction and installation of onshore activities and facilities would have localized, short-term negligible to minor impacts on land use and coastal infrastructure.

Land disturbance: The SRWEC would be connected to onshore facilities and spliced with the Onshore Transmission Cable at co-located TJB and link boxes located at Smith Point County Park on Fire Island in the Town of Brookhaven, New York. The SRWEC would land at the landfall location via HDD methodology, would occur within the boundaries of Smith County Park and the Fire Island National Seashore, and would be adjacent to the Otis Pike Wilderness area (COP Section 3.3.3.3; Sunrise Wind 2022). This landfall site was selected as the preferred landfall site as it minimizes direct disturbances to natural or cultural resources in the nearshore and coastal areas and has minimal interruptions to existing nearby land uses, when compared to the other five landfall sites considered along southern Long Island (see Section 3.6.5). Smith Point County Park provides sufficient area to accommodate onshore HDD operations within developed areas, as opposed to areas that have not been developed at the other landfall sites considered, with minor to moderate disruption to adjacent land uses. This site was chosen as favorable because of its distance from existing sand borrow areas, mapped shipwrecks or obstructions and recreational boating activity, and due to minimal impacts on natural resources. Smith Point County Park is a public recreation facility, and based on information from the Town of Brookhaven Division of Public Information (2020), land use within the area is characterized as “Recreational and Open Space.” Zoning in the vicinity is characterized as Commercial Recreation, which is consistent with the zoning of multiple parks and campground sites located throughout the Fire Island National Seashore. The proposed nearshore portion of the HDD would traverse through Fire Island National Seashore, NPS-administered land over which the United States holds an easement. NPS exercises authority over public lands included in the National Park System. While Smith Point County Park is not owned by the federal government, it is within the boundaries of Fire Island National Seashore and portions of the SRWEC-NYS and Onshore Transmission Cable would be located under the seafloor within Fire Island National Seashore, in an area where the United States holds an easement for the use and occupation of lands for the purposes of Fire Island National Seashore. This easement on the Atlantic Ocean side extends from mean high tide to 1,000 feet out and on the bay side, the National Park Service has jurisdiction of the water column to 4,000 feet out into the bay. Sunrise Wind submitted an application for a special use permit for temporary construction activities and a ROW Permit pursuant to 54 USC § 100902 in September 2021, and the application was deemed complete by NPS in June 2022 (COP Section 1.4; Sunrise Wind 2022). As such, the Cable may be so located only if the NPS grants a right-of-way (54 USC § 100902; 36 C.F.R. Part 14) and special use permit for construction (36 C.F.R. § 5.7) for the Cable. Construction activities with land disturbance would occur within Smith Point County Park. Land uses would be impacted during construction activities, including disturbances to portions of the parking lots causing interruptions to recreation activities at both Smith County Park and the Fire Island National Seashore, and would be moderate, short-term during the period of construction (COP Section 2.2.1.1; Sunrise Wind 2022). The landfall site within Smith Point County Park is adjacent to the federally designated Otis Pike Wilderness Area. Land uses in the adjacent wilderness area would also be impacted due to land disturbance activities from construction activities. These impacts to adjacent land uses are anticipated to be moderate during the construction period. The Landfall Work Area would have a maximum disturbance of 6.5 acres (2.6 ha). To help minimize impacts, Sunrise Wind proposes an APM to complete construction activities to the extent possible in the off season of Smith Point County Park, which occurs from November 12 to March 31 annually; however, some construction activities may extend beyond that window (Suffolk County Parks 2018). However, there would still be impacts to some visitors, as the park, Fire Island National Seashore, and Otis Pike Wilderness Area are open to visitors year-round. The Otis Pike Wilderness Area is the only federally designated wilderness in the State of New York, and reports both recreational and non-recreational visitors to the area throughout the entire year. The busiest months at Fire Island National Seashore are July and August, but visitors come to the area throughout the entire year (NPS 2022). There would also be no direct impacts to intertidal and beach areas during installation of the Landfall HDD and ICW HDD. Temporary laydown areas at Smith Point County Park would be restored to the previous condition once construction activities have been completed. The presence of other construction activities, including impacts from construction activities at Smith Point County Park and within the boundaries of the Fire Island National Seashore would be short-term and minor to moderate to land use and coastal infrastructure.

The Onshore Transmission Cable route of the Proposed Action has been sited within existing disturbed ROW to the greatest extent possible. The Onshore Transmission Cable would be located underground. Construction of the Onshore Transmission Cable and Onshore Interconnection Cable would involve site preparation, trench excavation, duct bank and vault installation, cable jointing, final testing, and restoration. Laydown yards utilized for construction activities would be short-term, and would generally be located in areas that are previously disturbed industrial sites or locations containing open lands. Upon completion of construction, temporary laydown yards would be restored to pre-existing conditions in accordance with landowner, local, and state requirements (COP Section 3.3.2.3; Sunrise Wind 2022). Impacts from construction activities would result in short-term impacts to neighboring land uses through construction noise, lighting, vibration, dust, travel delays, and changes in the visual characteristics. Construction of the cables would occur in areas where land is already disturbed and much of the land use is designated for roadways, utilities, or other industrial uses. The land uses of the Proposed Action are generally compatible with existing and proposed land uses within the GAA. However, some construction activities would occur in areas utilized for recreation and tourism and neighbor residential areas. Impacts from construction would be short-term and minor to moderate to land use and coastal infrastructure during the construction period.

The construction of onshore substations would result in short-term impacts due to construction activities and permanent impacts due to the facilities that would be completed after construction. Construction of the onshore substation requires a site that is within close proximity to the Holbrook Substation, a parcel of approximately 6 to 10 acres (0.02 to 0.04 km^2), suitable parcel shape, suitable ground conditions, appropriate zoning and land use compatibility, and avoidance of disturbance to sensitive natural and cultural resources (COP Section 2.2.1.1; Sunrise Wind 2022). The Union Avenue site, located in Brookhaven, New York, and bordering the town of Islip, New York, would be in an area of existing industrial development, and is currently being utilized for industrial and commercial development (Suffolk County 2020). Therefore, construction at this site would be compatible with existing land uses and the potential impacts on land use would be minor. Interconnection would also occur at the exiting Holbrook substation. Any upgrades or construction activities associated with the existing Holbrook site would be compatible with existing uses and would result in minor impacts to land use and coastal infrastructure.

Lighting: Onshore construction activities would have general yard lighting present, but lighting would be minimal. Additional lighting may be required if construction activities are occurring at night or if the contractor deems additional lights necessary for safety and security purposes. Sunrise Wind would follow state and local requirements for lighting otherwise (COP, Section 3.3.1; Sunrise Wind 2022). Impacts to land use and coastal infrastructure from lighting during construction activities should be short-term and negligible to minor.

Noise: Construction of onshore facilities would generate noise from HDD operations, installation of the Onshore Transmission Cable and Onshore Interconnection Cable, installation of the OnCS-DC, and vehicular traffic. Construction activities that occur at all trenchless crossings would exceed the NYSDEC criterion of 65 dB in the proximity of noise sensitive receptors if left unmitigated. BMPs would be implemented to reduce noise at all trenchless crossing locations along the Onshore Transmission Cable route. Installation of the OnCS-DC would occur during daytime hours, making it exempt from both Suffolk County and the Town of Brookhaven noise ordinances. However, per NYSDEC policy of limiting levels to 65 dB at residential properties and 79 dB at industrial properties, BMPs would be implemented to minimize noise. Noise levels at noise sensitive receptors are anticipated to be similar to existing conditions. Onshore construction activities would occur adjacent to the Otis Pike Wilderness Area, an area that is managed by the NPS. The NPS utilizes the Acoustical Toolbox: Recommendations for Reducing Noise Impacts in National Parks to help reduce noise pollution and increase opportunities for visitors to hear unique natural and cultural sounds in the park (NPS 2010). Sunrise Wind would follow the BMPs included in this guide to the extent feasible to reduce impacts on the adjacent park soundscape.

Onshore construction activities would also increase vehicle noise, particularly in the area surrounding Smith Point County Park and in some residential areas in the Town of Brookhaven, New York. Access to the landfall area would be maintained through Smith County Park and would not traverse portions of the Otis Pike Wilderness area or other portions of the Fire Island National Seashore. Vehicles would include heavy equipment, such as excavators, cranes, dump trucks, and paving equipment, and the increased noise levels are anticipated to be similar to standard utility or roadway construction work (COP Section 4.2.3.3; Sunrise Wind 2022). Construction activities associated with site preparation at HDD and HAB sites would generate noise of approximately 84 dB at a distance of 50 ft (15 m) after implementing noise control strategies. Permissible noise limits are not expected to be exceeded at the Landfall HDD, the ICW, HDD, or TCs along the Onshore Interconnection Cable route since the specified controls are anticipated to reduce noise at NSRs below permissible levels. Mitigative measures would be implemented to attenuate construction noise from drilling operations below permissible levels (COP Appendix I2; Sunrise Wind 2022). Impacts from noise would be short-term, localized, and minor on land use and coastal infrastructure. during onshore construction activities.

Port utilization: Under the Proposed Action, the anticipated primary construction ports that would be used include Albany and/or Coeymans, New York; Port of New London, Connecticut; and Port of Davisville-Quonset Point, Rhode Island. At these ports, there would not be a need for upgrades beyond what has already occurred or upgrades that are currently occurring to support the construction of the

SRWF. For example, the Port of New London is redeveloping the State Pier into a facility to accommodate heavy lifting to help support the offshore wind industry and is expected to have improvements completed by 2023 (Connecticut Port Authority 2021). Additionally, the Port of Davisville recently invested almost $30 million to improve its facilities to accommodate a wide range of projects, including offshore wind (Quonset Business Park 2022). Use of these ports during construction activities could result in minor beneficial impacts due to the increased use and associated economic benefits. These ports are expected to be used during construction but would not be dedicated solely to use of the Project. Construction activities occurring at ports could result in noise, vibration, and vehicle traffic at the ports. However, these impacts are typical for industrial port, and would result in negligible impacts to land uses or use of coastal infrastructure.

Presence of structures: The Proposed Action has a landfall location at Smith Point County Park in Brookhaven, New York. Construction at the landing site would lead to short-term disturbances to neighboring land uses, including recreation uses and residential uses, through construction noise, vibration, dust, and increased traffic in the vicinity of the construction activity. Sunrise Wind proposes landfall construction methods that would minimize impacts on land use, and areas would be restored to their previous condition after construction activities are complete. Under the Proposed Action, the Onshore Transmission Cable and Onshore Interconnection Cable would be located underground and generally in areas where land is already disturbed and designated for roadways, utilities, or other industrial uses. However, some construction activities would occur in areas utilized for recreation and tourism and residential areas. Impacts from onshore construction activities would be short-term, minor, and would stem from construction noise, lighting, vibration, dust, travel delays, and changes in the visual characteristics.

The Union Avenue site of the OnCS-DC would occupy approximately 7 acres (0.03 km^2) and be sited in an area that is currently used for industrial/commercial development. The site is bound by areas of commercial and industrial development. Since the OnCS-DC is proposed to be built on a previously developed site, there would be minimal change to existing land use.

Onshore construction activities associated with the Proposed Action would result in short-term or permanent impacts to land use. Under the Proposed Action, Sunrise Wind proposes a construction schedule to minimize onshore construction activities during the peak tourism and recreation season from May to September. Expected impacts to existing land use during onshore construction activities include short-term increases in noise levels, lighting, and traffic. Sunrise Wind would implement BMPs to help minimize impacts to surrounding land uses and coastal infrastructure. Onshore construction activities would not change existing land uses. Therefore, the onshore construction would have short-term, minor adverse impacts on land use and coastal infrastructure.

Traffic: Onshore construction activities within and adjacent to existing roadways could result in short-term, localized impacts to traffic from activities such as lane closures, shifted traffic patterns, or closed roadways. Vehicular traffic associated with construction activities would be comparable to typical roadway or utility construction work. As stated in the COP (COP Section 4.2.7.3; Sunrise Wind 2022), the onshore construction activities would comply with local ordinances to the extent practicable, and would need to adhere to local ordinances. The Onshore Transmission Cable route would travel up to 17.5 miles (28.2 km) in length from the Landfall Work Area to the OnCS-DC (COP Section 3.3.2; Sunrise Wind 2022). As an APM, Sunrise Wind would work with the Town of Brookhaven, New York to develop a detailed plan that includes traffic and other control measures prior to construction activities. As stated in the COP (COP Section 4.8.2.2; Sunrise Wind 2022), Sunrise Wind would use commercially-reasonable efforts to maintain at least one travel lane of traffic in the section(s) of the road(s) in which construction crews are working; however, during certain periods of work, short-term road closures may be necessary. Sunrise Wind would develop a Maintenance and Protection of Traffic (MPT) plan within the Project's Environmental Management and Construction Plan (EM&CP) that describes measures to minimize and mitigate for potential impacts to land transportation to the maximum extent practicable during construction (COP Section 4.8.2.2; Sunrise Wind 2022).

It is anticipated that there would be short-term increases of vehicular traffic in the area around Smith Point County Park, including the Fire Island National Seashore. Construction of the Onshore Facilities would result in short-term reduction in access to recreational areas, including portions of the parking lot at Smith Point County Park, with the level of impact from traffic varying depending on the location, construction activity occurring, and time of year. Access to Smith Point County Park and the Fire Island National Seashore would still be maintained throughout construction activities, however, partial areas of the parking lots may be closed during the offseason time. Sunrise Wind would also implement BMPs and adhere to construction schedules to the extent practicable that avoids the busy summer recreation and tourism season from May to September. Sunrise Wind anticipates coordination with the NPS, FHWA, DOT, and local DPWs on bridge use, LIE crossing, and local roads for construction related activities, and would implement BMPs to the extent practicable to minimize impacts in coordination with these agencies. After construction activities are completed, roadways would be returned to pre-construction conditions. Impacts to traffic would be short-term and localized would have short-term, moderate adverse impacts on land use and coastal infrastructure.

3.6.5.5.1.2 Offshore Activities and Facilities

Accidental releases and discharges: The construction of offshore facilities could result in accidental discharges and releases of fuels, fluids, and hazardous materials that could impact land use. Sunrise Wind would manage accidental releases or discharges during offshore construction activities through an Emergency Response Plan/Oil Spill Response Plan, an APM that would minimize impacts from accidental releases and discharges to land use and coastal infrastructure. All construction vessels would be required to comply with applicable federal and state regulations and standards for the prevention and control of spills and discharge. Accidental releases from the Proposed Action on land use and coastal infrastructure would have short-term, localized, negligible to minor impacts.

Lighting: Offshore construction activities would result in increased vessel and air traffic that could be visible from some coastlines and elevated areas within the GAA and offshore nighttime construction lighting. The visibility would be dependent upon distances from the viewer, vegetation, topography, weather, and atmospheric conditions. The increased presence of lighting could result in minor impacts to land use through impacts on recreation, tourism, and changes in property values if the presence of lighting influences the decisions of visitors and those purchasing property. The USCG maintains a listing of all coastal light sources, which includes offshore structures such as buoys, markers, and lighthouses, and indicates that there are lighted buoys and markers present in the GAA (USGC 2022). Visual impacts from lighting are further discussed in Section 3.6.9. Lighting from offshore construction activities would have short-term, minor impacts on land use and coastal infrastructure.

Noise: The Proposed Action would comply with NYSDEC and local noise regulations to the extent practicable to help minimize the impacts to nearby communities. Activities associated with offshore construction of the Proposed Action would generate noise. However, these activities would occur at a significant distance away from existing land use. For example, the exit side of the Landfall HDD is located approximately 0.5 mi (800 m) offshore. Construction at this site would produce a sound level of approximately 60 dB or less at the nearest shoreline, which is below all applicable criteria (COP, Section 4.2.3.3; Sunrise Wind 2022). This would result in short-term, negligible impacts to land use and coastal infrastructure as noise levels from offshore construction activities should not change existing land use or coastal activities.

Port utilization: The Proposed Action would include increased utilization of ports that are already industrial or commercial in nature. Impacts to land use and coastal infrastructure would include increased vehicle traffic to and from the ports, increased construction noise and vibration at the ports, and increased vehicular emissions (BOEM 2016). However, these impacts would be minor and typical of activities that already occur at these ports and would not change the existing land use. The existing land uses meet the goals and zoning criteria of the locations of the ports. Increased port utilization and improvements could also lead to minor beneficial impacts through the support of designated uses and infrastructure improvements.

Traffic: Offshore construction activities would result in increased vessel and air traffic for construction equipment and supplies. This increased vessel and air traffic could be visible from coastal and onshore locations within the geographic area, but would not be expected to have impacts on land uses and coastal infrastructure. Offshore construction activities could result in increases in vehicle traffic around ports utilized for construction activities. However, these impacts would be short-term, localized, and negligible, and would be occurring in areas that are utilized for industrial or commercial land uses.

3.6.5.5.2 Operations and Maintenance

3.6.5.5.2.1 Onshore Activities and Facilities

Accidental releases and discharges: Operation of the OnCS-DC could result in the release of fuel/fluids/hazardous materials. Accidental releases and discharges would potentially have negative impacts on land use to the Fire Island National Seashore waters and onshore Otis Pike Wilderness Area. Releases and discharges could result in disruptions to land use in these areas by potentially causing for areas utilized by visitors to be temporarily closed due to the presence of fuel/fluids/hazardous materials and negatively influencing the wilderness area by polluting the area. However, to help minimize the risk of this, equipment to operate the OnCS-DC would be mounted on concrete foundations with a concrete secondary oil containment designed in accordance with industry and local utility standards (COP Table 4.8.3-1, Page 4-661; Sunrise Wind 2022). Under the Proposed Action, onshore facilities would be designed in accordance with National Electric Safety Code, American National Standards Institute/Institute of Electrical and Electronics Engineers Standards and New York Independent System Operation requirements to help minimize impacts (COP Section 3.3.1; Sunrise Wind 2022). Therefore, O&M activities would have negligible adverse impacts on land use and coastal infrastructure.

Land Disturbance: The OnCS-DC would result in a permanent structure and site and associated infrastructure. After onshore facilities have been installed, adjacent land uses would not be changed, and it is not expected that coastal infrastructure would be affected. Onshore facilities would be located in areas compatible with their intended land uses, and areas where construction activities had occurred would have been restored back to their previous uses. The OnCS-DC would be located in land use areas designated for commercial and industrial land use and would be connected to the existing Holbrook Station. The Proposed Action would have land uses that are compatible with existing land uses. Due to this, potential adverse impacts on land use and coastal infrastructure would be minor.

Lighting: Routine operations at the OnCS-DC would have security lighting present. However, yard lighting would be minimal at night and subject to state and local requirements. Sunrise Wind proposes to implement shielding to security lighting would to mitigate light pollution as an APM (COP Section 3.3.1; Sunrise Wind 2022). Facilities would be located in areas that are already used for commercial and industrial land uses, and the presence of security lighting should not change the character of the area. Therefore, impacts from lighting at onshore facilities would be negligible on land use and coastal infrastructure.

Noise: During O&M, a new noise source would be anticipated to regularly occur from the operation of the OnCS-DC from the converter transformers, reactors, filters, and outdoor cooling equipment associated with the valve hall. Other noises associated with the OnCS-DC would not be anticipated to add significant contributions to the overall sound levels in the vicinity of the facility. Modeling activities have found that in-air noise from the OnCS-DC associated with the Proposed Action would range from 28 to 67 dB, which would result in a sound level of 42 dB at the closest residence, a 9 dB increase in the total sound level relative to existing conditions. The predicted total sound levels of the OnCS-DC comply with all applicable criteria as specified by the EPA, NYSDEC, and the Town of Brookhaven (COP Section 4.2.3.2; Sunrise Wind 2022). Any routine O&M activities of the Onshore Transmission Cable and Onshore Interconnection Cable may result in short-term, localized noise to adjacent areas. Impacts from noise from O&M activities to land use and coastal infrastructure are anticipated to be minor adverse.

Port utilization: The Proposed Action would result in the Project having an onshore O&M facility located at an existing, industrial port. The Proposed Action's offshore facilities would require daily activity to occur at the O&M facility. The facilities needed to support the O&M facility would be consistent with the range of land uses that already occur at the proposed ports. The increased activity would reinforce the designated land use of the port, support jobs, and would provide a source of investment to coastal infrastructure. This would have minor, beneficial impacts to land use and coastal infrastructure.

Presence of structures: Onshore facilities would be located primarily in areas that are already used for commercial and industrial purposes, so the OnCS-DC structure and land use would be compatible with adjacent areas. The existing use of the proposed location for the OnCS-DC is zoned for commercial and industrial uses, and therefore, would not change the current land use of the proposed site. Once construction activities are completed, the Onshore Transmission Cable and Onshore Interconnection Cable would be located primarily underground in already disturbed areas and existing ROWs when practicable. With compatible OnCS-DC structure for commercial and industrial uses and underground facilities, the anticipated impacts would be negligible to land use and coastal infrastructure.

Traffic: Onshore facilities would require periodic maintenance and inspection activities that would require the use of construction vehicles and equipment that could temporarily impact traffic. These impacts would be expected to be similar to other routine utility and construction activities and would lead to negligible adverse impacts to land use and coastal infrastructure.

3.6.5.5.2.2 Offshore Activities and Facilities

Accidental releases and discharges: O&M activities associated with offshore facilities have the potential to result in accidental discharges and releases of fuels, fluids, and hazardous materials that could impact land use. Sunrise Wind would manage accidental releases or discharges through an Emergency Response Plan/Oil Spill Response Plan if needed, an APM that would minimize impacts from accidental releases and discharges to land use and coastal infrastructure. Accidental releases would have short-term, localized, negligible to minor impacts depending upon the size of the release.

Lighting: The Proposed Action would include the installation and continuous use of aviation hazard avoidance lighting on WTGs during low-light nighttime conditions. Please see Section 3.6.9 for further discussion on the impacts to visual resources from lighting. During operations, lighting from up to 94 WTGs and one OSC-DC structure could be visible from coastal locations within the analysis area depending upon distance of the viewer, vegetation, topography, weather, and atmospheric conditions. To help minimize impacts, Sunrise Wind proposes to implement ADLS as an APM, which would result in aviation obstruction lights being turned on and off when aircraft are in proximity of the wind farm. This could result in the lights being on for a shorter duration of time, thus reducing the impacts on land use and coastal infrastructure. This lighting could result in impacts to recreation and tourism activities in the GAA and has the potential to effect property value and use. The impacts of offshore facility lighting would result in long-term negligible to minor impacts on land use and coastal infrastructure.

Port utilization: The Proposed Action would result in the Project having an onshore O&M facility located at an existing, industrial port. The Proposed Action's offshore facilities would require daily activity to occur at the O&M facility. The facilities that would need to support the O&M facility would be consistent with the range of land uses that already occur at the proposed ports. The increased activity would reinforce the designated land use of the port, support jobs, and would provide a source of investment to coastal infrastructure. This would have minor, beneficial impacts to land use and coastal infrastructure.

Presence of structures: The Proposed Action would result in up to 94 WTGs and one OSC-DC present in the offshore environment that could be visible from coastal locations within the analysis area depending upon the distance of the viewer, vegetation, topography, weather, and atmospheric conditions. The presence of structures could result in impacts to recreation and tourism activities in the GAA and has the potential to effect property value and use. Please see Section 3.6.9 for further discussion on the impacts to visual resources from the presence of structures. A University of Delaware study evaluated the potential impacts of visible offshore WTGs on beach use ad found that WTGs of approximately 574 feet (175 m) in height visible from greater than 15 miles (24.1 km) away would have negligible impacts on existing land uses that rely on recreation and tourism activity (Parsons and Firestone 2018). The presence of WTGs would be long-term and have negligible to minor impacts on land use and coastal infrastructure.

3.6.5.5.3 Conceptual Decommissioning

3.6.5.5.3.1 Onshore Activities and Facilities

Conceptual decommissioning of the Proposed Action would have similar, negligible to minor adverse and minor beneficial impacts to land use and coastal infrastructure as described under construction activities. BMPs would be implemented to limit adverse impacts from noise, lighting, traffic, and land disturbance, and major onshore construction activities would occur outside of the busy recreation and tourism summer season.

3.6.5.5.3.2 Offshore Activities and Facilities

Conceptual decommissioning of the Proposed Action would have similar, negligible to minor adverse and minor beneficial impacts to land use and coastal infrastructure as described under construction activities. BMPs would be implemented to limit adverse impacts from noise, lighting, traffic, and land disturbance.

3.6.5.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned offshore wind activities. Ongoing and planned non-offshore wind activities related to beach, dune, and berm construction; breach response plans; port expansion; onshore development projects; underwater improvement projects such as dredging; and upgrades to roads would contribute to impacts on land use and coastal infrastructure through the primary IPFs of noise, light, presence of structures, land disturbance, traffic, port utilization, and accidental releases and discharges. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of noise, light, presence of structures, land disturbance, traffic, port utilization, and accidental releases and discharges. The cumulative impacts on land use and coastal infrastructure is anticipated to range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts.

3.6.5.5.5 Conclusions

Impacts of the Proposed Action

BOEM anticipates that impacts on land use and coastal infrastructure from the Proposed Action would range from **negligible** to **moderate** adverse impacts with **minor beneficial** impacts. The Proposed Action would have **moderate** adverse impacts resulting from traffic and land disturbance. The Proposed Action would have **minor** adverse impacts resulting from accidental releases and discharge, noise from onshore construction activities, the construction of onshore facilities, and the presence of WTGs. The Proposed Action would have **negligible** adverse impacts to lighting, offshore construction noise, and increased port utilization. The Proposed Action would have **minor beneficial** impacts to port utilization by supporting designated activities that already occur at existing ports. The overall adverse impacts to land use and coastal infrastructure would be short-term, localized, and small, with beneficial impacts resulting from port utilization.

Cumulative Impacts of the Proposed Action

In the context of other reasonably foreseeable environmental trends in the area, the cumulative impacts resulting from individual IPFs would range from **negligible** to **moderate** and **minor beneficial** impacts. Considering all the IPFs together, BOEM anticipates that the contribution of the Proposed Action to the impacts associated with ongoing and planned activities would result in **moderate** adverse impacts and **minor beneficial** impacts on land use and coastal infrastructure in the GAA.

3.6.5.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.6.5.6.1 Construction and Installation

3.6.5.6.1.1 Onshore Activities and Facilities

The impacts of Alternative C-1 on construction and installation would be similar to the Proposed Action for onshore activities and facilities.

3.6.5.6.1.2 Offshore Activities and Facilities

The impacts of Alternative C-1 on construction and installation would be similar to the Proposed Action for offshore activities and facilities.

3.6.5.6.2 Operations and Maintenance

3.6.5.6.2.1 Onshore Activities and Facilities

The impacts of Alternative C-1 on O&M would be similar to the Proposed Action for onshore activities and facilities.

3.6.5.6.2.2 Offshore Activities and Facilities

The impacts of Alternative C-1 on O&M would be similar to the Proposed Action for offshore activities and facilities.

3.6.5.6.3 Conceptual Decommissioning

3.6.5.6.3.1 Onshore Activities and Facilities

The impacts of Alternative C-1 on the conceptual decommissioning would be similar to the Proposed Action for onshore activities and facilities.

3.6.5.6.3.2 Offshore Activities and Facilities

The impacts of Alternative C-1 on the conceptual decommissioning would be similar to the Proposed Action for offshore activities and facilities.

3.6.5.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts on land use and coastal would range from **negligible** to **moderate adverse** to **minor beneficial** impacts. In the context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on land use and coastal infrastructure would be similar to those described under the Proposed Action.

3.6.5.6.5 Conclusions

Impacts of Alternative C-1

Under Alternative C-1, the potential impacts to land use and coastal infrastructure are anticipated to be the same as described under the Proposed Action under Construction and Installation, Operation and Maintenance, and Conceptual Decommissioning actions. Under this alternative, the construction of onshore facilities would remain the same, and changes in construction to offshore facilities would not result in significantly different impacts than under the Proposed Action. There is the potential for differences in the visual impacts from the lighting and location of WTGs in the offshore area; however, these differences would not result in changes to land use and coastal infrastructure impacts. As a result, BOEM expects that the impacts from Alternative C-1 to land use and coastal infrastructure would be similar to the Proposed Action, and impacts would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts.

Cumulative Impacts of Alternative C-1

In context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to the cumulative impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the Proposed Action. Impacts are expected to range from **negligible** to **moderate** adverse impacts for onshore land use and coastal infrastructure and **minor beneficial** impacts. The overall impacts of Alternative C-1 combined with ongoing and planned activities on land use would be very similar to those of the Proposed Action. These impacts would primarily stem from installation of onshore infrastructure and port utilization, which would be the same for all of the alternatives considered.

3.6.5.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

Alternative C-2 was developed to potentially reduce impacts to fisheries habitat within the Lease Area by removing 8 WTGs from Priority Areas 1, 2, 3, and/or 4 and relocating 12 WTGs to currently unoccupied positions along the eastern side of the Lease Area. Under Alternative C-2, the 11-MW WTGs and OCS-DC would occur within the range of design parameters outlined in the COP.

3.6.5.7.1 Construction and Installation

3.6.5.7.1.1 Onshore Activities and Facilities

The impacts of Alternative C-2 on construction and installation would be similar to the Proposed Action for onshore activities and facilities.

3.6.5.7.1.2 Offshore Activities and Facilities

The impacts of Alternative C-2 on construction and installation would be similar to the Proposed Action for offshore activities and facilities.

3.6.5.7.2 Operations and Maintenance

3.6.5.7.2.1 Onshore Activities and Facilities

The impacts of Alternative C-2 on O&M would be similar to the Proposed Action for onshore activities and facilities.

3.6.5.7.2.2 Offshore Activities and Facilities

The impacts of Alternative C-2 on O&M would be similar to the Proposed Action for offshore activities and facilities.

3.6.5.7.3 Conceptual Decommissioning

3.6.5.7.3.1 Onshore Activities and Facilities

The impacts of Alternative C-2 on decommissioning would be similar to the Proposed Action for onshore activities and facilities.

3.6.5.7.3.2 Offshore Activities and Facilities

The impacts of Alternative C-2 on decommissioning would be similar to the Proposed Action for offshore activities and facilities.

3.6.5.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts on land use and coastal would range from **negligible** to **moderate** adverse to **minor beneficial** impacts. In the context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 to the cumulative impacts on land use and coastal infrastructure would be similar to those described under the Proposed Action.

3.6.5.7.5 Conclusions

Impacts of Alternative C-2

Under Alternative C-2, the potential impacts to land use and coastal infrastructure are anticipated to be the same as described under the Proposed Action under Construction and Installation, Operation and Maintenance, and Conceptual Decommissioning actions. Under this alternative, the construction of onshore facilities would remain the same, and changes in construction to offshore facilities would not result in significantly different impacts than under the Proposed Action. There is the potential for differences in the visual impacts from the lighting and location of WTGs in the offshore area; however, these differences would not result in changes to land use and coastal infrastructure impacts. As a result, BOEM expects that the impacts from Alternative C-2 to land use and coastal infrastructure would be similar to the Proposed Action, and impacts would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts.

Cumulative Impacts of Alternative C-2

In context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the Proposed Action. Impacts are expected to range from **negligible** to **moderate** adverse impacts for onshore land use and infrastructure and **minor beneficial** impacts. The overall impacts of Alternative C-2 combined with ongoing and planned activities on land use would be very similar to those of the Proposed Action. These impacts would primarily stem from installation of onshore infrastructure and port utilization, which would be the same for all of the alternatives considered.

3.6.5.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall negligible to minor adverse impacts and minor beneficial impacts on land use and coastal infrastructure. Table 3.6.5-2 provides an overall summary of alternative impacts.

Table 3.6.5-2. Comparison of Alternative Impacts on Land Use and Coastal Infrastructure

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Land Use and Coastal Infrastructure	*Proposed Action*: BOEM anticipates that impacts on land use and coastal infrastructure from the Proposed Action would range from **negligible** to **moderate** adverse impacts with **minor beneficial** impacts. *Cumulative Impacts of the Proposed Action:* Considering all the IPFs together, BOEM anticipates that the contribution of the Proposed Action to the impacts associated with ongoing and planned activities would result in **negligible** to **moderate** adverse impacts and **minor beneficial** impacts on land use and coastal infrastructure in the GAA.	*Alternative C-1*: BOEM expects that the impacts from Alternative C-1 to land use and coastal infrastructure would be similar to the Proposed Action, and impacts would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts. *Cumulative Impacts of Alternative C-1*: In context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to the cumulative impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the	*Alternative C-2*: BOEM expects that the impacts from Alternative C-2 to land use and coastal infrastructure would be similar to the Proposed Action, and impacts would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts. *Cumulative Impacts of Alternative C-2*: In context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the

3.6.5.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2; however for land use and coastal infrastructure, there are no measures currently proposed by BOEM. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to land use and coastal infrastructure.

3.6.6 Navigation and Vessel Traffic

This section discusses potential impacts on navigation and vessel traffic from the proposed Project, alternatives, and future offshore wind activities in the GAA (Appendix D, Figure D-16). The navigation and vessel traffic GAA as described in Appendix D, includes a 10-mile buffer around Sunrise Wind Farm and neighboring wind farms, as well as port facilities and neighboring fairways and recommended vessel routes.

In 2019, the USCG conducted the Massachusetts and Rhode Island Port Access Route Study (MARIPARS) to determine what, if any, navigational safety concerns exist with vessel transits in the study area, and to evaluate the need for establishing vessel routing measures for projects in the MA/RI WEA (USCG 2020). The study recommended that the turbine layout be developed along a standard and uniform grid pattern with at least three lines of orientation and standard 1-nm spacing to accommodate vessel transits, fishing operations, and search and rescue operations (USCG 2020). The USCG further concluded that adoption of a standard and uniform grid pattern would likely eliminate the need for formal or informal routing measures (USCG 2020). In 2019, all leases in the Rhode Island and Massachusetts Wind Energy Areas proposed a uniform and aligned 1-nm x 1-nm structure layout (Navigation Risk and Safety Assessment [NRSA]) (DNV GL 2020).

Sunrise Wind included a NRSA (DNV GL 2020) as part of the Sunrise Wind COP in accordance with USCG Navigation and Vessel Inspection Circular (NVIC 01-19). The NSRA used traffic data (including AIS and VMS data), operational data, and environmental data to evaluate the impact of the proposed Sunrise Wind Farm on navigation.

DNV GL utilized AIS Data from July 1, 2018 to June 30, 2019 and the Marine Accident Risk Calculation System (MARCS) model to calculate incident frequency within the Sunrise Wind Farm Project area. MARCS was developed by DNV GL in the mid-1990s, and combines a risk model with calculation tools that estimate the frequency of navigation hazards, including collision, grounding, and allision as outlined by the NVIC 01-19. MARCS calculates the frequency at which critical situations are produced. In the context of navigation risk, critical situations may result in an incident: defined as collision, allision, or grounding. A vessel colliding with another vessel is defined as a collision. A vessel colliding with a stationary object is an allision. A craft contacting the seabed is known as grounding (COP, Section 4.8.1; Sunrise Wind 2022).

3.6.6.1 Description of the Affected Environment and Future Baseline Conditions

Existing marine traffic and navigation in the region, including the Sunrise Wind Farm (SRWF), were outlined in Appendix X *Navigational Safety Risk Assessment* of the COP (Sunrise Wind 2022). This assessment details the variety of vessels using the Lease Area and the surrounding waters. Commercial, military, and recreational vessels comprise the major types of vessels transiting these waters. Recreational vessels are seasonally active, compared to the year-round transit of commercial and military vessels (COP, Section 4.8.1; Sunrise Wind 2022). Summer traffic in the region can increase as much as four times the winter traffic due to this increase in recreational and pleasure watercraft (USCG 2020).

The majority of vessel traffic within the SRWF is pleasure, fishing, and other/undefined (COP, Section 4.8.1; Sunrise Wind 2022). Other/undefined AIS data may be the result of improper equipment registration or the system using it as a default value, but these records were not found to deviate from patterns of defined vessels (USCG 2020). Fishing vessels and cargo and tanker vessels in the Lease Area transited mostly on repeat routes by type, whereas pleasure, recreation, and other/undefined vessels were much less common and did not follow a typical transit pattern when they did pass through the Lease Area. Cargo and tanker vessels are infrequent in their travel through the Lease Area, even though they are the most regular in their transits; AIS data show north-south and east-west cargo and tanker ship travel through the Lease Area (COP, Section 4.8.1; Sunrise Wind 2022). AIS data confirm that fewer than one tanker and one cargo vessel per day transit the Lease Area. Tugs and service vessels similarly displayed very few crossings into the Lease Area, maintaining coastwise transit patterns (COP, Section 4.8.1; Sunrise Wind 2022).

Future baseline conditions are hard to predict. One of the only indicators of future vessel traffic is proposed port development activities because the region has a lack of proper infrastructure with sufficient water depths for larger vessels (USCG 2020). Current or projected dredging projects in the immediate vicinity would not be expected to impact vessel traffic or density because they are to maintain currently authorized depths and there are no permitted bridge projects with the intention to increase air draft (USCG 2020). While the ports of New York and New Jersey and Boston Harbor are deepening to accommodate post-Panamax vessels, the data suggest that vessel traffic within the MR/RI WEA is expected to remain relatively stable into the foreseeable future (BOEM 2019). However, the ports of New Bedford, Fairhaven, Davisville, and Brayton Point have been upgraded to support offshore wind activities, from construction through O&M and decommissioning (USCG 2020). An increase is expected at the Port of Providence in the number of liquified petroleum gas vessels that transit through the WEA, up to 8 annually, while the Port of Newport anticipates the current rate of 40 to 50 cruise ships to double (USCG 2020). During wind farm development activities, the USCG (2020) anticipates that there may be a slight increase in certain vessels and traffic characteristics, which should be met with an equal increase in vessels and traffic conditions during decommissioning. The USCG (2020) anticipates the number of recreational vessels, excursion vessels, and fishing vessels to increase post-construction. The Project assumes that large vessels would navigate around the wind farm (COP, Section 4.8.1; Sunrise Wind 2022).

3.6.6.2 Impact Level Definitions for Navigation and Vessel Traffic

This Draft EIS uses a four-level classification scheme to analyze potential impact levels to navigation and vessel traffic from the alternatives, including the Proposed Action. Table 3.6.6-1 the definitions for both the potential adverse impact levels and potential beneficial impact levels for navigation and vessel traffic. Table G-18 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to navigation and vessel traffic. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project.

Table 3.6.6-1. Definitions of Potential Beneficial and Adverse Impact Levels for Navigation and Vessel Traffic

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	No measurable impacts would occur	Either no effect or no measurable impacts
Minor	Impacts to vessels and turbines could be avoided with EPMs. Impacts would not disrupt the normal or routine functions or navigation of the vessel or turbine.	N/A
Moderate	Impacts are unavoidable, although EPMs would reduce impacts substantially during the life of the Project. The vessel would have to adjust somewhat to account for disruptions due to impacts of the Project	N/A
Major	Vessel traffic would experience unavoidable disruptions to a degree beyond what is normally acceptable.	N/A

3.6.6.3 Impacts of Alternative A - No Action on Navigation and Vessel Traffic

When analyzing the impacts of the No Action Alternative on navigation, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities on the baseline conditions for navigation. 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 E*, Planned Activities Scenario*.

The description of Section 3.7.6.3 - *Affected Environment and Future Baseline Conditions* provides an overview of information on past and present activities related to navigation and vessel traffic. Future non-Project actions include offshore wind energy development, undersea transmission lines, gas pipelines, other submarine cables, tidal energy projects, marine minerals use and ocean-dredged material disposal, military uses, marine transportation, fisheries use and management, global climate change, oil and gas activities, and onshore development activities which are discussed in further detail in Appendix E. Impacts associated with future offshore wind activities in relation to navigation and vessel traffic are described in the following text.

3.6.6.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for navigation and vessel traffic would continue to follow regional current trends and respond to IPFs introduced by other ongoing and planned activities. Ongoing activities within the GAA that contribute to impacts on navigation and vessel traffic are generally associated with marine transportation, military use, NMFS activities and scientific research, fisheries use and management, and existing and permitted/in construction offshore wind farms. Impacts from these activities increase vessel traffic in the area, adding to congestion in waterways and increasing the potential for maritime accidents. Impacts associated with global climate change have the potential to require modifications to existing port infrastructure and aids to navigation, with the former adding to port congestion and limited berths during construction activities.

Ongoing offshore wind activities within the GAA that contribute to impacts on navigation include:

- Continued O&M of the Block Island Project (5 WTGs) installed in State waters,
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Forks projects would affect navigation through the primary IPFs of anchoring, cable emplacement and maintenance, presence of structures, port utilization, and traffic. Ongoing offshore wind activities would have the same type of impacts from anchoring, cable emplacement and maintenance, presence of structures, port utilization, and traffic that are described in the following section for planned offshore wind activities.

3.6.6.3.2 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 Proposed Action).

Planned non-offshore wind activities that may affect navigation and vessel traffic in the GAA include port improvement projects, dredging projects, and installation of new structures on the OCS (refer to Appendix E for a description of ongoing and planned activities). These activities may result in a moderate increase in port maintenance activities, port upgrades to accommodate larger deep-draft vessels, and short term increases in vessel traffic for offshore cable emplacement and maintenance. Appendix E provides a summary of potential impacts associated with ongoing and planned non-offshore wind activities by IPF for navigation and vessel traffic.

Including the Sunrise Wind Farm, a total of three other wind farms are proposed for MA/RI WEA with others in planning and construction phases. These future activities are expected to affect navigation and vessel traffic through the following primary IPFs.

Anchoring: Future offshore wind developers are expected to coordinate with the maritime community and USCG to avoid laying export cables through any traditional or designated lightering/anchorage areas, meaning that any risk for deep-draft vessels would come from anchoring in an emergency scenario, specifically near the Narragansett Bay and Buzzards Bay traffic separation schemes (Table 3.6.6-2). Larger vessels accidently dropping anchor on an export cable (buried or mattress protected) to prevent drifting in the event of vessel power failure would result in damage to the export cable, risks to the vessel associated with an anchor contacting an electrified cable, and impacts to the vessel operator’s liability and insurance. Impacts on navigation and vessel traffic would be short term and localized, and navigation and vessel traffic would fully recover following the disturbance.

Cable emplacement and maintenance: Under the No-Action Alternative, every other project within the RI/MA WEA is expected to plan a unique cable route. Cable emplacement would have short term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions.

Presence of structures: The placement of structures would have long-term adverse impacts on vessel traffic in the MA/RI WEA. Ocean renewable infrastructure would likely displace large vessels. In 2016, USCG concluded that creating routing measures where structures currently do not exist would more than likely result in an increase in risk due to vessels navigating in closer proximity to each other than they would otherwise in an open ocean scenario (USCG 2016). While large vessels are expected to navigate around the RI/MA WEA, this would increase journey time and voyage cost.

BOEM assumes that all offshore wind developments would utilize the joint lessee proposed structure layout, to be developed along a standard and uniform grid pattern with at least three lines of orientation and standard 1-nm (1.9-km) spacing. Because this layout supports the traditional east-west active fishing operations, traditional northwest to southeast transit patterns, and allows for dispersal of small vessel traffic, this arrangement would reduce, but not eliminate, navigational complexity and economic displacement during the operational phase of the project.

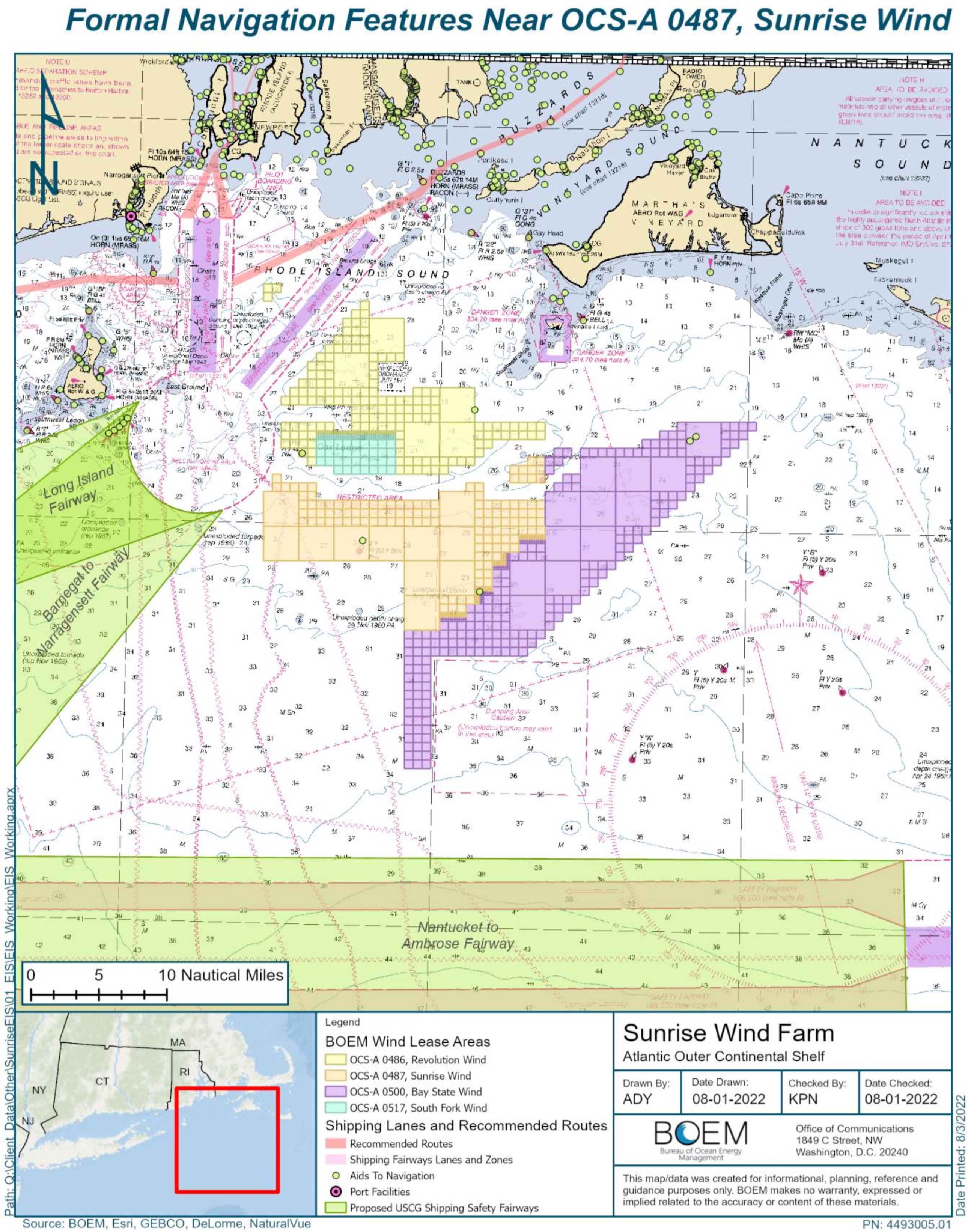

Figure 3.6.6-1. Current and Proposed Offshore Wind Farms within the MA/RI WEA with Convex Hull which Represents the Shortest Path around the Navigational Obstruction

Marine vessel radars are not optimized to operate in the MA/RI WEA, because the nominal WTG structure has a large radar cross section leading to many strong reflected signals entering the radar receiver, which is further complicated by multipath and other ambiguous returns (National Academies of Science, Technology, and Engineering 2021). BOEM expects the industry to adopt both technological and non-technology-based measures to reduce impacts on marine radar, including greater use of AIS and electronic charting systems, new technologies like LiDAR, employing more watchstanders[21], and simply avoiding wind farms altogether (National Academies of Science, Technology, and Engineering 2021).

Port utilization: The USCG indicates that the ports of New Bedford, Fairhaven, Davisville, and Brayton Point have been upgraded to support offshore wind activities associated with the RI/MA WEA, while the ports of Bridgeport, New London, Port Jefferson, and New York have announced upgrade projects to support the wind energy industry (USCG 2020). It is expected that vessel congestion would increase in the short-term, during construction and again during decommissioning. However, it is unlikely significant enough to impact safe navigation through wind farms (USCG 2020). Construction port facilities are expected to serve multiple offshore wind projects, and potentially multiple offshore wind related and other maritime industries. Specifically, the COP indicates the following are primary construction ports, Albany and/or Coeymans, New York (foundation), New London, Connecticut (staging and preassembly), and the Port of Davisville-Quonset Point, Rhode Island (construction management base) (COP, Section 3.3.10; Sunrise Wind 2022). Back-up options include the Port of New York-New Jersey, New York, the New Bedford Marine Commerce Terminal, Massachusetts, Sparrow's Point, Maryland, Paulsboro Marine Terminal, New Jersey, Port of Providence, Rhode Island and Port of Norfolk, Virginia (COP, Section 3.3.10; Sunrise Wind 2022).

Traffic: Construction and decommissioning activities associated with adjacent wind farms would result in an increase of vessel traffic near those areas. Additional impacts would include delays within or approaching ports; increased navigational complexity; detours to offshore travel or port approaches; or increased risk of incidents such as collision, strikes or allisions, and groundings. Other reasonably foreseeable future offshore projects would produce additional vessel traffic during construction, but because of their timing, they are not anticipated to use the same traffic routes. Construction of other offshore wind projects would be scheduled to minimize overlapping construction periods and reduce the number of construction vessels in operation at any given time, effectively reducing the cumulative impact on port congestion and construction vessel rerouting.

3.6.6.3.3 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and conceptual decommissioning would not occur at any proposed project; and potential impacts on navigation and vessel traffic associated with the Project would not occur. However,

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[21] Watchstander--a person on watch on a ship.

ongoing and future activities would have continuing short term to long-term impacts on navigation, primarily through existing traffic activity, port use, and the presence of structures. Continuation of existing environmental trends and activities under the No Action Alternative would result in **negligible** to **moderate** adverse impacts on navigation and vessel traffic.

Cumulative Impacts of the No Action Alternative

BOEM anticipates that the range of impacts for reasonably foreseeable offshore wind activities, especially the presence of structures, port utilization, and vessel traffic, would be **negligible** to **moderate**. As described in COP, Section 4.8.1 (Sunrise Wind 2022), BOEM anticipates that the range of impacts for ongoing activities and reasonably foreseeable activities including the existing approved and constructed offshore wind farms would be **minor** to **moderate** and not disrupt navigation and vessel traffic. Future offshore wind projects, once approved, would increase vessel activity, which could lead to congestion at affected ports, the possible need for port upgrades beyond those currently envisioned, as well as an increased likelihood of collisions and allisions, with resultant increased risk of accidental releases. In addition, the presence of new WTGs would increase the risk for collisions, allisions, and resultant accidental releases and threats to human health and safety.

Considering all the IPFs together, BOEM anticipates that the impacts associated with future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in **moderate** adverse impacts because the overall effect would be notable but vessels could adjust to account for disruptions and EPMs would reduce impacts.

3.6.6.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the COP, Section 4.8.1 (Sunrise Wind 2022), would result in impacts similar to or less than the described actions listed below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on navigation and vessel traffic characteristics:

- The Project layout including the number, type, and placement of the WTGs and OCS-DC including the location, width, and orientation of the SRWF rows and columns;
- The number of vessels utilized for construction, installation, and decommissioning;
- The SRWEC corridor route;
- Time of year of construction;
- Ports selected to support construction, installation, and decommissioning
- Ports selected to perform O&M
- Variances in any of these factors could affect navigation vessel traffic and navigation routes. Since this section assessed the maximum-case scenario, variances are expected to lead to similar or even reduced impacts.

3.6.6.5 Impacts of Alternative B – Proposed Action on Navigation and Vessel Traffic

BOEM expects the Proposed Action to impact navigation and vessel traffic during construction and installation, O&M, and decommissioning activities.

3.6.6.5.1 Construction and Installation

During the construction and installation phase of the Project, the Proposed Action is anticipated to affect navigation and vessel traffic. The Project would plan vessel routes for all vessel types in accordance with industry guidelines and best practices as defined by the International Chamber of Shipping (COP, Section 4.8.1; Sunrise Wind 2022). All vessels associated with the construction of the SRWF would be equipped with AIS to monitor compliance with speed requirements (COP, Section 4.8.1; Sunrise Wind 2022). All offshore work would halt during unsafe wind conditions, lightning storms, and/or sea states that exceed Project operational limits (COP, Section 4.8.1; Sunrise Wind 2022). Sunrise Wind would implement a communication plan during the construction phase to inform mariners of construction related activities, which would be facilitated through the maintenance of a Project website, liaison with fisheries, notice to mariners and vessel float plans, and in coordination with the USCG (COP, Section 4.8.1; Sunrise Wind 2022).

3.6.6.5.1.1 Onshore Activities and Facilities

Construction and installation associated with onshore facilities would not be expected to impact navigation and vessel traffic.

3.6.6.5.1.2 Offshore Activities and Facilities

Planned offshore construction and installation activities associated with the SRWF would significantly impact navigation and vessel traffic. Project effects include increased vessel traffic near the SRWF and OCS-DC, and ports used by the Project; obstructions to navigation; delays within or approaching ports; increased navigational complexity; changes to navigation patterns; detours to offshore travel or port approaches; or increased risk of incidents such as collision, allision, and groundings. The Project may request that the USCG establish temporary safety zones around each WTG, the OCS-DC, and each cable-laying vessel (COP, Section 4.8.1; Sunrise Wind 2022). However, mariners must always abide by Convention on the International Regulations for Preventing Collisions at Sea (COLREGS).

The expected timeline to construct and install offshore facilities would span from mid-second quarter 2024 to mid-third quarter 2025 (COP, Section 4.8.1; Sunrise Wind 2022). During that timeline, up to 94 11-MW WTGs, inter array cabling, and an OCS-DC would be constructed, and 106-miles of export cable would be laid (COP, Section 4.8.1; Sunrise Wind 2022).

Anchoring: SRWF is expected to coordinate with the maritime community and USCG to avoid laying export cables through any traditional or designated lightering/anchorage areas, meaning that any risk for deep-draft vessels would come from anchoring in an emergency scenario. The cable and other Project features would be appropriately plotted on nautical charts as well. Generally, larger vessels accidently dropping anchor on top of an export cable (buried or mattress protected) to prevent drifting in the event of vessel power failure would result in damage to the export cable, risks to the vessel associated with an anchor contacting an electrified cable, and impacts to the vessel operator's liability and insurance. Impacts on navigation and vessel traffic would be short term and localized, and navigation and vessel traffic would fully recover following the disturbance.

Cable emplacement and maintenance: Cable emplacement would have short term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions. The SRWEC would be installed within a survey corridor ranging in width from 1,312 ft to 2,625 ft (400 m to 800 m) depending on water depth, buried to a target depth of 3 ft to 7 ft (0.9 mi to 2.1 m), and supported by 31 different vessels during construction (COP, Section 4.8.1; Sunrise Wind 2022). A cable laying vessel would move along the pre-determined route from landfall towards the SRWF and would disturb up to 1,890.2 acres (7.6 km^2) in state and federal waters (COP, Section 4.8.1; Sunrise Wind 2022). BOEM expects that Sunrise Wind would implement a communication plan during the cable emplacement and maintenance, which would be facilitated through the maintenance of a Project website, liaison with fisheries, notice to mariners and vessel float plans, and in coordination with the USCG (COP, Section 4.8.1; Sunrise Wind 2022).

Presence of structures: The placement of structures would have long-term adverse impacts on vessel traffic in the MA/RI WEA. Ocean renewable infrastructure would likely displace large vessels. In 2016, USCG concluded that creating routing measures where structures currently do not exist would more than likely result in an increase in risk due to vessels navigating in closer proximity to each other than they would otherwise in an open ocean scenario (USCG 2016). While large vessels are expected to navigate around the RI/MA WEA, this would increase journey time and voyage cost.

BOEM assumes that all offshore wind developments would utilize the joint lessee proposed structure layout, to be developed along a standard and uniform grid pattern with at least three lines of orientation and standard 1-nm (1.9-km) spacing. As the proposed layout for SRWF is aligned with the joint proposed layout, and because this layout supports the traditional east-west active fishing operations, traditional northwest to southeast transit patterns, and allows for dispersal of small vessel traffic, this arrangement would reduce, but not eliminate, navigational complexity and economic displacement during the operational phase of the Project.

Marine vessel radars are not optimized to operate in the MA/RI WEA, because the nominal WTG structure has a large radar cross section leading to many strong reflected signals entering the radar receiver, which is further complicated by multipath and other ambiguous returns (National Academies of Science, Technology, and Engineering 2021). BOEM expects the industry to adopt both technological and non-technology-based measures to reduce impacts on marine radar, including greater use of AIS and electronic charting systems, new technologies like LiDAR, employing more watchstanders, and simply avoiding wind farms altogether (National Academies of Science, Technology, and Engineering 2021).

Port utilization: The USCG indicates that the ports of New Bedford, Fairhaven, Davisville, and Brayton Point have been upgraded to support offshore wind activities associated with the RI/MA WEA, while the ports of Bridgeport, New London, Port Jefferson, and New York have announced upgrade projects to support the wind energy industry (USCG 2020). During construction, the Project could utilize ports in seven different states for WTG component storage, pre-commissioning, foundation fabrication, staging, preassembly, and to serve as a construction base (Port of Davisville) (COP, Section 4.8.1 Sunrise Wind 2022). Specifically, the COP indicates the following are primary construction ports, Albany and/or Coeymans, New York (foundation), New London, Connecticut (staging and preassembly), and the Port of Davisville-Quonset Point, Rhode Island (construction management base) (COP, Section 3.3.10; Sunrise Wind 2022). Back-up options include the Port of New York-New Jersey, New York, the New Bedford Marine Commerce Terminal, Massachusetts, Sparrow's Point, Maryland, Paulsboro Marine Terminal, New Jersey, Port of Providence, Rhode Island and Port of Norfolk, Virginia (COP, Section 3.3.10; Sunrise Wind 2022). It is expected that vessel congestion would increase in the short-term, during construction and again during decommissioning. However, it is unlikely significant enough to impact safe navigation through wind farms and in approaching ports (USCG 2020).

Traffic: Construction and decommissioning activities associated with SRWF would result in an increase of vessel traffic near those areas and the applicable ports. Prior to WTG installation, short term vessel traffic within the SRWF would increase during geophysical and geotechnical surveys, surveys for MEC/UXO, and missions to clean seafloor debris. Depending upon the final foundation type, installation could last from 4 hours (monopile) up to 48 hours (suction bucket jacket). It is estimated that 16 vessels would be needed for WTG construction and 25 vessels for foundation construction (COP, Section 4.8.1; Sunrise Wind 2022). The construction of the OCS-DC would require another 25 vessels (COP, Section 4.8.1; Sunrise Wind 2022). Additional impacts would include delays within or approaching ports; increased navigational complexity; detours to offshore travel or port approaches; or increased risk of incidents such as collision, strikes or allisions, and groundings. Other reasonably foreseeable future offshore projects would produce additional vessel traffic during construction, but because of their timing, they are not anticipated to use the same traffic routes. Construction of other offshore wind projects would be scheduled to minimize overlapping construction periods and reduce the number of construction vessels in operation at any given time, effectively reducing the cumulative impact on port congestion and construction vessel rerouting.

3.6.6.5.2 Operations and Maintenance

A 24/7 SCADA surveillance system would operate the Project remotely, and when issues arise would sound an alarm (COP, Section 4.8.1; Sunrise Wind 2022). The Project's asset management system provides a data-driven assessment of the asset condition and allows for prediction and assessment of whether inspections and/or maintenance activities should be accelerated or postponed (COP, Section 4.8.1; Sunrise Wind 2022). In addition to reactive and predictive maintenance, the Project would also implement a reliability maintenance program aimed at preventing mechanical breakdowns with a potential 20 missions per year for routine service of electrical components (COP, Section 4.8.1; Sunrise Wind 2022).

3.6.6.5.2.1 Onshore Activities and Facilities

O&M of onshore facilities would not be expected to impact navigation and vessel traffic.

3.6.6.5.2.2 Offshore Activities and Facilities

Anchoring: The SRWF is expected to coordinate with the maritime community and USCG to avoid laying export cables through any traditional or designated lightering/anchorage areas, meaning that any risk for deep-draft vessels would come from anchoring in an emergency scenario. Generally, larger vessels accidently dropping anchor on top of an export cable (buried or mattress protected) to prevent drifting in the event of vessel power failure would result in damage to the export cable, risks to the vessel associated with an anchor contacting an electrified cable, and impacts to the vessel operator's liability and insurance. Impacts on navigation and vessel traffic would be short term and localized, and navigation and vessel traffic would fully recover following the disturbance.

Cable emplacement and maintenance: Regular maintenance of the Sunrise Wind Export Cable (SRWEC) would occur routinely and would result in an increase in vessel traffic and density. The SRWF would communicate regularly scheduled maintenance with mariners.

Presence of structures: The placement of structures would have long-term adverse impacts on vessels. Ocean renewable infrastructure would likely displace large vessels. In 2016, USCG concluded that creating routing measures where structures currently do not exist would more than likely result in an increase in risk due to vessels navigating in closer proximity to each other than they would otherwise in an open ocean scenario (USCG 2016). While large vessels would be expected to navigate around the RI/MA WEA, this would increase journey time and voyage cost.

Smaller vessels, such as fishing vessels, O&M tenders, and recreational vessels are expected to transit through the SRWF. During the O&M phase of the Project, DNV GL predicts incident probabilities would increase in frequency by 1.61 accidents per year. Compared to a No Action Alternative baseline, the increase is accounted for by allision accidents caused by vessels striking wind structures. There are no potential grounding areas within the wind farm area.

BOEM assumes that all offshore wind developments would utilize the joint lessee proposed structure layout, to be developed along a standard and uniform grid pattern with at least three lines of orientation and standard 1-nm (1.9-km) spacing. As the proposed layout for SRWF is aligned with the joint proposed layout, and because this layout supports the traditional east-west active fishing operations, traditional northwest to southeast transit patterns, and allows for dispersal of small vessel traffic, this arrangement would reduce, but not eliminate, navigational complexity and economic displacement during the operational phase of the Project.

Finally, BOEM expects that Sunrise Wind would procure valid Private Aids to Navigation for each of its structures in accordance with applicable guidance, supporting navigation both within and outside of SRWF (COP, Section 4.8.1; Sunrise Wind 2022).

Port utilization: While not yet chosen, five potential ports have been identified for O&M activities, including the Port of Brooklyn, Port Jefferson, Port of Montauk, Port of Davisville, and the Port of Galilee. The Project expects that any ports used by O&M vessels would accommodate their needs without significant modifications or upgrades.

Traffic: O&M activities associated with SRWF and OCS-DC would result in an increase of vessel traffic near those areas and the applicable ports. Additional impacts would include increased navigational complexity; or increased risk of incidents such as collision, strikes or allisions, and groundings. Other reasonably foreseeable future offshore projects would produce additional vessel traffic during O&M that would lead to increased navigational complexity and increased risk of incidents within those projects.

3.6.6.5.3 Conceptual Decommissioning

Decommissioning would occur at the end of the Project's operational life according to an as yet to be completed plan. The plan would follow applicable laws, regulations, and best management practices (BMPs) that exist at the end of the Project's operational life. It is anticipated that conceptual decommissioning would have similar adverse impacts as construction because a conceptual decommissioning would use similar number of vessels and implement the same EPMs.

3.6.6.5.3.1 Onshore Activities and Facilities

Onshore decommissioning activities would not be expected to impact navigation and vessel traffic.

3.6.6.5.3.2 Offshore Activities and Facilities

During the decommissioning phase of the Project, the Proposed Action would affect navigation and vessel traffic. The Project would plan vessel routes for all vessel types in accordance with industry guidelines and best practices as defined by the International Chamber of Shipping (COP, Section 4.8.1; Sunrise Wind 2022). All vessels associated with the decommissioning of the SRWF would be equipped with AIS technology to monitor compliance with speed requirements and ensure that all vessels operate in accordance with applicable rules and regulations for maritime operation in United States and federal waters (COP, Section 4.8.1; Sunrise Wind 2022). All offshore work would halt during unsafe wind conditions, lightning storms, and/or sea states that exceed Project operational limits (COP, Section 4.8.1; Sunrise Wind 2022). Sunrise Wind would implement a Communication Plan during the decommissioning phase to inform mariners of construction related activities, which would be facilitated through the maintenance of a Project website, liaison with fisheries, notice to mariners and vessel float plans, and in coordination with the USCG (COP, Section 4.8.1; Sunrise Wind 2022).

Anchoring: Generally, larger vessels accidently dropping anchor on top of an export cable (buried or mattress protected) to prevent drifting in the event of vessel power failure would result in damage to the export cable, risks to the vessel associated with an anchor contacting an electrified cable, risks to decommissioning vessels attached to the cable and/or each other, and impacts to the vessel operator's liability and insurance. Impacts on navigation and vessel traffic would be short term and localized, and navigation and vessel traffic would fully recover following the disturbance.

Cable emplacement and maintenance: Cable decommissioning would have short term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions.

Presence of structures: Decommissioning is expected to impact navigation and vessel traffic at levels equivalent to the construction and commissioning phase of the Project. Presence of structures and decommissioning vessels would have significant short-term impact. Fishing and recreational vessels that once enjoyed transit through the SRWF would be temporarily restricted due to decommissioning and structure removal activities.

Port utilization: It is not yet known which ports would support decommissioning activities, however, BOEM anticipates that impacts generated during decommissioning would be equivalent to those generated during construction. It is expected that vessel congestion would increase in the short-term.

Traffic: Construction and decommissioning activities associated with SRWF would result in an increase of vessel traffic near those areas and the applicable ports. Additional impacts would include delays within or approaching ports; increased navigational complexity; detours to offshore travel or port approaches; or increased risk of incidents such as collision, strikes or allisions, and groundings. Other reasonably foreseeable future offshore projects would produce additional vessel traffic during construction, but because of their timing, they are not anticipated to use the same traffic routes. Decommissioning of other offshore wind projects would be scheduled to minimize overlapping periods and reduce the number of vessels in operation at any given time, effectively reducing the cumulative impact on port congestion and construction vessel rerouting.

3.6.6.5.4 Cumulative Impacts of the Proposed Action

These future activities are expected to affect navigation and vessel traffic through the following primary IPFs.

Anchoring: Future offshore wind developers are expected to coordinate with the maritime community and USCG to avoid laying export cables through any traditional or designated lightering/anchorage areas, meaning that any risk for deep-draft vessels would come from anchoring in an emergency scenario, specifically near the Narragansett Bay and Buzzards Bay traffic separation schemes (Table 3.6.6-2). Larger vessels accidently dropping anchor on an export cable (buried or mattress protected) to prevent drifting in the event of vessel power failure would result in damage to the export cable, risks to the vessel associated with an anchor contacting an electrified cable, and impacts to the vessel operator's liability and insurance. Impacts on navigation and vessel traffic would be short term and localized, and navigation and vessel traffic would fully recover following the disturbance.

Cable emplacement and maintenance: Under the Proposed Action, Sunrise Wind Farm and all other proposed offshore wind farms are is expected to plan a unique cable route. Cable emplacement would have short term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions.

Presence of structures: The placement of structures would have long-term adverse impacts on vessel traffic in the MA/RI WEA. Ocean renewable infrastructure would likely displace large vessels. In 2016, USCG concluded that creating routing measures where structures currently do not exist would more than likely result in an increase in risk due to vessels navigating in closer proximity to each other than they would otherwise in an open ocean scenario (USCG 2016). While large vessels are expected to navigate around the RI/MA WEA, this would increase journey time and voyage cost.

BOEM assumes that all offshore wind developments would utilize the joint lessee proposed structure layout, to be developed along a standard and uniform grid pattern with at least three lines of orientation and standard 1-nm (1.9-km) spacing. Because this layout supports the traditional east-west active fishing operations, traditional northwest to southeast transit patterns, and allows for dispersal of small vessel traffic, this arrangement would reduce, but not eliminate, navigational complexity and economic displacement during the operational phase of the project.

Marine vessel radars are not optimized to operate in the MA/RI WEA, because the nominal WTG structure has a large radar cross section leading to many strong reflected signals entering the radar receiver, which is further complicated by multipath and other ambiguous returns (National Academies of Science, Technology, and Engineering 2021). BOEM expects the industry to adopt both technological and non-technology-based measures to reduce impacts on marine radar, including greater use of AIS and electronic charting systems, new technologies like LiDAR, employing more watchstanders[22], and simply avoiding wind farms altogether (National Academies of Science, Technology, and Engineering 2021).

Port utilization: The USCG indicates that the ports of New Bedford, Fairhaven, Davisville, and Brayton Point have been upgraded to support offshore wind activities associated with the RI/MA WEA, while the ports of Bridgeport, New London, Port Jefferson, and New York have announced upgrade projects to support the wind energy industry (USCG 2020). It is expected that vessel congestion would increase in the short-term, during construction and again during decommissioning. However, it is unlikely significant enough to impact safe navigation through wind farms (USCG 2020). Construction port facilities are expected to serve multiple offshore wind projects, and potentially multiple offshore wind related and other maritime industries. Specifically, the COP indicates the following are primary construction ports, Albany and/or Coeymans, New York (foundation), New London, Connecticut (staging and preassembly), and the Port of Davisville-Quonset Point, Rhode Island (construction management base) (COP, Section 3.3.10; Sunrise Wind 2022). Back-up options include the Port of New York-New Jersey, New York, the New Bedford Marine Commerce Terminal, Massachusetts, Sparrow's Point, Maryland, Paulsboro Marine Terminal, New Jersey, Port of Providence, Rhode Island and Port of Norfolk, Virginia (COP, Section 3.3.10; Sunrise Wind 2022).

Traffic: Construction and decommissioning activities associated with adjacent wind farms would result in an increase of vessel traffic near those areas. Additional impacts would include delays within or approaching ports; increased navigational complexity; detours to offshore travel or port approaches; or increased risk of incidents such as collision, strikes or allisions, and groundings. Other reasonably foreseeable future offshore projects would produce additional vessel traffic during construction, but because of their timing, they are not anticipated to use the same traffic routes. Construction of other offshore wind projects would be scheduled to minimize overlapping construction periods and reduce

[22] Watchstander--a person on watch on a ship.

the number of construction vessels in operation at any given time, effectively reducing the cumulative impact on port congestion and construction vessel rerouting.

3.6.6.5.5 Conclusions

Impacts of the Proposed Action

Construction, installation, O&M, and decommissioning activities would impact navigation and vessel traffic within and around the SRWF. The anticipated impacts would be generated through increased vessel traffic, obstructions to navigation, delays within or approaching ports, increased navigational complexity, changes to navigation patterns, detours to offshore travel or port approaches; or increased risk of incidents such as collision, allision, and groundings. BOEM anticipates that the impacts resulting from the Proposed Action would be **negligible** to **moderate**. Therefore, BOEM expects the overall impact on navigation from the Proposed Action and ongoing activities to be **moderate**, as the change in navigation and safety risk would be small.

Cumulative Impacts of the Proposed Action

In the context of reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual IPFs would be **moderate**. The main IPF is the presence of structures, which could alter navigation patterns as large vessels would likely navigate around the Project. Small vessels such as fishing vessels, recreational, and O&M tenders would navigate within the SRWF and DNV-GL predicts up to 1.61 incidents per year. Potential incidents range from collisions to allisions. DNV-GL concluded that there was no area shallow enough within or in the immediate vicinity of the Project.

3.6.6.6 Alternative C-1 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Under the Fisheries Habitat Impact Minimization Alternative C-1, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OSS (OSS-AC) within the proposed Project Area and associated IAC and SRWEC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, eight WTGs positions would be selected for removal to potentially reduce impacts to complex fisheries habitats that are the most vulnerable to long-term impacts. The impacts to navigation and vessel traffic generated by this alternative would not be expected to be greater than the proposed Project.

3.6.6.6.1 Construction and Installation

3.6.6.6.1.1 Onshore Activities and Facilities

Onshore development activities for Alternative C-1 would not be expected to impact navigation and vessel traffic.

3.6.6.6.1.2 Offshore Activities and Facilities

Under Alternative C-1, the construction and installation of the 11-MW WTGs, OCS-DC, inter-array cables (IAC), and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to as described for the Proposed Action since the same number of WTGs would be installed.

3.6.6.6.2 Operations and Maintenance

3.6.6.6.2.1 Onshore Activities and Facilities

O&M associated with onshore activities and facilities would not be expected to impact navigation and vessel traffic.

3.6.6.6.2.2 Offshore Activities and Facilities

Under Alternative C-1, O&M of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to as described for the Proposed Action since the same number of WTGs would be installed.

3.6.6.6.3 Conceptual Decommissioning

3.6.6.6.3.1 Onshore Activities and Facilities

Onshore decommissioning activities associated with any alternative would not be expected to impact navigation and vessel traffic.

3.6.6.6.3.2 Offshore Activities and Facilities

Under Alternative C-1, the conceptual decommissioning of the proposed Project components would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to as described for the Proposed Action because there is no difference in the number of offshore components between the Proposed Action and Alternative C-1.

3.6.6.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts of Alternative C-1 activities are expected to affect navigation and vessel traffic through the following primary IPFs.

Anchoring: Future offshore wind developers are expected to coordinate with the maritime community and USCG to avoid laying export cables through any traditional or designated lightering/anchorage areas, meaning that any risk for deep-draft vessels would come from anchoring in an emergency scenario, specifically near the Narragansett Bay and Buzzards Bay traffic separation schemes (Table 3.6.6-2). Larger vessels accidently dropping anchor on an export cable (buried or mattress protected) to prevent drifting in the event of vessel power failure would result in damage to the export cable, risks to the vessel associated with an anchor contacting an electrified cable, and impacts to the vessel operator's liability and insurance. Impacts on navigation and vessel traffic would be short term and localized, and navigation and vessel traffic would fully recover following the disturbance.

Cable emplacement and maintenance: Under the Alternative C-1, Sunrise Wind Farm and all other proposed offshore wind farms are is expected to plan a unique cable route. Cable emplacement would have short term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions.

Presence of structures: The placement of structures would have long-term adverse impacts on vessel traffic in the MA/RI WEA. Ocean renewable infrastructure would likely displace large vessels. In 2016, USCG concluded that creating routing measures where structures currently do not exist would more than likely result in an increase in risk due to vessels navigating in closer proximity to each other than they would otherwise in an open ocean scenario (USCG 2016). While large vessels are expected to navigate around the RI/MA WEA, this would increase journey time and voyage cost.

BOEM assumes that all offshore wind developments would utilize the joint lessee proposed structure layout, to be developed along a standard and uniform grid pattern with at least three lines of orientation and standard 1-nm (1.9-km) spacing. Because this layout supports the traditional east-west active fishing operations, traditional northwest to southeast transit patterns, and allows for dispersal of small vessel traffic, this arrangement would reduce, but not eliminate, navigational complexity and economic displacement during the operational phase of the project.

Marine vessel radars are not optimized to operate in the MA/RI WEA, because the nominal WTG structure has a large radar cross section leading to many strong reflected signals entering the radar receiver, which is further complicated by multipath and other ambiguous returns (National Academies of Science, Technology, and Engineering 2021). BOEM expects the industry to adopt both technological and non-technology-based measures to reduce impacts on marine radar, including greater use of AIS and electronic charting systems, new technologies like LiDAR, employing more watchstanders[23], and simply avoiding wind farms altogether (National Academies of Science, Technology, and Engineering 2021).

Port utilization: The USCG indicates that the ports of New Bedford, Fairhaven, Davisville, and Brayton Point have been upgraded to support offshore wind activities associated with the RI/MA WEA, while the ports of Bridgeport, New London, Port Jefferson, and New York have announced upgrade projects to support the wind energy industry (USCG 2020). It is expected that vessel congestion would increase in the short-term, during construction and again during decommissioning. However, it is unlikely significant enough to impact safe navigation through wind farms (USCG 2020). Construction port facilities are expected to serve multiple offshore wind projects, and potentially multiple offshore wind related and other maritime industries. Specifically, the COP indicates the following are primary construction ports, Albany and/or Coeymans, New York (foundation), New London, Connecticut (staging and preassembly), and the Port of Davisville-Quonset Point, Rhode Island (construction management base) (COP, Section 3.3.10; Sunrise Wind 2022). Back-up options include the Port of New York-New Jersey, New York, the New Bedford Marine Commerce Terminal, Massachusetts, Sparrow's Point, Maryland,

[23] Watchstander--a person on watch on a ship.

Paulsboro Marine Terminal, New Jersey, Port of Providence, Rhode Island and Port of Norfolk, Virginia (COP, Section 3.3.10; Sunrise Wind 2022).

Traffic: Construction and decommissioning activities associated with adjacent wind farms would result in an increase of vessel traffic near those areas. Additional impacts would include delays within or approaching ports; increased navigational complexity; detours to offshore travel or port approaches; or increased risk of incidents such as collision, strikes or allisions, and groundings. Other reasonably foreseeable future offshore projects would produce additional vessel traffic during construction, but because of their timing, they are not anticipated to use the same traffic routes. Construction of other offshore wind projects would be scheduled to minimize overlapping construction periods and reduce the number of construction vessels in operation at any given time, effectively reducing the cumulative impact on port congestion and construction vessel rerouting.

3.6.6.6.5 Conclusions

Impacts of Alternative C-1

Under Alternative C-1, impacts on navigation and vessel traffic from onshore and offshore construction, O&M, and decommissioning would be the same described for the Proposed Action. The anticipated impacts would be generated through increased vessel traffic, obstructions to navigation, delays within or approaching ports, increased navigational complexity, changes to navigation patterns, detours to offshore travel or port approaches; or increased risk of incidents such as collision, allision, and groundings. BOEM anticipates that the impacts resulting from the Proposed Action would be **negligible** to **moderate**. Therefore, BOEM expects the overall impact on navigation and vessel traffic from Alternative C-1 to be **negligible** to **moderate**, as the change in navigation and safety risk would be small.

Cumulative Impacts of Alternative C-1

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to navigation and vessel traffic impacts from ongoing and future activities would be **moderate** and the same as the Proposed Action.

3.6.6.7 Alternative C-2 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

3.6.6.7.1 Construction and Installation

Under the Fisheries Habitat Impact Minimization Alternative C-2, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OSS-AC within the proposed Project Area and associated IAC and SRWEC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, for Alternative C-2, in addition to excluding 8 WTG positions for development within the Priority Areas, another 12 WTG positions would be relocated to the eastern side to potentially further reduce impacts to complex fisheries habitats that are the most vulnerable to long-term impacts. The impacts generated by this alternative would not be expected to be greater than the proposed Project, as it would construct the same number of structures for sea surface navigation.

3.6.6.7.1.1 Onshore Activities and Facilities

Onshore construction and installation activities for Alternative C-2 would not be expected to impact navigation and vessel traffic.

3.6.6.7.1.2 Offshore Activities and Facilities

Under Alternative C-2, the construction and installation of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to as described for the Proposed Action since the same number of WTGs would be installed.

3.6.6.7.2 Operations and Maintenance

3.6.6.7.2.1 Onshore Activities and Facilities

O&M associated with onshore activities and facilities would not be expected to impact navigation and vessel traffic.

3.6.6.7.2.2 Offshore Activities and Facilities

Under Alternative C-2, the O&M of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to as described for the Proposed Action since the same number of WTGs would be installed.

3.6.6.7.3 Conceptual Decommissioning

3.6.6.7.3.1 Onshore Activities and Facilities

Onshore decommissioning activities associated with any alternative would not be expected to impact navigation and vessel traffic.

3.6.6.7.3.2 Offshore Activities and Facilities

Under Alternative C-2, the conceptual decommissioning of the proposed Project components would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to as described for the Proposed Action because there is no difference in the number of offshore components between the Proposed Action and Alternative C-2.

3.6.6.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts of Alternative C-2 activities are expected to affect navigation and vessel traffic through the following primary IPFs.

Anchoring: Future offshore wind developers are expected to coordinate with the maritime community and USCG to avoid laying export cables through any traditional or designated lightering/anchorage areas, meaning that any risk for deep-draft vessels would come from anchoring in an emergency scenario, specifically near the Narragansett Bay and Buzzards Bay traffic separation schemes (Table 3.6.6-2). Larger vessels accidently dropping anchor on an export cable (buried or mattress protected) to prevent drifting in the event of vessel power failure would result in damage to the export cable, risks to the vessel associated with an anchor contacting an electrified cable, and impacts to the vessel operator's liability and insurance. Impacts on navigation and vessel traffic would be short term and localized, and navigation and vessel traffic would fully recover following the disturbance.

Cable emplacement and maintenance: Under the Alternative C-1, Sunrise Wind Farm and all other proposed offshore wind farms are is expected to plan a unique cable route. Cable emplacement would have short term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions.

Presence of structures: The placement of structures would have long-term adverse impacts on vessel traffic in the MA/RI WEA. Ocean renewable infrastructure would likely displace large vessels. In 2016, USCG concluded that creating routing measures where structures currently do not exist would more than likely result in an increase in risk due to vessels navigating in closer proximity to each other than they would otherwise in an open ocean scenario (USCG 2016). While large vessels are expected to navigate around the RI/MA WEA, this would increase journey time and voyage cost.

BOEM assumes that all offshore wind developments would utilize the joint lessee proposed structure layout, to be developed along a standard and uniform grid pattern with at least three lines of orientation and standard 1-nm (1.9-km) spacing. Because this layout supports the traditional east-west active fishing operations, traditional northwest to southeast transit patterns, and allows for dispersal of small vessel traffic, this arrangement would reduce, but not eliminate, navigational complexity and economic displacement during the operational phase of the project.

Marine vessel radars are not optimized to operate in the MA/RI WEA, because the nominal WTG structure has a large radar cross section leading to many strong reflected signals entering the radar receiver, which is further complicated by multipath and other ambiguous returns (National Academies of Science, Technology, and Engineering 2021). BOEM expects the industry to adopt both technological and non-technology-based measures to reduce impacts on marine radar, including greater use of AIS and electronic charting systems, new technologies like LiDAR, employing more watchstanders[24], and simply avoiding wind farms altogether (National Academies of Science, Technology, and Engineering 2021).

Port utilization: The USCG indicates that the ports of New Bedford, Fairhaven, Davisville, and Brayton Point have been upgraded to support offshore wind activities associated with the RI/MA WEA, while the ports of Bridgeport, New London, Port Jefferson, and New York have announced upgrade projects to support the wind energy industry (USCG 2020). It is expected that vessel congestion would increase in the short-term, during construction and again during decommissioning. However, it is unlikely significant

[24] Watchstander--a person on watch on a ship.

enough to impact safe navigation through wind farms (USCG 2020). Construction port facilities are expected to serve multiple offshore wind projects, and potentially multiple offshore wind related and other maritime industries. Specifically, the COP indicates the following are primary construction ports, Albany and/or Coeymans, New York (foundation), New London, Connecticut (staging and preassembly), and the Port of Davisville-Quonset Point, Rhode Island (construction management base) (COP, Section 3.3.10; Sunrise Wind 2022). Back-up options include the Port of New York-New Jersey, New York, the New Bedford Marine Commerce Terminal, Massachusetts, Sparrow's Point, Maryland, Paulsboro Marine Terminal, New Jersey, Port of Providence, Rhode Island and Port of Norfolk, Virginia (COP, Section 3.3.10; Sunrise Wind 2022).

Traffic: Construction and decommissioning activities associated with adjacent wind farms would result in an increase of vessel traffic near those areas. Additional impacts would include delays within or approaching ports; increased navigational complexity; detours to offshore travel or port approaches; or increased risk of incidents such as collision, strikes or allisions, and groundings. Other reasonably foreseeable future offshore projects would produce additional vessel traffic during construction, but because of their timing, they are not anticipated to use the same traffic routes. Construction of other offshore wind projects would be scheduled to minimize overlapping construction periods and reduce the number of construction vessels in operation at any given time, effectively reducing the cumulative impact on port congestion and construction vessel rerouting.

3.6.6.7.5 Conclusions

Impacts of Alternative C-2

Under Alternative C-2, impacts on navigation and vessel traffic from onshore and offshore construction, O&M, and decommissioning would be the same described for the Proposed Action. The anticipated impacts would be generated through increased vessel traffic, obstructions to navigation, delays within or approaching ports, increased navigational complexity, changes to navigation patterns, detours to offshore travel or port approaches; or increased risk of incidents such as collision, allision, and groundings. BOEM anticipates that the impacts resulting from the Proposed Action would be **negligible** to **moderate**. Therefore, BOEM expects the overall impact on navigation from the Proposed Action alone to be **moderate**, as the change in navigation and safety risk would be small.

Cumulative Impacts of Alternative C-2

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to navigation and vessel traffic impacts from ongoing and future activities would be **moderate** and the same as the Proposed Action.

3.6.6.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall negligible to moderate adverse impacts on navigation and vessel traffic. Table 3.6.6-2 provides an overall summary of alternative impacts.

Table 3.6.6-2. Comparison of Alternative Impacts on Navigation and Vessel Traffic

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Navigation and Vessel Traffic	*Proposed Action*: BOEM anticipates that the impacts resulting from the Proposed Action would be **negligible** to **moderate**. Therefore, BOEM expects the overall impact on navigation from the Proposed Action and ongoing activities to be **moderate**, as the change in navigation and safety risk would be small. *Cumulative Impacts of the Proposed Action:* In the context of reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual IPFs would be **moderate**. The main IPF is the presence of structures, which could alter navigation patterns as large vessels would likely navigate around the Project.	*Alternative C-1*: BOEM anticipates that the impacts resulting from the Proposed Action would be **negligible** to **moderate**. Therefore, BOEM expects the overall impact on navigation and vessel traffic from Alternative C-1 to be **negligible** to **moderate**, as the change in navigation and safety risk would be small. *Cumulative Impacts of Alternative C-1*: In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to navigation and vessel traffic impacts from ongoing and future activities would be **moderate** and the same as the Proposed Action.	*Alternative C-2*: BOEM anticipates that the impacts resulting from the Proposed Action would be **negligible** to **moderate**. Therefore, BOEM expects the overall impact on navigation and vessel traffic from Alternative C-2 to be **negligible** to **moderate**, as the change in navigation and safety risk would be small. *Cumulative Impacts of Alternative C-2*: In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to navigation and vessel traffic impacts from ongoing and future activities would be **moderate** and the same as the Proposed Action

3.6.6.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to navigation and vessel traffic.

3.6.7 Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)

3.6.7.1 Description of the Affected Environment and Future Baseline Conditions

This section discusses potential impacts on other uses (marine minerals, military use, aviation, scientific research, and surveys) from the proposed Project, alternatives, and future offshore wind activities in the GAA (Appendix D, Figure D-17). The GAA for other uses as described in Appendix D differs based on the other use being analyzed. For marine mineral extraction, the GAA encompassed areas within 0.25 mi (0.40 km) of the SRWF and footprints of other cables and wind lease areas in the RI-MA WEA. An area roughly bounded by Montauk, New York; Providence, Rhode Island; Provincetown, Massachusetts; and within a 10-mi buffer from wind lease areas in the RI-MA WEA was the GAA for national security and military uses, aviation and air traffic, and radar systems. In addition, the aviation and air traffic GAA encompassed airspace and airports used by regional air traffic, and radar systems included air space used by regional air traffic. The cables and pipelines GAA encompassed an area within 1 mile of the Project and other undersea facilities and wind lease areas in the RI-MA WEA. The Northeast Shelf Large Marine Ecosystem was the GAA for scientific research and surveys.

3.6.7.1.1 Marine Mineral Extraction

BOEM's Marine Mineral Program manages non-energy minerals (primarily sand and gravel) in federal waters of the OCS and leases access to these resources to target shoreline erosion, beach renourishment, and restoration projects. The closest active lease in BOEM's Marine Minerals Program is located approximately 165 miles (266 km) from the Project near Harvey Cedars, Surf City, Long Beach Township, Ship Bottom, and Beach Haven, New Jersey (Lease Number OCS-A-0505).

In addition, reconnaissance and/or design-level OCS studies along the East Coast from Rhode Island to Florida have identified potential future sand resources. Sand resources identified near the Project include locations offshore Rhode Island (between Block Island and Charlestown), Long Island (Rockaway Beach, Long Beach, and Fire Island, New York), and Sandy Hook, New Jersey. The nearest sand resource is located 35 miles (56 km) to the northwest of the SRWF.

The EPA Region 1 designates and manages ocean disposal sites for materials offshore in the region of the Project. The USACE issues permits for ocean disposal sites; all ocean sites are for the disposal of dredged material permitted or authorized under the Marine Protection, Research, and Sanctuaries Act (16 USC 1431 et seq. and 33 USC 1401 eq seq.). Nine active projects are located in the analysis area along the Massachusetts, Rhode Island, Connecticut, and New York coasts, with the closest dredge disposal site, the Rhode Island Sound Disposal Site (RISDS) located northeast of Block Island, approximately 12.3 miles (19.8 km) from the Project (USACE 2018). No inactive or closed disposal sites are located in the GAA.

Increased shoreline erosion and coastal damage from storms has led to increased demand for sand resources in recent years. Although this increased demand is expected to continue, BOEM does not anticipate overlap between marine mineral leases and the Proposed Action.

3.6.7.1.2 National Security and Military Uses

Military uses (US Navy and other services, including Homeland Security [USCG]) span the SRWF, SRWEC–OCS, and SRWEC–NYS. Such uses exist largely because of the proximity to Naval Station Newport, Newport Naval Undersea Warfare Center (Rhode Island), Naval Submarine Base New London, and USCG Academy (City of New London) (BOEM 2018; RI CRMC 2010). The US Atlantic Fleet conducts training and testing exercises in the Narraganset Bay Operating Area, and the Newport Naval Undersea Warfare Center routinely performs testing in the area (BOEM 2012). Air National Guard training ranges are also located in this area.

Military and national security interests are expected to continue to use offshore areas in the analysis area at similar levels in the foreseeable future. Search and rescue (SAR) occurs on an as-needed basis and thus could be considered non-routine, USCG and other entities conduct regular SAR training and perform active SAR missions frequently enough in or near the GAA that SAR is evaluated here as a routine activity. The installation of foundations within the GAA could attract interest for recreational fishing or sightseeing, resulting in vessels that may travel farther offshore than typically occurs. Recreational fishing vessel traffic would be additive to vessel traffic that already transits the leased areas, and could increase demand for USCG SAR operations near the WTGs, with the structures themselves complicating SAR operations.

The presence and layout of large numbers of WTGs could make it more difficult for SAR aircraft to perform operations, leading to less effective search patterns or earlier abandonment of searches. This could result in otherwise avoidable loss of life due to maritime incidents.

3.6.7.1.3 Aviation and Air Traffic

There are multiple public and private-use airports located within the general proximity of the Project, including sites in New York, Massachusetts, Rhode Island, and Connecticut (see Figure 4.8.3-1 of COP, Sunrise Wind 2022). Brookhaven Calabro (HWV) airport is the nearest airport to the Landfall and Long Island MacArthur (ISB) is the nearest airport to the OnCS–DC.

Air traffic is expected to continue at current levels in and around the Project in the foreseeable future.

3.6.7.1.4 Cable and Pipelines

There are existing submarine cables that run through regional waters, and which are laid on, or buried within, the seafloor and are used to transmit communications or power. Most of these existing cables pass through Green Hill, RI and along the south shore of Long Island, NY (Figure 4.7.5-1 in COP, Sunrise Wind 2022). In addition, there are NOAA nautical chart cable and pipeline areas that denote where such infrastructure may be located. The existence of these areas does not necessarily mean that actual cables or pipeline are present (BOEM 2018).

3.6.7.1.5 Radar Systems

Model results and studies from the U.S. and Europe incorporating typical offshore wind farm configurations have demonstrated that wind turbines cause interference to oceanographic high-frequency (HF) radar systems. HF radar systems primarily measure ocean surface currents (speed and direction, determined from sea state) and waves. They are used for marine spill response, U.S. Coast Guard search-and-rescue, weather forecasting, and other marine applications. Mitigation measures to address wind turbine interference to HF radar systems include software (BOEM 2021) paired with in situ current and wave sensors within and around the periphery of the WEA. NOAA-funded HF radar statins operated by NOAA Integrated Ocean Observing System (IOOS) academic partners exist within the region (Figure 4.7.5-1 in COP, Sunrise Wind 2022) and include:

- HF radar on Block Island (two radars operated by University of Rhode Island and Rutgers University)
- HF radar on Martha's Vineyard (one radar operated by Rutgers University and three radars operated by Woods Hole Oceanographic Institution)
- HF radar on Nantucket Island (one radar operated by Rutgers University and one radar operated by Woods Hole Oceanographic Institution)
- HF radar on Long Island (one radar operate by University of Rhode Island and two radars operated by Rutgers University)

These radar systems would continue to provide sea state, weather forecast, and HAZMAT response support to the region. The number of radars and their coverage area is anticipated to remain at current levels but may grow over time depending on NOAA IOOS Surface Currents Program funding.

3.6.7.1.6 Scientific Research and Surveys

Research in the GAA includes oceanographic, biological, geophysical, and archaeological surveys focused on the OCS and nearshore environments, and resources that may be affected by offshore wind development. Federal and state agencies, education institutions, and environmental non-governmental organizations participate in ongoing offshore research in the proposed Project Area and surrounding waters.

Current fisheries management and ecosystem monitoring surveys conducted by or in coordination with the NMFS NEFSC would overlap with offshore wind lease areas in the Mid-Atlantic region. Surveys include (1) the NEFSC Bottom Trawl Survey, a more than 50-year multispecies stock assessment tool using a bottom trawl; (2) the NEFSC Sea Scallop/Integrated Habitat Survey, a sea scallop stock assessment and habitat characterization tool, using a bottom dredge and camera tow; (3) the NEFSC Surfclam/Ocean Quahog Survey, a stock assessment tool for both species using a bottom dredge; (4) the NEFSC Ecosystem Monitoring Program, a more than 40-year shelf ecosystem monitoring program using plankton tows and conductivity, temperature, and depth units; (5) AMAPPS shipboard and aerial surveys; and (6) the North Atlantic Right Whale Sighting Advisory System, line-transect aerial abundance surveys.

A variety of other surveys and scientific assessments are also in-progress or planned throughout various areas of the RI-MA WEA and the MA WEA. For example, Woods Hole Oceanographic Institution (WHOI) is conducting ocean surveys with buoys and autonomous underwater vehicles to survey temperature and salinity levels, and the Cox Ledge Study (funded through BOEM) is using an autonomous underwater glider and an acoustic telemetry receiver to detect fish spawning sounds, baleen whales, and tagged fish. These surveys overlap the proposed Project Area. As offshore wind development continues, alternative platforms, sampling designs, and sampling methodologies could be needed to maintain surveys conducted in or near the Project.

3.6.7.2 Impact Level Definitions for Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)

This Draft EIS uses a four-level classification scheme to analyze potential impact levels for other uses of the alternatives, including the Proposed Action. Table 3.6.7-1 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for other uses. Table G-19 in Appendix G identifies potential IPFs, Issues, and Indicators to assess impacts to other uses. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project.

Table 3.6.7-1. Definition of Potential Adverse and Beneficial Impact Levels for Other Uses

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	No measurable impacts or effects to other uses would occur.	No measurable impacts or effects to other uses would occur.
Minor	Most impacts could be avoided with EPMs.	A small and measurable benefit for other uses.
Moderate	EPMs would minimize, but not fully resolve impact.	A notable and measurable benefit for other uses.
Major	Impacts would be unavoidable even with EPMs; additional mitigation could be required.	A large local, or notable regional benefit for other uses.

3.6.7.3 Impacts of Alternative A - No Action on Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)

When analyzing impacts of the No Action Alternative on other uses, BOEM considered the impacts of ongoing non-offshore wind and ongoing offshore wind activities on baseline conditions for other uses. 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 E*, Planned Activities Scenario*.

The Description of the Affected Environment and Future Baseline Conditions section provides an overview of information on past and present activities related to other uses within the vicinity of the Project. Future non-Project actions include offshore wind energy development, undersea transmission lines, gas pipelines, other submarine cables, tidal energy projects, marine minerals use and ocean-dredged material disposal, military uses, marine transportation, fisheries use and management, global climate change, oil and gas activities, and onshore development activities which are discussed in further detail in Appendix E. Impacts associated with future offshore wind activities in relation to other uses are described below.

3.6.7.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, marine minerals, military and national security uses, aviation and air traffic, offshore cables and pipelines, radar systems, and scientific research and surveys described in Section 3.6.7.1, *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 activities within the GAA that would contribute to impacts on other uses would generally be associated with offshore developments and climate change. Ongoing offshore wind activity has the potential to affect ongoing research and surveys within the GAA.

Ongoing offshore wind activities within the GAA that contribute to impacts on other uses include:

- Continued O&M of the Block Island project (5 WTGs) installed in State waters,
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect other uses through the primary IPFs of presence of structures for marine minerals, aviation and air traffic, offshore cables and pipelines, radar systems, and scientific research and surveys, and presence of structures and traffic for military and national security uses. Ongoing offshore wind activities would have the same type of impacts from presence of structures and traffic that are described in detail in the following section for planned offshore wind activities, but the impacts would be of lower intensity.

3.6.7.3.2 Cumulative Impacts of the No Action Alternative

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

Under the No Action Alternative, marine minerals, military and national security uses, aviation and air traffic, offshore cables and pipelines, radar systems, and scientific research and surveys would continue to follow current regional trends and respond to IPFs introduced by other ongoing and future activities.

No future activities related to other uses in the offshore environment, such as the installation of new structures on the OCS outside of planned offshore wind projects, were identified (see Appendix E for a complete description of ongoing and future activities). BOEM anticipates future offshore wind activities to affect other uses through the following primary IPFs.

3.6.7.3.2.1 Marine Mineral Extraction

Presence of structures: The demand for sand and gravel resources is expected to grow with increasing trends in coastal erosion, storm events, and sea level rise. The GAA contains a large area of available sand and mineral resources (over 4 million cubic yards [3 million metric tons] of sand available for authorized use [USACE 2020]). Future offshore wind project infrastructures, including WTGs and transmission cables, could prevent future marine mineral extraction activities where project footprints would overlap with extraction areas. However, mineral extraction typically occurs within 8 miles (12.9 km) of the shoreline, limiting adverse impacts to cable routes. Additionally, future projects could avoid identified borrow areas by consulting with BOEM Marine Minerals Program and USACE before approving offshore wind cable routes. The adverse impacts on sand and marine mineral extraction of future offshore wind activities are anticipated to be negligible**.**

3.6.7.3.2.2 National Security and Military Uses

The offshore wind lease area geographic boundaries were developed through coordination with stakeholders to address concerns surrounding overlapping military and security uses. BOEM continues to coordinate with stakeholders to minimize these concerns, as needed.

Presence of structures: Installation of over 1,000 structures in the RI/MA WEA, which currently supports only five offshore WTGs associated with the BIWF, as well as several meteorological buoys (see Appendix E), would impact military and national security vessels primarily through risk of allision and collision with stationary structures and other vessels. Generally, deep-draft military vessels are not anticipated to transit outside of navigation channels unless necessary for or other non-typical activities. Smaller-draft vessels moving within or near the wind installation have a higher risk of allision with offshore wind structures. Wind energy facility structures would be lighted according to USCG and BOEM requirements at sea level to decrease allision risk. Allision risk would be further mitigated through coordination with stakeholders on WTG layouts to allow for safe navigation through the offshore wind lease areas in the analysis area.

The construction of future offshore wind projects in the GAA would incrementally change navigational patterns and would increase navigational complexity for vessels and military aircraft operating in the region around the wind energy projects. The structures associated with offshore wind energy may necessitate route changes to navigate around the offshore wind lease areas and vessels associated with the construction of a project. Military and national security aircraft would be affected by the presence of tall equipment necessary for offshore wind facility construction, such as stationary lift vessels and cranes, which would increase navigational complexity in the area. Refer to Section 3.6.6 *Navigation and Vessel Traffic*, for additional discussion of navigation impacts in the offshore wind areas.

Potential measures mitigating risks that offshore wind projects could implement include operational protocols to stop WTG rotation during SAR aircraft operations and implementation of FAA- and BOEM-recommended navigational lighting and marking to reduce the risk of aircraft collisions. Wind energy structures would be visible on military and national security vessel and aircraft radar. Navigational hazards would be eliminated as structures are removed during decommissioning. Due to anticipated coordination with agencies and the mitigation measures described above, the overall impacts on military and national security uses from future offshore wind energy activities are anticipated to be minor to moderate.

Traffic: Impacts on military operations from vessel traffic related to the construction and operation of future offshore wind activities on the OCS are expected to be short term and localized. Vessel traffic is expected to increase during construction and could peak in 2024 with construction of reasonably foreseeable projects. While construction periods of various wind energy facilities may be staggered, some overlap would result in a cumulative impact to traffic loads.

3.6.7.3.2.3 Aviation and Air Traffic

Presence of structures: Future offshore wind development could add over 1,000 structures to the offshore environment in the RI/MA WEA. WTGs could have maximum blade tip height of 1,171 feet (357 meters) AMSL. As these structures are built, aircraft navigational patterns and complexity would incrementally increase in the region around the offshore wind lease areas, along transit routes between ports and construction sites, and locally around ports. These changes could compress lower-altitude aviation activity into more limited airspace in these areas, leading to airspace conflicts or congestion and increasing collision risks for low-flying aircraft. After all foreseeable future offshore wind energy projects are built, there would still be open airspace available over the open ocean. Navigational hazards and collision risks in transit routes would be reduced as construction is completed.

All stationary structures would have aviation and navigational marking and lighting in accordance with FAA, USCG, and BOEM requirements and guidelines to minimize and mitigate impacts on air traffic. For this reason, the adverse impacts on aviation and airports are anticipated to be minor.

3.6.7.3.2.4 Cables and Pipelines

Presence of structures: Over 1,000 structures along with over 4,000 miles of cables are expected to be installed by 2030 in the RI/MA WEA as part of future offshore wind energy project infrastructure. The presence of future offshore wind energy structures could preclude future submarine cable placement within any given development footprint, requiring future cables to route around these areas. However, the placement and presence of these cables would not prohibit the placement of additional cables and pipelines. Following standard industry procedures, cables and pipelines can be crossed without adverse impact. The risk of allision to cable maintenance vessels could increase as more offshore wind energy projects are constructed. However, given the infrequency of required maintenance at any given location along a cable route, this risk is expected to be low. Impacts on submarine cables would be eliminated during conceptual decommissioning of offshore wind farms if export cables associated with those projects are removed. Under the No Action alternative, minor adverse impacts to cables in the area would be anticipated.

3.6.7.3.2.5 Radar Systems

Presence of structures: WTGs that are near or in direct line-of-site to land-based radar systems can interfere with the radar signal causing shadows or clutter in the received signal. Construction of over 1,000 structures in the RI/MA WEA could lead to localized, long-term, moderate impacts on radar systems. Development of offshore wind projects could incrementally decrease the effectiveness of individual radar systems if the field of WTGs expands within the radar system's coverage area. In addition, large areas of installed WTGs could create a large geographic area of degraded radar coverage that could affect multiple radars. Wind turbines in the maritime environment affect marine vessel radar in a situation-dependent manner, with the most common impact being a substantial increase in strong, reflected energy cluttering the operator's display, leading to complications in navigation decision-making (NAS 2022). Most offshore wind structures would be sited at such a distance from existing and proposed land-based radar systems to minimize interference to most radar systems, but some impacts are anticipated.

BOEM assumes that all offshore wind developments in the GAA would use the developer agreed upon 1 x 1-nm spacing in fixed east-west rows and north-south columns (Baird 2020) and would evaluate each of those individual projects in their respective NEPA analyses. This arrangement would reduce, but not eliminate, navigational complexity and space use conflicts during the operation phases of the projects. Navigational complexity in the area would increase during construction as offshore wind foundations are installed, would remain constant during simultaneous operations, and would decrease as projects are decommissioned and structures are removed. The Wind Turbine Generator Impacts on Marine Vessel Radar (BOEM 2022) concluded that general mitigation measures, such as properly trained radar operators, properly installed and adjusted vessel equipment, and reference buoys are practicable options to mitigate wind turbine generator impacts on marine vessel radar (NAS 2022).

3.6.7.3.2.6 Scientific Research and Surveys

Presence of structures: Construction of other wind energy projects between 2023 and 2030 in the GAA would add up to 2,865 WTGs, associated cable systems, and associated vessel activity that would present additional navigational obstructions for sea- and air-based scientific studies. Collectively, these developments would prevent NMFS from continuing ongoing scientific research surveys or protected species surveys under current vessel capacities and could reduce future opportunities for NMFS' scientific research in the area. This Draft EIS incorporates, but reference, the detailed analysis of potential impacts to scientific research and surveys provided in the Vineyard Wind final EIS in Section 3.12.2.5, *Scientific Research and Surveys* (BOEM 2021). In summary, offshore wind facilities actuate impacts on scientific surveys and advice by preclusion of NOAA survey vessels and aircraft from sampling in survey strata and impacts on the random-stratified statistical design that is the basis for assessments, advice, and analyses. NOAA has determined survey activities within offshore wind facilities are outside of safety and operational limits. Survey vessels would be required to navigate around offshore wind projects to access survey locations, leading to a decrease in operational efficiency. The height of turbines would affect aerial survey design and protocols, requiring flight altitudes and transects to change. Scientific survey and protected species survey operations would therefore be reduced or eliminated as offshore wind facilities are constructed (BOEM 2021). Offshore wind facilities would disrupt survey sampling statistical designs, such as random stratified sampling. Impacts to the statistical design of region-wide surveys violate the assumptions of probabilistic sampling methods. Development of new survey technologies, changes in survey methodologies, and required calibrations could help to mitigate losses in accuracy and precision of current practices due to the impacts of wind development on survey strata.

Other offshore wind projects could also require implementation of mitigation and monitoring measures identified in records of decision. Identification and analysis of specific measures are speculative at this time; however, these measures could further impact NMFS's ongoing scientific research surveys or protected species surveys because of the increased vessel activity and/or in-water structures from these other projects.

BOEM is committed to working with NOAA toward a long-term regional solution to account for changes in survey methodologies as a result of offshore wind farms.

Overall, the No Action alternative would have major effects on NMFS' scientific research and protected species surveys, potentially leading to impacts on fishery participants and communities; as well as potential major impacts on monitoring and assessment activities associated with recovery and conservation programs for protected species.

3.6.7.3.3 Conclusions

Impacts of the No Action Alternative

BOEM expects ongoing non-offshore wind and offshore wind activities to have continuing impacts on military and national security uses, aviation and air traffic, offshore cables and pipelines, radar systems, and scientific research and surveys primarily through presence of structures that introduce navigational complexities and vessel traffic.

BOEM anticipates that the other uses impacts as a result of ongoing non-offshore and offshore wind activities associated with the Alternative A – No Action would be **negligible** for marine mineral extraction, marine and national security uses, aviation and air traffic, cables and pipelines, and radar systems. Military and national security use, aviation and air traffic, vessel traffic, commercial fishing, and scientific research and surveys are expected to continue in the GAA. Impacts of ongoing non-offshore and offshore wind activities on scientific research surveys are anticipated to be **major** due to the impacts of ongoing offshore wind activities.

Cumulative Impacts of the No Action Alternative

BOEM anticipates that the other uses impacts as a result of ongoing and planned activities other than offshore wind would also contribute to impacts on other uses. Planned activities expected to occur in the GAA other than offshore wind include increasing vessel traffic; continued residential, commercial, and industrial development onshore and along the shoreline; and continued development of FAA-regulated structures including cell towers and onshore wind turbines. BOEM anticipates that any issues with aviation routes or radar systems would be resolved through coordination with DoD or FAA, as well as through implementation of aviation and navigational marking and lighting of structures according to FAA, USCG, and BOEM requirements and guidelines. There are no planned offshore activities anticipated to affect marine mineral extraction or cable and pipeline infrastructure.

BOEM anticipates that the overall impacts associated with Alternative A, the no action alternative, when combined with all other planned activities (including offshore wind) in the GAA would result in overall **moderate** adverse impacts. The impacts would be **negligible** to **minor** adverse impacts for most uses, for marine mineral extraction, aviation and air traffic, and cables and pipelines; **moderate** for radar system due to WTG interference; **minor** for military and national security uses except for USCG SAR operations, which would have **major** adverse impacts; and **major** for scientific research and surveys. The presence of stationary structures associated with offshore wind energy projects could prevent or impede continued opportunities for other NOAA scientific research studies in the area. Coordinators of large-vessel survey operations or operations deploying mobile survey gear have determined that activities within offshore wind facilities would not be within current safety and operational limits. In addition, changes in required flight altitudes due to the proposed WTG height would affect aerial surveys design and protocols. BOEM acknowledges that NOAA's Office of Marine and Aviation Operations endorses the restriction of large-vessel operation to greater than 1 nm from wind installations due to safety and operational challenges.

3.6.7.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than those described in the sections below. The following PDE parameters (Appendix C) would influence the magnitude of the impacts on other uses:

- The number, size, location, and spacing of WTGs;
- Timing of offshore construction and installation activities; and
- Location and route of offshore export cable corridor.

Variability of the proposed Project design exists as outlined in Appendix C. Below is a summary of potential variances in impacts:

- WTG size and location: larger turbines closer to shore could increase effects on land-based radar systems, movements of civilian and military aircraft, and military vessels.
- WTG spacing: Removal of groups of WTGs, creating spacing of greater than 1 nm, could allow for scientific research and surveys in those areas, decreasing the impact.
- Timing of construction: Construction could affect submarine or surface military vessel activity during typical operations and training exercises.
- Offshore cable route options: The route chosen (including variants within the general route) could conflict with marine mineral extraction or cables and pipelines.

3.6.7.5 Impacts of Alternative B - Proposed Action on Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)

3.6.7.5.1 Construction and Installation

3.6.7.5.1.1 Onshore Activities and Facilities

3.6.7.5.1.1.1 National Security and Military

Currently, there are no military uses on Long Island. Therefore, the construction of onshore activities and facilities would have no impact on national security and military operations.

3.6.7.5.1.1.2 Aviation and Air Traffic

Presence of structures: Offshore construction activities would result in WTG components located at onshore staging ports. The presences of these structures could result in aircrafts needing to reroute due to the issuance of notices to airmen. Impacts from WTG components located in staging ports would be short-term, adverse, negligible impacts.

3.6.7.5.1.2 Offshore Activities and Facilities

3.6.7.5.1.2.1 Marine Mineral Extraction

Presence of structures: The presence of structures, including transmission cables and WTGs, associated with the Proposed Action has the potential to limit future marine mineral extraction activities. However, there are no BOEM OCS sand and mineral lease areas, and no identified sand resource blocks identified within the SRWF and SRWEC. There are sand borrow areas located within a 1-mile (1.6-km) radius of cables associated with the Proposed Action, but these cables would not directly intersect sand borrow areas. Similarly, construction activities associated with the Proposed Action would not overlap any active dredged material disposal sites. Since the Proposed Action would avoid mineral leases, sand and gravel leases, borrow areas, and ocean disposal areas, potential impacts from the Proposed Action would be negligible.

3.6.7.5.1.2.2 National Security and Military

Presence of structures: Under the Proposed Action, the addition of up to 94 11-MW WTGs and one OSC-DC structure would increase the risk of collision between military vessels and structures. This risk would be enhanced in bad weather conditions or low visibility. The presence of the WTGs and OSC-DC would increase navigational complexity and could lead to military vessels and aircraft in the vicinity of the SRWF having to change navigational routes and patterns and would increase the risk of collisions within the proposed Project Area. During construction activities and under normal operations, USCG helicopters would continue conducting search and rescue operations as needed. Under the Proposed Action, offshore structures would be visible on military and national security vessel and aircraft radar, which would help minimize the impacts associated with the Project. The presence of structures would result in minor adverse impacts on national security and military operations, with the exception of SAR, on which there would be moderate impacts.

Traffic: Offshore construction activities would result in additional vessels present within the vicinity of the Project. This would increase the potential risk of collision or conflict with military vessels and vessels associated with national security, the potential for military and national security vessels to have to alter navigational routes, and result in congestion at ports utilized for construction activities. During construction and conceptual decommissioning activities, potential impacts would be greater than during O&M activities. Potential impacts from vessel traffic and navigation impacts are discussed in Section 3.6.6 *Navigation and Vessel Traffic*.

3.6.7.5.1.2.3 Aviation and Air Traffic

Presence of structures: Under the Proposed Action, up to 94 11-MW WTGs with maximum blade tip heights of up to 787 feet (240 m) AMSL would be added to the GAA. The presence of these structures would increase navigational complexity, resulting in increased risk of collision with structures in the Project vicinity, and could change aircraft navigational patterns around the SRWF. More than 90 percent of existing air traffic within the analysis area, including commercial and military flight operations, would not be impacted by the presence of WTGs because it occurs at altitudes that would not be impacted by the presence of WTGs (BOEM 2021). However, it would be anticipated that low-level flights would be affected by the presence of structures throughout the construction and operation timeframe of the Proposed Action.

To help minimize risk of collisions, WTGs and the OSC-DC would be equipped with lighting and marking to meet FAA and USCG regulations and guidelines to minimize impacts on air traffic. WTGs would be visible on the radar systems of low-lying aircrafts. The presence of offshore structures under the Proposed Action would result in long-term, localized, negligible adverse impacts.

Traffic: Offshore construction activities associated with the Proposed Action would result in a short-term increase in traffic from aircraft. There is the potential for various helicopters and unmanned aircraft to be used to assist in offshore construction activities, including the potential use for crew changes during the installation of the WTGs. However, the Proposed Action anticipates the majority of offshore construction to be supported with vessels. Therefore, impacts to aviation and air traffic during offshore construction activities would be negligible to minor.

3.6.7.5.1.2.4 Radar Systems

Presence of structures: Sunrise Wind conducted an analysis of radar and navigation aids in the Project vicinity and found that under the Proposed Action either portions of or the entire proposed Project Area are within the line of sight of and would affect the following radar systems: Falmouth ASR-8, Nantucket ASR-9, and Providence ASR-9 (COP, Appendix Y1; Sunrise Wind 2022 citing Westlope Consulting 2020). Impacts on the North Truro ARSR-4 and Riverhead SRSR-4 are not expected as the WTGs in the proposed Project Area would not be within line-of-sight of these radar sites.

Potential impacts to radar systems in the GAA without mitigation efforts include clutter resulting in a partial loss of primary target detection and a number of false primary targets and partial loss of weather detection and false weather indications (COP, Appendix Y1; Sunrise Wind 2022 citing Westlope Consulting 2020).

BOEM also completed a study that assessed the impact of offshore wind farms to the U.S. HF Radar National Network and found that offshore wind turbines interfere with the operation of HF radars. There are effective mitigation techniques that can be implemented to help minimize impacts, including updated software (BOEM 2021) paired with in situ current and wave sensors within and around the periphery of the WEA. Under the Proposed Action, Sunrise Wind would coordinate with the DOD and FAA for air surveillance radar systems, NOAA NWS for weather radar systems, and the NOAA IOOS Surface Currents Program to address potential impacts to HF radar systems and would implement agreed upon steps determined in consultation with each radar system's Federal Program Manager to help minimize these impacts. While impacts to radars related to the presence of offshore structures differ from system to system, with appropriate mitigations impacts would be moderate.

3.6.7.5.1.2.5 Cable and Pipelines

Presence of structures: Installation of the SRWEC would cross up to eight known telecommunications cables, five of which are in service and three of which are out of service (COP, Figure 3.3.3.-10; Sunrise Wind 2022). Two of the eight cables also have the potential to be crossed by the IAC. The Proposed Action would be designed to minimize, where practicable, crossing existing cables with the routes for the IAC. Sunrise Wind would follow standard industry procedures for crossing utility lines to avoid or minimize adverse impacts from construction activities, which would result in negligible to minor adverse impacts. Additionally, the presence of the Proposed Action's offshore export cables would not prohibit the placement of additional cables and pipelines. Offshore export cables associated with the Proposed Action could be crossed using standard industry protection techniques.

3.6.7.5.1.2.6 Scientific Research and Surveys

Presence of structures: Scientific research and surveys, particularly for NOAA surveys supporting commercial fisheries and protected-species research programs, could be affected during the construction and operation of the Proposed Action; however, research activities may continue within the proposed Project Area, as permissible by survey operators. The Proposed Action would affect survey operations by excluding certain portions of the Lease Area occupied by Project components from sampling, affecting the statistical design of surveys, reducing survey efficiency, and causing habitat alteration within the proposed Project Area that cannot be monitored. This Draft EIS incorporates by reference the detailed analysis of potential impacts on scientific research and surveys provided in the Vineyard Wind 1 Final EIS (BOEM 2021a). The analysis in the Vineyard Wind 1 Final EIS is summarized above under the discussion of the No Action Alternative in Section 3.6.7.3 *Impacts of Alternative A – No Action on Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys).*

The Proposed Action would result in up to 94 11-MW WTGs with a maximum blade tip height of 787 feet (240 m) AMSL being installed. Aerial survey track lines for cetacean and sea turtle abundance surveys could not continue at the current altitude (600 feet AMSL) within the proposed Project Area because the planned maximum-case scenario for WTG blade tip height would exceed the survey altitude. The increased altitude necessary for safe survey operations could result in lower chances of detecting marine mammals and sea turtles, especially small species. Agencies would need to expend resources to update scientific survey methodologies due to construction and operation of the Proposed Action, as well as to evaluate these changes on stock assessments and fisheries management, resulting in major impacts for scientific research and surveys.

3.6.7.5.2 Operations and Maintenance

3.6.7.5.2.1 Onshore Activities and Facilities

Under the Proposed Action, it would not be anticipated that O&M of onshore facilities and activities would result in impacts to other uses.

3.6.7.5.2.2 Offshore Activities and Facilities

Under the Proposed Action, impacts would be anticipated to be less than or similar to those described for construction activities. Please see the discussion below for further information on how O&M activities would impact other uses.

3.6.7.5.2.2.1 National Security and Military

Under O&M activities of the Proposed Action, the installation of foundations within the GAA could attract interest for recreational fishing or sightseeing, resulting in vessels that may travel farther offshore than typically occurs. Recreational fishing vessel traffic would be additive to vessel traffic that already transits the leased areas, and could increase demand for USCG SAR operations near the WTGs, with the structures themselves complicating SAR operations. The presence and layout of large numbers of WTGs could make it more difficult for SAR aircraft to perform operations, necessitating changes in USCG SAR operational procedures, leading to less effective search patterns or earlier abandonment of searches. This could result in otherwise avoidable loss of life due to maritime incidents. resulting in moderate adverse effects.

3.6.7.5.2.2.2 Radar Systems

O&M activities of offshore infrastructure associated with the Proposed Action would have minor adverse effects on air traffic control and national defense radar within the line of sight of the offshore infrastructure.

3.6.7.5.2.2.3 Cables and Pipelines

The presence of offshore structures associated with the Proposed Action, including the OSC-DC and WTGs would increase navigational hazards in the project vicinity, leading to increased risk of collision for vessels conducting O&M activities for existing submarine telecommunication cables. To minimize risk, Sunrise Wind would implement lighting and marking to comply with FAA, USCG, and BOEM guidelines and regulations. Additionally, risk of collision would be low due to the relative infrequency of the need for O&M activities to existing cables and pipelines. This would result in negligible impacts.

3.6.7.5.3 Conceptual Decommissioning

3.6.7.5.3.1 Onshore Activities and Facilities

Conceptual decommissioning of the Proposed Action would have similar, negligible adverse impacts to aviation and air traffic as described under construction activities.

3.6.7.5.3.2 Offshore Activities and Facilities

Conceptual decommissioning of the Proposed Action would have similar, negligible to major adverse and minor beneficial impacts to other uses as described under construction activities.

3.6.7.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities.

Marine Mineral Extraction: In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the impacts on marine mineral extraction from ongoing and planned activities would be negligible. BOEM anticipates that other offshore wind projects would be designed to avoid existing and proposed mineral extraction areas through consultation with the BOEM, USACE, and local agencies; therefore, there would be limited to no impacts on future mineral marine extraction.

Military and National Security Uses: In context of reasonably foreseeable environmental trends, the Proposed Action would contribute to impacts on military use from ongoing and planned activities through the construction and operation of offshore structures. While potential impacts on most military and national security uses are anticipated to be minor, installation of up to 2,865 WTGs throughout the GAA would hinder USCG SAR operations across a larger area, potentially leading to increased loss of life.

Aviation and Air Traffic: In the context of reasonably foreseeable environmental trends and planned activities, the Proposed Action and other offshore wind project WTGs would contribute to impacts on aviation and air traffic. Open airspace around the offshore wind lease areas in the GAA would still exist after all foreseeable future offshore wind energy projects are built. BOEM assumes that offshore wind project operators would coordinate with aviation interests throughout the planning, construction, operations, and conceptual decommissioning processes to avoid or minimize impacts on aviation activities and air traffic.

Cables and Pipelines: In the context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the impacts on cables and pipelines from ongoing and planned activities could result in some localized and long-term impacts. However, these impacts would be negligible because they can be avoided by standard protection techniques.

Radar Systems: In context of reasonably foreseeable environmental trends, the Proposed Action would contribute to the impacts on radar systems from ongoing and planned activities, primarily due to the presence of WTGs within the line of sight causing interference with radar systems. Development of offshore wind projects could incrementally decrease the effectiveness of individual radar systems if the field of WTGs could create a large geographic area of degraded radar coverage that could affect multiple radars.

Scientific Research and Surveys: In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the impacts on scientific research and surveys from ongoing and planned activities would be long term and major, particularly for NOAA surveys that support commercial fisheries and protected-species research programs. The entities conducting scientific research and surveys would have to make significant investments to change methodologies to account for areas occupied by offshore energy components, such as WTGs and cable routes, that are no longer able to be sampled.

3.6.7.5.5 Conclusions

Impacts of the Proposed Action

Under the Proposed Action, up to 94 11-MW WTGs with a maximum blade tip of 787 feet (240 m) above AMSL would be installed, operate, and eventually be decommissioned within the proposed Project Area. The presence of these structures would introduce navigational complexity and increased vessel traffic in the area that would continue to have short-term to long-term impacts that range from **negligible** to **major** on marine mineral extraction, military and national security uses, aviation and air traffic, cables and pipelines, radar systems, and scientific research and surveys.

Marine Mineral Extraction: The SRWF and offshore export cable routes for the Proposed Action would avoid sand, gravel, borrow, and ocean disposal areas, resulting in **negligible** potential impacts.

Military and National Security Uses: The installation of WTGs in the proposed Project Area would result in increased navigational complexity and increased allision risk, creating potential **major** adverse impacts on USCG SAR operations and potential **minor** impacts on all other military and national security uses.

Aviation and Air Traffic: Potential **minor** impacts on low-level flights would occur, primarily due to the installation of WTGs in the Project Area and changes in navigation patterns. Potential impacts on commercial and military flight operations are not anticipated, as WTGs would be constructed under the listed FAA flight level ceiling.

Cables and Pipelines: Potential impacts on cables and pipelines would be **negligible** due to the use of standard protection techniques to avoid impacts.

Radar: Potential minor adverse impacts on radar systems would primarily be caused by the presence of WTGs within their line of sight or over the horizon coverage area causing interference with radar systems. Options are available to minimize or mitigate impacts and Sunrise Wind would continue to coordinate with the FAA, DOD, and NOAA on impacts.

Scientific Research and Surveys: Potential impacts on scientific research and surveys would generally be **major**, particularly for NOAA surveys supporting commercial fisheries and protected-species research programs. The presence of structures would exclude certain areas within the proposed Project Area occupied by Project components (e.g., WTG foundations, cable routes) from potential vessel and aerial sampling, and by impacting survey gear performance, efficiency, and availability.

In summary, BOEM anticipates that the contribution of the Proposed Action to the impacts of individuals IPFs resulting from ongoing activities would range from **negligible** to **major**.

Cumulative Impacts of the Proposed Action

Considering all IPFs together, BOEM anticipates that the cumulative impacts associated with the Proposed Action when combined with ongoing and planned activities would range from **negligible** to **minor** for aviation and air traffic, cables and pipelines, marine mineral extraction, radar systems, and most military and national security uses; **moderate** for radar systems; and **major** for USCG SAR operations and scientific research and surveys. The presence of structures associated with the Proposed Action and increased risk of allisions are the primary driver for impacts on other marine uses. Impacts on scientific research and surveys would qualify as major because entities conducting surveys and scientific research would have to make significant investments to change methodologies to account for unsampleable areas, with potential long-term and irreversible impacts on fisheries and protected-species research as a whole, as well as on the commercial fisheries community.

3.6.7.6 Alternative C-1 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

The impacts resulting from individual IPFs associated with the construction and installation, O&M, and decommissioning of the Project under Alternative C-1 would be similar to those described under the Proposed Action. Under Alternative C-1, 8 WTG positions would be eliminated from NMFS's Priority Areas to minimize impacts to fisheries habitat.

3.6.7.6.1 Construction and Installation

3.6.7.6.1.1 Onshore Activities and Facilities

Alternative C-1 would be similar in effect to the Proposed Action for onshore activities and facilities. The presence of WTG components located at onshore staging ports would cause short-term, adverse, negligible impacts. However, the impacts would be slightly less due to the reduced number of WTGs.

3.6.7.6.1.2 Offshore Activities and Facilities

Impacts to offshore activities and facilities related to construction and installation for marine mineral extraction, national security and military, aviation and air traffic, radar systems, cables and pipelines, and scientific research and surveys would be similar as those described under the Proposed Action. Cable emplacement and maintenance, presence of structures, and traffic would still be the IPFs that would affect other uses associated with Alternative C-1.

Impacts of Alternative C-1 would range from negligible for marine mineral extraction and cables and pipelines to major adverse impacts to scientific research and surveys and USCG SAR operations. Minor adverse impacts would occur for aviation and air traffic, national security and military uses, and radar systems.

3.6.7.6.2 Operations and Maintenance

3.6.7.6.2.1 Onshore Activities and Facilities

Alternative C-1 would not affect the Project's onshore facilities and should result in very similar operations and maintenance needs as the Proposed Action. Therefore, it is not anticipated that O&M of onshore facilities and activities would result in any impacts to other uses.

3.6.7.6.2.2 Offshore Activities and Facilities

Under Alternative C-1, impacts to other uses due to O&M would be anticipated to be similar to those described under the Proposed Action.

3.6.7.6.3 Conceptual Decommissioning

3.6.7.6.3.1 Onshore Activities and Facilities

Conceptual decommissioning of Alternative C-1 would have similar, negligible adverse impacts to aviation and air traffic as described under construction activities of the Proposed Action.

3.6.7.6.3.2 Offshore Activities and Facilities

Under Alternative C-1, conceptual decommissioning of offshore facilities would have similar, negligible to major adverse and minor beneficial impacts to other uses as described under construction activities.

3.6.7.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts of Alternative C-1 considered the impacts of Alternative C-1 in combination with other ongoing and planned wind activities. Cumulative impacts would be similar to those described for the Proposed Action.

3.6.7.6.5 Conclusions

Impacts of Alternative C-1

Under Alternative C-1, 8 fewer WTG positions would be available for installing WTGs, although the total number of WTGs installed would be the same as the Proposed Action. As such, the construction and installation of offshore activities and facilities would be the same as anticipated for the Proposed Action. The impacts of Alternative C-1 resulting from individual IPFs would be **negligible** for marine mineral extraction, cables and pipelines; **minor** for aviation and air traffic, most military and national security uses, and radar systems; **moderate** for USCS SAR operations; and **major** for scientific research and surveys.

Cumulative Impacts of Alternative C-1

In context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to the individual IPFs resulting from ongoing and planned activities would be similar to that of the cumulative impacts of the Proposed Action. The impacts would range from **negligible** to **minor** for aviation and air traffic, cables and pipelines, marine mineral extraction, and most military and national security uses; **moderate** for radar systems; and **major** for USCG SAR operations and scientific research and surveys. These impact ratings are primarily driven by the presence of offshore structures such as WTGs in the offshore wind lease areas.

3.6.7.7 Alternative C-2 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

The impacts resulting from individual IPFs associated with the construction and installation, O&M, and decommissioning of the Project under Alternative C-2 would be similar to those described under the Proposed Action. Under Alternative C-2, 8 WTGs would be removed and 12 WTG positions would be relocated to the eastern side of the lease area from Priority Areas 1, 2, 3, and/or 4 to minimize impacts to fisheries habitat.

3.6.7.7.1 Construction and Installation

3.6.7.7.1.1 Onshore Activities and Facilities

The Fisheries Habitat Impact Minimization Alternative C-2 would be similar in effect to the Proposed Action on onshore activities and facilities. The presence of WTG components located at onshore staging ports would cause short-term, adverse, negligible impacts to. However, the impacts would be slightly less due to the reduced number of WTGs.

3.6.7.7.1.2 Offshore Activities and Facilities

Impacts to offshore activities and facilities related to construction and installation for marine mineral extraction, national security and military, aviation and air traffic, radar systems, cables and pipelines, and scientific research and surveys would be similar as those described under the Proposed Action. Cable emplacement and maintenance, presence of structures, and traffic would still be the IPFs that would affect other uses associated with Alternative C-2. However, due to fewer WTGs, less IAC would be needed, which would result in a decreased disturbance impact compared to the Proposed Action.

Impacts of Alternative C-2 would range from negligible for marine mineral extraction and cables and pipelines to major adverse impacts to USCG SAR operations and scientific research and surveys. Minor adverse impacts would occur for aviation and air traffic, most national security and military uses, and radar systems.

3.6.7.7.2 Operations and Maintenance

3.6.7.7.2.1 Onshore Activities and Facilities

Alternative C-2 would not affect the Project's onshore facilities and should result in very similar operations and maintenance needs as the Proposed Action. Therefore, it is not anticipated that O&M of onshore facilities and activities would result in any impacts to other uses.

3.6.7.7.2.2 Offshore Activities and Facilities

Under Alternative C-2, impacts would be anticipated to be similar to those described under the Proposed Action. Fewer WTGs and less IAC would require slightly less O&M activities.

3.6.7.7.3 Conceptual Decommissioning

3.6.7.7.3.1 Onshore Activities and Facilities

Conceptual decommissioning of Alternative C-2 would have similar, negligible adverse impacts to aviation and air traffic as described under construction activities of the Proposed Action.

3.6.7.7.3.2 Offshore Activities and Facilities

Under Alternative C-2, conceptual decommissioning of offshore facilities would have similar, negligible to major adverse and minor beneficial impacts to other uses as described under construction activities.

3.6.7.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts of Alternative C-2 considered the impacts of Alternative C-2 in combination with other ongoing and planned wind activities. Cumulative impacts would be similar to those described for the Proposed Action.

3.6.7.7.5 Conclusions

Impacts of Alternative C-2

Under the C-2 alternative, BOEM considers reducing the number of WTGs from 94 to 86. The 8 WTGs would be removed from Priority Areas 1, 2, 3, and/or 4. The construction and installation of offshore activities and facilities would be less due to the reduced mileage of IAC and fewer WTGs. The overall level of impact would remain similar to the Proposed Action, and the impacts of each alternative alone resulting from individual IPFs associated with these alternatives would be **negligible** for marine mineral extraction, cables and pipelines; **minor** for aviation and air traffic, military and national security uses, and radar systems; **moderate** for USCG SAR operations; and **major** for scientific research and surveys.

Cumulative Impacts of Alternative C-2

In context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to the individual IPFs resulting from ongoing and planned activities would be similar to that of the cumulative impacts for the Proposed Action. The impacts would range from **negligible** to **minor** for aviation and air traffic, cables and pipelines, marine mineral extraction, and most military and national security uses; **moderate** for radar systems; and **major** for USCG SAR operations and scientific research and surveys. These impact ratings are primarily driven by the presence of offshore structures such as WTGs in the offshore wind lease areas.

3.6.7.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall negligible to major adverse impacts on other uses. Table 3.6.7-2 provides an overall summary of alternative impacts.

Table 3.6.7-2. Comparison of Alternative Impacts on Other Uses

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Other uses	Negligible to major impacts to mineral extraction, military use, air traffic, land-based radar services, cables and pipelines, and scientific surveys. Overall cumulative adverse impacts would be minor for most uses. However, the overall impact would be moderate adverse for radar and major adverse for USCG SAR operations and scientific research and protected species surveys.	Negligible to major impacts to mineral extraction, military use, air traffic, land-based radar services, cables and pipelines, and scientific surveys. Overall cumulative adverse impacts would be minor for most uses. However, the overall impact would be moderate adverse for radar and major adverse for USCG SAR operations and scientific research and protected species surveys.	Negligible to major impacts to mineral extraction, military use, air traffic, land-based radar services, cables and pipelines, and scientific surveys. Overall cumulative adverse impacts would be minor for most uses. However, the overall impact would be moderate adverse for radar and major adverse for USCG SAR operations and scientific research and protected species surveys.

3.6.7.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to other uses.

Radar Systems

BOEM has identified possible mitigation measures that, if implemented, could reduce the impact of the Proposed Action on radar systems. These mitigation measures, described in Table H-2 in Appendix H, are derived from BOEM's Radar Interference Analysis for Renewable Energy Facilities on the Atlantic Outer Continental Shelf (BOEM 2020). The mitigation measures aim to reduce the primary impacts of wind farms on radar systems including unwanted radar returns, or clutter, resulting in a partial loss of primary target detection, false primary target detection due to the WTG structures, and the partial loss of weather detection, including false weather indications. As described above, the Proposed Action falls within the measurement coverage area of multiple NOAA IOOS funded high-frequency (HF) radar stations operated by their academic partners: HF radar on Block Island (two radars operated by University of Rhode Island and Rutgers University); HF radar on Martha's Vineyard (one radar operated by Rutgers University and three radars operated by Woods Hole Oceanographic Institution); HF radar on Nantucket Island (one radar operated by Rutgers University and one radar operated by Woods Hole Oceanographic Institution); and HF radar on Long Island (one radar operated by University of Rhode Island and two radars operated by Rutgers University).

For impacts on HF radars, mitigation software paired with in situ current and wave sensors within and around the periphery of the WEA is the most effective operational mitigation option. Additionally, for radar systems other than HF radars, modification mitigations have been identified such as utilizing dual beams of the radar simultaneously, which results in improvements in radar detection by providing elevation data to give spatial information to mitigate the clutter from wind farms and reduce the number of false primary targets.

Scientific Research and Surveys

BOEM is committed to working with NOAA towards a long-term regional solution to account for changes in survey methodologies because of offshore wind farms. On December 5, 2022 NOAA Fisheries and BOEM published a draft Federal Survey Mitigation Implementation Strategy for the Northeast U.S. Region[25] to address anticipated impacts of offshore wind energy development on NOAA Fisheries' scientific surveys. This implementation strategy also defines stakeholders, partners, and other ocean users that would be engaged throughout the process and identifies potential resources for successful implementation. Activities described in the implementation strategy are designed to mitigate the effect of offshore wind energy development on NOAA Fisheries surveys and is referred to as the Federal Survey Mitigation Program. The mitigation program would include survey-specific mitigation plans for each affected survey including both vessel and aerial surveys. The implementation strategy is intended to guide the implementation of the mitigation program through the duration of wind energy development in the Northeast U.S. region. The implementation strategy was made available in draft form for public comment until May 6, 2022. Measures from the recently published implementation strategy will be analyzed in the Final EIS.

[25] https://media.fisheries.noaa.gov/2022-03/NOAA%Fisheries-and-BOEM-Federal-Survey-Mitigation_Strategy_DRAFT_508.pdf

3.6.8 Recreation and Tourism

3.6.8.1 Description of the Affected Environment and Future Baseline Conditions

As a resource, recreation and tourism is described as the relationship between the natural setting and resources of an area with public use and values of the resources (BOEM 2012). This section describes the affected environment and potential effects related to recreation and tourism from the construction and installation, O&M, and conceptual decommissioning of the SRWF within the GAA, which includes the vicinity of the Project in the expanded Region of Influence (ROI) (COP Figure ES-1, Sunrise Wind 2022; COP Table 4.7-1; Sunrise Wind 2022). The GAA includes the communities within the viewshed, defined as the area within a 40-mile (64.4 km) radius of the SRWF, resources adjacent to the landfall construction area, including land within the Fire Island National Seashore boundary, Smith Point County Park boundary, and Otis Pike Wilderness boundary, 1,000 feet (304.8 m) into the Atlantic Ocean, and 4,000 feet (1,219.2 m) into Great South Bay that is located within the boundary of the Fire Island National Seashore, a 3-mile (4.8-km) radius around the proposed OnCS-DC site (Union Avenue site), and portions of the towns of Brookhaven and Islip along with small portions of the villages of Lake Grove and Patchogue and the cable landfall and cable routes to the OnCS-DC site, as described in Appendix D, Figure D-19, that could experience potential effects of the SRWF on recreation and tourism. Please refer to Appendix D, Figure D-18, to view the GAA for Recreation and Tourism activities related to the proposed Project. Recreation and tourism resources associated with the proposed Project are primarily related to coastal and nearshore/offshore activities, with inland and open ocean recreation and tourism activities also considered. In the proposed Project Area, there are extensive opportunities for recreation and tourism activities to occur based on the landscape and natural resources in this region. These activities can occur in a wide variety of manners; they can require recreational equipment, occur in groups or individually, can require specialized skills, and can be passive (e.g., sunbathing or wildlife viewing) or active (e.g., swimming or hiking) recreational and tourism activities. The location, environment, and landscape of the Project provide opportunities for a variety of high-quality recreation and tourism experiences. In these communities, the scenic quality and natural resources associated with the coastal environment can be an important contributing factor to recreation and tourism activities and experiences.

The proposed Project facilities would occur on land in New York and could result in potential effects to coastal communities in New York, Connecticut, Massachusetts, and Rhode Island. BOEM ranked and evaluated the potential sensitivity of coastal communities along the East Coast of the United States. In this analysis, 113 geographic areas were analyzed, 16 were within the states in the expanded ROI (ICF 2012). Recreation and tourism constitute a sizable portion of the coastal economies of the states and counties affected by the Project. The National Oceanic and Atmospheric Administration (NOAA) gathers data regarding ocean economies by collecting the economic data for six different sectors that are dependent upon the ocean and Great Lakes. These six sectors are marine construction, living resources, offshore mineral extraction, ship and boat building, tourism and recreation, and marine transportation. The economic activities considered are based only on those that are related to the ocean economy. The dataset only includes establishments located in shore-adjacent zip codes, and for establishments such as restaurants or hotels, only includes those nearest to the coast. The Tourism and Recreation sector is composed of North American Industry Classification System data for the categories Sporting and Athletic Goods Manufacturing, Scenic and Sightseeing Transportation, Sports and Recreation Instruction, Recreation Goods Rental, Amusement and Recreation Services Not Elsewhere Classified, Zoo and Botanical Gardens, and Nature Parks and Other Similar Institutions (NMFS 2021b). A summary of ocean economic data for counties identified in the ROI identified in Section 3.6.3 *Demographics, Employment, and Economics* is aggregated in Table 3.6.8-1. Recreation and tourism were predominant sources of ocean economic activity for the majority of the locations and make up a significant portion of the economies of the geographic areas within the ROI.

Table 3.6.8-1. 2018 Ocean Economies Tourism and Recreation Data for Counties and States That Would Be Directly or Indirectly Affected by the Sunrise Wind Project

Location	Number of Establishments (% of total establishments in ocean economy)	Number of Employed Residents for Tourism and Recreation (% of total residents employed in ocean economy)	Total Wages for Tourism and Recreation (% of total wages generated by ocean economy)	Total GDP for Tourism and Recreation (% of total GDP generated by ocean economy)
New York (NY)	22,269 (93%)	359,193 (91%)	$12.6 billion (83%)	$29 billion (87%)
Suffolk, NY	2,740 (90%)	36,385 (88%)	$921.1 million (70%)	$1.9 billion (74%)
Connecticut (CT)	2,830 (91%)	39,238 (68%)	$992 million (40%)	$2 billion (44%)
New London, CT	490 (91%)	7,397 (36%)	$176.5 million (13%)	$374.3 million (16%)
Massachusetts (MA)	4,775 (81%)	79,117 (80%)	$2.2 billion (59%)	$4.7 billion (60%)
Barnstable, MA	1,222 (90%)	17,028 (94%)	$489 million (88%)	$1.1 billion (87%)
Bristol, MA	193 (38%)	2,963 (49%)	$55 million (19%)	$105.8 million (16%)
Dukes, MA	167 (91%)	1,394 (97%)	$52.9 million (96%)	$120.1 million (97%)
Nantucket, MA	134 (94%)	1,668 (99%)	$71.2 million (99%)	$159.7 million (99%)
Plymouth, MA	642 (87%)	9,180 (87%)	$203.8 million (71%)	$400.9 million (71%)
Rhode Island (RI)	2,248 (91%)	37,127 (81%)	$850.8 million (60%)	$1.9 billion (58%)
Kent, RI	373 (96%)	7,338 (96%)	$148.5 million (92%)	$321.8 million (93%)
Newport, RI	421 (91%)	6,976 (82%)	$184.4 million (54%)	$444.1 million (57%)
Providence, RI	873 (94%)	14,803 (92%)	$326.3 million (85%)	$700 million (88%)
Washington, RI	441 (86%)	6,032 (53%)	$145.2 million (32%)	$327.6 million (28%)

Source: NOAA 2018

The GAA supports inland, coastal or beach, and ocean-based activities related to recreation and tourism. The majority of recreation and tourism activities that are potentially impacted by the SRWF occur close to the shore and along the shoreline. The summer months of June, July, and August are when approximately two-thirds of trips are made to the beach on the East coast of the United States, thus representing the time with the largest potential impacts (Parsons and Firestone 2018). Common recreational activities in the analysis area include beach-going, photography, walking/hiking, swimming, surfing, paddleboarding, kite sailing, wildlife watching, kayaking, boating, boat-fishing, sailing, parasailing, yachting, harbor cruises, with further offshore activities including recreational boating, sailboat racing, yachting, cruise ship tourism, scuba diving, and offshore wildlife viewing (ICF 2012; NYSERDA 2017). The majority of these activities occur at higher intensities along and adjacent to the shoreline and along the oceanfront closer to shore.

Offshore activities include wildlife-watching, scuba diving, boating, sailboat racing, and recreational fishing. Three scuba diving sites were identified within 2 mi (3.2 km) of the SRWEC and the SRWF; the Moriches Anglers site, the SeaWolf site, and the Suffolk site. Six offshore recreational dive sites were identified as sensitive within the Area of Analysis of NYSERDA's *Offshore Wind Master Plan-Marine Recreational Uses Study*, with one being present in the expanded ROI, located southeast of Montauk, New York (NYSERDA 2017). These sites were classified as sensitive due to their cultural, historic, high conservation, or human use values. Many of the offshore recreation activities are directly linked with local businesses centered around tourism, including hotels, restaurants, and other leisure activities.

Sailboat, boat, and yacht races occur within the GAA. Many of these races are associated with local yacht clubs and marinas. The races can range from approximately 15 vessels to over 150 vessels depending on the event and typically occur from May to September (ICF 2012). Larger events include, but are not limited to, the Newport to Bermuda Yacht Race, the Fishers Island Yacht Club Round Island Race, the Long Island Sound IRC/PHRF Championships, and the Storm Trysail Foundation/Fishers Island Yacht Club Jr. Safety at Sea race (ICF 2012; Bloeser et al. 2015; COP Figure 4.7.3-1; Sunrise Wind 2022; COP Table 4.7.3-1; Sunrise Wind 2022; COP Table 4.7.3-2; Sunrise Wind 2022).

Recreational boating and fishing are significant recreational activities that occur in coastal waters in the analysis area. The *2012 Northeast Recreational Boater Survey* identified recreation and tourism locations and routes within the analysis area, and estimated that during the 2012 study season, there were approximately 817,368 boating trips in ocean and coastal waters by boaters documented and registered in the four states within the analysis area, Connecticut, Massachusetts, New York, and Rhode Island (SeaPlan 2013). There were many routes used by recreational boaters identified in the analysis area (COP Figure 4.7.2-1; Sunrise Wind 2022). In this survey, 52 percent of boating trips occurred within 1 mi (1.6 km) of the coastline, with the largest levels in harbors and partially protected bays near major cities (SeaPlan 2013).

Recreational fishing of highly migratory species and fishing along the coastline are both popular in the analysis area and throughout Southern New England waters. NOAA compiles estimates of data related to recreational fisheries, including the number of participants, number of trips by state, and estimates of the recreational catch. In 2019, marine recreational anglers on the Atlantic coast caught a total of 597 million fish on almost 130 million trips (NMFS 2021a). More than 10 percent of these trips, approximately 13 million trips, were made in New York and almost 6 percent of total trips, approximately 7.8 million trips, were made from Massachusetts. The most commonly caught non-bait species by number were black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), striped bass (*Morone saxatilis*), summer flounder (*Paralichthys denatus*), and scup (*Stenotomus chrysops*). By weight, the largest harvest of fish were striped bass, bluefish, scup, dolphinfish, and black sea bass (NMFS 2021a).

Fishing occurs from shore, from fishing piers, near-shore in boats, and offshore in boats (ICF 2012). Recreational fishing efforts were studied at the nearby Vineyard Wind lease area with data collected through an online survey that had responses from 136 private anglers, 34 charter/headboat captains, and one unknown respondent, data from NMFS Large Pelagics Intercept Survey, and tagging data

(Kneebone and Capizzano 2020). It was identified that there was widespread angling effort of highly migratory species throughout Southern New England seasonally from June to October, with fleets of 50-100 recreational vessels sometimes congregating to target popular Highly Migratory Species (HMS) in small geographic areas (Kneebone and Capizzano 2020). Approximately 12 percent of HMS trips from 2002 through 2018 occurred within the MA/RI Lease Areas. In the WEA, Coxes Ledge, The Fingers, and The Claw had the highest amount of effort, with a large amount of effort reported in areas both inside and outside of the WEA (Kneebone and Capizzano 2020). Recreational fishermen would also have to travel through the WEA to reach some of the SNE canyons, and to other popular fishing grounds, including The Dump, Tuna Ridge, The Horns, and The Lanes (Kneebone and Capizzano 2020). Section 3.6.1 provides additional detail on for-hire recreational fishing and commercial fishing.

Within the ROI, there are 346 public beaches, 226 marinas, 82 harbors, 83 yacht clubs, and 9 national parks (COP Section 4.7.3.1; Sunrise Wind 2022). The national parks include: Suffolk County, NY: Fire Island National Seashore and Sagamore Hill National Historic Site; Barnstable County, MA: Cape Cod National Seashore, Mashpee National Wildlife Refuge, and Monomoy National Wildlife Refuge; Bristol County MA: New Bedford Whaling National Historical Park; Nantucket County, MA: Nantucket National Wildlife Refuge; Newport County RI: Touro Synagogue National Historic Site; and Providence County, RI: Roger Williams National Memorial. The communities located within the ROI have a variety of resources that support and have shaped the recreation and tourism industries (COP Table 4.7.3-3; Sunrise Wind 2022). The closest communities to the Project in Massachusetts and Rhode Island, Martha's Vineyard, and Block Island respectively, both have economies that are highly dependent upon recreation and tourism. Both communities are accessible only by boat or by air. On Block Island, water sports are popular recreation activities, including snorkeling, sailing, parasailing, fishing, boating, wildlife viewing, and kayaking (COP Section 4.7.3.1; Sunrise Wind 2022). Other coastal communities in Massachusetts and Rhode Island have major tourism and recreation industries centered around their beaches and coastal activities (ICF 2012). Public beaches are prominent throughout the ROI, with 202 public beaches present between Barnstable, Bristol, Dukes, Nantucket, and Plymouth counties. The tourism industry in these areas have high levels of tourism with activities that include beachgoing, yachting, sailing, and visiting cultural landmarks, such as lighthouses.

The proposed Project's Onshore Facilities would be located in Suffolk County, which has many summer tourism destinations and approximately 980 mi (1577 km) of coastline, including Montauk, the Hamptons, and Fire Island (Bolger 2016). Southampton is a popular recreation and tourism destination that has two of America's ten top-rated golf courses, shops and attractions, and white sand beaches (ICF 2012). The Fire Island National Seashore encompasses 19,579 acres (7,923 hectares) of protected land that features high dunes, forestland, undeveloped sandy beaches, and abundant wildlife that attracts large numbers of visitors, including surfers, nature enthusiasts, campers, boaters, and beachgoers (ICF 2012; Bolger 2016). The Fire Island National Seashore was established "[f]or the purpose of conserving and preserving for the use of future generations certain relatively unspoiled and undeveloped beaches, dunes, and other natural features within Suffolk County, New York, which possess high values to the Nation as examples of unspoiled areas of great natural beauty in close proximity to large concentrations of urban population" (16 U.S.C. § 459e(a)). This area also houses the Fire Island Lighthouse, listed on the National Register of Historic Places, a culturally and historically significant monument (NPS 2018). The Fire Island National Seashore has communities, the Otis Pike Wilderness Area, natural areas, and historical and cultural resources within its boundaries (see Figure 3.6.5-1 in Section 3.6.5, *Land Use and*

Coastal Infrastructure). More than three-quarters of Fire Island National Seashore is marine or estuarine habitat, with 14,644 acres of the park consisting of open water. The Seashore boundary extends 1,000 feet (304.8 m) into the Atlantic Ocean from Moriches Inlet to Robert Moses State Park, and up to 4,000 feet (1,219.2 m) into the Great South Bay, and Bellport, Narrow and Moriches Bay (NPS 2022). In 2021, 255,000 park visitors spent an estimated $11.1 million in local gateways while visiting Fire Island National Seashore. These expenditures supported a total of 110 jobs, $6.1 million in labor income, $9.9 million in value added, and $14.9 million in economic output in local gateway economies surrounding Fire Island National Seashore (NPS 2022).

The proposed Project's Onshore Facilities would be located in Suffolk County, which has many summer tourism destinations and approximately 980 mi (1577 km) of coastline, including Montauk, the Hamptons, and Fire Island (Bolger 2016). Southampton is a popular recreation and tourism destination that has two of America's ten top-rated golf courses, shops and attractions, and white sand beaches (ICF 2012). The Fire Island National Seashore encompasses 19,579 acres (7,923 hectares) of protected land that features high dunes, forestland, undeveloped sandy beaches, and abundant wildlife that attracts large numbers of visitors, including surfers, nature enthusiasts, campers, boaters, and beachgoers (ICF 2012; Bolger 2016). This area also houses the Fire Island Lighthouse, listed on the National Register of Historic Places, a culturally and historically significant monument (NPS 2018). In 2017, 681,518 people visited National Park Service sites on the Fire Island National Seashore.

Under the Proposed Action, there are a variety of potential port facilities where an operations and management facility for the SRWF would be established (COP Table 3.3.10-1; Sunrise Wind 2022; COP Figure 3.3.10-1; Sunrise Wind 2022). These port locations would include New York--the Port of Brooklyn, Port Jefferson, and Port of Montauk; and in Rhode Island-- Port of Davisville, Quonset Point, and the Port of Gailee. These ports are currently all primarily industrial, with limited recreation and tourism activities occurring in the adjacent vicinities.

3.6.8.2 Impact Level Definitions for Recreation and Tourism

This Draft EIS uses a four-level classification scheme to analyze potential impact levels on recreation and tourism from the alternatives, including the proposed action. Table 3.6.8-2 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for recreation and tourism. Table G-20 in Appendix G identifies potential IPFs, Issues, and Indicators to assess impacts to recreation and tourism. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project.

The analysis for recreation and tourism has a strong relationship to visual resources, Section 3.6.9, as the setting of recreation and tourism is highly dependent upon the viewscape of the area.

Table 3.6.8-2. Definition of Potential Impact Levels for Recreation and Tourism

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	No measurable impacts to the recreation setting, recreation opportunities, or recreation experiences would occur.	No measurable impacts or effects to the recreation setting, recreation opportunities, or recreation experiences would occur.
Minor	Impacts would not disrupt the normal functions of the affected activities and communities.	A small and measurable benefit for tourism or recreation activities in the GAA.
Moderate	The affected activity or community would have to adjust somewhat to account for disruptions due to the project.	A notable and measurable benefit for tourism or recreation activities in the GAA.
Major	The affected activity or community would have to adjust to significant disruptions due to large local or notable regional adverse impacts of the project.	A large local, or notable regional benefit for tourism or recreation and tourism in the GAA.

3.6.8.3 Impacts of Alternative A - No Action on Recreation and Tourism

When analyzing the impacts of the No Action Alternative on recreation and tourism, BOEM considered the impacts of ongoing and planned non-offshore wind activities and other offshore 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 wind and offshore wind activities, as described in Appendix E, 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, Affected Environment, would continue to follow current regional trends and respond to IPFs introduced by ongoing activities. Ongoing non-offshore wind activities within the GAA that contribute to impacts on recreation and tourism include undersea transmission lines, gas pipelines, other submarine cables, tidal energy projects, marine minerals use and ocean dredged material disposal, military uses, marine transportation, fisheries and management, global climate change, oil and gas activities, and onshore development activities. These activities are expected to continue at current trends and have the potential to affect recreation and tourism. Recreation and tourism activities would experience periodic disruption from these activities, but would not be significantly impacted, as they are a typical part of daily life along the coast in the GAA. It is expected that visitors would continue to pursue recreation and tourism activities that rely on the area’s coastal and ocean environment, scenic qualities, natural resources, and establishments that provide services for recreation and tourism activities. The beach, and by proxy the ocean, are resources that are of primary concern for recreation and tourism.

Ongoing offshore wind activities within the GAA that contribute to impacts on recreation and tourism include:

- Continued O&M of the Block Island project (5 WTGs) installed in State waters.
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of Block Island and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect recreation and tourism through the primary IPFs of traffic, anchoring, port utilization, lighting, presence of structure, and new cable emplacement and maintenance. Ongoing offshore wind activities would have the same type of impacts from the IPFs that are described in detail in the following section for planned offshore wind activities, but the impacts would be of lower intensity.

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 Proposed Action).

Other planned non-offshore wind activities that may affect recreation and tourism include undersea transmission lines, gas pipelines, other submarine cables, tidal energy projects, marine minerals use and ocean dredged material disposal, military uses, marine transportation, fisheries and management, global climate change, oil and gas activities, and onshore development activities.

The sections below summarize the potential impacts of planned offshore wind activities on recreation and tourism during construction, O&M, and decommissioning of the projects. BOEM anticipates future offshore wind activities to affect recreation and tourism through the following primary IPFs.

Traffic: The construction and decommissioning of future offshore wind projects would generate increased onshore vehicle traffic in localized areas near ports needed for construction activities. Traffic would occur on existing roadways that are used by recreators. During construction, safety guidelines and plans would be implemented to prevent most adverse impacts for recreational users. The construction of offshore projects would result in small increases in vehicle traffic from operations and maintenance activities, and therefore, would present minor, short-term impacts on recreational users in the impacted area and negligible long-term adverse impacts as a result of maintenance activities.

Future projects would generate increased vessel traffic, predominantly during construction and decommissioning activities, but also with operation and maintenance of facilities, which could result in nuisances for recreational vessels. The impacts would occur within the analysis area, largely along routes between ports and potential construction areas. The exact vessel traffic associated with each future project is not known, but the construction of the proposed SRWF would be expected to use 69 different vessels, that would not all be operating at the same time (COP Section 4.8.1.2; Sunrise Wind 2022). Increased vessel traffic could result in collisions, minor delays, or route adjustments for recreational vessels in the analysis area. The risks and associated impacts would increase if future offshore wind facilities were simultaneously under construction. However, the majority of construction related vessel traffic would be located within temporary safety zones and safety guidelines would be established to help minimize potential adverse impacts and risks with recreational and tourism related activities. Increased traffic would be higher during construction, thus resulting in greater inconveniences.

However, the increased traffic would be short-term and localized during these activities and should not incrementally add to adverse impacts. Vessel traffic associated with operation and maintenance of future projects would likely be much lower than during the construction period but would add on to the impacts of vessel traffic associated with other projects. Vessel traffic from offshore wind activities would represent a small portion of total vessels. Impacts from increased vessel traffic due to future offshore wind development are anticipated to result in minor, localized adverse impacts on recreational users.

Anchoring: With increased vessel traffic, there would also be an increase in anchoring. Anchoring impacts to fish species targeted for recreational fishing are addressed in Section 3.5.5.3. The presence of additional anchored vessels within the analysis area and the development of areas with cable hardcover or scour protection could result in adverse impacts to recreational vessels by limiting or making it more difficult to anchor in areas. The largest portion of anchored vessels associated with the offshore wind development would be located in offshore work areas during construction and decommissioning activities. During these periods, anchored construction-related vessels would most likely be within established temporary safety zones established by the USCG. These safety zones would be located around all marine construction activities, including each WTG site, OCS_DC site, and each cable-laying vessel. During construction activities at the Block Island Wind Farm, the Coast Guard established a 500-yard safety zone around each location where WTGs and cables were installed[26]. The size of the safety zone for the SRWF has not yet been established, but it is anticipated that it would be similar to the that established at the Block Island Wind Farm. Within the analysis area, future offshore wind development is expected to lead to overlapping construction periods and increases in survey activities. Once a project has been constructed, vessel anchoring would also occur during operations and maintenance activities. The development of offshore wind projects would likely result in an increase in the number of anchored vessels and work platforms that could impact recreation and tourism vessels. There would be localized, short-term impacts on recreational boating from anchored construction, survey, or service vehicles. Adverse impacts are anticipated to range from minor to moderate, depending upon the frequency and number of anchored vessels needed, as this leads to inconvenience and navigational complexity for recreational vessels and would be less frequent during operations.

Port utilization: The utilization of ports for staging and construction activities for future projects could also provide facilities for recreational boats or may be on waterways that are shared with recreational marinas. The majority of regional ports that are suitable for staging and construction activities associated with offshore wind are primarily industrial, with recreational activity use being secondary. If improvements at ports are necessary for construction, it could result in short-term adverse impacts during construction, but long-term benefits for improvements to facilities and channels for recreational vessels. Regardless of future offshore wind development, recreation and tourism activities related to current marine industrial activities at existing ports would not experience significant changes (BOEM 2016). Therefore, the impact of port utilization to recreation and tourism would be negligible.

Light: Construction of future projects could result in light impacts for recreational users and tourists. Some projects would result in the construction of new visible structures or lighting during the nighttime

[26] As described in 81 Federal Register 31862. https://www.federalregister.gov/documents/2016/05/20/2016-11826/safety-zone-block-island-wind-farm-rhode-island-sound-ri

at onshore locations. The majority of onshore project components are expected to be located in areas that are already lighted and previously developed, minimizing adverse impacts. The adverse effects to recreation and tourism of lighting from onshore construction would be short-term and localized.

The construction of future offshore wind projects would require nighttime, dusk, or early morning lighting on WTGs, vessels, and platforms that may be visible to tourists, onshore recreational users, and offshore boaters recreating at those times. Adverse impacts to offshore recreational boaters would be minimized due to the lack of offshore recreational activities that occur at night. Permanent aviation warning lighting on the WTGs could cumulatively adversely impact recreation and tourism activities from south-facing beaches within the analysis area if lighting is a factor that is considered when deciding locations to visit. Previous studies found that WTGs visible more than 15 miles (24.1 km) from the viewer would have negligible impacts on recreation and tourism activity, which is where BOEM-related projects would be located (Parsons and Firestone 2018). Aviation warning lighting would be visible from shore and would vary in both appearance and intensity depending upon the elevation of the viewer, height of the WTG, and the distance between the two. However, it has been found that an Aircraft Detection Lighting System (ADLS) could result in over a 99 percent reduction in system activated duration as compared to traditional always-on obstruction lighting systems (COP Section 4.8.1.2; Sunrise Wind 2022).

The analysis area includes the southern shores of Martha's Vineyard and the western shores of Nantucket, both of which are part of the viewshed. These areas include landscapes that are characterized by bluffs, beaches, dunes, and tidal marshes with low development density in this area, leading to there being very little existing nighttime lighting. This would lead to more pronounced impacts to these areas than to viewsheds that are located in developed and industrial areas. Nighttime lighting on WTGs would add to cumulative visual impacts on recreation and tourism in the analysis area. These impacts would be long-term and continuous and would vary between minor to moderate adverse impacts for recreation and tourism dependent upon the project and the distance of the user from the modified feature.

Presence of Structures: The development of future offshore wind projects in the Rhode Island Massachusetts Lease Areas would include the presence of in-water structures, including WTGs and the OSS-AC that would have impacts on recreation and tourism. In-water structures would remain in place for up to 30 years from installation until the decommissioning of the facility. These project features would be the most visible and would have the highest impact on the viewshed of recreational users and tourists. Adverse impacts to recreational boating and fishing include the risk of collision; risk of gear entanglement, damage, or loss; navigational hazards; presence of cable infrastructure; visual impacts; and space use conflicts.

The risk of collision with WTGs or OSSs is greater for smaller vessels, including recreational vessels, moving in close proximity to installed facilities. However, the *2012 Northeast Recreational Boater Survey* found that 52 percent of recreational boaters within the area of analysis typically traveled within one nautical mile of the coastline (SeaPlan 2013). Larger recreational vessels generally remain within 3 to 10 nautical miles of the coast, and this trend is expected to continue into the future. This would reduce potential conflict between recreational boating and in-water structures of future offshore wind development, as the Lease Areas in Rhode Island and Massachusetts are located further offshore.

Recreational vessels that travel further offshore, including recreational fishing vessels, long-distance sailboat races, wildlife watching boats, large sailing vessels, and sightseeing tours, would be impacted by in-water structures. This could result in recreational users having to change the routes that they use to avoid the in-water structures. Wildlife watching boats, including whale watches, and sightseeing boats often travel further offshore where wildlife is more likely to be present, and would need to take extra caution in navigating through or around future projects. Large sailing vessels would likely navigate away from future offshore wind projects if they are equipped with masts taller than the lowest elevation of WTG blade tips. The height of the WTGs would vary with the size of the WTGs installed in future offshore wind farms. Depending upon the route chosen, the Transatlantic Race, Marion Bermuda Race, and Newport Bermuda Race, long-distance sailboat and yacht races, have the potential to pass through the area of analysis. The development of future projects could require the routes of recreational boaters, sightseeing boats, wildlife watching boats, and boat races to be adjusted. The adverse impact to recreational boating would be minor and limited as the majority of documented routes by recreational boaters occur closer to shore.

Future offshore wind projects would lead to additional cable protection and scour protection located on the ocean floor. Lessees of future projects would need to continue to work with both the United States Coast Guard and National Oceanic and Atmospheric Administration to ensure that recreational vessel users have up-to-date information regarding the location of these structures. Cable protection can make it so that anchors could become stuck on the hard structures and lost or create difficulty in holding in place. Future offshore WTGs would be installed in water depths where anchoring is uncommon, but there is the potential for impacts to recreational users to have higher anchoring risk in the areas where export cables are located closer to shore. The adverse impacts from anchoring would be minor, localized, continuous, and would last for the duration of the time that the project remains installed.

In-water structures from offshore wind development may overlap with fisheries that target highly migratory fish species located further offshore. The presence of structures could inhibit some mobile methods used to target highly migratory species, including trolling and drifting, as it would be more challenging for the recreational user to avoid the presence of the in-water structures. Despite these challenges, the in-water structures serve as artificial reefs and shelter for fish, making them attractive sites for the recreational fishing industry (Webster and Porter 2020). At the Block Island Wind Farm, fishermen have noted that the site has been incredibly popular, resulting in issues with fishing pressure, vessel crowding, and an increased risk of allision (Webster and Porter 2020). Future offshore wind development could provide attractive sites for recreational fishermen and spread-out fishing pressure. The artificial habitat of the structures leads to an increase in the amount of target species present near offshore wind facilities and could have minor, positive effects on recreational fishing.

In-water structures of future offshore wind projects could provide new opportunities for offshore tourism. The Block Island Wind Farm has led to the creation of tours to allow for interested tourists to travel out to the Project, and similar tours could be established for future offshore wind projects (Block Island Ferry 2022). There could result in additional opportunities associated with recreational fishing and wildlife watching. The structures could attract species targeted for recreational fishing, leading to more recreational fishing vessels traveling offshore to fish near the WTGs and OSSs. The in-water structures may also lead to higher densities of seals, odontocetes, and sea turtles that would forage near the structures. This could create negligible, beneficial impacts to recreation and tourism, but the benefits would likely decline with distance from shore, as recreational vessels would likely not travel to projects located further away from the coast.

In-water structures would be the most visible part of future offshore wind projects. The presence of these structures on the offshore horizon would differ from the ocean's water surface and the visual horizon. The color of the turbines would contrast with sun angles throughout the day, and the motion of the WTGs for generation would draw attention from recreational users and tourists within the viewshed. The visual dominance of the WTGs would be influenced by a variety of factors, with the most significant being the distance between the WTGs and the viewing location. A survey-based study found that the net effect, considering the difference between respondents reporting the presence of turbines (of approximately 574 feet or 175 m in height) would make their experience worse and better, was at 12.5 miles (19.6 km) the net effect is 7% worse, at 15 miles (24.1 km) the net effect is zero, and at 20 miles (32.2 km) it is 7% better (Parsons and Firefield 2018). As described above, the southern shores of Martha's Vineyard and the western shores of Nantucket have little development and high value for tourism, scenic, historic, and recreational qualities. Future offshore wind development would result in WTGs that could be visible from shorelines, adding a developed/industrial visual element to the viewshed that previously was characterized by open ocean with periodic aircraft and transient vessels. This change in the viewshed would have negligible to moderate adverse impacts on visual resources depending on the location due to the introduction of industrial elements into an area that previously did not have development. Visual impacts would be long-term, continuous, and negligible to moderate adverse to recreation and tourism. See Section 3.6.9 for a more detailed discussion regarding potential impacts to Visual Resources. There is the possibility that some areas with the most direct viewsheds of the WTGs and other in-water structures could have some reductions in recreational and tourism activities, but it is not anticipated that there would be overall reductions in recreation and tourism in the analysis area.

Noise: Noise from planned future projects could have adverse impacts on recreation and tourism by disrupting the natural sounds of the marine environment. Offshore noise that could impact recreation and tourism includes noise from G&G survey activities, pile-driving, trenching, and construction-related vessel noise. Pile-driving is anticipated to be the activity that would have the loudest noise associated with construction activities. Noise associated with this should not be audible from onshore locations, as the majority of pile-driving activities would occur a sufficient distance away from shore. Noise could be audible to some offshore boaters and recreational fishers, and cause for them to avoid areas where they are occurring. However, the loudest noises would come from within the safety zones that would be expected to be established by offshore wind developers and USCG, meaning that very few recreational users would be in the vicinity of the loudest sound levels from pile-driving activities. The safety zones are anticipated to be 500-yards around each WTG, OCS-DC, and cable while under construction based on the size of safety zones that have been established during previous offshore wind farm construction activities. However, the size of the safety zone could be different for the SRWF. Pile-driving activities would be anticipated to reach airborne sound levels of 60 dBA at a distance of 2,400 feet (731.5 m) (COP V1 June 2021 Appendix I3; Sunrise Wind 2022), comparable to a vacuum cleaner at 9.8 feet (3 m) or normal conversation of 3.3 feet (1 m) (FHWA 2018). The Federal Highway Administration (FHWA) data and the distance of future offshore wind farms from the shoreline, suggests that noise from piling driving of future projects would not be expected to have adverse impacts on sound levels to recreation and tourism activities occurring on land or near the coastline. Noise from pile-driving would be produced periodically throughout construction and could be amplified if construction was occurring at more than one project at the same time. Sound levels from pile-driving activities would not be expected to have adverse impacts to human health or wellness but may present inconveniences to recreational boaters.

Noise from construction activities could have short-term, localized adverse impacts to fish species that are sensitive to underwater sound, driving fish away from the construction site, thus impacting recreational fishing in the vicinity of future offshore wind projects. As is discussed when describing IPFs associated with in-water structures, recreational fishing targeting highly migratory species would have a greater potential to be impacted, as fishing efforts occur further offshore and closer to where construction of future offshore wind projects would take place. Marine mammals, primarily whales, may be deterred from construction areas due to noise, resulting in adverse impacts on offshore wildlife watching. Section 3.5.6 further describes potential impacts on marine mammals, and as noted, BMPs can minimize exposure. Operational noise from WTGs should not impact recreational fishing or offshore wildlife watching as the amount of noise produced should have little effect on fish and marine mammals. Construction activities would result in short-term, localized minor short-term adverse impacts to offshore wildlife watching and recreational fishing activities, but with BMPs employed, no long-term adverse impacts would be expected.

During normal operations, WTG operation would generate continuous noise, with sound pressure levels at or below ambient levels at relatively short distances from WTG foundations (Kraus et al. 2016). Noise levels measured during normal operations at the Block Island Wind Farm at the WTG base at 164 feet (50.0 meters) minimally exceeded ambient noise levels. As wind speeds increase, the correlated increase in noise of the WTGs becomes less detectable due to the increase in ambient noise. During field observations, it was also determined that WTG operational noise was not detectable from the shore from Block Island Wind Farm operations (HDR 2019). Noise associated with maintenance operations could result in short-term, localized adverse impacts to recreation and tourism.

Noise from onshore construction activities would be short-term but could have adverse impacts to nearby recreation or tourism areas as the noise could be disruptive. Noise producing activities of onshore construction would include the cable installation at the landfall sites. Adverse impacts of onshore noise would be negligible, short term and localized and would be expected to occur in previously developed areas. The impact level would depend upon the project type and the distance from the recreation and tourism site but would range from negligible to minor.

New cable emplacement and maintenance: Within the analysis area, there is the potential for emplaced cables to affect up to 3,400 acres (13.8 km^2) for other future offshore wind projects between 2022 and 2030. The installation of offshore cable emplacement would create localized, short-term adverse to recreational boating due to noise of installation and the need to navigate around work areas. Cable installation could also have short-term minor adverse impacts on recreational fishing, as targeted fish and invertebrates may be disturbed due to the required dredging, turbulence, disturbance, and turbidity. After installation has occurred, recreational boating would be impacted by cables only during maintenance operations and if they are not properly noted on charts, operators could lose anchors as the hard-bottom areas could make anchoring more difficult. Risks associated with anchoring would be minimal, as recreational vessels do not commonly anchor in the water depths where offshore structures would be installed. Impacts of cable emplacement on recreation and tourism would be negligible to minor, short-term, localized, and adverse.

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. Recreation and tourism in the GAA would continue to be affected by ongoing activities, including vessel traffic, noise and trenching from periodic maintenance or installation of coastal and nearshore infrastructure, and onshore development activities. These activities would lead to periodic disruptions to recreation and tourism activities but would not significantly impact recreation and tourism as they are a typical part of daily life along the coast in the GAA. The No Action Alternative would result in **negligible** to **moderate** adverse and **minor beneficial** impacts.

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 IPFs associated with those activities. Planned non-offshore wind activities that could affect recreation and tourism include the installation of undersea transmission lines, gas pipelines, and other submarine cables, marine minerals use and ocean-dredged material disposal, military uses, dredging activities, and port improvements, through primary IPFs of vessel traffic, noise, and cable installation. Planned activities would have short-term, localized adverse impacts, but would not impact the area's scenic quality. Adverse impacts would result primarily from changes in the viewshed from undeveloped to having industrialized structures present and impacts associated with marine construction activities, including noise, lighting, and traffic. Beneficial impacts to recreation and tourism would come from increased sightseeing opportunities and the potential for improvements to recreational fishing from the presence of in-water structures. It is anticipated that recreation and tourism activities would continue to occur in the analysis area with or without future offshore wind projects. BOEM anticipates that the cumulative impacts of the No Action Alternative would likely be **negligible** to **moderate** adverse and **minor beneficial**.

The impacts associated with future offshore wind activities in the analysis area, considered with other reasonably foreseeable activities, current activities, and environmental trends, would be **negligible** to **moderate** adverse effects if no other offshore wind farms are authorized. Most of the adverse impacts could be avoided with APMs, but some impacts would only be minimized with APMs in place. If other offshore wind farms are authorized, BOEM would anticipate **negligible** to **moderate** adverse impacts to recreation and tourism with **minor** beneficial impacts.

3.6.8.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on recreation and tourism:

- The Project layout, including the number, type, height, and placement of the WTGs and OSS;

- The choice of location for port operations;
- The design of visibility lighting on in-water structures;
- The time of year that construction occurs both near the coast and onshore;
- The accessibility of Smith County Park and Fire Island National Seashore to recreation users during construction; and
- The accessibility for recreational boaters to the Project area.

Variability of the proposed Project design exists as outlined in Appendix E. Below is a summary of potential variances in impacts:

- WTG number, size, location, and lighting. Visual impacts that could impact recreation and tourism would change depending upon the distance from the shore and the size of the turbines present.
- WTG arrangement. The arrangement of WTG arrays could have different impacts on navigational routes of recreational boaters and present different safety issues.
- Choice of location for port operations: Different ports have varying levels of recreational use both at the ports and in nearshore waters adjacent to the ports. The choice of port could change the level of impact to recreational boaters.
- Design of visibility of lighting: Visibility lighting design options would impact the nighttime visibility of WTGs to onshore communities depending upon the orientation and type of safety lighting.
- Time of construction: Recreation and tourism activities in the expanded ROI are centered around the summer months (Parsons and Firestone 2018). Impacts on recreation and tourism would be more significant if construction were to occur during the recreation and tourism season.
- Accessibility of public recreational resources: Some recreation and tourism activities occur year-round, and there is the potential for activities to occur that affect public access. Public access to Smith County Park would not be allowed during construction activities. Additionally, public access could be limited to specific areas of the Fire Island National Seashore. However, the level of this impact would be directly associated with the time of year that construction activities would occur.

Impacts to tourism and recreation would vary if the incremental contributions from the action differ. Impacts could be beneficial or adverse. The incremental differences between relevant design parameters would be similar, with impacts ranging from negligible to moderate adverse and minor beneficial. IPFs from lighting, noise, in-water infrastructure and traffic could be slightly modified depending upon the design parameters. Short-term impacts to recreational boaters related to traffic could be mitigated if construction activities were limited outside of the busy summer season, as recreation and tourism activities in the analysis area are centered around the summer months (Parsons and Firestone 2018). It is important that communication around construction schedules occurs to help minimize adverse impacts of the Project. Construction schedule plays an important role in determining the impacts of the Project. Construction of the onshore facilities are proposed to occur in the offseason of tourism, helping to minimize potential adverse impacts. This would help minimize interference with public use at Smith Point County Park and Fire Island National Seashore by allowing for use to occur during busy season. Additionally, establishing restriction zones would influence the potential impacts of the Project. If the general public no longer had access to recreational resources, impacts would be greater.

The number of WTGs could change the incremental impacts associated with recreation and tourism. If WTGs with higher capacities were installed, it would result in less WTGs overall. This would lead to less adverse impacts on traffic and boating, as navigating would be easier through less WTGs, but would lead to greater adverse impacts to the viewshed as the WTGs would be more prominent and seen from a further distance away. As such, the incremental differences would change, but the overall impact would remain the same.

The choice of port for operations and maintenance activities could have implications in the long-term, continuous impacts of the SRWF on recreation and tourism. The choice of a port that is more industrialized in nature would result in less impacts to tourism and recreation.

3.6.8.5 Impacts of Alternative B - Proposed Action on Recreation and Tourism

3.6.8.5.1 Construction and Installation

The construction of the SRWF could result in potential onshore and offshore impacts to recreation and tourism from vessel traffic, visible infrastructure, noise, and lighting and marking. The Proposed Action would have long-term, minor adverse impacts on recreation and tourism in the geographic area due to the presence of up to 94 11-MW WTGs within 102 potential positions. The WTGs would impact visual resources within the viewshed of coastal locations and would create potential impacts due to increased safety risks within the area where WTGs are present. The Proposed Action would also have long-term minor beneficial impacts to recreation and tourism from the presence of in-water structures both creating artificial habitat that would lead to increased fish aggregation and improving recreational fishing opportunities and creating the potential for increased opportunities for sightseeing. There would be short-term minor impacts associated with increased vessel traffic, noise, and lighting from construction and decommissioning activities of the Proposed Action.

3.6.8.5.1.1 Onshore Activities and Facilities

Anchoring: Anchoring activities would not impact onshore activities and facilities related to recreation and tourism. Impacts to offshore activities and facilities during construction activities are discussed below.

Noise: Noise from construction activities and the potential for recreational users and tourists to have workers, equipment, vehicles, debris, or cleared areas in their GAA could have short-term, short-term adverse impacts on recreation and tourism near the landfall site at Smith Point County Park, a public beach access point within the Fire Island National Seashore, and adjacent to the federally designated Otis Pike Wilderness Area. Sunrise Wind has proposed to implement an APM of utilizing a construction work schedule that, to the extent practicable, limits onshore construction activities related to the onshore connection cable. If implemented, this would help lessen impacts to recreation and tourism, as two-thirds of tourism activities occur within the summer season, from Memorial Day to Labor Day.

However, the Fire Island National Seashore is open year-round to visitors. Visitors would be expected to be present in areas adjacent to construction activities and would be adversely impacted from construction noise. BMPs to mitigate impacts from noise are identified in Appendix H, and would help lessen impacts to visitors in adjacent areas. Impacts from noise would be short-term and range from minor to moderate for onshore recreation and tourism activities.

Land Disturbance: The Onshore Transmission Cable route has, to the extent practical, been sited within existing disturbed ROW, with the intent to minimize changes to the view and nature of surrounding facilities. The Onshore Transmission Cable Route is sited to cross under the William Floyd Parkway to a recreational area located to the west of William Floyd Parkway. The Onshore Transmission Cable will be installed via HDD below the Carmans River, in the vicinity of a segment that is a New York State designated Recreational River. During construction activities, access to this recreational resource would be limited. There would be short-term, minor adverse impacts to recreational users of this area, as opportunities may be limited during the construction period. The construction of the Landfall and ICW HDD is expected to occur over a five-month period outside of the peak summer tourist season to minimize impacts to recreation and tourism. Construction would result in short-term reductions in facilities that provide access to recreational areas at Smith Point County Park, Fire Island National Seashore, Otis Pike Wilderness Area, and Smith Point Marina. The schedule for the remaining onshore facilities would be designed to the best extent possible to minimize impacts to local communities. Sunrise would develop a plan for access in parkland and open space such that the Project will not hinder the use of recreational uses or reduce existing parking areas below what is needed to accommodate seasonal use, as is identified in New York State's Article VII Joint Proposal to minimize impacts to recreation opportunities to the extent practical. Construction staging areas would be located, to the extent possible, so that public parking, beach access, access to recreational facilities, and access to campsites would be maintained. Impacts from onshore construction would be minor to moderate, short-term and would occur during times when recreation and tourism are not as busy in the area.

Port utilization: Sunrise Wind is investigating existing facilities in New York, Connecticut, Massachusetts, Maryland, New Jersey, Rhode Island, and Virginia for potential use for staging, construction, and/or for O&M purposes. The proposed locations are all existing industrial ports, which would result in minimal impacts to recreation and tourism. A BOEM study has found that recreation and tourism should not experience long-term, significant impacts at existing ports centered around marine industrial activities with or without offshore wind development (BOEM 2016). Sunrise Wind would consider potential impacts to recreation and tourism when selecting the port that would be utilized for O&M.

Presence of structures: The interconnection facility in Brookhaven is proposed in close proximity to the existing Holbrook substation and is located in an already developed area that is zoned for commercial and utility use. Onshore construction and installation would result in the incremental additions of an O&M facility, an interconnection facility, and distribution cable. The locations of these onshore structures are already developed, and commercial/industrial in nature, but recreation users may be sensitive to the changes in the view from construction impacts. This would not result in long-term adverse visual impacts to recreational users. During Landfall HDD and ICW HDD, a temporary landing structure would be installed to aid in the offloading of equipment and materials. The landing structure may consist of a floating module(s), bridge sections and/or a ramp or transition pad connecting the floating module to shore, and would result in short-term impacts to access of the nearby fishing pier.

The landing structure may need to remain in place year-round, but the use would be limited to fall and spring. Visual impacts from construction activities are further discussed in Section 3.6.9.5. Onshore recreation and tourism would have short-term, minor adverse impacts from construction noise. However, these impacts would be short-term and only last during the duration of construction activities.

Traffic: Recreation and tourism users along the Long Island Expressway and Route 97 may experience delays from onshore SRWF construction activities occurring along or adjacent to the roadways. Roadways or short-term lane closures may need to occur during construction activities, resulting in adverse impacts for local communities. Sunrise Wind has consulted with local entities including the DPW, the Town of Brookhaven Department of Public Works, and the NYSDOT regarding route location, traffic management, construction methodology, and time of year considerations (COP Section 4.8.2.2; Sunrise Wind 2022). In addition, as required by New York State Law, Sunrise Wind would implement an APM by developing an MPT plan to minimize potential traffic impacts during construction. The MPT would be submitted to NYDPS for review and approval during the Article VII review process (COP Section 4.8.2.2; Sunrise Wind 2022). Additionally, Sunrise Wind would coordinate, to the extent practicable, onshore construction activities to occur outside of the busy summer tourism season, implementing another APM to help minimize impacts to recreation and tourism activities at Smith County Park, the Fire Island National Seashore, and Otis Pike Wilderness Area. Construction vehicles would add short-term, adverse minor to moderate impacts from traffic delays on local roadways, as well as short-term, adverse light, noise, and traffic and parking limitations at the Smith Point County Park landfall site, which provides parking for Smith Point County Park and the adjacent Fire Island National Seashore and Otis Pike Wilderness Area.

Conclusion: The construction of onshore facilities would also result in long-term, minor to moderate adverse impacts to recreation and tourism as a result of increased visible infrastructure, traffic, and lighting.

3.6.8.5.1.2 Offshore Activities and Facilities

During construction, tourism and recreational offshore uses including boating, fishing, wildlife watching, scuba diving, and sightseeing could experience minor to moderate adverse impacts. Construction activities would lead to boating traffic, construction noise, visual impacts, and changes in public safety requirements for recreational boaters. Construction impacts from the SRWEC could be more significant than the construction of the WTGs as construction activities occur closer to shore. Regardless of location, construction activity would be short-term and transient, having limited short-term potential impacts.

Appendix H *Mitigation and Monitoring* describes APMs that would be implemented to mitigate risks to offshore recreation and tourism from construction activities, including but not limited to; scheduling onshore construction at the Smith Point County Park, located in the Fire Island National Seashore and adjacent to the Otis Pike Wilderness Area, outside of the busy tourism season; communication plans with boaters and offshore recreation activities; choice of port; and timing of construction activities. The Smith Point County Park landfall location was chosen in part to help minimize interactions with recreational boating activity in the region and to minimize interactions with mapped shipwrecks viewed by scuba divers.

Anchoring: Anchoring during construction activities related to the Proposed Action would affect recreation and tourism activities in the region by creating an inconvenience to navigation by recreational vessels that must operate around anchored vessels and by contributing to the disturbance of marine species that are important to recreational fishing and wildlife viewing activities. BOEM anticipates that the USCG may establish short-term safety zones around offshore wind construction areas, which would minimize impacts from anchored construction vessels to recreational boaters. Vessel anchoring related to construction of the Proposed Action would have localized, short-term, minor impacts on recreation and tourism due to the navigational challenges it creates for recreational boaters and the disturbance of species important to recreational fishing and wildlife viewing.

Noise: Offshore construction activities of both the SRWF and SRWEC would result in increased noise levels that would have short-term, localized impacts to some fish species, marine mammals, and other marine animals. Fish species avoiding construction areas could result in adverse impacts to recreational fishing in these areas (See Section 3.6.1 for further discussion of impacts to fisheries). If marine mammals and other marine species, such as sea turtles, avoid construction sites, there would be adverse impacts to offshore wildlife watching recreation (see Sections 3.5.6 and 3.5.7 for further discussion of Marine Mammals and Sea Turtles). Sunrise Wind would implement BMPs during construction to help minimize sound exposure and mitigate these adverse impacts. Increased noise levels could also be a nuisance to recreational boaters near offshore construction areas. However, with the safety zone in place, it is unlikely that boats would be traveling close enough to the construction area to result in significant adverse impacts. The safety zones are anticipated to be 500-yards around each WTG, OCS-DC, and cable while under construction based on the size of safety zones that have been established during previous offshore wind farm construction activities. However, the size of the safety zone could be different for the SRWF. Accordingly, offshore construction noise impacts should be short-term and result in minor adverse impacts to recreation and tourism.

Lighting: When nighttime construction activities occur, lighting would be necessary. However, onshore construction activities are anticipated to occur primarily within areas that are industrial or developed in nature. Project-related construction vessels and in-water equipment for both the WTGs and OCS-DC require USCG-approved navigation lighting so that they are visible to other vessels. Depending upon atmospheric conditions and location onshore, lights may be visible. The majority of recreation and tourism activities occur in the daylight, so adverse impacts from lighting would be negligible, limited and short-term.

Presence of structures: While offshore construction of both the SRWF and SRWEC are occurring, it is likely that construction vessels would be visible from some onshore recreation and tourism resources in the analysis area. These visual impacts would be limited due to the distance of the offshore construction area from the coast, and short-term for the duration of construction activities. Impacts from visual resources would increase as the distance between recreation and tourism activities becomes closer to the construction activities. Therefore, the visual impacts on offshore recreational users during construction activities are anticipated to be greater due to the closer proximity of these activities. Offshore construction activities could have adverse impacts on viewers who expect to see a pristine, undeveloped ocean landscape, or beneficial impacts on viewers who see the construction and renewable energy development as a positive activity. The preference of the viewer is an important feature in determining the visual impact on recreation and tourism activities. However, changes in the viewshed could have adverse impacts from specific viewpoints or recreational areas but are not expected to have adverse impacts to recreation and tourism in the region as a whole. Visual impacts from construction are expected to be short-term and limited. Visual impacts from the proposed construction of the Project are further discussed in Section 3.6.9.5. Impacts to recreation and tourism as a result of offshore construction activities would be moderate adverse and short-term.

Traffic: Offshore construction would increase vessel traffic in the analysis area, but over half of recreational boating occurs within 1-mile of the shore, with few routes occurring in the proposed SRWF location (SeaPlan 2013). Construction could impact long distance boat sailing races, potentially causing the need for routes to be shifted. Sailboat, distance, and buoy races in or near Rhode Island Sound and Block Island Sound can be found in COP Table 4.7.3-1; Sunrise Wind 2022, and Sailboat, Distance, and Buoy Races in or Near Long Island Bays and the Atlantic Ocean can be found in COP Table 4.7.3-2; Sunrise Wind 2022. Construction could impact the navigation of smaller recreational vessels. Safety zones designed in conjunction with the USCG during construction could alter the routes of recreational boaters during the period of offshore construction activities. The safety zones are anticipated to be 500-yards around each WTG, OCS-DC, and cable while under construction based on the size of safety zones that have been established during previous offshore wind farm construction activities. However, the size of the safety zone could be different for the SRWF. Sunrise Wind would also implement a communication plan to inform vessels of construction activities, vessel movements, and how construction activities may affect this area to help reduce adverse impacts to tourism and recreation. Agency and stakeholder outreach would continue to occur throughout the project construction period (COP Table 1.5-1; Sunrise Wind 2022) and the implementation of a fisheries communication plan would help to minimize impacts to recreational activities (COP Appendix B: Fisheries Communication Plan; Sunrise Wind 2022). With these measures implemented, offshore construction of the SRWF is expected to result in limited, short-term, minor adverse impacts to vessel traffic and navigation routes.

3.6.8.5.2 Operations and Maintenance

3.6.8.5.2.1 Onshore Activities and Facilities

O&M activities of onshore facilities would result in negligible, variable adverse impacts to recreation and tourism over the lifespan of the Project. O&M activities would be periodic and short-term. The underground Onshore Transmission Cable and onshore interconnection cable would not require maintenance unless there was a failure or malfunction. The OnCS-DC would be located in previously developed, industrial area that has an existing substation, helping minimize the impacts to recreation and tourism as industrial and commercial activity would be expected to occur in the areas where Onshore facilities are located. Limited equipment would be visible at Onshore facilities, and yard lighting at Onshore facilities would be minimal and subject to state and local requirements. O&M of Onshore facilities should result in negligible adverse impacts to recreation and tourism.

O&M would affect onshore recreation and tourism by changing the visual character of the viewshed. Normal operations of the Project would have visible infrastructure in the water and could change the scenic quality for onshore recreation and tourist activities. Impacts to onshore recreation would be lessened as the distance from the Project facilities increases. Visual impacts are further described in Section 3.6.9.5. O&M of Onshore activities and facilities would have permanent, minor adverse impacts to recreation and tourism.

3.6.8.5.2.2 Offshore Activities and Facilities

Anchoring: Anchoring during O&M activities would be expected to have less impacts than during construction and decommissioning because there would be less anchored vessels present in the proposed Project Area. Anchored vessels would create navigational challenges for recreational boaters and would disturb wildlife important for recreational fishing and wildlife viewing. However, there would be less anchored vessels present, which would lessen the impacts on recreation and tourism activities. Vessel anchoring during O&M activities would result in impacts ranging from negligible to minor, depending upon the number of vessels present.

Noise: Noise from O&M activities could result in impacts on recreation and tourism. Impacts on recreation and tourism would result along the Wind Farm Area and offshore export cable route. Noise would be short-term, and only would occur when some O&M activities are occurring. Depending upon the level of noise, recreation users could have adverse impacts from sounds. Noise from O&M activities would result in short-term, negligible to minor impacts to recreation and tourism.

Lighting: The WTGs associated with the Proposed Action would be equipped with USCG navigation warning lights and aviation obstruction lights as a safety feature to reduce the risk of allision. Impacts to recreation and tourism would depend upon the distance of users from the SRWF, visibility of the SRWF from the location, and the existing visual quality surrounding the SRWF. Additional lighting in the offshore environment could affect tourists and recreational users who are accustomed to experiencing dark nighttime skies. In many places, offshore lighting visibility would be limited due to existing offshore light sources, shoreline light sources, and the distance of the SRWF from the viewer. Sunrise Wind is proposing to implement ADLS on WTGs and comply with any other USCG requirements while minimizing visibility from shore as an APM to minimize impacts from lighting. ADLS would reduce the duration of potential impacts of nighttime aviation lighting to less than 1 percent of the normal operation time that would occur without using ADLS. Offshore recreational activities are limited at nighttime, so the majority of impacts would occur to onshore viewers. Impacts from offshore lighting would be dependent upon the location of the viewer in comparison to the SRWF, but would likely be negligible due to the vast majority of recreation and tourism activities that occur at night happening onshore.

Port utilization: O&M activities would occur at existing port facilities where recreational activities are not expected to occur. However, recreational boating could be impacted in the surrounding region as there would be an increase in vessel traffic moving from the port to areas that would need O&M activities. Port activities would follow any federal, state, and local regulatory guidelines to minimize adverse impacts to recreation and tourism activities in the nearby areas. Therefore, the Proposed Action is anticipated to result in negligible impacts on port utilization.

Presence of structures: Offshore infrastructure, particularly up to 94 11-MW WTGs, have the potential to be visible from the shoreline to a limited number of communities in the analysis area. The upper blade tip height would be up to 787 feet (240 m) above mean sea level per the PDE, which would be a significant change to the current viewshed of the undeveloped, open ocean. Recreation and tourist activities could be affected by changes in the viewshed, particularly from undeveloped viewpoints. Recreation activities occur along beaches, bluffs, dunes, open fields, and residential yards that have unobstructed ocean views, and recreational users could experience adverse impacts from the changes in the viewshed if their preference is to have undeveloped open ocean views. The University of Delaware completed a study to evaluate potential impacts of visible offshore WTGs with a rotor diameter of 492 feet (150 m) so that when a blade was at the apex the turbine was 574 feet high (175 m), on beach use. At 15 miles (24.1 km), 68 percent of respondents answered that the WTGs would not improve or worsen their experience, 16 percent answered that the WTGs would improve their beach experience, and 16 percent answered that the WTGs would worsen their beach experience (Parsons and Firestone 2018). Therefore, there is the potential for a range of negligible to moderate beneficial and adverse impacts of the visibility of the WTGs on recreation and tourism activities and experiences. Further discussion on potential visual impacts from the Proposed Action are discussed in Section 3.6.9.5.

Operation of the SRWF could have the potential for positive effects to recreation and tourism. There is the potential for wind-farm related sightseeing and tourism activities, similar to offshore tours of the Block Island Wind Farm (Block Island Ferry 2022). The presence of in-water structures could also act as artificial reef habitat and shelter for fish, providing benefits to the recreational fishing industry (Webster and Porter 2020). The increased number of fish have the potential to result in other benefits to recreation and tourism, as there could be wildlife watching opportunities for species that would forage on the fish, or potential for additional scuba diving opportunities to view the wildlife near the WTGs. The in-water infrastructure could result in potential beneficial impacts related to changes to the natural resources.

Traffic: O&M of offshore Project facilities would result in restricted recreational boat traffic around the SRWF through permanent navigation exclusion areas. Safety zones, that are anticipated to be 500-yards around each WTG, OCS-DC, and cable while under construction based on the size of safety zones that have been established during previous offshore wind farm construction activities, may be established during O&M activities, resulting in limited, short-term disruptions for recreation and tourism activities that occur in close proximity to the SRWF. Sunrise Wind would maintain communication methods to help minimize adverse impacts related to recreational boating traffic. A summary of anticipated routine maintenance activities and the regularity at which they are expected to occur can be found in COP Table 3.5.2-1, Table 3.5.3-1, and Table 3.5.4-1; Sunrise Wind 2022.

Vessel traffic associated with O&M of the SRWF and SRWEC would be less than during construction activities, but still would result in an increase in vessel traffic in the analysis area. It is not anticipated that maintenance would be needed for the SRWEC unless there is fault or failure of Project facilities. Depending upon the location of the necessary maintenance, O&M activities may transect routes used for distance sailing races or recreational boating, and could result in short-term, limited effects to recreation and tourism. For typical O&M activities, it is anticipated that smaller vessels would be used than those needed for construction related activities. However, the type and number of vessels would vary depending upon the required work. Helicopters may also be used during O&M activities. Operation of vessels and helicopters could result in noise impacts to recreation and tourism activities. These impacts would decrease as the distance away from O&M increases. The increase in vessel traffic and potential changes in routes could result in minor, long-term adverse impacts to recreation and tourism.

3.6.8.5.3 Conceptual Decommissioning

3.6.8.5.3.1 Onshore Activities and Facilities

Conceptual decommissioning would have similar, short-term minor and moderate adverse impacts to recreation and tourism as described under construction. The same APMs, including developing an MPT plan, would be implemented to limit adverse effects to traffic and onshore construction occurring outside of the summer season.

3.6.8.5.3.2 Offshore Activities and Facilities

Recreational boaters would experience similar short-term, minor to moderate adverse impacts from conceptual decommissioning of offshore Project components and offshore Project construction. Sunrise Wind would implement the same APMs for conceptual decommissioning as they propose for construction. This would include a comprehensive communication plan with outreach to stakeholders in the offshore recreation and tourism industry to help minimize adverse impacts.

3.6.8.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to the installation of undersea transmission lines, gas pipeline, and other submarine cables, marine mineral use, ocean-dredged material disposal, military uses, dredging activities, and port improvements would contribute to impacts on recreation and tourism through the primary IPFs of vessel traffic, noise, lighting, and cable installation. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of traffic, presence of structures, lighting, noise, anchoring, port utilization, and land disturbance. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute incrementally to the cumulative IPFs and impacts on recreation and tourism. BOEM anticipates that the cumulative impacts of the Proposed Action would likely be **minor** to **moderate** adverse and **minor** beneficial.

3.6.8.5.5 Conclusions

Impacts of Proposed Action

BOEM anticipates the construction, operation and maintenance, and conceptual decommissioning of the Proposed Action would have **negligible** to **moderate** adverse and **minor beneficial** impacts to recreation and tourism. Construction and decommissioning activities would result in increases in vehicle traffic, vessel anchoring, vessel traffic, noise, lighting, and visible construction activities to recreational users and tourists. These activities would result in short-term adverse impacts to recreation and tourism and would be partially mitigated by the proposed APMs. Project operations and maintenance would result in both short-term and long-term IPFs from vessel traffic, vessel anchoring noise, lighting, and visible infrastructure. The impacts of O&M activities associated with the Proposed Alternative would range from **negligible** to **moderate** adverse and **minor beneficial** impacts to recreation and tourism. The overall effect of the Proposed Action on recreation and tourism would be expected to be **negligible** to

moderate adverse and **minor beneficial** impacts, as recreation and tourism activities are expected to continue with most impacts being avoided with APMs in place.

Cumulative Impacts of the Proposed Action

BOEM anticipates that the cumulative impacts on recreation and tourism in the GAA would range from **negligible** to **moderate** adverse impacts and **minor beneficial** impacts. In the context of reasonably foreseeable environmental trends, the incremental impacts contributed by the Proposed Action would be marginal. Short-term impacts from construction and conceptual decommissioning activities would include noise, lighting, anchored vessels, and changes in navigational routes. Long-term impacts include the presence of visible infrastructure in the GAA during operations impacting the visual quality of the area, the presence of buried cable structures impacting anchoring, and changes to vessel navigation to avoid allision. Beneficial impacts would result from offshore wind-farm sightseeing opportunities and from the potential reef effect and shelter that the infrastructure would provide. The majority of the impacts to recreation and tourism from the Proposed Action could be avoided with APMs in place.

3.6.8.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.6.8.6.1 Construction and Installation

3.6.8.6.1.1 Onshore Activities and Facilities

Alternative C-1 would not affect the Project's onshore facilities and activities. Alternative C-1 would also not change construction activities that could impact onshore activities. There would be similar levels of noise, lighting, and visible construction equipment, and impacts to traffic for onshore activities when compared to the Proposed Action. Therefore, direct and indirect effects to onshore recreation and tourism would be the same as the Proposed Action. Impacts would be adverse and short-term and would be expected to range from negligible to moderate adverse impacts to minor beneficial impacts.

3.6.8.6.1.2 Offshore Activities and Facilities

Impacts to offshore activities and facilities during construction would be similar to those described under the Proposed Action and would be negligible to moderate and short-term. Offshore construction activities would result in impacts to recreational boating, fishing, wildlife watching, scuba diving, and sightseeing. Traffic, noise, lighting, and visible infrastructures would be the IPFs that would affect recreation and tourism associated with Alternative C-1. Under this alternative, sensitive benthic habitats would be avoided that may be important for recreational fishing activities. Impacts would be short-term and would be expected to range from negligible to moderate.

3.6.8.6.2 Operations and Maintenance

3.6.8.6.2.1 Onshore Activities and Facilities

Alternative C-1 would not affect the Project's onshore facilities and should result in very similar operations and maintenance needs as the Proposed Action. Therefore, impacts to onshore recreation and tourism would be the same as described under the Proposed Action. The impacts would be adverse long-term and range from negligible to moderate.

3.6.8.6.2.2 Offshore Activities and Facilities

O&M activities under Alternative C-1 to offshore facilities would be similar to those described under the Proposed Action. There would be potential impacts from noise, lighting, visible infrastructure, and traffic. However, Alternative C-1 involves removing 8 11-MW WTGs from Priority Areas 1, 2, 3, and/or 4 to minimize impacts to fisheries habitat. Depending on where the WTGs are removed from, there could be less impacts to recreation and tourism. For example, Cox Ledge has been identified as one of the most popular recreation fishing spots in Southern New England and protecting this complex habitat could help mitigate adverse impacts to recreational fishing in the region (Kneebone and Capizzano 2020). All other impacts are anticipated to be similar to those described under the Proposed Action and would range from negligible to moderate adverse impacts to minor beneficial impacts.

3.6.8.6.3 Conceptual Decommissioning

3.6.8.6.3.1 Onshore Activities and Facilities

The Fisheries Habitat Impact Minimization Alternative would not affect the Project's onshore facilities and activities. Alternative C-1 would also not change conceptual decommissioning activities that could impact onshore activities. There would be similar levels of noise, lighting, and visible construction equipment, and impacts to traffic for onshore activities. Therefore, direct and indirect effects to onshore recreation and tourism would be the same as the Proposed Action. Impacts would be short-term and would be expected to range from adverse negligible to moderate.

3.6.8.6.3.2 Offshore Activities and Facilities

Impacts to offshore activities and facilities during conceptual decommissioning would be similar to those described under the Proposed Action and would be adverse negligible to moderate and short-term. Offshore conceptual decommissioning activities would result in impacts to recreational boating, fishing, wildlife watching, scuba diving, and sightseeing. Traffic, noise, lighting, and visible infrastructures IPFs would affect recreation and tourism associated with Alternative C-1. Impacts would be short-term and would be expected to range from adverse negligible to moderate.

3.6.8.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts on recreation and tourism would likely be **negligible** to **moderate** adverse to **minor beneficial.** In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 and the cumulative impacts on recreation and tourism would be similar to those described under the Proposed Action.

3.6.8.6.5 Conclusions

Impacts of Alternative C-1

Alternative C-1 could result in reduced impacts to recreational fishing, as WTGs would be relocated from complex fish habitat. This could improve recreational experiences by helping protect fish species that are targeted by recreational fishing vessels. This area is part of cod spawning habitat, and recreational fishers are permitted to catch up to ten cod per day in this area (NOAA 2021). However, at this distance offshore, recreational fishing predominantly targets highly migratory species. Therefore, it is not expected that impacts would be significantly different from Alternative C-1 to the Proposed Action on recreation and tourism. As a result, BOEM expects that the impacts from Alternative C-1 to recreation and tourism would be similar, but potentially less, to the Proposed Action. All other impacts are anticipated to be similar to those described under the Proposed Action and would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts.

Cumulative Impacts of Alternative C-1

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on recreation and tourism would be marginal. BOEM anticipates that the cumulative impacts of Alternative C-1 would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts. This impact rating is driven by ongoing and planned activities as well as short-term and permanent disturbance associated with both onshore and offshore construction, O&M and decommissioning of the Alternative.

3.6.8.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

Alternative C-2 was developed to potentially reduce impacts to fisheries habitat within the Lease Area by removing 8 WTGs from Priority Areas 1, 2, 3, and/or 4 and relocating 12 WTGs to currently unoccupied positions along the eastern side of the Lease Area. Under Alternative C-2, the 11-MW WTGs and OCS-DC would occur within the range of design parameters outlined in the COP.

3.6.8.7.1 Construction and Installation

3.6.8.7.1.1 Onshore Activities and Facilities

Impacts of Alternative C-2 to recreation and tourism resources during construction activities would be similar to those described under the Proposed Action. Impacts would be short-term, and would be expected to range from negligible to moderate adverse impacts to minor beneficial impacts.

3.6.8.7.1.2 Offshore Activities and Facilities

Impacts of Alternative C-2 to recreation and tourism resources during construction activities from traffic, noise, lighting, and presence of structures would be similar to those described under the Proposed Action. Impacts would be short-term and would be expected to range from negligible to moderate.

3.6.8.7.2 Operations and Maintenance

3.6.8.7.2.1 Onshore Activities and Facilities

Impacts of Alternative C-2 to recreation and tourism resources from O&M activities of onshore facilities would be similar to those described under the Proposed Action. Impacts would be long-term, and range from negligible to moderate.

3.6.8.7.2.2 Offshore Activities and Facilities

O&M activities under Alternative C-2 to offshore facilities would be similar to those described under the Proposed Action. Under Alternative C-2, 20 11-MW WTGs would be removed from Priority Areas 1, 2, 3, and/or 4 (8 removed and 12 relocated). The 12 WTGs would be relocated to currently unoccupied positions along the eastern side of the Lease Area. Under Alternative C-2, the same number of WTGs, 84 11-MW WTGs would be installed, the same as under the Proposed Action. The different locations of the WTGs could result in less impacts to recreational fishing. For example, Cox Ledge has been identified as one of the most popular recreation fishing spots in Southern New England, and protecting this complex habitat could lessen adverse impacts to recreational fishing in the region (Kneebone and Capizzano 2020). All other impacts are anticipated to be similar to those of the Proposed Action and would range from negligible to moderate adverse impacts to minor beneficial impacts.

3.6.8.7.3 Conceptual Decommissioning

3.6.8.7.3.1 Onshore Activities and Facilities

Impacts of Alternative C-2 to recreation and tourism resources during decommissioning activities would be similar to those described under the Proposed Action. Impacts would be short-term and would be expected to range from adverse negligible to moderate.

3.6.8.7.3.2 Offshore Activities and Facilities

Impacts to offshore activities and facilities during conceptual decommissioning would be similar to those described under the Proposed Action and would be adverse negligible to moderate and short-term. Offshore conceptual decommissioning activities would result in impacts to recreational boating, fishing, wildlife watching, scuba diving, and sightseeing. Traffic, noise, lighting, and visible infrastructures IPFs would affect recreation and tourism associated with Alternative C-2. Impacts would be short-term and would be expected to range from adverse negligible to moderate.

3.6.8.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts on recreation and tourism would likely be **negligible** to **moderate** adverse to **minor beneficial**. In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 and the cumulative impacts on recreation and tourism would be similar to those described under the Proposed Action.

3.6.8.7.5 Conclusions

Impacts of Alternative C-2

Alternative C-2 could result in reduced impacts to recreational fishing, as WTGs would be relocated from complex fish habitat. This could improve recreational experiences by helping protect fish species that are targeted by recreational fishing vessels. This area is part of cod spawning habitat, and recreational fishers are permitted to catch up to ten cod per day in this area (NOAA 2021). However, at this distance offshore, recreational fishing predominantly targets highly migratory species. Therefore, it is not expected that impacts would be significantly different from Alternative C-2 to the Proposed Action on recreation and tourism. As a result, BOEM expects that the impacts from Alternative C-2 to recreation and tourism would be similar, but potentially less, to the Proposed Action. All other impacts are anticipated to be similar to those described under the Proposed Action and would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts.

Cumulative Impacts of Alternative C-2

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on recreation and tourism would be marginal. BOEM anticipates that the cumulative impacts of Alternative C-1 would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts. This impact rating is driven by ongoing and planned activities as well as short-term and permanent disturbance associated with both onshore and offshore construction, O&M and decommissioning of the Alternative.

3.6.8.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall negligible to moderate adverse impacts and minor beneficial impacts on recreation and tourism. Table 3.6.8-3 provides an overall summary of alternative impacts.

Table 3.6.8-3. Comparison of Recreational and Tourism Impacts

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
Recreation and Tourism	*Proposed Action*: BOEM anticipates the construction, operation and maintenance, and conceptual decommissioning of the Proposed Action would have **negligible** to **moderate** adverse and **minor beneficial** impacts to recreation and tourism. The impacts of O&M activities associated with the Proposed Alternative would range from **negligible** to **moderate** adverse and **minor** beneficial impacts to recreation and tourism. The overall effect of the Proposed Action on recreation and tourism would be expected to be **negligible** to **moderate** adverse and **minor** beneficial impacts, as recreation and tourism activities are expected to continue with most impacts being avoided with APMs in place.	*Alternative C-1*: BOEM expects that the impacts from Alternative C-1 to recreation and tourism would be similar, but potentially less, to the Proposed Action. All other impacts are anticipated to be similar to those described under the Proposed Action and would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts. *Cumulative Impacts of Alternative C-1*: In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on	*Alternative C-2*: BOEM expects that the impacts from Alternative C-2 to recreation and tourism would be similar, but potentially less, to the Proposed Action. All other impacts are anticipated to be similar to those described under the Proposed Action and would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts. *Cumulative Impacts of Alternative C-2*: In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)
	Cumulative Impacts of the Proposed Action: BOEM anticipates that the cumulative impacts on recreation and tourism in the GAA would range from **negligible** to **moderate** adverse impacts and **minor** beneficial impacts. In the context of reasonably foreseeable environmental trends, the incremental impacts contributed by the Proposed Action would be marginal.	recreation and tourism would be marginal. BOEM anticipates that the cumulative impacts of Alternative C-1 would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts. This impact rating is driven by ongoing and planned activities as well as short-term and permanent disturbance associated with both onshore and offshore construction, O&M and decommissioning of the Alternative.	cumulative impacts on recreation and tourism would be marginal. BOEM anticipates that the cumulative impacts of Alternative C-1 would range from **negligible** to **moderate** adverse impacts to **minor beneficial** impacts. This impact rating is driven by ongoing and planned activities as well as short-term and permanent disturbance associated with both onshore and offshore construction, O&M and decommissioning of the Alternative.

3.6.8.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to recreation and tourism.

BOEM would ensure that Sunrise Wind develops a construction schedule that minimizes overlap with recreational fishing tournaments and other important seasonal recreational fishing events. If this mitigation measure is adopted by BOEM, construction activities would not occur during recreational fishing events, avoiding impacts such as vessel traffic, noise, and other construction activity that might otherwise adversely affect these events. This mitigation measure would minimize the impact on recreational fishing but would not reduce the overall impact level. Impacts from the Proposed Action and other action alternatives would remain minor beneficial and negligible to moderate adverse. In addition, Sunrise Wind should develop a communications plan with adjacent land managing agencies to communicate the construction schedule with the public and provide messaging via various platforms and on-site in adjacent lands. The communication plan would be used to help inform the public of what to expect when planning recreation visits in areas adjacent to construction activities.

3.6.9 Scenic and Visual Resources

This section discusses potential impacts on seascape, ocean, and landscape character, as well as potential scenic and visual view impacts associated with the proposed Project, alternatives, and ongoing and planned activities in the scenic and visual resources GAA. This section also addresses non-historic visual resources; historic visual resources are addressed in the Section 3.6.2 Cultural Resources. A Historic Resources Viewshed Effects Analysis (HRVEA) was completed to assess the proposed Project's potential visual effects on the qualities that qualify above-ground historic resources for the NRHP, Identifying 307 historic resources within the APE for viewshed resources. The results of this analysis are included in Section 3.6.2, Cultural Resources. As described in the COP VIA (COP Appendix Q1, Sunrise Wind 2022), the Geographic Visual Analysis Study Area (VSA) for the Sunrise project encompasses a 40-mile (64.4 km) radius from the outside perimeter of the proposed action and estimates the radius as the maximum threshold of potential visibility based on human vision, size of the turbines, and curvature of the earth (Appendix D, Figure D-19). The visual geographic analysis area includes approximately 6,854-sq-mi (17,751-sq.-km) of ocean, 685-sq-mi (1774 sq. km) of land (including inland water bodies), and over 615 linear miles (990 linear km) of shoreline in Rhode Island, Massachusetts, Connecticut, and New York. The COP VRA (COP Appendix Q2, Sunrise Wind 2022), identified the onshore VSA a three-mile radius around the proposed OnCS-DC site (Union Avenue site); however, did not include the land areas associated with the cable routes and cable landfall area, which are also outside of the COP VIA identified VSA. Therefore, for this DEIS, the onshore GAA is identified to encompass an approximate 3-mi- (4.8-km) radius around the proposed OnCS–DC site, approximately 31 sq. mi (81 sq. km), and also includes portions of the towns of Brookhaven and Islip along with small portions of the villages of Lake Grove and Patchogue, and the cable landfall and cable routes to the OnCS-DC site, as described in Appendix D, Figure D-18, and Section 3.6.9.1. Table 3.6.9-1 provides a summary of the states, counties, and towns located within the defined VSA for both the onshore and offshore components.

Table 3.6.9-1. States, Counties, and Towns within the Visual Study Area

State	County	Town(s)
New York	Suffolk	Brookhaven, East Hampton, Islip, Southold
Connecticut	New London	North Stonington, Stonington
Massachusetts	Barnstable	Falmouth, Mashpee
	Bristol	Dartmouth, Fairhaven, Fall River, New Bedford, Westport
	Dukes	Aquinnah, Chilmark, Edgartown, Gosnold, Oak Bluffs, Tisbury, West Tisbury
	Nantucket	Nantucket
	Plymouth	Mattapoisett
Rhode Island	Kent	East Greenwich, West Greenwich
	Newport	Jamestown, Little Compton, Middletown, Newport, Portsmouth, Tiverton
	Washington	Charlestown, Exeter, Hopkinton, Narragansett, New Shoreham, North Kingstown, Richmond, South Kingstown, Westerly

Source: Sunrise Wind 2022 COP VIA, Appendix Q1, amended by BOEM.

This analysis of scenic and visual resources considers methodologies provided in the *Assessment of Seascape, Landscape, and Visual Impacts (SLVIA) of Offshore Wind Developments on the Outer Continental Shelf of the United States* (BOEM 2021) and the *Guidelines for Landscape and Visual Impact Assessment* (3rd Edition) (Landscape Institute and Institute of Environmental Management and Assessment 2016). The BOEM SLVIA (2021) describes the methodology for seascape, landscape, and visual impact assessment that BOEM applies to identify the potential impacts of offshore wind energy developments in federal waters on the OCS of the United States. The SLVIA has two parts, including the seascape and landscape impact assessment (SLIA) and visual impact assessment (VIA). The SLIA analyzes and evaluates impacts of the proposed Project on both the physical elements and distinctive features that make up a landscape or seascape character, and the aesthetic, perceptual, and experiential aspects of the landscape or seascape that make it distinctive. The VIA analyzes and evaluates the impacts from selected viewpoints (i.e., key observation points [KOPs]) on people who are likely to be at that viewpoint (viewers) due to the change in the composition of the view as a result of the proposed Project.

3.6.9.1 Description of the Affected Environment and Future Baseline Conditions

The Description of the Affected Environment and Future Baseline Conditions section provides an overview of information on past and present activities related to scenic and visual resources. Future non-Project actions include offshore wind energy development, undersea transmission lines, gas pipelines, other submarine cables, tidal energy projects, marine minerals use and ocean-dredged material disposal, military uses, marine transportation, fisheries use and management, global climate change, oil and gas activities, and onshore development activities which are discussed in further detail in Appendix E. Impacts associated with future offshore wind activities in relation to scenic and visual resources are described below.

SLIA Factors

The SLIA assesses the potential impacts of the proposed Project on the physical elements and features that make up a landscape or seascape character units, including the ocean character area (OCA), seascape character area (SCA) and landscape character area (LCA). The OCAs include the area within the Project viewshed but outside of the SCAs within the viewshed and includes the offshore components of the open ocean areas. The SCAs include the discrete areas of coastal landscape (estimated at approximately up to 3 nautical miles /3.45 statute miles from shoreline), and adjoining areas of open water where there is a share intervisibility between the land and sea that includes an area of the sea, a length of coastline, and an area of land. The LCAs include the inland areas that may be affected by the proposed Project but do not include the coastline or sea components (BOEM 2021).

This section summarizes the seascape, ocean, landscape, and viewer baseline conditions within the VSA GAA area as described in the COP, Appendix Q1, Offshore Visual Impacts Assessment (Sunrise Wind 2022). The COP refines the potential areas of impact based on the assessment of the Zone of Visual Influence (ZVI)[27] which is defined as the potential visibility of the Project facilities within the viewshed based on a viewshed model that considered vegetation, buildings/structures, and the curvature of the earth in order to delineate those areas that may have potential views of the highest portions of the WTGs (i.e., blade tips in the upright position). The COP offshore VIA considered the Project Design

[27] The COP V2 April 2022 VIA also refers to the ZVI as Project Area of Potential Affect (PAPE).

Envelope (PDE) approach to Project facilities and activities with up to 122 WTGs, with a maximum potential height of 968 feet above mean sea level (MSL) and 3 offshore platform locations[28].

The COP VIA defines the VSA in terms of land cover and landscape similarity zones (LSZ)[29] based on the similarity of visual features, such as landform, vegetation, water, and land use patterns, and defined 17 LSZs within the VSA (COP Appendix Q1, Sunrise Wind 2022). The LSZs provide a framework for the analysis of existing visual resources and viewer circumstances and further refinement of the existing landscape description. Generally, SCAs and LSZs include ocean, shoreline, marsh, and bays, and inland areas, as summarized in Table 3.6.9-2, and water, landforms, vegetation, and built structures as summarized in

Table 3.6.9-3.

Table 3.6.9-2. General Land and Water Areas and Landscape Similarity Zones

Land and Water Areas	Character Units	Characteristics
Atlantic Ocean	OCA/SCA	Ocean
Shoreline	SCA/LCA	Jetty/Seawall, Beachfront, Coastal Dune, Boardwalk, Island Community
Marsh and Bay	SCA	Marshland, Bay/Shoreline, Ridges
Inland	LCA	Mainland

Table 3.6.9-3. General Landform Water, Vegetation and Structure Categories

Category	Landscape Features
Landform	Flat shorelines to gently sloping beaches, dunes, islands, and inland topography
Water	Ocean, bay, estuary, tidal river, river, and stream water patterns
Vegetation	Tidal salt marshes and estuarine biomes, beach grass, meadows, and maritime forests
Structures	Buildings, plazas, signage, walks, parking, roads, trails, seawalls, jetties, and infrastructure

[28] The VIA considered the original proposal of 122 WTGs and 3 offshore platforms. Subsequent to the COP Offshore Visual Impacts Assessment, Sunrise Wind has modified the proposed turbine array to include 94 WTGs with a maximum height of 787 ft (240 m) AMSL and one OCS-DC. The VIA states that the design changes are anticipated to result in the same or lower impacts than those presented in the VIA report.

[29] Landscape Similarity Zones provided in the COP (Sunrise Wind 2022) have been characterized by associated OCA, SCA and LCA character areas (BOEM 2021).

Table 3.6.9-4 provides a summary of, and Figures in Appendix I, Attachment I-1 provide the locations of the land cover categories identified in the COP based on the U.S. Geological Survey (USGS) National Land Cover Dataset (NLCD) and the associated LSZs, Character Units (OCA, SCA, LCA), and estimated acreages within the VSA and ZVI as provided in the COP Appendix Q1, (Sunrise Wind 2022) and supplemental information (EDR 2022). Representative photographs and additional descriptions of the LSZs are provided in the COP VIA, Appendix Q1 (Sunrise Wind 2022).

Table 3.6.9-4. Physiographic Areas and Landscape Similarity Zones

Land Cover Category	Landscape Similarity Zones[1]	Character Units	Acres within the VSA	Square Miles within the VSA	Acres within the ZVI	Square Miles within the ZVI	Percent of ZVI within the VSA
Open Water	Open Water/Ocean Zone	OCA	4,564,040	7,131	4,384,203	6,850	96.1
Open Water	Inland Lakes and Ponds	LCA	23,371	37	3,529	6	15.1
Agriculture/ Open Developed	Agricultural, Maintained Recreation Area Highway Transportation, Rural Residential, Shoreline Residential	LCA/ SCA	76,140	119	4,515	7	26.6
Developed	Highway Transportation, Rural Residential, Shoreline Residential, Suburban Residential, Developed Waterfront, Village Town Center, Commercial	LCA/ SCA	70,130	110	1,964	3	8.6
Emergent Herbaceous Wetland	Salt Pond Tidal Marsh	LCA	14,814	23	1,541	2	10.4
Exposed Sand/Soil	Shoreline Beach, Coastal Dunes, Coastal Bluff	SCA	12,887	20	5,337	8	41.4
Forest/Scrub	Forest, Coastal Scrub Shrub	LCA/ SCA	243,964	381	3,150	5	8.5
	Total		**5,005,346**	**7,821**	**4,404,239**	**6,881**	**N/A**

Source: Request for Information Response; EDR, 2022 Landscape Similarity Zones provided in the COP (Sunrise Wind 2022) have been characterized by associated OCA, SCA and LCA character areas (BOEM 2021).

Existing scenic and visually sensitive resources within the VSA identified in the COP VIA, Appendix Q1 (Sunrise Wind 2022) include locations that may be particularly sensitive to visual change and/or that have been identified by national, state, or local governments, organizations, and/or Native American tribes as important sites which are afforded some level of recognition or protection. These areas can include historic resources, designated scenic areas and scenic byways; national, state and local parks, forests and wildlife management areas; public recreation trails, areas and beaches; lighthouses and seaports. Table 3.6.9-5 provides a summary of identified sensitive resources within the VSA and ZVI and Appendix I, Attachment I-1 provides maps denoting the locations of the visually sensitive resources within the ZVI. See also discussion of historic visual resources in *Cultural Resources* (Section 3.6.2). The COP VIA and supplemental materials (EDR 2022) provide further description and details of the identified visually sensitive resources, including a summary table provided in Appendix A2 of the COP VIA Appendix Q1 (Sunrise Wind 2022) (see also Appendix I, Attachment I-2 of this DEIS).

Table 3.6.9-5. Identified Existing Scenic and Visually Sensitive Resources within the VSA

VSR Type	Acres within the VSA	Acres within the ZVI	Percent of ZVI within the VSA
National Historic Landmarks	11,012	2,482	22.5
Properties Listed on the National or State Registers of Historic Places	3,881	446	11.5
Properties Determined Eligible for the National or State Registers of Historic Places	7,209	689	9.6
National Natural Landmarks	350	263	75.3
State Scenic Areas	104,685	17,028	16.3
National Wildlife Refuges	93,342	2,367	2.5
State Wildlife Management Areas	1,452	224	15.4
National Parks	18	0	2.1
State Parks	9,803	3,000	30.6
State Nature and Historic Preserves	248	<1	0.0
State Forests	5,302	3	0.1
State Beaches	4,188	991	23.7
Highways Designated or Eligible as Scenic	451	40	8.9
National Historic Trails	242	0	0.1
National Recreation Trails	89	64	72.2
State Fishing and Boating Access	241	70	29.0
Lighthouses (non-State/NRHP-Listed)	7	6	80.8
Public Beaches	3,716	982	26.4
Ferry Routes	7,714	5,146	66.7
Seaports	54	0	0.6
Other State- Owned Environmental Land with Public Access	7,769	252	3.2
EJ Areas[1]	35,560	3,388	9.5
Total	**297,333**	**37,441**	**N/A**

Source: Request for Information Response; EDR, 2022

[1] Environmental justice impacts are further discussed in Section 3.6.4, Environmental Justice.

SLIA Impact Analysis Considerations

The SLIA analyzes and evaluates impacts of the proposed Project on both the physical elements and distinctive features that make up a landscape or seascape character, and the aesthetic, perceptual, and experiential aspects of the landscape or seascape that make it distinctive. The impact assessment on the landscape, seascape, and ocean characteristic is based on the sensitivity of the receptor and the magnitude of the character changes from the Proposed Action (BOEM 2021). The sensitivity of the seascape, ocean, and landscape features to change is defined by combining the judgements of the susceptibility of the receptor to impact and the perceived societal value of that receptor (BOEM 2021). The magnitude of the impact is determined by considering the size and scale of the change as a result of the Proposed Action to existing conditions, considering the geographic extent of the area, and duration and reversibility of the potential impacts (BOEM 2021). This analysis considers shoreline and landform features associated with the seascape, ocean, and landscape areas, such as whether the shoreline is a complex or simple straight shoreline; degree of ocean view and vistas, such as narrow or panoramic view; distinctiveness of the features, such as distinctive features of local or national significance; and natural and development patterns, such as degree of manmade versus natural elements. Information describing the seascape and landscape character is used to identify potential impacts from the proposed development. Table 3.6.9-6 summarizes the visual characteristics and features of the seascape, ocean, and landscape conditions within the geographic area of analysis.

Table 3.6.9-6. Seascape, Ocean, and Landscape Conditions

Category	Description
Seascape	Intervisibility within coastal and adjacent marine areas within the 40-mile (64.4-km) GAA by pedestrians and boaters.
Seascape Features	Physical features range from built elements, landscape, dunes, and beaches to flat water and ripples, waves, swells, surf, foam, chop, and whitecaps.
Seascape Character	Experiential characteristics stem from built and natural landscape forms, lines, colors, and textures to the foreground water's tranquil, mirrored, and flat; active, rolling, and angular; vibrant, churning, and precipitous. Forms range from horizontal planar to vertical structures', landscapes', and water's slopes; lines range from continuous to fragmented and angular; colors of structures, landscape, and the water's foam, and spray reflect the changing colors of the daytime and nighttime, built environment, land cover, sky, clouds, fog, and haze; and textures range from mirrored smooth to disjointed coarse.
Ocean	Inter-visibility within the ocean that is beyond the seascape area and within the 40-mile (64.4-km) GAA from seagoing vessels, including recreational cruising and fishing, commercial "cruise ship" routes, commercial fishing activities, tankers, and cargo vessels; and air traffic over and near the WTG array and cable routes.
OceanFeatures	Physical features range from flat water to ripples, waves, swells, surf, foam, chop, and whitecaps.
OceanCharacter	Experiential characteristics range from tranquil, mirrored, and flat; to active, rolling, and angular; to vibrant, churning, and precipitous. Forms range from horizontal planar to vertical slopes; lines range from continuous and horizontal to fragmented and angular; colors of water, foam, and spray reflect the changing colors of sky, clouds, fog, haze, and the daytime and nighttime, built environment and land cover; and textures range from mirrored smooth to disjointed coarse.
Landscape	Inter-visibility within the adjacent inland areas, seascape, and ocean; nighttime views diminished by ambient light levels of shorefront development; open, modulated, and closed views of water, landscape, and built environment; and pedestrian, bike, and vehicular traffic throughout the region.
Landscape Features	Natural elements: landward areas of barrier islands, bays, marshlands, shorelines, vegetation, tidal rivers, flat topography, and natural areas. Built elements: boardwalks, bridges, buildings, gardens, jetties, landscapes, life-saving stations, umbrellas, lighthouses, parks, piers, roads, seawalls, skylines, trails, single-family residences, commercial corridors, village centers, mid -rise motels, moderate to high-density residences.
Landscape Character	Tranquil and pristine natural to vibrant and ordered, to chaotic and disordered.

The sensitivity of the seascape, ocean and landscape character is defined by its innate features, elements, and susceptibility to change, and its perceived value to residents and visitors. Table 3.6.9-7 provides a summary of sensitivity rating criteria related to the seascape, ocean, and landscape character of high, medium, or low sensitivity. The sensitivity ratings within the geographic area of analysis are summarized in Table 3.6.9-7. Based on assessment of potential sensitivity of the existing seascape, ocean, and landscape character within the geographic area of analysis, the sensitivity rating for all of the seascape and ocean settings would be high, and for the landscape settings would range from high to low sensitivity ratings (see also see Appendix I Attachment I-2).

Table 3.6.9-7. Seascape, Ocean, and Landscape Character Units' Sensitivity Rating Factors

Category	LSZs	Sensitivity Rating[1] Factor Description
Ocean Character Unit		
High	Open Water/Ocean Zone	Ocean character is highly vulnerable to the type of change proposed, distinctive, and highly valued by residents and visitors.
Medium		Ocean character is reasonably resilient to the type of change proposed, moderately distinctive,and moderately valued by residents and visitors.
Low		Ocean character is unlikely to be affected by the type of change proposed, common, andunimportant to residents and visitors.
Seascape Character Unit		
High	Shoreline Beach, Coastal Dunes, Coastal Bluff, Coastal Scrub Shrub, Shoreline Residential, Maintained Recreation Area, Developed Waterfront,	Seascape character is highly vulnerable to the type of change proposed, distinctive, and highly valued by residents and visitors.
Medium		Seascape character is reasonably resilient to the type of change proposed, moderately distinctive, and moderately valued by residents and visitors.
Low		Seascape character is unlikely to be affected by the type of change proposed, common, and unimportant to residents and visitors.
Landscape Character Unit		
High	Agricultural, Maintained Recreation Area Highway Transportation, Rural Residential, Suburban Residential, Developed Waterfront, Village Town Center, Commercial, Forest,	Landscape characteristics are highly vulnerable to the type of change proposed or within a designated scenic or historic landscape.
Medium		Landscape characteristics are reasonably resilient to the type of change proposed, or within alandscape of locally valued scenic quality.
Low		Landscape characteristics are unlikely to be affected by the type of change proposed, or within a landscape of minimal scenic value.

References: Sunrise Wind 2022; BOEM Ocean Wind 2022

VIA Factors

The VIA defines the physiographic categories of VSA based on major differences in landscape structure that define the physical character to include islands, mainland, and Atlantic Ocean. The islands physiographic areas include areas such as Long Island, Block Island Long Island, Block Island, Conanicut Island, Prudence Island, Aquidneck Island, the Elizabeth Islands, Martha's Vineyard, Nantucket, and several smaller islands scattered along the coast of Connecticut, Massachusetts, and Rhode Island. The islands physiographic areas were estimated to encompass approximately 204.6 sq. mi (530 sq. km) of land within the VSA, and 22.2 square miles (57.45 sq. km) within the ZVI. The mainland areas include elevations ranging from sea level along the coast to a high point of 528.2 feet (161 m) AMSL in the Town of Exeter, Washington County, Rhode Island. The mainland areas within the VSA include approximately 480.2 sq. mi (1244 sq. km), including approximately 33.2 sq. mi (86 sq. km) in Connecticut, 340.5 sq. mi (882 sq. km) in Rhode Island, and 106.5 sq. mi (276 sq. km) in Massachusetts. The mainland areas within the ZVI encompasses approximately 10.4 sq. mi (27 sq. km) of mainland: including Massachusetts at 4.9 sq. mi (13 sq. km), Rhode Island at 5.5 sq. miles (14 sq. km), and Connecticut at less than 0.1 sq. mi (less than 1 sq. km). No mainland New York areas occur within the VSA or ZVI. The Atlantic Ocean areas within the VSA include Rhode Island Sound, Block Island Sound, Narragansett Bay, Fischer's Island Sound, Buzzards Bay, Mount Hope Bay, Vineyard Sound, Nantucket Sound, and other bays and coves, and encompass approximately 7,131.3 sq. m (18,470 sq km) within the VSA and approximately 6850.3 sq. mi (17,742.2 sq km) within the ZVI (96.2 percent).

VIA Impact Analysis Considerations

The VIA analyzes and evaluates the impacts from selected viewpoints (i.e., KOPs) on people who are likely to be at that viewpoint (viewers) due to the change in the composition of the view as a result of the proposed Project. The potential scenic and visual impacts can also be influenced by the magnitude of the scale of the Project features relative to the viewer, such as distance to the nearest WTG and visibility threshold, and geographic extent, such as vertical and horizontal scale of the Project features in relation to the viewing location. Impacts are determined through evaluation sensitivity factors (susceptibility to change and value attached to views) and magnitude of change (size and scale of change, geographic extent, and duration of impact), which considers number of viewers, viewer expectations, viewer activity, frequency and duration of the views, viewer familiarity with view settings, viewer concern for these settings, and viewing location and proximity to the Project features. Viewer expectations can be influenced by viewer activity. Changes to the visual setting may affect the experiential quality of certain passive activities while the character change may be unnoticed when viewers are engaged in more active activities. Viewer activity within the VSA can range from local residents with views from residential, commercial, and shoreline areas; individuals traveling through the area via walking, vehicle, public transportation, or boat (offshore); individuals participating in recreational activities, including tourists and those on vacation; and fishing community engaging in both onshore and offshore commercial fishing activities. The viewer sensitivity can also be influenced by the proximity of the Project to the viewer, such as elevation and viewing angle of the viewer and distance from the viewer to the Project features.

Daytime and nighttime views of the Project features can range from immediate foreground (such as from offshore viewing from fishing boats, cruise ships, or pleasure craft) to extended background views distances. The COP V2 VIA, Appendix Q1 (Sunrise Wind 2022) identifies three distinct distance zones for the VSA, including foreground-middle ground (Project features at distances from 0 to 5 mi [0 to 8 km]); background (Project features at distances of greater than 5 mi [8 km] to 15 mi [24.1 km] distances), and extended background (Project features at distances greater than 15 mi [24.1 km]). View distances from onshore to offshore to the proposed Project WTGs and OCS-DC would range from approximately 15 mi (24.1 km) to approximately 40 mi (64.4 km). As measured to the nearest WTG, the proposed Project would be located approximately 30.5 mi (49 km) from Long Island, 16.7 mi (27 km) from Block Island, 25.5 mi (41 km) from mainland Rhode Island, 31.8 mi (51 km) from mainland Massachusetts, 18.8 mi (30 km) from Martha's Vineyard, and 34.4 mi (55 km) from Nantucket (COP VIA, Appendix Q1; Sunrise Wind 2022).

As stated in the BOEM SLVIA (2021) guidelines and by Sullivan et al. (2013), offshore wind facilities reaching heights of 502 feet to the tip of blade can be visible for distances exceeding 25 mi (40 km). Sullivan et al. (2013) indicated that offshore wind facilities reaching heights of 502 feet to the tip of blade were estimated to be a major focus of visual attention at distances up to 10 mi (16 km), noticeable to casual observers at distances up to 18 mi (29 km) and were visible with extended viewing at distances beyond 25 mi (40 km). In addition, Sullivan et al. (2013) estimated that wind turbine blade movement is visible at distances as far as mi (39 km), and nighttime with aerial hazard navigation lighting was visible at distances greater than 24 mi (39 km). However, the Sullivan et al. (2013) assessment was based on review of WTGs smaller in height (i.e., tallest wind turbine observed was approximately 502 feet above MSL) than those proposed at the SRWF. The COP VIA considered the extended height of the WTGs (PDE height of 968 feet above MSL) and assessment of potential beach-level and earth curvature factors and estimated the maximum threshold of potential visibility at a distance of 40 miles or 64.4 km (COP VIA, Appendix Q1; see inset 1.2-1; Sunrise Wind 2022); which informed and is consistent with the VSA area of potential impact.

Generally, at distances of 15 miles or closer the WTGs and OSS may appear dominant in form and visual contrast. WTGs located within viewing distances from 0-15 miles would be within foreground level visual prominence, distances from 16-25 miles as middle-ground and background visual prominence, and greater than 25 miles would be considered extended background level visual prominence. The visibility and noticeability of Project features can be affected by factors such as time of day, view angle, sun angle, atmospheric conditions, elevation and viewing angle of the viewer, and distance from the viewer to the Project features. Visual contrast of WTGs and OCS-DC would vary throughout the day depending on whether the WTGs and OCS-DC are backlit, side-lit, or front-lit and based on the visual character and atmospheric conditions of the horizon backdrop. Variations of these factors throughout the course of the day would result in modification of the potential visual impacts ranging from periods of moderate to major visual effects, such as during sunset conditions with backlighting of Project features, while at other times of day would have minor or negligible effects, such as hazy atmospheric conditions and Project features within a background or extended background view.

Visibility of Project features can be affected by weather conditions, waves on the ocean surface, humidity levels, and air pollution. In the Project vicinity, National Climatic Data Center (NCDC) weather data were collected from the Newport and Block Island stations from January 1, 2010, to December 31, 2016. These data indicate that during daylight hours, clear skies, defined as 0-30 percent cloud cover, occur on average 42 percent of the time, partly cloudy conditions occurred approximately 4 percent of the time, and overcast sky conditions occurred approximately 52 percent of the time (Sunrise Wind 2018).

NOAA's National Data Buoy Center Station 44017 at Montauk Point, New York collected minimum and maximum air temperatures of -13.8°C and 27°C (7.2°F and 80.6°F), with a mean air temperature range between 1.3°C and 22.4°C (34.3°F and 72.3°F) (NOAA 2020; COP VIA Appendix Q1, Figure 4.3.1-14; Sunrise Wind 2022). A study conducted by Merrill (2010) assessed potential fog development from Buzzard's Bay Tower (west of the Elizabeth Islands) and Martha's Vineyard Coastal Observatory (1.9 mi [3 km] offshore). The results of this study indicated that in the Project vicinity, the summer period has the highest potential for fog development, with 10 potential days in June compared to 1 to 4 potential days during each of the winter months. In the vicinity of the SRWF, ocean waves generally move from the south with average wave heights ranging from 3.3 to 9.8 ft (1 to 3 m), with the highest storm waves up to 30 ft (9 m) high (RI CRMC 2010). Relative sea level rise is forecasted to increase by 3.3 mm/year based on data trends recorded at NOAA Station 8510560 in Montauk, New York, which could influence the waves surrounding the project.

View receptor and sensitivity is based on the engagement of the people viewing the Project and the viewer expectations. Table 3.6.9-8 summarizes sensitivity criteria for the VIA assessment of impacts.

Table 3.6.9-8. VIA View Receptor Sensitivity Ranking Criteria

Sensitivity Level	Sensitivity Criteria
High	Susceptibility: Residents with views of the Project from their homes; visitors to historic or culturally important sites, where views of the surroundings are an important contributor to the experience; people who regard the visual environment as an important asset to their community, churches, schools, cemeteries, public buildings, and parks; and people traveling on scenic highways and roads, or walking on beaches and trails, specifically for enjoyment of views. Value: association with a strong cultural, historic, religious, or spiritual connection to landscape or seascape views; designation as a scenic viewpoint or designated scenic area or roadway; viewers engaged in outdoor recreation whose attention or interest is focused on the seascape and landscape and on particular views
Medium	Susceptibility: People engaged in outdoor recreation whose attention or interest is unlikely to be focused on the landscape and on particular views because of the type of activity; people at their places of livelihood, commerce. Value: personal needs (inside or outside) whose attention is generally focused on that engagement, not on scenery, and where the seascape and landscape setting are not important to the quality of their activity, generally, those commuters and other travelers traversing routes that are dominated by non-scenic developments.
Low	People who regard the visual environment as an unvalued asset.

Source: BOEM 2021, BOEM Ocean Wind 2022

The COP VIA Appendix Q1 (Sunrise Wind 2022) identifies 40 representative KOPs within the VSA for assessment and evaluation, including development of computer simulations of representative conditions, such as daytime, nighttime, and sunset conditions. The KOPs provide representative viewing locations where individual or groups viewing experiences may be affected by the proposed Project WTGs and OCS-DC. Table 3.6.9-9 provides a summary of KOPs, and Figure 2.2-1, Key-Observation Points, in the COP VIA Appendix Q1 (Sunrise Wind 2022) and Appendix I, Attachment I-1, for location of the KOPs.

Table 3.6.9-9. Representative Key Observation Points (KOP) within the VSA

KOP ID	KOP Name	Location	Landscape Similarity Zones	Character Units	Distance to SRWF (Miles/km)	Viewer Type	Visually Sensitive Resources
New York							
LI01	Camp Hero State Park Overlook	Town of East Hampton, Suffolk County, New York	Coastal Bluff	LCA/SCA	31.2/50.2	Resident, Tourist	State Park, State Area of Scenic Significance
LI04	Montauk Point State Park	Town of East Hampton, Suffolk County, New York	Maintained Recreation Area	LCA/SCA	30.6/49.2	Local Residents, Tourists/Vacationers, Fishing Community	State Park, Lighthouse, State Scenic Area, State Area of Scenic Significance
Massachusetts							
CI01	Cuttyhunk Island	Town of Gosnold, Dukes County, Massachusetts	Coastal Scrub/Shrub	LCA/SCA	25.8/41.5	Local Residents, Tourists/Vacations	State Scenic Area
MM01	Gooseberry Island	Town of Westport, Bristol County, Massachusetts	Coastal Scrub/Shrub	LCA/SCA	30.7/49.4	Local Residents, Tourists/Vacationers	Multiple, Public Beach, State Reservation, State Scenic Area
MM04	Nobska Lighthouse	Town of Falmouth, Barnstable County, Massachusetts	Maintained Recreation Area	LCA/SCA	34.7/55.8	Local Residents, Tourists/Vacationers	Nobska Point Lighthouse
MM06	Demarest Lloyd State Park	Town of Dartmouth, Bristol County, Massachusetts	Shoreline Beach, Coastal, Scrub/Shrub	LCA/SCA	33.1/53.3	Local Residents, Tourists/Vacationers	Public Beach, State Park, State Scenic Area
MM07	Fort Taber District	Town of New Bedford, Bristol County, Massachusetts	Maintained Recreation Area	LCA/SCA	37.8/60.8	Local Residents, Tourists/Vacationers	Lighthouse, Public Beach
MV02	Philbin Beach	Town of Aquinnah, Dukes County, Massachusetts	Shoreline Beach	LCA/SCA	21.0/33.8	Local Residents, Tourists/Vacationers	Public Beach, State Scenic Area
MV03	Lucy Vincent Beach	Town of Chilmark, Dukes County, Massachusetts	Coastal Bluffs	LCA/SCA	22.0/35.4	Local Residents, Tourists/Vacationers	Public Beach, State Scenic Area
MV05	Moshup Beach	Town of Aquinnah, Dukes County, Massachusetts	Coastal Dunes	LCA/SCA	21.2/34.1	Local Residents, Tourists/Vacationers	Public Beaches, State Scenic Areas

KOP ID	KOP Name	Location	Landscape Similarity Zones	Character Units	Distance to SRWF (Miles/km)	Viewer Type	Visually Sensitive Resources
MV07	Aquinnah Overlook	Town of Aquinnah, Dukes County, Massachusetts	Coastal Bluff	LCA/SCA	21.5/34.6	Local Residents, Tourists/Vacationers	National Natural Landmark, State Scenic Areas, Historic Site, Lighthouse, Public Beaches
MV09	Gay Head Lighthouse	Town of Aquinnah, Dukes County, Massachusetts	Maintained Recreation Area	LCA/SCA	21.6/34.8	Local Residents, Tourists/Vacationers	National Natural Landmark, State Scenic Areas, Historic Site, Lighthouse, Public Beaches
MV10	South Beach State Park	Town of Edgartown, Dukes County, Massachusetts	Shoreline Beach	SCA	27.1/43.6	Local Residents, Tourists/Vacationers	State Park
MV11	Wasque Point	Town of Edgartown, Dukes County, Massachusetts	Shoreline Beach	SCA	29.4/47.3	Local Residents, Tourists/Vacationers	Public Beach
MV12	Peaked Hill	Town of Chilmark, Dukes County, Massachusetts	Forest	LCA	22.9/36.9	Local Residents, Tourists/Vacationers	Tribal Significance
MV13	Edwin D Vanderhoop	Town of Aquinnah, Dukes County, Massachusetts	Coastal Bluff	LCA/SCA	21.5/34.6	Local Residents, Tourists/Vacationers	National Natural Landmark, State Scenic Areas, Lighthouse
NI10	Madaket Beach	Town of Nantucket, Nantucket County, Massachusetts	Shoreline Beach	LCA/SCA	37.0/59.5	Local Residents, Tourists/Vacationers	Public Beach, Historic District
NL01	Nomans Land Island	Town of Chilmark, Dukes County, Massachusetts	Coastal Bluff	LCA/SCA	15.6/25.1	No Access	National Wildlife Refuge
Rhode Island							
AI01	Brenton Point State Park	Town of Newport, Newport County, Rhode Island	Maintained Recreation Area	LCA/SCA	28.9/46.5	Local Residents, Tourists/Vacationers, Fishing Community	State Park, State Scenic Area, Historic District, State Boat Access
AI03	Newport Cliff Walk	Town of Newport, Newport County, Rhode Island	Shoreline Residential, Maintained Recreation Area	LCA/SCA	28.6/46.0	Local Residents, Tourists/Vacationers	National Recreation Trail, State Scenic Area, Historic District

KOP ID	KOP Name	Location	Landscape Similarity Zones	Character Units	Distance to SRWF (Miles/km)	Viewer Type	Visually Sensitive Resources
AI05	Sachuest Point National Wildlife Refuge	Town of Middletown, Newport County, Rhode Island	Coastal Scrub/Shrub	LCA/SCA	29.8/48.0	Local Residents, Tourists/Vacationers	National Wildlife Refuge, Scenic Area
AI06	Sachuest Beach (Second)	Town of Middletown, Newport County, Rhode Island	Shoreline Beach	LCA/SCA	30.9/49.7	Local Residents, Tourists/Vacationers	Scenic Highway, Public Beach, Bird Sanctuary
AI07	Hanging Rock	Town of Middletown, Newport County, Rhode Island	Coastal Scrub/Shrub	LCA/SCA	31.1/50.1	Local Residents, Tourists/Vacationers	Scenic Highway, Public Beach, Bird Sanctuary
AI09	Easton's Beach	Town of Newport, Newport County, Rhode Island	Shoreline Beach	SCA	30.9/49.7	Local Residents, Tourists/Vacationers	National Recreation Trail, Historic District, Public Beach
BI02	Great Salt Pond	Town of New Shoreham, Washington County, Rhode Island	Commercial Waterfront	LCA/SCA	20.1/32.3	Local Residents, Tourists/Vacationers	National Wildlife Refuge, Boat/Fish Access, Public Beach, State Scenic Area, Ferry Route
BI04	Southeast Lighthouse	Town of New Shoreham, Washington County, Rhode Island	Maintained Recreation Area, Coastal Bluff	LCA/SCA	16.9/27.2	Local Residents, Tourists/Vacationers	Public Beach, State Scenic Area, National Historic Landmark
BI06	New Shoreham Beach	Town of New Shoreham, Washington County, Rhode Island	Shoreline Beach	SCA	17.8/28.6	Local Residents, Tourists/Vacationers	Boat/Fish Access, Lodges, and Cottages
BI08	Fred Benson Beach	Town of New Shoreham, Washington County, Rhode Island	Shoreline Beach	SCA	19.0/30.6	Local Residents, Tourists/Vacationers	State Scenic Areas, Public Beach, Roadway
BI12	Clayhead Trail	Town of New Shoreham, Washington County, Rhode Island	Coastal Bluff	LCA/SCA	19.5/31.4	Local Residents, Tourists/Vacationers	Trail, Roadway
BI16	Mohegan Bluffs	Town of New Shoreham, Washington County, Rhode Island	Shoreline Beach, Coastal Bluff	LCA/SCA	17.2/27.7	Local Residents, Tourists/Vacationers	State Scenic Areas, Public Beach, State Recreation Land, Boat/Fish Access

KOP ID	KOP Name	Location	Landscape Similarity Zones	Character Units	Distance to SRWF (Miles/km)	Viewer Type	Visually Sensitive Resources
C01	Beavertail Lighthouse	Town of Jamestown, Newport County, Rhode Island	Maintained Recreation Area	LCA/SCA	29.5/47.5	Local Residents, Tourists/Vacationers	State Park, Boat/Fish Access, Scenic Area, Lighthouse
RI01	Watch Hill Lighthouse	Town of Westerly, Washington County, Rhode Island	Maintained Recreation Area, Shoreline Residential	LCA/SCA	36.0/57.9	Local Residents, Tourists/Vacationers	State Scenic Area, Historic District, Lighthouse
RI02	Weekapaug Breachway	Town of Westerly, Washington County, Rhode Island	Shoreline Beach	SCA	33.0/53.1	Local Residents, Tourists/Vacationers	State Scenic Area, State Boat/Fish Access, National Wildlife Refuge, Public Beach
RI03	Point Judith Lighthouse	Town of Narragansett, Washington County, Rhode Island	Maintained Recreation Area	LCA/SCA	25.7/41.4	Local Residents, Tourists/Vacationers	State Scenic Area, Wildlife Management Area, Lighthouse
RI04	South Shore Beach	Town of Little Compton, Newport County, Rhode Island	Shoreline Beach, Shoreline Residential	LCA/SCA	31.6/50.9	Local Residents, Tourists/Vacationers	State Scenic Area, Public Beach
RI06	Trustom Pond NWR	Town of South Kingstown, Washington County, Rhode Island	Salt Pond/Tidal Marsh	LCA/SCA	29.0/46.7	Local Residents, Tourists/Vacationers	National Wildlife Refuge, Public Beach, State Scenic Area
RI08	Scarborough Beach	Town of Narragansett, Washington County, Rhode Island	Shoreline Beach	SCA	27.1/43.6	Local Residents, Tourists/Vacationers	National Wildlife Refuge, Public Beach, State Lands
RI09	Narragansett Beach	Town of Narragansett, Washington County, Rhode Island	Shoreline Beach	SCA	29.7/47.8	Local Residents, Tourists/Vacationers	National Wildlife Refuge, Public Beach, State Scenic Area
RI11	Matunuck Beach	Town of South Kingstown, Washington County, Rhode Island	Developed Waterfront, Shoreline Beach	LCA/SCA	28.0/45.1	Local Residents, Tourists/Vacationers	National Wildlife Refuge, Public Beach
RI12	Ninigret National Wildlife Refuge	Town of Charlestown, Washington County, Rhode Island	Shoreline Beach	SCA	30.5/49.1	Local Residents, Tourists/Vacationers, Fishing Community	National Wildlife Refuge, State Lands

Source: COP VIA Appendix Q1 Sunrise Wind 2022

Onshore Area

This section summarizes the onshore visual GAA baseline conditions associated with the proposed landfall area, cable location, and OnCS-DC facility as described in COPVRA, Appendix Q2, Onshore Visual Resources Assessment (VRA) (Sunrise Wind 2022).

Onshore project infrastructure would be located in the town of Brookhaven, Suffolk County, New York, on the south shore of Long Island. Brookhaven is characterized by unique hamlets, villages, and communities; two world renowned research centers, Stony Brook University and Brookhaven National Laboratory; popular beaches; and recreation areas (Brookhaven 2022). The western portion of Brookhaven has a much higher concentration of development, whereas the eastern portion has more areas allocated for recreation and open space (Suffolk County 2016). The town land uses that constitute the most acreage are preserved recreation and open space (43 percent), low-density and medium-density housing (21 percent), and vacant land (10 percent) (Suffolk County 2020).

Landfall of the SRWEC would occur at Smith Point County Park, which includes public access to the beach and camping facilities and is located on the Fire Island National Seashore barrier island in the town of Brookhaven (Suffolk County Park 2018). Smith Point County Park while not owned by the federal government, is located within the Fire Island National Seashore boundaries, and adjacent to the Otis Pike Wilderness (see Figure 3.6.5-1 in Section 3.6.5, Land Use and Coastal Infrastructure). Fire Island is an approximately 30-mile-long (48.3-km-long) island that is separated from Long Island by the Great South Bay. This area is characterized by dynamic barrier island beaches, an ancient maritime forest, and historic resources, and contains the 26-mile-long (41.8-km-long) protected Fire Island National Seashore (National Park Foundation 2022). This area is a popular recreation and tourism destination, where many visitors go to enjoy the nature and scenic quality.

The Fire Island National Seashore has communities, the Otis Pike Wilderness area, natural areas, and historical and cultural resources within its boundaries. More than three-quarters of Fire Island National Seashore is marine or estuarine habitat, with 14,644 acres of the park consisting of open water. The Seashore boundary extends 1,000 feet (304.8 m) into the Atlantic Ocean from Moriches Inlet to Robert Moses State Park, and up to 4,000 feet (1219.2 m) into the Great South Bay, and Bellport, Narrow and Moriches Bay (NPS 2022). Fire Island National Seashore was established "[f]or the purpose of conserving and preserving for the use of future generations certain relatively unspoiled and undeveloped beaches, dunes, and other natural features within Suffolk County, New York, which possess high values to the Nation as examples of unspoiled areas of great natural beauty in close proximity to large concentrations of urban population." (16 U.S.C. § 459(e)).

The Otis Pike Fire Island High Dune Wilderness Act (enacted December 23, 1983) designated approximately 1,363 acres of the Fire Island National Seashore as federally designated wilderness (Otis Pike Wilderness Area) and later expanded the wilderness area to an additional 18 acres. The Otis Pike Wilderness area is the smallest wilderness area managed by the National Park Service and the only federally designated wilderness area in New York State. The Otis Pike Wilderness is located directly west of Smith County Park, and in an area where, per enabling legislation for the Fire Island National seashore, "every effort shall be exerted to maintain and preserve" this area of the seashore "in as nearly [its] present state and condition as possible" (16 U.S.C. § 459e-6(b)).

From Smith Point County Park, the onshore transmission cable would be routed through the western side of Brookhaven until it reaches the OnCS-DC. The OnCS-DC for the Project is proposed to be located on two parcels, approximately 7 acres (2.8 ha) in size. This site is currently being used for industrial/commercial purposes and is in a location that is zoned for industrial and commercial uses.

Local communities identify important scenic and visual resources in their communities in local comprehensive plans, recreation and open space plans, local waterfront revitalization plans (New York State only), and conservation plans. In reviewing these resources, 11 municipalities were identified as having greater than 5 percent of their land area within the ZVI and are listed in Table 3.6.9-10. Each of the 11 listed municipalities have some level of comprehensive plan or open space recreation plan that provide general, high-level discussion about the protection of scenic and historic resources (COP VIA Appendix Q1; Sunrise Wind 2022). Several of the plans identify potential risks to historic and scenic resources, including the risk of flooding from climate change and sea-level rise and development or change of existing historic properties.

Table 3.6.9-10. Municipalities with Greater than 5 Percent ZVI Content

Municipality	Percent within ZVI
Gosnold, Dukes County, MA	20.3%
Aquinnah, Dukes County, MA	18.0%
Edgartown, Dukes County, MA	8.5%
Nantucket, Nantucket County, MA	6.7%
West Tisbury, Dukes County, MA	5.3%
New Shoreham, Washington County, RI	10.0%
Newport, Newport County, RI	9.8%
Little Compton, Newport County, RI	9.3%
Middletown, Newport County, RI	9.1%
Narragansett, Washington County, RI	5.7%

3.6.9.2 Impact Level Definitions for Visual Resources

This Draft EIS uses a four-level classification to analyze potential impact levels for scenic and visual resources of the alternatives, including the proposed action. Table 3.6.9-11 lists the definitions for the potential adverse impact levels for scenic and visual resources under the SLIA and the VIA. Table G-21 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to scenic and visual resources. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of less than five years. Long-term impacts may occur over a period ranging from 5 years to 30 years, and impacts that occur longer than 30 years are considered permanent. The analysis for scenic and visual resources helps to inform the impact assessment to recreation and tourism viewscape and settings, Section 3.6.8. Appendix I contains additional analysis of the LSZs, scenic resources, and representative key observation points and viewer experiences that would be affected by Proposed Action and alternatives. Visual simulations of the No Action Alternative and Proposed Action alternative are provided in the COP VIA, Appendix Q1 (Sunrise Wind 2022) and Appendix I, Attachment I-3 of this DEIS.

Table 3.6.9-11. Potential Adverse and Beneficial Impact Level Definitions

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
SLIA		
Major	SLIA: The project would introduce features that would have dominant levels of visual prominence within the geographic area of an ocean/seascape/landscape character unit. The project would introduce a visual character that is inconsistent with the character of the unit, which may have a major negative effect to the unit's features, elements, or key qualities. The concern for change (susceptibility/value) to the character unit is high.	N/A
Moderate	SLIA: The project would introduce features that would have medium to large levels of visual prominence within the geographic area of an ocean/seascape/landscape character unit. The project would introduce a visual character that is inconsistent with the character of the unit, which may have a moderate negative effect to the unit's features, elements, or the key qualities. In areas affected by large magnitudes of change, the unit's features, elements or key qualities have low susceptibility and/ or value.	N/A
Minor	SLIA: The project would introduce features that may have noticeable low to medium levels of visual prominence within the geographic area of an ocean/ seascape/ landscape character unit. The project features may introduce a visual character that is somewhat inconsistent with the character of the unit, It may have minor to medium negative effects to the unit's features, elements, or key qualities, but the unit's features, elements, or key qualities have low susceptibility or value.	N/A
Negligible	SLIA: Very little or no effect on seascape/landscape unit character, features, elements, or key qualities because unit lacks distinctive character, features, elements, or key qualities; values for these are low; and/or Project visibility is minimal.	N/A
VIA		
Major	VIA: The visibility of the project would introduce a major level of character change to the view; would attract, hold, and dominate the viewer's attention; and have a moderate to major effect on the viewer's visual experience. The viewer receptor sensitivity/susceptibility/value is medium to high. If the magnitude of change to the view's character is medium, but the susceptibility or value at the KOP is high, and, then evaluate the nature of the sensitivity to determine if elevating the impact to major is justified. If the susceptibility and value at the KOP is low in an area where the magnitude of change is large, then evaluate the nature of the sensitivity to determine if lowering the impact to moderate is justified.	N/A
Moderate	VIA: The visibility of the project would introduce a moderate to large level of change to the view's character; may have a moderate to large levels of visual prominence that attracts and holds but may or may not dominate the viewer's attention; and	N/A

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
	has a moderate effect on the viewer's visual experience. The viewer receptor sensitivity/susceptibility/value is medium to low. Moderate impacts are typically associated with medium viewer receptor sensitivity (combination of susceptibility/value) in areas where the view's character has medium levels of change; or low viewer receptor sensitivity (combination of susceptibility/value) in areas where the view's character has large changes to the character. If the value, susceptibility, and viewer concern for change is high, then evaluate the nature of the sensitivity to determine if elevating the impact to the next level is justified.	
Minor	VIA: The visibility of the project would introduce a small but noticeable to medium level of change to the view's character; have a low to medium level of visual prominence that attracts but may or may not hold the viewer's attention; and have a small to medium effect on the viewer's experience. The viewer receptor sensitivity/susceptibility/value is low. If the value, susceptibility, and viewer concern for change is medium or high, then evaluate the nature of the sensitivity to determine if elevating the impact to the next level is justified. For instance, a KOP with a low magnitude of change, but has a high level of viewer concern (combination of susceptibility/value) may justify adjusting to a moderate level of impact.	N/A
Negligible	VIA: Very little or no effect on viewers' visual experience because view value is low, viewers are relatively insensitive to view changes, or Project visibility is minimal.	N/A

3.6.9.3 Impacts of Alternative A - No Action on Visual Resources

When analyzing the impacts of the No Action Alternative on visual resources, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities on the baseline conditions for visual resources. 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 E, *Planned Activities Scenario*.

3.6.9.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for scenic and visual resources described in Section 3.6.9, Affected Environment, would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities. Onshore development and construction activities and offshore vessel traffic are ongoing activities in the GAA that could have impacts on scenic and visual resources. They would potentially contribute to impacts on scenic and visual resources through new structures, traffic congestion, and nighttime lighting. Impacts associated with non-offshore ongoing activities could be short-term or permanent in nature.

Ongoing offshore wind activities within the GAA that contribute to impacts on scenic and visual resources include:

- Continued O&M of the Block Island project (5 WTGs) installed in State waters
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island project and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect scenic and visual resources through the primary IPFs of presence of structures, nighttime lighting, and traffic congestion. Ongoing offshore wind activities would have the same type of impacts from land disturbance, port utilization, accidental releases, traffic, lighting, and presence of structures that are described in detail below for planned offshore wind activities, but the impacts would be of lower intensity.

3.6.9.3.2 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 Proposed Action).

Planned offshore activities, excluding offshore wind, within the GAA that contribute to seascape, open ocean, landscape, and viewers include activities related to undersea transmission lines, gas pipelines, submarine cables, tidal energy projects, marine minerals use and ocean-dredged material disposal, military use, marine transportation, fisheries use and management, global climate change and oil and gas activities (see Appendix E for further description of planned activities in the GAA). These planned activities could potentially impact seascape character, ocean character, landscape character, and viewer experience through the presence of new or additional structures, light, land disturbance, vessel and vehicle traffic, air emissions, and accidental releases to the landscape or seascape.

The sections below summarize the potential impacts of planned offshore wind activities on scenic and visual resources during construction, O&M, and decommissioning of the projects. BOEM anticipates future offshore wind activities to affect scenic and visual resources through the following primary IPFs.

Presence of structures: Without the proposed action, future offshore wind development would result in the addition of structures, including but not limited to WTGs, OCS-DC, and onshore development of interconnecting facilities. Under this alternative, proposed or anticipated future wind facility projects would consist of up to 3,618 WTGs, associated OSS, and associated onshore structures in the visual GAA. The presence of the WTGs and OSS from ten planned offshore wind projects would contribute to adverse impacts to scenic and visual resources. The impact on visual components of onshore structures would be dependent upon their location, including the existing development and zoning of the area. Impacts would be limited if onshore structures were constructed in areas that are already industrial in nature and used for commercial or industrial purposes. The degree of visual significance of these in-water structures would depend upon the perceivable contrast, dominance, and scale of structures along the ocean horizon and the distance of the viewer. Future offshore wind activities would result in adverse impacts to visual and scenic resources, as the presence of WTGs and OSS would influence the seascape character, ocean character, landscape character, and viewer experience. Projects located within 12 miles (19.3 km) of viewing areas would have the most significant visual impacts, and those located further away from viewing areas would have less significant impacts. A recent study undertaken by NYSERDA suggest that wind energy projects of a typical magnitude, which for this study was considered to be 100 8-MW WTGs, would have minimal visual effects beyond a distance of 20 mi (32.2 km) and negligible effects beyond 25 mi (40.2 km) (EDR 2017). Theses distances assume open views with ideal viewing conditions for atmospheric haze, cloud cover, and human visual acuity. The changes in visual and scenic characteristics would result in long-term, adverse impacts to scenic and visual resources.

Light: Under the No Action Alternative, anticipated construction would involve seven offshore wind farm projects in the visual GAA. Construction activities associated with these developments would result in lighting from construction vessels and equipment. Lighting could be used in nighttime, dusk, and early morning construction activities and could be visual from onshore and offshore locations. Under the maximum case scenario, seven offshore wind projects (without the Proposed Action) could have nighttime lighting associated with construction activities in the visual GAA. These impacts would be short-term, periodic, and localized. Nighttime lighting of vessels could also occur during O&M of future offshore wind developments. This could have long-term, periodic minor to major adverse impacts on visual and scenic resources, as the seascape character, ocean character, nighttime viewer experience, and valued scenery would be influenced.

Future offshore wind development would require permanent lighting from aviation warning lighting on the in-water structures. Depending upon location of the viewer, distance from the structure, angle of the structure, and atmospheric conditions, the impacts from warning lighting would range from long-term minor to long-term major adverse impacts. Lighting would be visible from beaches and coastlines within the visual GAA. Up to 3,618 structures would be equipped with FAA hazard lighting systems during O&M activities.

An important factor that influences the impacts from lighting is whether the future offshore developments would implement Aircraft Detection Lighting Systems (ADLS) to activate the hazard lighting system in response to the presence of nearby aircraft. If ADLS is implemented, lighting would be activated for shorter periods of time and would be anticipated to result in shorter duration of adverse impacts to visual and scenic resources. A recent study was completed to understand the duration of timing that ADLS lighting would be activated if implemented (Atlantic Shores 2021). Results found that if implemented, ADLS lighting would occur for less than 11 hours per year for 880- or 890-foot-tall (268m or 271m) WTGs, compared to standard, continuous FAA hazard lighting. If implemented, it is anticipated that the reduced timing of lighting would result in less than 1 percent of the normal operating time that would occur if ADLS is not implemented. ADLS is implemented when aircraft enter the light activation volume, which is defined as a three-dimensional volume of airspace or coverage area, around the obstructions within a 3 nautical mile perimeter around the edge of the Project, and a minimum of 1,000 ft (304.8 m) above the highest part of the obstructions in the Project, however actual light activation volume will vary depending on the ADLS (Atlantic Shores 2021).

Traffic (vessel): Future offshore wind projects would result in increased vessel traffic, predominantly during construction and decommissioning activities, but increased traffic would also be present to a lesser extent during O&M activities. Activities would be concentrated along routes from the future offshore wind construction areas and ports used to support the construction, O&M, and decommissioning activities. The exact vessel traffic associated with each future project is not known but would be expected to be similar to that of the Proposed Action, which is projected to use up to 69 different vessels over the course of the project, but not all vessels would be operating simultaneously (COP Section 4.8.1.2; Sunrise Wind 2022). During construction activities of future offshore wind development, increased vessel traffic could affect visual and scenic resources by changing the daytime and nighttime seascape and ocean character to an active waterway with an increased presence of stationary and moving vessels. Vessel activity and impacts to visual and scenic resources during decommissioning would be anticipated to be similar to those described for construction.

O&M activities for future offshore wind development would result in impacts to visual and scenic resources from vessel activity being visible from both onshore and offshore viewing areas. During O&M of future offshore wind projects, vessel traffic would result in long-term, periodic contrasts in the viewer experience of valued scenery and to seascape and ocean character.

Land disturbance: Future projects would require onshore infrastructure to be installed, including onshore export cables, onshore substations, and transmission infrastructure. The installation of these facilities would result in localized, short-term, visual impacts near construction sites. Construction activities would affect visual and scenic resources because of land disturbance, potential vegetation clearing, grading, or trenching, construction staging, and construction laydown areas. These impacts would be minor and short-term, as they would last through construction activities and when measures are taken to restore sites. Project O&M may require some land disturbance to occur. The significance of impacts to visual and scenic resources from land disturbance would be dependent upon the location, scenic features, and expected viewer experience. It would be anticipated that proposed offshore wind projects would have short-term, localized impacts to scenic and visual resources during construction, O&M, and decommissioning activities.

Port utilization: Future offshore wind projects would require ports to be utilized for staging and construction activities, O&M activities, and decommissioning activities. The vast majority of regional ports that are suitable for activities related to construction of offshore wind projects are industrial in nature. Additional activity occurring at the ports could influence visual and scenic resources. However, activities would be occurring in current, marine industrial areas at existing ports, and would therefore, not significantly change scenic and visual resources (BOEM 2016). Overall, port utilization of future offshore wind projects would not be expected to have adverse impacts on visual and scenic resources.

Accidental releases: During construction, O&M, and decommissioning activities associated with future offshore wind projects, accidental releases are possible. Accidental releases could influence nearby seascape character, ocean character, landscape character, and viewers through the accidental release of fuel, trash, debris, or suspended sediments. Visual and scenic resources could be impacted if accidental releases result in the short-term closure of beaches or other recreational areas that would limit viewer experiences. Accidental releases would be more likely to occur during construction and decommissioning activities but would be short-term impacts. Potential impacts from accidental releases during O&M would be continuous, but less likely to occur.

3.6.9.3.3 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative scenic and visual resources would continue to be affected by current regional trends and would change in response to other ongoing activities. Ongoing activities would continue to have both short-term and long-term impacts on seascape character, ocean character, landscape character, and viewer experience through the presence of structures, lighting, vessel traffic, land disturbance, and accidental releases. Ongoing O&M of the Block Island project and construction of the Vineyard Wind 1 project and South Fork project would have impacts on a viewer's experience, as they change the expected environment and contrasts to the previous seascape, landscape, and open ocean environments. The No Action Alternative would result in **minor** to **moderate** impacts on scenic and visual resources.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities would continue and scenic and visual resources would continue to be affected by the relevant IPFs. Planned activities would contribute to impacts on scenic and visual resources due to short-term and long-term impacts on seascape character, ocean character, landscape character and viewer experience. The development of future offshore wind projects under the No Action Alternative would anticipate the installation of seven current and future offshore wind projects within the visual GAA. This would result in changes to the surrounding marine environment as the undeveloped ocean character is changed to an industrial wind farm environment. Impacts to seascape, open ocean, landscape, and viewer experience would be short-term and long-term. IPFs that would contribute to these impacts include the presence of structures, lighting, vessel traffic, accidental releases, and land disturbance.

The planned activities evaluated under the cumulative impacts of the No Action Alternative would result in up to 1,294 WTGs would be present, changing the visual character of the ocean character, which could have adverse impacts on the viewer experience. Activities related to construction, O&M, and decommissioning of future offshore wind projects could have impacts on a viewer's experience, as they would result in changes in the expected environment and contrasts to the previous seascape, landscape, and open ocean environments that did not have the IPFs from future offshore wind development present

The cumulative impacts of the No Action Alternative would result in **major** impacts on visual and scenic resources within the GAA due to the presence of new structures, nighttime lighting, land disturbance, and increased traffic.

3.6.9.4 Relevant Design Parameters and Potential Variances in Impacts

This Draft EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than those described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of impacts on scenic and visual resources:

- The Project layout, including the number, size, and placement of the WTGs and OSS.
- The design of lighting systems for structures including the implementation of ADLS lighting systems.
- The number and type of vessels involved in construction, O&M, and decommissioning.
- The time of day and time of year that construction, O&M, and decommissioning occur.

- The onshore cable export route options.
- The size and location of onshore substations.

Variability of the proposed Project design exists as outlined in Appendix C. Below is a summary of potential variances in impacts:

- The number, size, location, and lighting of the WTGs. The visual impacts from onshore KOPs would increase with the presence of more WTGs and larger turbine size. The design and type of WTG lighting would affect nighttime visibility of WTGs from onshore and offshore viewing locations. Implementation of ADLS technology would reduce visual impacts.
- The time of day that construction, O&M, and decommissioning activities occur. Activities are anticipated to occur outside of the busy summer tourist season.
- The location and size of onshore Project components could have varying impacts depending on the current land use and zoning of the project facilities. If Project facilities are located in closer proximity to sensitive receptors, then they would have greater impacts.

3.6.9.5 Impacts of Alternative B - Proposed Action on Visual Resources

This section addresses the impacts associated with the construction, O&M, and conceptual decommissioning of the Proposed Action on seascape character, open ocean character, landscape character, and viewer experience in the visual GAA. The impact level is considered in with the context to the sensitivity of the view receptor and the magnitude of the impact. The magnitude of the impact considers the noticeable features; distance and field of view (FOV) effects; view framing and intervening foregrounds; and the form, line, color, and texture contrasts, scale of change, and prominence in the characteristic seascape, open ocean, and landscape. The impact from the presence of structures can vary due to the variability in visual contrast from changing sun angles, atmospheric conditions, orientation of viewers within the KOPs and the orientation of the KOP to the project.

The degree of adverse effects is determined by the following criteria:

- The Proposed Action's susceptibility to change of baseline seascape, open ocean, and landscape characters.
- The characteristics, contrasts, scale of change, prominence, and spatial interaction with the special qualities.
- The duration/reversibility of the change to scenic and visual resources.
- The sensitivities and locations of viewers.
- The primary use and use level of the resource.
- The intervisibility between viewer locations and the Proposed Action's features.

Viewers or visual receptors within the Proposed Action's zone of theoretical visibility include:

- Residents living in coastal communities or individual residences.
- Tourists visiting, staying in, or traveling through the area.

- Recreational users of the seascape, including those using ocean beaches and tidal areas.
- Recreational users of the open ocean, including those involved in yachting, fishing, boating, and passage on ships.
- Recreational users of the landscape, including those using landward beaches, nature preserves, parks, cycle routes, and footpaths.
- Tourists, workers, visitors, or local people using transport routes.
- People working in the marine environment, such as those on fishing vessels and crews of ships.

The seascape, open ocean, and landscape character units, and potential level of impact would be affected by sensitivity of the seascape, open ocean, and landscape and noticeable elements, distances, and contrasting elements of the proposed Project. Table 3.6.9-12 considers the potential level of impact of the proposed Project by seascape character unit, open ocean character unit, and landscape character unit.

Table 3.6.9-12. Proposed Action Impact on Seascape Character, Open Ocean Character, Landscape Character (SLIA)

Level of Impact	Character Units	Characteristics
Major	OCA	Open Ocean Areas
	SCA	Ocean shoreline areas; seascapes with national, state or local designations; beaches, seaward boardwalks, jetties, and piers
	LCA	Ocean shoreline areas; beaches, seaward boardwalks, jetties, and piers
Moderate	SCA	Beachfront and Jetty/Seawall, Boardwalk Coastal Dune, and Island Community
	LCA	Beachfront and Jetty/Seawall, Boardwalk Coastal Dune, and Island Community
Minor	LCA	Bays, sounds, and adjoining estuaries and shores
Negligible	LCA	Inland areas beyond the viewsheds of the Project's offshore and onshore facilities

KOPs 1 through 40 (Table 3.6.9-10) are representative of sensitive receptors and their vicinities in the shoreward seascape and landscape parts of the visual GAA. Visual simulations of the No Action Alternative and Proposed Action alternative are provided in the COP Appendix Q1 (Sunrise Wind 2022) and Appendix I, Attachment I-3 of this DEIS. Table 3.6.9-13 provides a summary of the potential viewer experience based on assessment of the KOP visualizations.

For each KOP, various sensitivity and magnitude factors were considered in evaluating the potential visual impact of the WTGs based on assessment of the KOP visualizations (Attachment I-3) according to BOEM's methodology provided in "*Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Developments on the Outer Continental Shelf of the United States (BOEM 2021).* Sensitivity Factors considered included: susceptibility and sensitivity of the landscape to change (i.e., distinctiveness, development patterns, landform, ocean view), and perceived value and user sensitivity associated with the KOP (i.e., anticipated visitor expectations, viewer elevation, duration of viewing experience, scenic resource value and use level). Magnitude Factors considered included: size and scale (i.e., distance to the nearest turbine, extent the WTG was viewable, and visibility threshold), geographic extent (i.e., vertical and horizontal scale of the WTGs in relation to the viewscape), and duration/reversibility (i.e., long term permanence of the WTG structures and ability to reverse or remove feature). Attachment I-4, Table I-4.3 provides a summary of the VIA KOP assessment parameters and considerations for the Sensitivity Factors and Magnitude Factors.

These evaluations were then collectively considered and assessed via BOEM's matrices for combining sensitivity components, magnitude components, and for identifying impact levels (BOEM 2021). Section 1.3 provides the results of this assessment and Attachment 1-4.1 provides summaries of key characteristics of the KOPs (location, view types, visually sensitive resources, KOP location landscape similarity zone), and Table I-4.2 provides a summary of additional KOP features, including distance from viewing location to nearest WTG, extent that WTG is visible (full tower, platform or partial), horizontal and vertical field of view, and rating factors (sensitivity, magnitude and visibility) for each KOP. Appendix I provides additional information regarding the methodology and assessment of potential effects on seascape, open ocean, landscape character areas, and the representative KOPs and viewers of offshore wind development considering the No-Action and the Proposed Action Alternatives.

Table 3.6.9-13. Proposed Action Summary of Potential Impact on Viewer Experience (VIA)

Level of Impact	KOP Information Appendix I, Attachment I-3 Page No. of KOP Cover Sheet	Key Observation Point ID and Name	Description of Key Contributing Factors for Impact Level Characterization
Major	41	MV05 Moshup Beach	The visibility of the project would introduce a major level of character change to the view; would attract, hold, and dominate the viewer's attention; and have a moderate to major effect on the viewer's visual experience. The viewer receptor sensitivity/susceptibility/value is medium to high. Panoramic ocean views, scenic resource value, high resident/visitor use area, high viewer sensitivity, high visibility threshold range, high susceptibility to change, backlighting increases visibility particularly at sunrise/sunset conditions
	46	MV07-SS Aquinnah Overlook - sunset	
	46	MV07 Aquinnah Overlook -day	
	46	MV07-NI Aquinnah Overlook -night	
	58	MV09-SS Gay Head Lighthouse - sunset	
	119	BI04-SR Southeast Lighthouse - sunrise	
Moderate	9	CI01 Cuttyhunk Island	The visibility of the project would introduce a moderate to large level of change to the view's character; may have a moderate to large levels of visual prominence that attracts and holds but may or may not dominate the viewer's attention; and has a moderate effect on the viewer's visual experience. The viewer receptor sensitivity/susceptibility/value is medium to
	28	MV02 Philbin Beach	
	35	MV03 Lucy Vincent Beach	
	35	MV03-SS Lucy Vincent Beach-sunset	
	58	MV09 Gay Head Lighthouse	

Level of Impact	KOP Information Appendix I, Attachment I-3 Page No. of KOP Cover Sheet	Key Observation Point ID and Name	Description of Key Contributing Factors for Impact Level Characterization
	70	MV12 Peaked Hill Reservation	low. Panoramic ocean views, moderate residential/visitor use, high to medium viewer sensitivity, moderate visibility threshold range, area of natural or cultural significance, backlighting increases visibility particularly at sunrise/sunset conditions, nighttime lighting increases visibility
	70	MV12-SS Peaked Hill-sunset	
	76	MV13 Edwin D Vanderhoop	
	83	NL01 Nomans Land Island - sunset	
	119	BI04 Southeast Lighthouse - day	
	119	BI04-NI Southeast Lighthouse-night	
	125	BI06 New Shoreham Beach	
	131	BI12 Clayhead Trail	
	136	BI16 Mohegan Bluffs	
	150	RI03 Point Judith Lighthouse	
Minor	4	LI04 Montauk Point State Park	The visibility of the project would introduce a small but noticeable to medium level of change to the view's character; have a low to medium level of visual prominence that attracts but may or may not hold the viewer's attention; and have a small to medium effect on the viewer's experience. The viewer receptor sensitivity/susceptibility/value is low. Ocean views, residential/visitor use, high to medium viewer sensitivity, lower magnitude and visibility threshold, backlighting/lighting may increase visibility particularly at sunrise/sunset, nighttime lighting increases visibility.
	4	LI04-N Montauk Point State Park - night	
	14	MM01 Gooseberry Island	
	64	MV10 South Beach State Park	
	67	MV11 Wasque Point	
	86	AI01-NI Brenton Point State Park - night	
	93	AI03 Newport Cliff Walk	
	98	AI05 Sachuest Point National Wildlife Refuge	
	128	BI08 Fred Benson Beach	
	155	RI04 South Shore Beach	
	163	RI08 Scarborough Beach	
	173	RI11 Matunuck Beach	
Negligible	1	LI01 Camp Hero State Park Overlook	Very little or no effect on viewers' visual experience because view value is low, viewers are relatively insensitive to view changes, or Project visibility is minimal. Medium viewer sensitivity, low magnitude and visibility threshold.
	19	MM04 Nobska Lighthouse	
	22	MM06 Demarest Lloyd State Park	
	46	MM07 Fort Taber District	
	79	NI10 Madaket Beach	

Level of Impact	KOP Information Appendix I, Attachment I-3 Page No. of KOP Cover Sheet	Key Observation Point ID and Name	Description of Key Contributing Factors for Impact Level Characterization
	79	NI10-CL Madaket Beach-clear	
	86	AI01 Brenton Point State Park	
	103	AI06 Sachuest Beach (Second)	
	108	AI07 Hanging Rock	
	113	AI09 Easton's Beach	
	116	BI02 Great Salt Pond	
	139	C01 Beavertail Lighthouse	
	144	RI01 Watch Hill Lighthouse	
	147	RI02 Weekapaug Breachway	
	160	RI06 Trustom Pond NWR	
	168	RI09 Narragansett Beach	
	176	RI12 Ninigret National Wildlife Refuge	

Visual simulations associated with the SRWF were assessed to illustrate potential cumulative visual impacts associated with other planned offshore wind Projects in the GAA (EDR 2021), as summarized Appendix I. With the Proposed Action, up to 3,618 WTGs would be present in the visual GAA, which would result in changes to the surrounding marine environment and the change of an undeveloped ocean character to an industrial wind farm environment. Reasonably foreseeable impacts an occur from individually minor but collectively significant actions that take place over time. Due to this, planned activities, described in Appendix E, have the potential to contribute to reasonably foreseeable impacts when combined with the Proposed Action and other alternatives over the specified spatial and temporal scales. Impacts to seascape, open ocean, landscape, and viewer experience would be short-term and long-term. This would result in major cumulative impacts on visual and scenic resources within the GAA due to the presence of new structures, nighttime lighting, land disturbance, and increased vessel traffic. Appendix I, Attachment I-5 provides selected Key Observation Points cumulative assessment visual simulations (EDR 2021).

3.6.9.5.1 Construction and Installation

3.6.9.5.1.1 Onshore Activities and Facilities

Presence of structures: Onshore construction activities for the Proposed Action has a landfall location at Smith Point County Park in Brookhaven, New York. Construction at the landing site would lead to short-term disturbances to neighboring land uses and have structures present during construction activities. Onshore construction and installation would result in the incremental additions of an O&M facility, an interconnection facility, and distribution cable. There would be visual impacts to users sensitive to changes in the view from construction impacts, including in the adjacent Otis Pike Wilderness Area and areas where the user would anticipate seeing undisturbed visual resources. The landfall construction area would change the scenic viewpoints of the Smith Point County Park Beach during construction activities, impacting users in this area and in adjacent areas where landfall construction activities are visible. The effects to onshore visual resources would be limited to the window in which the construction activities are occurring and visible to those recreating in the vicinity of the viewshed. Effects would be expected to be limited and short-term.

During onshore construction activities of the SRWF project facilities, the main visible elements would be related to site preparation, duct bank installation, cable installation, cable jointing, final testing, and site restoration. To help minimize impacts, sites would be mainly screened by existing vegetation and structure. Therefore, it is expected that impacts would be short-term and minor to scenic and visual resources during onshore construction activities.

Lighting: Onshore construction activities would have general yard lighting present, which would affect the visual and scenic resources of the visual GAA. Lighting would be minimal at night. Construction activities are planned to occur primarily in daytime hours, however, if nighttime construction needed to occur, there would be additional lighting uses. Lighting for construction activities at dawn, dusk, and during the nighttime would have impacts to dark skies in the undeveloped Otis Pike Wilderness Area, adjacent to the proposed landfall site. Users located in this area would experience artificial lighting that could negatively influence their viewer experience Sunrise Wind would follow state and local requirements for lighting otherwise and follow the five principles for responsible outdoor lighting recommended by Illuminating Engineering Society and International Dark-Sky Association to limit visual impact (COP Section 3.3.1; Sunrise Wind 2022; NPS 2022). Impacts to scenic and visual resources from lighting during onshore construction activities should be short-term and minor to negligible.

Land disturbance: Onshore construction activities would connect the SRWEC to onshore facilities at Smith Point County Park on Fire Island in the town of Brookhaven, New York. The SRWEC would land at the landfall location via HDD methodology and would have minimal visual impact on Smith Point County Park (COP Section 3.3.3.3; Sunrise Wind 2022). Sunrise Wind proposes to implement the APM that construction activities, to the extent possible, would occur during the period when fewer recreational use occurs at Smith Point County Park (November 12 to March 31), which would help reduce the potential magnitude of visual resource impacts. However, visitors utilize the Fire Island National Seashore and Otis Pike Wilderness Area year-round, resulting in those who are in the area during the offseason of recreation activities experiencing changes in the scenic resources in the area. Once construction activities are completed, short-term laydown areas would be restored to their previous condition.

The Onshore Transmission Cable route would be sited, to the extent possible, within existing disturbed ROWs and would be located underground. Construction activities would involve site preparation, trench excavation, duct bank and vault installation, cable jointing, final testing, and restoration, resulting in temporary impacts. Impacts would be short-term and negligible to minor to scenic and visual resources.

3.6.9.5.1.2 Offshore Activities and Facilities

Presence of structures: During construction activities, construction vessels would be present in the visual GAA. Additionally, in varying stages of construction, the WTGs and OCS-DC would be visible in the viewshed. The presence of these structures would result in short-term, limited, adverse impacts on visual resources in the visual GAA.

Lighting: If construction activities occur during nighttime, evening, or early morning hours, visual resources would be impacted from nighttime vessel and barge lighting. The impact from vessel lighting would be dependent upon the quantity of vessels, distance from the viewpoint, and intensity of lighting being utilized. Lighting would be visible from some onshore viewpoints and could result in skyglow from a previously dark seascape. Impacts from vessel lighting during construction activities would be adverse but would be short-term, localized and negligible to minor.

Traffic (vessel): Construction activities associated with the Proposed Action would result in increased vessel traffic. The impacts would occur primarily along routes between ports and the construction area of the Proposed Action. Marine vessel traffic is common along coastal shores of the Atlantic Ocean and increased traffic from construction activities would not be expected to result in a significant increase in the number of vessels using waterways and commercial shipping lanes in the vicinity of the Proposed Action. It would be anticipated that the majority of the vessels used would be similar in size to existing commercial vessels, resulting in minimal visual impacts from vessel traffic. Some larger vessels, such as barges, would result in greater visual impacts as they may draw additional viewer attention. Increased vessel traffic would result in short-term, localized, minor adverse impacts to visual resources.

Land disturbance: Construction of the Proposed Action would require the installation of onshore export cables, onshore substations, and transmission infrastructure to connect to the electrical grid. Visual resources would have short-term, localized impacts where land disturbance would occur due to construction activities, including trenching, clearing, site grading, vegetation clearing, and construction staging activities. After the completion of construction activities, land would be restored to the extent possible. This would result in short-term, negligible impacts to visual resources.

Accidental release: Under the Proposed Action, accidental releases could occur during offshore construction activities. Accidental releases could influence nearby seascape character, ocean character, landscape character, and viewers through the accidental release of fuel, trash, debris, or suspended sediments. Visual and scenic resources could be impacted if accidental releases result in the short-term closure of beaches or other recreational areas that would limit viewer experiences. Impacts from accidental releases during construction activities would be short-term, localized, and minor.

3.6.9.5.2 Operations and Maintenance

3.6.9.5.2.1 Onshore Activities and Facilities

Presence of structures: Impacts to scenic and visual resources from the O&M activities of the Proposed Action from the presence of structure would be dependent upon the character of the surrounding landscape and area. The OnCS-DC would be located within the vicinity of other similar uses, including an existing substation. Onshore infrastructure would be in areas where the existing character is commercial and industrialized. Therefore, the presence of structure during O&M activities should have negligible adverse impacts to visual and scenic resources.

Lighting: Facility lighting would be required for the safe and secure operation of the OnCS-DC during routine O&M activities. The proposed location of the OnCS-DC is in a developed site that is currently occupied by various commercial industries and existing light sources, highway traffic, and visual distractions (COP, Section 4.5.1.2; Sunrise Wind 2022). Impacts from this lighting to visual resources would be expected to be localized and negligible, as it would not change the character of the area due to the current developed nature of the area. It would be expected that visual effects from facility lighting of onshore structures during O&M would be minimal.

Land disturbance: Under the Proposed Action, O&M activities would not significantly change the existing landscape character. Project facilities, to the extent possible, would be sited within existing disturbed ROW. The Onshore Transmission Cable route would be located underground. Other facilities would be located in areas that are currently used for commercial and industrial uses. Therefore, impacts from land disturbance associated with O&M of onshore facilities of the Proposed Action would be negligible.

3.6.9.5.2.2 Offshore Activities and Facilities

Presence of structures: The Proposed Action would result in the installation of 94 11-MW WTGs within 102 potential positions extending up to 787 feet (240 m) AMSL and one OCS-DC with up to 361 feet (110.0 m) total structure height from LAT, including lighting protection and ancillary structures within the Lease Area. As an APM, Sunrise Wind proposes to paint the WTGs a light grey (RAL 7035) to pure white (RAL 9010). By using these colors, the WTGs would not require daytime lighting or further turbine marking for daytime conspicuity, helping to minimize impacts to scenic and visual resources.

The presence of offshore structures in the visual GAA would affect the character of the seascape, open ocean, landscape character, and viewer experience. The magnitude of impact is defined by the noticeable features; distance and FOV effects; view framing and intervening foregrounds; and the form, line, color, and texture contrasts, scale of change, and prominence in the characteristic seascape, open ocean and landscape. Appendix Q1 in the COP V2 April 2022 (Sunrise Wind 2022) presents visual simulations from each of the 40 KOPs considered in this analysis. The effects analyses involved consideration of susceptibility/sensitivity to change, value/user sensitivity, magnitude factor, geographic extent, duration/reversibility. These analyses included consideration of different atmospheric conditions, different times of day, variability of viewer location within the KOP vicinity, and nighttime visibility.

Appendix I in this Draft EIS provides additional analyses of the Proposed Action from the KOPs, and provides an assessment of the Proposed Action’s noticeable elements, distance effects, FOV effects, foreground elements and influence, and contrast rating effects by seashore character unit, landscape character unit, and offshore and onshore KOPs.

The presence of WTGs and the OSC-DC would affect the visual and scenic resources during O&M due to its noticeable elements changing the seascape character units, ocean character unit, landscape character units, and viewer experiences. These impacts at specific locations would be dependent upon the character of the viewer location, applicable distance, open view versus intervening foregrounds, and form, line, color, and texture contrasts in the characteristic seascape, open ocean, and landscape. Higher impacts occur at locations where viewers expect to experience an undisturbed landscape, sensitivity of location, sensitivity of viewer, distance from the structures, and meteorological conditions. Table 3.6.9-12 considers all of these factors for the totality of the Proposed Action's level of impact by seascape character unit, ocean character unit, landscape character unit, and offshore and onshore KOPs.

O&M activities of the Proposed Action would result in result in the installation of 94 11-MW WTGs within 102 potential wind turbine positions and one OCS-DC present that would alter the seascape character, ocean character, landscape character, and viewer experience. These changes would be long term and would result in major impacts to scenic and visual resources.

Lighting: O&M activities from the Proposed Action could result in nighttime vessel lighting if activities are undertaken during nighttime, evening, or early morning hours. Dependent upon the quantity of vessels, intensity of lighting, and distance from the viewer, lighting could be visible from some areas of shore. Impacts to visual resources from vessel lighting would be intermittent and long-term during O&M activities.

The Proposed Action would result in the installation of 94 11-MW WTGs within 102 potential wind turbine positions and one OCS-DC within the Lease Area. The WTGs would be painted a light grey (RAL 7035) to pure white (RAL 9010) to eliminate the need for daytime lighting (COP Section 4.5.1.2; Sunrise Wind 2022). Nighttime lighting would be necessary on these structures. Under the Proposed Action, as an APM, Sunrise Wind would install ADLS or related means on WTGs to limit visual impacts pursuant to approval by the FAA and BOEM (COP Section 4.5.1.2; Sunrise Wind 2022). The installation of ADLS would result in shorter-duration impacts from lighting to visual resources, as lighting would only be activated in response to detection of the presence of nearby aircraft. This would lessen impacts to the sea scape, open ocean, landscape, and viewers in comparison to other nighttime lighting alternatives because it would result in the lights being turned on for shorter periods of time. When the lights are on, it would result in a major impact within the range of the viewer, but when the lights are off there would be no impact from them. The impacts from lighting would also be dependent on the viewer location, the atmospheric conditions, and distance from the lighting source. . Impacts to visual resources from lighting would be short-term and intermittent in nature but could result in some onshore resources experiencing visual impacts when lighting is in use. The impact to visual resources would be dependent upon the distance from the SRWF, presence of existing onshore and offshore light sources, meteorological conditions, and angle of view. Impacts from lighting would range from negligible to major long-term effects to visual resources.

Traffic (vessel): O&M activities associated with the Proposed Action would result in increases in vessel traffic that could contribute to adverse impacts to visual resources within the visual GAA. Marine traffic associated with O&M of the Proposed Action would be expected to be less frequent than during construction activities. Within the SRWF ZVI, there are relatively frequent trips undertaken by vessels (COP Section 4.5.1.2; Sunrise Wind 2022). Impacts to visual resources from vessel traffic would be long term but would be minor.

Accidental release: Under the Proposed Action, accidental releases could occur during O&M activities. Accidental releases could influence nearby seascape character, ocean character, landscape character, and viewers through the accidental release of fuel, trash, debris, or suspended sediments. Visual and scenic resources could be impacted if accidental releases result in the short-term closure of beaches or other recreational areas that would limit viewer experiences. Impacts from accidental releases during O&M activities would be short-term, localized, and minor.

3.6.9.5.3 Conceptual Decommissioning

3.6.9.5.3.1 Onshore Activities and Facilities

Conceptual decommissioning activities to onshore facilities would have similar minor to moderate adverse impacts to scenic and visual resources as described under construction activities.

3.6.9.5.3.2 Offshore Activities and Facilities

Conceptual decommissioning activities to offshore facilities would have similar minor to major adverse impacts to scenic and visual resources as described under construction activities.

3.6.9.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned offshore wind activities. Ongoing and planned non-offshore wind activities related to onshore development and construction activities and offshore vessel traffic would contribute to impacts on scenic and visual resources through the primary IPFs of lighting, presence of structures, traffic, land disturbance, port utilization and accidental releases. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of lighting, presence of structures, traffic, land disturbance, port utilization, and accidental releases. Short-term and permanent changes to the seascape character units, ocean character units, landscape character units, and viewer experience would be impacted. The impacts would be dependent upon the Project's features, applicable distances, horizontal and vertical FOV extents, view framing, form, line, color, texture and contrasts, scale of change, and prominence. The cumulative impacts on scenic and visual resources would be **negligible** to **major** adverse. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a detectable increment to the presence of structures, lighting, traffic, land disturbance, increased vessel traffic, port utilization, and accidental releases.

3.6.9.5.5 Conclusions

Impacts of the Proposed Action

Under the Proposed Action, the seascape character units, ocean character unit, landscape character units, and viewer experience would be impacted from construction, O&M, and decommissioning activities. These impacts would be dependent upon the Project's features, applicable distances, horizontal and vertical FOV extents, view framing, form, line, color, texture and contrasts, scale of change, and prominence. The Proposed Action would have **major** adverse impacts on scenic and visual resources on the ocean character unit. These impacts would result from the presence of WTGs and the OCS-DC and from associated nighttime lighting changing the character of the open ocean landscape. The presence of offshore WTGs and OCS-DC would result in **moderate** to **major** adverse impacts to the seascape character and landscape character. Onshore scenic and visual resources would have short-term **minor** to **moderate** adverse impacts during construction and decommissioning activities that would result in changes to the resources. Onshore structures would be located either underground or in previously developed areas, which would result in **negligible** impacts during O&M activities. Under the Proposed Action, impacts of the SRWF to scenic and visual resources would be **negligible** to **major** adverse.

Cumulative Impacts of the Proposed Action

BOEM anticipates that the cumulative impacts on scenic and visual resources in the GAA would be **negligible** to **major** adverse. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a detectable increment to the presence of structures, lighting, traffic, land disturbance, port utilization, and accidental releases. The Proposed Action would contribute to the cumulative impacts through changes in seascape character units, ocean character units, landscape character units, and viewer experience.

3.6.9.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Alternative C-1 was developed to potentially reduce impacts to fisheries habitat within the Lease Area by removing 8 WTGs from Priority Areas 1, 2, 3, and/or 4. Under Alternative C, the 11-MW WTGs and OCS-DC would occur within the range of design parameters outlined in the COP.

3.6.9.6.1 Construction and Installation

3.6.9.6.1.1 Onshore Activities and Facilities

Impacts of Alternative C-1 to scenic and visual resources during construction activities would be similar to those described under the Proposed Action.

3.6.9.6.1.2 Offshore Activities and Facilities

Impacts of Alternative C-1 to scenic and visual resources during construction activities would be similar to those described under the Proposed Action.

3.6.9.6.2 Operations and Maintenance

Impacts of Alternative C-1 to scenic and visual resources from vessel traffic, accidental releases, and land disturbance would be anticipated to be similar to those described under the Proposed Action. However, there are anticipated differences in impacts from presence of structures and lighting. These impacts are discussed below.

3.6.9.6.2.1 Onshore Activities and Facilities

Impacts of Alternative C-1 to scenic and visual resources from O&M activities of onshore facilities would be similar to those described under the Proposed Action.

3.6.9.6.2.2 Offshore Activities and Facilities

Under Alternative C-1, 8 11-MW WTG positions would be removed from Priority Areas 1, 2, 3, and/or 4. Under Alternative C-1, the same number of WTGs, 94 11-MW WTGs would be installed, the same as under the Proposed Action. The different locations of the WTGs and associated lighting could have increased visibility from different KOPs. Viewers located closer to the eastern side of the Lease Area would have slightly greater impacts to visual and scenic resources, as WTGs would be closer to those coastal communities. These negligible changes in distance would be unnoticeable to the casual viewer at this distance, and would not have noticeable differences in form, line, color, or texture contrasts to seascape unit character, open ocean unit character, landscape unit character, or onshore or offshore viewer experience as compared to the Proposed Action.

3.6.9.6.3 Conceptual Decommissioning

3.6.9.6.3.1 Onshore Activities and Facilities

Impacts of Alternative C-1 to scenic and visual during decommissioning activities would be similar to those described under the Proposed Action.

3.6.9.6.3.2 Offshore Activities and Facilities

Impacts of Alternative C-1 to scenic and visual during decommissioning activities would be similar to those described under the Proposed Action.

3.6.9.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts on scenic and visual resources would be **negligible** to **major** adverse because the seascape character unit, ocean character unit, landscape character unit, and viewer experience would be impacted through the primary IPFs of lighting, presence of structures, traffic, land disturbance, port utilization, and accidental releases. In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts would be similar to those described under the Proposed Action.

3.6.9.6.5 Conclusions

Impacts of Alternative C-1

Under Alternative C-1, the seascape character units, ocean character unit, landscape character units, and viewer experience would have similar **negligible** to **major** adverse impacts to those of the Proposed Action. The negligible changes in distance of the WTGs relocation would be unnoticeable to the casual viewer and impacts to scenic and visual resources would be similar.

Cumulative Impacts of Alternative C-1

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on scenic and visual resources would be detectable. However, the differences in impacts among the Proposed Action and Alternative C-1 would be negligible. BOEM anticipates that the cumulative impacts of Alternative C-1 would be **negligible** to **major** adverse.

3.6.9.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of 12 WTG Positions to the Eastern Side of the Lease Area

Alternative C-2 was developed to potentially reduce impacts to fisheries habitat within the Lease Area by removing 8 WTGs from Priority Areas 1, 2, 3, and/or 4 and relocating 12 WTGs to currently unoccupied positions along the eastern side of the Lease Area. Under Alternative C-2, the 11-MW WTGs and OCS-DC would occur within the range of design parameters outlined in the COP.

3.6.9.7.1 Construction and Installation

3.6.9.7.1.1 Onshore Activities and Facilities

Impacts of Alternative C-2 to scenic and visual resources during construction activities would be similar to those described under the Proposed Action.

3.6.9.7.1.2 Offshore Activities and Facilities

Impacts of Alternative C-2 to scenic and visual resources from vessel traffic, accidental releases, and land disturbance would be anticipated to be similar to those described under the Proposed Action. However, there are anticipated differences in impacts from presence of structures and lighting. These impacts are discussed below.

3.6.9.7.2 Operations and Maintenance

3.6.9.7.2.1 Onshore Activities and Facilities

Impacts of Alternative C-2 to scenic and visual resources from O&M activities of onshore facilities would be similar to those described under the Proposed Action.

3.6.9.7.2.2 Offshore Activities and Facilities

Under Alternative C-2, 20 11-MW WTGs would be removed from Priority Areas 1, 2, 3, and/or 4 (8 removed and 12 relocated). The 12 WTGs would be relocated to currently unoccupied positions along the eastern side of the Lease Area. Under Alternative C-2, the same number of WTGs, 94 11-MW WTGs would be installed, the same as under the Proposed Action. The different locations of the WTGs and associated lighting could have increased visibility from different KOPs. Viewers located closer to the eastern side of the Lease Area would have slightly greater impacts to visual and scenic resources, as WTGs would be closer to those coastal communities. For those shoreline viewers northeast of the Lease Area, the distance to the nearest WTG would decrease under Alternative C-2 when compared to the Proposed Action. Coastal communities located north, and northwest of the Lease Area could have slightly less impacts to scenic and visual resources, as the WTGs would be located farther away from those coastal communities. These negligible changes in distance would be unnoticeable to the casual viewer at this distance, and would not have noticeable differences in form, line, color, or texture contrasts to seascape unit character, open ocean unit character, landscape unit character, or onshore or offshore viewer experience as compared to the Proposed Action.

3.6.9.7.3 Conceptual Decommissioning

3.6.9.7.3.1 Onshore Activities and Facilities

Impacts of Alternative C-2 to scenic and visual during decommissioning activities would be similar to those described under the Proposed Action.

3.6.9.7.3.2 Offshore Activities and Facilities

Under Alternative C-2, the seascape character units, open ocean character unit, landscape character units, and viewer experience would have similar negligible to major adverse impacts to those of the Proposed Action. The negligible chances in distance of the WTGs would be unnoticeable to the casual viewer at the distance and impacts to scenic and visual resources would be similar.

3.6.9.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts on scenic and visual resources would be **negligible** to **major** adverse because the seascape character unit, ocean character unit, landscape character unit, and viewer experience would be impacted through the primary IPFs of lighting, presence of structures, traffic, land disturbance, port utilization, and accidental releases. In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 to the cumulative impacts would be similar to those described under the Proposed Action.

3.6.9.7.5 Conclusions

Impacts of Alternative C-2

Under Alternative C-2, the seascape character units, ocean character unit, landscape character units, and viewer experience would have similar negligible to major adverse impacts to those of the Proposed Action. The negligible changes in distance of the WTGs relocation would be unnoticeable to the casual viewer and impacts to scenic and visual resources would be similar.

Cumulative Impacts of Alternative C-2

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 to the cumulative impacts on scenic and visual resources would be detectable. However, the differences in impacts among the Proposed Action and Alternative C-2 would be negligible. BOEM anticipates that the cumulative impacts of Alternative C-2 would be **negligible** to **major** adverse.

3.6.9.8 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, and C-2 would have the same overall negligible to major adverse impacts on scenic and visual resources. Table 3.6.9-14 provides an overall summary of alternative impacts.

Table 3.6.9-14. Comparison of Alternative Impacts on Scenic and Visual Resources Impacts

Resource	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C1)	Fisheries Habitat Minimization (Alternative C2)
Scenic and Visual Resources	*Proposed Action*: Under the Proposed Action, impacts of the SRWF to scenic and visual resources would be **negligible** to **major** adverse. The presence of offshore WTGs and OCS-DC would result in **moderate** to **major** adverse impacts to the seascape character and landscape character. Onshore structures would be located either underground or in previously developed areas, which would result in **negligible** impacts during O&M activities. *Cumulative Impacts of the Proposed Action:* BOEM anticipates that the cumulative impacts on scenic and visual resources in the GAA would be **negligible** to **major** adverse. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a detectable increment to the presence of structures, lighting, traffic, land disturbance, port utilization, and accidental releases. The Proposed Action would contribute to the cumulative impacts through changes in seascape character units, ocean character units, landscape character units, and viewer experience.	*Alternative C-1*: Under Alternative C-1, the seascape character units, ocean character unit, landscape character units, and viewer experience would have similar **negligible** to **major** adverse impacts to those of the Proposed Action. The negligible chances in distance of the WTGs would be unnoticeable to the casual viewer at the distance and impacts to scenic and visual resources would be similar. *Cumulative Impacts of Alternative C-1*: In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on scenic and visual resources would be detectable. However, the differences in impacts among the Proposed Action and Alternative C-1 would be negligible. BOEM anticipates that the cumulative impacts of Alternative C-1 would be **negligible** to **major** adverse.	*Alternative C-2*: Under Alternative C-2, the seascape character units, ocean character unit, landscape character units, and viewer experience would have similar **negligible** to **major** adverse impacts to those of the Proposed Action. The negligible chances in distance of the WTGs would be unnoticeable to the casual viewer at the distance and impacts to scenic and visual resources would be similar. *Cumulative Impacts of Alternative C-2*: In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 to the cumulative impacts on scenic and visual resources would be detectable. However, the differences in impacts among the Proposed Action and Alternative C-2 would be negligible. BOEM anticipates that the cumulative impacts of Alternative C-2 would be **negligible** to **major** adverse.

3.6.9.9 Proposed Mitigation Measures

Appendix H details the proposed mitigation and monitoring measures for the Project. Table H-1 includes the mitigation measures proposed by Sunrise Wind (APMs) that are assessed as part of the Proposed Action. BOEM-proposed mitigation and monitoring measures are included in Table H-2; however for scenic and visual resources, there are no measures currently proposed by BOEM. These measures may change as a result of comments on this Draft EIS. Implementing one or more proposed mitigation and monitoring measure could reduce overall impacts to scenic and visual resources.

Chapter 4

Other Required Impact Analyses

4.0 OTHER REQUIRED IMPACT ANALYSES

4.1 Unavoidable Adverse Impacts of the Proposed Action

Table 4.1-1. summarizes unavoidable adverse impacts for each analyzed resource, subject to applicable mitigation and monitoring (refer to Appendix H). However, it does not include potential additional mitigation measures that could avoid or further minimize or mitigate Project impacts. Please see the individual resource discussions in Chapter 3 for detailed analyses.

Table 4.1-1. Potential Unavoidable Adverse Impacts of the Proposed Action

Resource Area	Potential, Unavoidable Adverse Impact of the Proposed Action
Air quality	Impacts from emissions from engines associated with vessel traffic, construction activities, and equipment operation.
Water quality	Increase in erosion, turbidity and sediment resuspension, and inadvertent spills during construction and installation, O&M, and conceptual decommissioning.
Bats	Displacement and avoidance behavior due to habitat loss and alteration, equipment noise, and vessel traffic. Individual mortality due to collisions with operating WTGs.
Benthic habitat	Habitat quality impacts including reduction in habitat as a result of seafloor surface alterations. Conversion of soft-bottom habitat to new hard-bottom habitat.
Birds	Displacement and avoidance behavior due to habitat loss and alteration, equipment noise, and vessel traffic. Individual mortality due to collisions with operating WTGs.
Coastal habitats and fauna	Displacement and avoidance behavior from habitat loss and alteration and from equipment noise. Individual mortality from collisions with vehicles or construction equipment. Short-term habitat alteration and increased invasive species risk.
Finfish, invertebrate, and Essential Fish Habitat	Increase in suspended sediments and resulting effects due to seafloor disturbance. Displacement, disturbance, and avoidance behavior due to habitat loss and alteration, equipment noise, vessel traffic, increased turbidity, sediment deposition, and electromagnetic fields. Individual mortality due to construction and installation, O&M, and conceptual decommissioning.

Resource Area	Potential, Unavoidable Adverse Impact of the Proposed Action
Marine mammals	Displacement, disturbance, and avoidance behavior due to habitat loss and alteration, equipment noise, vessel traffic, increased turbidity, and sediment deposition during construction and installation and O&M. short-term loss of acoustic habitat and increased potential for vessel strikes.
Sea turtles	Disturbance, displacement, and avoidance behavior due to habitat loss and alteration, equipment noise, vessel traffic, increased turbidity, sediment deposition, and electromagnetic fields.
Wetlands and other WOTUS	Increase in soil erosion, sedimentation, and discharges and releases from land disturbance during construction and installation, O&M, and conceptual decommissioning.
Commercial fisheries and for-hire recreation fishing	Disruption to access or short-term restriction in port access or harvesting activities due to construction of offshore Project elements. Disruption to harvesting activities during operations of offshore wind facility. Changes in vessel transit and fishing operation patterns. Changes in risk of gear entanglement or target species.
Cultural resources	Impacts to unidentified or undefined submerged marine resources from Project construction and installation and O&M. Impacts to terrestrial cultural resources and to the viewshed from Project construction, installation, and O&M.
Demographics, employment, and economics	No unavoidable adverse impacts.
Environmental justice	Changes to air quality, water quality, land use and coastal infrastructure, and commercial fisheries used for for-hire recreational fishing that are disproportionately borne by minority or low-income populations from Project construction and installation, O&M, and conceptual decommissioning.
Land use and coastal infrastructure	Land use disturbance due to construction as well as effects due to noise, vibration, and travel delays.
Navigation and vessel traffic	Changes in vessel transit patterns.
Other marine uses	Changes in access to marine mineral resources, and cable placement. Disruption of scientific surveys, radar systems, military, and aviation traffic.

Resource Area	Potential, Unavoidable Adverse Impact of the Proposed Action
Recreation and tourism	Disruption of coastal recreation activities during onshore construction, such as beach access. Viewshed effects from the WTGs altering enjoyment of marine and coastal recreation and tourism activities. Disruption to access or short-term restriction of in-water recreational activities from construction of offshore Project elements. Hindrances to some types of recreational fishing from the WTGs during operation.
Visual resources	Change in scenic quality of landscape and seascape.

4.2 Irreversible and Irretrievable Commitment of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time, such as the short-term loss of timber productivity in forested areas that are kept clear for a power line or a road. Table 4.2-1 summarizes irreversible or irretrievable effects for each analyzed resource, subject to applicable mitigation measures. Table 4.2-1 does not include potential additional mitigation measures that could avoid or further minimize or mitigate Project impacts. Chapter 3 provides a detailed discussion of effects associated with the Project.

Table 4.2-1. Irreversible and Irretrievable Commitment of Resources by Resource Area

Resource Area	Irreversible Impacts	Irretrievable Impacts	Explanation
Air quality	No	No	BOEM expects air emissions to be compliant with permits regulating air quality standards, and emissions would be short-term during construction activities. If the Proposed Action displaces fossil-fuel energy generation, overall improvement of air quality would be expected.
Water quality	No	No	BOEM does not expect activities to cause loss of major impacts on existing inland waterbodies or wetlands. Turbidity and other water quality impacts in the marine and coastal environment would be short-term, with the rare exception of a major spill.
Bats	No	No	Based on the healthy populations of bat species, bats are more susceptible to collision with operating WTGs, and assuming implementation of time-of-year restrictions for tree clearing, displacement, avoidance behavior, and individual mortality due to collisions with operating WTGs are not expected to be irreversible or irretrievable.
Benthic habitat	No	No	Although local mortality of benthic fauna and habitat alteration could occur, BOEM does not anticipate population-level impacts. The Project could alter habitat during construction and operations but could restore the habitat after conceptual decommissioning.
Birds	No	No	Based on the healthy populations of bird species more susceptible to collision with operating WTGs, displacement, avoidance behavior, and individual mortality due to collisions with operating WTGs are not expected to be irreversible or irretrievable. Irreversible and irretrievable impacts on bird species could occur if one or more individuals of species listed under the Endangered Species Act (ESA) were injured or killed. However, ongoing consultation with the United States Fish and Wildlife Service (USFWS) would identify mitigation measures that would reduce or eliminate the potential for such impacts on listed species.
Coastal Habitat and Fauna	No	No	Although local mortality could occur, BOEM does not anticipate population-level impacts on other coastal fauna. The Project could alter habitat during construction and operations but could restore the habitat after conceptual decommissioning.
Finfish, Invertebrates and Essential Fish Habitat	No	No	Although local mortality of finfish and invertebrates could occur, and habitat alteration and loss of submerged aquatic vegetation (SAV) habitat could occur, BOEM does not anticipate population-level impacts on finfish, invertebrates, or essential fish habitat (EFH). It is expected that the aquatic habitat for finfish and invertebrates would recover following decommissioning activities.
Marine mammals	No	Yes	Irreversible impacts on marine mammals could occur if one or more individuals of species listed under the ESA were injured or killed; however, mitigation measures would reduce or eliminate the potential for such impacts on listed species. Irretrievable impacts could occur if individuals or populations grow more slowly as a result of displacement from the Lease Area.

Resource Area	Irreversible Impacts	Irretrievable Impacts	Explanation
Sea turtles	No	Yes	Irreversible impacts on sea turtles could occur if one or more individuals of species listed under the ESA were injured or killed; however, mitigation measures would reduce or eliminate the potential for impacts on listed species. Irretrievable impacts could occur if individuals or populations grown more slowly as a result of displacement from the Lease Area.
Wetlands and other Waters of the United States (WOTUS)	No	No	BOEM does not expect activities to cause loss of or major impacts on existing wetlands or other WOTUS.
Commercial fisheries and for-hire recreation fishing	No	Yes	Based on the anticipated duration of construction, installation, and O&M, BOEM does not anticipate impacts on commercial fisheries to result in irreversible impacts. The Project could alter habitat during construction or reduce vessel maneuverability during operations. However, the conceptual decommissioning of the Project would reverse those impacts. Irretrievable impacts could occur due to the loss of use of fishing areas at an individual level.
Cultural resources	Yes	Yes	Although unlikely, unanticipated removal or disturbance of previously unidentified cultural resources onshore and offshore could result in irreversible or irretrievable impacts.
Demographics, employment, and economics	No	No	Based on the anticipated duration of construction. Installation, and O&M, BOEM does not anticipate that contractor needs, housing needs, and supply requirements would lead to an irretrievable loss of workers for other projects or increase housing and supply costs.
Environmental justice	No	No	Potential EJ impacts, if any, would be short term and localized.
Land use and coastal infrastructure	Yes	Yes	Land use required for construction and operation activities, such as the land proposed for the interconnection facility, could result in a minor irreversible impact. Construction activities could result in a minor irretrievable impact due to the short-term loss of use of the land for otherwise typical activities. Onshore facilities may or may not be decommissioned.
Navigation and vessel traffic	No	Yes	Based on the anticipated duration of construction, installation, and O&M, BOEM does not anticipate impacts on vessel traffic to result in irreversible impacts. Irretrievable impacts could occur due to changes in transit routes, which could be less efficient during the life of the Project.
Other marine uses	No	No	Disruption of offshore scientific research and surveys would occur during proposed Project construction, operations, and decommissioning activities.
Recreation and tourism	No	No	Construction activities near the shore could result in a minor to moderate, short-term loss of use of the land for recreation and tourism purposes, but these impacts would not be irreversible or irretrievable.
Visual resources	No	Yes	Viewshed changes would persist for the life of the Project, until conceptual decommissioning is complete.

4.3 Relationship Between the Short-term Use of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

CEQ's NEPA implementing regulations (40 CFR 1502.16) require that an EIS address the relationship between short-term use of the environment and the potential impacts of such use on the maintenance and enhancement of long-term productivity. Such impacts could occur as a result of a reduction in the flexibility to pursue other options in the future, or assignment of a specific area (land or marine) or resource to a certain use that would not allow other uses, particularly beneficial uses, to occur at a later date. An important consideration when analyzing such effects is whether the short-term environmental effects of the action would result in detrimental effects to long-term productivity of the affected areas or resources.

As assessed in Chapter 3, BOEM anticipates that most of the potential adverse effects associated with the Proposed Action would occur during construction activities and would be short-term and minor to moderate in severity/intensity. Table 4.1-1 and Table 4.2-1 identify unavoidable, irretrievable, or irreversible impacts that would be associated with the Project. However, BOEM expects most of the marine and onshore environments to return to normal long-term productivity levels after Project conceptual decommissioning. Based on the findings, BOEM anticipates that the Proposed Action would not result in impacts that would significantly narrow the range of future uses of the environment.

Additionally, the Project would provide several long-term benefits:

- Promotion of clean and safe development of domestic energy sources and clean energy job creation;
- Promotion of renewable energy to help ensure geopolitical security; combat climate change; and provide electricity that is affordable, reliable, safe, secure, and clean;
- Delivery of power to the New York grid, to contribute to the state's renewable energy requirements; and
- Increased habitat for certain fish species.

U.S. Department of the Interior (USDOI)

The DOI protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors the Nation’s trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

Bureau of Ocean Energy Management (BOEM)

BOEM’s mission is to manage development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.

BOEM
Bureau of Ocean Energy Management