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Mayflower Wind Project Draft Environmental Impact Statement

February 2023

Volume II: Appendices A-H

BOEM
Bureau of Ocean Energy Management

Appendix A: Required Environmental Permits and Consultations

A.1 Required Environmental Permits

Table A-1 includes a summary of federal, state, and local permits or approvals that are required for the Mayflower Wind Project's (Project) implementation.

Table A-1. Required environmental permits and consultations for the proposed Project

Agency/Regulatory Authority	Permit/Approval	Status
Federal (Portions of the Project within Federal Jurisdiction)		
Bureau of Ocean Energy Management (BOEM)	Construction and Operations Plan (COP) Approval	COP filed with BOEM on February 15, 2021. Updates to the COP were submitted on August 30, 2021, October 28, 2021, March 17, 2022, and December 22, 2022.
Department of Defense (DoD)	Informal Project Notification Form	Submitted May 2020
National Marine Fisheries Service (NMFS)	Marine Mammal Protection Act (MMPA) Incidental Take Regulations and Letter of Authorization	Application accepted as complete September 2022
U.S. Army Corps of Engineers (USACE)	Clean Water Act Section 404 and Rivers and Harbors Act Section 10 Individual Permit	Submitted December 2022
U.S. Coast Guard (USCG)	Private Aids to Navigation (PATON) authorization	Planned
USCG	Local Notice to Mariners per Ports and Waterways Safety Act	Planned
U.S. Environmental Protection Agency (USEPA)	Clean Air Act Outer Continental Shelf (OCS) Air Permit	Submitted November 2022
USEPA	National Pollutant Discharge Elimination System General Permit	Submitted October 2022
Federal Aviation Administration	Determination of No Hazard, if required	Planned
Bureau of Safety and Environmental Enforcement (BSEE)	Oil Spill Response Plan	Planned
State (Portions of the Project within State Jurisdiction)		
Massachusetts Executive Office of Energy and Environmental Affairs	Massachusetts Environmental Policy Act (MEPA) Environmental Notification Form (ENF) or Environmental Impact Report (EIR) and Certificate of Secretary of Energy and Environmental Affairs	Falmouth ENF filed November 17, 2021. EIR planned for 2023. Brayton Point ENF filed August 12, 2022. EIR planned for 2023.

Agency/Regulatory Authority	Permit/Approval	Status
Massachusetts Energy Facility Siting Board (MA EFSB)	Siting Petition pursuant to G.L. c. 164, 69J and Certificate of Environmental and Public Need (Section 72 Approval Consolidated with MA EFSB)	Filed November 17, 2021 for Falmouth. Filed May 27, 2022 for Brayton Point.
Massachusetts Department of Public Utilities	Section 72 petition pursuant to G.L. c. 164, 72 and Zoning petition pursuant to G.L. c. 40A, 3	Filed November 17, 2021 for Falmouth. Filed May 27, 2022 for Brayton Point.
Massachusetts Department of Environmental Protection (MassDEP)	Chapter 91 Waterways License/Permit for dredge, fill, or structures in waterways or tidelands	Planned
	Section 401 Water Quality Certification	Planned
Massachusetts Office of Coastal Zone Management	Coastal Zone Management Consistency Determination	Submitted February 15, 2021. Updates provided January 13, 2022.
Massachusetts Department of Transportation	State Highway Access/ Easement/ Right-of-Way Permits	Planned
Massachusetts Historical Commission	Project Notification Form/Field Investigation Permits (980 Code of Massachusetts Regulations 70.00)	Submitted February 14, 2020 for Falmouth and July 26, 2021 for Brayton Point.
	Section 106 Consultation	Initiated October 1, 2021. Notice of Intent (NOI) provided November 1, 2021.
Massachusetts Board of Underwater Archaeological Resources (BUAR)	Section 106 Consultation	Initiated September 29, 2021. NOI provided November 1, 2021.
Massachusetts Fisheries and Wildlife (MassWildlife) – Natural Heritage & Endangered Species Program (NHESP)	Endangered Species Act Checklist and Conservation and Management Permit (if needed) or No-Take Determination	Planned
Rhode Island Coastal Resources Management Council (RICRMC)	Coastal Zone Management Consistency Determination	Filed in 2021. Revised version filed March 16, 2022.
RICRMC	Freshwater Wetlands Permit	Planned
RICRMC	Category B Assent and Submerged Lands License	Planned
Rhode Island Energy Facility Siting Board (RI EFSB)	Certificate of necessity/public utility	Filed May 31, 2022.
Rhode Island Historical Preservation and Heritage Commission (RIHPHC)	Archaeological Permit	Phase 1 permit issued December 17, 2021. Marine Archaeological Resources Assessment submitted March 16, 2022.

Agency/Regulatory Authority	Permit/Approval	Status
RIHPHC	Section 106 Consultation	Initiated September 29, 2022. NOI provided November 1, 2021.
Rhode Island Department of Environment	Water Quality Certification and Dredging Permit	Planned
Rhode Island Department of Environment	Rhode Island Pollution Discharge Elimination System General Permit for Stormwater Discharge Associated with Construction Activity	Planned
Rhode Island Department of Transportation	Utility Permit/Physical Alteration Permit	Planned
Local (Portions of the Project within Local Jurisdiction)		
Cape Cod Commission	Development of Regional Impact Review	Planned
Martha's Vineyard Commission	Development of Regional Impact Review	Planned
Falmouth, Portsmouth, and/or Somerset Planning and Zoning Boards	Local Planning/Zoning Approvals (if needed)	Planned
Falmouth and Somerset Conservation Commissions	Notice of Intent and Order of Conditions (Massachusetts Wetland Protection Act and municipal wetland non-zoning bylaws)	Planned
Edgartown, Oak Bluffs, Tisbury, and Nantucket Conservation Commissions	Notice of Intent and Order of Conditions (Massachusetts Wetlands Protection Act and municipal wetland non-zoning bylaws) for offshore route (if needed as dictated by final offshore route)	Planned
Falmouth, Portsmouth, and Somerset Department of Public Works, Board of Selectmen, and/or Town Council	Street Opening Permits/Grants of Location	Planned

A.2 Consultation and Coordination

A.2.1 Introduction

This section discusses public and agency involvement leading up to the preparation and publication of the Draft Environmental Impact Statement (EIS), including formal consultations, cooperating agency exchanges, the public scoping comment period, and correspondence. This section discusses public involvement in the preparation of this Draft EIS, including BOEM's responses to public comments, formal consultations, and cooperating agency exchanges. Interagency consultation, coordination, and correspondence throughout the development of this Draft EIS occurred primarily through virtual meetings, teleconferences, and written communications (including email). BOEM coordinated with numerous agencies throughout the development of this document, as listed in Section A.2.3.2, *Cooperating Agencies*.

A.2.2 Consultations

A.2.2.1 Coastal Zone Management Act

The Coastal Zone Management Act requires that federal actions within and outside the coastal zone that have reasonably foreseeable effects on any coastal use or natural resource of the coastal zone be consistent with the enforceable policies of a state's federally approved coastal management program. On February 15, 2021, Mayflower Wind submitted a federal consistency certification with the Massachusetts Office of Coastal Zone Management, with a revised version filed by Mayflower Wind on January 13, 2022. Mayflower Wind's COP (Mayflower Wind 2022) provided the necessary data and information under 15 Code of Federal Regulations (CFR) 930.58. The state's concurrence is required before BOEM may approve or approve with conditions the Mayflower Wind COP per 30 CFR 585.628(f) and 15 CFR 930.130(1).

A.2.2.2 Endangered Species Act

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 United States Code [USC] 1531 et seq.), requires that each federal agency ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of those species. When the action of a federal agency may affect a protected species or its critical habitat, that agency is required to consult with either NMFS or U.S. Fish and Wildlife Service (USFWS), depending upon the jurisdiction. Pursuant to 50 CFR 402.07, BOEM has accepted designation as the lead federal agency for the purposes of fulfilling interagency consultation under Section 7 of the ESA for listed species under the jurisdiction of NMFS and USFWS. BOEM will consult on the proposed activities considered in this Draft EIS with both NMFS and USFWS and is preparing Biological Assessments for listed species under their respective jurisdictions.

A.2.2.3 Government-to-Government Tribal Consultation

Executive Order 13175 commits federal agencies to engage in government-to-government consultation with tribal nations when federal actions have tribal implications, and Secretarial Order No. 3317 requires U.S. Department of the Interior agencies to develop and participate in meaningful consultation with federally recognized tribal nations where a tribal implication may arise. A June 29, 2018, memorandum outlines BOEM's current tribal consultation policy (BOEM 2018). This memorandum states that "consultation is a deliberative process that aims to create effective collaboration and informed federal decision-making" and is in keeping with the spirit and intent of the National Historic Preservation Act (NHPA) and National Environmental Policy Act (NEPA), Executive and Secretarial Orders, and U.S. Department of the Interior Policy (BOEM 2018). BOEM implements tribal consultation policies through formal government-to-government consultation, informal dialogue, collaboration, and other engagement.

From September 29 to November 1, 2021, BOEM initiated formal consultation with eight tribal nations under the NHPA and invited them to be NHPA Section 106 consulting parties to the Project through individual letters mailed and emailed to tribal leaders with the Delaware Nation, the Delaware Tribe of Indians, the Mashantucket Pequot Tribal Nation, the Mashpee Wampanoag Tribe, the Mohegan Tribe of Connecticut, the Narragansett Indian Tribe, the Shinnecock Indian Nation, and the Wampanoag Tribe of Gay Head (Aquinnah). Five tribal nations responded that they would like to participate as consulting parties to the Project: the Mashantucket Pequot Tribal Nation, the Mashpee Wampanoag Tribe, the Narragansett Indian Tribe, the Shinnecock Indian Nation, and the Wampanoag Tribe of Gay Head (Aquinnah). The Delaware Tribe of Indians and the Mohegan Tribe of Connecticut did not respond to BOEM's initiation of consultation, however BOEM has included these tribal nations in all consulting party communications and considers them consulting parties.

On October 8, 2021, BOEM sent a Memorandum of Understanding to the Delaware Nation, Delaware Tribe of Indians, the Mashantucket Pequot Tribal Nation, the Mashpee Wampanoag Tribe, the Mohegan Tribe of Connecticut, the Narragansett Indian Tribe, the Shinnecock Indian Nation, and the Wampanoag Tribe of Gay Head (Aquinnah) to establish a cooperating agency relationship with the purpose of preparing an EIS. One tribe, the Delaware Nation, declined the invitation to be a consulting party on October 13, 2021.

On November 2, 2021, BOEM sent another set of letters and emails to tribal leaders notifying them that the NOI to prepare an EIS for the Project was issued that day and noted that the scoping comment period was open until December 2, 2021. The letter also offered a government-to-government consultation meeting to discuss the public scoping information for the Project and to request input regarding alternatives for consideration, the identification of historic properties, potential effects to historic properties, and potential measures to avoid, minimize and/or mitigate impacts on environmental and cultural resources to be analyzed in the EIS. BOEM held a government-to-government meeting with the tribal nations that responded, the Mashantucket Pequot Tribal Nation, the Mashpee Wampanoag Tribe, and the Wampanoag Tribe of Gay Head (Aquinnah), on November 19, 2021. The tribal nations expressed interest in continuing consultation for offshore wind, and emphasized the importance of early consultation in Project development.

On May 2, 2022, BOEM held a government-to-government meeting specifically with the Chairwoman, Tribal Historic Preservation Officer, and council members of the Wampanoag Tribe of Gay Head (Aquinnah). In the meeting, BOEM introduced and discuss the overall renewable energy program and process and summarized details and status of projects off the coast of New England. Topics identified for future discussion included cumulative visual simulations and resource impacts, the transmission process that is part of a lease, decommissioning process and oversight, proposed mitigation plans and agreements, and the Tribal capacity-building initiatives.

On June 1, 2022, BOEM held a government-to-government meeting with the Chairwoman and Council members of the Wampanoag Tribe of Gay Head (Aquinnah). This meeting was a follow up to the May 2, 2022 meeting to continue the collective conversation on various topics and tribal concerns related to offshore wind development off the New England coast.

On June 2, 2022, the BOEM Director met in-person with the Mashpee Wampanoag Tribe to provide the Tribal Council with an overview of the current state of wind farm permitting off the coast of New England, including the Gulf of Maine; discuss and receive feedback on project and regional biological and economic concerns and potential mitigation strategies; discuss and receive feedback on cumulative visual impacts and simulations; discuss and receive feedback on other programmatic topics including transmission as part of a lease and capacity-building initiatives.

A.2.2.4 National Historic Preservation Act

Section 106 of the NHPA (54 USC 306108) and its implementing regulations (36 CFR 800) require federal agencies to consider the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. BOEM has determined that the proposed Project is an undertaking subject to Section 106 review. The construction of wind turbine generators (WTGs) and offshore substation platforms (OSPs), installation of interarray cables, and development of staging areas are ground- or seabed-disturbing activities that may adversely affect archaeological resources. The presence of WTGs may also introduce visual elements out of character with the historic setting of historic structures or landscapes; in cases where historic setting is a contributing element of historic properties' eligibility for the NRHP, the Project may adversely affect those historic properties.

The Section 106 regulations at 36 CFR 800.8 provide 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. This process is commonly known as "NEPA substitution for Section 106" and BOEM is using this process and documentation required for the preparation of this EIS and the Record of Decision to comply with Section 106. Appendix I of this Draft EIS contains BOEM's Determination of Effect for NHPA Section 16 Consultation, which includes a description and summary of BOEM's consultation so far. BOEM will continue consulting with the Massachusetts Historical Commission (the Massachusetts SHPO), the Rhode Island Historical Preservation & Heritage Commission (RIHPHC; the Rhode Island SHPO), and the Massachusetts Board of Underwater Archaeological Resources (BUAR), ACHP, federally recognized tribal nations, and the consulting parties regarding the Finding of Adverse Effect and the resolution of adverse effects. BOEM has and will be conducting Section 106 consultation meeting(s) on the Finding of Adverse Effect and the resolution of adverse effects, and the agency will be requesting the consulting parties to review and comment on the Finding of Adverse Effect and proposed resolution measures.

BOEM fulfilled public involvement requirements for Section 106 of the NHPA through the NEPA public scoping and public meetings process, pursuant to 36 CFR 800.2(d)(3). The Scoping Summary Report (BOEM 2022), available on BOEM's Project-specific website, summarizes comments on historic preservation issues. On September 29, 2021, BOEM initiated consultation with eight federally recognized tribal nations: the Delaware Nation, Delaware Tribe of Indians, Mashantucket Pequot Tribal Nation, Mashpee Wampanoag Tribe, Mohegan Tribe of Connecticut, Narragansett Indian Tribe, Shinnecock Indian Nation, and Wampanoag Tribe of Gay Head (Aquinnah) (Section A.2.2.3, *Government-to-Government Tribal Consultation*). The following five tribal nations notified BOEM of their interest in participating as a consulting party: the Mashantucket Pequot Tribal Nation on October 19, 2021; the Mashpee Wampanoag Tribe on October 6, 2021; the Narragansett Indian Tribe on November 1, 2021; the Shinnecock Indian Nation on February 4, 2022; and the Wampanoag Tribe of Gay Head (Aquinnah) on November 1, 2021. The following two tribal nations did not respond to BOEM's initiation of consultation, however BOEM has included these tribal nations in all consulting party communications and considers them consulting parties: the Delaware Tribe of Indians; and the Mohegan Tribe of Connecticut. One tribe, the Delaware Nation, declined the invitation to be a consulting party on October 13, 2021. BOEM requested information from tribal consulting parties on sites of religious and cultural significance to the tribal nations that the proposed Project could affect, and BOEM offered its assistance in providing additional details and information on the proposed Project to the tribal nations.

From September 29 to October 7, 2021, BOEM corresponded with governments and organizations by mail and email to provide information about the Project and extend an invitation to be a consulting party to the NHPA Section 106 review of the COP. BOEM also used this correspondence to notify of its intention to use the NEPA process for Section 106 purposes, as described in 36 CFR 800.8(c), during its review. On November 1, 2021, BOEM notified consulting parties of its issuance of a NOI to prepare an EIS consistent with NEPA regulations to assess the potential impacts of the Proposed Action and alternatives. On July 7, 2022, BOEM held virtual NHPA Section 106 Consultation Meeting #1. The presentation included a brief Project overview, review of NEPA substitution for the NHPA Section 106 process, overview of Section 106 consultation opportunities for the Project, NHPA Section 110(f) compliance requirements, and a question-and-answer session with discussion. For additional information on Section 106 consultation and coordination, see Appendix I, Section I.2.2.3 *NHPA Section 106 Consultations.* Participants that have accepted consulting party status for the NHPA Section 106 Consultation are listed in Table A-2. During the consultations, additional parties were made known to BOEM and were added as they were identified; these additional parties are included in this list.

Table A-2. Participating consulting parties

Participants in the Section 106 Process	Participating Consulting Parties
SHPOs and state agencies	Massachusetts Board of Underwater Archaeological Resources (BUAR) Massachusetts Historical Commission Rhode Island Historical Preservation & Heritage Commission (RIHPHC)
Federal agencies or facilities	Advisory Council on Historic Preservation (ACHP) BSEE National Park Service (NPS) USACE

Participants in the Section 106 Process	Participating Consulting Parties
Federally recognized tribal nations	Delaware Tribe of Indians Mashantucket Pequot Tribal Nation Mashpee Wampanoag Tribe Mohegan Tribe of Connecticut Narragansett Indian Tribe Shinnecock Indian Nation Wampanoag Tribe of Gay Head (Aquinnah)
Non-federally recognized tribal nations	Chappaquiddick Tribe of Wampanoag Nation
Local governments	Cape Cod Commission City of East Providence, Rhode Island City of New Bedford and New Bedford Port Authority, Massachusetts Falmouth Historical Commission Martha's Vineyard Commission Nantucket Historic District Commission Nantucket Historical Commission Nantucket Planning & Economic Development Commission (represented by Cultural Heritage Partners [CHP]) Town of Aquinnah, Massachusetts Town of Barnstable, Historical Commission, Massachusetts Town of Bristol, Rhode Island Town of Falmouth, Massachusetts Town of Jamestown, Rhode Island Town of Middletown, Rhode Island Town of Nantucket, Massachusetts (represented by CHP) Town of Somerset, Massachusetts, Historical Commission Town of South Kingstown, Rhode Island Town of Swansea, Massachusetts Town of Warren, Rhode Island Town of Westport, Massachusetts
Nongovernmental organizations or groups	Alliance to Protect Nantucket Sound (APNS) Gay Head Lighthouse Advisory Board Nantucket Preservation Trust The Maria Mitchell Association
Lessee	Mayflower Wind Energy LLC

A.2.2.5 Magnuson-Stevens Fishery Conservation and Management Act

Pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), federal agencies are required to consult with NMFS on any action that may result in adverse effects on Essential Fish Habitat (EFH). NMFS regulations implementing the EFH provisions of the MSA can be found at 50 CFR 600. As provided for in 50 CFR 600.920(b), BOEM has accepted designation as the lead agency for the purposes of fulfilling EFH consultation obligations under Section 305(b) of the MSA. Certain OCS activities authorized by BOEM may result in adverse effects on EFH and, therefore, require consultation with NMFS. BOEM developed a draft EFH Assessment concurrent with the Draft EIS and transmitted the draft EFH Assessment to NMFS on October 21, 2022.

A.2.2.6 Marine Mammal Protection Act

Section 101(a) of the MMPA (16 USC 1361) prohibits persons or vessels subject to the jurisdiction of the United States from taking any marine mammal in waters or on lands under the jurisdiction of the United States or on the high seas (16 USC 1372(a)(l), (a)(2)). Sections 101(a)(5)(A) and (D) of the MMPA provide exceptions to the prohibition on take, which give NMFS the authority to authorize the incidental but not intentional take of small numbers of marine mammals, provided certain findings are made and statutory and regulatory procedures are met. Incidental Take Authorizations may be issued as either (1) regulations and associated Letters of Authorization, or (2) an Incidental Harassment Authorization. Letters of Authorizations may be issued for up to a maximum period of 5 years, and Incidental Harassment Authorizations may be issued for a maximum period of 1 year. NMFS has also promulgated regulations to implement the provisions of the MMPA governing the taking and importing of marine mammals (50 CFR 216) and has published application instructions that prescribe the procedures necessary to apply for an Incidental Take Authorization. Applicants seeking to obtain authorization for the incidental take of marine mammals under NMFS' jurisdiction must comply with these regulations and application instructions in addition to the provisions of the MMPA.

Once NMFS determines an application is adequate and complete, NMFS has a corresponding duty to determine whether and how to authorize take of marine mammals incidental to the activities described in the application. To authorize the incidental take of marine mammals, NMFS evaluates the best available scientific information to determine whether the take would have a negligible impact on the affected marine mammal species or stocks and an immitigable impact on their availability for taking for subsistence uses. NMFS must also prescribe the "means of effecting the least practicable adverse impact" on the affected species or stocks and their habitat, and on the availability of those species or stocks for subsistence uses, as well as monitoring and reporting requirements.

Mayflower Wind submitted an application for incidental take regulations and a Letter of Authorization to NMFS on March 18, 2022. The application was reviewed and considered complete on September 19, 2022. NMFS published a Notice of Receipt in the Federal Register on October 17, 2022.

A.2.3 Development of Draft Environmental Impact Statement

This section provides an overview of the development of the Draft EIS, including public scoping, cooperating agency involvement, and distribution of the Draft EIS for public review and comment.

A.2.3.1 Scoping

On November 1, 2021, BOEM issued an NOI to prepare an EIS consistent with NEPA regulations (42 USC 4321 et seq.) to assess the potential impacts of the Proposed Action and alternatives (86 Federal Register 60270). The NOI commenced a public scoping process for identifying issues and potential alternatives for consideration in the EIS. The formal scoping period was from November 1 through December 1, 2021. Three virtual scoping meetings were held on November 10, 15, and 18, 2021. During this timeframe, federal agencies, state and local governments, and the general public had the opportunity to help BOEM identify potential significant resources and issues, impact-producing factors, reasonable alternatives (e.g., size, geographic, seasonal, or other restrictions on construction and siting of facilities and activities), and potential mitigation measures to analyze in the EIS, as well as provide additional information. BOEM also used the NEPA scoping process to initiate the Section 106 consultation process under the NHPA (54 USC 300101 et seq.), as permitted by 36 CFR 800.2(d)(3), which requires federal agencies to assess the effects of projects on historic properties. Additionally, BOEM informed its Section 106 consultation by seeking 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 COP. The NOI requested comments from the public in written form, delivered by mail, or through the regulations.gov web portal. The public could also submit oral comments at the three virtual scoping meetings hosted by BOEM.

A Scoping Summary Report (BOEM 2022) summarizing the submissions received and the methods for analyzing them is available on BOEM's website at https://www.boem.gov/mayflower-wind. In addition, all public scoping submissions received can be viewed online at http://www.regulations.gov by typing "BOEM-2021-0062" in the search field. As detailed in the Scoping Summary Report, the resource areas or NEPA topics most referenced in the scoping comments include NEPA/Public Involvement Process; recreation and tourism; mitigation and monitoring; commercial fisheries and for-hire recreational fishing; birds; demographics, employment and economics; and others.

A.2.3.2 Cooperating Agencies

BOEM invited other federal agencies and state, tribal, and local governments to consider becoming cooperating agencies in the preparation of the Draft EIS. According to Council on Environmental Quality (CEQ) guidelines, qualified agencies and governments are those with "jurisdiction by law or special expertise" (CEQ 1981). BOEM asked potential cooperating agencies to consider their authority and capacity to assume the responsibilities of a cooperating agency, and to be aware that an agency's role in the environmental analysis neither enlarges nor diminishes the final decision-making authority of any other agency involved in the NEPA process. BOEM also asked agencies to consider the "Factors for Determining Cooperating Agency Status" in Attachment 1 to CEQ's January 30, 2002, Memorandum for the Heads of Federal Agencies (CEQ 2002). BOEM held interagency meetings on August 6, 2021, September 23, 2021, January 5, 2022, March 8, 2022, and October 28, 2022, to discuss the environmental review process, schedule, responsibilities, consultation, and potential alternatives.

The following federal agencies and state governments have supported preparation of the Draft EIS as cooperating agencies:

- NMFS
- USACE
- BSEE
- USEPA
- USCG

- Massachusetts Office of Coastal Zone Management
- RICRMC
- New York State Department of State

NMFS is serving as a cooperating agency pursuant to 40 CFR 1501.8 because the scope of the Proposed Action and alternatives involve activities that have the potential to affect marine resources under its jurisdiction by law and special expertise. As applicable, permits and authorizations are issued pursuant to the MMPA, as amended (16 USC 1361 et seq.); the regulations governing the taking and importing of marine mammals (50 CFR 216); the ESA (16 USC 1531 et seq.); and the regulations governing the taking, importing, and exporting of threatened and endangered species (50 CFR 222–226). In accordance with 50 CFR 402, NMFS also serves as the Consulting Agency under Section 7 of the ESA for federal agencies proposing action that may affect marine resources listed as threatened or endangered. NMFS has additional responsibilities to conserve and manage fishery resources of the United States, which include the authority to engage in consultations with other federal agencies pursuant to the MSA and 50 CFR 600 when proposed actions may adversely affect EFH. The MMPA is the only authorization for NMFS that requires NEPA compliance. NMFS intents to adopt BOEM’s Final EIS if, after independent review and analysis, NMFS determines the Final EIS to be sufficient to support the authorization.

USACE is serving as a cooperating agency pursuant to 40 CFR 1501.8 because the scope of the Proposed Action and alternatives involves activities that could affect resources under USACE’s jurisdiction by law and special expertise. As applicable, permits and authorizations are issued pursuant to Sections 10 and 14 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. Section 10 of the Rivers and Harbors Act, approved on March 3, 1899 (33 USC 403), prohibits the unauthorized obstruction or alteration of any navigable water of the United States. The construction of any structure in or over any navigable water of the United States; the excavating from or depositing of material in such waters; or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. The instrument of authorization is designated a permit. The authority of the Secretary of the Army to prevent obstructions to navigation in navigable waters of the United States was extended to artificial islands, installations, and other devices located on the seabed, to the seaward limit of the OCS, by Section 4(f) of the Outer Continental Shelf Lands Act of 1953, as amended (43 USC 1333(e)). Section 14 of the Rivers and Harbors Act (33 USC 408) provides that USACE must grant permission for any temporary occupation or use of any sea wall, bulkhead, jetty, dike, levee, wharf, pier, or other work built by the United States. The purpose of USACE's Section 408 review is to evaluate the applicant’s request and determine whether the proposed alterations would be injurious to the public interest or would impair the usefulness of the proposed Project. This review is needed to ensure that congressionally authorized projects continue to provide their intended benefits to the public. Section 404 of the Clean Water Act (33 USC 1344) authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits, after notice and opportunity for public hearing, for the discharge of dredged or fill material into the waters of the United States at specified disposal sites (33 CFR 323.) The selection and use of disposal sites will be in accordance with guidelines developed by the Administrator of the USEPA in conjunction with the Secretary of the Army and published in 40 CFR 230. If these guidelines prohibit the selection or use of a disposal site, the Chief of Engineers shall consider the economic impact on navigation and anchorage of such a prohibition in reaching their decision. Furthermore, the Administrator can deny, prohibit, restrict, or withdraw the use of any defined area as a disposal site whenever they determine, after notice and opportunity for public hearing and after consultation with the Secretary of the Army, that the discharge of such materials into such areas will have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas, wildlife, or recreational areas (40 CFR 230). Under Section 10 of the Rivers and Harbors Act, activities regulated between the mean high water mark and the 3-nautical-mile limit of the territorial seas may include dredging, cable installation, and cable protection installation. Regulated structures include the cables and the cable protection. Structures regulated under Section 10 on the OCS may include the offshore export cables, WTGs, OSPs, interarray cables, OSP inter-link cables, scour protection, and cable protection. Under Section 404 of the Clean Water Act, USACE regulates the placement of dredged or fill material into waters of the United States. In tidal waters, Section 404 activities are regulated between the high tide line and the 3-nautical-mile mark as measured from the baseline of the territorial seas. The Section 404 fill activities associated with the Project may include the redeposition of dredged material associated with sand wave dredging and cable installation work, the redeposition of dredged material associated with horizontal directional drilling, the placement of cable scour protection, and the installation of any temporary cofferdams. Issuance of Section 10 or Section 404 permits requires NEPA compliance, which will be met via adoption of BOEM's EIS and issuance of the Record of Decision.

BSEE is serving as a cooperating agency pursuant to 40 CFR 1501.8 because the scope of the Proposed Action and alternatives involves activities that could affect marine resources under its jurisdiction by law and special expertise; and safety, compliance, and enforcement issues. Pursuant to a December 2020 Memorandum of Agreement between BOEM and BSEE, BSEE conducts activities, consults, and advises BOEM on safety and environmental enforcement for renewable energy projects.

USEPA is serving as a cooperating agency pursuant to 40 CFR 1501.8 because the scope of the Proposed Action and alternatives involves activities that could affect resources under its jurisdiction by law and special expertise, including air quality and water quality.

USCG is serving as a cooperating agency pursuant to 40 CFR 1501.8 because the scope of the Proposed Action and alternatives involves activities that could affect navigation and safety issues that fall under its jurisdiction by law and special expertise. USCG is the Federal On Scene Coordinator for spills in the Lease Area. USCG encourages coordination with all stakeholders to ensure information regarding worst case discharges and response strategies are incorporated into the Area Contingency Plan.

Massachusetts Office of Coastal Zone Management, RICRMC, and New York State Department of State are serving as cooperating agencies pursuant to 40 CFR 1501.8 because they have special expertise with respect to potential impacts that may occur as a result of the Proposed Action.

A.2.3.3 Distribution of the Draft Environmental Impact Statement for Review and Comment

The Draft EIS is available in electronic format for public viewing at https://www.boem.gov/renewable-energy/state-activities/mayflower-wind. Hard copies and digital copies of the Draft EIS can be requested by contacting the BOEM Program Manager, Office of Renewable Energy in Sterling, Virginia. Publication of the Draft EIS initiates a 45-day comment period where government agencies, members of the public, and interested stakeholders can provide comments and input. BOEM will accept comments in any of the following ways:

- In hard copy form, delivered by mail, enclosed in an envelope labeled "Mayflower Wind COP EIS" and addressed to Program Manager, Office of Renewable Energy, Bureau of Ocean Energy Management, 45600 Woodland Road, Sterling, Virginia 20166.
- Through the regulations.gov web portal by navigating to https://www.regulations.gov/ and searching for docket number "BOEM-2023-0011." Click the "Comment" button to the right of the document link. Enter your information and comment, then click "Submit Comment."
- By attending one of the public meetings on the dates listed in the notice of availability and providing written or verbal comments.

BOEM will use comments received during the public comment period to inform its preparation of the Final EIS, as appropriate. EIS notification lists for the Project are provided in Appendix M, *Distribution List*.

A.3 References Cited

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Appendix B: Supplemental Information and Additional Figures and Tables

B.1 Wetlands

Table B-1 summarizes National Wetland Inventory (NWI) wetland communities in the Massachusetts part of the wetlands geographic analysis area. Table B-2 quantifies the potential wetland impacts based on NWI data for the Falmouth onshore components for the Mayflower Wind Project (Project). These tables are similar to Table 3.5.8-1 and Table 3.5.8-3 in Section 3.5.8, *Wetlands*, respectively, but show NWI data instead of Massachusetts Department of Environmental Protection (MassDEP) wetland data. Note that the NWI GIS data were used for the analysis in Rhode Island in Section 3.5.8, *Wetlands*, including the impacts disclosed for Alternatives C-1 and C-2, so that information is not repeated here.

Table B-1. NWI wetland communities in the Massachusetts part of the geographic analysis area

Wetland Community	Falmouth Onshore Project Area	Percent of Total
Estuarine and Marine Wetland	4,901	34%
Freshwater Emergent Wetland	992	7%
Freshwater Forested/Shrub Wetland	8,600	59%
Total	**14,493**	**100%**

Source: USFWS 2021

Table B-2. NWI wetland impacts in the Falmouth Onshore Project area—Proposed Action

Onshore Project Component	Wetland Community	Impact (acres)	% Relative to Wetlands in GAA	Duration
Falmouth Onshore				
Onshore Export Cable Routes				
Worcester Avenue Route	N/A	0	0	N/A
Shore Street Route Eastern Option	N/A	0	0	N/A
Shore Street Route Western Option	N/A	0	0	N/A
Central Park Route	N/A	0	0	N/A
Lawrence Lynch to Cape Cod Aggregates Route	N/A	0	0	N/A
Paper Road – Thomas B Landers Road Deviation	N/A	0	0	N/A
Onshore Substation Locations				
Lawrence Lynch	N/A	0	0	N/A
Cape Cod Aggregates	N/A	0	0	N/A

Onshore Project Component	Wetland Community	Impact (acres)	% Relative to Wetlands in GAA	Duration
Underground Transmission Route and Point of Interconnection				
Underground Transmission Route from Cape Cod Aggregates to POI	Freshwater Forested/ Shrub Wetland	0.06	<0.1	Long term (> 5 years)
Point of Interconnection (Falmouth Switching Station)	N/A	0	0	N/A

Source: USFWS 2021
Note: The disturbance area used to calculate the potential wetland impact areas from export cables is based on a 40-foot-wide corridor along the cable route, except for the cable route from Cape Cod Aggregates to POI, which is a 100-foot-wide corridor.
GAA = geographic analysis area; N/A = not applicable; POI = point of interconnection

B.1.1 Characteristic Wetland Communities in the Falmouth Onshore Project Area

B.1.1.1 Red Maple Swamp

Red maple (*Acer rubrum*) swamps are the most common forested wetlands in Massachusetts (COP Appendix J, Section 4.1.4.1; Mayflower Wind 2022). Within these wetlands, red maple is the dominant species in the tree stratum. The shrub layer within red maple swamps in Eastern Massachusetts typically includes sweet pepper-bush, highbush blueberry, northern arrow-wood (*Viburnum dentatum*), spicebush, and greenbrier (*Smilax rotundifolia*). Ferns are typically abundant with cinnamon fern (*Osmundastrum cinnamomeum*) being the most common. Other ferns include sensitive fern (*Onoclea sensibilis*), royal fern (*Osmunda regalis*), marsh fern (*Thelypteris palustris*), and spinulose wood fern (*Dryopteris carthusiana*). Skunk cabbage (*Symplocarpus foetidus*) is one of the most common herbaceous species (COP Appendix J, Section 4.1.4.1; Mayflower Wind 2022).

B.1.1.2 Atlantic White Cedar Bog

Atlantic white cedar bogs are semi-forested, acidic, dwarf-shrub wetlands (Natural Heritage and Endangered Species Program [COP Appendix J, Section 4.1.4.1; Mayflower Wind 2022]). Short (6–30 feet [2-10 meters]) Atlantic white cedar (*Chamaecyparis thyoides*) trees dominate the open canopy. An open to nearly continuous, low (3 feet [1 meter]) shrub layer often includes small Atlantic white cedars. Scattered red maple may be present with occasional associates including white and pitch pine, grey birch (*Betula populifolia*), and black spruce (*Picea mariana*). Scattered tall shrubs may be present and include highbush blueberry and swamp azalea. A dense low shrub layer is frequently comprised of leatherleaf, sheep laurel (*Kalmia angustifolia*), black huckleberry, rhodora (*Rhododendron canadense*), and bog rosemary (*Andromeda polifolia var. glaucophylla*). There is typically a well-formed sphagnum moss (*Sphagnum spp*.) layer below the shrubs, and large and small cranberry (*Vaccinium macrocarpon and V. oxycoccos*), sundews (*Drosera* spp.), and pitcher plants (*Sarracenia purpurea*) may be present (COP Appendix J, Section 4.1.4.1; Mayflower Wind 2022).

B.1.1.3 Kettlehole Level Bog

Kettlehole level bogs are unique peatland ecosystems that develop in valley bottoms without inlets or outlets. Species composition in this ecosystem includes sphagnum moss blueberries, leatherleaf (*Chamaedaphne calyculata*), and species of laurel (*Kalmia spp*.). The Natural Heritage and Endangered Species Program identifies this ecosystem as Imperiled (COP Appendix J, Section 4.1.4.1; Mayflower Wind 2022).

B.1.1.4 Shrub Swamp

Shrub swamps are shrub-dominated wetlands and often occur within overhead electric utility rights-of-way as a result of previous tree clearing for installation of the utility and subsequent integrated vegetation management activities that targets removal of tree species while allowing for continued growth and establishment of low-growing species, such as shrubs. The species composition of shrub swamps is highly variable and can include meadowsweet (*Spiraea alba var. latifolia*), steeplebush (*Spirea tomentosa*), swamp azalea, silky dogwood (*Swida amomum*), winterberry (*Ilex verticillata*), sweet gale (*Myrica gale*), and arrowwood. Low-growing, weak-stemmed shrubs include dewberry (*Rubus hispidus*), water-willow (*Decodon verticillatus*), and Canadian burnet (Sanguisorba canadensis). The herbaceous layer often includes common arrowhead (*Sagittaria latifolia*), skunk cabbage, ferns, sedges (*Carex* spp.), bluejoint grass (Calamagrostis canadensis), bur reed (*Sparganium* spp.), virgin's-bower (*Clematis virginiana*), swamp candles (*Lysimachia terrestris*), clearweed (*Pilea pumila*), and turtlehead (*Chelone glabra*). Sphagnum moss is often abundant. Invasive species include reed canary-grass (*Phalaris arundinacea*), glossy buckthorn (Frangula alnus), common buckthorn (*Rhamnus alnifolia*), and purple loosestrife (*Lythrum salicaria*) (COP Appendix J, Section 4.1.4.1; Mayflower Wind 2022).

B.1.1.5 Emergent Marsh

The deep emergent marsh wetland type occurs along rivers, streams, lakes, ponds, and other waterbodies. Water depths are less than 3 feet (1 meter), though some depth of water is usually always present in most years and influences the vegetation present. Often this wetland type is part of a wetland mosaic with shrub swamp and forested wetland bordering the emergent portions of the wetland. Vegetation consists primarily of herbaceous species and graminoids. These often include broad-leaved cattail (*Typha latifolia*), sphagnum moss, wool-grass (*Scirpus cyperinus*), common threesquare (*Schoenoplectus pungens*), bluejoint grass, reed canary-grass, rice cut-grass (*Leersia oryzoides*), tussock-sedge (*Carex stricta*), arrow-leaf tearthumb (*Persicaria sagittata*), beggar-ticks (*Bidens* spp.), bedstraw (*Galium* spp.), common arrowhead, slender-leaved goldenrod (*Euthamia caroliniana*), marsh-fern, marsh St. John's-wort (*Triadenum virginicum*), Joe-Pye-weeds (*Eutrochium* spp.), bonesets (*Eupatorium* spp.), and water-horehound (*Lycopus* spp.). Areas with more permanent open water often support floating-leaved plants like water-lilies (*Nymphaea odorata and Nuphar* spp.). Shrubs can include red osier dogwood (*Swida sericea*), leatherleaf (*Chamaedaphne calyculata*), sweet-gale, meadowsweet, steeplebush, and highbush blueberry; however, shrub cover is sparse (COP Appendix J, Section 4.1.4.1; Mayflower Wind 2022).

B.1.1.6 Highbush Blueberry Thicket

Highbush blueberry thickets are peatlands that host tall shrubs and sometimes small red maple trees. Common species within this ecosystem include the namesake highbush blueberry along with other common blueberry species including swamp azalea (*Rhododendron viscosum*), winterberry (*Ilex verticillata*), and sweet pepperbush (COP Appendix J, Section 4.1.4.1; Mayflower Wind 2022).

B.1.1.7 Vernal pools

Vernal pools are temporary pools or ponds, typically occurring within wetlands, that fill with water in the fall or winter due to rainfall and seasonal high groundwater levels and remain ponded through the spring and into summer. Often vernal pools dry up completely by the middle or end of the summer, or at least every few years, which prevents fish populations from becoming established within the pool. The absence of fish is critical to the reproductive success of many amphibian and invertebrate species that rely exclusively on vernal pools to provide breeding habitat, including wood frog (*Lithobates sylvaticus*), mole salamanders (*Ambystoma* spp.), and fairy shrimp (*Eubranchipus* spp.). For this reason, vernal pools are a unique and sensitive aquatic habitat, and have specific protections under both the Massachusetts Wetlands Protection Act regulations (310 Code of Massachusetts Regulations [CMR] 10.00) and the U.S. Army Corps of Engineers New England District's General Permits for the Commonwealth of Massachusetts for activities subject to Corps jurisdiction in waters of the U.S., including wetlands (COP Appendix J, Section 4.1.4.1; Mayflower Wind 2022).

B.2 Climate and Meteorology

The Atlantic seaboard is classified as a mid-latitude climate zone based upon the Köppen Climate Classification System. The region is characterized by mostly moist subtropical conditions, generally warm and humid in the summer with mild winters. The Massachusetts climate is characterized by frequent and rapid changes in weather, large daily and annual temperature ranges, large variations from year to year, and geographic diversity. During the winter, the main weather feature in the northeastern United States is the northeaster (cold-core extratropical cyclone). During the summer, convective thunderstorms occur frequently. The Atlantic hurricane season runs from June 1 to November 30.

The National Climatic Data Center (NCDC) defines distinct climatological divisions to represent geographic areas that are nearly climatically homogeneous. Locations within the same climatic division are considered to share the same overall climatic features and influences. The site of the Proposed Action is located within the Massachusetts coastal division (NOAA 2021).

B.2.1 Ambient Temperature

According to NCDC data for the Massachusetts coastal division, the average annual temperature is 50.5 degrees Fahrenheit (°F) (10.3 degrees Celsius [°C]), the average winter (December–February) temperature is 31.7°F (-0.2°C) and the average summer (June–August) temperature is 69.6°F (20.9°C), based on data collected from 1987 through 2019. Table B-3 summarizes average temperatures at the individual recording stations within the general area of the proposed Project area. Data for some stations as seen in the table are reflective of different years of weather observations; however, the general pattern shows little difference across the listed locations.

Table B-3. Representative temperature data

Station	Annual Average °F/°C	Annual Maximum °F/°C	Annual Minimum °F/°C
Coastal Division	50.5/10.3	59.2/15.1	41.8/5.4
Nantucket	50.7/10.4	57.6/14.2	43.9/6.6
Martha's Vineyard	51.2/10.7	59.1/15.1	43.2/6.2
Hyannis	51.1/10.6	58.8/14.9	43.4/6.3
Buzzards Bay Buoy	50.4/10.2	N/A	N/A
Nantucket Sound Buoy	52.4/11.3	N/A	N/A

Sources: NOAA 2019a (Coastal Division 2019 data; Nantucket 2019 data; Martha's Vineyard 2019 data; Hyannis 2019 data), NOAA 2019b (Buzzards Bay Buoy 2009-2019 data; Nantucket Sound Buoy 2009-2019 data).
°C = degrees Celsius; °F = degrees Fahrenheit; N/A = not available.

B.2.2 Wind Conditions

Prevailing winds in the middle latitudes over North America flow mostly west to east ("westerlies"). Westerlies within the Lease Area vary in strength, pattern, and directionality. Extreme wind conditions on the U.S. East Coast are influenced by both winter storms and tropical systems. Several northeasters occur each winter season, while hurricanes are rarer but potentially more extreme. The tropical systems, therefore, define the wind farm design, based on extreme wind speeds (those with recurrence periods of 50 years or more).

Table B-4 summarizes wind conditions in the Massachusetts coastal division. This table shows the monthly average wind speeds, monthly average peak wind gusts, and the hourly peak wind gusts for each individual month. Data from 2009 through 2019 show that monthly wind speeds range from a low of 11.97 miles per hour (mph) (19.27 kilometers per hour [km/hr]) in July to a high of 17.02 mph (27.38 km/hr) in January. The monthly wind peak gusts reach a maximum during November at 21.23 mph (34.17 km/hr). The one-hour average wind gusts reach a maximum during October at 64.65 mph (104.04 km/hr).

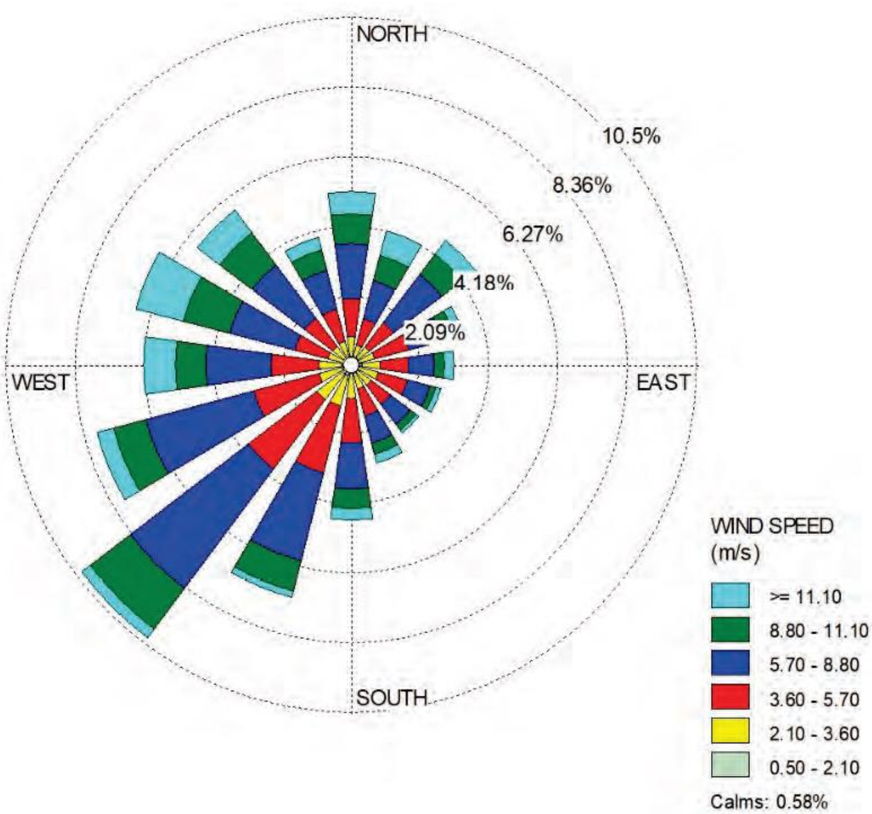
Table B-4. Representative wind speed data for the Massachusetts coastal division

Month	Monthly Average Wind Speed		Monthly Average Peak Gust		Peak One-Hour Average Gust	
	mph	km/hr	mph	km/hr	mph	km/hr
January	17.02	27.38	20.97	33.75	61.29	98.64
February	15.77	25.38	19.35	31.15	63.53	102.24
March	15.91	25.61	19.44	31.29	64.42	103.68
April	14.90	23.97	18.12	29.16	49.21	79.20
May	13.14	21.14	15.89	25.58	58.16	93.60

Month	Monthly Average Wind Speed		Monthly Average Peak Gust		Peak One-Hour Average Gust	
	mph	km/hr	mph	km/hr	mph	km/hr
June	12.31	19.81	14.93	24.03	44.52	71.64
July	11.97	19.27	14.49	23.32	57.04	91.80
August	12.48	20.08	15.14	24.37	59.95	96.48
September	13.92	22.40	17.08	27.48	51.90	83.52
October	16.45	26.48	20.40	32.82	64.65	104.04
November	17.01	27.38	21.23	34.17	57.71	92.88
December	15.99	25.73	19.84	31.93	59.50	95.76

Source: NOAA 2019b (National Data Buoy Center, Nantucket Sound Station 44020, 2009–2019).
km/hr = kilometer per hour; mph = miles per hour.

Throughout the year, wind direction is variable. However, seasonal wind directions are primarily focused from the west/northwest during the winter months (December–February) and from the south/southwest during the summer months (June–August). Figure B-1 shows a 5-year wind rose for Buoy Station 44020 (Nantucket Sound). Wind speeds are in meters per second. Percentages indicate how frequently the wind blows from that direction.



Source: NOAA 2019b.

Figure B-1. 5-year (2015–2019) wind rose for Nantucket Sound

B.2.3 Precipitation and Fog

Data from NCDC show that the annual average precipitation is 49.75 inches (126.37 centimeters) in the Massachusetts coastal division. Table B-5 shows monthly variations in average precipitation, which ranges from a high of 5.59 inches (14.20 centimeters) for October to a low of 3.30 inches (8.38 centimeters) in May.

Snowfall amounts can vary quite drastically within small distances. Data from the Martha's Vineyard Station (KMVY) shows that the annual snowfall average is approximately 23 inches (58.4 centimeters), and the month with the highest snowfall is February, averaging around 8 inches (20.3 centimeters).

Fog is a common occurrence along coastal Massachusetts. Fog is especially dense across the water south of Cape Cod toward the islands of Martha's Vineyard and Nantucket. Fog data were collected from 1997 to 2009 at the BUZM3 meteorological station located in Buzzard's Bay, approximately 25 miles (40 kilometers) from the Project area; and from 2007 to 2009 at the Martha's Vineyard Coastal Observatory (MVCO) meteorological station located 2 miles (3 kilometers) south of Martha's Vineyard (Merrill 2010). The data show that fog is most common in the Project area during the months of June, July, and August, with a typical range of 6 to 11 days per month with at least 1 hour of fog. In the winter, fog is much less frequent, with 3 or fewer days with at least 1 hour of fog.

Table B-5. Representative monthly precipitation data for the Massachusetts coastal division (2009–2019) [a]

Month	Average Precipitation	
	Inches	Centimeters
January	4.04	10.26
February	3.86	9.80
March	4.67	11.85
April	4.14	10.51
May	3.30	8.38
June	4.20	10.67
July	3.72	9.44
August	3.67	9.33
September	3.56	9.03
October	5.59	14.20
November	4.15	10.53
December	4.87	12.36
Annual Average	49.75	126.37

Source: NOAA 2019a.
[a] Precipitation is recorded in melted inches (snow and ice are melted to determine monthly equivalent). Data are representative of the Massachusetts coastal division.

The potential for icing conditions, i.e., atmospheric conditions that can lead to the deposition of ice from the atmosphere onto a structure, was also predicted based on data collected at the BUZM3 tower

(Merrill 2010). Icing is rare when the water temperature is greater than 43°F (6°C), so in most months of the year, and for many days during the winter months, there is no potential for icing to occur. The data show that moderate icing (defined by the Federal Aviation Administration as a rate of accumulation such that short encounters become potentially hazardous) is unlikely to occur more than 1 day per month, while the potential for light icing is above 5 days per month in December, January, and February. Icing would be unlikely to occur at any time from April through October.

B.2.4 Hurricanes and Tropical Storms

During the 160 years for which weather records have been kept, ten hurricanes have made landfall in Massachusetts and five others have passed through the Wind Farm Area without making landfall. The latest hurricane that made a direct landfall was Hurricane Bob in 1991. Out of those ten hurricanes, five ranked as Category 1 on the Saffir-Sampson Scale, two were Category 2 hurricanes, and three were Category 3 hurricanes. Since records have been kept, no Category 4 or 5 hurricanes have made landfall in Massachusetts. Of the hurricanes that passed through the Wind Farm Area without making landfall in Massachusetts, one was Category 2, one was Category 1, and three were tropical storms when they passed through the Wind Farm Area (NOAA 2018). The most recent of these storms was Beryl in 2006. The National Oceanic Atmospheric Administration (NOAA) 2019c defines the winds speeds and typical damage associated with each category of hurricane.

In addition to hurricanes, northeasters may occur several times per year in the fall and winter months. Wind gusts during the strongest northeasters can cause similar damage to a Category 1 hurricane, although northeasters typically are larger and last longer than hurricanes.

B.2.5 Mixing Height

The mixing height is the altitude above ground level to which air pollutants vertically disperse. The mixing height affects air quality because it acts as a lid on the height pollutants can reach. Lower mixing heights can allow less air volume for pollutant dispersion and lead to higher ground-level pollutant concentrations than do higher mixing heights. Table B-6 presents atmospheric mixing height data from the nearest measurement locations to the Project area (Nantucket and Chatham, Massachusetts). As shown in the table, the minimum average mixing height is 389 meters (1,276 feet), while the maximum average mixing height is 1,421 meters (4,662 feet).

Table B-6 Representative seasonal mixing height data

Season	Data Hours Included [a]	Average Mixing Height (meters/feet)	
		Nantucket	Chatham
Winter (December, January, February)	Morning: no-precipitation hours	780/2,559	668/2,192
	Morning: all hours	905/2,969	655/2,149
	Afternoon: no-precipitation hours	791/2,595	774/2,539
	Afternoon: all hours	890/2,920	747/2,451

Season	Data Hours Included [a]	Average Mixing Height (meters/feet)	
		Nantucket	Chatham
Spring (March, April, May)	Morning: no-precipitation hours	588/1,929	681/2,234
	Morning: all hours	734/2,408	664/2,178
	Afternoon: no-precipitation hours	746/2,447	1,218/3,996
	Afternoon: all hours	827/2,713	1,110/3,642
Summer (June, July, August)	Morning: no-precipitation hours	389/1,276	569/1,867
	Morning: all hours	448/1,470	568/1,863
	Afternoon: no-precipitation hours	609/1,998	1,421/4,662
	Afternoon: all hours	667/2,188	1,295/4,249
Fall (September, October, November)	Morning: no-precipitation hours	625/2,051	586/1,923
	Morning: all hours	739/2,425	583/1,913
	Afternoon: no-precipitation hours	765/2,510	1,036/3,399
	Afternoon: all hours	831/2,726	945/3,100
Annual Average	Morning: no-precipitation hours	595/1,952	620/2,034
	Morning: all hours	707/2,320	618/2,028
	Afternoon: no-precipitation hours	727/2,385	1,121/3,678
	Afternoon: all hours	804/2,638	1,028/3,373

Source: USEPA 2021.
[a] Missing values are not included.

B.2.6 Potential General Impacts of Offshore Wind Facilities on Meteorological Conditions

A known impact of offshore wind facilities on meteorological conditions is the wake effect. A wind turbine generator (WTG) extracts energy from the free flow of wind, creating turbulence downstream of the WTG. The resulting “wake effect” is the aggregated influence of the WTGs for the entire wind farm on the available wind resource and the energy production potential of any facility located downstream. Christiansen and Hasager (2005) observed offshore wake effects from existing facilities via satellite with synthetic aperture radar to last anywhere from 1.2 to 12.4 miles (2 to 20 kilometers) depending on ambient wind speed, direction, degree of atmospheric stability and the number of turbines within a facility. During stable atmospheric conditions, these offshore wakes can be longer than 43.5 miles (70 kilometers).

Under certain conditions, offshore wind farms also can affect temperature and moisture downwind of the facilities. For example, from September 2016 to October 2017, a study using aircraft observations accompanied by mesoscale simulations examined the spatial dimensions of micrometeorological impacts from a wind energy facility in the North Sea (Siedersleben et al. 2018). Measurements and associated modeling indicated that measurable redistribution of moisture and heat were possible up to 62 miles (100 kilometers) downwind of the wind farm. However, this occurred only when (a) there was a strong, sustained temperature inversion at or below hub height and (b) wind speeds were greater than approximately 13.4 mph (6 meters/second) (Siedersleben et al. 2018). Typically, air temperature will decrease with height above the sea surface in the lower atmosphere (i.e., the troposphere), and air will freely rise and disperse up to the mixing height (Holzworth 1972; Ramaswamy et al. 2006). A temperature inversion occurs when a warmer overlying air mass causes temperatures to increase with height; a strong inversion inhibits the further rise of cooler surface air masses, thus limiting the mixing height (Ramaswamy et al. 2006). Therefore, the North Sea study suggests that rapidly spinning turbines with hub heights at or above a strong inversion may induce mixing between air masses that would otherwise remain separated, which can significantly affect temperature and humidity downwind of a wind farm.

As shown in Table B-6, the minimum average mixing height in the region is much higher than the height of the top of the proposed WTG rotors (780–1,066 feet [238–325 meters]) or the WTG hubs (419–605 feet [128–184 meters]). Therefore, WTG hub heights are expected to remain well below the typical mixing height and associated temperature inversions over the open ocean in the Project region. Accordingly, the redistribution of moisture and heat due to rotor-induced vertical mixing, and any associated shifts to the microclimate, would be limited to the immediate vicinity of the Project.

B.3 Marine Mammals

There are 38 species of marine mammals within the Northwest Atlantic Outer Continental Shelf (OCS) region and 31 that have been documented or are considered likely to occur in the Project area (Table B-7). Species' federal protection status, occurrence in the geographic analysis area and Project area, critical habitat, population size trends, and mortality data must be considered to understand the potential impacts and their magnitude from the Proposed Action, action alternatives, and the No Action Alternative. The West Indian manatee (*Trichechus manatus*) is considered extralimital and rare and is not expected to occur in the Project area; thus, this species is not considered further. In addition, six species within the toothed whales and dolphins group were considered to have "hypothetical" occurrence and were excluded from the assessment of the Proposed Action (BOEM 2014). For an in-depth discussion of marine mammals in the vicinity of the Project area and the analysis of impacts, refer to Chapter 3, Section 3.5.6, *Marine Mammals*.

Table B-7. Marine mammal species documented or likely to occur in the Project area and their stock information

Species	Scientific Name	Stock	Best Population Estimate [a]	Status under MMPA [b]	Status under ESA	Relative Occurrence in Project Region [c]	Population trend [d]	Reference for Population Data
Baleen Whales (Mysticetes)								
Blue whale	*Balaenoptera musculus*	W. North Atlantic	402 [e]	Strategic	Endangered	Rare	Unavailable	Hays et al. (2020)
Fin whale	*Balaenoptera physalus*	W. North Atlantic	6,802	Strategic	Endangered	Common	Unavailable	Hays et al. (2021)
Humpback whale	*Megaptera novaeangliae*	Gulf of Maine	1,396	Non-Strategic	Not Listed	Common	+2.8%/year	Hays et al. (2021)
Minke whale	*Balaenoptera acutorostrata*	Canadian East Coast	21,968	Non-Strategic	–	Common	Unavailable	(Hays et al. 2021)
North Atlantic right whale	*Eubalaena glacialis*	W. North Atlantic	368	Strategic	Endangered	Common	Decreasing	Hays et al. (2021)
Sei whale	*Balaenoptera borealis*	Nova Scotia	6,292	Strategic	Endangered	Common	Unavailable	Hays et al. (2021)
Toothed Whales (Odontocetes)								
Atlantic spotted dolphin	*Stenella frontalis*	W. North Atlantic	39,921	Non-Strategic	–	Rare	Decreasing	Hays et al. (2020)
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	W. North Atlantic	93,233	Non-Strategic	–	Common	Unavailable	Hays et al. (2020)
Common bottlenose dolphin	*Tursiops truncatus*	W. North Atlantic, Northern Migratory Coastal	6,639	Strategic	–	Common	Decreasing	Hays et al. (2021)
Pantropical spotted dolphin	*Stenella attenuata*	W. North Atlantic	6,593	Non-Strategic	–	Rare	Unavailable	Hays et al. (2020)
Risso's dolphin	*Grampus griseus*	W. North Atlantic	35,215	Non-Strategic	–	Uncommon	Unavailable	Hays et al. (2020)
Short beaked common dolphin	*Delphinus delphis*	W. North Atlantic	172,825	Non-Strategic	–	Common	Unavailable	Hays et al. (2020)

Species	Scientific Name	Stock	Best Population Estimate [a]	Status under MMPA [b]	Status under ESA	Relative Occurrence in Project Region [c]	Population trend [d]	Reference for Population Data
Striped dolphin	*Stenella coeruleoalba*	W. North Atlantic	67,036	Non-Strategic	–	Rare	Unavailable	Hays et al. (2020)
White-beaked dolphin	*Lagenorhynchus albirostris*	W. North Atlantic	536,016	Non-Strategic	–	Rare	Unavailable	Hays et al. (2020)
Harbor porpoise	*Phocoena phocoena*	Gulf of Maine/Bay of Fundy	95,543	Non-Strategic	–	Common	Unavailable	Hays et al. (2021)
Blainville's beaked whale	*Mesoplodon densirostris*	W. North Atlantic	10,107 [f]	Non-Strategic	–	Rare	Unavailable	Hays et al. (2020)
Cuvier's beaked whale	*Ziphius cavirostris*	W. North Atlantic	5,744 [f]	Non-Strategic	–	Rare	Unavailable	Hays et al. (2020)
Dwarf sperm whale	*Kogia sima*	W. North Atlantic	7,750[g]	Non-Strategic	–	Rare	Increasing [h]	Hays et al. (2020)
Gervais' beaked whale	*Mesoplodon europaeus*	W. North Atlantic	10,107 [f]	Non-Strategic	–	Rare	Unavailable	Hays et al. (2020)
Killer whale	*Orcinus orca*	W. North Atlantic	Unknown	Non-Strategic	–	Rare	Unavailable	Waring et al. (2015)
Long-finned pilot whale	*Globicephala melas*	W. North Atlantic	39,215	Non-Strategic	–	Uncommon	Unavailable	Hays et al. (2020)
Pygmy sperm whale	*Kogia breviceps*	W. North Atlantic	7,750 [g]	Non-Strategic	–	Rare	Increasing [h]	Hays et al. (2020)
Short-finned pilot whale	*Globicephala macrorhynchus*	W. North Atlantic	28,924	Non-Strategic	–	Rare	Unavailable	Hays et al. (2020)
Sowerby's beaked whale	*Mesoplodon bidens*	W. North Atlantic	10,107 [f]	Non-Strategic	–	Rare	Unavailable	Hays et al. (2020)
Sperm whale	*Physeter macrocephalus*	North Atlantic	4,349	Strategic	Endangered	Uncommon	Unavailable	Hays et al. (2020)
True's beaked whale	*Mesoplodon mirus*	W. North Atlantic	10,107 [f]	Non-Strategic	–	Rare	Unavailable	Hays et al. (2020)

Species	Scientific Name	Stock	Best Population Estimate [a]	Status under MMPA [b]	Status under ESA	Relative Occurrence in Project Region [c]	Population trend [d]	Reference for Population Data
Earless Seals (Pinnipeds)								
Harbor seals	*Phoca vitulina*	W. North Atlantic	61,336	Non-Strategic	–	Common	Unavailable	Hays et al. (2021)
Gray seals	*Halichoerus grypus*	W. North Atlantic	27,300	Non-Strategic	–	Common	Increasing	Hays et al. (2021)
Hooded seals	*Cystophora cristata*	W. North Atlantic	Unknown	Non-Strategic	–	Rare	Unavailable	Hays et al. (2020)
Harp seal	*Phoca groenlandica*	W. North Atlantic	7.6 million	Non-Strategic	–	Uncommon	Unavailable	Hays et al. (2020)

[a] Best stock population estimates reported in the Draft 2021 U.S Atlantic and Gulf of Mexico Marine Mammal Stock Assessments (Hays et al. 2021).
[b] The MMPA defines a “strategic” stock as a marine mammal stock (a) for which the level of direct human-caused mortality exceeds the potential biological removal level; (b) which, based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; (c) which is listed as a threatened or endangered species under the ESA; or (d) is designated as depleted.
[c] Data from Mayflower Wind COP Volume 2.
[d] Increasing = beneficial trend, not quantified; Decreasing = adverse trend, not quantified; Unavailable = population trend analysis not conducted on this species.
[e] The minimum population estimate is reported as the best population estimate in the most recently updated 2021 draft stock assessment report (Mayflower Wind 2022).
[f] This estimate includes Gervais’ beaked whales and Blainville’s beaked whales for the Gulf of Mexico stocks, and all species of *Mesoplodon* undifferentiated beaked whales in the Atlantic.
[g] This estimate includes both dwarf and pygmy sperm whales.
[h] Increasing trend should be interpreted with caution (Hays et al. 2020)
ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act

B.4 Finfish

There are a variety taxa of state- and federally managed fishes managed finfish within the Northeast Continental Shelf Large Marine Ecosystem that have essential fish habitat (EFH) designated in the Project area (COP Volume 2, Section 6.7.2.2.1, Table 6-49 through Table 6-51; Mayflower Wind 2022) or recorded catch in (COP Appendix V, Section 2.2, Table 2-5; Mayflower Wind 2022) or in and around (COP Appendix V, Section 2.1, Table 2-1; Mayflower Wind 2022) the Project area. These species are listed in Table B-8.

Table B-8. Relevant managed fish taxa in the Northeast Continental Shelf Large Marine Ecosystem

Taxa		
Acadian redfish (*Sebastes fasciatus*)	Albacore tuna (*Thunnus alalunga*)	Coastal and non-coastal sharks (for full list of shark species see COP Volume 2, Section 6.7.2.2.1, Table 6-51; Mayflower Wind 2022)
American eel (*Anguilla rostrata*)	American plaice (*Hippoglossoides platessoides*)	Goosefish (*Lophius americanus*)
American shad (*Alosa sapidissima*)	Atlantic cod (*Gadus morhua*)	Hickory shad (*Alosa mediocris*)
Atlantic croaker (*Micropogonias undulatus*)	Atlantic halibut (*Hippoglossus hippoglossus*)	Ocean pout (*Macrozoarces americanus*)
Atlantic herring (*Clupea harengus*)	Atlantic mackerel (*Scomber scombrus)*	Pollock (*Pollachius pollachius)*
Atlantic menhaden (*Brevoortia tyrannus)*	Atlantic striped bass (*Morone saxatilis)*	River herring (*Alosa* spp.*)*
Atlantic sturgeon (*Acipenser oxyrinchus)*	Atlantic wolffish (*Anarhichas lupus)*	Scup (*Stenotomus chrysops)*
Barndoor skate (*Dipturus laevis*)	Black sea bass (*Centropristis striata*)	Cobia (*Rachycentron canadum*)
Bluefin tuna (*Thunnus thynnus*)	Bluefish (*Pomatomus saltatrix*)	Haddock (*Melanogrammus aeglefinus*)
Butterfish (*Peprilus triacanthus*)	Clearnose skate (*Raja eglanteria*)	Little skate (*Leucoraja erinacea*)
Skipjack tuna (*Katsuwonus pelamis)*	Smooth skate (*Mustelus canis)*	Offshore hake *(Merluccius albidus)*
Spanish mackerel (*Scomberomorus maculatus)*	Spiny dogfish (*Squalus acanthias)*	Red hake *(Urophycis chuss)*
Spot (*Leiostomus xanthurus)*	Summer flounder (*Paralichthys dentatus*)	Rosette skate (*Leucoraja garmani*)
Swordfish (*Xiphias gladius)*	Tautog (*Tautoga onitis*)	Silver hake (*Merluccius bilinearis)*
Thorny skate	Tilefish	Witch flounder

Taxa		
(Amblyraja radiata)	(*Caulolatilus microps and Lopholatilus chamaelonticeps)*	*(Glyptocephalus cynoglossus)*
Weakfish (*Cynoscion regalis*)	White hake (*Urophycis tenuis*)	Winter flounder (*Pseudopleuronectes americanus*)
White marlin (*Tetrapturus albidus)*	Windowpane (*Scopthalmus aquosus)*	Winter skate (*Leucoraja ocellata*)

Source: Mayflower Wind 2022.

B.5 Environmental Justice

The U.S. Census tracts with environmental justice communities in the geographic analysis area, as described in Section 3.6.4, *Environmental Justice*, are presented in the following tables. Table B-9 presents the tracts for Massachusetts based on Massachusetts Executive Office of Energy and Environmental Affairs data. Table B-10 presents the tracts for Rhode Island, Connecticut, and Virginia based on U.S. Environmental Protect Agency's Environmental Justice Screening and Mapping Tool's data.

Table B-9. U.S. census tracts with environmental justice populations in Massachusetts

Tract	Low Income	Low Income and English Isolation	Minority	Minority and English Isolation	Minority and Low Income	Minority, Low Income, and English Isolation
Barnstable County						
010100	2					
010304	1		1			
010306	1					
010400					1	
010700	1					
010800	2					
011200	1					
011500			1			
011600	1				1	
011700	1					
012002	1					
012101	1		2			
012102	2					
012502			2			
012601			1			
012602			2		2	
013800			1			
013900	1					

Tract	Low Income	Low Income and English Isolation	Minority	Minority and English Isolation	Minority and Low Income	Minority, Low Income, and English Isolation
014002	1					
014100	2					
014402			1			
014500	1					
014600					1	
014800	2					
014900	1					
015002	1		1			
015300					2	
Bristol County						
600203			1			
613100			1			
613300	1					
613400			1			
613600	1				1	
613700					1	
613800	1		1		2	
613901					1	
613902	1					
614000					2	
614101			2		1	
614102			1			
630101			1		1	
630102	3					
630200			1			
630300	1					
630400			1			
631100	4		1			
631200					1	
631300	1					
631400	1				1	
631600			2		1	
631700	2					
640100					2	
640200	3				2	
640300	1				2	
640400	1	1			1	

Tract	Low Income	Low Income and English Isolation	Minority	Minority and English Isolation	Minority and Low Income	Minority, Low Income, and English Isolation
640500	4			1		
640600	3		1			
640700	2					
640800		1			1	
640901	2			1	2	
641000	1				1	1
641101					2	
641200	1				1	
641300	1		2			1
641400					2	1
641500	1				1	
641600	2					
641700	2					
641800	1					
641900					2	
642000			1		1	
642100	1				1	
642200	3				1	
642400	1					
645101	1					
646101	1					
650101			1			
650102			1		1	
650201			1			
650300	1				1	
650400	3					
650500					2	
650600					3	
650700						2
650800			2		1	1
650900					2	1
651001	1					
651002					1	
651100	1				1	1
651200					1	1
651300					2	
651400	1		2		1	

Tract	Low Income	Low Income and English Isolation	Minority	Minority and English Isolation	Minority and Low Income	Minority, Low Income, and English Isolation
651500			1		3	
651600			3		1	
651700					2	
651800					2	
651900					1	1
652000					2	1
652100					1	
652200	1					
652300					2	
652400					1	1
652500					1	1
652600					1	1
652700					3	1
652800			2			
653101	1					
653301	1					
654100			1			
654200	1					
655200	1		2		1	
655300	1					
985500			1			
Dukes County						
200100	2					
200200	1		1			
200300			1			
200400			1			
Essex County						
202102			1			
203200	1		1			
203301	1					
204101			1		1	
204102			1			
204200	1		2		1	
204300					1	1
204400					1	
204500			1			
204600			2			

Tract	Low Income	Low Income and English Isolation	Minority	Minority and English Isolation	Minority and Low Income	Minority, Low Income, and English Isolation
204701						1
204702					1	
205100	1		3	1		
205200			2	1	1	1
205300			3			
205500			1		1	
205600			1	1	1	
205700			5			
205800			1		1	1
205900			3			
206000					2	
206100					1	1
206200			2		1	
206300			2		2	
206400			2		1	1
206500					1	2
206600			1		3	
206700			2		2	
206800						2
206900					1	2
207000					1	1
207100					1	2
207200			1			1
208102			3			
208200	1		1			
208300			1			
210300	2					
210400	1		1			
210500			1			
210600					2	
210700					3	
210800	1				1	
211100	1					
211300			1			
215101			1			
215102	1					
217100	1					

Tract	Low Income	Low Income and English Isolation	Minority	Minority and English Isolation	Minority and Low Income	Minority, Low Income, and English Isolation
217300	1		2		1	
217400	1				1	
217500	1					
217600	1					
220101	1					
221400	2				1	
221500	2					
221600	1				1	
221700	2					
223100	1					
223200	1					
250100						1
250200					4	
250300						1
250400				1	1	1
250500					1	2
250600				2		2
250700				1		2
250800			1		3	1
250900						2
251000						1
251100				1	1	1
251200						1
251300					2	1
251400			1		2	1
251500			2		3	
251600			2			2
251700			1	2		1
251800			4			
252101			3			
252102			1			
252300			3			1
252400			1		1	1
252501			2		1	
252502			2		1	
252601			2			
252602			2			

Tract	Low Income	Low Income and English Isolation	Minority	Minority and English Isolation	Minority and Low Income	Minority, Low Income, and English Isolation
252603			1			
253100			1			
253202			3			
253204			1			
254402			1			
260100			1		2	
260200			1		1	
260401			1			
260402			1			
260500			1			
260600			2		1	
260700					1	
260800					2	
260900					3	
261000			1			
261102					1	
265101	1					
266300	1					
266400	1					
268300	2					
Nantucket County						
950200			1			
Plymouth County						
502200	1					
503102	1					
510100			3		1	
510200			4			
510300					1	2
510400			1		3	
510501			1		1	
510502			1	1	2	1
510503					2	
510600			3			
510700			3		2	1
510800			4	2		
510900				1	2	
511000			1		1	

Tract	Low Income	Low Income and English Isolation	Minority	Minority and English Isolation	Minority and Low Income	Minority, Low Income, and English Isolation
511100			5			
511200			3		1	1
511301			4		1	
511302			3		1	
511400					4	
511500			2		2	
511600			3	1	2	
511701			4		1	
511702			2			
520201			1			
521102	1					
523202			1			
525203			1			
525300			1			
530100	1					
530200	1					
530500	2					
530600			1			
542300	1					
544200	2					
545100	1					
545200	2		2			
545300	1				1	
545400	1				1	
561100			1			
561200					1	
502200	1					
Total Number of Tracts	**133**	**2**	**196**	**17**	**174**	**58**

Source: MAEEA 2021.

Table B-10. U.S. census tracts with environmental justice populations in Rhode Island, Connecticut, and Virginia

Tract	Low Income	Low Income and Minority	Minority
Rhode Island – Newport County			
040200	1		
Rhode Island – Providence County			
000101		1	
000102		1	
000200		1	
000300		1	
000400		1	
000500		1	
000600		1	
000700		1	
000800	1		
000900	1		
001000		1	
001100	1		
001200		1	
001300		1	
001400		1	
001500			1
001600			1
001700		1	
001800		1	
001900		1	
002000		1	
002101			1
002102			1
002200		1	
002500			1
002600		1	
002700		1	
002800		1	
002900			1
003700	1		

Tract	Low Income	Low Income and Minority	Minority
010800		1	
010900		1	
011000		1	
011100		1	
014100			1
014700			1
015000			1
015100		1	
015200		1	
015300		1	
015400			1
015500			1
016000			1
016100		1	
016300			1
016400		1	
016600			1
016700			1
017100			1
017400		1	
017600		1	
017900	1		
018000	1		
018100	1		
018300	1		
Total Number of Tracts – Rhode Island	**9**	**31**	**16**
Connecticut – New London County			
690300		1	
690400		1	
690500		1	
690700		1	
690800		1	
696100	1		
696400	1		

Tract	Low Income	Low Income and Minority	Minority
696700		1	
696800		1	
697000		1	
702500	1		
702800	1		
709200	1		
870200	1		
870300	1		
Total Number of Tracts – Connecticut	**7**	**8**	**0**
Virginia – Newport news			
030100		1	
030300		1	
030400		1	
030500		1	
030600		1	
030800		1	
030900		1	
031100		1	
031200		1	
031300		1	
031400		1	
031601			1
031701	1		
031902			1
032006		1	
032007			1
032113		1	
032114		1	
032117		1	
032123			1
032124		1	
032126		1	
032127		1	
032128		1	
032129		1	

Tract	Low Income	Low Income and Minority	Minority
032130			1
032131			1
032132			1
032211			1
032212		1	
032223			1
032224		1	
032225		1	
032226		1	
032300		1	
032400		1	
Virginia – Portsmouth			
210200	1		
210300	1		
210500		1	
210600			1
210900		1	
211100		1	
211400		1	
211500		1	
211600	1		
211700		1	
211800		1	
211900		1	
212000		1	
212100		1	
212300		1	
212400		1	
212500		1	
212600		1	
212701			1
212702			1
212801		1	
213001			1
213101		1	

Tract	Low Income	Low Income and Minority	Minority
213103			1
213104			1
213200		1	
980100			1
Total Number of Tracts – Virginia	**4**	**43**	**16**

Source: USEPA 2022.

B.6 Water Quality

The following figures (Figures B-2 through B-6) show the potential HVDC convertor station location and the plan views of the excess temperatures from Scenarios 1 through 4 for that station location from Mayflower Wind's National Pollutant Discharge Elimination System permit application (TetraTech and Normandeau Associates, Inc. 2022).

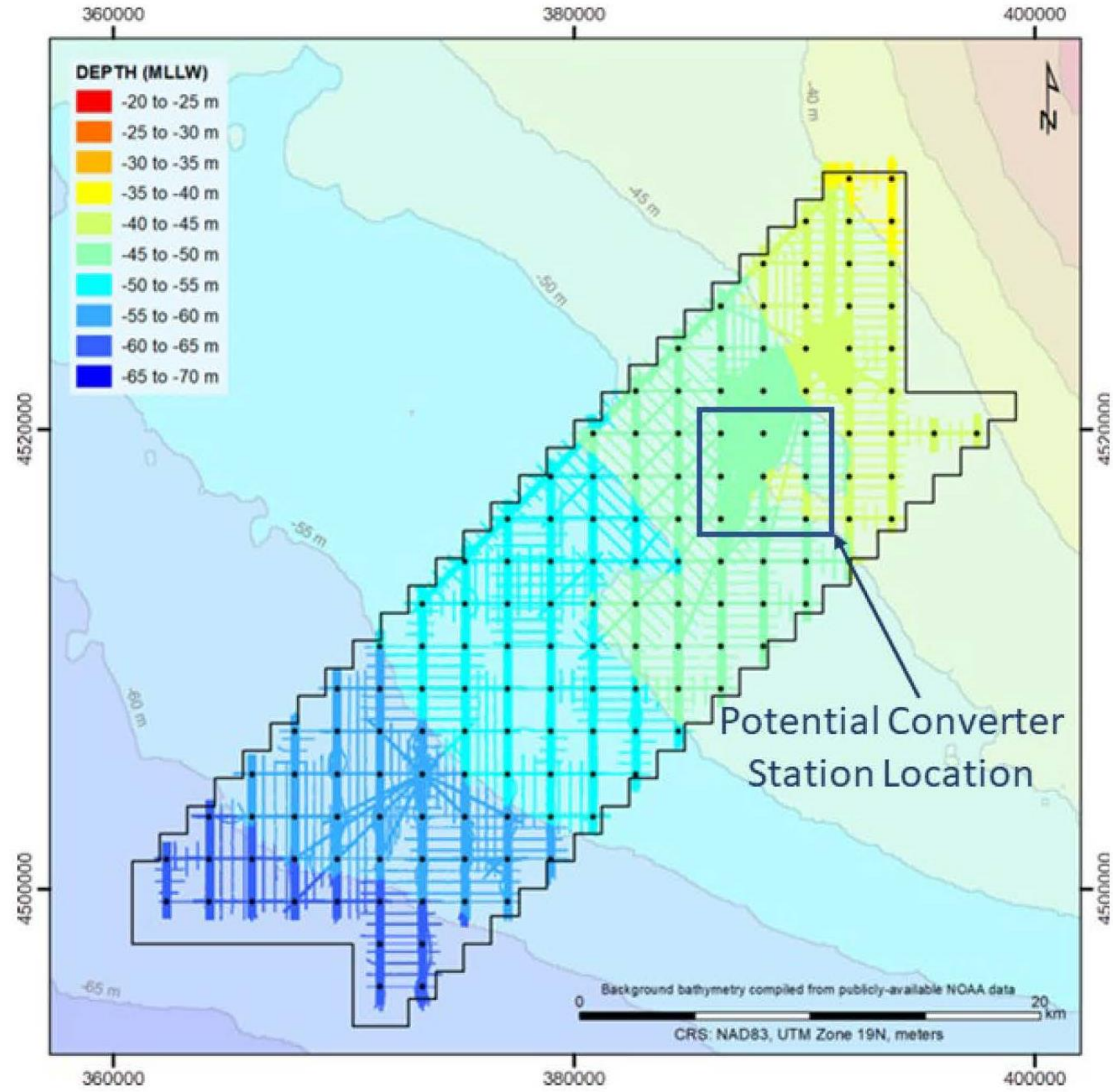


Figure B-2. Approximate Location of the Offshore Substation Platform with Converter Station, within the Lease Area (at one of the existing positions, shown as black dots)

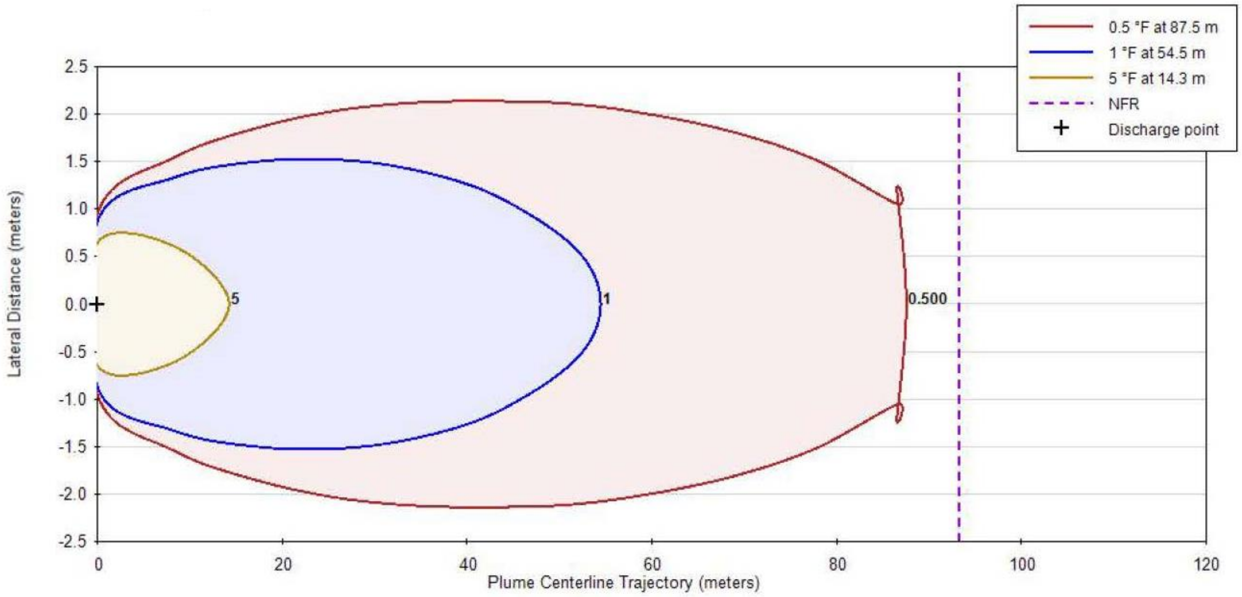


Figure B-3. Zone of Dilution for Scenario I, Winter Max. Current Speed (temperatures shown as ΔT)

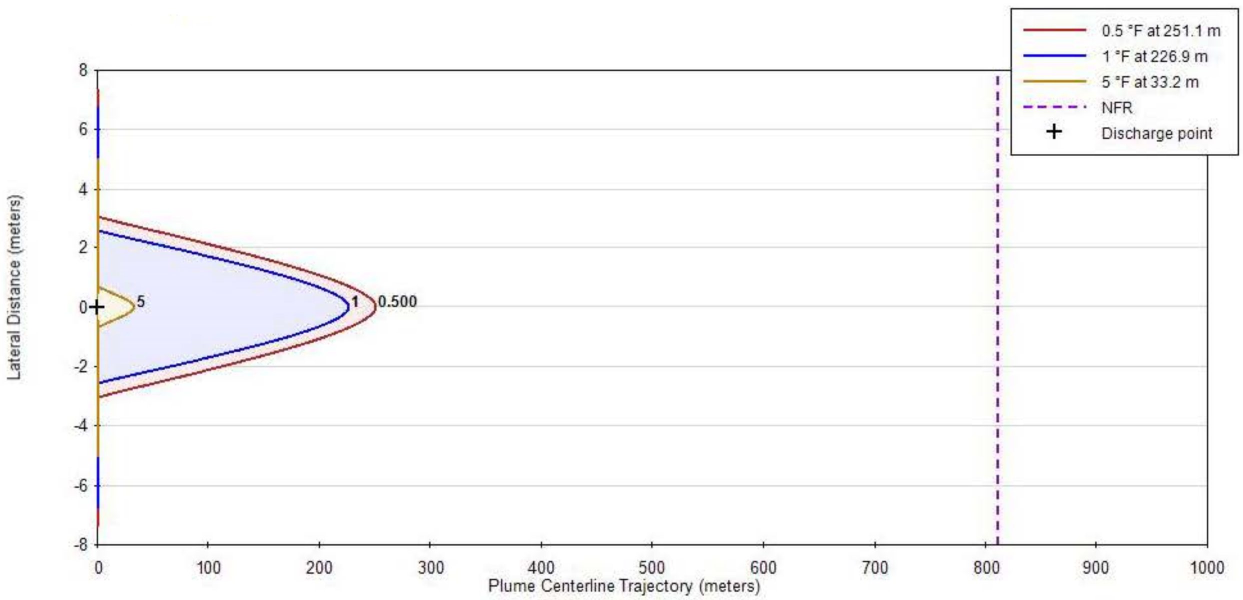


Figure B-4. Zone of Dilution for Scenario 2, Winter Min. Current Speed (temperatures shown as ΔT)

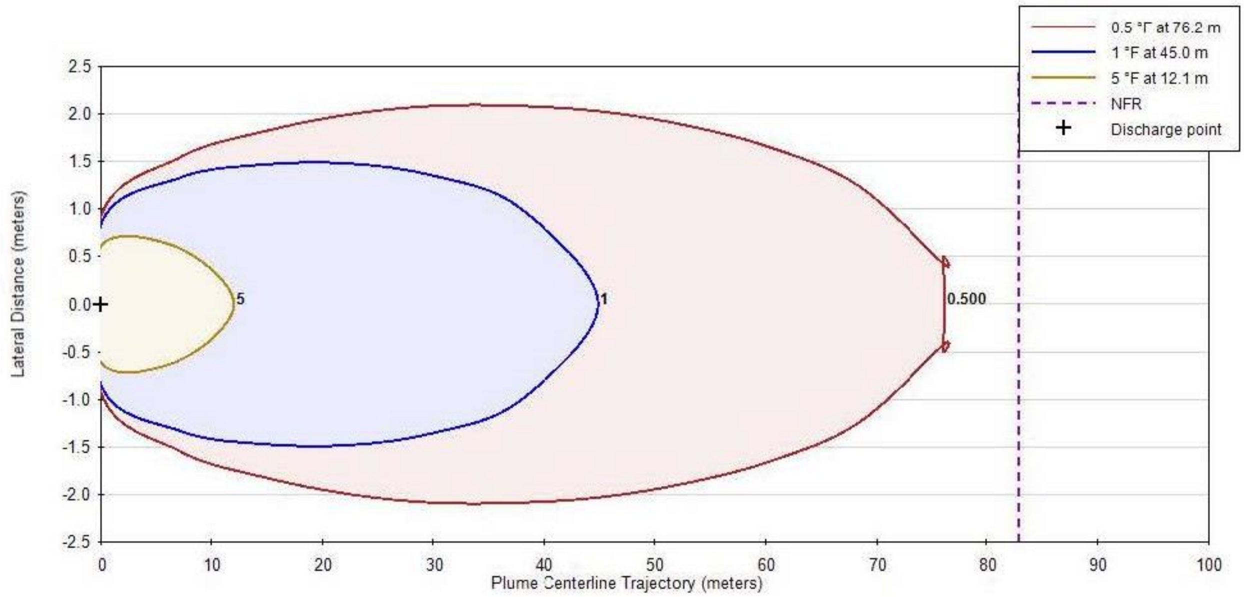


Figure B-5. Zone of Dilution for Scenario 3, Summer Max. Current Speed (temperatures shown as ΔT)

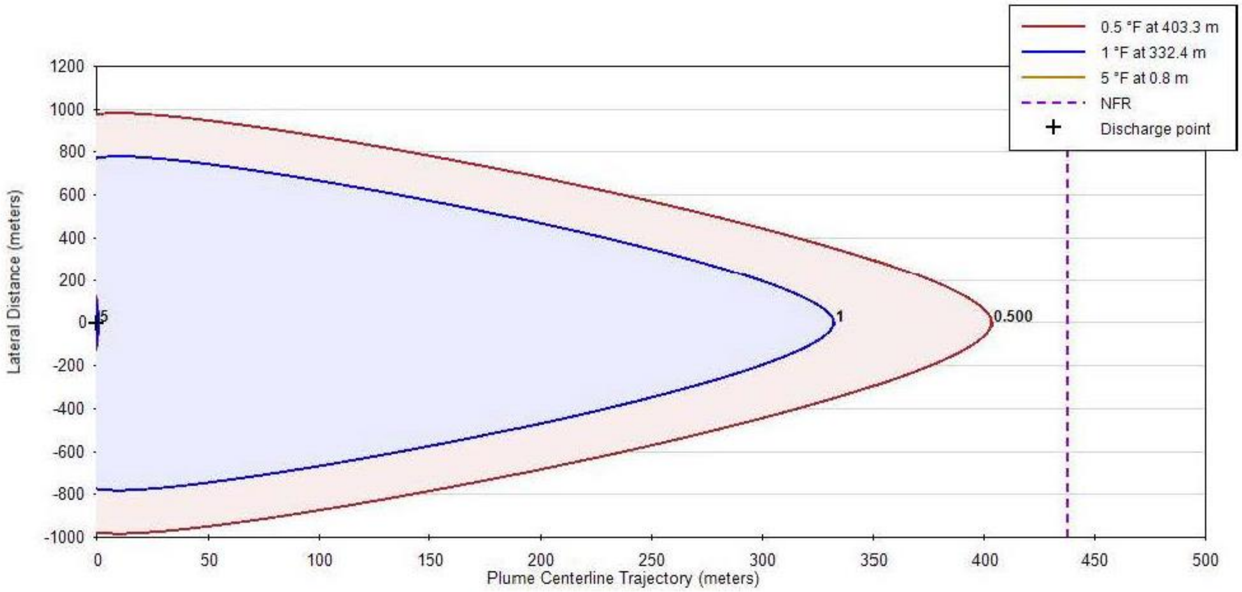
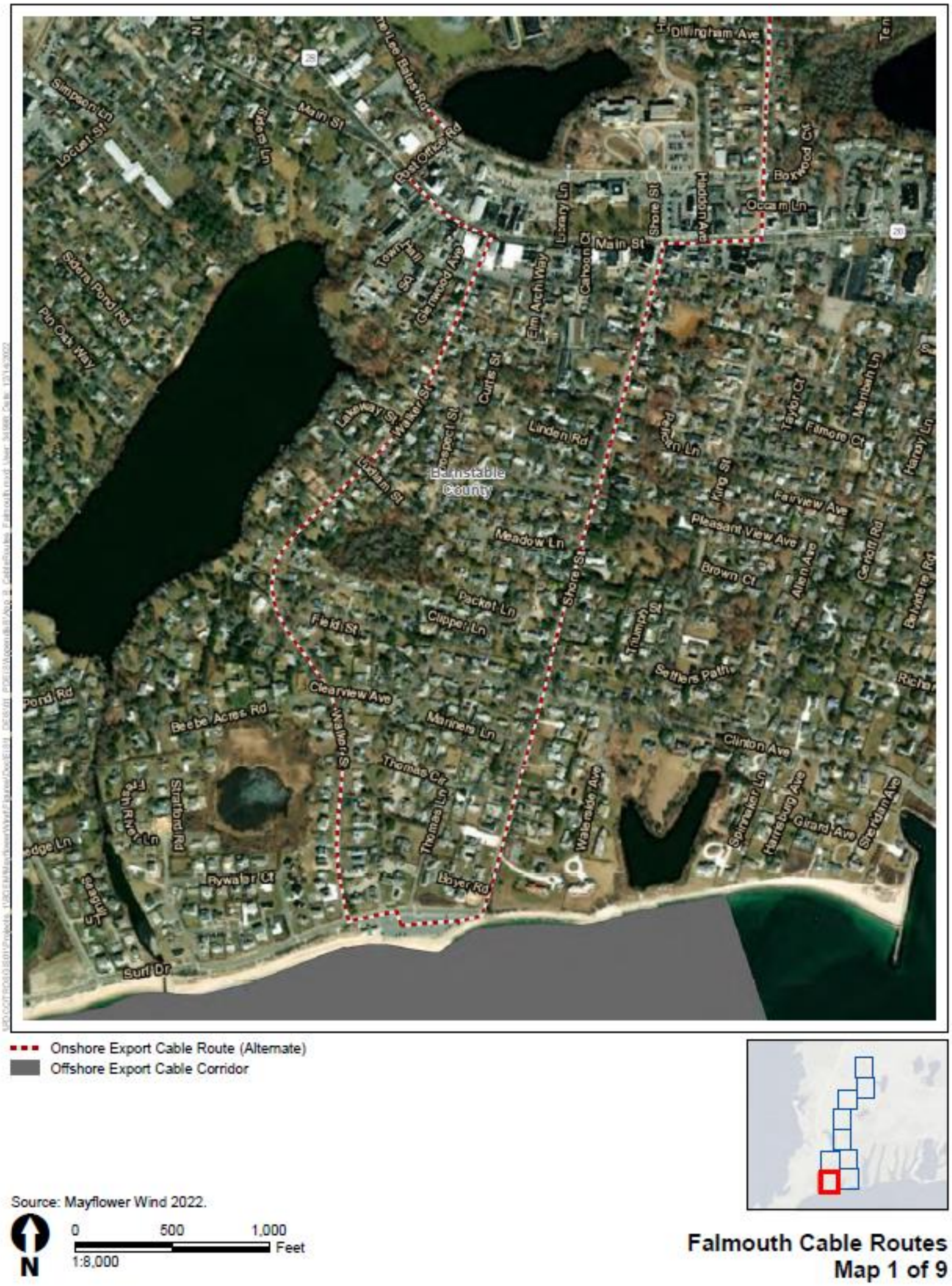


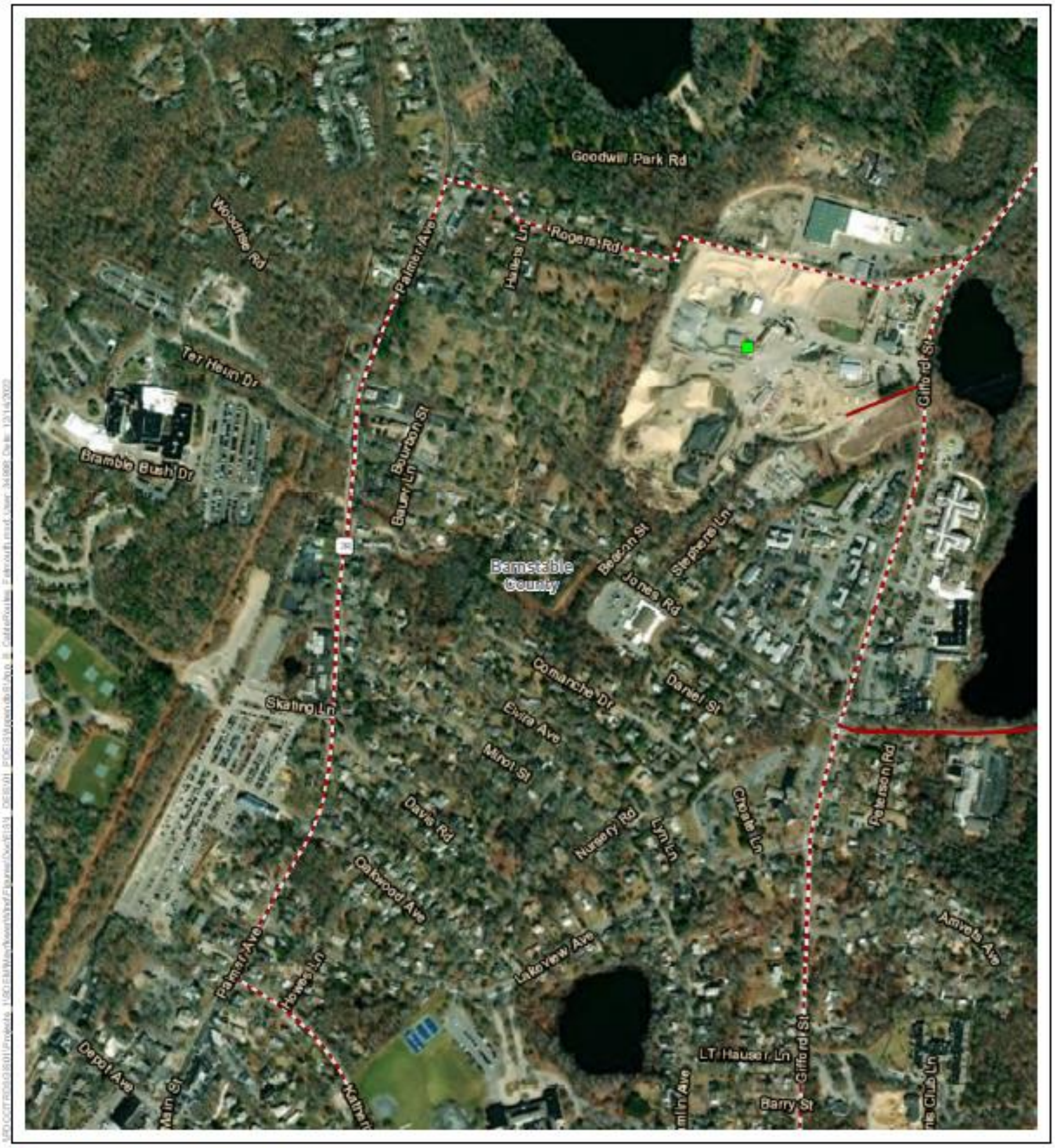
Figure B-6. Zone of Dilution for Scenario 4, Summer Min. Current Speed (temperatures shown as ΔT)

B.7 Onshore Cable Route Maps

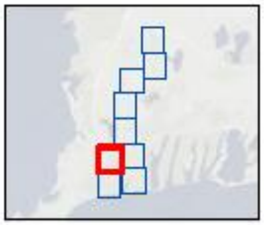
This section contains detailed maps of the onshore cable routes analyzed in this EIS, as described in Chapter 2, *Alternatives*.

B.7.1 Proposed Action - Falmouth Onshore Cable Routes





Falmouth Preferred Onshore Substation
Onshore Export Cable Route (Preferred)
Onshore Export Cable Route (Alternate)
Offshore Export Cable Corridor



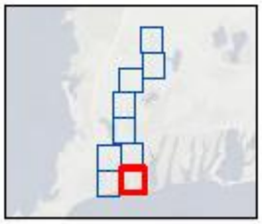
Source: Mayflower Wind 2022.

N

0 500 1,000 Feet

1:8,000

Falmouth Cable Routes
Map 2 of 9



- Onshore Export Cable Route (Preferred)
- Onshore Export Cable Route (Alternate)
- Offshore Export Cable Corridor

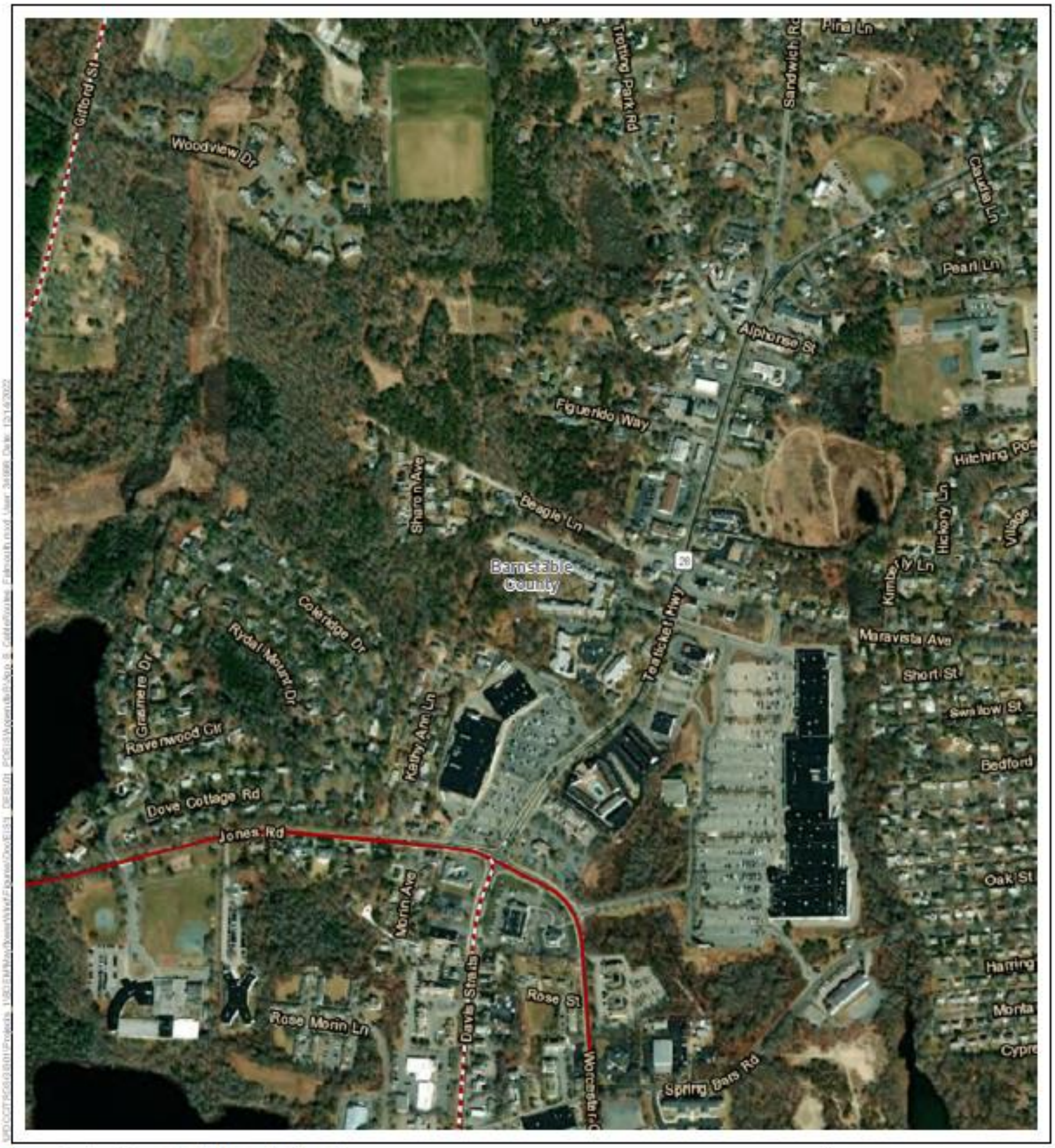
Source: Mayflower Wind 2022.

N

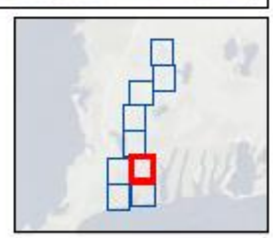
0 500 1,000 Feet

1:8,000

Falmouth Cable Routes
Map 3 of 9



Onshore Export Cable Route (Preferred)
Onshore Export Cable Route (Alternate)
Offshore Export Cable Corridor



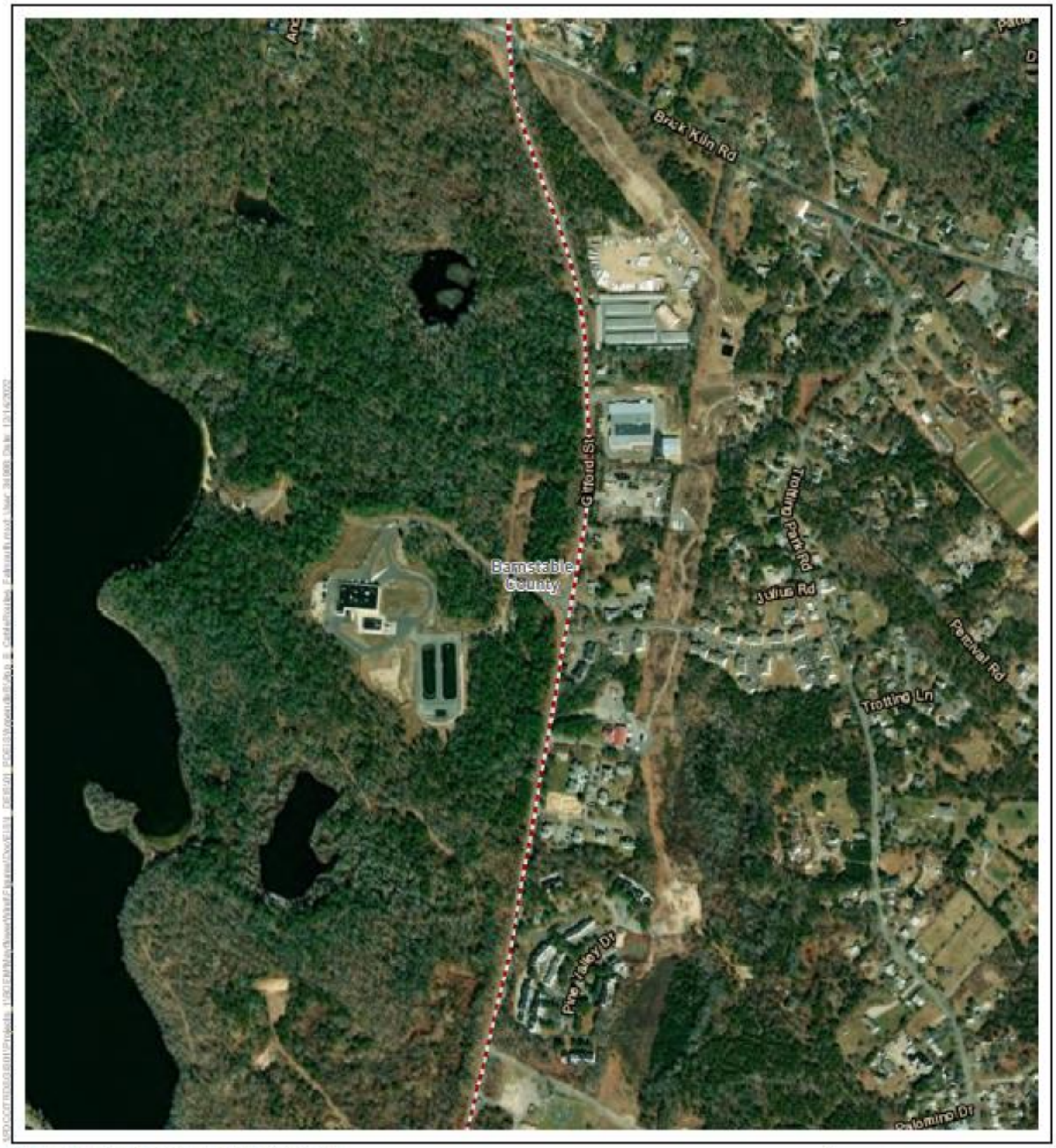
Source: Mayflower Wind 2022.

N

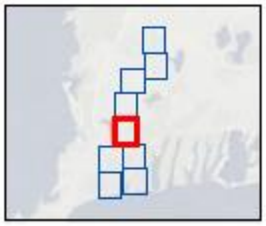
0 500 1,000 Feet

1:8,000

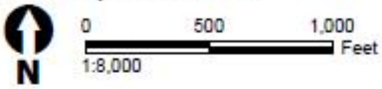
Falmouth Cable Routes
Map 4 of 9



Onshore Export Cable Route (Alternate)
Offshore Export Cable Corridor

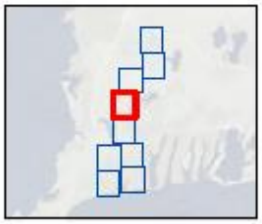


Source: Mayflower Wind 2022.



Falmouth Cable Routes
Map 5 of 9

Onshore Export Cable Route (Alternate)
Offshore Export Cable Corridor



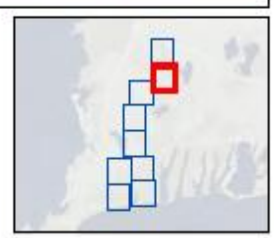
Source: Mayflower Wind 2022.

0 500 1,000 Feet
1:8,000

Falmouth Cable Routes
Map 6 of 9

Falmouth Cable Routes
Map 7 of 9

Falmouth Alternative Onshore Substation
Onshore Export Cable Route (Alternate)
Underground Transmission Route (Alternate)
Offshore Export Cable Corridor

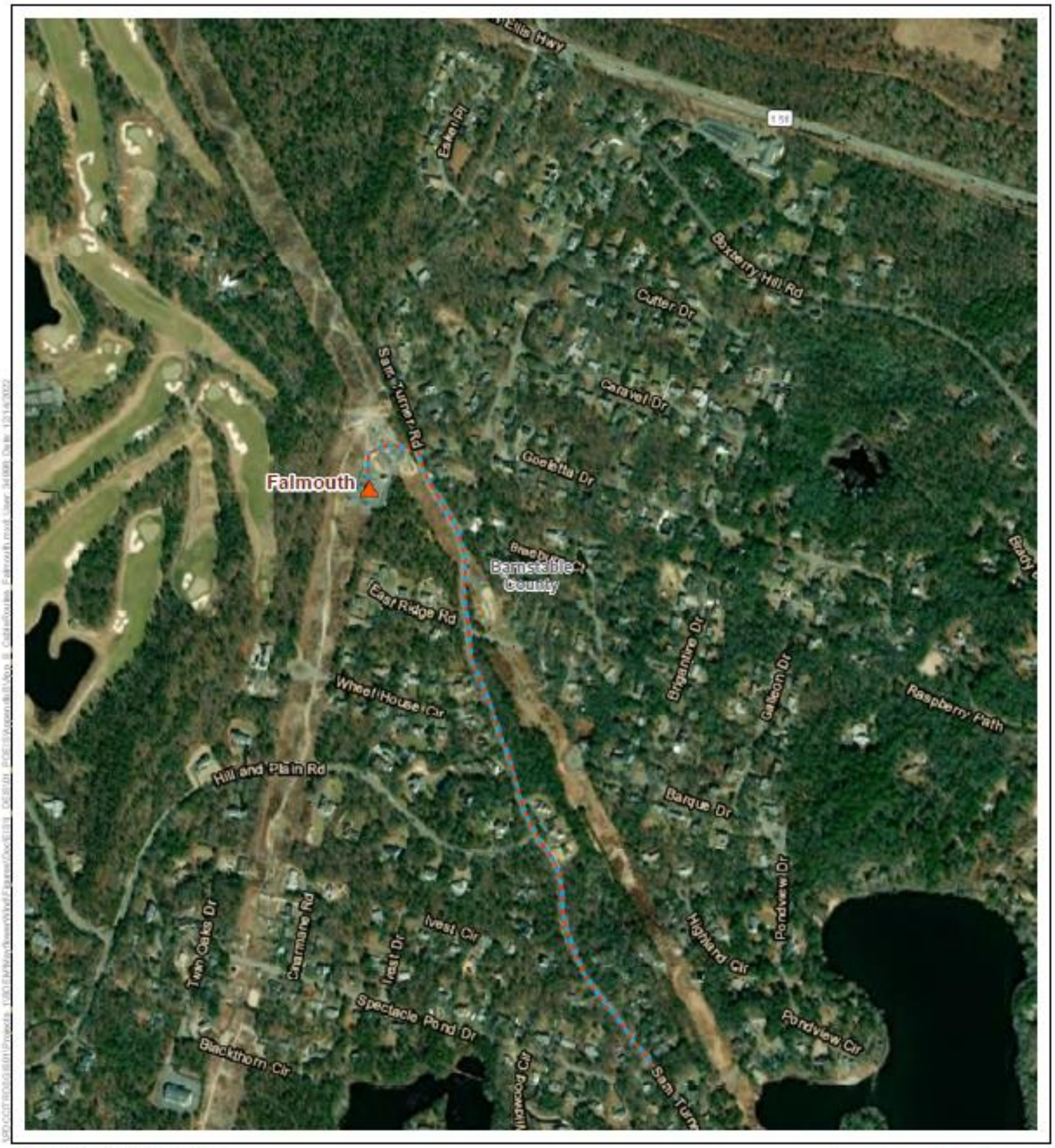


Source: Mayflower Wind 2022.

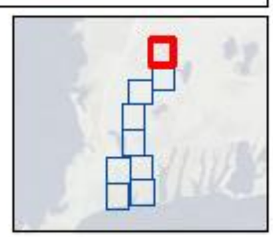
N

0 500 1,000 Feet
1:8,000

Falmouth Cable Routes
Map 8 of 9



▲ Point of Interconnection
Underground Transmission Route (Alternate)
Offshore Export Cable Corridor



Source: Mayflower Wind 2022.

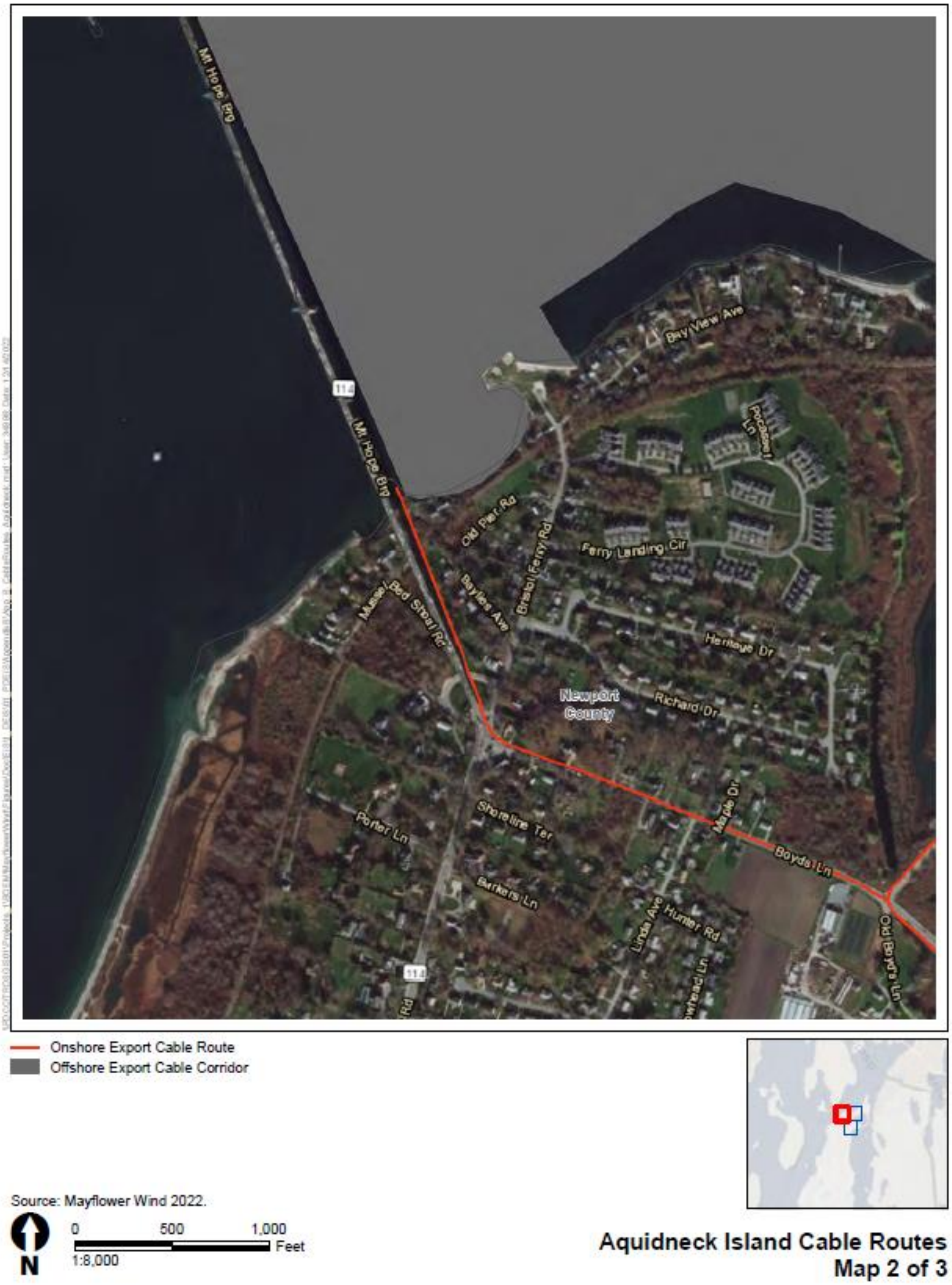
N
0 500 1,000 Feet
1:8,000

Falmouth Cable Routes
Map 9 of 9

B.7.2 Proposed Action - Brayton Point Onshore Cable Routes

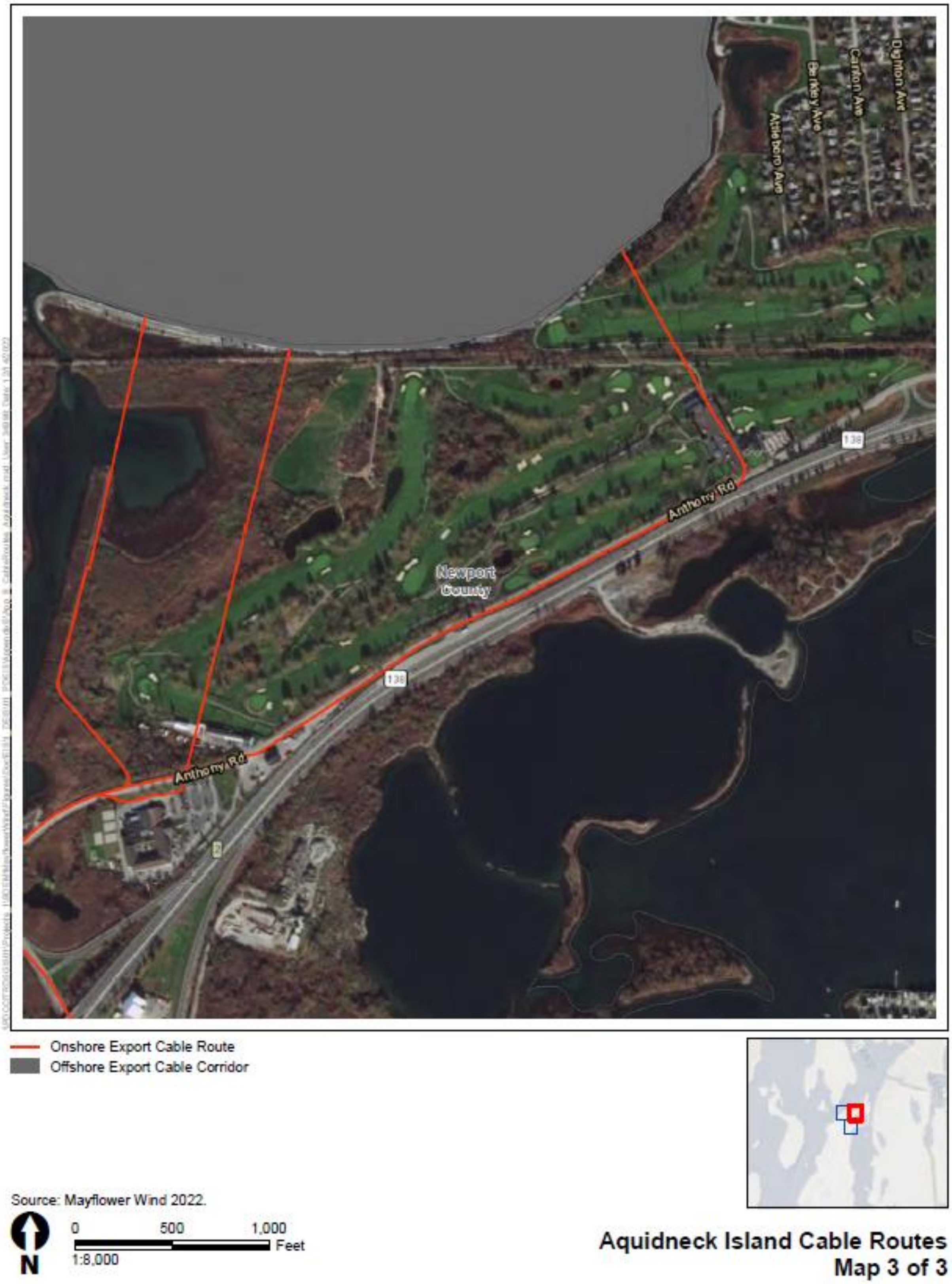
B.7.3 Proposed Action - Aquidneck Island Cable Routes

Aquidneck Island Cable Routes
Map 1 of 3



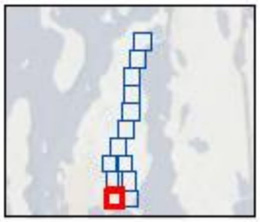
Source: Mayflower Wind 2022.

Aquidneck Island Cable Routes
Map 2 of 3



Aquidneck Island Cable Routes
Map 3 of 3

B.7.4 Alternative C-1 Onshore Cable Routes (Aquidneck Island)



Alternative C-1 - Onshore Export Cable Route

Offshore Export Cable Corridor

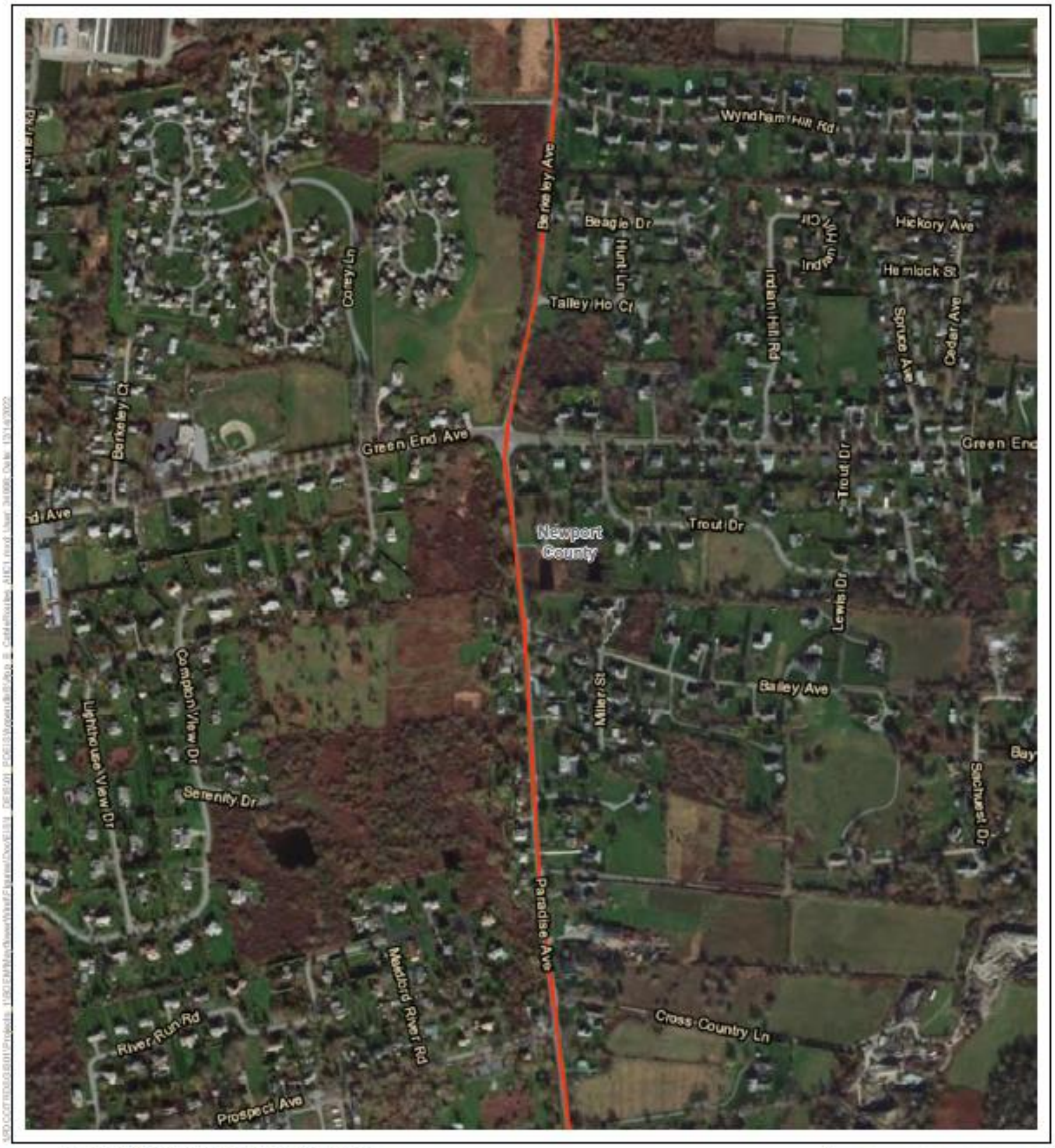
Source: Mayflower Wind 2022.

N

0 500 1,000 Feet

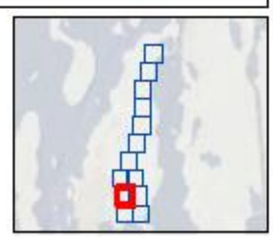
1:8,000

Alternative C-1 Onshore Export Cable Route
Map 1 of 13



Alternative C-1 - Onshore Export Cable Route

Offshore Export Cable Corridor



Source: Mayflower Wind 2022.

N

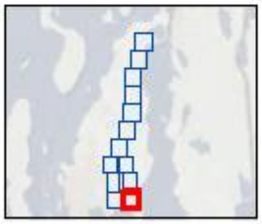
0 500 1,000 Feet

1:8,000

Alternative C-1 Onshore Export Cable Route
Map 2 of 13

Alternative C-1 Onshore Export Cable Route
Map 3 of 13

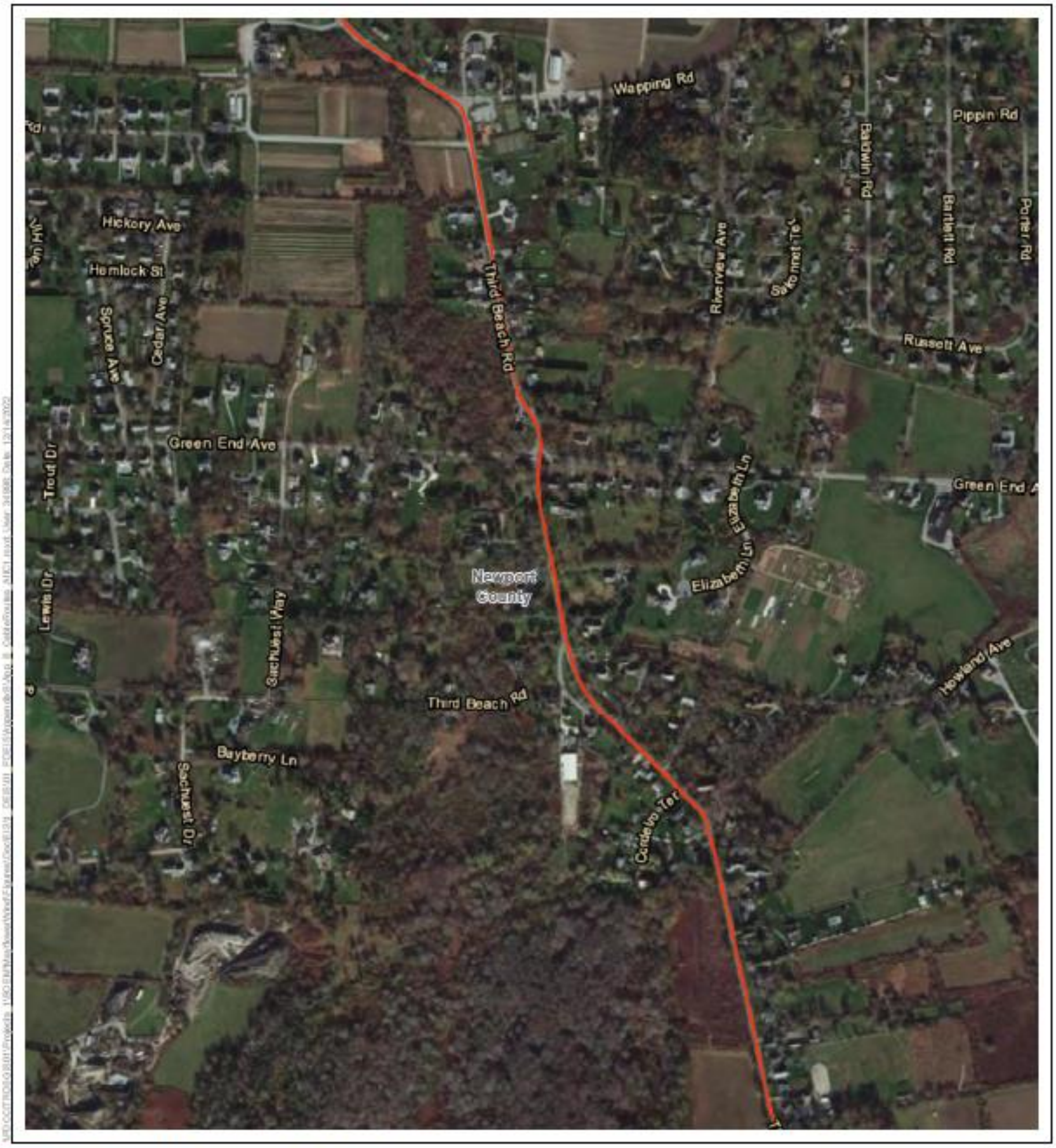
Alternative C-1 - Onshore Export Cable Route
Offshore Export Cable Corridor



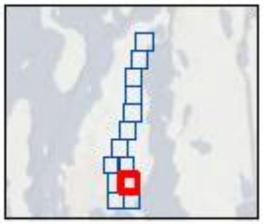
Source: Mayflower Wind 2022.

N 0 500 1,000 Feet 1:8,000

Alternative C-1 Onshore Export Cable Route
Map 4 of 13



Alternative C-1 - Onshore Export Cable Route
Offshore Export Cable Corridor



Source: Mayflower Wind 2022.

N 0 500 1,000 Feet 1:8,000

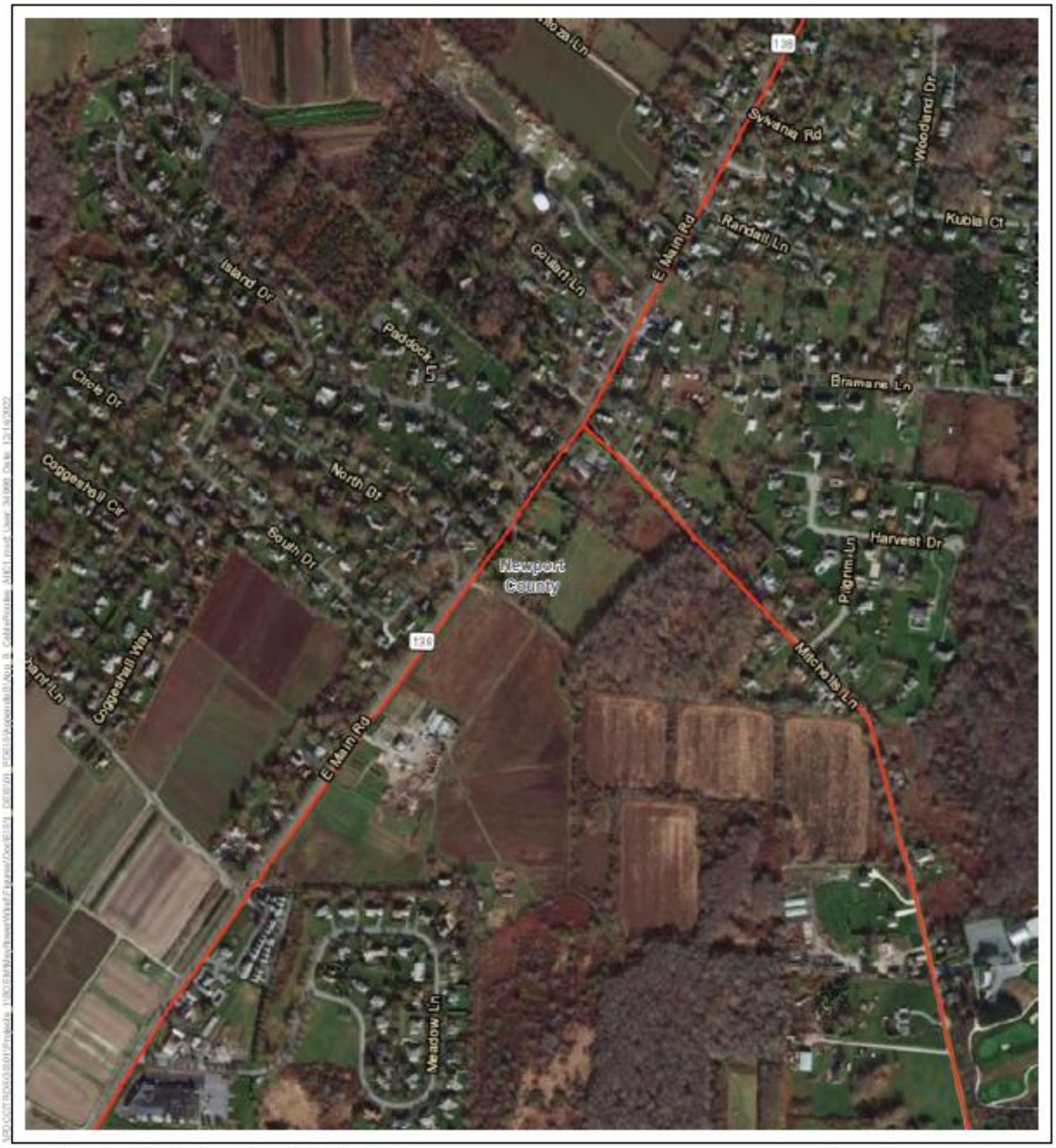
Alternative C-1 Onshore Export Cable Route
Map 5 of 13

Alternative C-1 - Onshore Export Cable Route
Offshore Export Cable Corridor

Source: Mayflower Wind 2022.

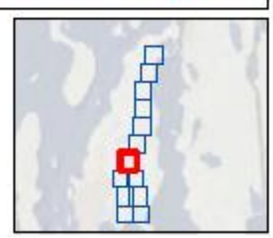
N
0 500 1,000 Feet
1:8,000

Alternative C-1 Onshore Export Cable Route
Map 6 of 13



— Alternative C-1 - Onshore Export Cable Route

Offshore Export Cable Corridor



Source: Mayflower Wind 2022.

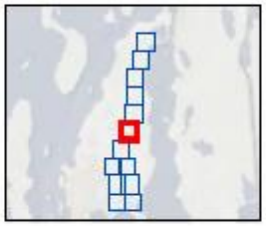
N

0 500 1,000 Feet

1:8,000

Alternative C-1 Onshore Export Cable Route
Map 7 of 13

Alternative C-1 - Onshore Export Cable Route
Offshore Export Cable Corridor



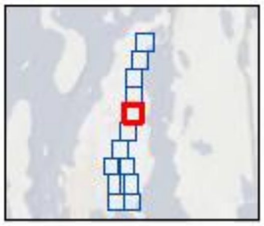
Source: Mayflower Wind 2022.

N 0 500 1,000 Feet 1:8,000

Alternative C-1 Onshore Export Cable Route
Map 8 of 13

Alternative C-1 - Onshore Export Cable Route

Offshore Export Cable Corridor



Source: Mayflower Wind 2022.

N

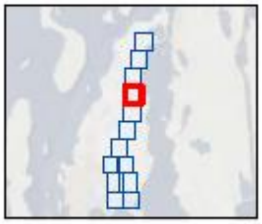
0 500 1,000 Feet

1:8,000

Alternative C-1 Onshore Export Cable Route
Map 9 of 13

— Alternative C-1 - Onshore Export Cable Route

Offshore Export Cable Corridor



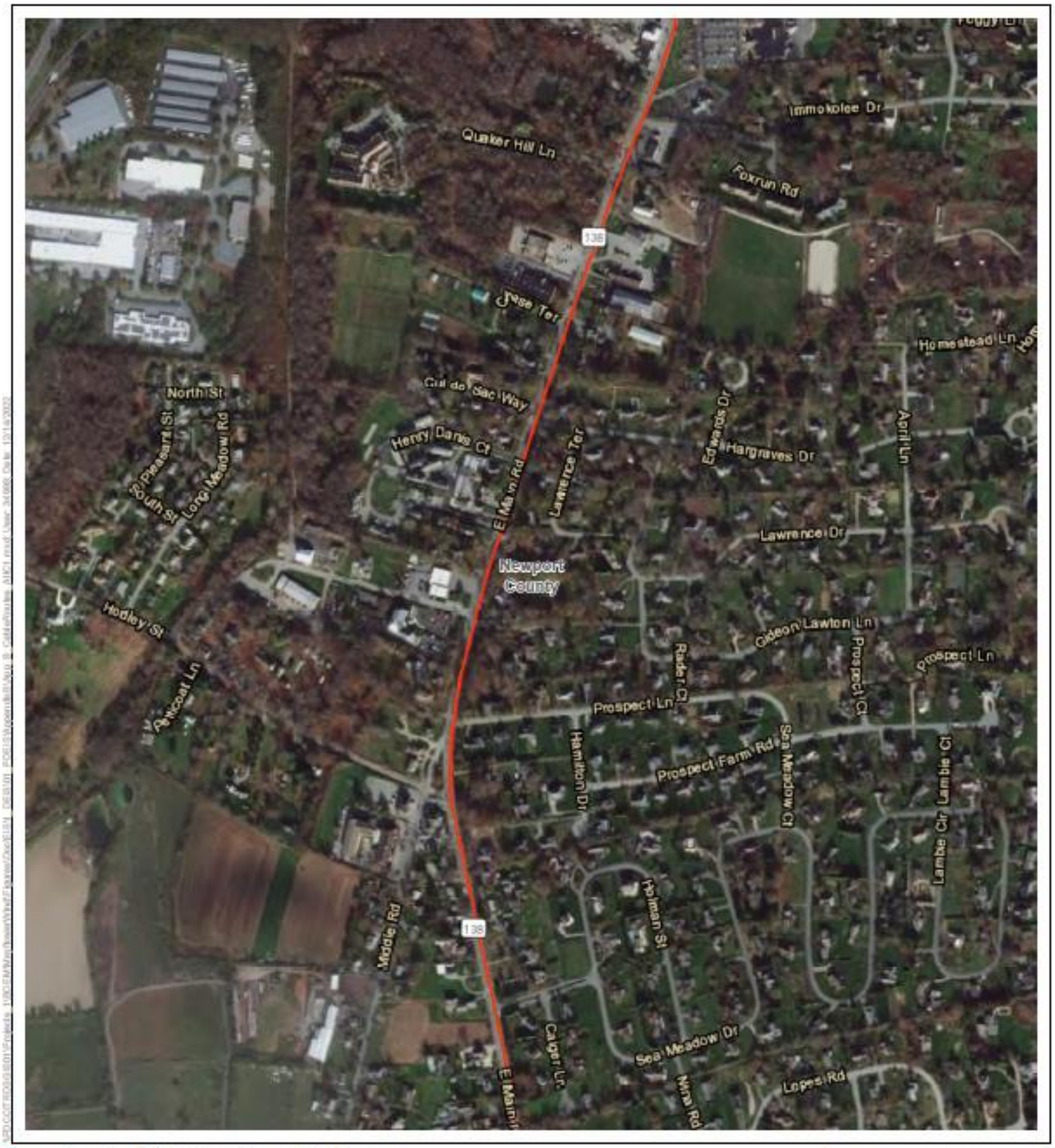
Source: Mayflower Wind 2022.

N

0 500 1,000 Feet

1:8,000

Alternative C-1 Onshore Export Cable Route
Map 10 of 13



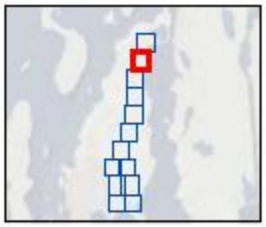
Alternative C-1 - Onshore Export Cable Route
Offshore Export Cable Corridor

Source: Mayflower Wind 2022.

N
0 500 1,000 Feet
1:8,000

Alternative C-1 Onshore Export Cable Route
Map 11 of 13

Alternative C-1 - Onshore Export Cable Route
Offshore Export Cable Corridor

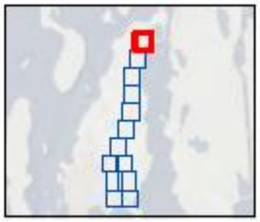


Source: Mayflower Wind 2022.

N 0 500 1,000 Feet 1:8,000

Alternative C-1 Onshore Export Cable Route
Map 12 of 13

Alternative C-1 - Onshore Export Cable Route
Offshore Export Cable Corridor



Source: Mayflower Wind 2022.

N 0 500 1,000 Feet 1:8,000

Alternative C-1 Onshore Export Cable Route
Map 13 of 13

B.7.5 Alternative C-2 Onshore Cable Routes (Little Compton and Tiverton, Rhode Island)

Alternative C-2 - Onshore Export Cable Route

Source: Mayflower Wind 2022.

N
0 500 1,000 Feet
1:8,000

Alternative C-2 Cable Route
Map 1 of 15

Alternative C-2 - Onshore Export Cable Route

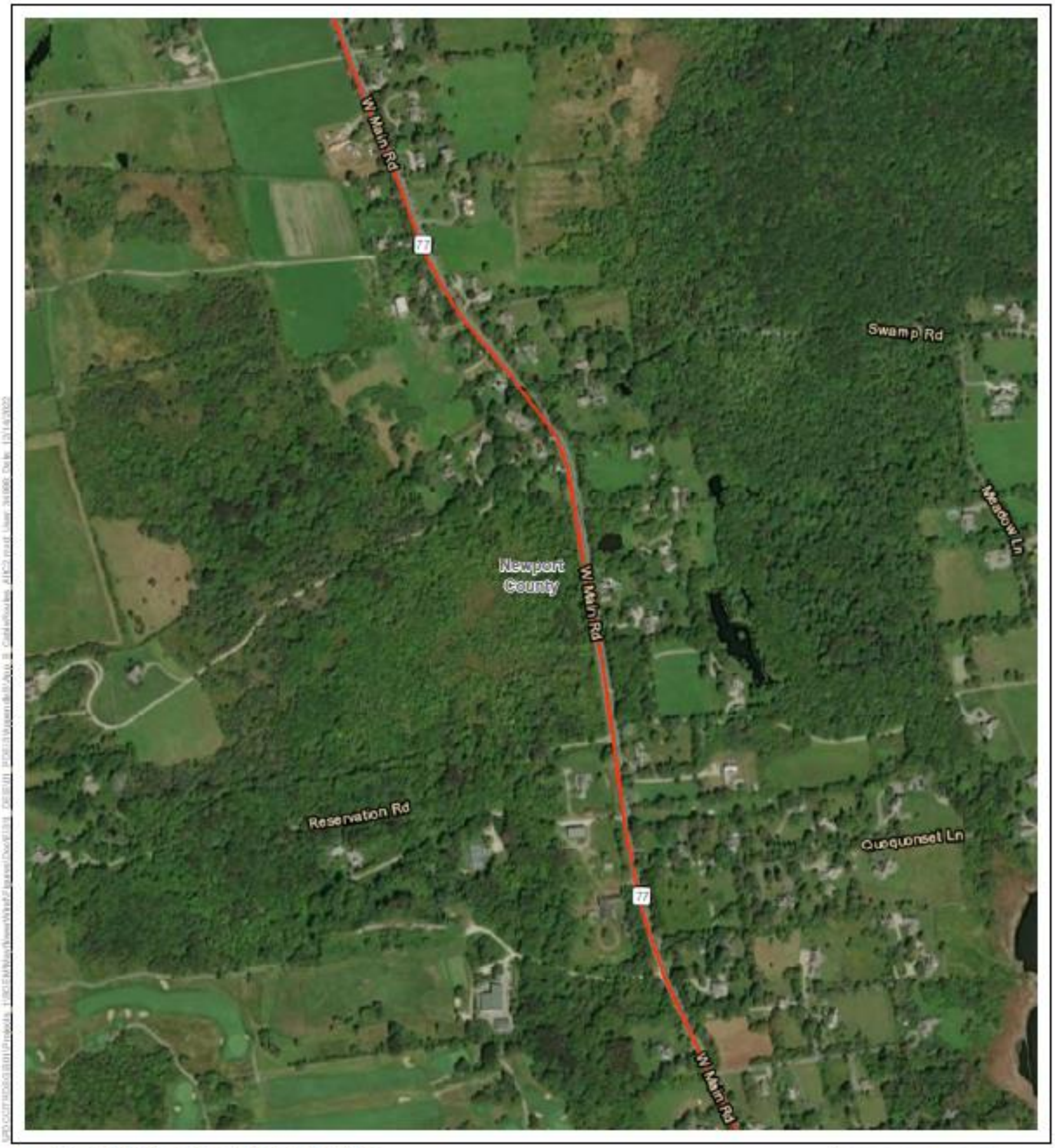
Source: Mayflower Wind 2022.

N

0 500 1,000 Feet

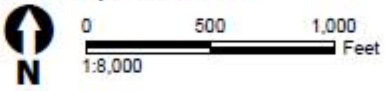
1:8,000

Alternative C-2 Cable Route
Map 2 of 15

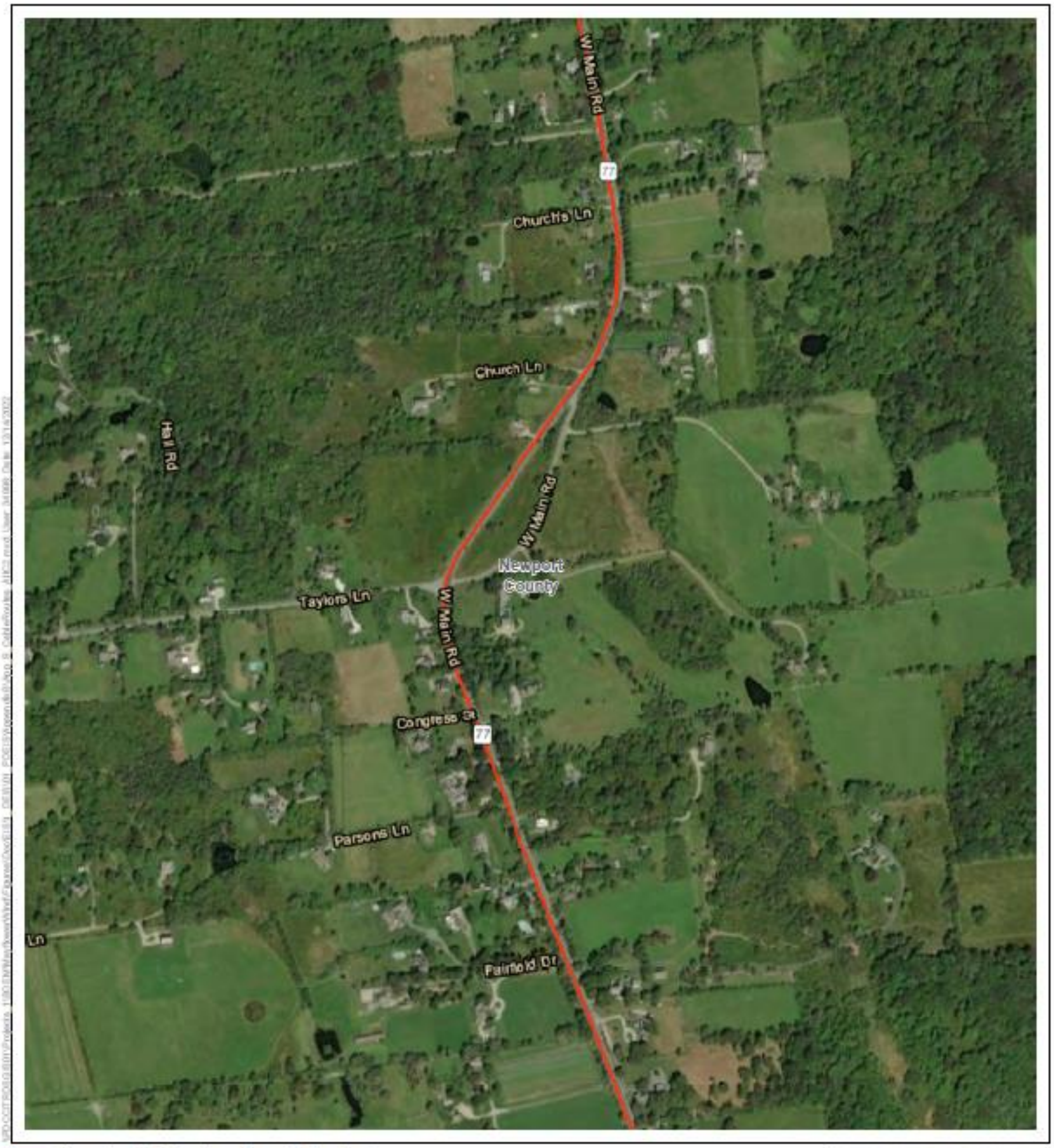


— Alternative C-2 - Onshore Export Cable Route

Source: Mayflower Wind 2022.



Alternative C-2 Cable Route
Map 3 of 15



Alternative C-2 - Onshore Export Cable Route

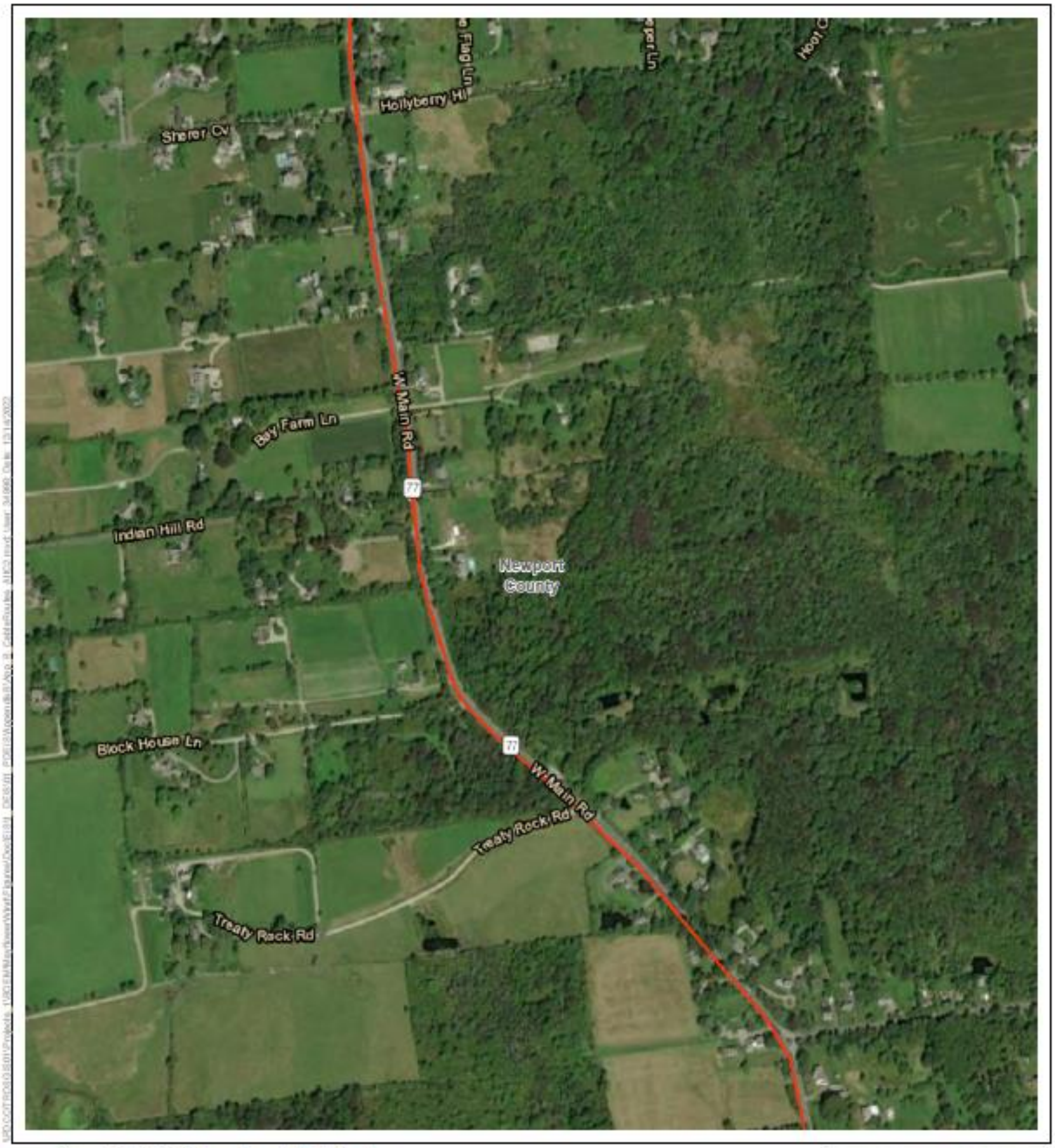
Source: Mayflower Wind 2022.

N

0 500 1,000 Feet

1:8,000

Alternative C-2 Cable Route
Map 4 of 15

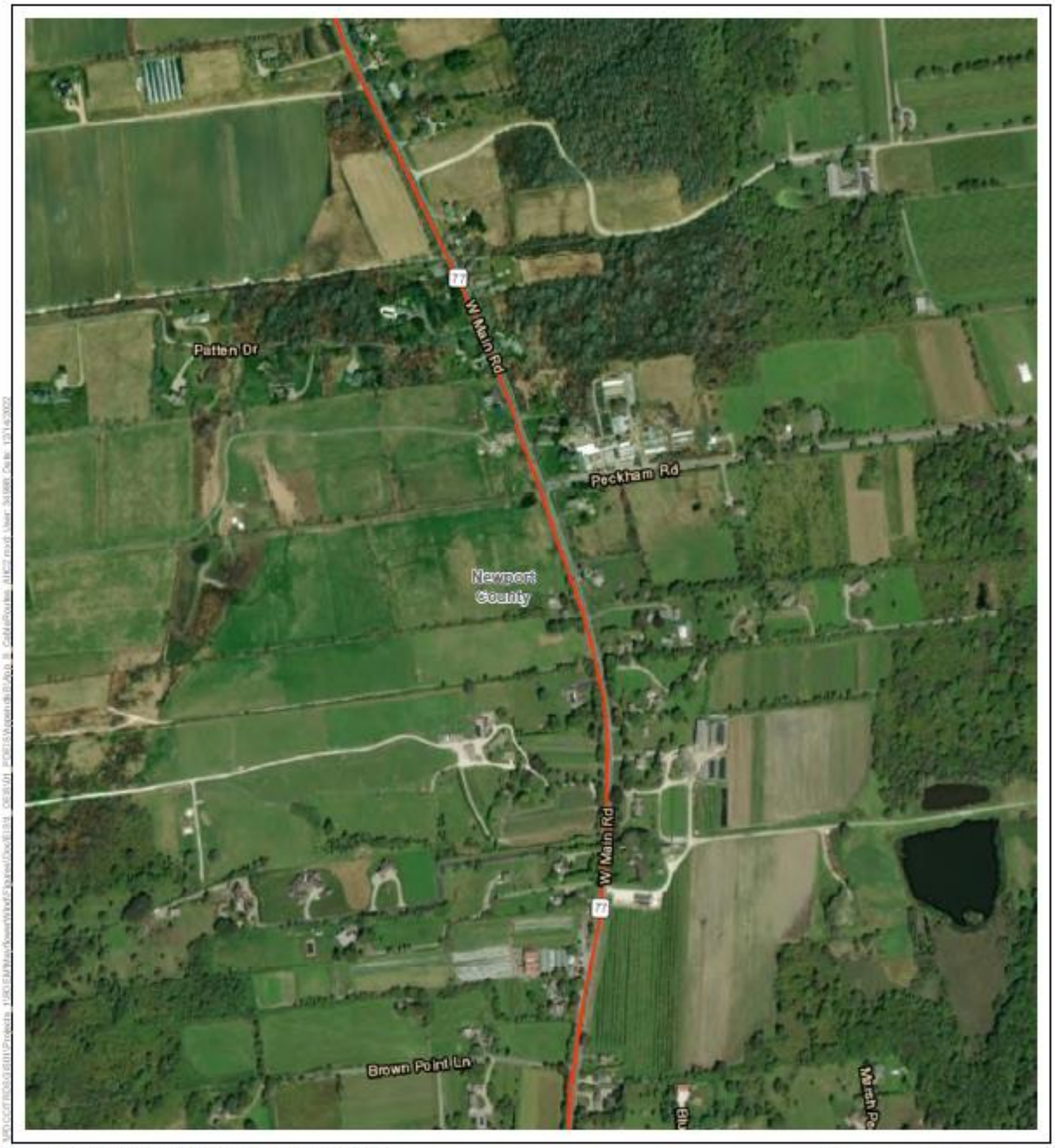


Alternative C-2 - Onshore Export Cable Route

Source: Mayflower Wind 2022.

N 0 500 1,000 Feet 1:8,000

Alternative C-2 Cable Route
Map 5 of 15



Alternative C-2 - Onshore Export Cable Route

Source: Mayflower Wind 2022.

N

0 500 1,000 Feet

1:8,000

Alternative C-2 Cable Route
Map 6 of 15

Alternative C-2 - Onshore Export Cable Route

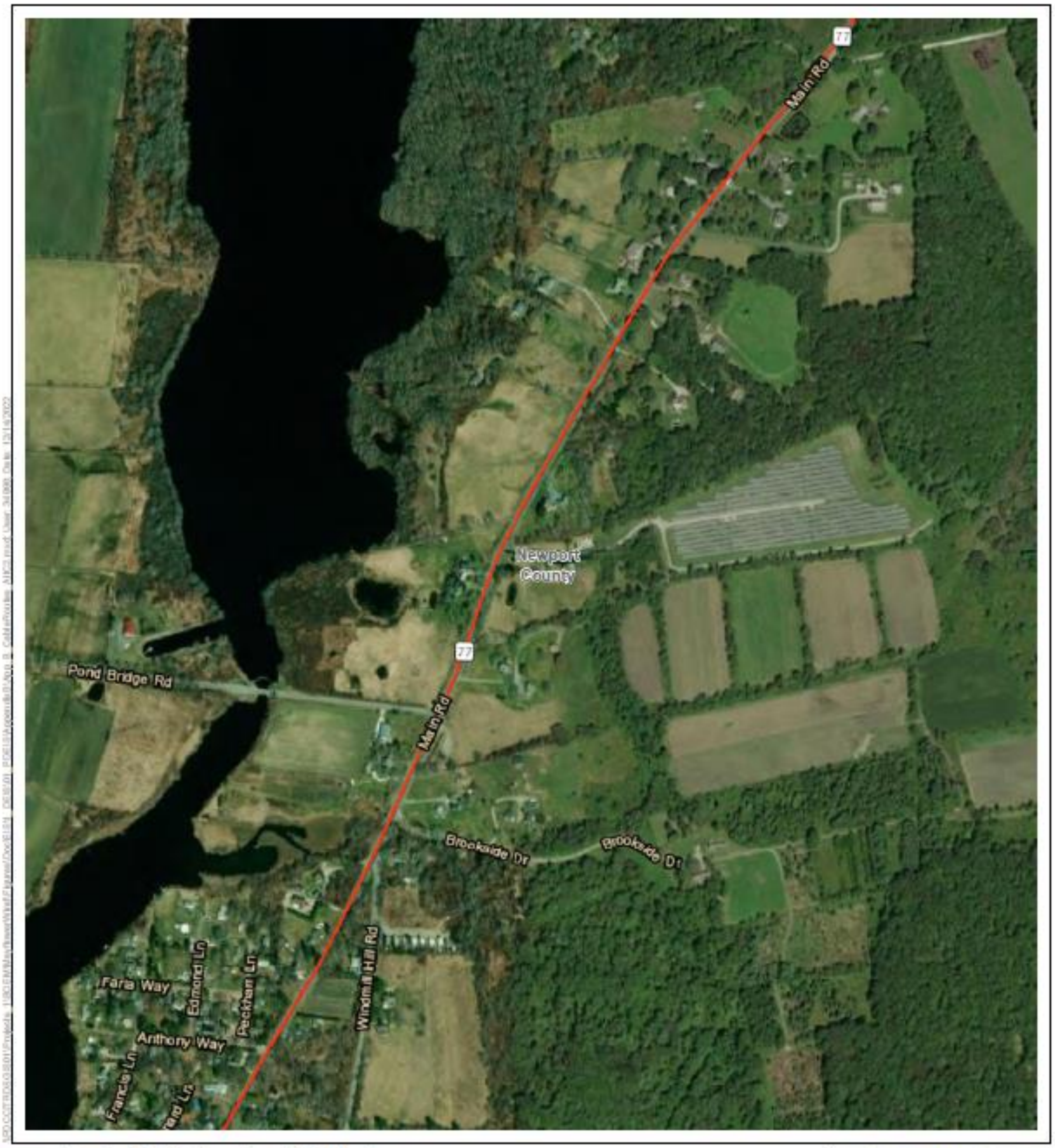
Source: Mayflower Wind 2022.

N

0 500 1,000 Feet

1:8,000

Alternative C-2 Cable Route
Map 7 of 15



Alternative C-2 - Onshore Export Cable Route

Source: Mayflower Wind 2022.

N

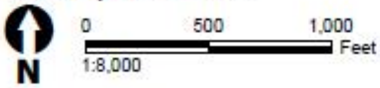
0 500 1,000 Feet

1:8,000

Alternative C-2 Cable Route
Map 8 of 15

Alternative C-2 - Onshore Export Cable Route

Source: Mayflower Wind 2022.



Alternative C-2 Cable Route
Map 9 of 15

Alternative C-2 - Onshore Export Cable Route

Source: Mayflower Wind 2022.

N

0 500 1,000 Feet

1:8,000

Alternative C-2 Cable Route
Map 10 of 15

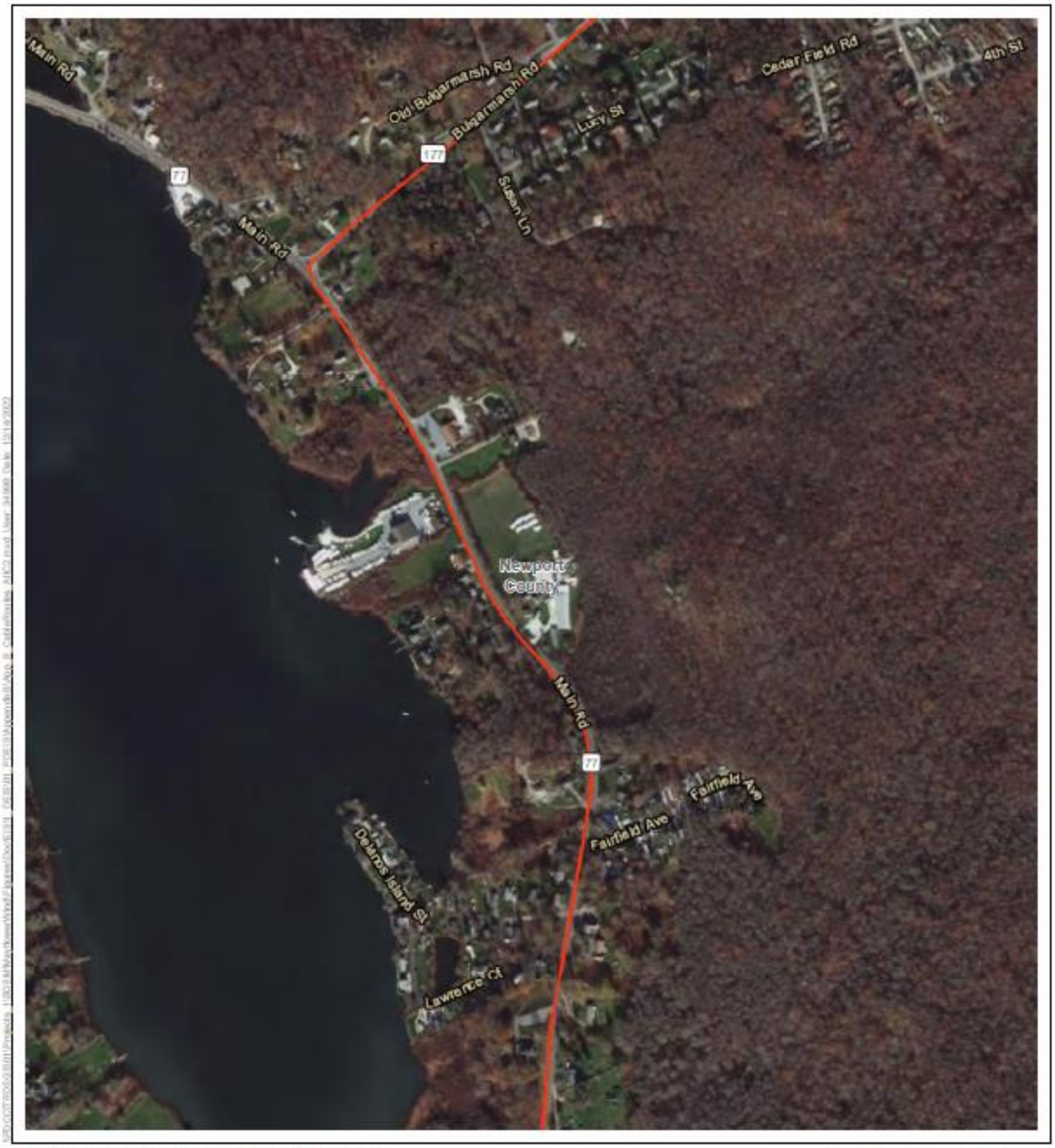
Alternative C-2 - Onshore Export Cable Route

Source: Mayflower Wind 2022.

0 500 1,000 Feet
1:8,000

N

Alternative C-2 Cable Route
Map 11 of 15

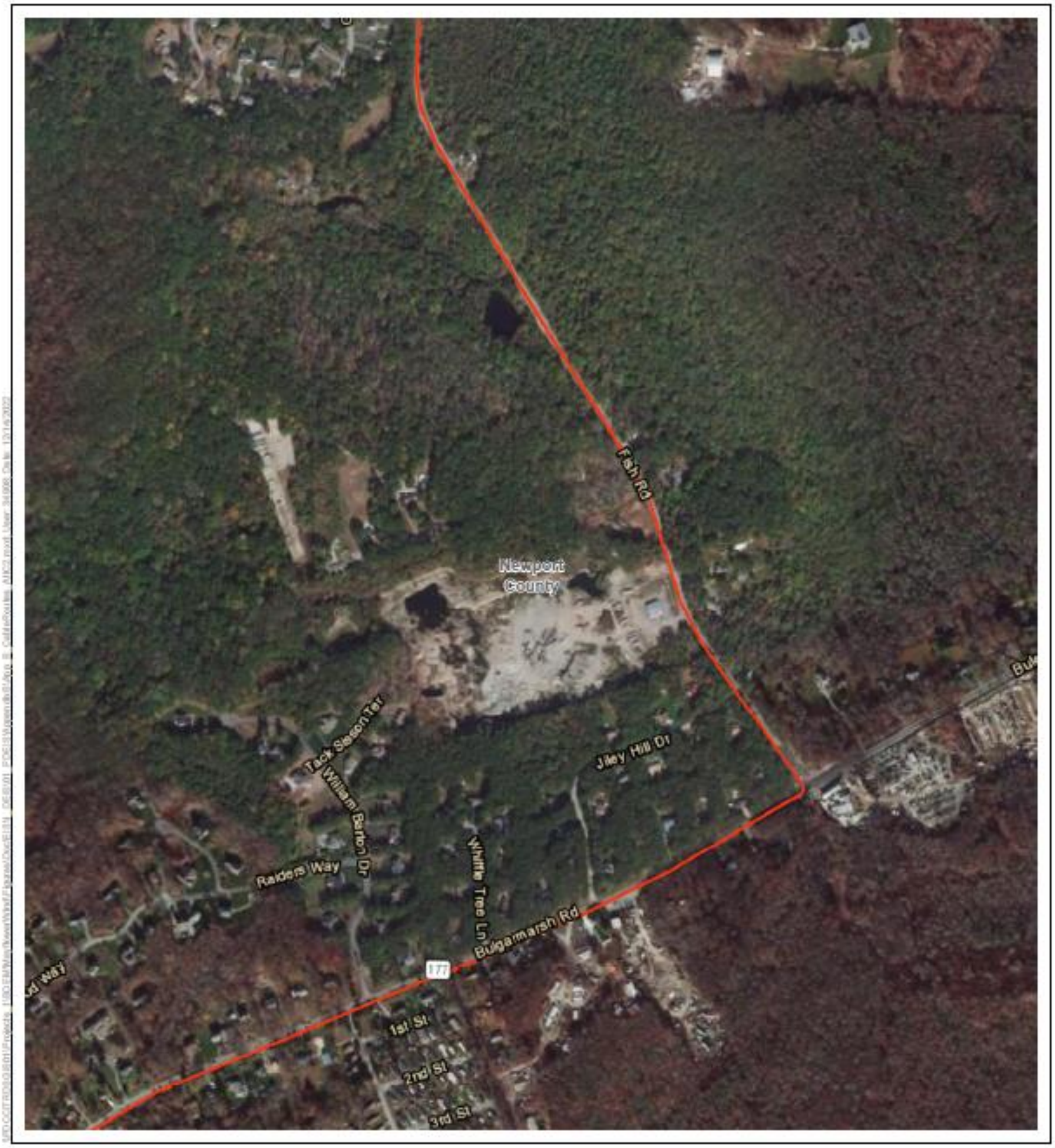


Alternative C-2 - Onshore Export Cable Route

Source: Mayflower Wind 2022.

N 0 500 1,000 Feet 1:8,000

Alternative C-2 Cable Route
Map 12 of 15



Alternative C-2 - Onshore Export Cable Route

Source: Mayflower Wind 2022.

N

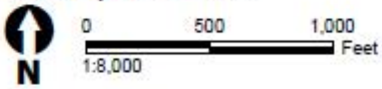
0 500 1,000 Feet

1:8,000

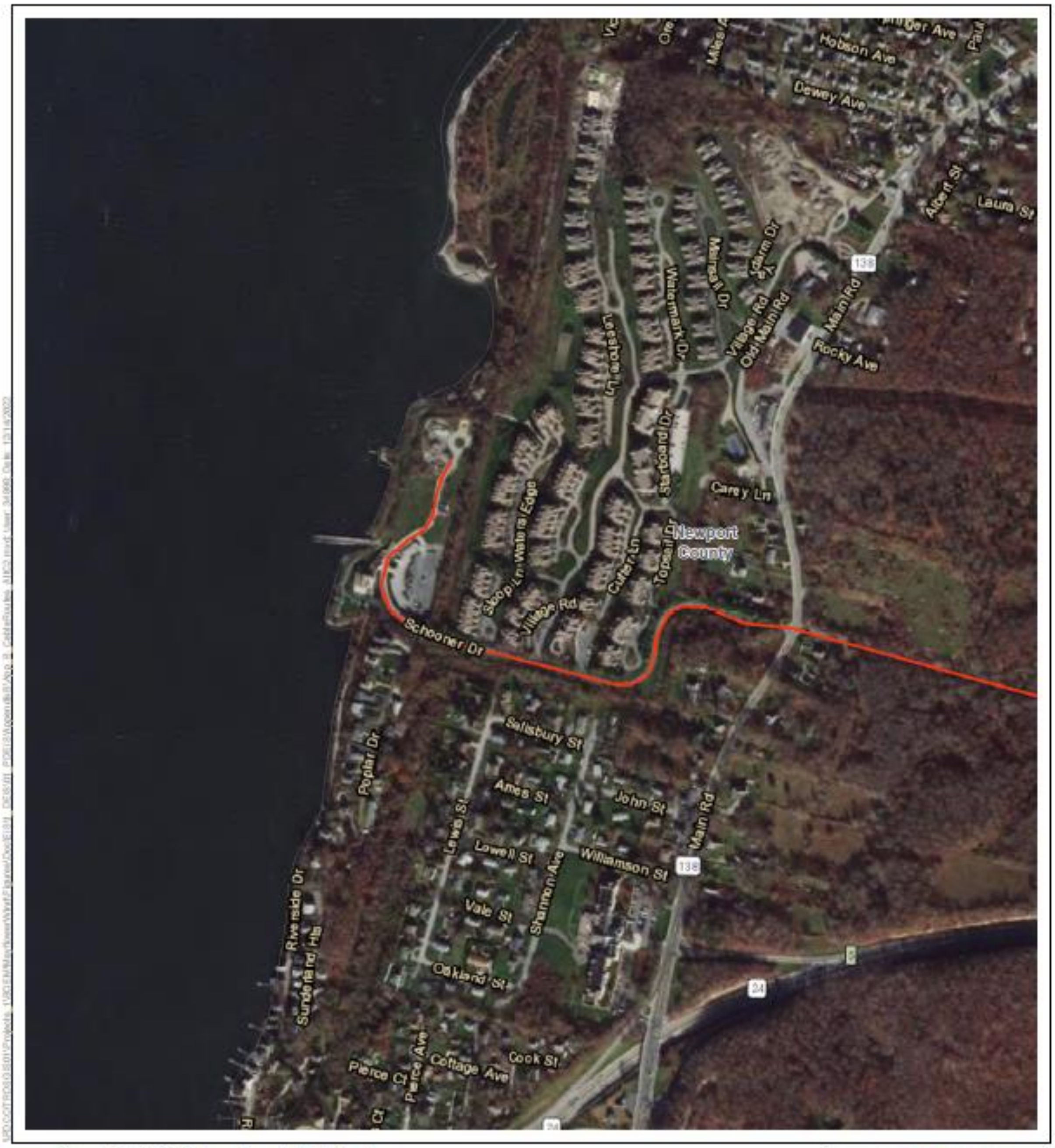
Alternative C-2 Cable Route
Map 13 of 15

Alternative C-2 - Onshore Export Cable Route

Source: Mayflower Wind 2022.



Alternative C-2 Cable Route
Map 14 of 15



Alternative C-2 - Onshore Export Cable Route

Source: Mayflower Wind 2022.

N

0 500 1,000 Feet

1:8,000

Alternative C-2 Cable Route
Map 15 of 15

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B.8.4 Finfish

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B.8.5 Environmental Justice

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B.8.6 Water Quality

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Appendix C: Project Design Envelope and Maximum-Case Scenario

Mayflower Wind Energy LLC (Mayflower Wind) would implement a Project Design Envelope (PDE) concept. This concept allows Mayflower 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 wind turbine generators (WTGs), foundations, submarine cables, and offshore substation platforms (OSPs).

The Bureau of Ocean Energy Management (BOEM) invited Mayflower Wind and other lessees to submit construction and operations plans (COPs) using the PDE concept—providing sufficiently detailed information within a reasonable range of parameters to analyze a “maximum-case scenario” within those parameters for each affected environmental resource. BOEM identified and verified that the maximum-case scenario based on the PDE provided by Mayflower Wind and analyzed in this Environmental Impact Statement (EIS) could reasonably occur if approved. This approach is intended to provide flexibility for lessees and allow BOEM to analyze environmental impacts in a manner that minimizes the need for subsequent environmental and technical reviews. In addition, the PDE approach may enable BOEM to expedite review by beginning National Environmental Policy Act (NEPA) evaluations of COPs before a lessee has finalized all its design decisions.

This EIS assesses the impacts of the reasonable range of project designs that are described in the Mayflower Wind COP 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 considers the interrelationship between aspects of the PDE rather than simply viewing each design parameter independently. This EIS also analyzes the planned action impacts of the maximum-case scenario alongside other reasonably foreseeable past, present, and future actions.

Certain resources evaluated in this EIS may have multiple maximum-case scenarios, and the most impactful design parameters may not be the same for all resources. A summary of Mayflower Wind’s PDE parameters is provided in Table C-1. Table C-2 details the full range of maximum-case design parameters for the proposed Project and which parameters are relevant to the analysis for each EIS Section in Chapter 3, *Affected Environment and Environmental Consequences*.

Table C-1. Summary of PDE parameters

Project Parameter Details
General (Layout and Project Size)
• Up to 147 WTGs • Up to 5 OSPs • Up to a total of 149 WTG/OSP positions • 1 nautical mile (nm) x 1 nm (1.9 kilometers x 1.9 kilometers) grid layout with east–west and north–south orientation
Foundations
• Monopile, piled jacket, suction-bucket jacket, and/or gravity-based structure (up to two different foundation concepts would be installed) • Scour protection for up to all foundations • Seabed penetration up to 295.3 feet (90 meters) depth • Foundation piles would be installed using a pile-driving hammer and/or drilling techniques such as using a hydraulic impact hammer, vibratory hammer, or water jetting
Wind Turbine Generators
• Rotor diameter up to 918.6 feet (280 meters) • Blade length up to 452.8 feet (138 meters) • Hub height up to 605.1 feet (184.4 meters) above mean lower low water (MLLW) • Upper blade tip height up to 1,066.3 feet (325 meters) above MLLW • Lowest blade tip height (air gap) 53.8 feet (16.4 meters) above highest astronomical tide
Offshore Substation Platforms
• Up to five OSPs • OSPs installed atop a monopile, piled jacket, suction-bucket jacket, and/or gravity-based structure • Total OSP structure height up to 344.5 feet (105 meters) above MLLW • Scour protection for all foundations • Maximum length and width of topside structure 360.9 feet by 328.1 feet (110 meters by 100 meters; with ancillary facilities) • Foundation piles to be installed using a pile-driving hammer and/or drilling techniques such as using a hydraulic impact hammer, vibratory hammer, or water jetting. • Up to 10 million gallons per day of once-through non-contact cooling water, with a maximum intake velocity of 0.5 foot per second, with a maximum anticipated temperature change of 18°F (10°C) from ambient water, and a maximum end-of-pipe discharge temperature of 90°F (32.2°C) • Depth of withdrawal for cooling water ranging from approximately 25 to 115 feet (7.6 to 35.0 meters) below the surface
Interarray Cables
• Target burial depth of 3.2 to 8.2 feet (1 to 2.5 meters) • Nominal interarray cable voltage: 60 kilovolt (kV) to 72.5 kV • Maximum total interarray cable length is 497.1 miles (800 kilometers) • Preliminary layout available; however, final layout pending • Cable lay, installation, and burial: Activities may involve use of a jetting remotely operated vessel (ROV), mechanical cutting ROV system, plowing (pre-cut and mechanical)

Project Parameter Details
Falmouth Offshore Export Cables
• Up to 5 offshore export cables • Nominal export cable voltage: 200 kV to 345 kV high voltage alternating current (HVAC) or ±525 kV high voltage direct current (HVDC) • Maximum total cable corridor length is 87 miles (140 kilometers) • Target burial depth of 3.2 to 13.1 feet (1 to 4 meters) • Up to 9 cable / pipeline crossings • Cable lay, installation, and burial: Activities may involve use of a jetting tool (jetting ROV or jetting sled), vertical injection, mechanical cutting ROV system, plowing (pre-cut and mechanical)
Brayton Point Offshore Export Cables
• Up to 6 offshore export cables • Nominal export cable voltage: ±320 kV HVDC • Maximum total cable corridor length is 124 miles (200 kilometers) • Target burial depth of 3.2 to 13.1 feet (1 to 4 meters) • Up to 16 cable/pipeline crossings • Cable lay, installation, and burial: Activities may involve use of a jetting tool (jetting ROV or jetting sled), vertical injection, mechanical cutting ROV system, plowing (pre-cut and mechanical)
Falmouth Landfall Site
• Three landfall locations under consideration: Worcester Avenue (preferred), Central Park, and Shore Street
Brayton Point Landfall Site
• Two landfall locations under consideration: the western (preferred) and eastern (alternate) shorelines of Brayton Point • Aquidneck Island, Portsmouth, Rhode Island; several locations under consideration for intermediate landfall across the island
Falmouth Onshore Export Cable Corridor
• Up to 12 onshore export cables and up to five communications cables • Nominal underground onshore export cable voltage: 200 kV to 345 kV HVAC • Maximum onshore export cable length is 6.4 statute miles (10.3 kilometers)
Brayton Point Onshore Export Cable Corridor
• Up to 6 onshore export cables and up to two communications cables • Nominal underground onshore export cable voltage: ±320 kV HVDC • Maximum onshore export cable length is 0.6 mile (1.0 kilometer)
Brayton Point Onshore Export Cable Corridor on Aquidneck Island (intermediate landfall)
• Up to 4 onshore export cables and up to two communications cables • Nominal underground onshore export cable voltage: ±320 kV HVDC • Onshore export cable corridor length is 3 miles (4.8 kilometers) across Aquidneck Island

Project Parameter Details
Falmouth Onshore Substation/Interconnection
• Two Falmouth locations under consideration - Lawrence Lynch (preferred) and Cape Cod Aggregates (alternate) • Up to 26 acres (10.5 hectares) permanent area • New 345-kV overhead (preferred) or underground (alternate) transmission line in existing right-of-way up to 2.1 miles (3.4 kilometers) in length • Transmission line to Falmouth point of interconnection would be designed, permitted, and constructed by interconnection transmission owner
Brayton Point Converter Station/Interconnection
• One Brayton Point location under consideration – existing National Grid substation • Up to 7.5 acres (3 hectares) permanent area • New 345-kV underground transmission route to existing Brayton Point point of interconnection, up to 0.2 mile (0.3 kilometer) on Brayton Point property

Table C-2. Project design envelope maximum-case scenario per resource

Design Parameter	Maximum Design Parameters	3.4 .1 Air Quality	3.4.2 Water Quality	3.5.1 Bats	3.5.2 Benthic Resources	3.5.3 Birds	3.5.4 Coastal Habitat and Fauna	3.5.5 Finfish, Invertebrates, and Essential Fish Habitat	3.5.6 Marine Mammals	3.5.7 Sea Turtles	3.5.8 Wetlands and Other Waters of the United States	3.6.1 Commercial Fisheries and For-Hire Recreational Fishing	3.6.2 Cultural Resources	3.6.3 Demographics, Employment, and Economics	3.6.4 Environmental Justice	3.6.5 Land Use and Coastal Infrastructure	3.6.6 Navigation and Vessel Traffic	3.6.7 Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)	3.6.8 Recreation and Tourism	3.6.9 Visual Resources
WIND FARM																				
Wind Facility Capacity	Up to 2,400 megawatts (MW)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WTG Foundation Arrangement Envelope	1 nm x 1 nm (1.9 kilometers x 1.9 kilometers)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WIND TURBINES																				
Parameters per Turbine																				
Number of WTG/OSP positions	149 total WTGs and OSPs	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Number of WTGs installed	147 WTGs	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Tip height above mean lower low water (MLLW)	1,066.3 feet (325 meters)			X		X						X	X	X	X	X	X	X	X	X
Hub height above MLLW	605.1 feet (184.4 meters)			X		X						X	X	X	X	X	X	X	X	X
Rotor diameter	918.6 feet (280 meters)			X		X						X	X	X	X	X	X	X	X	X
Blade length	452.8 feet (138 meters)			X		X						X	X	X	X	X	X	X	X	X
Tip clearance above highest astronomical tide	53.8 feet (16.4 meters)			X		X						X	X	X	X	X	X	X	X	X
PARAMETERS PER WTG FOUNDATION STRUCTURE (COP Volume 1 Table 3-2)																				
WTG Pin-Piled Jacket (COP Volume 1 Table 3-2)																				
Diameter at seabed (seabed centerline diameter)	164.0 feet (50.0 meters)				X			X	X	X		X	X				X		X	
Foundation diameter	14.7 feet (4.5 meters)				X			X	X	X		X	X				X		X	
Footprint diameter across [a]	380.5 feet (116.0 meters)				X			X	X	X		X	X				X		X	
Number of legs/discrete contact points with seabed per substructure	4				X			X	X	X		X	X				X			
Depth of penetration below seabed with scour protection	229.6 feet (70.0 meters)				X			X	X	X		X	X						X	
WTG Monopile (COP Volume 1 Table 3-2)																				
Foundation diameter	52.5 feet (16.0 meters)				X			X	X	X		X	X				X		X	
Footprint diameter across [a]	374 feet (114.0 meters)				X			X	X	X		X	X				X		X	
Number of legs/discrete contact points with seabed per substructure	1				X			X	X	X		X	X				X		X	
Depth of penetration below seabed with scour protection	164.0 feet (50.0 meters)				X			X	X	X		X	X				X		X	
WTG Suction Bucket Jacket (COP Volume 1 Table 3-2)																				
Diameter of suction bucket at seabed (seabed centerline diameter)	180.4 feet (55.0 meters)				X			X	X	X		X	X				X		X	
Foundation diameter	65.6 feet (20.0 meters)				X			X	X	X		X	X				X		X	
Footprint diameter across [a]	521.6 feet (159.0 meters)				X			X	X	X		X	X				X		X	

Design Parameter	Maximum Design Parameters	3.4 .1 Air Quality	3.4.2 Water Quality	3.5.1 Bats	3.5.2 Benthic Resources	3.5.3 Birds	3.5.4 Coastal Habitat and Fauna	3.5.5 Finfish, Invertebrates, and Essential Fish Habitat	3.5.6 Marine Mammals	3.5.7 Sea Turtles	3.5.8 Wetlands and Other Waters of the United States	3.6.1 Commercial Fisheries and For-Hire Recreational Fishing	3.6.2 Cultural Resources	3.6.3 Demographics, Employment, and Economics	3.6.4 Environmental Justice	3.6.5 Land Use and Coastal Infrastructure	3.6.6 Navigation and Vessel Traffic	3.6.7 Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)	3.6.8 Recreation and Tourism	3.6.9 Visual Resources
Number of legs/discrete contact points with seabed per substructure	4				X			X	X	X		X	X				X		X	
Depth of penetration below seabed with scour protection	65.6 feet (20.0 meters)				X			X	X	X		X	X				X		X	
WTG Gravity-based Structure (COP Volume 1 Table 3-2)																				
Diameter of gravity-based structure at seabed (seabed centerline diameter) (maximum for 4-foundation gravity-based structure)	393.7 feet (120 meters)				X			X	X	X		X	X				X		X	
Foundation diameter (maximum for 1-foundation gravity-based structure)	229.6 feet (70.0 meters)				X			X	X	X		X	X				X		X	
Footprint diameter across [a] (maximum for 4-foundation gravity-based structure)	696.2 feet (212.2 meters)				X			X	X	X		X	X				X		X	
Number of legs/discrete contact points with seabed per substructure	Up to 4				X			X	X	X		X	X				X		X	
Depth of penetration below seabed	29.6 feet (9 meters)				X			X	X	X		X	X				X		X	
Maximum total dredging volume of all locations combined for installation	111,973,203 ft^3 (3,170,728 m^3)				X			X	X	X		X	X				X		X	
OFFSHORE SUBSTATIONS																				
PARAMETERS PER OSP FOUNDATION STRUCTURE																				
Topside Offshore Substations																				
Number of OSPs	Up to 5	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Height of OSP topside above MLLW	344.5 feet (105 meters)			X	X							X	X				X	X		X
PARAMETERS PER OSP FOUNDATION STRUCTURE (COP Volume 1 Table 3-3) – Option A Modular																				
OSP Monopile (COP Volume 1 Table 3-3)																				
Number of OSPs	Up to 5	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Diameter at seabed (seabed centerline diameter)	52.5 feet (16.0 meters)				X			X	X	X		X	X				X		X	
Footprint diameter at mudline	52.5 feet (16.0 meters)				X			X	X	X		X	X				X		X	
Number of legs/discrete contact points with seabed per substructure	1				X			X	X	X		X	X				X		X	
Depth of penetration below seabed with scour protection	164.0 feet (50.0 meters)				X			X	X	X		X	X				X		X	
Total foundation footprint contacting seabed per foundation [a]	2.52 acres (1.02 hectares)				X			X	X	X		X	X				X		X	
OSP Pin-Pile Jacket (COP Volume 1 Table 3-3)																				
Number of OSPs	Up to 5	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Diameter at seabed (seabed centerline diameter)	164.0 feet (50.0 meters)				X			X	X	X		X	X				X		X	
Foundation diameter (pile or bucket diameter at mudline)	14.7 feet (4.5 meters)				X			X	X	X		X	X				X		X	
Number of legs/discrete contact points with seabed per substructure	Up to 4 foundations and up to 2 piles per foundation				X			X	X	X		X	X				X		X	
Depth of penetration below seabed with scour protection	229.6 feet (70.0 meters)				X			X	X	X		X	X				X		X	
Distance between adjacent legs at seabed	116 feet (36 meters)				X			X	X	X		X	X				X		X	
Total foundation footprint contacting seabed per foundation [a]	2.61 acres (1.05 hectares)				X			X	X	X		X	X				X		X	

Design Parameter	Maximum Design Parameters	3.4 .1 Air Quality	3.4.2 Water Quality	3.5.1 Bats	3.5.2 Benthic Resources	3.5.3 Birds	3.5.4 Coastal Habitat and Fauna	3.5.5 Finfish, Invertebrates, and Essential Fish Habitat	3.5.6 Marine Mammals	3.5.7 Sea Turtles	3.5.8 Wetlands and Other Waters of the United States	3.6.1 Commercial Fisheries and For-Hire Recreational Fishing	3.6.2 Cultural Resources	3.6.3 Demographics, Employment, and Economics	3.6.4 Environmental Justice	3.6.5 Land Use and Coastal Infrastructure	3.6.6 Navigation and Vessel Traffic	3.6.7 Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)	3.6.8 Recreation and Tourism	3.6.9 Visual Resources
OSP Suction-Bucket Jacket (COP Volume 1 Table 3-3)																				
Number of OSPs	Up to 5	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Diameter of suction bucket at seabed (seabed centerline diameter)	180.4 feet (55.0 meters)				X			X	X	X		X	X				X		X	
Foundation diameter (pile or bucket diameter at mudline)	65.6 feet (20.0 meters)				X			X	X	X		X	X				X		X	
Number of legs/discrete contact points with seabed per substructure	Up to 4 foundations and 1 bucket per foundation				X			X	X	X		X	X				X		X	
Depth of penetration below seabed with scour protection	65.6 feet (20.0 meters)				X			X	X	X		X	X				X		X	
Distance between adjacent legs at seabed	65.6 feet (20.0 meters)				X			X	X	X		X	X				X		X	
Total foundation footprint contacting seabed per foundation [a]	4.90 acres (1.98 hectares)				X			X	X	X		X	X				X		X	
OSP Gravity-based Structure (COP Volume 1 Table 3-3)																				
Number of OSPs	Up to 5	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Diameter at seabed (centerline diameter)	Not applicable				X			X	X	X		X	X				X		X	
Diameter of gravity-based structure at seabed [seabed centerline diameter]	229.6 feet (70 meters)				X			X	X	X		X	X				X		X	
Number of legs/discrete contact points with seabed	Up to 4 foundations				X			X	X	X		X	X				X		X	
Depth of penetration below seabed	Not appliable				X			X	X	X		X	X				X		X	
Distance between adjacent legs at seabed	Not applicable				X			X	X	X		X	X				X		X	
Total foundation footprint contacting seabed per foundation [a]	11.55 acres (4.67 hectares)				X			X	X	X		X	X				X		X	
PARAMETERS PER OSP FOUNDATION STRUCTURE (COP Volume 1 Table 3-3) – Option B Integrated																				
OSP Pin-Pile Jacket (COP Volume 1 Table 3-3)																				
Number of OSPs	Up to 5	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Diameter at seabed (seabed centerline diameter)	213 feet x 105 feet (65 meters x 32 meters)				X			X	X	X		X	X				X		X	
Foundation diameter (pile or bucket diameter at mudline)	11.7 feet (3.57 meters)				X			X	X	X		X	X				X		X	
Number of legs/discrete contact points with seabed per substructure	Up to 6 foundations and up to 3 piles per foundation				X			X	X	X		X	X				X		X	
Depth of penetration below seabed with scour protection	277.2 feet (84.5 meters)				X			X	X	X		X	X				X		X	
Foundation diameter/leg spacing at mean sea level (MSL)	114.8–168.0 feet (35–50 meters				X			X	X	X		X	X				X		X	
Total foundation footprint contacting seabed per foundation [a]	7.54 acres (3.05 hectares)				X			X	X	X		X	X				X		X	
PARAMETERS PER OSP FOUNDATION STRUCTURE (COP Volume 1 Table 3-3) – Option C DC Converter																				
OSP Pin-Pile Jacket (COP Volume 1 Table 3-3)																				
Number of OSPs	Up to 5	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Diameter at seabed (seabed centerline diameter)	279 feet x 197 feet (85 meters x 60 meters)				X			X	X	X		X	X				X		X	
Foundation diameter (pile or bucket diameter at mudline)	12.8 feet (3.9 meters)				X			X	X	X		X	X				X		X	

Design Parameter	Maximum Design Parameters	3.4 .1 Air Quality	3.4.2 Water Quality	3.5.1 Bats	3.5.2 Benthic Resources	3.5.3 Birds	3.5.4 Coastal Habitat and Fauna	3.5.5 Finfish, Invertebrates, and Essential Fish Habitat	3.5.6 Marine Mammals	3.5.7 Sea Turtles	3.5.8 Wetlands and Other Waters of the United States	3.6.1 Commercial Fisheries and For-Hire Recreational Fishing	3.6.2 Cultural Resources	3.6.3 Demographics, Employment, and Economics	3.6.4 Environmental Justice	3.6.5 Land Use and Coastal Infrastructure	3.6.6 Navigation and Vessel Traffic	3.6.7 Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)	3.6.8 Recreation and Tourism	3.6.9 Visual Resources
Number of legs/discrete contact points with seabed	4 to 9 foundations and 1 to 3 piles / foundation = 4 to 27 piles				X			X	X	X		X	X				X		X	
Depth of penetration below seabed with scour protection	262.4 feet (80 meters)				X			X	X	X		X	X				X		X	
Total foundation footprint contacting seabed per foundation [a]	9.79 acres (3.96 hectares)				X			X	X	X		X	X				X		X	
OSP Gravity-based Structure (COP Volume 1 Table 3-3)																				
Number of OSPs	Up to 5	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Diameter of gravity-based structure at seabed (seabed centerline diameter)	361 feet x 328 feet (110 x 100 meters)				X			X	X	X		X	X				X		X	
Number of legs/discrete contact points with seabed per substructure	4 to 9 foundations				X			X	X	X		X	X				X		X	
Depth of penetration below seabed	Not applicable				X			X	X	X		X	X				X		X	
Foundation diameter/leg spacing at mean sea level (MSL)	262.0–328.1 feet (80–100 meters)				X			X	X	X		X	X				X		X	
Total foundation footprint contacting seabed per foundation [a]	10.90 acres (4.41 hectares)				X			X	X	X		X	X				X		X	
PERMANENT SEABED DISTURBANCE (COP Volume 1 Table 3-36; Table 3-37)																				
Monopile WTG Substructures (COP Volume 1 Table 3-37)																				
Total permanent footprint per foundation [a]	2.52 acres (1.02 hectares)		X		X			X	X	X		X	X				X		X	
Total permanent footprint for 147 WTG foundations [a]	370.44 acres (149.94 hectares)		X		X			X	X	X		X	X				X		X	
Pin-Pile Jacket WTG Substructures (COP Volume 1 Table 3-37)																				
Total permanent footprint per foundation [a]	2.61 acres (1.05 hectares)		X		X			X	X	X		X	X				X		X	
Total permanent footprint for 147 WTG foundations [a]	383.67 acres (154.35 hectares)		X		X			X	X	X		X	X				X		X	
Pin-Pile Jacket OSP Substructures (COP Volume 1 Table 3-36)																				
Total permanent footprint per OSP foundation [a]	9.8 acres (3.7 hectares)		X		X			X	X	X		X	X				X		X	
Total permanent footprint for 2 OSP foundations [a]	19.6 acres (7.4 hectares)		X		X			X	X	X		X	X				X		X	
Suction Bucket Jacket WTG Substructures (COP Volume 1 Table 3-37)																				
Total permanent footprint per foundation [a]	4.90 acres (1.98 hectares)		X		X			X	X	X		X	X				X		X	
Total permanent footprint for 147 WTG foundations [a]	720.30 acres (291.06 hectares)		X		X			X	X	X		X	X				X		X	
WTG Gravity Based Substructures (COP Volume 1 Table 3-37)																				
Total permanent footprint per foundation [a]	11.55 acres (4.67 hectares)		X		X			X	X	X		X	X				X		X	
Total permanent footprint for 147 WTG foundations [a]	1,697.85 acres (686.49 hectares)		X		X			X	X	X		X	X				X		X	

Design Parameter	Maximum Design Parameters	3.4 .1 Air Quality	3.4.2 Water Quality	3.5.1 Bats	3.5.2 Benthic Resources	3.5.3 Birds	3.5.4 Coastal Habitat and Fauna	3.5.5 Finfish, Invertebrates, and Essential Fish Habitat	3.5.6 Marine Mammals	3.5.7 Sea Turtles	3.5.8 Wetlands and Other Waters of the United States	3.6.1 Commercial Fisheries and For-Hire Recreational Fishing	3.6.2 Cultural Resources	3.6.3 Demographics, Employment, and Economics	3.6.4 Environmental Justice	3.6.5 Land Use and Coastal Infrastructure	3.6.6 Navigation and Vessel Traffic	3.6.7 Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)	3.6.8 Recreation and Tourism	3.6.9 Visual Resources
Gravity Based OSP Substructures (COP Volume 1 Table 3-36)																				
Total permanent footprint per foundation [a]	10.9 acres (4.4 hectares)		X		X			X	X	X		X	X				X		X	
Total permanent footprint for 2 OSP foundations [a]	21.8 acres (8.8 hectares)		X		X			X	X	X		X	X				X		X	
TEMPORARY SEABED DISTURBANCE DURING CONSTRUCTION																				
Monopile WTG Substructures (COP Volume 1 Table 3-37; Table 3-38)																				
Disturbance due to jack-up or anchored vessels per foundation	2.96 acres (1.2 hectares)		X		X			X	X	X		X	X				X		X	
Total temporary seabed disturbance beyond permanent footprint per foundation	0.5 acre (0.2 hectare)		X		X			X	X	X		X	X				X		X	
Total temporary seabed disturbance beyond permanent footprint for 147 WTG foundations	73.5 acres (29.4 hectares)		X		X			X	X	X		X	X				X		X	
Pin-Pile Jacket WTG Substructures (Table 3-37; Table 3-38)																				
Disturbance due to jack-up or anchored vessels per foundation	2.96 acres (1.2 hectares)		X		X			X	X	X		X	X				X		X	
Total temporary seabed disturbance beyond permanent footprint per foundation	0.5 acre (0.2 hectare)		X		X			X	X	X		X	X				X		X	
Total temporary seabed disturbance beyond permanent footprint for 147 WTG foundations	73.5 acres (29.4 hectares)		X		X			X	X	X		X	X				X		X	
Pin-Pile Jacket OSP Substructures (COP Volume 1 Table 3-36; Table 3-38)																				
Disturbance due to jack-up or anchored vessels per foundation	2.96 acres (1.2 hectares)		X		X			X	X	X		X	X				X		X	
Total temporary seabed disturbance beyond permanent footprint per foundation	0.5 acre (0.2 hectare)		X		X			X	X	X		X	X				X		X	
Total temporary seabed disturbance beyond permanent footprint for 2 OSP foundations	1.0 acres (0.4 hectare)		X		X			X	X	X		X	X				X		X	
Suction Bucket Jacket WTG Substructures (COP Volume 1 Table 3-37; Table 3-38)																				
Disturbance due to jack-up or anchored vessels per foundation	2.96 acres (1.2 hectares)		X		X			X	X	X		X	X				X		X	
Total temporary seabed disturbance beyond permanent footprint per foundation	0.6 acre (0.3 hectare)		X		X			X	X	X		X	X				X		X	
Total temporary seabed disturbance beyond permanent footprint for 147 WTG foundations	88.2 acres (44.1 hectares)		X		X			X	X	X		X	X				X		X	
Gravity Base WTG Substructures (COP Volume 1 Table 3-37; Table 3-38)																				
Disturbance due to jack-up or anchored vessels per foundation	2.96 acres (1.2 hectares)		X		X			X	X	X		X	X				X		X	
Total temporary seabed disturbance beyond permanent footprint per foundation	1.0 acres (0.4 hectare)		X		X			X	X	X		X	X				X		X	
Total temporary seabed disturbance beyond permanent footprint for 147 WTG foundations	147.0 acres (58.8 hectares)		X		X			X	X	X		X	X				X		X	
Gravity Base OSP Substructures (COP Volume 1 Table 3-36; Table 3-38)																				
Disturbance Due to jack-up or anchored vessels per foundation	2.96 acres (1.2 hectares)		X		X			X	X	X		X	X				X		X	
Total temporary seabed disturbance beyond permanent footprint per foundation	1.5 acres (0.6 hectare)		X		X			X	X	X		X	X				X		X	
Total temporary seabed disturbance beyond permanent footprint for 2 OSP foundations	3.0 acres (1.2 hectares)		X		X			X	X	X		X	X				X		X	

Design Parameter	Maximum Design Parameters	3.4 .1 Air Quality	3.4.2 Water Quality	3.5.1 Bats	3.5.2 Benthic Resources	3.5.3 Birds	3.5.4 Coastal Habitat and Fauna	3.5.5 Finfish, Invertebrates, and Essential Fish Habitat	3.5.6 Marine Mammals	3.5.7 Sea Turtles	3.5.8 Wetlands and Other Waters of the United States	3.6.1 Commercial Fisheries and For-Hire Recreational Fishing	3.6.2 Cultural Resources	3.6.3 Demographics, Employment, and Economics	3.6.4 Environmental Justice	3.6.5 Land Use and Coastal Infrastructure	3.6.6 Navigation and Vessel Traffic	3.6.7 Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)	3.6.8 Recreation and Tourism	3.6.9 Visual Resources
Installation Timeframe																				
Monopile																				
Approximate duration per foundation	4 hours	X	X	X	X	X		X	X	X		X					X		X	
Number of piles driven per day	2	X	X	X	X	X		X	X	X		X					X		X	
Piled Jacket																				
Approximate duration per foundation	2 hours	X	X	X	X	X		X	X	X		X					X		X	
Number of piles driven per day	8	X	X	X	X	X		X	X	X		X					X		X	
Temporary Seabed Disturbance During WTG Construction (COP Volume 1 Table 3-37; Table 3-38)																				
Area of seabed preparation per foundation monopile	0.5 acre (0.2 hectare)		X		X			X	X	X		X	X				X		X	
Area of seabed preparation per foundation pin-pile jacket	0.5 acre (0.2 hectare)		X		X			X	X	X		X	X				X		X	
Area of seabed preparation per foundation suction-bucket jacket	0.6 acre (0.3 hectare)		X		X			X	X	X		X	X				X		X	
Area of seabed preparation per foundation gravity-base	1.0 acre (0.4 hectare)		X		X			X	X	X		X	X				X		X	
Area of disturbance per jack-up vessel (vessel spuds including all legs)	0.37 acre (0.15 hectare)		X		X			X	X	X		X	X				X		X	
Number of vessel visits per WTG location	6 to 8	X	X		X			X	X	X		X	X	X	X		X		X	
Temporary Seabed Disturbance During OSP Construction (COP Volume 1 Table 3-36; Table 3-38)																				
Area of seabed preparation per foundation pin-pile jacket	0.5 acre (0.2 hectare)		X		X			X	X	X		X	X				X		X	
Area of seabed preparation per foundation gravity base	1.5 acre (0.6 hectare)		X		X			X	X	X		X	X				X		X	
Number of vessel visits per OSP location	4	X	X		X			X	X	X		X	X	X	X		X		X	
Temporary Seabed Disturbance During WTG/OSP Construction (COP Volume 1 Table 3-38)																				
Total jack-up vessel spud seabed footprint area (149 WTG/OSP locations)	441.8 acres (178.8 hectares)		X		X			X	X	X		X	X				X		X	
INTERARRAY and EXPORT CABLES																				
Interarray Cable (COP Volume 1 Table 3-12; Table 3-30)																				
Cable diameter	8 inches		X		X	X		X	X	X		X	X				X	X		
Nominal cable voltage (AC)	72.5 kV				X			X	X	X										
Number of WTGs per interarray cable string	1 to up to 9				X								X	X			X	X		
Seabed preparation (assumes boulder removal and grapnel run over entire length)	99 acres (40 hectares)		X		X	X		X	X	X		X	X	X		X	X			
Cable installation (assumed 19.7 feet [6 meters] of surface impact around each cable)	1,186 acres (480 hectares)		X		X	X		X	X	X		X	X	X		X	X			
Cable protection (assumes mattresses or rock placement at cable crossings and as needed; assumes 10 percent of the interarray cable will require additional protection; a 19.7-foot (6-meter)-wide rock berm would be constructed along these cable sections)	122 acres (50 hectares)		X		X	X						X	X	X			X	X	X	
Total area disturbed	1,408 acres (570 hectares)		X		X	X		X	X	X		X	X	X		X	X		X	

Design Parameter	Maximum Design Parameters	3.4 .1 Air Quality	3.4.2 Water Quality	3.5.1 Bats	3.5.2 Benthic Resources	3.5.3 Birds	3.5.4 Coastal Habitat and Fauna	3.5.5 Finfish, Invertebrates, and Essential Fish Habitat	3.5.6 Marine Mammals	3.5.7 Sea Turtles	3.5.8 Wetlands and Other Waters of the United States	3.6.1 Commercial Fisheries and For-Hire Recreational Fishing	3.6.2 Cultural Resources	3.6.3 Demographics, Employment, and Economics	3.6.4 Environmental Justice	3.6.5 Land Use and Coastal Infrastructure	3.6.6 Navigation and Vessel Traffic	3.6.7 Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)	3.6.8 Recreation and Tourism	3.6.9 Visual Resources
Interarray cable length	497.1 miles (800 kilometers)	X			X	X		X	X	X		X	X	X			X	X	X	
Target burial depth	8.2 feet (2.5 meters)				X	X		X	X	X		X	X				X	X	X	
Number of cable/pipeline crossings	Up to 10				X													X		
Offshore Export Cable (COP Volume 1 Table 3-29; Table 3-14) – Falmouth																				
Number of export cables	Up to 5	X	X		X	X		X	X	X		X	X	X		X	X	X	X	
Nominal cable voltage	345 kV (HVAC) ±525 kV (HVDC)				X			X	X	X										
Burial depth	13.1 feet (4 meters)				X	X		X	X	X		X	X				X	X	X	
Export cable diameter (excluding cable protection)	13.8 inches (350.0 millimeters)		X		X	X		X	X	X		X	X				X	X		
Maximum Length of export cable	434.9 miles (700 kilometers)	X	X		X	X		X	X	X		X	X				X	X		
Length of Offshore cable corridor	87.0 miles (140 kilometers)		X		X	X		X	X	X		X	X				X	X		
Export cable corridor width	3,280.8 feet (1,000 meters)		X		X	X		X	X	X		X	X				X	X		
Number of cable/pipeline crossings (COP Volume 1 Table 3-15)	Up to 9				X													X		
Typical separation distance of export cable	328 feet (100 meters)		X		X	X						X	X				X	X		
Seabed preparation (per cable) (assumes suction hopper dredger over 5 percent of route; boulder field clearance 10 percent of route; grapnel run over the entire route)	138 acres (56 hectares)		X		X	X		X	X	X		X	X	X		X	X			
Cable installation (per cable) (assumes surface impact of 19.7 feet [6 meters] around each cable)	186 acres (75 hectares)		X		X	X		X	X	X		X	X	X		X	X			
Cable protection (per cable) (an estimated 10 percent of the route will require additional cable protection. It is assumed that a 19.7 foot- (6 meter)-wide rock berm will be constructed)	27 acres (11 hectares)		X		X	X		X	X	X		X	X	X		X	X			
Total seabed disturbance area (per cable)	351 acres (142 hectares)		X		X	X		X	X	X		X	X	X		X	X		X	
Total seabed disturbance area (5 cables)	1,753 acres (709 hectares)		X		X	X		X	X	X		X	X	X		X	X		X	
Offshore Export Cable (COP Volume 1 Table 3-29; Table 3-14) – Brayton Point																				
Number of export cable bundles (each bundle consisting of two power cables and one communication cable)	Up to 2	X	X		X	X		X	X	X		X	X	X		X	X	X	X	
Nominal cable voltage (HVDC)	±320 kV				X			X	X	X										
Export cable diameter (excluding cable protection)	6.9 inches (175.0 millimeters)		X		X	X		X	X	X		X	X				X	X		
Burial depth	13.1 feet (4 meters)				X	X		X	X	X		X	X				X	X	X	

Design Parameter	Maximum Design Parameters	3.4 .1 Air Quality	3.4.2 Water Quality	3.5.1 Bats	3.5.2 Benthic Resources	3.5.3 Birds	3.5.4 Coastal Habitat and Fauna	3.5.5 Finfish, Invertebrates, and Essential Fish Habitat	3.5.6 Marine Mammals	3.5.7 Sea Turtles	3.5.8 Wetlands and Other Waters of the United States	3.6.1 Commercial Fisheries and For-Hire Recreational Fishing	3.6.2 Cultural Resources	3.6.3 Demographics, Employment, and Economics	3.6.4 Environmental Justice	3.6.5 Land Use and Coastal Infrastructure	3.6.6 Navigation and Vessel Traffic	3.6.7 Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)	3.6.8 Recreation and Tourism	3.6.9 Visual Resources
Maximum length of export cable	744 miles (1,200 kilometers)	X	X		X	X		X	X	X		X	X				X	X		
Length of Offshore cable corridor	124 miles (200 kilometers)		X		X	X		X	X	X		X	X				X	X		
Export cable corridor width	2,300 feet (700 meters)		X		X	X		X	X	X		X	X				X	X		
Number of cable/pipeline crossings (COP Volume 1 Table 3-15)	Up to 16				X													X		
Typical separation distance of export cable	164 feet (50 meters)		X		X	X						X	X				X	X		
Seabed preparation (per cable bundle) (boulder field clearance 10 percent of route; grapnel run over the entire route)	65 acres (26 hectares)		X		X	X		X	X	X		X	X	X		X	X			
Cable installation (per cable bundle) (assumes surface impact of 19.7 feet [6 meters] around each cable)	242 acres (98 hectares)		X		X	X		X	X	X		X	X	X		X	X			
Cable protection (per cable bundle) (an estimated 15 percent of the route will require additional cable protection. It is assumed that a 19.7-foot (6-meter)-wide rock berm will be constructed	56 acres (23 hectares)		X		X	X		X	X	X		X	X	X		X	X			
Seabed disturbance area (per cable bundle)	363 acres (147 hectares)		X		X	X		X	X	X		X	X	X		X	X		X	
Total seabed disturbance area (2 cables bundles)	727 acres (294 hectares)		X		X	X		X	X	X		X	X	X		X	X		X	
Onshore Components Falmouth (COP Volume 1 Table 3-18; Table 3-19; Table 3-34; Table 3-39)																				
Landfall locations	Worcester Avenue; Shore Street; or Central Park		X	X		X	X				X		X	X	X	X			X	X
Landfall transition method	horizontal directional drilling (HDD)		X	X	X	X	X				X		X			X				
Number of sea to shore HDDs	Up to 4		X	X	X	X	X				X		X			X				
Area of disturbance per HDD	0.1 acre (0.04 hectare)		X	X		X	X				X		X			X				
Total area of HDD disturbance	0.4 acre (0.16 hectare)		X	X		X	X				X		X			X				
Onshore substation locations	Lawrence Lynch or Cape Cod Aggregates		X	X		X	X				X		X	X	X	X			X	X
Maximum distance from landfall to substation (Shore Street to Cape Cod Aggregates)	6.4 miles (10.25 kilometers)		X	X		X	X				X		X			X				
Number of Onshore export power cables	3 to 12		X	X		X	X				X		X			X				
Number of Onshore communications cables	1 to 5		X	X		X	X				X		X			X				
Number of Onshore continuity cables	1 to 4		X	X		X	X				X		X			X				
Approximate cable diameter	5.59 inches (142 millimeters)		X	X		X	X				X		X			X				
Nominal cable voltage (HVAC)	345 kV		X	X		X	X				X		X			X				
Transition joint bay (4 transition joint bays)	0.066 acre (0.027 hectare)		X	X		X	X				X		X			X				
Maximum case duct bank (direct buried duct bank arrangement 12 ducts)	10 acres (4 hectares)		X	X		X	X				X		X			X				

Design Parameter	Maximum Design Parameters	3.4 .1 Air Quality	3.4.2 Water Quality	3.5.1 Bats	3.5.2 Benthic Resources	3.5.3 Birds	3.5.4 Coastal Habitat and Fauna	3.5.5 Finfish, Invertebrates, and Essential Fish Habitat	3.5.6 Marine Mammals	3.5.7 Sea Turtles	3.5.8 Wetlands and Other Waters of the United States	3.6.1 Commercial Fisheries and For-Hire Recreational Fishing	3.6.2 Cultural Resources	3.6.3 Demographics, Employment, and Economics	3.6.4 Environmental Justice	3.6.5 Land Use and Coastal Infrastructure	3.6.6 Navigation and Vessel Traffic	3.6.7 Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)	3.6.8 Recreation and Tourism	3.6.9 Visual Resources
Buried splice vault (installed)	0.4 acre (0.2 hectare)		X	X		X	X				X		X			X				
Maximum case landfall construction	0.91 acre (0.37 hectare)		X	X		X	X				X		X			X				
Trench excavation area along duct bank route	12.4 acres (5 hectares)		X	X		X	X				X		X			X				
Splice vault work area (20 locations; 0.5 acre per location)	10 acres (4 hectares)		X	X		X	X				X		X			X				
Onshore substation (HVAC)	26 acres (10.5 hectares)		X	X		X	X				X		X			X				
Alternate Falmouth underground transmission line	18.86 acres (7.6 hectares)		X	X		X	X				X		X			X				
Onshore Components Brayton Point (COP Volume 1 Table 3-18; Table 3-20; Table 3-35; Table 3-39)																				
Landfall locations	East Brayton Point / West Brayton Point		X	X		X	X				X		X	X	X	X			X	X
Landfall transition method	HDD		X	X	X	X	X				X		X			X				
Number of sea to shore HDDs	Up to 12		X	X	X	X	X				X		X			X				
Area of disturbance per HDD	0.3 acre (0.12 hectare)		X	X		X	X				X		X			X				
Total area of HDD disturbance	1.20 acres (0.48 hectare)		X	X		X	X				X		X			X				
Onshore substation location	Existing National Grid Substation		X	X		X	X				X		X	X	X	X			X	X
Maximum length of onshore cable to Brayton Point	3,940 feet (1,200 meters)		X	X		X	X				X		X			X				
Maximum length of onshore cable at intermediate landfall on Aquidneck Island	3 miles (4.8 kilometers)		X	X		X	X				X		X			X				
Maximum distance from landfall to converter station (Western Brayton Point)	0.6 mile (1.0 kilometers)		X	X		X	X				X		X			X				
Number of Onshore export power cables	1 to 4		X	X		X	X				X		X			X				
Number of Onshore communications cables	1 to 2		X	X		X	X				X		X			X				
Approximate cable diameter	5.9 inches (150 millimeters)		X	X		X	X				X		X			X				
Nominal cable voltage (HVDC)	±320 kV		X	X		X	X				X		X			X				
Maximum case duct bank (split duct bank, 4 power conduits)	1.8 acres (0.7 hectare)		X	X		X	X				X		X			X				
Buried transition joint bays and splice vaults (installed)	0.14 acre (0.06 hectare)		X	X		X	X				X		X			X				
Landfall construction area	3 acres (1.2 hectares)		X	X		X	X				X		X			X				
Trench excavation area along duct bank route (split duct bank installation)	2.7 acres (1.1 hectares)		X	X		X	X				X		X			X				
Buried transition and splice vault work area	0.11 acre (0.05 hectare)		X	X		X	X				X		X			X				
Converter station (HVDC)	10 acres (4.0 hectares)		X	X		X	X				X		X			X				
Alternate Brayton Point underground transmission line	0.2 acre (0.10 hectare)		X	X		X	X				X		X			X				

[a] Footprint includes combined area of foundation, scour protection, and mud mats

Appendix D: Planned Activities Scenario

Contents

List of Tables

D.1 Ongoing and Planned Activities Scenario

This appendix describes the other ongoing and planned activities that could occur in the geographic analysis area for each resource and contribute to baseline conditions and trends for resources considered in this environmental impact statement (EIS). The Mayflower Wind Project (Project) is the construction, operations and maintenance (O&M), and conceptual decommissioning of a wind energy facility proposed by Mayflower Wind Energy LLC (Mayflower Wind) in its Construction and Operations Plan (COP) within the Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0521, approximately 26 nautical miles (nm) (48 kilometers [km]) south of Martha's Vineyard and 20 nm (37 km) south of Nantucket, Massachusetts.

The geographic analysis area varies for each resource as described in the individual resource sections of Chapter 3, *Affected Environment and Environmental Consequences*. BOEM anticipates that impacts could occur from the start of Project construction in 2024 through Project decommissioning. Construction of the Project is anticipated to be completed in approximately 3 years, and the decommissioning phase of the Project is anticipated to be around 35 years after construction is completed.[1] The geographic analysis area is defined by the anticipated geographic extent of impacts for each resource. For the mobile resources—bats, birds, finfish, and invertebrates; marine mammals; and sea turtles—the species potentially affected are those that occur in the area of impact of the Proposed Action. The geographic analysis area for these mobile resources is the general range of the species. The purpose is to capture the cumulative impacts on each of those resources that would be affected by the Proposed Action, as well as the impacts that would still occur under the No Action Alternative.

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

D.2 Ongoing and Planned Activities

This section includes a list and description of ongoing and planned activities that could contribute to baseline conditions and trends in the geographic analysis area for each resource topic analyzed in this EIS. Projects or actions that are considered speculative per the definition provided in 43 Code of Federal

[1] Mayflower Wind's lease with BOEM (Lease OCS-A 0521) has an operations term of 33 years that commences on the date of COP approval (https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/MA/Lease-OCS-A-0521.pdf; see also 30 CFR 585.235(a)(3)). Mayflower Wind would need to request and be granted an extension of its operations term from BOEM to operate the proposed Project for 35 years. While Mayflower Wind has not made such a request, this EIS uses the longer period to avoid possibly underestimating any potential effects.

Regulations (CFR) 46.30[2] are noted in subsequent tables but excluded from the cumulative impact analysis in Chapter 3.

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

BOEM analyzed the possible extent of future other offshore wind energy development activities on the Atlantic Outer Continental Shelf (OCS) to determine reasonably foreseeable cumulative effects measured by installed power capacity. Attachment 2, Table D2-1, represents the status of projects as of October 1, 2022. The methodology for developing the scenario is the same as for the Vineyard Wind 1 project and details of the scenario development are described in the Vineyard Wind 1 Final EIS (BOEM 2021a).

D.2.1 Offshore Wind Energy Development Activities

D.2.1.1 Site Characterization Studies

A lessee is required to provide the results of site characterization activities with its site assessment plan (SAP) and COP. For the purposes of the cumulative impact analysis, BOEM makes the following assumptions, which represent the maximum-case scenario for survey and sampling activities:

- Site characterization would occur on all existing leases and potential export cable routes.
- Site characterization would likely take place in the first 3 years following execution of a lease, based on the fact that a lessee would likely want to generate data for its COP at the earliest possible opportunity.
- Lessees would likely survey most or all of the proposed Lease Area during the 5-year site assessment term to collect required geophysical information for siting of a meteorological tower, two buoys, and commercial facilities (wind turbines). The surveys may be completed in phases, with the meteorological tower and buoy areas likely to be surveyed first.
- Lessees would not use air guns, which are typically used for deep-penetration two-dimensional or three-dimensional exploratory seismic surveys to determine the location, extent, and properties of oil and gas resources (BOEM 2016).

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[2] 43 CFR 46.30 – Reasonably foreseeable future actions include those federal and non-federal activities not yet undertaken, but sufficiently likely to occur, that a responsible official of ordinary prudence would take such activities into account in reaching a decision. The federal and non-federal activities that BOEM must take into account in the analysis of cumulative impacts include, but are not limited to, activities for which there are existing decisions, funding, or proposals identified by BOEM. Reasonably foreseeable future actions do not include those actions that are highly speculative or indefinite.

Table D-1 describes the typical site characterization surveys, the types of equipment and method used, and which resources the survey information would inform.

Table D-1. Site characterization survey assumptions

Survey Type	Survey Equipment and Method	Resource Surveyed or Information Used to Inform
HRG surveys	Side-scan sonar, sub-bottom profiler, magnetometer, multi- beam echosounder	Shallow hazards, archaeological, bathymetric charting, benthic habitat
Geotechnical/sub-bottom sampling	Vibracores, deep borings, cone penetration tests	Geological, marine archaeology
Biological	Grab sampling, benthic sled, underwater imagery/sediment profile imaging	Benthic habitat
	Aerial digital imaging; visual observation from boat or airplane	Birds, marine mammals, sea turtles
	Ultrasonic detectors installed on survey vessels used for other surveys	Bat
	Visual observation from boat or airplane	Marine fauna (marine mammals and sea turtles)
	Direct sampling of fish and invertebrates	Fish and invertebrates

Source: BOEM 2016.
HRG = high-resolution geophysical

D.2.1.2 Site Assessment Activities

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

D.2.1.3 Construction and Operation of Offshore Wind Facilities

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

D.2.2 Commercial Fisheries Cumulative Fishery Effects Analysis

Table D-2 depicts future construction of offshore wind projects from Maine to North Carolina including development of Lease Areas OCS-A 0520 and OCS-A 0522 that are proposed offshore Massachusetts adjacent to Mayflower Wind. Also included are all of the projects currently in various stages of planning within BOEM's offshore leases from Massachusetts to North Carolina. Projected construction dates for each offshore wind project are listed in Attachment 2, Table D2-1, and each project will require a National Environmental Policy Act (NEPA) process with an EIS or environmental assessment prior to approval.

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

Note that the Kitty Hawk project is included despite its location in the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) South Atlantic Region. Fishing vessels operating in fisheries managed by the NMFS Greater Atlantic Regional Office regularly harvest in this area. It is also likely that vessels participating in fisheries managed by the NMFS Southeast Regional Office would be affected by the Kitty Hawk project.

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

Table D-2. Future offshore wind project construction schedule (dates shown as of October 1, 2022)

<table>
<tr><th rowspan="2">Project/Region</th><th colspan="11">Number of Foundations</th></tr>
<tr><th>Before 2021</th><th>2021</th><th>2022</th><th>2023</th><th>2024</th><th>2025</th><th>2026</th><th>2027</th><th>2028</th><th>2029</th><th>2030 and Beyond</th></tr>
<tr><td>NE Aqua Ventus (Maine state waters)</td><td>-</td><td>-</td><td>-</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Block Island (Rhode Island state waters)</td><td>5</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="12">Massachusetts/Rhode Island Region</td></tr>
<tr><td>Vineyard Wind 1, part of OCS-A 0501</td><td>-</td><td>-</td><td>-</td><td>63</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>South Fork, OCS-A 0517</td><td>-</td><td>-</td><td>-</td><td>13</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Sunrise, OCS-A 0487</td><td>-</td><td>-</td><td>-</td><td>-</td><td>95</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Revolution, part of OCS-A 0486</td><td>-</td><td>-</td><td>-</td><td colspan="2">102</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>New England Wind, OCS-A 0534 and portion of OCS-A 0501 remainder (Phase 1 [i.e. Park City Wind])</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="3">64</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e. Commonwealth Wind])</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="3">82</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Mayflower Wind, OCS-A 0521</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="6">149</td></tr>
<tr><td>Beacon Wind 1, part of OCS-A 0520</td><td>-</td><td>-</td><td>-</td><td>-</td><td>79</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Beacon Wind 2, part of OCS-A 0520</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="2">78</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Bay State Wind, part of OCS-A 0500</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="6">112</td></tr>
<tr><td>Vineyard Wind Northeast [formerly Liberty Wind], OCS-A 0522</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="6" rowspan="3">232</td></tr>
<tr><td>OCS-A 0500 remainder</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>OCS-A 0487 remainder</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Estimated annual Massachusetts/Rhode Island construction</td><td>0</td><td>0</td><td>0</td><td>178</td><td>320</td><td>571</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Estimated O&M total</td><td>0</td><td>0</td><td>0</td><td>0</td><td>178</td><td>498</td><td>1,069</td><td>1,069</td><td>1,069</td><td>1,069</td><td>1,069</td></tr>
<tr><td colspan="12">New York/New Jersey Region</td></tr>
<tr><td>Ocean Wind 1, OCS-A 0498</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="2">101</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Atlantic Shores South, OCS-A 0499</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>11</td><td colspan="2">200</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Ocean Wind 2, OCS-A 0532</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">113</td></tr>
<tr><td>Empire Wind 1, part of OCS-A 0512</td><td>-</td><td>-</td><td>-</td><td colspan="4">58</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>

<table>
<tr><th rowspan="2">Project/Region</th><th colspan="11">Number of Foundations</th></tr>
<tr><th>Before 2021</th><th>2021</th><th>2022</th><th>2023</th><th>2024</th><th>2025</th><th>2026</th><th>2027</th><th>2028</th><th>2029</th><th>2030 and Beyond</th></tr>
<tr><td>Empire Wind 2, part of OCS-A 0512</td><td>-</td><td>-</td><td>-</td><td colspan="5">91</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Atlantic Shores North, OCS-A 0549</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">160</td></tr>
<tr><td>OW Ocean Winds East, OCS-A 0537</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">102</td></tr>
<tr><td>Attentive Energy OCS-A 0538</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">104</td></tr>
<tr><td>Bight Wind Holdings, OCS-A 0539</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">148</td></tr>
<tr><td>Atlantic Shores Offshore Wind Bight, OCS-A 0541</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">95</td></tr>
<tr><td>Invenergy Wind Offshore, OCS-A 0542</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">99</td></tr>
<tr><td>Mid-Atlantic Offshore Wind, OCS-A 0544</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">104</td></tr>
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<tr><td colspan="12">Delaware/Maryland Region</td></tr>
<tr><td>Skipjack, OCS-A 0519</td><td>-</td><td>-</td><td>-</td><td>-</td><td>17</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>US Wind, OCS-A 0490</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="4">126</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>GSOE I, OCS-A 0482</td><td>-</td><td>-</td><td>-</td><td colspan="8" rowspan="2">93</td></tr>
<tr><td>OCS-A 0519 remainder</td><td></td><td></td><td></td></tr>
<tr><td>Estimated annual Delaware/Maryland construction</td><td>0</td><td>0</td><td>0</td><td>93</td><td>143</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Estimated O&M total</td><td>0</td><td>0</td><td>0</td><td>0</td><td>93</td><td>236</td><td>236</td><td>236</td><td>236</td><td>236</td><td>236</td></tr>
<tr><td colspan="12">Virginia/North Carolina Region</td></tr>
<tr><td>CVOW, OCS-A 0497</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>CVOW-C, OCS-A 0483</td><td>-</td><td>-</td><td>-</td><td colspan="5">208</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Kitty Hawk North, OCS-A 0508</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="7">70</td></tr>
<tr><td>Kitty Hawk South, OCS-A 0508 remainder</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="4">123</td></tr>
<tr><td>Estimated annual Virginia/North Carolina construction</td><td>2</td><td>0</td><td>0</td><td>208</td><td>70</td><td>0</td><td>0</td><td>123</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Estimated O&M total</td><td>2</td><td>2</td><td>2</td><td>2</td><td>210</td><td>280</td><td>280</td><td>280</td><td>403</td><td>403</td><td>403</td></tr>
<tr><td colspan="12">Total</td></tr>
<tr><td>Estimated annual total construction</td><td>7</td><td>0</td><td>0</td><td>630</td><td>634</td><td>582</td><td>1,125</td><td>123</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Estimated O&M total</td><td>7</td><td>7</td><td>7</td><td>7</td><td>637</td><td>1,271</td><td>1,853</td><td>2,978</td><td>3,101</td><td>3,101</td><td>3,101</td></tr>
</table>

CVOW = Coastal Virginia Offshore Wind; GSOE = Garden State Offshore Energy

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

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

The BOEM (2019) study identifies the relationships between IPFs associated with specific ongoing and planned activities in the North Atlantic OCS to consider in a NEPA cumulative impacts scenario. These IPFs and their relationships were used in the EIS analysis of cumulative impacts.

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

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

Several in-service and abandoned submarine telecommunications cables are present in the offshore export cable corridor and in the vicinity of the Lease Area (COP Volume 2, Figure 14-6, Table 14-2; Mayflower Wind 2022). The Brayton Point export cable corridor could have up to 13 crossings of planned cables and up to 3 crossings of existing pipelines. The Falmouth export cable corridor could have up to 7 crossings of planned cables and up to 2 crossings of existing cables.

The offshore wind projects listed in Attachment 2, Table D2-1 that have a COP under review are presumed to include at least one identified cable route. Cable routes have not yet been announced for the remainder of the projects.

D.2.5 Tidal Energy Projects

The Bourne Tidal Test Site located in the Cape Cod Canal near Bourne, Massachusetts, is a testing platform for tidal turbines that was installed in late 2017 by the Marine Renewable Energy Collaborative. The Bourne Tidal Test Site offers a test platform for tidal turbines (MRECo 2017, 2018). On behalf of the Marine Renewable Energy Collaborative of New England, Barrett Energy Resources Group, LLC (BERG) filed a Draft Pilot License Application dated November 3, 2021. The Draft Pilot License Application is an application to interconnect and operate a marine hydrokinetic test facility (the Bourne Tidal Test Site) (Barrett 2021).

The Roosevelt Island Tidal Energy Project is in the East Channel of the East River, a tidal strait connecting Long Island Sound with the Atlantic Ocean in New York Harbor. In 2005, Verdant Power petitioned the Federal Energy Regulatory Commission (FERC) for permission for the first U.S. commercial license for tidal power. In 2012, FERC issued a 10-year license to install up to 1 megawatt (MW) of power (30 turbines/10 TriFrames) at the Roosevelt Island Tidal Energy Project (FERC 2012a; Verdant Power 2022).

The Cobscook Bay Tidal Project, located in Maine, is a FERC-licensed tidal project that began operations in 2012 (FERC 2012b). The project owner, Ocean Renewable Power Company, informed FERC in a March 14, 2017, submittal that it did not intend to file a notice of intent (NOI) to relicense the project or a Pre-Application Document at the time. The Ocean Renewable Power Company anticipates that the project infrastructure, environmental monitoring and data analysis efforts, resource information documentation, and collaborative relationships with existing marine users will continue through the duration of the existing pilot license term through 2022 and potentially beyond (PNNL 2020). The Western Passage Tidal Energy Project, a proposed tidal energy site in the Western Passage, received a preliminary permit from FERC in 2016. The preliminary permit allows developers to study a project but does not authorize construction (PNNL 2021).

D.2.6 Dredging and Port Improvement Projects

The following dredging and port improvement projects have been proposed or studied at ports that may be used by the Project in Massachusetts, Rhode Island, Connecticut, and Virginia, and are either funded/under construction projects or are considered reasonably foreseeable.

- **Point Judith, Port of Galilee, Rhode Island.** The Rhode Island Department of Environmental Management (RIDEM), which operates the Port of Galilee, a Narragansett-based commercial fishing port, is conducting four projects in 2022 in the north bulkhead area of the port totaling nearly $15 million in investments. The proposed Rhode Island Fiscal Year 2023 budget includes approximately $50 million in State Fiscal Recovery Funding to continue the work of upgrading essential infrastructure at the Port of Galilee. The proposed investment would fund the replacement of bulkheads and docks, water supply, electrical, and security upgrades, and improvements to bolster the port against the effects of climate change (Office of the Governor of Rhode Island 2022).
- **Port of Davisville, Rhode Island.** The Rhode Island Fiscal Year 2023 budget includes $60 million and $35 million, respectively, for infrastructure upgrades to the Port of Davisville and the South Quay Marine Terminal in East Providence to support offshore wind activities on the U.S. East Coast. The funding for the Port of Davisville would support construction of the port’s Terminal 5 Pier and completion of required dredging, preparation of about 34 acres to accommodate additional cargo laydown, and reconstruction and hardening of the existing surface of Pier 1 (Buljan 2022).
- **Massachusetts Port Authority.** The Port of Massachusetts is implementing an $850 million port upgrade project to accommodate larger freight vessels. Project work includes dredging of Boston Harbor, construction of a new berth, and installation of new ship-to-share cranes (Glenn 2021).
- **Port of New Bedford.** The New Bedford Port Authority is conducting a $17 million project to expand the North Terminal at the Port of New Bedford; adding 150,000 square feet of terminal space. The bulkhead would be constructed using up to 97,000 yards of contaminated dredge material.

Construction is anticipated to commence in May 2022 (Port of New Bedford 2022; Standard Times 2022).

- **New London Heavy Lift Port.** The Connecticut Port Authority is conducting a project to redevelop the Port of New London State Pier as a heavy-lift capable port facility, in partnership with terminal operator Gateway Terminal, and joint venture partners Ørsted and Eversource. Heavy-lift capability would support various cargoes including wind turbine construction staging and pre-assembly, including construction support for the South Fork, Revolution Wind, and Sunrise offshore wind projects. Environmental permits for in-water work and onshore construction were issued in December 2021. Construction is anticipated to be completed by quarter 1 of 2023 (Connecticut Port Authority 2021a; 2021b; CT Examiner 2022).
- **Port of Virginia***.* A channel-deepening project at the Port of Virginia is currently underway with the U.S. Army Corps of Engineers (USACE) and a private contractor engaged in dredging approximately 1.1 million cubic yards of sediment from the federal channel in Norfolk Harbor and Newport News, Virginia (USACE 2019). The project is anticipated to be completed in 2024, resulting in a channel depth of over 50 feet in the harbor, which will allow it to accommodate two ultra-large container vessels simultaneously (Virginia Port Authority 2021).

D.2.7 Marine Minerals Use and Ocean Dredged Material Disposal

To help meet the sand resource needs of coastal communities, BOEM-funded reconnaissance or design-level OCS studies along the East Coast from Rhode Island to Florida have identified potential future sand resources in many areas. Sand resources identified nearest the Project include OCS locations offshore Massachusetts and Rhode Island; many of these potential sand resources are within 5 miles of the Project Lease Area and associated planned infrastructure (e.g., export cables) (Mabee and Woodruff 2016; King et al. 2016). Topographic profiles and grain size analyses were performed on sediment samples collected at 18 Massachusetts beaches experiencing erosion were taken during the summer and winter seasons from 2014 through 2016 to evaluate seasonal and spatial variability. This information will be used primarily to match native-beach material with compatible offshore sand resources for beach nourishment projects (BOEM 2016).

U.S. Environmental Protection Agency (USEPA) Region 1 is responsible for designating and managing ocean disposal sites for all materials except dredged material in the region of the Project. USACE is the permitting agency for ocean disposal of dredged material; all ocean sites are for the disposal of dredged material permitted or authorized under the Marine Protection, Research, and Sanctuaries Act (16 United States Code [USC] 1431 et seq. and 33 USC 1401 et seq.). There is one active project along the southern Massachusetts/Rhode Island Coast, the Rhode Island Sound Disposal Site located approximately 10 miles northeast of Block Island. The Rhode Island Sound Disposal Site was first used in 2003 and was last used in 2019 (USACE 2022). The Eastern Long Island Sound Disposal Site offshore New London, Connecticut is permitted for offshore disposal but has not been used (USACE 2022).

D.2.8 Military Use

The Lease Area is within the Narragansett Bay Operations Area. The Narragansett Bay Operations Area extends from the shoreline seaward to approximately 180 nm from land at its farthest point; the subsurface portion of the Narragansett Bay Operations Area has the same boundaries as the surface water portion. The offshore Narragansett Bay Range Complex provides infrastructure for U.S. Atlantic Fleet training and testing exercises (U.S. Navy 2018). The offshore Narragansett Bay Range Complex also supports training and testing by other services (Ecology & Environment 2016).

Military activities with the Narragansett Bay Range Complex can include various vessel training exercises, submarine and antisubmarine training, and U.S. Air Force exercises. The U.S. Navy, the U.S. Coast Guard (USCG), and other military entities have numerous facilities in the region. Major onshore regional facilities include Joint Base Cape Cod, Naval Station Newport, Newport Naval Undersea Warfare Center, Naval Submarine Base New London, and USCG Academy (BOEM 2013; Rhode Island Coastal Resources Management Council 2010). The U.S. Atlantic Fleet also conducts training and testing exercises in the Narraganset Bay Operations Area, and the Newport Naval Undersea Warfare Center routinely performs testing in the area (BOEM 2013).

D.2.9 Marine Transportation

Marine transportation in the region is diverse and sourced from many ports and private harbors. Commercial vessel traffic in the region includes research, tug/barge, tankers (such as those used for liquid petroleum), cargo, cruise ships, smaller passenger vessels, and commercial fishing vessels. Recreational vessel traffic includes private motor boats and sailboats. A number of federal agencies, state agencies, educational institutions, and environmental non-governmental organizations participate in ongoing research offshore including oceanographic, biological, geophysical, and archaeological surveys. The Northeast Regional Planning Body anticipates that major vessel traffic routes will be relatively stable in the region for the foreseeable future, but that coastal developments and market demands that are unknown at this time could affect them (Northeast Regional Planning Body 2016). Most vessel traffic, excluding recreational vessels, tends to travel within established vessel traffic routes and the number of trips, as well as the number of unique vessels, has remained consistent (USCG 2021). In response to future offshore wind projects in the New York Bight, multiple additional fairways and a new anchorage may be established to route existing vessel traffic around wind energy projects (USCG 2021). Two Maritime Highway Routes are designated in the Atlantic Coast by the U.S. Department of Transportation Maritime Administration; Marine Highway M-95 (Atlantic Ocean Coastal Waters) that extends from Florida to Maine and Marine Highway M-295 that includes the East River (New York Harbor), Long Island Sound (New York and Connecticut) to Block Island Sound (Rhode Island) (USDOT 2022).

D.2.10 National Marine Fisheries Service Activities

Research and enhancement permits may be issued for marine mammals protected by the Marine Mammal Protection Act (MMPA) and for threatened and endangered species protected under the federal Endangered Species Act (ESA). NMFS is anticipated to continue issuing research permits under

Section 10(a)(1)(A) of the ESA to allow take of certain ESA-listed species for scientific research. Scientific research permits issued by NMFS currently authorize studies on ESA-listed species in the Atlantic Ocean. Current fisheries management and ecosystem monitoring surveys conducted by or in coordination with the Northeast Fisheries Science Center (NEFSC) could overlap with offshore wind lease areas in the New England region and south into the Mid-Atlantic region. Surveys include (1) the NEFSC Bottom Trawl Survey, a more than 50-year multispecies stock assessment tool using a bottom trawl; (2) the NEFSC Sea Scallop/Integrated Habitat Survey, a sea scallop stock assessment and habitat characterization tool, using a bottom dredge and camera tow; (3) the NEFSC Surfclam/Ocean Quahog Survey, a stock assessment tool for both species using a bottom dredge; and (4) the NEFSC Ecosystem Monitoring Program, a more than 40-year shelf ecosystem monitoring program using plankton tows and conductivity, temperature, and depth units. These surveys are anticipated to continue within the region, regardless of offshore wind development.

The regulatory process administered by NMFS, which includes stock assessments for all marine mammals and 5-year reviews for all ESA-listed species, assists in informing decisions on take authorizations and the assessment of project-specific and cumulative impacts that consider ongoing and planned activities in biological opinions. Stock assessments completed regularly under the MMPA include estimates of potential biological removal that stocks of marine mammals can sustainably absorb. MMPA take authorizations require that a proposed action have no more than a negligible impact on species or stocks, and that a proposed action impose the least practicable adverse impact on the species. MMPA authorizations are reinforced by monitoring and reporting requirements so that NMFS is kept informed of deviations from what has been approved. Biological opinions for federal and non-federal actions are similarly grounded in status reviews and conditioned to avoid jeopardy and to allow continued progress toward recovery. These processes help to ensure that, through compliance with these regulatory requirements, a proposed action would not have a measurable impact on the conservation, recovery, and management of the resource.

D.2.10.1 Directed Take Permits for Scientific Research and Enhancement

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

D.2.10.2 Fisheries Use and Management

NMFS implements regulations to manage commercial and recreational fisheries in federal waters, including those within which the Project would be located; the State of Massachusetts regulates commercial fisheries in state waters (within 3 nm of the coastline). There are no aquaculture leases in the vicinity of the Falmouth landfall locations (Mayflower Wind 2022). There are nine approved aquaculture leases located near the Brayton Point offshore export cable in and near the Sakonnet River that are mostly for oysters but also for clams, scallops, and quahogs (RIDEM 2022). The Project (including landfall and potential marshalling and O&M port locations) overlaps two of NMFS's eight regional councils to manage federal fisheries: Mid-Atlantic Fishery Management Council (MAFMC), which includes New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina; and NEFMC, which includes Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut (NEFMC 2022). The councils manage species with many Fishery Management Plans (FMPs) that are frequently updated, revised, and amended and coordinate with each other to jointly manage species across jurisdictional boundaries (MAFMC 2022). Many of the fisheries managed by the councils are fished for in state waters or outside of the Mid-Atlantic region, so the council works with the Atlantic States Marine Fisheries Commission (ASMFC). The ASMFC is composed of the 15 Atlantic coast states and coordinates the management of marine and anadromous resources found in the states' marine waters. In addition, the states and NMFS, under the framework of ASMFC's *Amendment 3 to the Interstate Fishery Management Plan for American Lobster*, cooperatively manage the American lobster resource and fishery (NOAA 1997).

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

NMFS also manages highly migratory species, such as tuna and sharks, that can travel long distances and cross domestic boundaries. Table D-3 summarizes other FMPs and actions in the region.

Table D-3. Other fishery management plans

Area	Plan and Projects
ASMFC	ASMFC *Five-Year Strategic Plan 2019–2023* (ASMFC 2019) ASMFC 2022 Action Plan (ASMFC 2021) *Management, Policy and Science Strategies for Adapting Fisheries Management to Changes in Species Abundance and Distribution Resulting from Climate Change* (ASMFC 2018).
Massachusetts	Massachusetts Shellfish Initiative 2021–2025 Strategic Plan (MSI 2021).
Rhode Island	Rhode Island 2018 Shellfish Sector Management Plan (RIDEM 2018) Rhode Island Department of Environmental Management Division of Marine Fisheries Strategic Plan (2021–2025) (RIDEM 2021).
Connecticut	Town of Groton, Connecticut Shellfish Management Plan (Town of Groton 2020).

Area	Plan and Projects
Virginia	The Virginia Marine Resources Commission implements current and long-term state policies affecting saltwater fisheries, both recreational and commercial, in Virginia's tidal waters and conservation and enhancement of finfish and shellfish resources (Virginia Marine Resources Commission 2021).

D.2.11 Global Climate Change

Climate change results primarily from the increasing concentration of greenhouse gas (GHG) emissions in the atmosphere, which causes planet-wide physical, chemical, and biological changes, substantially affecting the world's oceans and lands. Changes include increases in global atmospheric and oceanic temperature, shifting weather patterns, rising sea levels, and changes in atmospheric and oceanic chemistry (Blunden and Arndt 2020). Section 7.6.1.4 of the *Programmatic EIS for Alternative Energy Development and Production and Alternate Use of Activities on the Outer Continental Shelf* (MMS 2007) describes global climate change with respect to assessing renewable energy development. Key drivers of climate change are increasing atmospheric concentrations of carbon dioxide (CO_2) and other GHGs, such as methane (CH_4) and nitrous oxide (N_2O). These GHGs reduce the ability of solar radiation to reradiate out of Earth's atmosphere and into space. Although all three of these GHGs have natural sources, the majority of these GHGs are released from anthropogenic activity. Since the industrial revolution, the rate at which solar radiation is reradiated back into space has slowed due to increasing GHG concentrations in the atmosphere, resulting in a net increase of energy in the Earth's system (Solomon et al. 2007). This energy increase presents as heat, raising the planet's temperature and causing climate change.

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

The Intergovernmental Panel on Climate Change released a special report in October 2018 that compared risks associated with an increase of global warming of 1.5 degrees Celsius (°C) and an increase of 2°C. The report found that climate-related risks depend on the rate, peak, and duration of global warming, and that an increase of 2°C was associated with greater risks associated with climatic changes such as extreme weather and drought; global sea level rise; impacts on terrestrial ecosystems; impacts on marine biodiversity, fisheries, and ecosystems and their functions and services to humans; and impacts on health, livelihoods, food security, water supply, and economic growth (IPCC 2018). Higher global temperatures increase the chances of sea level rise by the end of the century, with a projected relative seal level rise of 0.6 to 2.2 meters along the contiguous U.S. coastline by 2100 (NOAA 2022). Expected relative sea level rise would cause tide and storm surge heights to increase, leading to a shift in the U.S. coastal flood regimes by 2050 with major and moderate high tide flood events occurring as frequently as moderate and minor high tide flood events occur today (NOAA 2022).

Global emissions of GHGs have impacts whose local effects are increasingly elucidated through research. For example, a recent study concerning North Atlantic right whale provides evidence that the whale's feeding area moved north following relocation of its food source related to climate change, and whale mortality may have increased because of fewer controls on fishing activities in the new, more northerly area (Meyer-Gutbrod et al. 2021). Climate change is predicted to affect Northeast fishery species in different ways (Hare et al. 2016), and the NMFS biological opinion discusses in detail the potential impacts of global climate change on protected species that occur within the Proposed Action area (NMFS 2013).

Local emissions, such as those from maintenance of and accidental chemical leaks from wind energy projects, would contribute incrementally to global GHG emissions. However, the largest climate impact from wind energy projects is expected to be beneficial: the energy generated by wind energy projects is expected to displace energy generated by combustion of fossil fuels, which would lead to reductions in regional emissions of air pollutants and GHGs from fossil-fueled power plants.

Table D-4 summarizes regional plans and policies that are in place to address climate change, and Table D-5 summarizes resiliency plans.

Table D-4. Climate change plans and policies

Plans and Policies	Summary/Goal
Massachusetts	
Global Warming Solutions Act of 2008	Framework to reduce GHG emissions by requiring 25% reduction in emissions from all sectors below 1990 baseline emissions level in 2020, at least 80% reduction in 2050. Full implementation of these policies is projected to result in total net reduction of 25.0 million metric tons of carbon dioxide equivalent, or 26.4% below 1990 baseline level (Commonwealth of Massachusetts 2018a).
Massachusetts Clean Energy and Climate Plan for 2025 and 2030	Interim policy that updates the 2015 and 2020 climate plans. Policies that aim to reduce GHG emissions in the commonwealth across all sectors; full implementation of policies would result in reducing emissions by at least 50% below 1900 level in 2030 (Commonwealth of Massachusetts 2020a).
An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy (2021)	Requires the Secretary of the Executive Office of Energy and Environmental Affairs to set interim emissions limit and sector-specific sublimit every 5 years. Calls for the 2030 emissions limit to be at least 50% below the 1990 baseline, the 2040 emissions limit to be at least 75% below the 1990 baseline, and a 2050 emissions limit that achieves at least net zero statewide GHG emissions, provided that in no event shall the emissions in 2050 be higher than a level 85% below the 1990 baseline (Commonwealth of Massachusetts 2021).

Plans and Policies	Summary/Goal
Massachusetts 2050 Decarbonization Roadmap (2020)	Framework for long-term and short-term strategies to reach net zero statewide greenhouse gas emissions by 2050 (Commonwealth of Massachusetts 2020b).
Executive Order 569, Establishing an Integrated Climate Strategy for the Commonwealth and "Act to Promote Energy Diversity" (2016)	Calls for large procurements of offshore wind and hydroelectric resources (Commonwealth of Massachusetts 2016).
Environmental Bond Bill and An Act to Advance Clean Energy (2018)	Sets new targets for offshore wind, solar, and storage technologies; expands Renewable Portfolio Standard requirements for 2020–2029; establishes a Clean Peak Standard; and permits fuel switching in energy efficiency programs.
Massachusetts State Hazard Mitigation and Climate Adaptation Plan 2018	Updated 2013 plan to comprehensively integrate climate change impacts and adaptation strategies with hazard mitigation planning while complying with federal requirements for state hazard mitigation plans and maintaining eligibility for federal disaster recovery and hazard mitigation funding under the Stafford Act. The plan received FEMA-approval and is effective through September 2023 (Commonwealth of Massachusetts 2018b).
Rhode Island	
Resilient Rhode Island Act (2014)	The 2014 Resilient Rhode Island Act established the Executive Climate Change Coordinating Council. It also set specific GHG emissions reduction targets; established an advisory board and a science and technical advisory board to assist the council; and incorporated consideration of climate change impacts into the powers and duties of all state agencies. The Executive Climate Change Coordinating Council is charged with developing and tracking the implementation of a plan to achieve GHG emissions reductions below 1990 levels of 10% by 2020, 45% by 2035, and 80% by 2050 (State of Rhode Island 2014).
Rhode Island 2021 Act on Climate (Section 42, Chapter 6.2)	The 2021 Act on Climate sets mandatory, enforceable climate emissions reduction goals leading the state to achieve net-zero emissions economy-wide by 2050. This legislation updates the previous 2014 Resilient Rhode Island Act.
Connecticut	
Executive Order 3 (2019)	Executive Order 3 established a framework for monitoring and reporting on the state's implementation of GHG emissions reduction strategies set forth in the previous Governor's Council on Climate Change, and a framework to develop a statewide Adaptation and Resilience Plan for Connecticut (State of Connecticut 2019).
Executive Order 21-3 (2021)	Executive Order 21-2 establishes policies for energy efficiency and resiliency, including conducting a State Vulnerability Assessment of state government assets and operations and climate resilience project pipeline (State of Connecticut 2021a).

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

Table D-5. Resiliency plans and policies in the Lease Area

Plans and Policies	Summary
Massachusetts	
Municipal Vulnerability Preparedness grant program (2017)	Created as part of Executive Order 568, the Municipal Vulnerability Preparedness grant program provides support for cities and towns in Massachusetts to identify climate hazards, assess vulnerabilities, and develop action plans to improve resilience to climate change (Climate Change Clearinghouse for the Commonwealth 2022).
Coastal Grant and Resilience Program	Provide financial and technical support for local and regional efforts to increase community understanding of coastal storm and climate impacts, evaluate vulnerabilities, conduct adaptation planning, redesign and retrofit vulnerable public facilities and infrastructure, and restore shorelines to enhance natural resources and provide storm damage protection. The Town of Falmouth was awarded a grant in 2022 for a project to address erosion along the Eel River Inlet shoreline (Commonwealth of Massachusetts 2022).
Rhode Island	
Rhode Island Executive Order 17-10: Action Plan to Stand Up to Climate Change (2017)	Executive Order 17-10 established the office of the Rhode Island Resiliency Officer. The Rhode Island Executive Climate Change Coordinating Council works with the Resiliency Officer to develop climate preparedness strategies.
Rhode Island Shoreline Change	The Shoreline Change Special Area Management Plan (SAMP) provides information, guidance, and a suite of tools to empower state and local decision makers as they plan for, recover from, and successfully adapt to the impacts of

Plans and Policies	Summary
Special Area Management Plan (Rhode Island Coastal Resources Management Council 2018)	coastal storms, erosion, and sea level rise (Rhode Island Coastal Resources Management Council 2018).
Connecticut	
Public Act No. 21-115 An Act Concerning Climate Change Adaptation (2021).	This act authorizes Connecticut municipalities to establish a municipal stormwater authority, broadens the authority of municipal flood and erosion control boards to include flood prevention and climate resilience and allows municipalities to form joint boards, and establishes an Environmental Infrastructure Fund (State of Connecticut 2021b).
Taking Action on Climate Change and Building a More Resilient Connecticut for All – Phase I Report (Office of the Governor of Connecticut 2021)	The Phase I report implements provisions of Executive Order 3, including a report on the progress on mitigation strategies and recommendations. Continued reporting on implementation of the mitigation strategies was also called for annually in the Executive Order. The framework for inventory of vulnerable assets and operations and the report from state agencies on adaptation strategies in their planning processes required under Executive Order Objective 2 is to be included in the Phase 2 report.
Virginia	
Virginia Coastal Zone Management Program 2020 Coastal Needs Assessment and Fiscal Year 2021–2025 Strategies (Section 309)	The Virginia Coastal Zone Management Program assesses Virginia's coastal resources and management efforts every 5 years, including coastal hazards and ocean resources. The 5-year grant strategies are applied to result in new enforceable policies to better manage high priority resources or issues; initiatives include responses to results of the Virginia Coastal Zone Management Program Phase I Coastal Hazards Assessment. Climate resiliency was selected by the Coastal Policy Team as a Fiscal Year 2020–2023 focal area theme to help meet the goals and needs in the statewide resiliency plan (Virginia Department of Environmental Quality 2021).
Virginia Clean Energy and Community Flood Preparedness Act	This Act creates a Virginia Community Flood Preparedness Fund to enhance flood prevention, protection, and coastal resilience.

D.2.12 Oil and Gas Activities

The proposed Project area is in the North Atlantic Planning Area of the OCS Oil and Gas Leasing Program (National OCS Program). On September 8, 2020, the White House issued a presidential memorandum for the Secretary of the Interior on the withdrawal of certain areas of the United States OCS from leasing disposition for 10 years, including the areas currently designated by BOEM as the South Atlantic and Straits of Florida Planning Areas (White House 2020a). The South Atlantic Planning Area includes the OCS off South Carolina, Georgia, and northern Florida. On September 25, 2020, the White House issued a similar memorandum for the Mid-Atlantic Planning Area that lies south of the northern administrative boundary of North Carolina (White House 2020b). This withdrawal prevents consideration of these areas for any leasing for purposes of oil and gas exploration, development, or production during the 10-year period beginning July 1, 2022 and ending June 30, 2032. However, currently, there has been no decision by the Secretary of the Interior regarding future oil and gas leasing in the North Atlantic or remainder of the Mid-Atlantic Planning Areas. Existing leases in the withdrawn areas are not affected.

BOEM issues geological and geophysical permits to obtain data for hydrocarbon exploration and production; locate and monitor marine mineral resources; aid in locating sites for alternative energy structures and pipelines; identify possible manmade, seafloor, or geological hazards; and locate potential archaeological and benthic resources. Geological and geophysical surveys are typically classified into categories by equipment type and survey technique. There are currently no such permits under review for areas offshore Massachusetts or Rhode Island (BOEM 2022).

Several liquefied natural gas ports are on the East Coast of the United States. Table D-6 lists existing and proposed liquified natural gas ports on the East Coast that provide (or may provide in the future) services such as natural gas export, natural gas supply to the interstate pipeline system or local distribution companies, storage of liquified natural gas for periods of peak demand, or production of liquified natural gas for fuel and industrial use (FERC 2022).

Table D-6. Liquid natural gas terminals in the eastern United States

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

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

D.2.13 Onshore Development Activities

Onshore development activities that may contribute to cumulative impacts include visible infrastructure, such as onshore wind turbines and cell towers, port development, and other energy projects, such as transmission and pipeline projects. Coastal development projects permitted through regional planning commissions, counties, and towns may also contribute to cumulative impacts. These may include residential, commercial, and industrial developments spurred by population growth in the region (Table D-7).

Table D-7. Existing, approved, and proposed onshore development activities

Type	Description
Local planning documents	*Massachusetts* Town of Falmouth Local Comprehensive Plan (Town of Falmouth 2016). City of New Bedford City Master Plan (City of New Bedford 2010). Town of Somerset Master Plan (Town of Somerset 2020).
	Rhode Island Town of Bristol 2016 Comprehensive Community Plan (Town of Bristol 2016). Town of Portsmouth Comprehensive Community Plan (Town of Portsmouth 2021). Town of Tiverton 2018 Comprehensive Plan (Town of Tiverton 2018). Aquidneck Island Planning Commission (AIPC 2022).
	Connecticut City of New London Strategic Plan (City of New London 2017).
Onshore wind projects	According to the USGS, there are no onshore wind projects within the 42.8-mile (68.9-kilometer) viewshed of the Project (USGS 2022).
Communications towers	There are numerous communications towers in communities within the viewshed of the Project. For example, there are 17 communications towers and 102 antennas within a 3-mile radius of Falmouth, Massachusetts; 55 communications towers and 360 antennas within a 3-mile radius of Brayton Point, Massachusetts; and 96 communications towers and 396 antennas within a 3-mile radius of the Port of New Bedford, Massachusetts (AntennaSearch.com 2022).
Development projects	*Massachusetts* City of New Bedford • The South Coast Rail project aims to restore commuter rail service between Boston and southeastern Massachusetts, including the City of New Bedford. Phase 1 construction is underway and will be complete by the end of 2023 (Massachusetts Bay Transportation Authority 2022). • An Offshore Wind Control Center is proposed by the offshore wind project developer, Vineyard Wind in the City of New Bedford. The development is contingent on Commonwealth Wind being selected by the state (Buljan 2021). Town of Falmouth • The Town of Falmouth intends to improve street safety and accessibility for motorists, pedestrians, and bicyclists through the development of a Complete Streets Prioritization Plan. If approved, the project would be eligible for up to $400,000 in construction funding from MassDOT (Cape Cod Commission 2022). Town of Somerset • The Town of Somerset received $32,100 as part of the Shared Streets and Spaces Grant Program through Mass DOT to extend bike lanes to improve connections to the South Coast Bikeway (Town of Somerset 2022). • Brayton Point LLC Redevelopment Project proposed by Brayton Point LLC (2021). Martha’s Vineyard • None identified.

Type	Description
	Rhode Island Town of Bristol • The Walley Beach/Halsey C. Herreshoff Park Seawall Repair project aims to restore the existing seawall along the seaside park. Proposed activities include replacing lost material and providing protective measures for the lawn. The project began in Spring 2021 and construction is ongoing (East Bay Rhode Island 2022). Town of Portsmouth • On May 20, 2021, a planned 3.16 MW, 18.3-acre solar project located on West Main Road in the Town of Portsmouth was approved by the town's Zoning Board of Review (West Main Solar 1, LLC 2021). Town of Tiverton • Two solar projects in the Town of Tiverton are currently in the planning stage: Brayton Road Solar and Cook Farm Solar Project. The Brayton Road Solar project received preliminary plan approval in 2021 and is expected to be approved by the Planning Board in 2022. The Cook Farm Solar project has received final plan approval from the Planning Board but has not begun construction (Newport Daily News 2021).
Port studies/ upgrades	*Massachusetts* • *Massachusetts Port Authority.* The Port of Massachusetts is implementing an $850 million port upgrade project to accommodate larger freight vessels. Project work includes dredging of Boston Harbor, constructing a new berth, and installing new ship-to-share cranes (Glenn 2021). • *Port of New Bedford.* The New Bedford Port Authority is conducting a $17 million project to expand the North Terminal at the Port of New Bedford, adding 150,000 square feet of terminal space. The bulkhead will be constructed using up to 97,000 yards of contaminated dredge material. Construction is anticipated to commence in May 2022 (Port of New Bedford 2022; Standard Times 2022).
	Rhode Island • *Point Judith, Port of Galilee, Rhode Island.* The Rhode Island Department of Environmental Management, which operates the Port of Galilee, a Narragansett-based commercial fishing port, is conducting four projects in 2022 in the north bulkhead area of the port totaling nearly $15 million in investments. The proposed Rhode Island Fiscal Year 2023 budget includes approximately $50 million in State Fiscal Recovery Funding to continue the work of upgrading essential infrastructure at the Port of Galilee. The proposed investment would fund the replacement of bulkheads and docks, water supply, electrical, and security upgrades, and improvements to bolster the port against the effects of climate change (Office of the Governor of Rhode Island 2022). • *Port of Davisville, Rhode Island.* The Rhode Island Fiscal Year 2023 budget includes $60 million and $35 million, respectively, for infrastructure upgrades to the Port of Davisville and the South Quay Marine Terminal in East Providence to support offshore wind activities on the U.S. East Coast. The funding for the Port of Davisville would support construction of the port's Terminal 5 Pier and completion of required dredging, preparation of about 34 acres to accommodate additional cargo laydown, and reconstruction and hardening of the existing surface of Pier 1 (Buljan 2022).

Type	Description
	Connecticut • *New London Heavy Lift Port.* The Connecticut Port Authority is conducting a project to redevelop the Port of New London State Pier as a heavy-lift capable port facility, in partnership with terminal operator Gateway Terminal, and joint venture partners Ørsted and Eversource. Heavy-lift capability would support various cargoes including wind turbine construction staging and pre-assembly, including construction support for the South Fork, Revolution Wind, and Sunrise offshore wind projects. Environmental permits for in-water work and onshore construction were issued in December 2021. Construction is anticipated to be completed by 1Q 2023 (Connecticut Port Authority 2021a; 2021b; CT Examiner 2022).
	Virginia • *Port of Virginia*. A study commissioned by the Virginia Department of Mines Minerals and Energy and published in 2015 evaluated 10 Virginia ports for their readiness to accommodate offshore wind manufacturing and construction activities and also evaluated five commercial shipyards for their readiness to manufacture offshore electrical substations. Using requirements including water-side infrastructure, onshore infrastructure, and access requirements, five ports in Virginia were identified with a high level of readiness to support offshore wind. Portsmouth and Newport News Marine Terminals were identified by the study team to have the highest level of port readiness due to the ample space available to accommodate multiple co-located offshore wind construction and deployment activities (BVG Associates 2015). Following the study, the State of Virginia plans to invest $40 million from its 2021 budget to upgrade the Portsmouth Marine Terminal, near Norfolk, Virginia to handle offshore wind manufacturing, handling, and transportation (Reuters 2021).

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Attachment 1: Ongoing and Future Non-Offshore Wind Activity Analysis

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BOEM developed the following tables based on its 2019 study *National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf* (BOEM 2019), which evaluates potential impacts associated with ongoing and future non-offshore wind activities. The content of these tables has been vetted by cooperating agencies to the EIS and therefore has been included in whole for their use in impact and cumulative analyses, and for ease in reference by the reader.

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

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	Accidental releases of air toxics HAPs are due to potential chemical spills. Ongoing releases occur in low frequencies. These may lead to short-term periods of toxic pollutant emissions through surface evaporation. According to the U.S. Department of Energy, 31,000 barrels of petroleum are spilled into U.S. waters from vessels and pipelines in a typical year. Approximately 40.5 million barrels of oil were lost as a result of tanker incidents from 1970 to 2009, according to International Tanker Owners Pollution Federation Limited, which collects data on oil spills from tankers and other sources. From 1990 to 1999, the average annual input to the coastal Northeast was 220,000 barrels of petroleum and offshore it was up to less than 70,000 barrels.	Accidental releases of air toxics or HAPs will be due to potential chemical spills. Gradually increasing vessel traffic over the next 40 years would increase the risk of accidental releases. These may lead to short-term periods of toxic pollutant emissions through evaporation. Air quality impacts will be short-term and limited to the local area at and around the accidental release location.
Air emissions: Construction and decommissioning	Air emissions originate from combustion engines and electric power generated by burning fuel. These activities are regulated under the CAA to meet set standards. Air quality has generally improved over the last 40 years; however, some areas in the Northeast have experienced a decline in air quality over the last 2 years. Some areas of the Atlantic coast remain in nonattainment for ozone, with the source of this pollution from power generation. Many of these states have made commitments toward cleaner energy goals to improve this, and offshore wind is part of these goals. Primary processes and activities that can affect the air quality impacts are expansions and modifications to existing fossil fuel power plants, onshore and offshore activities involving renewable energy facilities, and various construction activities.	Many Atlantic states have committed to clean energy goals, with offshore wind being a large part of that. Other reductions include transitioning to onshore wind and solar. The No Action Alternative without implementation of other future offshore wind projects would likely result in increased air quality impacts regionally due to the need to construct and operate new energy generation facilities to meet future power demands. These facilities may consist of new natural-gas-fired power plants, coal-fired, oil-fired, or clean-coal-fired plants. These types of facilities would likely have larger and continuous emissions and result in greater regional scale impacts on air quality.
Air emissions: O&M		
Air emissions: Power generation emissions reductions		

CAA = Clean Air Act; hazmat = hazardous materials; HAPs = hazardous air pollutants

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

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded and would result in high-intensity, low-exposure level, long-term, but localized intermittent risk to bats in nearshore waters. Direct impacts are not expected to occur as recent research has shown that bats may be less sensitive to TTS than other terrestrial mammals (Simmons et al. 2016). Indirect impacts (i.e., displacement from potentially suitable habitats) could occur as a result of construction activities, which could generate noise sufficient to cause avoidance behavior (Schaub et al. 2008). Construction activity would be temporary and highly localized.	Similar to ongoing activities, noise associated with pile driving activities would be limited to nearshore waters, and these high-intensity, but low-exposure risks would not be expected to result in direct impacts. Some indirect impacts (i.e., displacement from potentially suitable foraging habitats) could occur as a result of construction activities, which could generate noise sufficient to cause avoidance behavior (Schaub et al. 2008). Construction activity would be temporary and highly localized, and no population-level effects would be expected.
Noise: Construction	Onshore construction occurs regularly for generic infrastructure projects in the bats geographic analysis area. There is a potential for displacement caused by equipment if construction occurs at night (Schaub et al. 2008). Any displacement would only be temporary. No individual or population level impacts would be expected. Some bats roosting in the vicinity of construction activities may be disturbed during construction but would be expected to move to a different roost farther from construction noise. This would not be expected to result in any impacts as frequent roost switching is a common component of a bat's life history (Hann et al. 2017; Whitaker 1998).	Onshore construction is expected to continue at current trends. Some behavioral responses and avoidance of construction areas may occur (Schaub et al. 2008). However, no injury or mortality would be expected.
Presence of structures: Migration disturbances	There may be few structures scattered throughout the offshore bats geographic analysis area, such as navigation and weather buoys and light towers. Migrating bats can easily fly around or over these sparsely distributed structures, and no migration disturbance would be expected. Bat use of offshore areas is very limited and generally restricted to spring and fall migration. Very few bats would be expected to encounter structures on the OCS and no population-level effects would be expected.	The infrequent installation of future new structures in the marine environment of the next 40 years is expected to continue. As described under Ongoing Activities, these structures would not be expected to cause disturbance to migrating tree bats in the marine environment.
Presence of structures: Turbine strikes	There may be few structures in the offshore bats geographic analysis area, such as navigation and weather buoys, turbines, and light towers. Migrating tree bats can easily fly around or over these sparsely distributed structures, and no strikes would be expected.	The infrequent installation of future new structures in the marine environment of the next 40 years is expected to continue. As described under Ongoing Activities, these structures would not be expected to result in increased collision risk to migrating tree bats in the marine environment.
Land disturbance: onshore construction	Onshore construction activities are expected to continue at current trends. Potential direct effects on individuals may occur if construction activities include tree removal when bats are potentially present. Injury or mortality may occur if trees being removed are occupied by bats at the time of removal. While there is some potential for indirect impacts associated with habitat loss, no individual or population-level effects would be expected.	Future non-offshore wind development would continue to occur at the current rate. This development has the potential to result in habitat loss and could result in injury or mortality of individuals.

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

Associated IPFs: Sub-IFPs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See the Water Quality table for a discussion of ongoing accidental releases. Accidental releases of hazmat occur periodically, mostly consisting of fuels, lubricating oils, and other petroleum compounds. Because most of these materials tend to float in seawater, they rarely contact benthic resources. The chemicals with potential to sink or dissolve rapidly often dilute to non-toxic levels before they affect benthic resources. The corresponding impacts on benthic resources are rarely noticeable.	Gradually increasing vessel traffic over the next 40 years would increase the risk of accidental releases. See previous cell and the Water Quality table for details.
Accidental releases: Invasive species	Invasive species are periodically released accidentally during ongoing activities, including the discharge of ballast water and bilge water from marine vessels. The impacts on benthic resources (e.g., competitive disadvantage, smothering) depend on many factors, but can be noticeable, widespread, and permanent.	No future activities were identified within the geographic analysis area other than ongoing activities.
Accidental releases: Trash and debris	Ongoing releases of trash and debris occurs from onshore sources, fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines and pipeline laying. However, there does not appear to be evidence that ongoing releases have detectable impacts on benthic resources.	No future activities were identified within the geographic analysis area other than ongoing activities.
Anchoring	Regular vessel anchoring related to ongoing military, survey, commercial, and recreational activities continue to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. These impacts include increased turbidity levels and the potential for direct contact to cause injury and mortality of benthic resources, as well as physical damage to their habitats. All impacts are localized; turbidity is temporary; injury and mortality are recovered in the short term; and physical damage can be permanent if it occurs in eelgrass beds or hard bottom.	No future activities were identified within the geographic analysis area other than ongoing activities.
EMFs	EMFs continuously emanate from existing telecommunication and electrical power transmission cables. New cables generating EMFs are infrequently installed in the geographic analysis area. Some benthic species can detect EMFs, although EMFs do not appear to present a barrier to movement. The extent of impacts (behavioral changes) is likely less than 50 feet (15.2 meters) from the cable and the intensity of impacts on benthic resources is likely undetectable.	No future activities were identified within the geographic analysis area other than ongoing activities.
Cable emplacement and maintenance	Cable maintenance activities infrequently disturb benthic resources and cause temporary increases in suspended sediment; these disturbances would be local and limited to the emplacement corridor. New cables are infrequently added near shore. Cable emplacement/maintenance activities injure and kill benthic resources, and result in temporary to long-term habitat alterations. The intensity of impacts depends on the time (season) and place (habitat type) where the activities occur. (See also the IPFs of Seabed profile alterations and Sediment deposition and burial.)	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Onshore/offshore construction	See finfish, invertebrates, and EFH table. Detectable impacts of construction noise on benthic resources rarely, if ever, overlap from multiple sources.	See finfish, invertebrates, and EFH table. Detectable impacts of construction noise on benthic resources would rarely, if ever, overlap from multiple sources.
Noise: G&G	See finfish, invertebrates, and EFH table. Detectable impacts of G&G noise on benthic resources rarely, if ever, overlap from multiple sources.	See finfish, invertebrates, and EFH table. Detectable impacts of G&G noise on benthic resources would rarely, if ever, overlap from multiple sources.
Noise: O&M	See finfish, invertebrates, and EFH table.	See finfish, invertebrates, and EFH table.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seabed can cause injury and/or mortality to benthic resources in a small area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Cable laying/trenching	Infrequent trenching activities for pipeline and cable laying, as well as other cable burial methods, emit noise. These disturbances are local, temporary, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines are likely to occur in the geographic analysis area. These disturbances would be infrequent over the next 40 years, local, temporary, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.
Port utilization: Expansion	See finfish, invertebrates, and EFH table.	See finfish, invertebrates, and EFH table.

Associated IPFs: Sub-IFPs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear are periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb, injure, or kill benthic resources, creating small, short-term, localized impacts.	Future new cables would present additional risk of gear loss, resulting in small, short-term, localized impacts (disturbance, injury).
Presence of structures: Hydrodynamic disturbance	See finfish, invertebrates, and EFH table.	See finfish, invertebrates, and EFH table.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables continuously create uncommon relief in a mostly sandy seascape. Structure-oriented fishes are attracted to these locations. Increased predation upon benthic resources by structure-oriented fishes can adversely affect populations and communities of benthic resources. These impacts are local and permanent.	New cables installed in the geographic analysis area over the next 40 years would likely require hard protection atop portions of the route (see the "cable emplacement and maintenance" row in this table). Any new towers, buoy, or piers would also create uncommon relief in a mostly flat, sandy seascape. Structure-oriented fishes could be attracted to these locations. Increased predation upon benthic resources by structure-oriented fishes could adversely affect populations and communities of benthic resources. These impacts are expected to be local and to be permanent as long as the structures remain.
Presence of structures: Habitat conversion	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables continuously provide uncommon hard-bottom habitat. A large portion is homogeneous sandy seascape but there is some other hard and/or complex habitat. Benthic species dependent on hard-bottom habitat can benefit on a constant basis, although the new habitat can also be colonized by invasive species (e.g., certain tunicate species). Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat.	Any new towers, buoy, piers, or cable protection structures would create uncommon relief in a mostly sandy seascape. Benthic species dependent on hard-bottom habitat could benefit, although the new habitat could also be colonized by invasive species (e.g., certain tunicate species). Soft bottom is the dominant habitat type in the region, and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010).
Presence of structures: Cable infrastructure	The presence of cable infrastructure, especially hard protection atop cables, causes impacts through entanglement/gear loss/damage, fish aggregation, and habitat conversion.	See other sub-IPFs within Presence of structures.
Discharges/intakes	The gradually increasing amount of vessel traffic is increasing the cumulative permitted discharges from vessels. Many discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated. However, there does not appear to be evidence that the volumes and extents have any impact on benthic resources.	There is the potential for new ocean dumping/dredge disposal sites in the Northeast. Impacts (disturbance, reduction in fitness) of infrequent ocean disposal to benthic resources are short-term because spoils are typically recolonized naturally. In addition, USEPA has established dredge spoil criteria and it regulates the disposal permits issued by USACE; these discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated.
Cable emplacement and maintenance: Seabed profile alterations	Ongoing sediment dredging for navigation purposes results in localized short-term impacts (habitat alteration, injury, and mortality) on benthic resources through this IPF. Dredging typically occurs only in sandy or silty habitats, which are abundant in the geographic analysis area and are quick to recover from disturbance. Therefore, such impacts, while locally intense, have little impact on benthic resources in the geographic analysis area.	No future activities were identified within the geographic analysis area other than ongoing activities.
Cable emplacement and maintenance: Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local, limited to the emplacement corridor. Sediment deposition could have adverse impacts on some benthic resources, especially eggs and larvae, including smothering and loss of fitness. Impacts may vary based on season/time of year. Where dredged materials are disposed, benthic resources are smothered. However, such areas are typically recolonized naturally in the short term. Most sediment dredging projects have time-of-year restrictions to minimize impacts on benthic resources. Most benthic resources in the geographic analysis area are adapted to the turbidity and periodic sediment deposition that occur naturally in the geographic analysis area.	USACE and/or private ports may undertake dredging projects periodically. Where dredged materials are disposed, benthic resources are buried. However, such areas are typically recolonized naturally in the short term. Most benthic resources in the geographic analysis area are adapted to the turbidity and periodic sediment deposition that occur naturally in the geographic analysis area.

EFH = Essential Fish Habitat; EMFs = electromagnetic fields; hazmat = hazardous materials

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

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See the Water Quality table for a quantitative analysis of these risks. Ongoing releases are frequent/chronic. Ingestion of hydrocarbons can lead to morbidity and mortality due to decreased hematological function, dehydration, drowning, hypothermia, starvation, and weight loss (Briggs et al. 1997; Haney et al. 2017; Paruk et al. 2016). Additionally, even small exposures that result in feather oiling can lead to sublethal effects that include changes in flight efficiencies and result in increased energy expenditure during daily and seasonal activities including chick provisioning, commuting, courtship, foraging, long-distance migration, predator evasion, and territory defense (Maggini et al. 2017). These impacts rarely result in population-level impacts.	Gradually increasing vessel traffic over the next 40 years would increase the potential risk of accidental releases and associated impacts, including mortality, decreased fitness, and health effects on individuals. Impacts are unlikely to affect populations.
Accidental releases: Trash and debris	Trash and debris are accidentally discharged through onshore sources; fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation, navigation, and traffic; survey activities; and cables, lines, and pipeline laying on an ongoing basis. In a study from 2010, students at sea collected more than 520,000 bits of plastic debris per square mile. In addition, many fragments come from consumer products blown out of landfills or tossed out as litter (Law et al. 2010). Birds may accidentally ingest trash mistaken for prey. Mortality is typically a result of blockages caused by both hard and soft plastic debris (Roman et al. 2019).	As population and vessel traffic increase gradually over the next 40 years, accidental release of trash and debris may increase. This may result in increased injury or mortality of individuals. However, there does not appear to be evidence that the volumes and extents would have any impact on bird populations.
Light: Vessels	Ocean vessels have an array of lights including navigational lights, deck lights, and interior lights. Such lights can attract some birds. The impact is localized and temporary. This attraction would not be expected to result in an increased risk of collision with vessels. Population-level impacts would not be expected.	Gradually increasing vessel traffic over the next 40 years would increase the potential for bird and vessel interactions. While birds may be attracted to vessel lights, this attraction would not be expected to result in increased risk of collision with vessels. No population-level impacts would be expected.
Light: Structures	Buoys, towers, and onshore structures with lights can attract birds. Onshore structures like houses and ports emit a great deal more light than offshore buoys and towers. This attraction has the potential to result in an increased risk of collision with lighted structures (Hüppop et al. 2006). Light from structures is widespread and permanent near the coast, but minimal offshore.	Light from onshore structures is expected to gradually increase in proportion with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
Cable emplacement and maintenance	Cable emplacement and maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be temporary and generally limited to the emplacement corridor. Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances will be temporary and limited to the emplacement corridor. Suspended sediment could impair the vision of diving birds that are foraging in the water column (Cook and Burton 2010). However, given the localized nature of the potential impacts, individuals would be expected to successfully forage in nearby areas not affected by increased sedimentation and no biologically significant impacts on individuals or populations would be expected.	Future new cables, would occasionally disturb the seafloor and cause temporary increases in suspended sediment, resulting in localized, short-term impacts. Impacts would be temporary and localized, with no biologically significant impacts on individuals or populations.
Noise: Aircraft	Aircraft routinely travel in the geographic analysis area for birds. With the possible exception of rescue operations and survey aircraft, no ongoing aircraft flights would occur at altitudes that would elicit a response from birds. If flights are at a sufficiently low altitude, birds may flush, resulting in non-biologically significant increased energy expenditure. Disturbance, if any, would be localized and temporary and impacts would be expected to dissipate once the aircraft has left the area.	Aircraft noise is likely to continue to increase as commercial air traffic increases; however, very few flights would be expected to be at a sufficiently low altitude to elicit a response from birds. If flights are at a sufficiently low altitude, birds may flush, resulting in non-biologically significant increased energy expenditure. Disturbance, if any, would be localized and temporary and impacts would be expected to dissipate once the aircraft has left the area.
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities could result in diving birds leaving the local area. Non-diving birds would be unaffected. Any displacement would only be temporary during non-migratory periods, but impacts could be greater if displacement were to occur in preferred feeding areas during seasonal migration periods.	Same as ongoing activities, with the addition of possible future oil and gas surveys.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water could result in intermittent, temporary, localized impacts on diving birds due to displacement from foraging areas if birds are present in the vicinity of pile-driving activity. The extent of these impacts depends on pile size, hammer energy, and local acoustic conditions. No biologically significant impacts on individuals or populations would be expected.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Noise: Onshore construction	Onshore construction is routinely used in generic infrastructure projects. Equipment could potentially cause displacement. Any displacement would only be temporary and no individual fitness or population-level impacts would be expected.	Onshore construction will continue at current trends. Some behavior responses could range from escape behavior to mild annoyance, but no individual injury or mortality would be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Vessels	Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Sub-surface noise from vessels could disturb diving birds foraging for prey below the surface. The consequence to birds would be similar to noise from G&G but likely less because noise levels are lower.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Presence of structures: Entanglement, gear loss, gear damage	Each year, 2,551 seabirds die annually from interactions with U.S. commercial fisheries on the Atlantic (Sigourney et al. 2019). Even more die due to abandoned commercial fishing gear (nets). In addition, recreational fishing gear (hooks and lines) is periodically lost on existing buoys, pilings, hard protection, and other structures and has the potential to entangle birds.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various hard protections atop cables create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these objects. These impacts are local and can be short-term to permanent. These fish aggregations can provide localized, short-term to permanent, beneficial impacts on some bird species because it could increase prey species availability.	New cables, installed incrementally in the geographic analysis area for birds over the next 20 to 40 years, would likely require hard protection atop portions of the cables (see cable emplacement and maintenance row). Any new towers, buoys, or piers would also create uncommon relief in a mostly flat seascape. Structure-oriented fishes could be attracted to these locations. Abundance of certain fishes may increase. These impacts are expected to be local and may be short-term to permanent. These fish aggregations can provide localized, short-term to permanent beneficial impacts on some bird species due to increased prey species availability.
Presence of structures: Migration disturbances	A few structures may be scattered about the offshore geographic analysis area for birds, such as navigation and weather buoys and light towers. Migrating birds can easily fly around or over these sparsely distributed structures.	The infrequent installation of future new structures in the marine or onshore environment over the next 40 years would not be expected to result in migration disturbances.
Presence of structures: Turbine strikes, displacement, and attraction	A few structures may be in the offshore geographic analysis area for birds, such as navigation and weather buoys, turbines, and light towers. Given the limited number of structures currently in the geographic analysis area, individual- and population-level impacts due to displacement from current foraging habitat would not be expected. Stationary structures in the offshore environment would not be expected to pose a collision risk to birds. Some birds like cormorants and gulls may be attracted to these structures and opportunistically roost on these structures.	The installation of future new structures in the marine or onshore environment over the next 40 years would not be expected to result in an increase in collision risk or to result in displacement. Some potential for attraction and opportunistic roosting exists but would be expected to be limited given the anticipated number of structures.
Traffic: Aircraft	General aviation accounts for approximately two bird strikes per 100,000 flights (Dolbeer et al. 2019). In addition to general aviation, aircraft are used for scientific and academic surveys in marine environments.	Bird fatalities associated with general aviation would be expected to increase with the current trend in commercial air travel. Aircraft will continue to be used to conduct scientific research studies as well as wildlife monitoring and pre-construction surveys. These flights would be well below the 100,000 flights and no bird strikes would be expected to occur.
Land disturbance: Onshore construction	Onshore construction activity will continue at current trends. There is some potential for indirect impacts associated with habitat loss and fragmentation.	Future non-offshore wind development would continue to occur at the current rate. This development has the potential to result in habitat loss but would not be expected to result in injury or mortality of individuals.

hazmat = hazardous materials

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

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See the Water Quality table for a discussion of ongoing accidental releases. Accidental releases of fuel/fluids/hazmat have the potential to cause habitat contamination and harm to the species that build biogenic coastal habitats (e.g., eelgrass, oysters, mussels, slipper limpets, salt marsh cordgrass) from releases and/or cleanup activities. Only a portion of the ongoing releases contact coastal habitats in the geographic analysis area. Impacts are small, localized, and temporary.	See the Water Quality table for a discussion of accidental releases.
Accidental releases: Trash and debris	Ongoing releases of trash and debris occur from onshore sources, fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines and pipeline laying. As population and vessel traffic increase, accidental releases of trash and debris may increase. Such materials may be obvious when they come to rest on shorelines; however, there does not appear to be evidence that the volumes and extents would have any detectable impact on coastal habitats.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
Anchoring	Vessel anchoring related to ongoing military, survey, commercial, and recreational activities will continue to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. These impacts include increased turbidity levels and potential for direct contact to cause physical damage to coastal habitats. All impacts are localized; turbidity is short-term and temporary; physical damage can be permanent if it occurs in eelgrass beds or hard bottom.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
EMF	EMFs continuously emanate from existing telecommunication and electrical power transmission cables. New cables generating EMFs are infrequently installed in the analysis area. The extent of impacts is likely less than 50 feet from the cable, and the intensity of impacts on coastal habitats is likely undetectable.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
Light: Vessels	Navigation lights and deck lights on vessels would be a source of ongoing light. The extent of impacts is limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats is likely undetectable.	Light is expected to continue to increase gradually with increasing vessel traffic over the next 40 years. The extent of impacts would likely be limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats would likely be undetectable.
Light: Structures	Ongoing lights from navigational aids and other structures onshore and nearshore. The extent of impacts is likely limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats is likely undetectable.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
Cable emplacement and maintenance	Ongoing cable maintenance activities infrequently disturb bottom sediments; these disturbances are local and limited to the emplacement corridor (see the Sediment deposition and burial IPF).	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Onshore/offshore construction	Ongoing noise from construction occurs frequently near shores of populated areas in New England and the mid-Atlantic, but infrequently offshore. Noise from construction near shore is expected to gradually increase over the next 40 years in line with human population growth along the coast of the geographic analysis area. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary.	No future activities were identified within the analysis area other than ongoing activities.
Noise: G&G	Site characterization surveys and scientific surveys are ongoing. The intensity and extent of the resulting impacts are difficult to generalize but are local and temporary.	Site characterization surveys, scientific surveys, and exploratory oil and gas surveys are anticipated to occur infrequently over the next 40 years. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seabed can reach coastal habitats. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the analysis area other than ongoing activities.
Noise: Cable laying/trenching	Rare but ongoing trenching for pipeline and cable laying activities emits noise; cable burial via jet embedment also causes similar noise impacts. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on coastal habitats are discountable compared to the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines may occur in the geographic analysis area infrequently over the next 40 years. These disturbances would be temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on coastal habitats are discountable compared to the impacts of the physical disturbance and sediment suspension.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Habitat conversion	Various structures, including pilings, piers, towers, riprap, buoys, and various means of hard protection, are periodically added to the seascape, creating uncommon relief in a mostly flat seascape and converting previously existing habitat (whether hard-bottom or soft-bottom) to a type of hard habitat, although it differs from the typical hard-bottom habitat in the analysis area, namely, coarse substrates in a sand matrix. The new habitat may or may not function similarly to hard-bottom habitat typical in the region (Kerckhof et al. 2019; HDR 2019). Soft bottom is the dominant habitat type on the OCS, and structures do not meaningfully reduce the amount of soft-bottom habitat available (Guida et al. 2017; Greene et al. 2010). Structures can also create an artificial reef effect, attracting a different community of organisms.	Any new cable or pipeline installed in the geographic analysis area would likely require hard protection atop portions of the route (see cells to the left). Such protection is anticipated to increase incrementally over the next 40 years. Where cables would be buried deeply enough that protection would not be used, presence of the cable would have no impact on coastal habitats.
Presence of structures: Transmission cable infrastructure	Various means of hard protection atop existing cables can create uncommon hard-bottom habitat. Where cables are buried deeply enough that protection is not used, presence of the cable has no impact on coastal habitats.	See above.
Land disturbance: Erosion and sedimentation	Ongoing development of onshore properties, especially shoreline parcels, periodically causes short-term erosion and sedimentation of coastal habitats.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance: Onshore construction	Ongoing development of onshore properties, especially shoreline parcels, periodically causes short-term to permanent degradation of onshore coastal habitats.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance: Onshore, land use changes	Ongoing development of onshore properties, especially shoreline parcels, periodically causes the conversion of onshore coastal habitats to developed space.	No future activities were identified within the geographic analysis area other than ongoing activities.
Cable emplacement and maintenance: Seabed profile alterations	Ongoing sediment dredging for navigation purposes results in localized, short-term impacts on coastal habitats through this IPF. Dredging typically occurs only in sandy or silty habitats, which are abundant in the analysis area and are quick to recover from disturbance. Therefore, such impacts, while locally intense, have little effect on the general character of coastal habitats.	No future activities were identified within the geographic analysis area other than ongoing activities.
Cable emplacement and maintenance: Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition within coastal habitats. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local, limited to the emplacement corridor. No dredged material disposal sites were identified within the geographic analysis area.	No future activities were identified within the geographic analysis area other than ongoing activities.

hazmat = hazardous materials

Table D1-6. Summary of activities and the associated impact-producing factors for commercial fisheries and for-hire recreational fishing

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring	Impacts from anchoring occur due to ongoing military, survey, commercial, and recreational activities. The short-term, localized impact on this resource is the presence of a navigational hazard (anchored vessel) to fishing vessels.	Impacts from anchoring may occur on a semi-regular basis over the next 40 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Anchoring could pose a temporary (hours to days), localized (within a few hundred meters of anchored vessel) navigational hazard to fishing vessels.
Cable emplacement and maintenance	New cable emplacement and infrequent cable maintenance activities disturb the seafloor, increase suspended sediment, and cause temporary displacement of fishing vessels. These disturbances would be local and limited to the emplacement corridor.	Future new cables and cable maintenance would occasionally disturb the seafloor and cause temporary displacement in fishing vessels and increases in suspended sediment resulting in local, short-term impacts. If the cable routes enter the geographic analysis area for this resource, short-term disruption of fishing activities would be expected.
Noise: Construction, trenching, operations and maintenance	Noise from construction occurs frequently in coastal habitats in populated areas in New England and the Mid-Atlantic, but infrequently offshore. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary. Infrequent offshore trenching could occur in connection with cable installation. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Low levels of elevated noise from operational WTGs likely have low to no impacts on fish and no impacts at a fishery level. Noise is also created by O&M of marine minerals extraction, which has small, local impacts on fish, but likely no impacts at a fishery level.	Noise from construction near shore is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource. Noise from dredging and sand and gravel mining could occur. New or expanded marine minerals extraction may increase noise during their O&M over the next 40 years. Impacts from construction, operations, and maintenance would likely be small and local on fish, and not seen at a fishery level. Periodic trenching would be needed for repair or new installation of underground infrastructure. These disturbances would be temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on commercial fish species are typically less prominent than the impacts of the physical disturbance and sediment suspension. Therefore, fishery-level impacts are unlikely.
Noise: G&G	Ongoing site characterization surveys and scientific surveys produce noise around sites of investigation. These activities can disturb fish and invertebrates in the immediate vicinity of the investigation and can cause temporary behavioral changes. The extent depends on equipment used, noise levels, and local acoustic conditions.	Site characterization surveys, scientific surveys, and exploratory oil and gas surveys are anticipated to occur infrequently over the next 40 years. Seismic surveys used in oil and gas exploration create high-intensity impulsive noise to penetrate deep into the seabed, potentially resulting in injury or mortality to finfish and invertebrates in a small area around each sound source and short-term stress and behavioral changes to individuals over a greater area. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves more similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when ports or marinas, piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seabed can cause injury and/or mortality to finfish and invertebrates in a small area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area, leading to temporary local impacts on commercial fisheries and for-hire recreational fishing. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified in the analysis area other than ongoing activities.
Noise: Vessels	Vessel noise is anticipated to continue at levels similar to current levels. While vessel noise may have some impact on behavior, it is likely limited to brief startle and temporary stress responses. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	Planned new barge route and dredging disposal sites would generate vessel noise when implemented.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 40 years.	Ports would need to perform maintenance and upgrades to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size. Port utilization is expected to increase over the next 40 years, with increased activity during construction. The ability of ports to receive the increase in vessel traffic may require port modifications, such as channel deepening, leading to local impacts on fish populations. Port expansions could also increase vessel traffic and competition for dockside services, which could affect fishing vessels.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Navigation hazard and allisions	Structures in and near the cumulative lease areas that pose potential navigation hazards include offshore wind turbines, buoys, and shoreline developments such as docks and ports. An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. Two types of allisions occur: drift and powered. A drift allision generally occurs when a vessel is powered down due to operator choice or power failure. A powered allision generally occurs when an operator fails to adequately control their vessel movements or is distracted.	No known reasonably foreseeable structures are proposed to be located in the geographic analysis area that could affect commercial fisheries. Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb habitats and potentially harm individuals, creating small, localized, short-term impacts on fish, but likely no impacts at a fishery level.	No future activities were identified in the analysis area other than ongoing activities.
Presence of structures: Habitat conversion and fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly sandy seascape. A large portion is homogeneous sandy seascape but there is some other hard and/or complex habitat. Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat. Structure-oriented fishes are attracted to these locations. These impacts are local and can be short-term to permanent. Fish aggregation may be considered adverse, beneficial, or neither. Commercial and for-hire recreational fishing can occur near these structures. For-hire recreational fishing is more popular, as commercial mobile fishing gear risk snagging on the structures.	New cables, installed incrementally in the analysis area over the next 20 to 40 years, would likely require hard protection atop portions of the route (see cable emplacement and maintenance IPF above). Any new towers, buoys, or piers would also create uncommon relief in a mostly flat seascape. Structure-oriented species could be attracted to these locations. Structure-oriented species would benefit (Claisse et al. 2014; Smith et al. 2016). This may lead to more and larger structure-oriented fish communities and larger predators opportunistically feeding on the communities, as well as increased private and for-hire recreational fishing opportunities. Soft bottom is the dominant habitat type in the region, and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010). These impacts are expected to be local and may be long term.
Presence of structures: Migration disturbances	Human structures in the marine environment, e.g., shipwrecks, artificial reefs, buoys, and oil platforms, can attract finfish and invertebrates that approach the structures during their migrations. This could slow species migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement than structure (Secor et al. 2018). There is no evidence to suggest that structures pose a barrier to migratory animals.	The infrequent installation of future new structures in the marine environment over the next 40 years may attract finfish and invertebrates that approach the structures during their migrations. This could tend to slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement (Secor et al. 2018). Migratory animals would likely be able to proceed from structures unimpeded. Therefore, fishery-level impacts are not anticipated.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Presence of structures: Cable infrastructure	The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between mainland and islands. Shoreline developments are ongoing and include docks, ports, and other commercial, industrial, and residential structures.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Traffic: Vessels and vessel collisions	No substantial changes are anticipated to the vessel traffic volumes. The geographic analysis area would continue to have numerous ports and the extensive marine traffic related to shipping, fishing, and recreation would continue to be important to the region's economy. The region's substantial marine traffic may result in occasional collisions. Vessels need to navigate around structures to avoid allisions. When multiple vessels need to navigate around a structure, then navigation is more complex, as the vessels need to avoid both the structure and each other. The risk for collisions is ongoing but infrequent.	New vessel traffic in the geographic analysis area would consistently be generated by proposed barge routes and dredging demolition sites. Marine commerce and related industries would continue to be important to the regional economy.

Table D1-7. Summary of activities and the associated impact-producing factors for cultural resources

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See the Water Quality table for water quality for a quantitative analysis of these risks. Accidental releases of fuel/fluids/hazmat occur during vessel use for recreational, fisheries, marine transportation, or military purposes, and other ongoing activities. Both released fluids and cleanup activities that require the removal of contaminated soils and/or seafloor sediments can cause impacts on cultural resources because resources are affected during by the released chemicals as well as the ensuing cleanup activities.	Gradually increasing vessel traffic over the next 40 years would increase the risk of accidental releases within the geographic analysis area for cultural resources, increasing the frequency of small releases. Although the majority of anticipated accidental releases would be small, resulting in small-scale impacts on cultural resources, a single, large-scale accidental release such as an oil spill, could have significant impacts on marine and coastal cultural resources. A large-scale release would require extensive cleanup activities to remove contaminated materials resulting in damage to or the complete removal of terrestrial and marine cultural resources. In addition, the accidentally released materials in deep water settings could settle on seafloor cultural resources such as wreck sites, accelerating their decomposition and/or covering them and making them inaccessible/unrecognizable to researchers, resulting in a significant loss of historic information. As a result, although considered unlikely, a large-scale accidental release and associated cleanup could result in permanent, geographically extensive, and large-scale impacts on cultural resources.
Accidental releases: Trash and debris	Accidental releases of trash and debris occur during vessel use for recreational, fisheries, marine transportation, or military purposes and other ongoing activities. While the released trash and debris can directly affect cultural resources, the majority of impacts associated with accidental releases occur during cleanup activities, especially if soil or sediment removed during cleanup affect known and undiscovered archaeological resources. In addition, the presence of large amounts of trash on shorelines or the ocean surface can impact the cultural value of Traditional Cultural Properties (TCPs) for stakeholders. State and federal laws prohibiting large releases of trash would limit the size of any individual release and ongoing local, state, and federal efforts to clean up trash on beaches and waterways would continue to mitigate the effects of small-scale accidental releases of trash.	Future activities with the potential to result in accidental releases include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications). Accidental releases would continue at current rates along the northeast Atlantic coast.
Anchoring	The use of vessel anchoring and gear (i.e., wire ropes, cables, chain, sweep on the seafloor) that disturbs the seafloor, such as bottom trawls and anchors, by military, recreational, industrial, and commercial vessels can impact cultural resources by physically damaging maritime archaeological resources such as shipwrecks and debris fields.	Future activities with the potential to result in anchoring/gear utilization include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); military use; marine transportation; fisheries use and management; and oil and gas activities. These activities are likely to continue to occur at current rates along the entire coast of the eastern United States.
Gear utilization: Dredging	Activities associated with dredge operations and activities could damage marine archaeological resources. Ongoing activities identified by BOEM with the potential to result in dredging impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities.	Dredging activities would gradually increase through time as new offshore infrastructure is built, such as gas pipelines and electrical lines, and as ports and harbors are expanded or maintained.
Light: Vessels	Light associated with military, commercial, or construction vessel traffic can temporarily affect coastal historic structures and TCP resources when the addition of intrusive, modern lighting changes the physical environment ("setting") of cultural resources. The impacts of construction and operational lighting would be limited to cultural resources on the shoreline for which a nighttime sky is a contributing element to historic integrity. This excludes resources that are closed at night, such as historic buildings, lighthouses, and battlefields, and resources that generate their own nighttime light, such as historic districts. Offshore construction activities that require increased vessel traffic, construction vessels stationed offshore, and construction area lighting for prolonged periods can cause more sustained and significant visual impacts on coastal historic structure and TCP resources.	Future activities with the potential to result in vessel lighting impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities. Light pollution from vessel traffic would continue at the current intensity along the northeast coast, with a slight increase due to population increase and development over time.
Light: Structures	The construction of new structures that introduce new light sources into the setting of historic architectural properties or TCPs can result in impacts, particularly if the historic and/or cultural significance of the resource is associated with uninterrupted nighttime skies or periods of darkness. Any tall structure (commercial building, radio antenna, large satellite dishes, etc.) requiring nighttime hazard lighting to prevent aircraft collision can cause these types of impacts.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	Major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Expansion of port facilities can introduce large, modern port infrastructure into the viewsheds of nearby historic properties, affecting their setting and historic significance.	Future activities with the potential to result in port expansion impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities. Port expansion would continue at current levels, which reflect efforts to capture business associated with the offshore wind industry (irrespective of specific projects).
Presence of structures	The only existing offshore structures within the viewshed of the geographic analysis area are minor features such as buoys.	Non-offshore wind structures that could be viewed would be limited to meteorological towers. Marine activity would also occur within the marine viewshed of the geographic analysis area.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and could cause impacts on submerged archaeological resources. These disturbances would be local and limited to emplacement corridors.	Future activities with the potential to result in seafloor disturbances similar to offshore impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; and oil and gas activities. Such activities could cause impacts on submerged archaeological resources including shipwrecks and formerly subaerially exposed pre-contact Native American archaeological sites.
Land disturbance: Onshore construction	Onshore construction activities can impact archaeological resources by damaging and/or removing resources.	Future activities that could result in terrestrial land disturbance impacts include onshore residential, commercial, industrial, and military development activities along the East Coast, particularly those proximate to export cables and interconnection facilities. Onshore construction would continue at current rates.

hazmat = hazardous materials; TCPs = Traditional Cultural Resources

Table D1-8. Summary of activities and the associated impact-producing factors for demographics, employment, and economics

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Light: Structures	Offshore buoys and towers emit low-intensity light, while onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
Light: Vessels	Ocean vessels have an array of lights including navigational lights and deck lights.	Anticipated modest growth in vessel traffic would result in some growth in the nighttime traffic of vessels with lighting.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors. In the geographic analysis area for demographics, employment, and economics there are six existing power cables.	Future new cables would disturb the seafloor and cause temporary increases in suspended sediment resulting in infrequent, localized, short-term impacts over the next 40 years.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area.	No future activities were identified within the geographic analysis area for demographics, employment, and economics other than ongoing activities.
Noise: Cable laying/trenching	Infrequent trenching for pipeline and cable laying activities emit noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	Periodic trenching would be needed over the next 40 years for repair or new installation of underground infrastructure.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Planned new barge route and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The New Jersey Wind Port is being developed and the Port of Paulsboro (New Jersey) and Port of New London (Connecticut) are being upgraded specifically to support the construction of offshore wind energy facilities.	Ports would need to perform maintenance and upgrade facilities over the next 40 years to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Port utilization: Maintenance/dredging	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. As ports expand, maintenance dredging of shipping channels is expected to increase.	Ports would need to perform maintenance and upgrades over the next 40 years to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Presence of structures: Allisions	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. The likelihood of allisions is expected to continue at or near current levels.	Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. Such loss and damage are direct costs for gear owners and are expected to continue at or near current levels.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these locations, which may be known as fish aggregation devices (FADs). Recreational and commercial fishing can occur near the FADs, although recreational fishing is more popular, because commercial mobile fishing gear is more likely to snag on FADs.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Habitat conversion	Structures, including foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly flat seascape. Structure-oriented species thus benefit on a constant basis.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, because vessels need to avoid both the structure and each other.	Vessel traffic, overall, is not expected to meaningfully increase over the next 40 years. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Viewshed	No existing offshore structures are within the viewshed of the offshore wind lease area except buoys.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Transmission cable infrastructure	The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between mainland and islands. Additional communication cables run between the U.S. East Coast and European countries along the eastern Atlantic.	No known proposed structures not associated with offshore wind development are reasonably foreseeable.
Traffic: Vessels	Ports and marine traffic related to shipping, fishing, and recreation are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes.	New vessel traffic near the geographic analysis area would be generated by proposed barge routes and dredging demolition sites over the next 40 years. Marine commerce and related industries would continue to be important to the geographic analysis area economy.
Traffic: Vessel collisions	The region's substantial marine traffic may result in occasional vessel collisions, which would result in costs to the vessels involved. The likelihood of collisions is expected to continue at or near current rates.	No substantial changes anticipated.
Land disturbance: Onshore construction	Onshore development activities support local population growth, employment, and economies. Disturbances can cause temporary, localized traffic delays and restricted access to adjacent properties. The rate of onshore land disturbance is expected to continue at or near current rates.	Onshore development projects would be ongoing in accordance with local government land use plans and regulations.

FADs = fish aggregating devices

Table D1-9. Summary of activities and the associated impact-producing factors for environmental justice

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Air emissions: Construction/ decommissioning	Ongoing population growth and new development within the analysis area is likely to increase traffic with resulting increase in emissions from motor vehicles. Some new industrial development may result in emissions-producing uses. At the same time, many industrial waterfront areas near environmental justice communities are losing industrial uses and converting to more commercial or residential uses.	New development may include emissions-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations will continue to lose industrial uses, with no new industrial development to replace it.
Air emissions: Operations and maintenance	Ongoing population growth and new development within the analysis area is likely to increase traffic with resulting increase in emissions from motor vehicles. Some new industrial development may result in emissions-producing uses. At the same time, many industrial waterfront areas near environmental justice communities are losing industrial uses and converting to more commercial or residential uses.	New development may include emissions-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations will continue to lose industrial uses, with no new industrial development to replace it.
Light: Structures	Offshore buoys and towers emit low-intensity light, while onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors.	Future new cables would disturb the seafloor and cause temporary increases in suspended sediment, resulting in infrequent, localized, short-term impacts over the next 40 years.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area.	No future activities were identified within the analysis area other than ongoing activities.
Noise: Trenching	Infrequent trenching for pipeline and cable laying activities emits noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	Periodic trenching would be needed over the next 40 years for repair or new installation of underground infrastructure.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	Vessel noise is anticipated to continue at or near current levels.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The New Jersey Wind Port is being developed and the Port of Paulsboro and Port of New London are being upgraded specifically to support the construction of offshore wind energy facilities.	Ports would need to perform maintenance and upgrade facilities to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Presence of structures: Entanglement, gear loss/damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. Such loss and damage are direct costs for gear owners and are expected to continue at or near current levels.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, because vessels need to avoid both the structure, and each other.	Vessel traffic is generally not expected to meaningfully increase over the next 40 years. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Viewshed	There are no existing offshore structures within the viewshed of the offshore wind lease area except buoys.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: cable infrastructure	Existing submarine cables cross cumulative lease areas.	Existing cable O&M activities would continue within the analysis area.
Traffic: Vessels	Ports and marine traffic related to shipping, fishing and recreation are important to the region’s economy. No substantial changes are anticipated to existing vessel traffic volumes.	Vessel traffic is not expected to meaningfully increase over the next 40 years. Marine commerce and related industries would continue to be important to area employment.
Land disturbance: Erosion and sedimentation	Potential erosion and sedimentation from development and construction is controlled by local and state development regulations.	New development activities would be subject to erosion and sedimentation regulations.
Land disturbance: Onshore construction	Onshore development supports local population growth, employment, and economics.	Onshore development would continue in accordance with local government land use plans and regulations.
Land disturbance: Onshore, land use changes	Onshore development would result in changes in land use in accordance with local government land use plans and regulations.	Development of onshore solar and wind energy would provide diversified, small-scale energy generation.

Table D1-10. Summary of activities and the associated impact-producing factors for finfish, invertebrates, and essential fish habitat

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See the Water Quality table for a quantitative analysis of these risks. Ongoing releases are frequent/chronic. Impacts, including mortality, decreased fitness, and contamination of habitat, are localized and temporary, and rarely affect populations.	Gradually increasing vessel traffic over the next 40 years would increase the risk of accidental releases. Impacts are unlikely to affect populations.
Accidental releases: Invasive species	Invasive species are periodically released accidentally during ongoing activities, including the discharge of ballast water and bilge water from marine vessels. The impacts on finfish, invertebrates, and EFH depend on many factors, but can be widespread and permanent.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Anchoring	Vessel anchoring related to ongoing military use, and survey, commercial, and recreational activities continue to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. Impacts on finfish, invertebrates, and EFH are greatest for sensitive EFH (e.g., eelgrass, hard bottom) and sessile or slow-moving species (e.g., corals, sponges, and sedentary shellfish).	Impacts from anchoring may occur on a semi-regular basis over the next 40 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. These impacts would include increased turbidity levels and potential for direct contact causing mortality of benthic species and, possibly, degradation of sensitive habitats. All impacts would be localized; turbidity would be temporary; impacts from direct contact would be recovered in the short term. Degradation of sensitive habitats such as certain types of hard bottom (e.g., boulder piles), if it occurs, could be long term.
EMF	EMF emanates continuously from installed telecommunication and electrical power transmission cables. Biologically significant impacts on finfish, invertebrates, and EFH have not been documented for AC cables (CSA Ocean Sciences, Inc. and Exponent 2019; Thomsen et al. 2015), but behavioral impacts have been documented for benthic species (skates and lobster) near operating DC cables (Hutchison et al. 2018). The impacts are localized and affect the animals only while they are within the EMF. There is no evidence to indicate that EMF from undersea AC power cables negatively affects commercially and recreationally important fish species (CSA Ocean Sciences, Inc. and Exponent 2019).	During operation, future new cables would produce EMF. Submarine power cables in the geographic analysis area are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels. Although the EMF would exist as long as a cable was in operation, impacts, on finfish, invertebrates, and EFH would likely be difficult to detect.
Light: Vessels	Marine vessels have an array of lights including navigational lights and deck lights. There is little downward-focused lighting, and therefore only a small fraction of the emitted light enters the water. Light can attract finfish and invertebrates, potentially affecting distributions in a highly localized area. Light may also disrupt natural cycles, e.g., spawning, possibly leading to short-term impacts.	Vessels would continue to be a light source within the analysis area.
Light: Structures	Offshore buoys and towers emit light, and onshore structures, including buildings and ports, emit a great deal more on an ongoing basis. Light can attract finfish and invertebrates, potentially affecting distributions in a highly localized area. Light may also disrupt natural cycles, e.g., spawning, possibly leading to short-term impacts. Light from structures is widespread and permanent near the coast, but minimal offshore.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances are local, limited to the cable corridor. New cables are infrequently added near shore. Cable emplacement/maintenance activities disturb, displace, and injure finfish and invertebrates and result in temporary to long-term habitat alterations. The intensity of impacts depends on the time (season) and place (habitat type) where the activities occur. (See also the IPF of Sediment deposition and burial.)	Future new cables would occasionally disturb the seafloor and cause temporary increases in suspended sediment, resulting in local short-term impacts. If the cable routes enter the geographic analysis area for this resource, short-term disturbance would be expected. The intensity of impacts would depend on the time (season) and place (habitat type) where the activities would occur.
Noise: Aircraft	Noise from aircraft reaches the sea surface on a regular basis. However, there is not likely to be any impact of aircraft noise on finfish, invertebrates, and EFH, as very little of the aircraft noise propagates through the water.	Aircraft noise is likely to continue to increase as commercial air traffic increases. However, there is not likely to be any impact of aircraft noise on finfish, invertebrates, and EFH.
Noise: Onshore/offshore construction	Noise from construction occurs frequently in near shores of populated areas in New England and the mid-Atlantic but infrequently offshore. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary. See also sub-IPF for Noise: Pile driving.	Noise from construction near shores is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource.
Noise: G&G	Ongoing site characterization surveys and scientific surveys produce noise around sites of investigation. These activities can disturb finfish and invertebrates in the immediate vicinity of the investigation and can cause temporary behavioral changes. The extent depends on equipment used, noise levels, and local acoustic conditions.	Site characterization surveys, scientific surveys, and exploratory oil and gas surveys are anticipated to occur infrequently over the next 40 years. Seismic surveys used in oil and gas exploration create high-intensity impulsive noise to penetrate deep into the seabed, potentially resulting in injury or mortality to finfish and invertebrates in a small area around each sound source and short-term stress and behavioral changes to individuals over a greater area. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves more similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: O&M	Some finfish and invertebrates may be able to hear the continuous underwater noise of operational WTGs. As measured at the Block Island Wind Farm, this low frequency noise barley exceeds ambient levels at 164 feet (50 meters) from the WTG base. Based on the results of Thomsen et al. (Thomsen et al. 2015), SPLs would be expected to be at or below ambient levels at relatively short distances (approximately 164 feet [50 meters]) from WTG foundations. These low levels of elevated noise likely have little to no impact. Noise is also created by O&M of marine minerals extraction and commercial fisheries, each of which has small local impacts.	New or expanded marine minerals extraction and commercial fisheries may intermittently increase noise during their O&M over the next 40 years. Impacts would likely be small and local.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seabed can cause injury and/or mortality to finfish and invertebrates in a small area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area. Eggs, embryos, and larvae of finfish and invertebrates could also experience developmental abnormalities or mortality resulting from this noise, although thresholds of exposure are not known (Weilgart 2018; Hawkins and Popper 2017). Potentially injurious noise could also be considered as rendering EFH temporarily unavailable or unsuitable for the duration of the noise. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Noise: Cable laying/trenching	Infrequent trenching activities for pipeline and cable laying, as well as other cable burial methods, emit noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines are likely to occur in the geographic analysis area for this resource. These disturbances would be infrequent over the next 40 years, temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.
Noise: Vessels	While ongoing vessel noise may have some effect on behavior, it is likely limited to brief startle and temporary stress responses. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	See cell to the left.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 40 years.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future. In addition, the general trend along the coast from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase may require port modifications, leading to local impacts. Future channel deepening activities will likely be undertaken. Existing ports have already affected finfish, invertebrates, and EFH, and future port projects would implement BMPs to minimize impacts. Although the degree of impacts on EFH would likely be undetectable outside the immediate vicinity of the ports, adverse impacts on EFH for certain species and/or life stages may lead to impacts on finfish and invertebrates beyond the vicinity of the port.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb habitats and potentially harm individuals, creating small, localized, short-term impacts.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Presence of structures: Hydrodynamic disturbance	Manmade structures, especially tall vertical structures such as foundations for towers of various purposes, continuously alter local water flow at a fine scale. Water flow typically returns to background levels within a relatively short distance from the structure. Therefore, impacts on finfish, invertebrates, and EFH are typically undetectable. Indirect impacts of structures influencing primary productivity and higher trophic levels are possible but are not well understood. New structures are periodically added.	Tall vertical structures can increase seabed scour and sediment suspension. Impacts would likely be highly localized and difficult to detect. Indirect impacts of structures influencing primary productivity and higher trophic levels are possible but are not well understood.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly sandy seascape. Structure-oriented fishes are attracted to these locations. These impacts are local and often permanent. Fish aggregation may be considered adverse, beneficial, or neutral.	New cables, installed incrementally in the geographic analysis area for this resource over the next 20 to 40 years, would likely require hard protection atop portions of the route (see the cable emplacement and maintenance IPF). Any new towers, buoys, or piers would also create uncommon relief in a mostly sandy seascape. Structure-oriented fishes could be attracted to these locations. Abundance of certain fishes may increase. These impacts are local and may be permanent.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Habitat conversion	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly sandy seascape. A large portion is homogeneous sandy seascape but there is some other hard and/or complex habitat. Structure-oriented species thus benefit on a constant basis; however, the diversity may decline over time as early colonizers are replaced by successional communities dominated by blue mussels and anemones (Degraer et al. 2019 [Chapter 7]). Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat.	New cable, installed incrementally in the analysis area over the next 20 to 40 years, would likely require hard protection atop portions of the route (see cable emplacement and maintenance). Any new towers, buoys, or piers would also create uncommon relief in a mostly sandy seascape. Structure-oriented species would benefit (Claisse et al. 2014; Smith et al. 2016); however, the diversity may decline over time as early colonizers are replaced by successional communities dominated by blue mussels and anemones (Degraer et al. 2019 [Chapter 7]). Soft bottom is the dominant habitat type from Cape Hatteras to the Gulf of Maine (over 60 million acres), and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010).
Presence of structures: Migration disturbances	Human structures in the marine environment, e.g., shipwrecks, artificial reefs, and oil platforms, can attract finfish and invertebrates that approach the structures during their migrations. This could slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement than structure is (Moser and Shepherd 2009; Fabrizio et al. 2014; Secor et al. 2018). There is no evidence to suggest that structures pose a barrier to migratory animals.	The infrequent installation of future new structures in the marine environment over the next 40 years may attract finfish and invertebrates that approach the structures during their migrations. This could tend to slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement (Moser and Shepherd 2009; Fabrizio et al. 2014; Secor et al. 2018). Migratory animals would likely be able to proceed from structures unimpeded.
Presence of structures: Cable infrastructure	See other sub-IPFs within the Presence of structures IPF. See table for Coastal Habitats and Fauna.	See other sub-IPFs within the Presence of structures IPF. See table for Coastal Habitats and Fauna.
Cable emplacement and maintenance: Seabed profile alterations	Ongoing sediment dredging for navigation purposes results in localized short-term impacts (habitat alteration, change in complexity) on finfish, invertebrates, and EFH through this IPF. Dredging is most likely in sand wave areas where typical jet plowing is insufficient to meet target cable burial depth. Sand waves that are dredged would likely be redeposited in like-sediment areas. Any particular sand wave may not recover to the same height and width as pre-disturbance; however, the habitat function would largely recover post-disturbance. Therefore, seabed profile alterations, while locally intense, have little impact on finfish, invertebrates, and EFH on a regional (Cape Hatteras to Gulf of Maine) scale.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Cable emplacement and maintenance: Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local, limited to the emplacement corridor. Sediment deposition could have negative impacts on eggs and larvae, particularly demersal eggs such as longfin squid, which are known to have high rates of egg mortality if egg masses are exposed to abrasion or burial. Impacts may vary based on season/time of year.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.

AC = alternating current; DC = direct current; EFH = Essential Fish Habitat; EMF = electromagnetic field; hazmat = hazardous materials; SPLs = sound pressure levels

Table D1-11. Summary of activities and the associated impact-producing factors for land use and coastal infrastructure

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

hazmat = hazardous materials; met = meteorological

Table D1-12. Summary of activities and the associated impact-producing factors for marine mammals

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See the Water Quality table for a quantitative analysis of these risks. Ongoing releases are frequent/chronic. Marine mammal exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality or sublethal effects on the individual fitness, including adrenal effects, hematological effects, liver effects lung disease, poor body condition, skin lesions, and several other health affects attributed to oil exposure (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshita et al. 2017). Additionally, accidental releases may result in impacts on marine mammals due to effects on prey species (see Finfish, Invertebrates, and Essential Fish Habitat table).	Gradually increasing vessel traffic over the next 40 years would increase the risk of accidental releases. Marine mammal exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality or sublethal effects on the individual fitness, including adrenal effects, hematological effects, liver effects lung disease, poor body condition, skin lesions, and several other health affects attributed to oil exposure (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshita et al. 2017). Additionally, accidental releases may result in impacts on marine mammals due to effects on prey species (see Finfish, Invertebrates, and Essential Fish Habitat table).
Accidental releases: Trash and debris	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines and pipeline laying, and debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low quantity, local, and low-impact events. Worldwide 62 of 123 (50.4%) marine mammal species have been documented ingesting marine litter (Werner et al. 2016). Stranding data indicate potential debris induced mortality rates of 0 to 22%. Mortality has been documented in cases of debris interactions, as well as blockage of the digestive track, disease, injury, and malnutrition (Baulch and Perry 2014). However, it is difficult to link physiological effects to individuals to population level impacts (Browne et al. 2015).	As population and vessel traffic increase gradually over the next 40 years, accidental release of trash and debris may increase. Trash and debris may continue to be accidentally released through fisheries use and other offshore and onshore activities. There may also be a long-term risk from exposure to plastics and other debris in the ocean. Worldwide 62 of 123 (50.4%) of marine mammal species have been documented ingesting marine litter (Werner et al. 2016). Mortality has been documented in cases of debris interacts, as well as blockage of the digestive track, disease, injury, and malnutrition (Baulch and Perry 2014).
EMF	EMFs emanate constantly from installed telecommunication and electrical power transmission cables. Marine mammals appear to have a detection threshold for magnetic intensity gradients (i.e., changes in magnetic field levels with distance) of 0.1% of the earth's magnetic field or about 0.05 µT (Kirschvink 1990) and are thus likely to be very sensitive to minor changes in magnetic fields (Walker et al. 2003). There is a potential for animals to react to local variations of the geomagnetic field caused by power cable EMFs. Depending on the magnitude and persistence of the confounding magnetic field, such an effect could cause a trivial temporary change in swim direction or a longer detour during the animal's migration (Gill et al. 2005). Such an effect on marine mammals is more likely to occur with direct current cables than with AC cables (Normandeau et al. 2011). However, there are numerous transmission cables installed across the seafloor and no impacts on marine mammals have been demonstrated from this source of EMF.	During operation, future new cables would produce EMF. Submarine power cables in the marine mammal geographic analysis area are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels. EMF of any two sources would not overlap. Although the EMF would exist as long as a cable was in operation, impacts, if any, would likely be difficult to detect, if they occur at all. Marine mammals have the potential to react to submarine cable EMF; however, no effects from the numerous submarine cables have been observed. Furthermore, this IPF would be limited to extremely small portions of the areas used by migrating marine mammals. As such, exposure to this IPF would be low, and as a result impacts on marine mammals would not be expected.
Cable emplacement and maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be local and generally limited to the emplacement corridor. Data are not available regarding marine mammal avoidance of localized turbidity plumes; however, Todd et al. (Todd et al. 2015) suggest that since some marine mammals often live in turbid waters and some species of mysticetes and sirenians employ feeding methods that create sediment plumes, some species of marine mammals have a tolerance for increased turbidity. Similarly, McConnell et al. (McConnell et al. 1999) documented movements and foraging of grey seals in the North Sea. One tracked individual was blind in both eyes, but otherwise healthy. Despite being blind, observed movements were typical of the other study individuals, indicating that visual cues are not essential for grey seal foraging and movement (McConnell et al. 1999). If elevated turbidity caused any behavioral responses such as avoiding the turbidity zone or changes in foraging behavior, such behaviors would be temporary, and any impacts would be temporary and short term. Turbidity associated with increased sedimentation may result in temporary, short-term impacts on marine mammal prey species (see Finfish, Invertebrates, and Essential Fish Habitat table).	The impact on water quality from accidental sediment suspension during cable emplacement is temporary and short term. If elevated turbidity caused any behavioral responses such as avoidance of the turbidity zone or changes in foraging behavior, such behaviors would be temporary, and any negative impacts would be temporary and short term. Turbidity associated with increased sedimentation may result in temporary, short-term impacts on some marine mammal prey species (see Finfish, Invertebrates, and Essential Fish Habitat table).
Noise: Aircraft	Aircraft routinely travel in the marine mammal geographic analysis area. With the possible exception of rescue operations, no ongoing aircraft flights would occur at altitudes that would elicit a response from marine mammals. If flights are at a sufficiently low altitude, marine mammals may respond with behavioral changes, including short surface durations, abrupt dives, and percussive behaviors (i.e., breaching and tail slapping) (Patenaude et al. 2002). These brief responses would be expected to dissipate once the aircraft has left the area. Similarly, aircraft have the potential to disturb hauled-out seals if aircraft overflights occur within 2,000 feet (610 meters) of a haul out area (Efroymson et al. 2000). However, this disturbance would be temporary, short-term, and result in minimal energy expenditure. These brief responses would be expected to dissipate once the aircraft has left the area.	Future low altitude aircraft activities such as survey activities and navy training operations could result short-term responses of marine mammals to aircraft noise. If flights are at a sufficiently low altitude, marine mammals may respond with a behavior changes, including short surface durations, abrupt dives, and percussive behaviors (i.e., breaching and tail slapping) (Patenaude et al. 2002). These brief responses would be expected to dissipate once the aircraft has left the area.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities have the potential to result in high intensity, high consequence impacts, including auditory injuries, stress, disturbance, and behavioral responses, if present within the ensonified area (NOAA 2018). Survey protocols and underwater noise mitigation procedures are typically implemented to decrease the potential for any marine mammal to be within the area where sound levels are above relevant harassment thresholds associated with an operating sound source to reduce the potential for behavioral responses and injury (PTS/TTS) close to the sound source. The magnitude of effects, if any, is intrinsically related to many factors, including acoustic signal characteristics, behavioral state (e.g., migrating), biological condition, distance from the source, duration and level of the sound exposure, as well as environmental and physical conditions that affect acoustic propagation (NOAA 2018).	Same as ongoing activities, with the addition of possible future oil and gas exploration surveys.
Noise: Turbines	Marine mammals would be able to hear the continuous underwater noise of operational WTGs. As measured at the Block Island Wind Facility, this low frequency noise barely exceeds ambient levels at 164 feet (50 meters) from the WTG base. Based on the results of Thomsen et al. (Thomsen et al. 2015) and Kraus et al. (Kraus et al. 2016), SPLs would be expected to be at or below ambient levels at relatively short distances from the WTG foundations.	This sub-IPF does not apply to future non-offshore wind development.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seabed can result in high-intensity, low-exposure level, long-term, but localized intermittent risk to marine mammals. Impacts would be localized in nearshore waters. Pile-driving activities may negatively affect marine mammals during foraging, orientation, migration, predator detection, social interactions, or other activities (Southall et al. 2007). Noise exposure associated with pile-driving activities can interfere with these functions and have the potential to cause a range of responses, including insignificant behavioral changes, avoidance of the ensonified area, PTS, harassment, and ear injury, depending on the intensity and duration of the exposure. BOEM assumes that all ongoing and potential future activities will be conducted in accordance with a project-specific IHA to minimize impacts on marine mammals.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.
Noise: Cable laying/trenching	Noise from cable laying could periodically occur in the analysis area.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.
Noise: Vessels	Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, scientific and academic research vessels, as well as other construction vessels. The frequency range for vessel noise falls within marine mammals' known range of hearing and would be audible. Noise from vessels presents a long-term and widespread impact on marine mammals across in most oceanic regions. While vessel noise may have some effect on marine mammal behavior, it would be expected to be limited to brief startle and temporary stress response. Results from studies on acoustic impacts from vessel noise on odontocetes indicate that small vessels at a speed of 5 knots in shallow coastal water can reduce the communication range for bottlenose dolphins within 164 feet (50 meters) of the vessel by 26% (Jensen et al. 2009). Pilot whales in a quieter, deep-water habitat could experience a 50% reduction in communication range from a similar size boat and speed (Jensen et al. 2009). Since lower frequencies propagate farther away from the sound source compared to higher frequencies, LFCs are at a greater risk of experiencing Level B Harassment produced by vessel traffic.	Any offshore projects that require the use of ocean vessels could potentially result in long term but infrequent impacts on marine mammals, including temporary startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes. However, BOEM expects that these brief responses of individuals to passing vessels would be unlikely given the patchy distribution of marine mammals and no stock or population level effects would be expected.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Port expansion activities are localized to nearshore habitats, and are expected to result in temporary, short-term impacts, if any, on marine mammals. Vessel noise may affect marine mammals, but response would be expected to be temporary and short-term (see Vessels: Noise sub-IPF above). The impacts on water quality from sediment suspension during port expansion activities is temporary, short-term, and would be similar to those described under the cable emplacement and maintenance IPF above.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase in larger ships will require port modifications. Future channel deepening activities are being undertaken to accommodate deeper draft vessels for the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long-term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g. ferry use and cruise industry) and may continue to increase in the foreseeable future. Additional impacts associated with the increased risk of vessel strike could also occur (see the Traffic: Vessel collisions sub-IPF below).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Entanglement or ingestion of lost fishing gear	There are more than 130 artificial reefs in the Mid-Atlantic region. This sub-IPF may result in long-term, high intensity impacts, but with low exposure due to localized and geographic spacing of artificial reefs, long-term. Currently bridge foundations and the Block Island Wind Facility may be considered artificial reefs and may have higher levels of recreational fishing, which increases the chances of marine mammals encountering lost fishing gear, resulting in possible ingestions, entanglement, injury, or death of individuals (Moore and van der Hoop 2012), if present nearshore where these structures are located. There are very few, if any, areas within the OCS geographic analysis area for marine mammals that would serve to concentrate recreational fishing and increase the likelihood that marine mammals would encounter lost fishing gear.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.
Presence of structures: Habitat conversion and prey aggregation	There are more than 130 artificial reefs in the Mid-Atlantic region. Hard-bottom (scour control and rock mattresses) and vertical structures (bridge foundations and Block Inland Wind Facility WTGs) in a soft-bottom habitat can create artificial reefs, thus inducing the “reef” effect (Taormina et al. 2018; NMFS 2015). The reef effect is usually considered a beneficial impact, associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for seals and small odontocetes compared to the surrounding soft-bottoms.	The presence of structures associated with non-offshore wind development in near shore coastal waters have the potential to provide habitat for seals and small odontocetes as well as preferred prey species. This “reef effect” has the potential to result in long term, low-intensity benefits. Bridge foundations will continue to provide foraging opportunities for seals and small odontocetes with measurable benefits to some individuals. Hard-bottom (scour control and rock mattresses used to bury the offshore export cables) and vertical structures (i.e., WTG and OSP foundations) in a soft-bottom habitat can create artificial reefs, thus inducing the “reef effect” (Taormina et al. 2018; Causon and Gill 2018). The reef effect is usually considered a beneficial impact, associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for marine mammals compared to the surrounding soft-bottoms.
Presence of structures: Avoidance/ displacement	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably contributing to this sub-IPF. There may be some impacts resulting from the existing Block Island Wind Facility, but given that there are only 5 WTGs, no measurable impacts are occurring.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Behavioral disruption - breeding and migration	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Displacement into higher risk areas (Vessels and Fishing)	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.
Traffic: Vessel collisions	Current activities that are contributing to this sub-IPF include port traffic levels, fairways, TSS, commercial vessel traffic, recreational and fishing activity, and scientific and academic vessel traffic. Vessel strike is relatively common with cetaceans (Kraus et al. 2005) and one of the primary causes of death to NARWs with as many as 75% of known anthropogenic mortalities of NARWs likely resulting from collisions with large ships along the U.S. and Canadian eastern seaboard (Kite-Powell et al. 2007). Marine mammals are more vulnerable to vessel strike when they are within the draft of the vessel and when they are beneath the surface and not detectable by visual observers. Some conditions that make marine mammals less detectable include weather conditions with poor visibility (e.g., fog, rain, and wave height) or nighttime operations. Vessels operating at speeds exceeding 10 knots have been associated with the highest risk for vessel strikes of NARWs (Vanderlaan and Taggart 2007). Reported vessel collisions with whales show that serious injury rarely occurs at speeds below 10 knots (Laist et al. 2001). Data show that the probability of a vessel strike increases with the velocity of a vessel (Pace and Silber 2005; Vanderlaan and Taggart 2007).	Vessel traffic associated with non-offshore wind development has the potential to result in an increased collision risk. While these impacts would be high consequence, the patchy distribution of marine mammals makes stock or population-level effects unlikely (Navy 2018).

µT = microtesla; AC = alternating current; EMF = electromagnetic field; hazmat = hazardous materials; IHA = Incidental Harassment Authorization; NARW = North Atlantic right whale; PTS = permanent threshold shift; SPLs = sound pressure levels; TSS = total suspended solids; TTS = temporary threshold shift

Table D1-13. Summary of activities and the associated impact-producing factors for navigation and vessel traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring	Larger commercial vessels (specifically tankers) sometimes anchor outside of major ports to transfer their cargo to smaller vessels for transport into port, an operation known as lightering. These anchors have deeper ground penetration and are under higher stresses. Smaller vessels (commercial fishing or recreational vessels) would anchor for fishing and other recreational activities. These activities cause temporary to short-term impacts on navigation in the immediate anchorage area. All vessels may anchor in an emergency scenario (such as power loss) if they lose power to prevent them from drifting and creating navigational hazards for other vessels or drifting into structures.	Lightering and anchoring operations are expected to continue at or near current levels, with the expectation of moderate increase commensurate with any increase in tankers visiting ports. Deep draft visits to major port visits are expected to increase as well, increasing the potential for an emergency need to anchor, creating navigational hazards for other vessels. Recreational activity and commercial fishing activity would likely stay largely the same related to this IPF.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in port usage by some fishing or recreational vessel operators.	Ports would need to perform maintenance and perform upgrades to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep draft vessels as they continue to increase in size. Impacts would be short term and could include congestion in ports, delays, and changes in port usage by some fishing or recreational vessel operators.
Presence of structures: Allisions	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. There are two types of allisions that occur: drift and powered. A drift allision generally occurs when a vessel is powered down due to operator choice or power failure. A powered allision generally occurs when an operator fails to adequately control their vessel movements or is distracted.	Although there are some exceptions (ferry traffic and cruise ships), BOEM expects vessel traffic to remain relatively steady into the reasonably foreseeable future (BOEM 2019:57). Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Presence of structures: Fish aggregation	Items in the water, such as ghost fishing gear, buoys, and energy platform foundations can create an artificial reef effect, aggregating fish. Recreational and commercial fishing can occur near the artificial reefs. Recreational fishing is more popular than commercial near artificial reefs as commercial mobile fishing gear can risk snagging on the artificial reef structure.	Fishing near artificial reefs is not expected to change meaningfully over the next 40 years.
Presence of structures: Habitat conversion	Equipment in the ocean can create a substrate for mollusks to attach to, and fish eggs to settle near. This can create a reef-like habitat and benefit structure-oriented species on a constant basis.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Migration disturbances	Noise-producing activities, such as pile driving and vessel traffic, may interfere and adversely affect marine mammals during foraging, orientation, migration, response to predators, social interactions, or other activities. Marine mammals may also be sensitive to changes in magnetic field levels. The presence of structures and operational noise could cause mammals to avoid areas.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions. When multiple vessels need to navigate around a structure, then navigation is made more complex, as the vessels need to avoid both the structure and each other.	Although there are some exceptions (ferry traffic and cruise ships), BOEM expects vessel traffic to remain relatively steady into the reasonably foreseeable future (BOEM 2019:57). Even with increased port visits by deep-draft vessels, this is still a relatively small effect when considering the whole of Atlantic Coast vessel traffic. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space use conflicts	Currently, the offshore area is occupied by marine trade, stationary and mobile fishing, and survey activities.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Cable infrastructure	See IPF for Anchoring.	See IPF for Anchoring.
Cable emplacement and maintenance	Within the geographic analysis area for navigation and vessel traffic, existing cables may require access for maintenance activities. Infrequent cable maintenance activities may cause temporary increases in vessel traffic and navigational complexity.	Future new cables would cause temporary increases in vessel traffic during installation or maintenance, resulting in infrequent, localized, short-term impacts over the next 40 years. Care would need to be taken by vessels that are crossing the cable routes during these activities.
Traffic: Aircraft	USCG SAR helicopters are the main aircraft that may be flying at low enough heights to risk interaction with WTGs. USCG SAR aircraft need to fly low enough that they can spot objects in the water.	SAR operations could be expected to increase with any increase in vessel traffic. However, as vessel traffic volume is not expected to increase appreciably, neither should SAR operations. EIS Section 3.6.6 provides a discussion of navigation impacts on fishing vessel traffic.
Traffic: Vessels	See the sub-IPF for Presence of structures: Navigation hazard.	See the sub-IPF for Presence of structures: Navigation hazard.
Traffic: Vessels, collisions	See the sub-IPF for Presence of structures: Navigation hazard.	See the sub-IPF for Presence of structures: Navigation hazard.

SAR = Search and Rescue

Table D1-14. Summary of activities and the associated impact-producing factors for other uses: military and national security uses

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Allisions	Existing stationary facilities that present allision risks include buoys that are used to mark inlet approaches, channels, and shoals, dock facilities, meteorological buoys associated with offshore wind lease areas, and other offshore or shoreline-based structures.	No additional non-offshore wind stationary structures were identified within the geographic analysis area. Stationary structures such as private or commercial docks may be added close to the shoreline.
Presence of structures: Fish aggregation	No existing stationary structures that would act as FADs were identified within the geographic analysis area.	No future non-offshore wind additional stationary structures that would act as FADs were identified within the geographic analysis area.
Presence of structures: Navigation hazard	Existing stationary facilities within the geographic analysis area that present navigational hazards include buoys that are used to mark inlet approaches, channels, and shoals, dock facilities, meteorological buoys associated with offshore wind lease areas, and other offshore or shoreline-based structures.	No future non-offshore wind stationary structures were identified within the offshore analysis area. Onshore, development activities are anticipated to continue with additional proposed communications towers and onshore commercial, industrial, and residential developments.
Presence of structures: Space use conflicts	Existing stationary facilities within the geographic analysis area that could present a space use conflict include onshore wind turbines, communication towers, and other onshore commercial, industrial, and residential structures.	No future non-offshore wind stationary structures were identified within the offshore analysis area. Onshore, development activities are anticipated to continue with additional proposed communications towers and onshore commercial, industrial, and residential developments.
Presence of structures: Cable infrastructure	Existing submarine cables cross cumulative lease areas.	Submarine cables would remain in current locations with infrequent maintenance continuing along those cable routes for the foreseeable future.
Traffic: Vessels	Current vessel traffic in the region is described in EIS Section 3.6.6. Vessel activities associated with offshore wind in the cumulative lease areas is currently limited to site assessment surveys.	Continued vessel traffic in the region.
Traffic: Vessels, collisions	Current vessel traffic in the region is described in EIS Section 3.6.6. Vessel activities associated with offshore wind in the cumulative lease areas is currently limited to site assessment surveys.	Continued vessel traffic in the region.

FAD = fish aggregating device; SAR =

Table D1-15. Summary of activities and the associated impact-producing factors for other uses: aviation and air traffic

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

Table D1-16. Summary of activities and the associated impact-producing factors for other uses: cables and pipelines

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Allisions and navigation hazards	Structures within and near the geographic analysis area that pose potential allision hazards include buoys that are used to mark inlet approaches, channels, and shoals, meteorological buoys associated with offshore wind lease areas, and shoreline developments such as docks, ports, and other commercial, industrial, and residential structures.	Reasonably foreseeable non-offshore wind structures that could affect submarine cables have not been identified in the geographic analysis area.
Presence of structures: Space use conflicts	Existing submarine cables cross cumulative lease areas and create potential space use conflicts with marine mineral and sand borrow areas.	Reasonably foreseeable non-offshore wind structures that could create space use conflicts with submarine cables have not been identified in the geographic analysis area.
Presence of structures: Cable infrastructure	Existing submarine cables cross cumulative lease areas.	Reasonably foreseeable non-offshore wind structures have not been identified in the geographic analysis area.

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

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Towers	Wind developments in the direct line-of-sight with, or extremely close to, radar systems can cause clutter and interference.	Reasonably foreseeable non-offshore wind structures proposed for construction in the lease areas that could affect radar systems have not been identified.

Table D1-18. Summary of activities and the associated impact-producing factors for other uses: scientific research and surveys

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

met = meteorological

Table D1-19. Summary of activities and the associated impact-producing factors for recreation and tourism

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring	Anchoring occurs due to ongoing military, survey, commercial, and recreational activities.	Impacts from anchoring would continue, and may increase due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Modest growth in vessel traffic could increase the temporary, localized impacts of navigational hazards, increased turbidity levels, and potential for direct contact causing mortality of benthic resources.
Light: Vessels	Ocean vessels have an array of lights including navigational lights and deck lights.	Anticipated modest growth in vessel traffic would result in some growth in the nighttime traffic of vessels with lighting.
Light: Structures	Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors.	Cable maintenance or replacement of existing cables in the geographic analysis area would occur infrequently and would generate short-term disturbances.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area.	No future activities were identified within the recreation and tourism geographic analysis area other than ongoing activities.
Noise: Cable laying/trenching	Offshore trenching occurs periodically in connection with cable installation or sand and gravel mining.	No future activities were identified within the recreation and tourism geographic analysis area other than ongoing activities.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance.	Ports would need to perform maintenance and upgrade facilities over the next 40 years to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Port utilization: Maintenance/dredging	Periodic maintenance is necessary for harbors within the analysis area.	Ongoing maintenance and dredging of harbors within the geographic analysis area will continue as needed. No specific projects are known.
Presence of structures: Allisions	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. The likelihood of allisions is expected to continue at or near current levels.	Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures.	No future activities were identified within the recreation and tourism geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these locations. Recreational and commercial fishing can occur near these aggregation locations, although recreational fishing is more popular, because commercial mobile fishing gear is more likely to snag on structures.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Habitat conversion	Structures, including foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly flat seascape. Structure-oriented species thus benefit on a constant basis.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, because vessels need to avoid both the structure and each other.	Vessel traffic, overall, is not expected to meaningfully increase over the next 40 years. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Viewshed	The only existing offshore structures within the viewshed of the Project are minor features such as buoys.	Non-offshore wind structures that could be viewed in conjunction with the offshore components of the Project would be limited to meteorological towers. Marine activity would also occur within the marine viewshed.
Traffic: Vessels	Geographic analysis area ports and marine traffic related to shipping, fishing, and recreation are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes.	New vessel traffic near the geographic analysis area would be generated by proposed barge routes and dredging demolition sites over the next 40 years. Marine commerce and related industries would continue to be important to the geographic analysis area economy.
Traffic: Vessel collisions	The region's substantial marine traffic may result in occasional vessel collisions, which would result in costs to the vessels involved. The likelihood of collisions is expected to continue at or near current rates.	An increased risk of collisions is not anticipated from future activities.

Table D1-20. Summary of activities and the associated impact-producing factors for sea turtles

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/ hazmat	See the Water Quality table for a quantitative analysis of these risks. Ongoing releases are frequent and chronic. Sea turtle exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality (Shigenaka et al. 2010) or sublethal effects on individual fitness, including adrenal effects, dehydration, hematological effects, increased disease incidence, liver effects, poor body condition, skin effects, skeletomuscular effects, and several other health effects that can be attributed to oil exposure (Camacho et al. 2013; Bembenek-Bailey et al. 2019; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to effects on prey species (see Finfish, Invertebrates, and Essential Fish Habitat table).	Gradually increasing vessel traffic over the next 40 years would increase the risk of accidental releases. Sea turtle exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality (Shigenaka et al. 2010; Wallace et al. 2010) or sublethal effects on individual fitness, including adrenal effects, dehydration, hematological effects, increased disease incidence, liver effects, poor body condition, skin effects, skeletomuscular effects, and several other health effects that can be attributed to oil exposure (Camacho et al. 2013; Bembenek-Bailey et al. 2019; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to effects on prey species (see Finfish, Invertebrates, and Essential Fish Habitat table).
Accidental releases: Trash and debris	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities, cables, lines, and pipeline laying, as well as debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low quantity, local, and low-impact events. Direct ingestion of plastic fragments is well documented and has been observed in all species of sea turtles (Bugoni et al. 2001; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). In addition to plastic debris, ingestion of tar, paper, Styrofoam™, wood, reed, feathers, hooks, lines, and net fragments have also been documented (Thomás et al. 2002). Ingestion can also occur when individuals mistake debris for potential prey items (Gregory 2009; Hoarau et al. 2014; Thomás et al. 2002). Potential ingestion of marine debris varies among species and life history stages due to differing feeding strategies (Nelms et al. 2016). Ingestion of plastics and other marine debris can result in both lethal and sublethal impacts on sea turtles, with sublethal effects more difficult to detect (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). Long-term sublethal effects may include dietary dilution, chemical contamination, depressed immune system function, poor body condition, as well as reduced growth rates, fecundity, and reproductive success. However, these effects are cryptic and clear causal links are difficult to identify (Nelms et al. 2016).	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines and pipeline laying, and debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low quantity, local, and low-impact events. Direct and indirect ingestion of plastic fragments and other marine debris is well documented and has been observed in all species of sea turtles (Bugoni et al. 2001; Gregory 2009; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014; Thomás et al. 2002). Ingestion can result in both lethal and sublethal impacts on sea turtles, with sublethal effects more difficult to detect (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). However, these effects are cryptic and clear causal links are difficult to identify (Nelms et al. 2016).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
EMF	EMFs emanate constantly from installed telecommunication and electrical power transmission cables. Sea turtles appear to have a detection threshold of magnetosensitivity and behavioral responses to field intensities ranging from 0.0047 to 4000 μT for loggerhead turtles, and 29.3 to 200 μT for green turtles, with other species likely similar due to anatomical, behavioral, and life history similarities (Normandeau et al. 2011). Juvenile or adult sea turtles foraging on benthic organisms may be able to detect magnetic fields while they are foraging on the bottom near the cables and up to potentially 82 feet (25 meters) in the water column above the cable. Juvenile and adult sea turtles may detect the EMF over relatively small areas near cables (e.g., when resting on the bottom or foraging on benthic organisms near cables or concrete mattresses). There are no data on impacts on sea turtles from EMFs generated by underwater cables, although anthropogenic magnetic fields can influence migratory deviations (Luschi et al. 2007; Snoek et al. 2016). However, any potential impacts from AC cables on turtle navigation or orientation would likely be undetectable under natural conditions, and thus would be insignificant (Normandeau et al. 2011).	During operations, future new cables would produce EMF. Submarine power cables in the geographic analysis area for sea turtles are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels. (Section 5.2.7 of BOEM's 2007 Final Programmatic EIS for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf.) EMF of any two sources would not overlap. Although the EMF would exist as long as a cable was in operation, impacts, if any, would likely be difficult to detect, if they occur at all. Furthermore, this IPF would be limited to extremely small portions of the areas used by resident or migrating sea turtles. As such, exposure to this IPF would be low, and as a result, impacts on sea turtles would not be expected.
Light: Vessels	Ocean vessels such as ongoing commercial vessel traffic, recreational and fishing activity, scientific and academic research traffic have an array of lights including navigational, deck lights, and interior lights. Such lights have some limited potential to attract sea turtles, although the impacts, if any, are expected to be localized and temporary.	Construction, operations, and decommissioning vessels associated with non-offshore wind activities produce temporary and localized light sources that could result in the attraction or avoidance behavior of sea turtles. These short-term impacts are expected to be of low intensity and occur infrequently.
Light: Structures	Artificial lighting on nesting beaches or in nearshore habitats has the potential to result in disorientation to nesting females and hatchling turtles. Artificial lighting on the OCS does not appear to have the same potential for effects. Decades of oil and gas platform operation in the Gulf of Mexico, that can have considerably more lighting than offshore WTGs, has not resulted in any known impacts on sea turtles (BOEM 2019).	Non-offshore wind activities would not be expected to appreciably contribute to this sub-IPF. As such, no impact on sea turtles would be expected.
Cable emplacement and maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be local and generally limited to the emplacement corridor. Data are not available regarding effects of suspended sediments on adult and juvenile sea turtles, although elevated suspended sediments may cause individuals to alter normal movements and behaviors. However, these changes are expected to be too small to be detected (NOAA 2020). Sea turtles would be expected to swim away from the sediment plume. Elevated turbidity is most likely to affect sea turtles if a plume causes a barrier to normal behaviors, but no impacts would be expected due to swimming through the plume (NOAA 2020). Turbidity associated with increased sedimentation may result in short-term, temporary impacts on sea turtle prey species (see Finfish, Invertebrates, and Essential Fish Habitat table).	The impact on water quality from accidental sediment suspension during cable emplacement is short-term and temporary. If elevated turbidity caused any behavioral responses such as avoidance of the turbidity zone or changes in foraging behavior, such behaviors would be temporary, and any impacts would be short-term and temporary. Turbidity associated with increased sedimentation may result in short-term, temporary impacts on some sea turtle prey species (see Finfish, Invertebrates, and Essential Fish Habitat table).
Noise: Aircraft	Aircraft routinely travel in the geographic analysis area for sea turtles. With the possible exception of rescue operations, no ongoing aircraft flights would occur at altitudes that would elicit a response from sea turtles. If flights are at a sufficiently low altitude, sea turtles may respond with a startle response (diving or swimming away), altered submergence patterns, and a temporary stress response (NSF and USGS 2011; Samuel et al. 2005). These brief responses would be expected to dissipate once the aircraft has left the area.	Future low-altitude aircraft activities such as survey activities and navy training operations could result in short-term responses of sea turtles to aircraft noise. If flights are at a sufficiently low altitude, sea turtles may respond with a startle response (diving or swimming away), altered submergence patterns, and a temporary stress response (NSF and USGS 2011; Samuel et al. 2005). These brief responses would be expected to dissipate once the aircraft has left the area.
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities have the potential to result in some impacts including potential auditory injuries, short-term disturbance, behavioral responses, and short-term displacement of feeding or migrating sea turtles, if present within the ensonified area (NSF and USGS 2011). The potential for PTS and TTS is considered possible in proximity to G&G surveys utilizing air guns, but impacts are unlikely as turtles would be expected to avoid such exposure and survey vessels would pass quickly (NSF and USGS 2011). No significant impacts would be expected at the population level.	Same as ongoing activities, with the addition of possible future oil and gas exploration surveys.
Noise: Turbines	Available evidence suggests that typical underwater noise levels from operating WTGs would be below current cumulative injury and behavioral effect thresholds for sea turtles. Operating turbines were determined to produce underwater noise on the order of 110 to 125 dB_{RMS}, occasionally reaching as high as 128 dB_{RMS}, in the 10-Hz to 8-kilohertz range (Tougaard et al. 2020). As measured at the Block Island Wind Facility, low frequency operational noise barely exceeds ambient levels at 164 feet (50 meters) from the WTG base (Miller and Potty 2017). Operational noise impacts would be expected to be negligible.	This sub-IPF does not apply to future non-offshore wind development.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seabed can result in high intensity, low exposure	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	levels, and long-term, but localized intermittent risk to sea turtles. Impacts, potentially including behavioral responses, masking, TTS, and PTS, would be localized in nearshore waters. Data regarding threshold levels for impacts on sea turtles from sound exposure during pile driving are very limited, and no regulatory threshold criteria have been established for sea turtles. Based on current literature, the following thresholds are used to assess impacts on turtles: Potential mortal injury: 210 dB cumulative SPL or greater than 207 dB peak SPL (Popper et al. 2014) Potential mortal injury: 204 dB_{SEL}, 232 dB_{PEAK} (PTS), 189 dB_{SEL}, 226 dB_{PEAK} (TTS) (Navy 2017) Behavioral harassment: 175 dB referenced to 1 μPa RMS (Navy 2017)	
Noise: Vessels	The frequency range for vessel noise (10 to 1000 Hz; MMS 2007) overlaps with sea turtles' known hearing range (less than 1,000 Hz with maximum sensitivity between 200 to 700 Hz; Bartol 1994) and would therefore be audible. However, Hazel et al. (Hazel et al. 2007) suggests that sea turtles' ability to detect approaching vessels is primarily vision-dependent, not acoustic. Sea turtles may respond to vessel approach and/or noise with a startle response (diving or swimming away) and a temporary stress response (NSF and USGS 2011). Samuel et al. (Samuel et al. 2005) indicated that vessel noise could have an effect on sea turtle behavior, especially their submergence patterns.	Any offshore projects that require the use of ocean vessels could potentially result in long-term but infrequent impacts on sea turtles, including temporary startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes, especially their submergence patterns (NSF and USGS 2011; Samuel et al. 2005). However, BOEM expects that these brief responses of individuals to passing vessels would be unlikely given the patchy distribution of sea turtles and no stock or population level effects would be expected.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Port expansion activities are localized to nearshore habitats, and are expected to result in short-term, temporary impacts, if any, on sea turtles. Vessel noise may affect sea turtles, but response would be expected to be short-term and temporary (see the Vessels: Noise sub-IPF above). The impact on water quality from sediment suspension during port expansion activities is short-term, temporary, and would be similar to those described under the cable emplacement and maintenance IPF above.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase in larger ships will require port modifications. Future channel deepening activities are being undertaken to accommodate deeper draft vessels for the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long-term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future. Additional impacts associated with the increased risk of vessel strikes could also occur (see the Traffic: Vessel collisions sub-IPF below).
Presence of structures: Entanglement or ingestion of lost fishing gear	The Mid-Atlantic region has more than 130 artificial reefs. Currently bridge foundations and the Block Island Wind Facility may be considered artificial reefs and may have higher levels of recreational fishing, which increases the chances of sea turtles encountering lost fishing gear, resulting in possible ingestions, entanglement, injury, or death of individuals (Berreiros and Raykov 2014; Gregory 2009; Vegter et al. 2014) if present where these structures are located. At the scale of the OCS geographic analysis area for sea turtles, there are very few areas that would serve to concentrate recreational fishing and increase the likelihood that sea turtles would encounter lost fishing gear.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Presence of structures: Habitat conversion and prey aggregation	The Mid-Atlantic region has more than 130 artificial reefs. Hard-bottom (scour control and rock mattresses) and vertical structures (bridge foundations, Block Island Wind Facility WTGs, and two WTGs with the Coastal Virginia Offshore Wind pilot project) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (Taormina et al. 2018; NMFS 2015). The reef effect is usually considered a beneficial impact, associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for sea turtles compared to the surrounding soft-bottoms.	The presence of structures associated with non-offshore wind development in near-shore coastal waters has the potential to provide habitat for sea turtles as well as preferred prey species. This reef effect has the potential to result in long-term, low-intensity beneficial impacts. Bridge foundations will continue to provide foraging opportunities for sea turtles with measurable benefits to some individuals.
Presence of structures: Avoidance/displacement	No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to this sub-IPF. There may be some impacts resulting from the existing Block Island Wind Facility (5 WTGs) and the Coastal Virginia Offshore Wind pilot project (2 WTGs) but given the limited number of WTGs, no measurable impacts are occurring.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Behavioral disruption - breeding and migration	No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Displacement into higher risk areas (Vessels and Fishing)	No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Traffic: Vessel collisions	Current activities contributing to this sub-IPF include port traffic levels, fairways, TSS, commercial vessel traffic, recreational and fishing activity, and scientific and academic vessel traffic. Propeller and collision injuries from boats and ships are common in sea turtles. Vessel strike is an increasing concern for sea turtles, especially in the southeastern United States, where development along the coasts is likely to result in increased recreational boat traffic. Sea turtles are most susceptible to vessel collisions in coastal waters, where they forage from May through November. Vessel speed may exceed 10 knots in such waters, and evidence suggests that they cannot reliably avoid being struck by vessels exceeding 2 knots (Hazel et al. 2007).	Vessel traffic associated with non-offshore wind development has the potential to result in an increased collision risk. While these impacts would be high consequence, the patchy distribution of sea turtles makes stock or population-level effects unlikely (Navy 2018).

µPa = ; micropascal; µT = microtesla; AC = alternating current; dB = decibels; hazmat = hazardous materials; HZ = hertz; PTS = permanent threshold shift; RMS = root mean square; SPL = sound pressure level; TTS = temporary threshold shift

Table D1-21. Summary of activities and the associated impact-producing factors for water quality

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	Accidental releases of fuels and fluids occur during vessel usage for dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable lines, and pipeline laying activities. According to the DOE, 31,000 barrels of petroleum are spilled into U.S. waters from vessels and pipelines in a typical year. Approximately 40.5 million barrels of oil were lost as a result of tanker incidents from 1970 to 2009, according to International Tanker Owners Pollution Federation Limited, which collects data on oil spills from tankers and other sources. From 1990 to 1999, the average annual input to the coastal Northeast was 220,000 barrels of petroleum and into the offshore was < 70,000 barrels. Impacts on water quality would be expected to brief and localized from accidental releases.	Future accidental releases from offshore vessel usage, spills, and consumption will likely continue on a similar trend. Impacts are unlikely to affect water quality.
Accidental releases: Trash and debris	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities, and cables, lines, and pipeline laying. Accidental releases of trash and debris are expected to be low probability events. BOEM assumes operator compliance with federal and international requirements for management of shipboard trash; such events also have a relatively limited spatial impact.	As population and vessel traffic increase gradually over the next 40 years, accidental release of trash and debris may increase. However, there does not appear to be evidence that the volumes and extents anticipated would have any effect on water quality.
Anchoring	Impacts from anchoring occur due to ongoing military use and survey, commercial, and recreational activities.	Impacts from anchoring may occur semi-regularly over the next 40 years due to offshore military operations or survey activities. These impacts would include increased seabed disturbance resulting in increased turbidity levels. All impacts would be localized, short term, and temporary.
Cable emplacement and maintenance	Elevated suspended sediment concentrations can occur under natural tidal conditions and increase during storms, trawling, and vessel propulsion. Survey activities, and new cable and pipeline laying activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances would be short-term and either be limited to the emplacement corridor or localized.	Suspension of sediments may continue to occur infrequently over the next 40 years due to survey activities, and submarine cable, lines, and pipeline-laying activities. Future new cables would occasionally disturb the seafloor and cause short-term increases in turbidity and minor alterations in localized currents resulting in local short-term impacts. If the cable routes enter the water quality geographic analysis area, short-term disturbance in the form of increased suspended sediment and turbidity would be expected.
Port utilization: Expansion	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase in larger ships will require port modifications, which, along with additional vessel traffic, could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long-term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future.	The general trend along the coastal region from Virginia to Maine is that port activity will increase modestly over the next 40 years. Port modifications and channel deepening activities are being undertaken to accommodate the increase in vessel traffic and deeper draft vessels that transit the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future.
Presence of structures	The installation of onshore and offshore structures leads to alteration of local water currents. These disturbances would be local but, depending on the hydrologic conditions, have the potential to impact water quality through the formation of sediment plumes.	Impacts associated with the presence of structures includes temporary sediment disturbance during maintenance. This sediment suspension would lead to interim and localized impacts.
Discharges/intakes	Discharges impact water quality by introducing nutrients, chemicals, and sediments to the water. There are regulatory requirements related to prevention and control of discharges, the prevention and control of accidental spills, and the prevention and control of nonindigenous species.	Increased coastal development is causing increased nutrient pollution in communities. In addition, ocean disposal activity in the North and Mid-Atlantic is expected to gradually decrease or remain stable. Impacts of ocean disposal on water quality are minimized because USEPA has established dredge spoil criteria and regulate the disposal permits issued by USACE.

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

DOE = U.S. Department of Energy; hazmat = hazardous materials

Table D1-22. Summary of activities and the associated impact-producing factors for scenic and visual resources

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

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

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

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Attachment 2: Maximum-Case Scenario Estimates for Offshore Wind Projects

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

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Table D2-1. Offshore wind development activities on the U.S. East Coast: Projects and assumptions (Part 1, Turbine and Cable Design Parameters)

Region	Lease, Project, Lease Remainder [a]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area) [c]						Estimated Construction Schedule [d]	Turbine Number [e]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles) [f]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Inter-Array Cable Length (statute miles) [g]	Hub Height (feet) [h]	Rotor Diameter (feet) [h]	Height of Turbine (feet) [h]
			Air Quality, Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism									
NE	Aquaventis (state waters)	State Project					X		2023	2	11					450	520
NE	Block Island (state waters)	Built					X		Built	5	30	28	5	2	328	541	659
	Total State Waters									**7**	**41**	**28**	**5**	**2**			
MA/RI	Vineyard Wind 1 part of OCS-A 0501	COP Approved (ROD issued 2021), PPA, SAP	X	X	X		X	X	2023	62	800	98	6.5	171	451	721	812
MA/RI	South Fork, OCS-A 0517	COP Approved (ROD issued 2021), PPA, SAP	X		X		X	X	2023	12	130	139	6.5	24	472	735	840
MA/RI	Sunrise, OCS-A 0487	COP, PPA, SAP	X		X		X	X	2024	94	1,034	105	6.5	180	459	656	787
MA/RI	Revolution, part of OCS-A 0486	COP, PPA, SAP	X		X		X	X	2023–2024	100	880	100	131	155	512	722	873
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	COP, PPA, SAP	X	X	X		X	X	2024–2026	62	804	125	10	139	630	837	1,047
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	COP, PPA, SAP	X	X	X		X	X	2024–2026	79	1,500	225	10	201	702	935	1,171
MA/RI	Mayflower Wind, OCS-A 0521	COP, PPA, SAP	X	X	X	X	X	X	2024–2030	147	2,400	1,179	6.5	497	605	919	1,066
MA/RI	Beacon Wind 1, part of OCS-A 0520	PPA, SAP	X	X	X		X	X	2024–2025	78	1,230	233	6.5	186	591	984	853
MA/RI	Beacon Wind 2, part of OCS-A 0520	SAP	X	X	X		X	X	2025–2026	77	1,200	233	6.5	186	591	984	853
MA/RI	Bay State Wind, part of OCS-A 0500	SAP, COP (unpublished), the MW is included in the description below.	X		X		X	X	By 2030, spread over 2025–2030	110	4,200	120	6.5	172	492	722	853
MA/RI	Vineyard Wind Northeast, OCS-A 0522	This group is exposed to 4,200 MW of demand—for MA (2,400 MW remaining), CT (1,200 MW remaining), and RI (600 MW expected). Collectively the remaining technical capacity is 4,764 MW.	X	X	X		X	X		227		360	6.5	368	492	722	853
MA/RI	OCS-A 0500 remainder		X		X		X	X							492	722	853
MA/RI	OCS-A 0487 remainder		X		X		X	X							492	722	853
	Remaining MA/RI Lease Area Total [b]									337	4,200	480	6.5	540	492	722	853
	Total MA/RI Leases [b]									**1,048**	**14,178**	**2,917**		**2,279**			
NY/NJ	Ocean Wind 1, OCS-A 0498	COP, PPA, SAP					X		2023–2025	98	1,100	194	98	190	512	788	906
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP					X		2024–2027	200	1,510	441	58	547	576	919	1,049

Region	Lease, Project, Lease Remainder [a]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area) [c]						Estimated Construction Schedule [d]	Turbine Number [e]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles) [f]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Inter-Array Cable Length (statute miles) [g]	Hub Height (feet) [h]	Rotor Diameter (feet) [h]	Height of Turbine (feet) [h]
			Air Quality, Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism									
NY/NJ	Ocean Wind 2, OCS-A 0532	PPA					X		By 2030, spread over 2026–2030	111	1,554	120	5	173	512	788	906
NY/NJ	Empire Wind 1, part of OCS-A 0512	COP, PPA, SAP					X		2023–2026	57	816	46	5	133	525	853	951
NY/NJ	Empire Wind 2, part of OCS-A 0512	COP, PPA, SAP					X		2023–2027	90	1,260	30	5	166	525	853	951
NY/NJ	Atlantic Shores North, OCS-A 0549	SAP					X		By 2030, spread over 2026–2030	157	2,198	99	58	249	576	919	1,049
NY/NJ	OW Ocean Winds East, OCS-A 0537						X		By 2030, spread over 2026–2030	100	1,200	120	5	157	492	722	853
NY/NJ	Attentive Energy, OCS-A 0538						X		By 2030, spread over 2026–2030	102	1,224	120	5	160	492	722	853
NY/NJ	Bight Wind Holdings, OCS-A 0539						X		By 2030, spread over 2026–2030	145	1,740	120	5	231	492	722	853
NY/NJ	Atlantic Shores Offshore Wind Bight, OCS-A 0541						X		By 2030, spread over 2026–2030	93	1,116	120	5	147	492	722	853
NY/NJ	Invenergy Wind Offshore, OCS-A 0542						X		By 2030, spread over 2026–2030	97	1,164	120	5	153	492	722	853
NY/NJ	Mid-Atlantic Offshore Wind, OCS-A 0544						X		By 2030, spread over 2026–2030	102	1,224	120	5	160	492	722	853
	Total NY/NJ Leases									**1,352**	**16,106**	**1,650**		**2,466**			
DE/MD	Skipjack, part of OCS-A 0519	COP, PPA, SAP					X		2024	16	120	40	10	30	492	722	853
DE/MD	US Wind, part of OCS-A 0490	COP, PPA, SAP					X		2024–2027	121	2,000	146	7	152	528	820	938
DE/MD	GSOE I, OCS-A 0482	Collectively the technical capacity of this is group is 1,080 MW (90 turbines). The remaining capacity may be utilized by demand from NJ or MD.					X		By 2030, spread over 2023–2030	90	1,080				492	722	853
DE/MD	OCS-A 0519 remainder						X								492	722	853
	Remaining DE/MD Lease Area Total									90	1,080	240	5	139			
	Total DE/MD Leases									**227**	**3,200**	**426**		**321**			
VA/NC	CVOW, OCS-A 0497	RAP, FDR/FIR					X		Built	2	12	27	3	9	364	506	620
VA/NC	CVOW-C, OCS-A 0483	COP, SAP					X		2025–2027	205	3,000	417	5	301	489	761	869
VA/NC	Kitty Hawk North, OCS-A 0508	COP, SAP					X		2024–2030	69	1,242	100	30	149	574	935	1,042

Region	Lease, Project, Lease Remainder [a]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area) [c]						Estimated Construction Schedule [d]	Turbine Number [e]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles) [f]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Inter-Array Cable Length (statute miles) [g]	Hub Height (feet) [h]	Rotor Diameter (feet) [h]	Height of Turbine (feet) [h]
			Air Quality, Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism									
VA/NC	Kitty Hawk South, OCS-A 0508						X		2024–2030	121	1,242	353	30	200	574	935	1,042
	Total VA/NC Leases									**397**	**5,496**	**897**		**659**			
	OCS Total [i,j]									**3,031**	**39,021**	**5,918**		**5,728**			

[a] The spacing/layout for projects are as follows: NE State water projects include a single strand of WTGs and no OSP. For projects in the RI, MA, NY, NJ, DE, MD lease areas, a 1×1–nm grid spacing is assumed. For the CVOW Project, the spacing is 0.7 nm; and the Dominion commercial lease area off the coast of Virginia would utilize 0.5 nm average spacing, which is less than the 1×1–nm spacing due to the need to attain the state's goals.
[b] Because development could occur anywhere within the RI and MA lease areas and assumes a continuous 1x1–nm grid, the actual development for these projects is expected to be approximately 88% of the collective technical capacity. Under the scenario described in this appendix, the total area in the RI and MA lease areas is greater than the area needed to meet state demand. Therefore, if a project is not constructed, BOEM assumes that another future project would be constructed to fulfill the unmet demand.
[c] This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.
[d] The estimated construction schedule is based on information known at the time of this analysis and could be different when an applicant submits a COP.
[e] The number of turbines for those lease areas without an announced number of turbines has been calculated based on lease size, a 1×1-nm grid spacing, and/or the generating capacity.
[f] BOEM assumes that each offshore wind development would have its own cable (both onshore and offshore) and that future projects would not utilize a regional transmission line. The length of offshore export cable for those lease areas without a known project size is assumed to include two offshore cables totaling 120 miles (193 kilometers). The offshore export cable would be buried a minimum of 4 feet (1.8 meters) but not more than 10 feet (3.1 meters).
[g] If information for a future project could not be obtained from a COP, the length of inter-array cabling is assumed to be the average amount per foundation based on the COPs submitted to date, which is 1.48 miles (2.4 kilometers). In addition, for those lease areas that require more than one OSP, it is assumed that an additional 6.2 miles (9.9 kilometers) of inter-link cable would be required to link the two OSPs. Inter-array cable is assumed to be buried between 4 and 6 feet.
[h] The hub height, rotor diameter, and turbine height for lease areas is based on worst-case scenario for the resource area. Presentation of heights vary by COP and may be presented relative to MLLW, mean sea level, or height above highest astronomical tide.
[i] BOEM recognizes that the estimates presented within this analysis are likely high, conservative estimates; however, BOEM believes that this analysis is appropriately capturing the potential cumulative impacts and errs on the side of maximum impacts. Totals by lease area and by OCS may not fully sum due to rounding errors.
[j] New York's demand is not double-counted, this total comes from looking at New York's state demand, not adding up the potential of the areas because that would double-count New York.
CT = Connecticut; CVOW = Coastal Virginia Offshore Wind; DE = Delaware; FDR = Facility Design Report; FIR = Fabrication and Installation Report; MA = Massachusetts; MD = Maryland; NC = North Carolina; NE = New England; NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement; RAP = research activities plan; RI = Rhode Island; SAP = Site Assessment Plan

Table D2-2. Offshore wind development activities on the U.S. East Coast: Projects and assumptions (Part 2, Seabed/Anchoring Disturbance and Scour Protection)

Region	Lease/Project/Lease Remainder [a]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps analysis area) [c]						Estimated Foundation Number [c]	Foundation Footprint [d] (acres)	WTG Seabed Disturbance (Foundation + Scour Protection) (acres) [e]	Offshore Export Cable Seabed Disturbance (acres) [f]	Offshore Export Cable Operating Seabed Footprint (acres) [g]	Offshore Export Cable Hard Protection (acres) [h]	Anchoring Disturbance (acres) [i]	Inter-Array Construction Footprint/Seabed Disturbance (acres) [j]	Inter-Array Operating Footprint/ Seabed Disturbance (acres) [k]	Inter-Array Cable Hard Protection (acres) [l]
			Air Quality, Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism										
MA/RI	Vineyard Wind 1 part of OCS-A 0501	COP Approved (ROD issued 2021), PPA, SAP	X	X	X		X	X	63	1	33	69	77	35	4	129	90	22
MA/RI	South Fork, OCS-A 0517	COP Approved (ROD issued 2021), PPA, SAP	X		X		X	X	13	1	11	555	7	7	663	340	19	20
MA/RI	Sunrise, OCS-A 0487	COP, PPA	X		X		X	X	95	3	108	1,259	102	25	11	462	145	129
MA/RI	Revolution, part of OCS-A 0486	COP, PPA	X		X		X	X	102	10	72	125	40	36	10	245	146	0
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	COP, PPA	X	X	X		X	X	64	2	86	263	22	22	34	222	92	129
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	COP	X	X	X		X	X	82	3	98	243	32	32	50	321	117	14
MA/RI	Mayflower Wind, OCS-A 0521	COP, PPA	X	X	X	X	X	X	149	142	1,697	2,480	472	247	442	1,408	213	122
MA/RI	Beacon Wind 1, part of OCS-A 0520	PPA, SAP	X	X	X		X	X	79	5	265	143	95	43	442	247	152	152
MA/RI	Beacon Wind 2, part of OCS-A 0520	SAP	X	X	X		X	X	78	5	265	143	95	43	442	247	152	152
MA/RI	Bay State Wind, part of OCS-A 0500	SAP	X		X		X	X	112	11	112	143	95	43	442	264	160	0
MA/RI	Vineyard Wind Northeast, OCS-A 0522		X	X	X		X	X	232	9	197	2,182	144	129	36	2,231	332	0
MA/RI	OCS-A 0500 remainder		X		X		X	X										
MA/RI	OCS-A 0487 remainder		X		X		X	X										
	Remaining MA/RI Lease Area Total [b]								344	20	309	2,325	239	171	478	2,495	492	0
	Total MA/RI Leases								**1,069**	**193**	**2,944**	**7,605**	**1,179**	**661**	**2,576**	**6,116**	**1,617**	**740**
	NY, NJ, DE, MD, NC, VA Leases								**2,025**	**69**	**1,706**	**143,333**	**1,381**	**914**	**496**	**28,657**	**3,029**	**442**
	OCS Total								**3,094**	**262**	**4,650**	**150,937**	**2,561**	**1,575**	**3,072**	**34,773**	**4,647**	**1,182**

[a] This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.
[b] Because development could occur anywhere within the RI and MA lease areas and assumes a continuous 1x1–nm grid, the actual development for these projects is expected to be approximately 88% of the collective technical capacity. Under the scenario described in this appendix, the total area in the RI and MA lease areas is greater than the area needed to meet state demand. Therefore, if a project is not constructed, BOEM assumes that another future project would be constructed to fulfill the unmet demand.
[c] The estimated number of foundations is the total number of turbines plus OSP. If information for a future project could not be obtained from a publicly available COP, it is assumed that for every 50 turbines there would be one OSP installed.
[d] If information for a future project could not be obtained from a publicly available COP, the foundation footprint is assumed to be 0.04 acre, which is based on the largest monopile reported (12 MW) for all lease areas.
[e] The seabed disturbance with the addition of scour protection was calculated based on scour protection expected in submitted COPs. If information for a future project could not be obtained from a publicly available COP, it is assumed that for all lease areas that a 12-MW foundation with addition of scour protection would be 0.85 acre per foundation.
[f] Offshore export cable seabed bottom disturbance is assumed to be due to installation of the export cable, the use of jack-up vessels, and the need to perform dredging. If information for a future project could not be obtained from a publicly available COP, export cable seabed disturbance assumed to be 6.06 acres per mile.
[g] If information for a future project could not be obtained from a publicly available COP, the offshore export cable operating seabed footprint assumed to be 0.4 acre per mile.
[h] If information for a future project could not be obtained from a publicly available COP, the offshore export cable hard protection is assumed to be similar to Vineyard Wind 1 Project, which is 0.357 acre per mile of offshore export cable.
[i] If information for a future project could not be obtained from a publicly available COP, anchoring disturbance for other lease areas is assumed to be a rate equal to 0.10 acre per mile of offshore export cable.
[j] If information for a future project could not be obtained from a publicly available COP, inter-array construction seabed disturbance is assumed to be 6.06 acres per mile.
[k] If information for a future project could not be obtained from a publicly available COP, the inter-array operating footprint is assumed to be a rate equal to the average amount per foundation of 1.43 acres per foundation.
[l] If information for a future project could not be obtained from a publicly available COP, the inter-array cable hard protection is assumed to be zero.
DE = Delaware; MA = Massachusetts; MD = Maryland; NC = North Carolina; PPA = Power Purchase Agreement; NJ = New Jersey; NY = New York; RI = Rhode Island; VA = Virginia

Table D2-3. Offshore wind development activities on the U.S. East Coast: Projects and assumptions (Part 3, Gallons of Coolant, Oils, Lubricants, and Diesel Fuel)

Region	Lease/Project/Lease Remainder [a]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps analysis area) [a]						Total Coolant Fluids in WTGs (gallons)	Total Coolant Fluids in OSP or ESP (gallons)	Total Oils and Lubricants in WTGs (gallons)	Total Oils and Lubricants in OSP or ESP (gallons)	Total Diesel Fuel in WTGs (gallons)	Total Diesel Fuel in OSP or ESP (gallons)
			Air Quality, Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism						
MA/RI	Vineyard Wind 1 part of OCS-A 0501	COP Approved (ROD issued 2021), PPA, SAP	X	X	X		X	X	42,300	46	383,000	123,559	79,300	5,696
MA/RI	South Fork, OCS-A 0517	COP Approved (ROD issued 2021), PPA, SAP	X		X		X	X	41,208	23	69,732	80,045	9,516	52,834
MA/RI	Sunrise, OCS-A 0487	COP, PPA	X		X		X	X	350,268	23	307,326	199,956	80,886	24,304
MA/RI	Revolution, part of OCS-A 0486	COP, PPA	X		X		X	X	343,400	0	330,300	0	79,300	0
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	COP, PPA	X	X	X		X	X	314,470	4,226	165,106	371,956	98,271	10,935
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	COP	X	X	X		X	X	475,826	9,510	249,798	557,934	146,087	24,604
MA/RI	Mayflower Wind, OCS-A 0521	COP, PPA	X	X	X	X	X	X	73,500	1,500	433,650	755,000	132,300	200,000
MA/RI	Beacon Wind 1, part of OCS-A 0520 [b]	PPA, SAP	X	X	X		X	X	38,970	795	229,922	400,302	70,146	106,040
MA/RI	Beacon Wind 2, part of OCS-A 0520 [b]	SAP	X	X	X		X	X	38,477	785	227,011	395,235	69,258	104,698
MA/RI	Bay State Wind, part of OCS-A 0500 [b]	SAP	X		X		X	X	55,248	1,128	325,965	567,517	99,447	150,336
MA/RI	Vineyard Wind Northeast, OCS-A 0522 [b]		X	X	X		X	X	114,443	2,336	675,213	1,175,570	205,997	311,409
MA/RI	OCS-A 0500 remainder [b]		X		X		X	X						
MA/RI	OCS-A 0487 remainder [b]		X		X		X	X						
	Remaining MA/RI Lease Area Total [c]								169,691	3,463	1,001,179	1,743,087	305,444	461,745
	Total MA/RI Leases								**1,888,110**	**20,372**	**3,397,024**	**4,627,074**	**1,070,508**	**990,856**
	NY, NJ, DE, MD, NC, VA Leases								**2,200,905**	**19,231**	**5,452,042**	**4,000,436**	**1,141,917**	**1,505,955**
	OCS Total								**4,089,015**	**39,603**	**8,849,066**	**8,627,510**	**2,212,425**	**2,496,811**

[a] This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.
[b] Quantities of coolant, oil and lubricants, and diesel fuel are scaled to Mayflower Wind based on number turbines and OSP foundations.
[c] Because development could occur anywhere within the RI and MA lease areas and assumes a continuous 1x1–nm grid, the actual development for these projects is expected to be approximately 88% of the collective technical capacity. Under the scenario described in this appendix, the total area in the RI and MA lease areas is greater than the area needed to meet state demand. Therefore, if a project is not constructed, BOEM assumes that another future project would be constructed to fulfill the unmet demand.
ESP = electrical service platform; DE = Delaware; MA = Massachusetts; MD = Maryland; NC = North Carolina; PPA = Power Purchase Agreement; NJ = New Jersey; NY = New York; RI = Rhode Island; VA = Virginia

Table D2-4. Offshore wind development activities on the U.S. East Coast: Projects and assumptions (Part 4, OCS Construction and Operation Emissions)

Region	Lease/Project/Lease Remainder [a]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps analysis area) [a]						Nitrogen oxides	Volatile organic compounds	Carbon monoxide	Particulate matter, 10 microns or less	Particulate matter, 2.5 microns or less	Sulfur dioxide	Carbon dioxide
			Air Quality, Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism							
									Construction Emissions (Total) – Tons						
MA/RI	Vineyard Wind 1 part of OCS-A 0501	COP Approved (ROD issued 2021), PPA, SAP	X	X	X		X	X	5,064	123	1,139	176	169	38	325,127
MA/RI	South Fork, OCS-A 0517	COP Approved (ROD issued 2021), PPA, SAP	X		X		X	X	1,451	59	284	49	47	33	97,026
MA/RI	Sunrise, OCS-A 0487	COP, PPA	X		X		X	X	5,876	138	2,441	108	108	6	637,986
MA/RI	Revolution, part of OCS-A 0486	COP, PPA	X		X		X	X	22,488	439	5,702	756	730	67	1,712,429
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	COP, PPA	X	X	X		X	X	6,074	128	1,402	223	216	36	404,287
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	COP	X	X	X		X	X	6,906	147	1,608	277	268	41	471,961
MA/RI	Mayflower Wind, OCS-A 0521	COP, PPA	X	X	X	X	X	X	39,964	1,589	8,284	2,897	1,566	1,556	2,607,026
MA/RI	Beacon Wind 1 and 2, part of OCS-A 0520	PPA, SAP	X	X	X		X	X	26,330	1,055	2,929	577	461	653	1,603,031
MA/RI	Bay State Wind, part of OCS-A 0500 [b]	SAP	X		X		X	X	29,905	1,189	6,199	2,168	1,172	1,164	1,950,836
MA/RI	Vineyard Wind Northeast, OCS-A 0522 [b]		X	X	X		X	X							
MA/RI	OCS-A 0500 remainder [b]		X		X		X	X	61,713	2,454	12,792	4,474	2,418	2,403	4,025,816
MA/RI	OCS-A 0487 remainder [b]		X		X		X	X							
	Remaining MA/RI Lease Area Total [c]								91,618	3,643	18,991	6,641	3,590	3,567	5,976,651
Total Air Quality Analysis Area – Total Construction Emissions									205,771	7,321	42,780	11,705	7,155	5,997	13,835,524
									Operations Emissions (Annual) – Tons per year						
MA/RI	Vineyard Wind 1 part of OCS-A 0501	COP Approved (ROD issued 2021), PPA, SAP	X	X	X		X	X	71	2	18	2	2	0	5,487
MA/RI	South Fork, OCS-A 0517	COP Approved (ROD issued 2021), PPA, SAP	X		X		X	X	281	6	58	10	10	2	18,894
MA/RI	Sunrise, OCS-A 0487	COP, PPA	X		X		X	X	590	14	246	11	11	1	64,145
MA/RI	Revolution, part of OCS-A 0486	COP, PPA	X		X		X	X	1,066	16	263	35	34	1	73,349
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	COP, PPA	X	X	X		X	X	412	7	101	14	13	1	35,179

Region	Lease/Project/Lease Remainder [a]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps analysis area) [a]						Nitrogen oxides	Volatile organic compounds	Carbon monoxide	Particulate matter, 10 microns or less	Particulate matter, 2.5 microns or less	Sulfur dioxide	Carbon dioxide
			Air Quality, Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism							
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	COP	X	X	X		X	X	419	7	102	14	13	1	42,376
MA/RI	Mayflower Wind, OCS-A 0521	COP, PPA	X	X	X	X	X	X	729	13	180	24	19	28	46,925
MA/RI	Beacon Wind 1 and 2, part of OCS-A 0520	PPA	X	X	X		X	X	563	18	97	11	11	5	65,257
MA/RI	Bay State Wind, part of OCS-A 0500 [b]	SAP	X		X		X	X	546	10	135	18	14	21	35,114
MA/RI	Vineyard Wind Northeast, OCS-A 0522 [b]		X	X	X		X	X	1,126	20	278	37	29	43	72,462
MA/RI	OCS-A 0500 remainder [b]		X		X		X	X							
MA/RI	OCS-A 0487 remainder [b]		X		X		X	X							
	Remaining MA/RI Lease Area Total [c]								1,671	30	413	55	44	64	107,576
Total Air Quality Analysis Area – Annual Operations Emissions									**5,802**	**113**	**1,477**	**176**	**156**	**103**	**459,188**

[a] This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.
[b] Emissions are scaled to Mayflower Wind based on number turbines.
[c] Because development could occur anywhere within the RI and MA lease areas and assumes a continuous 1x1–nm grid, the actual development for these projects is expected to be approximately 88% of the collective technical capacity. Under the scenario described in this appendix, the total area in the RI and MA lease areas is greater than the area needed to meet state demand. Therefore, if a project is not constructed, BOEM assumes that another future project would be constructed to fulfill the unmet demand.
MA = Massachusetts; RI = Rhode Island; PPA = Power Purchase Agreement

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Appendix E: Analysis of Incomplete and Unavailable Information

In accordance with Section 1502.21 of the Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA), when an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement (EIS) and when information is incomplete or unavailable, the agency shall make clear that such information is lacking. When incomplete or unavailable information was identified, the Bureau of Ocean Energy Management (BOEM) considered whether the information was relevant to the assessment of impacts and essential to its analysis of alternatives based upon the resource analyzed. If essential to a reasoned choice among the alternatives, BOEM considered whether it was possible to obtain the information and if the cost of obtaining it was exorbitant. If it could not be obtained or if the cost of obtaining it was exorbitant, BOEM applied acceptable scientific methodologies to inform the analysis in light of this incomplete or unavailable information. For example, conclusive information on many impacts of the offshore wind industry may not be available for years, and certainly not within the contemplated timeframe of this NEPA process. However, if this information is essential for a reasoned decision, subject matter experts have used the scientifically credible information available and generally accepted scientific methodologies to evaluate impacts on the resources while this information is unavailable. The following sections present an analysis by resource topic of incomplete or unavailable information in the EIS for the Mayflower Wind Project (Project) proposed by Mayflower Wind Energy LLC (Mayflower Wind) in its Construction and Operations Plan (COP) (Mayflower Wind 2022) within Lease Area OCS-A 0521 (Lease Area).

E.1 Incomplete or Unavailable Information Analysis for Resource Areas

E.1.1 Physical Resources

E.1.1.1 Air Quality

Although a quantitative emissions inventory analysis of the region, or regional modeling of pollutant concentrations, over the next 35 years would more accurately assess the overall impacts of the changes in emissions from the Project, any action alternative would lead to reduced emissions regionally and can only lead to a net improvement in regional air quality. The differences among action alternatives with respect to direct emissions due to construction, operations and maintenance (O&M), and decommissioning of the Project are expected to be small. As such, the analysis provided in this EIS is sufficient to support sound scientific judgments and informed decision-making related to the use of the offshore portions of the Wind Farm Area and offshore export cable route corridors. Therefore, BOEM does not believe that there is incomplete or unavailable information on air quality that is essential to a reasoned choice among alternatives.

E.1.1.2 Water Quality

No incomplete or unavailable information related to the analysis of impacts on water quality was identified.

E.1.2 Biological Resources

E.1.2.1 Bats

There will always be some level of incomplete information on the distribution and habitat use of bats in the offshore portions of the Lease Area, as habitat use and distribution varies among seasons and species. Additionally, surveying bat activity offshore provides challenges as limited methods have been developed and tested for surveying within this environment. No BOEM issued guidance for bat surveys currently exist for renewable energy development on the outer continental shelf (OCS). Although Mayflower Wind did not complete Project-specific surveys within the Project area, the evaluation of several studies was examined to provide a baseline understanding of the presence, abundance, and seasonality of bats which may occur within the Project area (including the OCS, State Waters, and coastal lands of Massachusetts and Rhode Island) and the northeast, and an examination of the terrestrial natural communities within the Onshore Project area. Additionally, because U.S. offshore wind development is in its infancy, with only two offshore wind projects having been constructed at the time of this analysis, there is some level of uncertainty regarding the potential collision risk to individual bats that may be present within the offshore portions of the Wind Farm Area. However, sufficient information on collision risk to bats observed at land-based U.S. wind projects exists and was used to analyze and corroborate the potential for this impact as a result of the proposed Project. In addition, the likelihood of a bat encountering an operating wind turbine generator (WTG) during migration is very low and, therefore, the differences among action alternatives with respect to bats for the Project are expected to be small. As such, the analysis provided in this EIS is sufficient to support sound scientific judgments and informed decision-making related to bat use of the Wind Farm Area and the potential for collision risk of bats. Therefore, BOEM does not believe that there is incomplete or unavailable information on bat resources that is essential to a reasoned choice among alternatives.

E.1.2.2 Benthic Resources

Although there is uncertainty regarding the spatial and temporal distribution of benthic (faunal) resources and periods during which they might be especially vulnerable to disturbance, Mayflower Wind's surveys of benthic resources and other broad-scale studies (Mayflower Wind 2022; Guida et al. 2017) provided this suitable basis for generally predicting the species, abundances, and distributions of benthic resources within the geographic analysis area. Surveys have not been completed for any of the alternative offshore export cable routes (Alternatives C-1 and C-2) where they diverge from the Proposed Action cable corridors. BOEM is relying on general information and the surveys of the Proposed Action cable corridors, which are in close proximity to the alternative cable routes to characterize benthic habitat impacts. Uncertainty also exists regarding the impact of some impact-producing factors (IPFs) on benthic resources. For example, specific stimulus-response related to acoustics and electromagnetic fields (EMF) is not well studied, although there is some emerging information from benthic monitoring at European wind facilities and the Block Island Wind Farm in the United States that allows for a broad understanding of the impacts. Similarly, specific secondary impacts, such as changes in diets throughout the food chain resulting from habitat modification and synergistic behavioral impacts from multiple IPFs, are not fully known. Again, results of benthic monitoring at European wind facilities and the Block Island Wind Farm in the United States provide general knowledge of the overall impacts of these IPFs combined, if not individually. Therefore, the analysis provided in this EIS is sufficient to support sound scientific judgments and informed decision-making related to the overall impacts. For these reasons, BOEM does not believe that there is incomplete or unavailable information on benthic resources that is essential to a reasoned choice among alternatives.

E.1.2.3 Birds

Habitat use and distribution of marine birds varies between seasons, species, and years and, as a result, there will always be some level of incomplete information on the distribution and habitat use of marine birds in the offshore portions of the geographic analysis area. However, in accordance with BOEM guidance (BOEM 2020 a-b), an Avian Exposure Risk Assessment was completed for Mayflower Wind (COP Appendix I1; Mayflower Wind 2022) to use the best-available marine avian species information with potential to occur in the OCS Lease Area with consideration of several quantitative, qualitative, and spatially explicit resources available for select species occurrences at multiple scales. The Avian Exposure Risk Assessment incorporated baseline regional information, and site-specific data collected during Mayflower Wind-sponsored high-definition aerial surveys and opportunistic ship-based surveys in order to evaluate the marine bird occurrences in the Lease Area with a specific focus on federally or state listed species and potentially sensitive species that are believed to be susceptible to displacement or collision. These findings were used to inform the predictive models and analyze the potential adverse impacts on bird resources in the EIS.

Because U.S. offshore wind development is in its infancy, there will always be some level of uncertainty regarding the potential for collision risk and avoidance behaviors for some of the bird species that may be present within the offshore portions of the geographic analysis area. In place of this information, subject matter experts used the data and assumptions described below and in the EIS to create models to evaluate impacts, where it was determined that the information was essential for reasoned decision-making. Bird mortality data are available for onshore wind facilities and, based on a number of assumptions regarding their applicability to offshore environments, were used to inform the analysis of bird mortality associated with the offshore WTGs analyzed in the EIS. However, uncertainties exist regarding the use of the onshore bird mortality rate to estimate the offshore bird mortality rate due to differences in species groups present and life history and behavior of species as well as differences in the offshore marine environment compared to onshore habitats. Modeling is commonly used to predict the potential mortality rates for marine bird species in Europe and the United States (BOEM 2015, 2021). Due to inherent data limitations, these models often represent only a subset of species potentially present. However, the datasets used by both Mayflower Wind and BOEM to assess the potential for exposure of marine birds to the Wind Farm Area represent the best available data and provide context at both local and regional scales. Furthermore, sufficient information on collision risk and avoidance behaviors observed in related species at European offshore wind projects is available and was used to analyze and corroborate the potential for these impacts as a result of the proposed Project (e.g., Skov et al. 2018). As such, the analysis provided in the EIS is sufficient to support sound scientific judgments and informed decision-making related to distribution and use of the offshore portions of the geographic analysis area as well as to the potential for collision risk and avoidance behaviors in bird resources. Furthermore, the similarity between the layouts analyzed for the different action alternatives does not render any of this incomplete and unavailable information essential to a reasoned choice among alternatives. Therefore, BOEM does not believe that there is incomplete or unavailable information on avian resources that is essential to a reasoned choice among alternatives.

E.1.2.4 Coastal Habitat and Fauna

Although the preferred habitats of terrestrial and coastal fauna are generally known, specific data on abundances and distributions within the geographic analysis area of various fauna within these habitats are likely to remain unknown without site-specific surveys. However, the species inventories and other general information about the area provide an adequate basis for evaluating the fauna likely to inhabit the onshore geographic analysis area. Additionally, the onshore activities proposed involve only common, industry-standard activities for which impacts are generally understood. Therefore, BOEM believes that the analysis provided in this EIS is sufficient to make a reasoned choice among the alternatives.

E.1.2.5 Finfish, Invertebrates, and Essential Fish Habitat

Although there is some uncertainty regarding the spatial and temporal distribution of finfish and invertebrate resources and periods during which they might be especially vulnerable to disturbance, Mayflower Wind's site assessment surveys and other broad-scale studies (e.g., Guida et al. 2017) provided a suitable basis for general predictions of finfish and invertebrate resources with respect to species, densities, and distributions within the geographic analysis area. Additional information related to species listed under the Endangered Species Act (ESA) and essential fish habitat (EFH) are addressed in the biological assessment (BA) and EFH Assessment. While impacts on these specific finfish and invertebrate species are not anticipated to vary from the general impacts provided in the EIS, specific impact discussion for ESA-listed species and EFH will be provided in the BA and EFH Assessment. Site assessment surveys have not been completed for any of the alternative offshore export cable routes (Alternatives C-1 and C-2) where they diverge from the Proposed Action cable corridors. BOEM is relying on general information and the assessment surveys of the Proposed Action cable corridors, which are in close proximity to the alternative cable routes to characterize habitat impacts for finfish, invertebrates, and EFH.

Uncertainty also exists regarding the impact of some IPFs on invertebrate resources, such as the effects of EMFs and underwater noise (e.g., generated from pile driving). The available information on invertebrate sensitivity to EMF is equivocal (Hutchinson et al. 2020), and sensitivity to sound pressure and particle motion effects is not well understood for many species, nor are synergistic or antagonistic impacts from multiple IPFs. Similarly, specific secondary impacts such as changes in diets throughout the food chain resulting from habitat modification are not well known for finfish and invertebrates. Lastly, the nature, extent, and significance of potential spillover effects on broader ecosystem functions, such as larval dispersal, are not fully understood (van Berkel et al. 2020). Where applicable, the assessment drew upon information in the available literature and an increasing number of monitoring and research studies related to wind development, other undersea development, or artificial reefs in Europe and the United States, several of which were recently drafted or published. These monitoring studies help provide a broad understanding of the overall impacts of these IPFs combined, if not individually.

For these reasons, the information provided in this EIS is sufficient to support sound scientific judgments and informed decision-making related to the overall impacts. Therefore, BOEM does not believe that there is incomplete or unavailable information on finfish, invertebrate, and EFH resources that is essential to a reasoned choice among alternatives.

E.1.2.6 Marine Mammals

The National Marine Fisheries Service (NMFS) has summarized the most current information about marine mammal population status, occurrence, and use of the region in its 2020 stock status report for the Atlantic OCS and Gulf of Mexico (Hayes et al. 2020, 2021). These studies provided a suitable basis for predicting the species, abundances, and distributions of marine mammals in the geographic analysis area. However, population trend data from NMFS are unavailable for 24 species, and annual human-caused mortality is unknown for 16 species (Appendix B, *Supplemental Information and Additional Figures and Tables*). The majority of species lacking population trend data are offshore species, such as blue whale, fin whale, and non-porpoise odontocetes (e.g., beaked whales and dolphins). As a result, there is uncertainty regarding how Project activities and cumulative effects may affect these populations. In addition to species distribution information, effects of some IPFs on marine mammals are also uncertain or ambiguous, as described below.

Potential effects of EMF have not been scaled to consider impacts on marine mammal populations or their prey in the geographic analysis area (Taormina et al. 2018). The widespread ranges of marine mammals and difficulty obtaining permits make experimental studies challenging. As a result, no scientific studies have been conducted that examine the effects of altered EMF on marine mammals. However, although scientific studies summarized by Normandeau et al. (2011) demonstrate that marine mammals are sensitive to, and can detect, small changes in magnetic fields (Section 3.5.6, *Marine Mammals*), potential impacts would likely only occur within a few feet of cable segments. The current literature does not support a conclusion that EMF could lead to changes in behavior that would cause significant adverse effects on marine mammal populations.

The behavioral effects of anthropogenic noises on marine mammals are increasingly being studied; however, behavioral responses vary depending on a variety of factors such as life stage, previous experience, and current behavior (e.g., feeding, nursing) and are, therefore, difficult to predict. In addition, the current NMFS disturbance criteria apply a single threshold for all marine mammals for impulsive noise sources and do not consider the overall duration, exposure, or frequency distribution of the sound to account for species-dependent hearing acuity. While elevated underwater sound could startle or displace animals, behavioral responses are not necessarily predictable from source levels alone (Southall et al. 2007).

In addition, research regarding the potential behavioral effects of pile-driving noise has generally focused on harbor porpoises and seals; studies that examine the behavioral responses of baleen whales to pile driving are absent from the literature. Of the available research, most studies conclude that, although pile-driving activities could cause avoidance behaviors or disruption of feeding activities, individuals would likely return to normal behaviors once the activity had stopped. However, uncertainty remains regarding the long-term cumulative acoustic impacts associated with multiple pile-driving projects that may occur over a number of years. This also applies to other project activities such as vessel movements, high-resolution geophysical (HRG) surveys, geotechnical drilling, and dredging activities that may elicit behavioral reactions in marine mammals. As a result, it is not possible to predict with certainty the potential long-term behavioral effects on marine mammals from Project-related pile driving or other activities, as well as ongoing concurrent and cumulative pile driving and other activities.

To address this uncertainty, the assessment used the best available information when considering behavioral effects related to underwater noise. To better characterize these impacts, all potential types of behavioral responses, as well as the context within which these responses may occur, were considered following guidance from applicable studies (Southall et al. 2021) and used in conjunction with the NMFS disturbance threshold, as described in Chapter 3, Section 3.5.6, *Marine Mammals*. For the assessment of large baleen whales, studies on other impulsive noises (e.g., seismic sources) were used to inform the potential behavioral reactions to pile-driving noise. Monitoring studies would provide insight into species-specific behavioral reactions to Project-generated underwater noise. Long-term monitoring of concurrent and multiple projects could inform the understanding of long-term effects and subsequent consequences from cumulative underwater noise activities on marine mammal populations.

There is a lack of research regarding the responses of large whale species to extensive networks of new structures due to the novelty of this type of development on the Atlantic OCS. Although new structures are anticipated from multiple offshore wind projects under the planned activities scenario, it is expected that spacing will allow large whales to access areas within and between wind facilities. No physical obstruction of marine mammal migration routes or habitat areas are anticipated, but whether avoidance of offshore wind lease areas will occur due to new structures is unknown. Additionally, while there is some uncertainty regarding how hydrodynamic changes around foundations may affect prey availability, these changes are expected to have limited impacts on the local conditions around WTG foundations. The potential consequences of these impacts on marine mammals are unknown. Monitoring studies would provide insight into species-specific avoidance behaviors and other potential behavioral reactions to Project structures.

At present, this EIS has no basis to conclude that these IPFs would result in significant adverse impacts on marine mammal populations.

BOEM determined that the overall costs of obtaining the missing information for or addressing these uncertainties are exorbitant, or the means to obtain it are not known. Therefore, to address these gaps as described above, BOEM extrapolated or drew assumptions from known information for similar species and studies using acceptable scientific methodologies to inform the analysis in light of this incomplete or unavailable information, as presented in Chapter 3, Section 3.5.6, *Marine Mammals*, and in the BA submitted to NMFS (BOEM 2022). The information and methods used to predict potential impacts on marine mammals represent the best available information, and the information provided in this EIS is sufficient to support sound scientific judgments and informed decision-making. Therefore, BOEM does not believe that there is incomplete or unavailable information on marine mammal resources that is essential to a reasoned choice among alternatives.

E.1.2.7 Sea Turtles

The NMFS BA (BOEM 2022) provides a thorough overview of the available information about potential species occurrence and exposure to Project-related IPFs. The studies summarized therein provide a suitable basis for predicting potential species occurrence, relative abundance, and probable distribution of sea turtles in the geographic analysis area. There are Protected Species Observer sightings and modeled densities of sea turtle species expected to occur within the Project Area outlined in the most recent COP submission (Mayflower Wind 2022). However, without specific sea turtle surveys or monitoring guidelines, data to investigate impacts on sea turtles is lacking.

Some uncertainty exists about the effects of certain IPFs on sea turtles and their habitats. The effects of EMF on sea turtles are not completely understood. However, the available relevant information is summarized in the BOEM-sponsored report by Normandeau et al. (2011). Although the thresholds for EMF disturbing various sea turtle behaviors are not known, the evidence suggests that impacts may only occur on hatchlings over short distances, and no adverse effects on sea turtles have been documented to occur from the numerous submarine power cables around the world.

There is also uncertainty about sea turtle responses to proposed Project construction activities, and data are not available to evaluate potential changes to movements of juvenile and adult sea turtles due to elevated suspended sediments. However, although some exposure may occur, total suspended solid impacts would be limited in magnitude and duration and would occur within the range of exposures periodically experienced by these species. On this basis, any resulting impact on sea turtle behavior due to sediment plumes would likely be too small to be biologically meaningful, and no adverse impacts would be expected (NOAA 2020). Some potential exists for sea turtle displacement, but it is unclear if this would result in adverse impacts (e.g., because of lost foraging opportunities or increased exposure to potentially fatal vessel interactions). Additionally, it is currently unclear whether concurrent construction of multiple projects, increasing the extent and intensity of impacts over a shorter duration, or spreading out project construction with lower-intensity impacts over multiple years would result in the least potential harm to sea turtles.

Information on sea turtle hearing is limited, and there are some discrepancies between hearing range determinations. Cumulative acoustic impacts associated with pile-driving activities are unknown, including whether sea turtles affected by construction activities would resume normal feeding, migrating, or breeding behaviors once daily pile-driving activities cease, or if secondary impacts would continue. Under the planned activities scenario, individual sea turtles may be exposed to acoustic impacts from multiple projects in a single day or from one or more projects over the course of multiple days. Although the consequences of these exposure scenarios have been analyzed with the best available information, some level of uncertainty remains due to the lack of observational data on species' responses to pile driving.

Since U.S. offshore wind development is in its infancy, there is some level of uncertainty regarding the potential collision risk to sea turtles that may be present within the offshore portions of the Wind Farm Area. The potential for sea turtle responses to Federal Aviation Administration hazard lights and navigation lighting is unknown. Mayflower Wind would limit lighting on WTGs and offshore substation platforms to minimum levels required by regulation for worker safety, navigation, and aviation. Although sea turtles' sensitivity to these minimal light levels is unknown, sea turtles do not appear to be adversely affected by oil and gas platform operations, which produce far more artificial light than offshore wind structures. The placement of new structures would be far from nesting beaches, so no impacts on nesting female or hatchling sea turtles are anticipated.

Considerable uncertainty exists about how sea turtles would interact with the long-term changes in biological productivity and community structure resulting from the reef effect of offshore wind farms across the geographic analysis area. Artificial reef and hydrodynamic impacts could influence predator-prey interactions and foraging opportunities in ways that influence sea turtle behavior and distribution. Also, the extent of sea turtle entanglement on artificial reefs and shipwrecks is not captured in sea turtle stranding records and the significance and potential scale of sea turtle entanglement in lost fishing gear are not quantified. These impacts are expected to interact with the ongoing influence of climate change on sea turtle distribution and behavior over broad spatial scales, but the nature and significance of these interactions are not predictable. BOEM anticipates that ongoing monitoring of offshore energy structures will provide some useful insights into these synergistic effects.

BOEM considered the level of effort required to address the uncertainties described above for sea turtles and determined that the methods necessary to do so are lacking or the associated costs would be exorbitant. Therefore, where appropriate, BOEM inferred conclusions about the likelihood of potential biologically significant impacts from available information for similar species and situations to inform the analysis in light of this incomplete or unavailable information. These methods are described in greater detail in Section 3.5.7, *Sea Turtles*, and in the BA submitted to NMFS (BOEM 2022). Therefore, the analysis provided is sufficient to support sound scientific judgments and informed decision-making about the proposed Project with respect to its impacts on sea turtles. For these reasons, BOEM does not believe that there is incomplete or unavailable information on turtles that is essential to a reasoned choice among alternatives.

E.1.2.8 Wetlands

The analysis of impacts on wetlands presented in Section 3.5.8, *Wetlands*, is based on publicly available data sets, including National Wetland Inventory, Massachusetts Bureau of Geographic Information wetlands dataset, and the University of Rhode Island Environmental Data Center and Rhode Island Geographic Information System Wetlands dataset. Mayflower Wind delineated wetlands during field surveys conducted within the onshore substation sites in Falmouth; however, the field delineation report for the onshore substation sites under consideration in Falmouth is private data and, therefore, has not been provided (COP Volume 2, Section 6.4.1.1; Mayflower Wind 2022). Additional field delineations will be completed as part of the federal (Clean Water Act Section 404) and state permitting processes as necessary. While delineated wetland data provides more accurate and site-specific impact information, use of the national and state wetland data provides adequate detail to characterize impacts on wetlands and any differences among the alternatives. Based on the foregoing, BOEM does not believe that there is incomplete or unavailable information on wetlands that is essential to a reasoned choice among alternatives.

E.1.3 Socioeconomic Conditions and Cultural Resources

E.1.3.1 Commercial Fisheries and For-Hire Recreational Fishing

Fisheries are managed in the context of an incomplete understanding of fish stock dynamics and effects of environmental factors on fish populations. The commercial fisheries information used in this assessment has limitations. For example, vessel trip report data are only an approximation because this information is self-reported and may not account for all trips. The vessel trip report data also do not include all commercial fishing operations that may be affected by the Proposed Action and only represent vessel logbook data for species managed by the Greater Atlantic Regional Fisheries Office. Additionally, available historical data lack consistency, making comparisons challenging.

Vessel Monitoring System (VMS) data are also limited, with a number of factors contributing to their limitations.

- VMS coverage is not universal for all fisheries, with some fisheries (summer flounder, scup, black sea bass, bluefish, American lobster, spiny dogfish, skate, whiting, and tilefish) not covered at all by VMS.
- There is limited historical coverage for most fisheries (e.g., monkfish is optional and elective on a yearly basis, 2005 or earlier for herring, 2006 for groundfish and scallops, 2008 for surfclams/ocean quahogs, 2014 for mackerel, and 2016 for longfin squid/butterfish).
- Trip declaration does not necessarily correspond to actual operation.
- Hourly position pings limit area resolution based on speed.
- Fishing time/location can be mis-estimated by operational assumptions (speed and direction) that are affected by externalities (weather, sea state, mechanical issues).

- Catch data are limited for there is no information on catch rates, retained catch composition is limited to target species and some bycatch species, and the data are not universal.
- Catch information is for the full trip, not sub-trips.
- Not all information is collected from all fisheries (gear type).

However, these data represent the best available data, and sufficient information exists to support the findings presented in this EIS.

A second limitation is that recent annual exposure of revenue for for-hire recreational fishing specific to the Lease Area is not available. The economic analysis conducted by BOEM of recreational for-hire boats, as well as for-hire and private-boat angler trips that might be affected by the overall Massachusetts Wind Energy Area (WEA), including the Lease Area, was conducted for 2007–2012 (Kirkpatrick et al. 2017), and the Massachusetts WEA is treated as one entity with no site-specific data for the individual offshore wind lease areas that compose the Massachusetts WEA. Currently, there are an insufficient number of trips available for NMFS to generate a description of selected fishery landings and estimates of recreational party and charter vessel revenue from within the Project area (NMFS 2021). Due to the low effort in the area, BOEM does not believe that there is incomplete or unavailable information on commercial fisheries and for-hire recreational fishing resources that is essential to a reasoned choice among alternatives.

E.1.3.2 Cultural Resources

BOEM requires detailed information regarding the nature and location of historic properties that may be affected by an applicant’s proposed activity in order to conduct review of the COP under Section 106 of National Historic Preservation Act (54 United States Code 306108). The assessment of effects from the proposed Project on historic properties is reliant on the identification and analysis of cultural resources in the geographic area in which these activities are proposed to take place (referred to as the Area of Potential Effects [APE]). BOEM has determined there is sufficient information on cultural resources in the APE for the proposed Project that allows for the assessment of impacts, analysis and comparison of alternatives, and preliminary completion of a determination of effect on historic properties. However, BOEM has identified areas of presently unavailable information that would better inform and increase the specificity of the analysis.

For the Marine Archaeological Resource Assessment, BOEM is seeking information from Mayflower Wind pertaining to the analysis and assessment of effects on ancient submerged landform features in the marine APE. These features may be contributing elements to the Nantucket Sound Traditional Cultural Property (TCP), and this information will allow BOEM to complete its analysis of alternatives, including the Proposed Action, and assess its effects on the Nantucket Sound TCP.

For the Terrestrial Archaeological Resource Assessment, BOEM requires a complete inventory of terrestrial archaeological resources in the terrestrial APE to assess Project impacts and complete the analysis of alternatives based on specific historic properties. Mayflower Wind will be using a process of phased identification and evaluation of historic properties as defined in 36 Code of Federal Regulations

(CFR) 800.4(b)(2) to provide BOEM with the full completion of historic property identification in the terrestrial APE. This includes completion of Phase IB terrestrial archaeological survey in presently unsurveyed areas. Any thus-far known terrestrial archaeological resources identified as being located in the APE are provided in the Terrestrial Archaeological Resource Assessment; however, additional terrestrial archaeological surveys completed for the proposed Project may lead to the identification of additional terrestrial archaeological resources.

In conclusion, BOEM has determined there is sufficient information on cultural resources in the geographic analysis area and APE for the analysis in this Draft EIS to support a reasoned choice among alternatives. BOEM anticipates receiving additional information that would better inform the analysis through Mayflower Wind's phased identification process as defined in 36 CFR 800.4(b)(2) and ongoing consultation.

E.1.3.3 Demographics, Employment, and Economics

Mayflower Wind's economic analysis estimated the employment and outputs for the Proposed Action. This provided sufficient information for the evaluation of demographics, employment, and economics to support a reasoned choice among alternatives. There is some inherent uncertainty in forecasting how economic variables in various areas will evolve over time. However, the differences among action alternatives with respect to demographics, employment, and economics are not expected to be significant. Therefore, BOEM does not believe that there is specific incomplete or unavailable information on demographics, employment, and economics that is essential to a reasoned choice among alternatives.

E.1.3.4 Environmental Justice

Evaluations of impacts on environmental justice communities rely on the assessment of impacts on other resources. As a result, incomplete or unavailable information related to other resources, as described in this document, also affect the completeness of the analysis of impacts on environmental justice communities.

As discussed in other sections, BOEM has determined that incomplete and unavailable resource information for environmental justice or for other resources on which environmental justice communities rely was either not relevant to assess reasonably foreseeable significant adverse impacts, was not essential to a reasoned choice among alternatives, alternative data or methods could be used to predict potential impacts and provided the best available information, or the overall costs of obtaining the information were exorbitant or the means to do so were unknown. Therefore, the information provided in the EIS is sufficient to support sound scientific judgments and informed decision-making related to the proposed uses of the onshore and offshore portions of the geographic analysis area. Furthermore, the differences among action alternatives with respect to environmental justice are not expected to be significant.

E.1.3.5 Land Use and Coastal Infrastructure

There is no incomplete or unavailable information related to the analysis of impacts on land use and coastal infrastructure.

E.1.3.6 Navigation and Vessel Traffic

Mayflower Wind's Navigation Safety Risk Assessment (COP Appendix X; Mayflower Wind 2022), of which the navigation and vessel traffic impact analysis in the EIS is largely based, relies on 1 year's (January 1–December 31, 2021) Automatic Identification System (AIS) data from vessels required to carry AIS (i.e., those 65 feet [19.8 meters] or greater in length). To account for some gaps in the data due to limitations of the AIS carriage requirements, additional vessel transits were added to the Navigation Safety Risk Assessment risk modeling to account for both current and future traffic not represented in the data (COP Appendix X; Mayflower Wind 2022). The AIS data and additional vessel trips added to the modeling described above represents the best available vessel traffic data and is sufficient to enable BOEM to make a reasoned choice among alternatives.

As stated in Section 3.6.6, *Navigation and Vessel Traffic*, WTGs could potentially interfere with marine radars. Marine radars have varied capabilities and the ability of radar equipment to properly detect objects is dependent on radar type, equipment placement, and operator proficiency; however, trained radar operators, properly installed and adjusted vessel equipment, marked wind turbines, and the use of AIS all would enable safe navigation with minimal loss of radar detection. Based on the foregoing, BOEM does not believe that there is incomplete or unavailable information on navigation and vessel traffic that is essential to a reasoned choice among alternatives.

E.1.3.7 Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research, and Surveys)

There is no incomplete or unavailable information related to the analysis of impacts on other uses.

E.1.3.8 Recreation and Tourism

Evaluations of impacts on recreation and tourism rely on the assessment of impacts on other resources. As a result, incomplete or unavailable information related to other resources, as described in this document, also affect the completeness of the analysis of impacts on recreational tourism. BOEM has determined that incomplete and unavailable resource information for recreation and tourism or for other resources on which the analysis of recreation and tourism impacts rely was either not relevant to reasonably foreseeable significant adverse impacts, was not essential to a reasoned choice among alternatives, alternative data or methods could be used to predict potential impacts and provided the best available information, or the overall costs of obtaining the information were exorbitant or the means to do so were unknown. Therefore, the information provided in the EIS is sufficient to support sound scientific judgments and informed decision-making related to the proposed uses of the onshore and offshore portions of the geographic analysis area.

E.1.3.9 Visual Resources

No incomplete or unavailable information related to the analysis of impacts on scenic and visual resources was identified.

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Appendix F: USACE 404(b)(1) Analysis

The U.S. Environmental Protection Agency (EPA)'s Clean Water Act (CWA) Section 404(b)(1) guidelines can be found at 40 Code of Federal Regulations (CFR) Part 230 and apply to the U.S. Army Corps of Engineer (USACE)'s review of proposed discharges of dredged or fill material into waters of the United States regulated under CWA Section 404. In tidal waters, the shoreward limit of Section 404 jurisdiction is the high tide line, while the seaward limit is 3 nautical miles from the baseline of the territorial seas. In non-tidal waters, the Section 404 jurisdictional limit is the ordinary high water mark of a waterbody. The guidelines also address impacts on "special aquatic sites" which are geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. Special aquatic sites include wetlands, sanctuaries and refuges, vegetated shallows (such as eelgrass), mud flats, coral reefs, and riffle and pool complexes.

Except as provided under CWA Section 404(b)(2), no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Where the activity associated with a discharge which is proposed for a special aquatic site does not require access or proximity to or siting within the special aquatic site in question to fulfill its basic purpose (i.e., is not ''water dependent''), practicable alternatives that do not involve special aquatic sites are presumed to be available, unless clearly demonstrated otherwise. In addition, where a discharge is proposed for a special aquatic site, all practicable alternatives to the proposed discharge which do not involve a discharge into a special aquatic site are presumed to have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise.

For the proposed Mayflower Wind Project, USACE has determined that the basic project purpose is offshore wind energy generation, which is not "water dependent" per the Section 404(b)(1) guidelines. The following information (including alternatives tables for Falmouth and Brayton Point) includes a description of alternatives considered that was provided by Mayflower Wind and will be analyzed according to the appropriate criteria in the guidelines.

F.1 Falmouth Alternatives (see Table F-1 for quantitative summary)

Preferred Offshore Export Cable Route

The Preferred Offshore Export Cable Route would run from the Lease Area in federal waters through Muskeget Channel and into Nantucket Sound in Massachusetts state waters, to make landfall in Falmouth, Massachusetts.

This route would be 309,028 linear feet, and there are no anticipated impacts on tidal waters, non-tidal waters, wetlands, or other protected resource areas anticipated (Table F-1).

The Preferred Offshore Export Cable Route follows the westernmost route option through Muskeget Channel. The western route has fewer areas of high risk related to extremely shallow water depths than the other options. The western route avoids ultra-shallow sections of the Muskeget Channel that would pose significant navigational hazards (even to a shallow-draft cable lay barge) during cable installation and (if needed) repair. It has a greater length proximate to or co-located with the Vineyard Wind 1 cables, which may reduce the cumulative impact area of both projects. Also, the selected route is the shortest of the three options assessed. Minimizing cable length is critical for reducing transmission losses and avoiding higher costs.

Alternative Offshore Cable Route 1

Falmouth Alternative Offshore Cable Route 1 would run from the Lease Area in federal waters through Muskeget Channel and into Nantucket Sound in Massachusetts state waters, to make landfall in Falmouth, Massachusetts. Alternative Offshore Cable Route 1 runs just east of the preferred offshore export cable route and is the easternmost option of the alternatives down-selected through Muskeget Channel.

This route would be 301,027 linear feet, and there are no impacts on tidal waters, non-tidal waters, wetlands, or other protected resource areas anticipated (Table F-1).

Mayflower Wind deselected Falmouth Alternative Offshore Cable Route 1 because of its similarity to selected corridors, which provided the proposed Project with adequately differentiated options through Muskeget Channel and into Nantucket Sound.

Alternative Offshore Cable Route 2

Falmouth Alternative Offshore Cable Route 2 would run from the Lease Area in federal waters through Muskeget Channel and into Nantucket Sound in Massachusetts state waters, to make landfall in Falmouth, Massachusetts. Alternative Cable Route 2 follows the same route as Alternative Offshore Cable Rote 1; however, it diverts to the east and reconnects to Alternative 3 (discussed below).

This route would be 314,803 Linear Feet and will utilize horizontal directional drilling (HDD) for the sea-to-shore transition of export cables between the ocean and the land; therefore there are no impacts to Tidal Waters, Non-Tidal Waters, Wetlands, or other protected resource areas anticipated (Table F-1).

Mayflower Wind deselected Falmouth Alternative Offshore Cable Route 2 to avoid conflict with other proposed offshore wind projects and because of challenging seabed conditions within Muskeget Channel that were identified during reconnaissance and site characterization surveys completed in 2020. The resulting level of technical risk was too high to carry these corridors through for the Project Design Envelope (PDE).

Alternative Offshore Cable Route 3

Falmouth Alternative Offshore Cable Route 3 would run from the Lease Area in federal waters through Muskeget Channel and into Nantucket Sound in Massachusetts state waters, to make landfall in Falmouth, Massachusetts. Alternative Offshore Cable Route 3 is further east compared to the preferred alternative and turns left parallel to the northernmost part of Martha's Vineyard.

This route would be 308,338 linear feet, and there are no impacts on tidal waters, non-tidal waters, wetlands, or other protected resource areas anticipated (Table F-1).

Mayflower Wind deselected Falmouth Alternative Offshore Cable Route 3 to avoid conflict with other proposed offshore wind projects and because of challenging seabed conditions within Muskeget Channel that were identified during reconnaissance and site characterization surveys completed in 2020. The resulting level of technical risk was too high to carry these corridors through for the PDE.

Alternative Offshore Cable Route 4

Falmouth Alternative Offshore Cable Route 4 would run from the Lease Area in federal waters through Muskeget Channel and into Nantucket Sound in Massachusetts state waters, to make landfall in Falmouth, Massachusetts. Alternative 4 is the easternmost cable route, closest to Nantucket, that heads to the east then curves west to rejoin the Alternative Offshore Cable Route 3 proposed corridor.

This route would be 321,925 linear feet, and there are no impacts on tidal waters, non-tidal waters, wetlands, or other protected resource areas anticipated (Table F-1).

Mayflower Wind deselected Falmouth Alternative Offshore Cable 4 because of challenging seabed conditions that were identified in a desktop assessment, amounting to a high level of technical risk, especially near Muskeget Island and Nantucket. For Falmouth Alternative Offshore Cable Routes 2 through 4, these challenging seabed conditions include expected high sediment mobility, very shallow bathymetry, and high seabed slopes.

Worcester Ave Landing to Preferred Onshore Substation Alternative

The preferred landfall is the easternmost potential landfall site located at Worcester Avenue. This location is protected by a short seawall, a broad beach, and Surf Drive. This landfall site would be located on a previously disturbed, off-road grassy median strip (also known as Worcester Park) that runs between the two lanes of Worcester Avenue. Residences and a hotel are adjacent to this landfall site but are buffered from the open green space by Worcester Avenue on either side. A paved parking lot located nearby could be used for construction staging operations. There are no known existing submarine cables that make landfall at Worcester Avenue and this landfall would avoid the need to cross any existing submarine cables between Martha's Vineyard and Falmouth, Massachusetts.

The preferred landfall would have no impacts on tidal waters. Due to HDD drilling activities, there is 0.22 acre of anticipated wetland impacts. There are no anticipated impacts on non-tidal waters or other special aquatic sites. This location is within northern long-eared bat habitat range, but due to no tree clearing, impacts are not anticipated. See Table F-1 for an impact summary.

The Worcester Avenue landfall is preferred because it has the overall shortest length and minimal impacts on protected resources. The Worcester Avenue landfall is 2.0 miles (3.3 kilometers) from the preferred Onshore Substation located at Lawrence Lynch and 5.9 miles (9.4 kilometers) from the alternate Onshore Substation located at Cape Cod Aggregates.

Central Park Landing to the Preferred Onshore Substation Alternative

The Central Park landing is approximately 700 feet (213 meters) west of the Worcester Avenue landfall location, situated at Central Park on Falmouth Heights Beach north of Grand Avenue. This landfall site would occur at a public recreational park with a baseball diamond and basketball court. The park is flanked on the southern side by paved parking spaces, which could be used for construction staging operations. There are no known existing submarine cables that make landfall at Central Park and this landfall would avoid the need to cross any existing submarine cables between Martha's Vineyard and Falmouth, Massachusetts.

The Central Park landing and onshore cable route to the substation would have no impacts on tidal waters, non-tidal waters, wetlands, or other special aquatic sites (Table F-1). This location is within northern long-eared bat habitat range, but due to no tree clearing, impacts are not anticipated.

The Central Park landing and cable route to the substation is not preferred due to its longer length and potential interference with activities at Central Park. The Central Park landfall is 2.2 miles (3.5 kilometers) from the preferred Onshore Substation located at Lawrence Lynch and 6.1 miles (9.8 kilometers) from the alternate Onshore Substation located at Cape Cod Aggregates.

Shore Street Landing to Alternate Onshore Substation Alternative

The Shore Street landfall site is west of the Central Park and Worcester Avenue landfall sites. It is located on Surf Drive Beach at the intersection of Surf Drive and Shore Street. An existing seawall and nearby rock jetties protect this landfall site. The Shore Street location has a large, over 2 acres (0.8 hectare) public parking lot that could be used to site the cable transition joint bays and accommodate vehicles and equipment during installation operations. The Shore Street landfall location involves the potential crossing of two existing submarine cables that also make landfall at Shore Street. The existing arrangement may allow Mayflower Wind to HDD underneath the existing cables in the approach to the landfall location.

Mayflower Wind will utilize HDD for the sea-to-shore transition of export cables between the ocean and the land; therefore, there are no anticipated impacts to tidal waters. Due to HDD drilling activities, there is 0.26 acre of anticipated wetland impacts. There is 0.01 acre of potential impacts on non-tidal waters due to a small stream crossing. There are no anticipated impacts on other special aquatic sites. This location is within northern long-eared bat habitat range, but due to no tree clearing, impacts are not anticipated. See Table F-1 for an impact summary.

Th Shore Street landing and cable route to the onshore alternate substation is not preferred due to its potential to cross existing submarine cables, and also due to its length. The Shore Street landfall is 2.3 miles (3.6 kilometers) from the preferred Onshore Substation located at Lawrence Lynch and 6.4 miles (10.25 kilometers) from the alternate Onshore Substation located at Cape Cod Aggregates.

Table F-1. Clean Water Act Section 404(b)(1) alternatives analysis table – Falmouth

Factors	No Action Alternative	Preferred Offshore Cable Route	Alternative Offshore Cable Route 1 from COP	Alternative Offshore Cable Route 2 from COP	Alternative Offshore Cable Route 3 from COP	Alternative Offshore Cable Route 4 from COP	Worcester Ave Landing to Preferred Onshore Substation	Central Park Landing to Preferred Onshore Substation	Shore Street Landing to Alternate Onshore Substation
Linear Foot of Cable [a,b]	0 LF	309,028 LF	301,027 LF	314,803 LF	308,338 LF	321,925 LF	N/A	N/A	N/A
Amount of Dredge Material [c]	0 CY	1,227,786 CY	1,195,995 CY	1,250,729 CY	1,225,045 CY	1,279,025 CY	0 CY	0 CY	0 CY
Amount of Fill Material	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres
Non-Tidal Waters (e.g., streams, ponds)	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres	.01 acres
Wetland Impacts	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres	.22 acres	0 acres	.26 acres
Impacts on Other Special Aquatic Sites	0	0	0	0	0	0	0	0	0
Other Resources of Concern	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres	NLEB [d]	NLEB [d]	NLEB [d]

[a] Excludes onshore export cable segments (i.e., export cable segments landward of the landfall).
[b] Distances reported in linear feet are inclusive of all export cable circuits.
[c] These numbers were achieved assuming the PDE max of 3-meter cable burial depth and 1 meter wide corridor per cable (5 cables total). Anticipated cable burial depth for the construction of the Project is 1.2 meters.
[d] Within northern long-eared bat habitat range; impacts on northern long-eared bat habitat are not anticipated.

F.2 Brayton Point (see Table F-2 – Table A and B for quantitative summary)

Proposed Action over Aquidneck Island via the Lee River (Western Route) with Point of Interest at Brayton Point, with Portsmouth Route Options 1, 2, 2B, and 3

The preferred route alternative over Aquidneck Island via the Lee River would traverse north from the Lease Area up the Sakonnet River. The offshore export cables would come ashore from the Sakonnet River to Portsmouth, Rhode Island at the northeast corner of Boyd's Lane and Park Avenue. Landfall would be accomplished using HDD technology to drill below the beach, seawall, and Park Avenue. This selected alternative includes an intermediate, onshore underground crossing of Aquidneck Island, through Portsmouth (route options and impacts described in further detail below), continuing offshore through Mount Hope Bay. The cables would then travel northwest through Mount Hope Bay to Brayton Point via the Lee River and would connect to the point of interest (POI) at Brayton Point in Somerset, Massachusetts.

Approximately 2.0 mile (3.4 kilometers) of onshore, underground export cable would be routed north through Portsmouth from the intersection of Boyd's Lane and Park Avenue on the east side of Boyd's Lane. From here, four onshore route variants are being considered:

- Route Option 1 (133,187 total linear feet of cable): Route Option 1 would continue north on Boyd's Lane to the roundabout, with HDD conducted on the east side of the Mount Hope Bridge into Mount Hope Bay. Because the route in its entirety would be HDD, there are no impacts on tidal waters, non-tidal waters, wetlands, or other protected resource areas anticipated (Table F-2).

- Route Option 2 (131,227 linear feet of cable): Route Option 2 would continue east onto Anthony Road, turning north onto RIDEM/Aquidneck Land Trust, with HDD conducted in a northeasterly direction. Because the route utilizes mostly HDD installation methodology, there are minimal impacts expected. There is 0.07 acre of impact anticipated due to a stream crossing along the route. There are also 1.12 acres of fill in wetlands anticipated due to construction and HDD activities through the Aquidneck Land Trust. There are no other anticipated impacts on protected resources. See Table F-2 for an impact summary.

- Route Option 2B (131,389 linear feet of cable): Route Option 2B would continue east onto Anthony Road and onto Roger Williams University property, with HDD conducted in a northeasterly direction toward Mount Hope Bay. Because the route utilizes mostly HDD installation methodology, there are minimal impacts expected. There is 0.07 acre of impacts anticipated due to a stream crossing along the route. There is also 0.03 acre of fill in wetlands anticipated due to construction and HDD activities on the Roger Williams University property. There are no other anticipated impacts on protected resources. See Table F-2 for an impact summary.

- Route Option 3 (133, 242 linear feet of cable): Route Option 3 would continue east onto Anthony Road to the entrance of Montaup Country Club, with HDD headed northwest to Mount Hope Bay conducted from the Montaup Country Club parking area. Because the route utilizes mostly HDD installation methodology, there are minimal impacts expected. There is 0.07 acre of impacts anticipated due to a stream crossing along the route. There is also 0.03 acre of fill in wetlands anticipated due to construction and HDD activities on the Montaup Country Club property. There are no other anticipated impacts on protected resources. See Table F-2 for an impact summary.

Mayflower Wind chose the preferred route alternative because it has a shorter, more direct route length relative to the other routes and avoids or minimizes potential conflicts with other marine stakeholders including recreational vessel users, federally maintained shipping channels, protected wildlife areas, and the U.S. Navy.

Proposed Action over Aquidneck Island via the Taunton River (Eastern Route) with Point of Interest at Brayton Point, with Portsmouth Route Options 1, 2, 2B, and 3

This route alternative over Aquidneck Island via the Taunton River would traverse north from the Lease Area up the Sakonnet River. The offshore export cables would come ashore from the Sakonnet River to Portsmouth, Rhode Island at the northeast corner of Boyd's Lane and Park Avenue. Landfall would be accomplished using HDD technology to drill below the beach, seawall, and Park Avenue. This selected alternative includes an intermediate, onshore underground crossing of Aquidneck Island, through Portsmouth (route options and impacts described in further detail below), continuing offshore through Mount Hope Bay. The cables would then travel northeast through Mount Hope Bay to Brayton Point via the Taunton River and would connect to the POI at Brayton Point in Somerset, Massachusetts.

Approximately 2.0 miles (3.4 kilometers) of onshore, underground export cable would be routed north through Portsmouth from the intersection of Boyd's Lane and Park Avenue on the east side of Boyd's Lane. From here, four onshore route variants are being considered:

- Route Option 1 (133,809 total linear feet of cable): Route Option 1 would continue north on Boyd's Lane to the roundabout, with HDD conducted on the east side of the Mount Hope Bridge into Mount Hope Bay. Because the route in its entirety would be HDD, there are minimal impacts on tidal waters, wetlands, and other protected resource areas anticipated. Due to a stream crossing with a culvert along the route, there is 0.04 acre of impact on non-tidal waters anticipated (Table F-2).

- Route Option 2 (131,849 linear feet of cable): Route Option 2 would continue east onto Anthony Road, turning north onto RIDEM/Aquidneck Land Trust, with HDD conducted in a northeasterly direction. Because the route utilizes mostly HDD installation methodology, there are minimal impacts expected. There is 0.07 acre of impact anticipated due to a stream crossing along the route. There are also 1.12 acres of fill in wetlands anticipated due to construction and HDD activities through the Aquidneck Land Trust. There are no other anticipated impacts on protected resources. See Table F-2 for an impact summary.

- Route Option 2B (132,011 linear feet of cable): Route Option 2B would continue east onto Anthony Road and onto Roger Williams University property, with HDD conducted in a northeasterly direction toward Mount. Hope Bay. Because the route utilizes mostly HDD installation methodology, there are minimal impacts expected. There is 0.07 acre of impact anticipated due to a stream crossing along the route. There is also 0.03 acre of fill in wetlands anticipated due to construction and HDD activities on the Roger Williams University property. There are no other anticipated impacts on protected resources. See Table F-2 for an impact summary.

- Route Option 3 (133,864 linear feet of cable): Route option 3 would continue east onto Anthony Road to the entrance of Montaup Country Club, with HDD headed northwest to Mount Hope Bay conducted from the Montaup Country Club parking area. Because the route utilizes mostly HHD installation methodology, there are minimal impacts expected. There is 0.07 acre of impact anticipated due to a stream crossing along the route. There is also 0.03 acre of fill in wetlands anticipated due to construction and HDD activities on the Montaup Country Club property. There are no other anticipated impacts on protected resources.

This alternative route with the eastern landfall via the Taunton River is the alternate to the preferred route due to a slightly longer route length. This alternative route was chosen because it avoids or minimizes potential conflicts with other marine stakeholders including recreational vessel users, federally maintained shipping channels, protected wildlife areas, and the U.S. Navy.

Habitat Minimization Alternative C1 Western (Middletown/ Paradise Ave) via the Lee River (Western Route) with Point of Interest at Brayton Point with Portsmouth Route Options 1, 2, 2B, and 3:

Habitat Minimization Alternative C1 Western would make landfall at the parking lot for Second Beach in Middletown via HDD under the municipal public beach from Sachuest Bay. From the landfall, the approximately 11-mile (17.7-kilometer) onshore route would proceed inland through Middletown via Paradise Avenue and Route 138, crossing into Portsmouth to join Route Options 1, 2, 2B, and 3 discussed above and continuing offshore through Mount Hope Bay. The cables would then travel northwest through Mount Hope Bay to Brayton Point via the Lee River and would connect to the POI at Brayton Point in Somerset, Massachusetts.

Route Options 1,2,2B and 3 are discussed in further detail below:

- Route Option 1 (137,733 total linear feet of cable): Route Option 1 would continue north on Boyd’s Lane to the roundabout, with HDD conducted on the east side of the Mount Hope Bridge into Mount Hope Bay. Due to HDD construction, there are no anticipated impacts on tidal waters. There are 0.12 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There is 0.01 acre of anticipated impact on wetlands due to construction activities. There would be no impacts on eelgrass or mudflats. See Table F-2 for an impact summary.

- Route Option 2 (135,773 linear feet of cable): Route Option 2 would continue east onto Anthony Road, turning north onto RIDEM/Aquidneck Land Trust, with HDD conducted in a northeasterly direction. Due to HDD construction, there are no anticipated impacts on tidal waters. There is 0.15 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There are 1.12 acres of anticipated impacts on wetlands due to construction activities. There would be no impacts on eelgrass or mudflats. See Table F-2 for an impact summary.

- Route Option 2B (135,935 linear feet of cable): Route Option 2B would continue east onto Anthony Road and onto Roger Williams University property, with HDD conducted in a northeasterly direction toward Mount Hope Bay. There is 0.15 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There is 0.09 acre of anticipated impact on wetlands due to construction activities. There would be no impacts on eelgrass or mudflats. See Table F-2 for an impact summary.

- Route Option 3 (137,788 linear feet of cable): Route Option 3 would continue east onto Anthony Road to the entrance of Montaup Country Club, with HDD headed northwest to Mount Hope Bay conducted from the Montaup Country Club parking area. Due to HDD construction, there are no anticipated impacts on tidal waters. There is 0.15 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There is 0.04 acre of anticipated impacts on wetlands due to construction activities. There would be no impacts on eelgrass or mudflats. See Table F-2 for an impact summary.

Mayflower Wind does not prefer this route due to the additional length and impacts on sensitive environmental resources. Second Beach, where this alternative would make landfall, is a dynamic beach system with mobile sediments, surrounded by wetlands, parks, and natural heritage. The Second Beach landfall site and routing also abuts the Norman Bird Sanctuary, a 325-acre bird sanctuary, nature preserve, environmental education center, and museum. To the west is Newport, a popular, year-round tourist destination and a designated Rhode Island historic district. In addition, this route passes through multiple residential areas, and also through High Value/High Vulnerability Habitat and Natural Heritage Areas. Paradise School, a historic property, is located along the route. There are also ten National Register-eligible resources within 0.5 mile of the route along with ten archaeological sites along the route.

Habitat Minimization Alternative C1 Western (Middletown/ Paradise Ave) via the Taunton River (Eastern Route) with Point of Interest at Brayton Point with Portsmouth Route Options 1, 2, 2B, and 3

Habitat Minimization Alternative C1 Western would make landfall at the parking lot for Second Beach in Middletown via HDD under the municipal public beach from Sachuest Bay. From the landfall, the approximately 11-mile (17.7-kilometer) onshore route would proceed inland through Middletown via Paradise Avenue and Route 138, crossing into Portsmouth to join Route Options 1, 2, 2B, and 3 discussed above and continuing offshore through Mount Hope Bay. The cables would then travel northeast through Mount Hope Bay to Brayton Point via the Taunton River and would connect to the POI at Brayton Point in Somerset, Massachusetts.

Route Options 1, 2, 2B, and 3 are discussed in more detail below:

- Route Option 1 (138,355 total linear feet of cable): Route Option 1 would continue north on Boyd's Lane to the roundabout, with HDD conducted on the east side of the Mount Hope Bridge into Mount Hope Bay. Due to HDD construction, there are no anticipated impacts on tidal waters. There are 0.12 acre of impact anticipated to non-tidal waters due to a stream crossing along the route.

There is 0.01 acre of anticipated impact on wetlands due to construction activities. There would be no impacts on eelgrass or mudflats. See Table F-2 for an impact summary.

- Route Option 2 (136,395 linear feet of cable): Route Option 2 would continue east onto Anthony Road, turning north onto RIDEM/Aquidneck Land Trust, with HDD conducted in a northeasterly direction. Due to HDD construction, there are no anticipated impacts on tidal waters. There is 0.15 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There are 1.12 acres of anticipated impacts on wetlands due to construction activities. There would be no impacts on eelgrass or mudflats. See Table F-2 for an impact summary.

- Route Option 2B (136,557 linear feet of cable): Route Option 2B would continue east onto Anthony Road and onto Roger Williams University property, with HDD conducted in a northeasterly direction toward Mount Hope Bay. There is 0.15 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There is 0.09 acre of anticipated impacts on wetlands due to construction activities. There would be no impacts on eelgrass or mudflats. See Table F-2 for an impact summary.

- Route Option 3 (138,410 linear feet of cable): Route option 3 would continue east onto Anthony Road to the entrance of Montaup Country Club, with HDD headed northwest to Mount Hope Bay conducted from the Montaup Country Club parking area. Due to HDD construction, there are no anticipated impacts on tidal waters. There is 0.15 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There is 0.04 acre of anticipated impact on wetlands due to construction activities. There would be no impacts on eelgrass or mudflats. See Table F-2 for an impact summary.

Mayflower Wind does not prefer this route due to the additional length and potential impacts on sensitive environmental resources. Second Beach, where this alternative would make landfall, is a dynamic beach system with mobile sediments, surrounded by wetlands, parks, and natural heritage. The Second Beach landfall site and routing also abuts the Norman Bird Sanctuary, a 325-acre bird sanctuary, nature preserve, environmental education center, and museum. To the west is Newport, a popular, year-round tourist destination and a designated Rhode Island historic district. In addition, this route passes through multiple residential areas, and also through High Value/High Vulnerability Habitat and Natural Heritage Areas. Paradise School, a historic property, is located along the route. There are also ten National Register-eligible resources within 0.5 miles of the route along with ten archaeological sites along the route.

Habitat Minimization Alternative C1 Eastern (Middletown/ Mitchell's Lane) via the Lee River (Western Route) with Point of Interest at Brayton Point with Portsmouth Route Options 1, 2, 2B, and 3

Habitat Minimization Alternative C1 Eastern would make landfall at the parking lot for Second Beach in Middletown via HDD under the municipal public beach from Sachuest Bay, similar to Habitat Minimization Alternative C1 Western. From the landfall, the approximately 11-mile (17.7-kilometer) onshore route would head east along Hanging Rock Road, then travel via Mitchell's Lane to Route 138, crossing into Portsmouth to join Route Options 1, 2, 2B, and 3 discussed above and continuing offshore through Mount Hope Bay. The cables would then travel northwest through Mount Hope Bay to Brayton Point via the Lee River and would connect to the POI at Brayton Point in Somerset, Massachusetts. Alternative C1 Eastern would also pass through several protected resource areas, including Normans Bird Sanctuary and the Sachest Point National Wildlife Refuge.

Route Options 1, 2, 2B, and 3 are discussed in further detail below:

- Route Option 1 (137,538 total linear feet of cable): Route Option 1 would continue north on Boyd's Lane to the roundabout, with HDD conducted on the east side of the Mount Hope Bridge into Mount Hope Bay. Due to HDD construction, there are no anticipated impacts on tidal waters. There is 0.19 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There are no anticipated impacts on wetlands, eelgrass or mudflats. See Table F-2 for an impact summary.
- Route Option 2 (135,578 linear feet of cable): Route Option 2 would continue east onto Anthony Road, turning north onto RIDEM/Aquidneck Land Trust, with HDD conducted in a northeasterly direction. Due to HDD construction, there are no anticipated impacts on tidal waters. There is 0.21 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There would be 1.12 acres of impact on wetlands due to construction activities under the Aquidneck Land Trust. There are no anticipated impacts on eelgrass or mudflats. See Table F-2 for an impact summary.
- Route Option 2B (135,740 linear feet of cable): Route Option 2B would continue east onto Anthony Road and onto Roger Williams University property, with HDD conducted in a northeasterly direction toward Mount Hope Bay. There is 0.21 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There is 0.8 acre of anticipated impact on wetlands due to construction activities. There would be no impacts on eelgrass or mudflats. Route Option 2B would also pass through several protected resource areas including the Norman Bird Sanctuary and the Sachest Point National Wildlife Refuge. See Table F-2 for an impact summary.
- Route Option 3 (137,593 linear feet of cable): Route Option 3 would continue east onto Anthony Road to the entrance of Montaup Country Club, with HDD headed northwest to Mount Hope Bay conducted from the Montaup Country Club parking area. Due to HDD construction, there are no anticipated impacts on tidal waters. There is 0.21 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There is 0.03 acre of anticipated impact on wetlands due to construction activities. There would be no impacts on eelgrass or mudflats. See Table F-2 for an impact summary.

Mayflower Wind does not prefer this route due to the additional length and potential impacts on sensitive environmental resources. This onshore route passes through multiple residential areas, and also through High Value/High Vulnerability Habitat and Natural Heritage Areas 237, 216, and 209 according to RIDEM and RIGIS mapping. This route also passes Gardiner Pond, a City of Newport drinking water supply area, and Paradise Brook. Historic properties along the route include Gardiner Pond Shell Midden and Union Church and Southernmost Schoolhouse. Additional sensitive receptors abut this alternative including wetlands, parks, reserves, emergency and rescue services facilities, schools, and government facilities.

Habitat Minimization Alternative C1 Eastern (Middletown/ Mitchell's Lane) via the Taunton River (Eastern Route) with Point of Interest at Brayton Point with Portsmouth Route Options 1, 2, 2B, and 3

Habitat Minimization Alternative C1 Eastern would make landfall at the parking lot for Second Beach in Middletown via HDD under the municipal public beach from Sachuest Bay, similar to Habitat Minimization Alternative C1 Western. From the landfall, the approximately 11-mile (17.7-kilometer) onshore route would head east along Hanging Rock Road, then travel via Mitchell's Lane to Route 138, crossing into Portsmouth to join Route Options 1, 2, 2B, and 3 discussed above and continuing offshore through Mount Hope Bay. The cables would then travel northwest through Mount Hope Bay to Brayton Point via the Taunton River and would connect to the POI at Brayton Point in Somerset, Massachusetts.

Route Options 1, 2, 2B, and 3 are discussed in further detail below:

- Route Option 1 (138,160 total linear feet of cable): Route Option 1 would continue north on Boyd's Lane to the roundabout, with HDD conducted on the east side of the Mount Hope Bridge into Mount Hope Bay. Due to HDD construction, there are no anticipated impacts on tidal waters. There is 0.19 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There are no anticipated impacts on wetlands, eelgrass or mudflats. See Table F-2 for an impact summary.

- Route Option 2 (136,200 linear feet of cable): Route Option 2 would continue east onto Anthony Road, turning north onto RIDEM/Aquidneck Land Trust, with HDD conducted in a northeasterly direction. Due to HDD construction, there are no anticipated impacts on tidal waters. There is 0.21 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There would be 1.12 acres of impact on wetlands due to construction activities under the Aquidneck Land Trust. There are no anticipated impacts on eelgrass or mudflats. See Table F-2 for an impact summary.

- Route Option 2B (136,362 linear feet of cable): Route Option 2B would continue east onto Anthony Road and onto Roger Williams University property, with HDD conducted in a northeasterly direction toward Mount Hope Bay. There is 0.21 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There is 0.8 acre of anticipated impacts on wetlands due to construction activities. There would be no impacts on eelgrass or mudflats. See Table F-2 for an impact summary.

- Route Option 3 (138,215 linear feet of cable): Route Option 3 would continue east onto Anthony Road to the entrance of Montaup Country Club, with HDD headed northwest to Mount Hope Bay conducted from the Montaup Country Club parking area. Due to HDD construction, there are no anticipated impacts on tidal waters. There is 0.21 acre of impact anticipated to non-tidal waters due to a stream crossing along the route. There is 0.03 acre of anticipated impact on wetlands due to construction activities. There would be no impacts on eelgrass or mudflats. See Table F-2 for an impact summary.

Mayflower Wind does not prefer this route due to the additional length and potential impacts on sensitive environmental resources. This onshore route passes through multiple residential areas, and through High Value/High Vulnerability Habitat and Natural Heritage Areas 237, 216, and 209 according to RIDEM and RIGIS mapping. This route also passes Gardiner Pond, a City of Newport drinking water supply area, and Paradise Brook. Historic properties along the route include Gardiner Pond Shell Midden and Union Church and Southernmost Schoolhouse. Additional sensitive receptors abut this alternative including wetlands, parks, reserves, emergency and rescue services facilities, schools, and government facilities.

Habitat Minimization Alternative C2 via the Lee River (Western Route) with Point of Interest at Brayton Point

Habitat Minimization Route C2 via the Lee River would make intermediate landfall at Sakonnet Point in Little Compton in a 0.9-acre parking lot across from the Sakonnet Harbor. The 15.8-mile (25.4-kilometer) route would then head east and turns north, following Route 77 along the Sakonnet River coast through Little Compton and into Tiverton. Once in Tiverton, the route turns east onto Route 177. The route heads north on Fish Road and then turns northwest on Souza Road. Souza Road turns into Schooner Drive, which is a steep access road to the dense residential Village at Mount Hope Bay and Boat House Waterfront Dining Restaurant. The route then re-enters the water from private property near where Mount Hope Bay and the Sakonnet River meet, north of the State Route 24 Bridge. The export cables would then travel northwest through Mount Hope Bay to Brayton Point via the Lee River and would connect to the POI at Brayton Point in Somerset, Massachusetts.

This route would be 146,661 linear feet, and because the route utilizes mostly HHD installation methodology, there are minimal expected impacts on tidal waters. There is 0.44 acre of non-tidal impacts anticipated due to a stream crossing along the route. There is also 0.05 acre of fill in wetlands anticipated due to construction. There would be no impacts on eelgrass or mudflats. See Table F-2 for an impact summary. Alternative C2 via the Lee River would also pass through several protected resource areas including USACE National Channel Framework, the Nature Conservancy Pocasset Ridge Conservation Area, and the Audubon Emilie Ruecker Wildlife Sanctuary.

Mayflower Wind does not prefer this route due to the extended duration of construction, use conflicts, potential for effects on the local economy, lack of sufficient space on small roads, and potential effects on sensitive environmental, historic, and cultural areas. After landfall the route passes by a public boat ramp that construction activities would temporarily restrict access to at Sakonnet Point. It also abuts the Haffenreffer Wildlife refuge, which is a destination for birding.

Both Route 77 and Route 177 are busy two-lane roads with minimal paved shoulders that pass through a high prevalence of protected natural, historical, and agricultural areas. In Tiverton, Route 77 passes within 500 feet of Nonquit Pond and through the Tiverton Four Corners Historic District.

Before entering Mount Hope Bay, the route also travels along Schooner Drive which serves the dense residential Village at Mount Hope Bay and Boat House Waterfront Dining Restaurant. Schooner Drive is the only access route for the Boat House Waterfront Dining Restaurant and residential Village at Mount

Hope Bay, meaning that construction activities would impact not only the commercial operations at the Boat House but also the residents of the Village at Mount Hope Bay, particularly if there is a road closure. Schooner Drive also includes a bridge over an abandoned railroad right-of-wa, which would require a trenchless installation method.

Habitat Minimization Alternative C2 via the Taunton River (Eastern Route) with Point of Interest at Brayton Point

Habitat Minimization Route C2 via the Taunton River would make intermediate landfall at Sakonnet Point in Little Compton in a 0.9-acre parking lot across from the Sakonnet Harbor. The 15.8-mile (25.4-kilometer) route would then head east and turns north, following Route 77 along the Sakonnet River coast through Little Compton and into Tiverton. Once in Tiverton, the route turns east onto Route 177. The route heads north on Fish Road and then turns northwest on Souza Road. Souza Road turns into Schooner Drive, which is a steep access road to the dense residential Village at Mount Hope Bay and Boat House Waterfront Dining Restaurant. The route then re-enters the water from private property near where Mount Hope Bay and the Sakonnet River meet, north of the State Route 24 Bridge. The cables would then travel northeast through Mount Hope Bay to Brayton Point via the Taunton River and would connect to the POI at Brayton Point in Somerset, Massachusetts.

This route would be 147,283 linear feet, and because the route utilizes mostly HDD installation methodology, there are minimal expected impacts on tidal waters. There is 0.44 acre of non-tidal impacts anticipated due to a stream crossing along the route. There is also 0.05 acre of fill in wetlands anticipated due to construction. There would be no impacts on eelgrass or mudflats. See Table F-2 for impact summary. Alternative C2 via the Taunton River would also pass through several protected resource areas including USACE National Channel Framework, the Nature Conservancy Pocasset Ridge Conservation Area, and the Audubon Emilie Ruecker Wildlife Sanctuary.

Mayflower Wind does not prefer this route due to the extended duration of construction, use conflicts, potential for effects on the local economy, lack of sufficient space on small roads, and potential effects on sensitive environmental, historic, and cultural areas. After landfall the route passes by a public boat ramp that construction activities would temporarily restrict access to at Sakonnet Point. It also abuts the Haffenreffer Wildlife refuge, which is a destination for birding.

Both Route 77 and Route 177 are busy two-lane roads with minimal paved shoulders that pass through a high prevalence of protected natural, historical, and agricultural areas. In Tiverton, Route 77 passes within 500 ft of Nonquit Pond and through the Tiverton Four Corners Historic District.

Before entering Mt. Hope Bay, the route also travels along Schooner Drive which serves the dense residential Village at Mount Hope Bay and Boat House Waterfront Dining Restaurant. Schooner Drive is the only access route for the Boat House Waterfront Dining Restaurant and the residential Village at Mt. Hope Bay. Construction activities would impact not only the commercial operations at the Boat House but also the residents of the Village at Mount Hope Bay, particularly if there is a road closure. Schooner Drive also includes a bridge over an abandoned railroad right-of-way, which would require a trenchless installation method.

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Table F-2. Clean Water Act Section 404(b)(1) alternatives analysis table – Brayton Point

Table A

	No Action	Proposed Action with Route Option 1 over Aquidneck Island and Western Landfall	Proposed Action with Route Option 2 over Aquidneck Island and Western Landfall	Proposed Action with Route Option 2B over Aquidneck Island and Western Landfall	Proposed Action with Route Option 3 over Aquidneck Island and Western Landfall	Proposed Action with Route Option 1 over Aquidneck Island and Eastern Landfall	Proposed Action with Route Option 2 over Aquidneck Island and Eastern Landfall	Proposed Action with Route Option 2B over Aquidneck Island and Eastern Landfall	Proposed Action with Route Option 3 over Aquidneck Island and Eastern Landfall	Habitat Minimization Alternative C1 western with Route Option 1 over Aquidneck Island and Western Landfall	Habitat Minimization Alternative C1 western with Route Option 2 over Aquidneck Island and Western Landfall	Habitat Minimization Alternative C1 western with Route Option 3 over Aquidneck Island and Western Landfall	Habitat Minimization Alternative C1 western with Route Option 1 over Aquidneck Island and Eastern Landfall
Linear Feet of Cable (LF)	0	133,187	131,227	131,389	133,242	133,809	131,849	132,011	133,864	137,733	135,773	135,935	138,355
Dredge Material (acres)	0	0	0	0	0	0	0	0	0	0	0	0	0
Amount of Fill in Tidal Waters (Cable Protection) (acres)*	0	0	0	0	0	0	0	0	0	0	0	0	0
Amount of Fill in Non-tidal Waters (stream crossings) (acres)	0	0	0.07	0.07	0.07	0.04	0.07	0.07	0.07	0.12	0.15	0.15	0.12
Amount of Fill in Wetlands (acres)	0	0	1.12	0.03	0.03	0.00	1.12	0.03	0.03	0.01	1.12	0.09	0.01
Impacts to Other SAS (Eelgrass, Mudflat) (acres)	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Resource Concerns	0	0	0	0	0	0	0	0	0	Middletown Cemetery, Middletown Historical Society Property	Middletown Cemetery, Middletown Historical Society Property	Middletown Cemetery, Middletown Historical Society Property	Middletown Cemetery, Middletown Historical Society Property
										Sachest Point Nat'l Wildlife Refuge	Sachest Point Nat'l Wildlife Refuge	Sachest Point Nat'l Wildlife Refuge	Sachest Point Nat'l Wildlife Refuge

Table B

	Habitat Minimization Alternative C1 western with Route Option 2 over Aquidneck Island and Eastern Landfall	Habitat Minimization Alternative C1 western with Route Option 2B over Aquidneck Island and Eastern Landfall	Habitat Minimization Alternative C1 western with Route Option 3 over Aquidneck Island and Eastern Landfall	Habitat Minimization Alternative C1 eastern with Route Option 1 over Aquidneck Island and Western Landfall	Habitat Minimization Alternative C1 eastern with Route Option 2 over Aquidneck Island and Western Landfall	Habitat Minimization Alternative C1 eastern with Route Option 2B over Aquidneck Island and Western Landfall	Habitat Minimization Alternative C1 eastern with Route Option 3 over Aquidneck Island and Western Landfall	Habitat Minimization Alternative C1 eastern with Route Option 1 over Aquidneck Island and Eastern Landfall	Habitat Minimization Alternative C1 eastern with Route Option 2 over Aquidneck Island and Eastern Landfall	Habitat Minimization Alternative C1 eastern with Route Option 2B over Aquidneck Island and Eastern Landfall	Habitat Minimization Alternative C2 and Western Landfall	Habitat Minimization Alternative C2 and Eastern Landfall
Linear Feet of Cable (LF)	136,395	136,557	138,410	137,538	135,578	135,740	137,593	138,160	136,200	136,362	146,661	147,283
Dredge Material (acres)	0	0	0	0	0	0	0	0	0	0	0	0
Amount of Fill in Tidal Waters (Cable Protection) (acres)	0	0	0	0	0	0	0	0	0	0	0	0
Amount of Fill in Non-tidal Waters (stream crossings) (acres)	0.15	0.15	0.15	0.19	0.21	0.21	0.21	0.19	0.21	0.21	0.44	0.44
Amount of Fill in Wetlands (acres)	1.12	0.09	0.04	0.00	1.12	0.80	0.03	0.00	1.12	0.80	0.05	0.05
Impacts to Other SAS (Eelgrass, Mudflat) (acres)	0	0	0	0	0	0	0	0	0	0	0	0
Other Resource Concerns	Middletown Cemetery, Middletown Historical Society Property	Middletown Cemetery, Middletown Historical Society Property	Middletown Cemetery, Middletown Historical Society Property	Norman Bird Sanctuary	Norman Bird Sanctuary	Norman Bird Sanctuary	Norman Bird Sanctuary	Norman Bird Sanctuary	Norman Bird Sanctuary	Norman Bird Sanctuary	National Channel Framework - USACE	National Channel Framework - USACE
	Sachest Point Nat'l Wildlife Refuge	Sachest Point Nat'l Wildlife Refuge	Sachest Point Nat'l Wildlife Refuge	Sachest Point Nat'l Wildlife Refuge	Sachest Point Nat'l Wildlife Refuge	Sachest Point Nat'l Wildlife Refuge	Sachest Point Nat'l Wildlife Refuge	Sachest Point Nat'l Wildlife Refuge	Sachest Point Nat'l Wildlife Refuge	Sachest Point Nat'l Wildlife Refuge	Nature Conversancy Pocasset Ridge Conservation Area	Nature Conversancy Pocasset Ridge Conservation Area
											Audubon Emilie Ruecker Wildlife Sanctuary	Audubon Emilie Ruecker Wildlife Sanctuary

Notes:
PDE max from the COP was used for the width of the corridor for calculations (40 feet; 12 meters) (6 cables).
HDD installation of the cables will be utilized and were specifically designed to avoid wetlands and sensitive areas to the extent practicable.

F.3 Summary

Based on the analysis performed, Mayflower Wind undertook a thorough route selection process for both offshore and onshore components of the Project. Mayflower Wind identified various routes and installation techniques as potential alternatives to satisfy the regional need for the Project to provide renewable clean energy from offshore wind generation. Mayflower Wind compared possible routes and route variants based upon reasonable criteria to evaluate the environmental impacts, social impacts, costs, and long-term maintainability to deliver energy from the Lease Area to the regional transmission system at Brayton Point and in Falmouth.

Brayton Point is an ideal site for the interconnection of offshore wind such as the Clean Energy Resource for several reasons, including, among others: (i) the robust 345-kilovolt regional transmission infrastructure available there, (ii) the brownfields legacy of the site, which both reduces impacts on the natural environment and provides an opportunity to revitalize it for clean energy uses and for the benefit of the community, including environmental justice populations within 1 mile of the Project location, (iii) its waterfront location, and (iv) its lack of residential abutters.

The preferred site in Falmouth was evaluated and chosen based on land availability and proximity to potential landfall locations. Subsequently, Mayflower Wind ruled out locations with greater environmental impacts. Sites were rejected for being too small to house all of the necessary equipment for the preferred onshore substation configuration or due to unnecessary environmental/social impacts which were apparent, such as required tree clearing, wetland and watershed resource disruption, or close proximity to residential neighborhoods.

The preferred onshore and offshore route variants would enable Mayflower Wind to achieve the best balance between reasonable cost and not causing unacceptable harm to the social and natural environment. Based on the foregoing analysis, Mayflower Wind has determined the proposed routes for Brayton Point and Falmouth would result in the least impacts and would allow for safe, practical, and long-term cable installation, maintenance, and operation as compared to the alternatives considered. Construction of the Project, as proposed, will provide access to a major renewable clean energy resource, and will not cause unacceptable harm to the environment.

Appendix G: Mitigation and Monitoring

This Draft Environmental Impact Statement (EIS) assesses the potential physical, biological, socioeconomic, and cultural impacts that could result from the construction, operations and maintenance (O&M), and conceptual decommissioning of the Mayflower Wind Project (Project) proposed by Mayflower Wind Energy LLC (Mayflower Wind) in its Construction and Operations Plan (COP). The proposed Project described in the COP and this Draft EIS would be up to 2,400 megawatts (MW) in scale and sited 30 miles (26 nautical miles [nm]) south of Martha's Vineyard, Massachusetts, and 23 miles (20 nm) south of Nantucket, Massachusetts within Lease Area OCS-A 0521 (Lease Area). The Project is designed to serve demand for renewable energy for the northeast United States, including Massachusetts.

As part of the Project, Mayflower Wind has committed to implement avoidance, minimization, and mitigation measures (AMMs) to avoid, reduce, mitigate, or monitor impacts on the resources discussed in Chapter 3, *Affected Environment and Environmental Consequences*, of this Draft EIS. These AMMs are described in Table G-1 and assessed as part of the Proposed Action. The Bureau of Ocean Energy Management (BOEM) considers as part of the Proposed Action only those measures that Mayflower Wind has committed to in the COP (Mayflower Wind 2022). Attachment G-1 contains the applicant-proposed mitigation measures proposed by Mayflower Wind as part of its Request for Incidental Take Regulations application.

BOEM may select alternatives and require additional mitigation or monitoring measures to further protect and monitor these resources. These additional mitigation and monitoring measures are described after Table G-1 and listed in Table G-2 and may result from reviews under several environmental statutes (Clean Area Act, Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, Marine Mammal Protection Act, and National Historic Preservation Action) as discussed in Appendix A, *Required Environmental Permits and Consultations*, of this Draft EIS, or other sources. Please note that not all of these mitigation measures are within BOEM's statutory and regulatory authority and some may be required by other governmental entities. Table G-2 and the text preceding it provides descriptions of these measures as well as measures arising from BOEM's own authorities.

If BOEM decides to approve the COP, the Record of Decision (ROD) will state which of the mitigation and monitoring measures identified by BOEM in Table G-2 have been adopted and, if not, why they were not. The ROD will describe the specific terms and conditions of these measures for which compliance is required (40 Code of Federal Regulations [CFR] 1505.3). Mayflower Wind would be required to certify compliance with these terms and conditions under 30 CFR 585.633(b). Furthermore, BOEM will periodically review the activities conducted under the approved COP, with the frequency and extent of the review based on the significance of any changes in available information and on onshore or offshore conditions affecting, or affected by, the activities conducted under the COP.

Monitoring may be required to evaluate the effectiveness of mitigation measures or to identify if resources are responding as predicted to impacts from the Proposed Action. This monitoring would typically be developed in coordination among BOEM and agencies with jurisdiction over the resource to be monitored. The information generated by monitoring may be used to (1) modify how a mitigation measure identified in the COP or ROD is being implemented, (2) revise or develop new mitigation or monitoring measures for which compliance would be required under the COP in accordance with 30 CFR 585.634(b), (3) develop measures for future projects, or (4) contribute to regional efforts for better understanding of the impacts and benefits resulting from offshore wind energy projects in the Atlantic (e.g., a potential cumulative impact assessment tool). Unless specified, the proposed mitigation measures described below would not change the impact ratings on the affected resource, as described in Chapter 3 of the Draft EIS, but would further reduce expected impacts or inform the development of additional mitigation measures if required.

G.1 Applicant-Proposed Measures

Table G-1 presents applicant-proposed measures as identified in Mayflower Wind's COP (Mayflower Wind 2022). In the last column of the table BOEM has identified the anticipated agency that would enforce each measure or whether the measure is a best practice and not an enforceable measure. Attachment G-1 contains the applicant-proposed mitigation measures proposed by Mayflower Wind as part of its Request for Incidental Take Regulations application under the Marine Mammal Protection Act, dated September 2022. The National Marine Fisheries Service (NMFS) published a Notice of Receipt of the application in the Federal Register on October 17, 2022. These mitigation measures are subject to change pending NMFS's development of final regulations.

Table G-1. Applicant-proposed measures

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
Applicant Proposed Measures from COP Volume 2, Table 16-1 (Mayflower Wind 2022)				
Construction	**Seabed or Ground Disturbance** Seabed preparation, offshore component installation, and vessel anchoring/spudding	• Mayflower Wind will use BMPs to minimize sediment mobilization during offshore component installation • Mayflower Wind, when feasible, will use technologies that minimize sediment mobilization and seabed sediment alteration for cable burial operations • Mayflower Wind, where practical and safe, will utilize DP vessels • Mayflower Wind will utilize HDD for sea-to-shore transition	Site Geology	Best practice - not an enforceable measure
O&M	**Seabed or Ground Disturbance** Routine offshore operation and maintenance	• Mayflower Wind will utilize scour protection methods to avoid developing scour holes at the base of structures • Mayflower Wind will bury submarine cables at depths to guard against exposure from seabed mobility	Site Geology	BSEE
Decommissioning	**Seabed or Ground Disturbance** Offshore component decommissioning	• Mayflower Wind will use BMPs to minimize sediment mobilization during decommissioning	Site Geology	Best practice - not an enforceable measure
Construction, O&M, Decommissioning	**Seabed or Ground Disturbance** Scour development	• Mayflower Wind will utilize scour protection methods to avoid developing scour holes at the base of structures • Mayflower Wind will bury submarine cables at depths to guard against exposure from seabed mobility	Physical Oceanography and Meteorology	BSEE
Construction, O&M	**Planned Discharges: Air Emissions** Vehicles, onshore and offshore construction equipment, drones,	• Mayflower Wind will ensure that vessels used for construction will use the jurisdictionally required compliant fuel, e.g., ultra-low sulfur diesel or a fuel with less emissions • Mayflower Wind will ensure fuels used for construction equipment comply with EPA or equivalent emissions standards	Air Quality	Best practice - not an enforceable measure

[1] BOEM and BSEE are in the process of transferring enforcement authorities from BOEM to BSEE.

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
	helicopters and generators	• Mayflower Wind will use low-NOx engines when possible • Mayflower Wind will engage with EPA on how to satisfy Best Available Control Technology		
Construction, O&M, Decommissioning	**Seabed or Ground Disturbance** Offshore component installation, routine offshore O&M, vessel anchoring, and decommissioning	• Mayflower Wind will select and use BMPs including the use of a SWPPP to minimize sediment mobilization during offshore construction of WTGs and OSPs, scour protection placement, and HDD operations • Mayflower Wind, when feasible, will use technologies that minimize sediment mobilization and seabed sediment alteration for cable burial operations	Water Quality	Best practice – not an enforceable measure
Construction, O&M, Decommissioning	**Seabed or Ground Disturbance** Onshore component installation and decommissioning	• Mayflower Wind will follow BMPs, including the use of a SWPPP, during onshore construction activities to control sedimentation and erosion	Water Quality	BSEE, USCG, EPA, MassDEP and RIDEM
Construction, O&M, Decommissioning	**Planned Discharges** Stormwater runoff, routine releases, and duct bank installation	• Mayflower Wind will follow USCG requirements at 33 CFR Part 151 and 46 CFR Part 162 regarding bilge and ballast water • Mayflower Wind will require all Project vessels to comply with regulatory requirements related to the prevention and control of discharges and accidental spills including EPA requirements under the EPA 2013 Vessel General Permit and state and local government requirements	Water Quality	BOEM, BSEE and USCG
Construction, O&M, Decommissioning	**Accidental Events/ Natural Hazards** Unplanned releases	• Mayflower Wind will comply with the regulatory requirements related to the prevention and control of discharges and accidental spills as documented in the proposed Project's OSRP • Mayflower Wind's SWPPP will include a Project-specific SPCC plan to prevent inadvertent releases of oils and other hazardous materials to the environment to the extent practicable	Water Quality	BOEM, BSEE and USCG

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• Mayflower Wind will have an HDD Contingency Plan in place to mitigate, control, and avoid unplanned discharges related to HDD activities		
Construction, O&M, Decommissioning	**Seabed or Ground Disturbance** Habitat loss/ fragmentation **Introduced Sound** Avoidance/ displacement **Presence of Structures** Collision with WTGs, avoidance/displacement and barrier effects, and habitat loss/modification	• Mayflower Wind will site the proposed Project to avoid locating Project components in or near areas of known important or high bird use (e.g., nesting, foraging and overwintering areas, migratory staging or resting areas) • Mayflower Wind will incorporate use of HDD at landfall locations to avoid disturbance to shorelines and coastal habitats to the extent practicable • Mayflower Wind will coordinate with MassWildlife, RIDEM, and USFWS to identify appropriate mitigation measures	Birds	BOEM, USFWS, MassDEP and RIDEM
Construction, Decommissioning	**Changes in Ambient Lighting** Displacement/attraction and collision with WTGs **Vessel Operations** Collision with vessels and avoidance/ displacement	• Mayflower Wind will minimize lighting, to the extent practicable, to reduce potential attraction of birds to vessels during construction activities	Birds	BOEM, BSEE, and USFWS
Construction, O&M, Decommissioning	**Planned Discharges** Disturbance or fatality **Accidental Events** Oiling or fatality from accidental spills, and ingestion of marine debris	• Mayflower Wind will use approved OSRP mitigation measures, as necessary, to prevent birds from going to affected areas including chumming, hazing, and relocating to unaffected areas	Birds	BOEM, BSEE, and USFWS
O&M	**Changes in Ambient Lighting**	• Mayflower Wind will develop and implement a Post-Construction Monitoring Plan	Birds	BOEM, BSEE, and USFWS

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
	Displacement/attraction and collision with WTGs	• Mayflower Wind will ensure that lighting on WTGs will be executed in accordance with FAA regulations • Lighting on OSPs will be minimized to that required for navigation safety to reduce potential attraction of birds to the extent practicable		
Construction, O&M, Decommissioning	**Ground Disturbance** Habitat loss/ fragmentation **Introduced Sound** Behavioral disturbance **Changes in Ambient EMF** Displacement/attract-ion	• Mayflower Wind will site Project components to avoid locating onshore facilities or landfall sites in or near significant fish and wildlife habitats, including known hibernacula, maternal roosting colonies or other concentration areas as practicable. The proposed onshore substation site and converter station will be constructed in primarily open, developed areas • Onshore export cables will be buried underground beneath local roadways from landfall to the onshore substation site • Mayflower Wind will coordinate with MassWildlife, RIDEM, and USFWS to identify appropriate mitigation measures	Bats	BSEE, USFWS, MassDEP and RIDEM
Construction, O&M, Decommissioning	**Changes in Ambient Lighting** Displacement/ attraction	• Mayflower Wind will ensure that lighting will be minimized to reduce potential attraction of bats to vessels and vehicles during construction activities within the Onshore and Offshore Project Areas to the extent practicable	Bats	Best practice – not an enforceable measure
Construction, O&M	**Tree Clearing** Roost disturbance from tree trimming or removal	• Mayflower Wind will consult with BOEM and the USFWS to discuss BMPs available to avoid and minimize potential effects from construction/decommissioning to bats	Bats	BOEM and USFWS
O&M	**Presence of Structures** Collisions with WTGs	• Mayflower Wind will develop and implement a Post-Construction Monitoring Plan	Bats	BOEM, BSEE, USFWS, MassDEP and RIDEM
Construction, O&M	**Ground Disturbance** Habitat loss/ fragmentation **Introduced Sound**	• Mayflower Wind will site Project components to avoid locating onshore facilities and landfall sites in or near significant fish and wildlife habitats to the greatest extent practicable. The proposed onshore substation site and the	Terrestrial Vegetation and Wildlife	BOEM, USFWS, NMFS, MassDEP and RIDEM

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
	Behavioral disturbance and displacement **Changes in EMF** Behavioral disturbance	converter station site will be constructed in primarily open, developed areas. • Mayflower Wind will train construction staff on biodiversity management and environmental compliance requirements • Mayflower Wind will bury the onshore export cables underground beneath local roadways from landfall to the onshore substation site.		
Construction	**Changes in Ambient Lighting** Displacement/ attract-ion	• If tree clearing is required, Mayflower Wind will conduct habitat assessments and presence/absence surveys and will coordinate with MassWildlife, RIDEM, and USFWS as appropriate • Mayflower Wind will, to the extent practicable, conduct construction activities outside of periods when highly sensitive species are likely to be present • Mayflower Wind will implement erosion and sediment control measures in areas adjacent to water resources, such as wetlands, ponds, and other waterbodies, or in areas with significant grades that would make them prone to erosion • Mayflower Wind will implement a Vegetation Management Plan as approved by NHESP, RIDEM, and the Massachusetts Department of Agricultural Resources • Mayflower Wind will ensure lighting will be minimized to the extent practicable to reduce potential displacement or attraction of wildlife species to Project sites during construction activities within the Project Area	Terrestrial Vegetation and Wildlife	USFWS, MassDEP and RIDEM
Construction, O&M, Decommissioning	**Operation of Equipment and Heavy Machinery** Collision with equipment and heavy machinery Collision with utility lines or electrocution	• Vehicle speed limits will be enforced at all Project sites to minimize potential for vehicle collisions with wildlife • Mayflower Wind will conduct presence/absence surveys; surveys for protected plant and wildlife species will be completed as needed to inform the detailed engineering and design of the Project facilities	Terrestrial Vegetation and Wildlife	Best practice – not an enforceable measure

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
Construction, Decommissioning	**Planned Discharges** Disruption of water flow or alteration of turbidity	• Mayflower Wind will ensure that standard construction BMPs (including erosion and sediment control measures) will be implemented to avoid dewatering discharge scour and siltation to nearby receiving waters, including wetlands	Terrestrial Vegetation and Wildlife	Best practice – not an enforceable measure
Construction, Decommissioning	**Accidental Events** Release of hazardous materials into environment	• Mayflower Wind will implement a construction-phase OSRP to provide procedures for containing, cleaning, and reporting any accidental spills of oil fuel, or other hazardous materials	Terrestrial Vegetation and Wildlife	BOEM, BSEE and USCG
O&M	**Ground Disturbance** Habitat loss/ fragmentation **Introduced Sound** Behavioral disturbance and displacement **Changes in Ambient Lighting** Displacement/attract-ion	• Mayflower Wind will implement a Vegetation Management Plan as approved by NHESP, RIDEM, and the Massachusetts Department of Agricultural Resources	Terrestrial Vegetation and Wildlife	Best practice - not an enforceable measure
O&M	**Accidental Events** Release of hazardous materials into environment	• Mayflower Wind will implement an operations-phase OSRP to provide procedures for containing, cleaning, and reporting any accidental spills of oil fuel, or other hazardous materials	Terrestrial Vegetation and Wildlife	BOEM,BSEE and USCG
Decommissioning	**Ground Disturbance** Habitat loss/ fragmentation **Introduced Sound** Behavioral disturbance and displacement **Changes in Ambient Lighting** Displacement/attract-ion	• Mayflower Wind will implement a Vegetation Management Plan approved by NHESP, RIDEM, and the Massachusetts Department of Agricultural Resources • Mayflower Wind will implement erosion and sediment control measures in accordance with applicable regulations	Terrestrial Vegetation and Wildlife	Best practice - not an enforceable measure

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
Construction, Decommissioning	**Ground Disturbance** Temporary habitat disturbance	• Mayflower Wind will implement erosion and sediment control measures in accordance with Massachusetts and Rhode Island regulations and industry BMPs throughout the Onshore Project Area to abate technical and biological erosion	Wetlands and Waterbodies	Best practice - not an enforceable measure
Construction, Decommissioning	**Planned Discharges** Dewatering and stormwater runoff	• If groundwater is encountered, Mayflower Wind will perform dewatering measures using standard construction BMPs for dewatering, including, but not limited to, use of temporary settling basins, dewatering filter bags, or temporary holding or frac tanks • Mayflower Wind will direct dewatering wastewaters to well-vegetated uplands away from wetlands or other water resources to allow for infiltration to the soil of the discharged water • Mayflower Wind will place construction mats to minimize soil disturbance in any wetland areas that cannot be avoided or are required to be temporarily crossed	Wetlands and Waterbodies	Best practice - not an enforceable measure
Construction	**Accidental Events** Release of hazardous materials into environment	• Mayflower Wind will always require the construction contractor to have spill control and containment kits on site to allow for immediate response and cleanup in the event of an accidental release of fuel, oils, or other hazardous materials • Implementation of BMPs, the SMS, and a SWPPP for construction as well as an emergency response procedure to avoid, control, and address any accidental releases during construction activities • Mayflower Wind and their construction contractor will store petroleum products in upland areas more than 100 feet (30.5 meters) from wetlands and waterbodies • Equipment will not be parked overnight within 100 feet (30.5 meters) of a wetland or waterbody, with an exception being for equipment that cannot be practically moved. Temporary containment will be required for equipment that cannot be	Wetlands and Waterbodies	BOEM, BSEE and USCG

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		practically moved and must be parked overnight within 100 feet (30.5 meters) of a wetland or other water resources • Mayflower Wind will use a secondary containment system for refueling that needs to occur within 100 feet (30.5 meters) of wetlands to contain any minor amounts of fuel inadvertently dripped or released during refueling • Mayflower Wind will set up cement cleanout tubs in areas at least 100 feet (30.5 meters) from wetlands or other water resources to contain and hold any residual cement and washout from cement trucks prior to their departure from the site		
O&M	**Planned Discharges** Dewatering and stormwater runoff	• Discharges as a result of dewatering will be managed in accordance with the requirements for applicable EPA, MassDEP, RIDEM, and/or local regulations pertaining to dewatering	Wetlands and Waterbodies	BOEM, EPA, MassDEP AND RIDEM
O&M	**Accidental Events** Release of hazardous materials into environment	• Mayflower Wind and their construction contractor will store petroleum products in upland areas more than 100 feet (30.5 meters) from wetlands and waterbodies	Wetlands and Waterbodies	BOEM, BSEE and USCG
Decommissioning	**Accidental Events** Release of hazardous materials into environment	• Mayflower Wind will always require the decommissioning contractor to have spill control and containment kits on site to allow for immediate response and cleanup in the event of an accidental release of fuel, oils, or other hazardous materials • Mayflower will implement BMPs, an SMS, and an SWPPP as well as an emergency response procedure to avoid, control and address any accidental releases during decommissioning activities as applicable • Equipment will not be parked overnight within 100 feet (30.5 meters) of a wetland or waterbody, with an exception being for equipment that cannot be practically moved • Temporary containment will be required for equipment that cannot be practically moved and must be parked overnight	Wetlands and Waterbodies	BOEM, BSEE and USCG

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		within 100 feet (30.5 meters) of a wetland or other water resources • The use of a secondary containment system for refueling that needs to occur within 100 feet (30.5 meters) of wetlands to contain any minor amounts of fuel inadvertently dripped or released during refueling		
Construction, O&M	**Seabed or Ground Disturbance** **Planned Discharges/ Accidental Events** Project installation and vessel O&M	• Mayflower Wind will select sites for construction that avoid areas of sensitive seafloor and benthic habitat to the extent practicable • Mayflower Wind will utilize HDD for nearshore export cable installation • Mayflower Wind will minimize trench and sidecasting widths for export cable installation and anchor outside of eelgrass beds where possible • To the extent possible, Mayflower Wind will avoid use of anchored vessels near known eelgrass beds	Coastal Habitats	BOEM and NMFS
Construction	**Change in Ambient Lighting**	• Any effects of changes to ambient lighting will be limited to proposed landfall locations where eelgrass beds or clusters of macroalgae were identified along the northern portions of the proposed export cable corridors	Coastal Habitats	BOEM and NMFS
Construction	**Actions that May Displace Biological Resources (Eelgrass and Macroalgae)** **Actions that May Cause Direct Injury or Death**	• Offshore export cable installation and the location of the HDD exit pit are planned for outside the mapped eelgrass extents at the cable landing locations	Coastal Habitats	BOEM and NMFS
O&M	**Change in Ambient EMF**	• EMF modeling conducted for the proposed Project indicates that HDD installation in nearshore areas will reduce, but not entirely eliminate magnetic fields in the area where eelgrass beds or clusters of macroalgae were identified.	Coastal Habitats	Best practice - not an enforceable measure

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
Decommissioning	**Seabed or Ground Disturbance**	• The proposed Project’s offshore export cables may be left in place to minimize environmental effects, thus resulting in minimal or no sea bottom disturbance	Coastal Habitats	Best practice - not an enforceable measure
Decommissioning	**Change in Ambient Lighting**	• The proposed Project’s offshore export cables may be left in place to minimize environmental effects, thus resulting in minimal or no sea bottom disturbance	Coastal Habitats	Best practice - not an enforceable measure
Decommissioning	**Displacement of Eelgrass and Macroalgae Actions that May Cause Direct Injury or Death of Biological Resources**	• The offshore export cables may be left in place to minimize environmental effects, thus resulting in no displacement	Coastal Habitats	Best practice - not an enforceable measure
Construction, Decommissioning	**Introduced Sound into the Environment (In-air or Underwater)** Behavioral disturbance	• Mayflower Wind will incorporate lower-impact construction methods, where possible	Benthic and Shellfish Resources	Best practice - not an enforceable measure
Construction, O&M, Decommissioning	**Seabed or Ground Disturbance/ Planned Discharges/ Accidental Events** Harassment/mortality	• Mayflower Wind will design the scour protection system to reduce and minimize scour and sedimentation to the extent practicable	Benthic and Shellfish Resources	Best practice - not an enforceable measure
Construction, Decommissioning	**Actions that May Displace Biological or Cultural Resources, or Human Uses** Habitat Loss	• Mayflower Wind will use HDD at landings to avoid disturbance to nearshore productive shellfish beds to the extent practicable • Mayflower Wind will select lower impact construction methods, where possible • Mayflower Wind will select corridor and micro-route cables within selected corridor to avoid complex habitats, where possible • Mayflower Wind’s Project cable burial layout was designed to minimize length of cable needed	Benthic and Shellfish Resources	BOEM and NMFS

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• Mayflower Wind will bury cables, where possible, to allow for benthic recolonization after construction is complete		
O&M	**Actions that May Displace Biological or Cultural Resources, or Human Uses** Habitat Loss	• Presence of Project foundation areas, scour protection, and cable burial would allow for benthic recolonization	Benthic and Shellfish Resources	Best practice – not an enforceable measure
O&M	**Change in Ambient EMF** Displacement/harass-ment	• Mayflower Wind will employ industry standard cable burial and cable shielding methods to reduce potential effects • Mayflower Wind's Project cable burial layout was designed to minimize length of cable needed to reduce potential effects	Benthic and Shellfish Resources	BSEE
Construction, Decommissioning	**Introduced Sound into the Environment (in-air or underwater)** Behavioral disturbance	• Mayflower Wind will incorporate soft start methods, to the extent practicable, during initial pile driving activities to allow mobile finfish and invertebrates to migrate away from the area • Mayflower Wind will employ sound-attenuation measures (e.g., bubble curtains, insulated piles) • Mayflower Wind will limit duration of pile driving activities to reduce sound propagation/sound exposure	Finfish and Invertebrates	BOEM, BSEE, and NMFS
Construction, O&M, Decommissioning	**Seabed or Ground Disturbance** Harassment/mortality	• Mayflower Wind will design the scour protection system to reduce and minimize scour and sedimentation	Finfish and Invertebrates	Best practice – not an enforceable measure
Construction, O&M, Decommissioning	**Habitat Disturbance and Modification** Habitat Loss and artificial reef effect from	• Mayflower Wind will design the sea-to-shore transition to reduce the dredging footprint and effects to benthic organisms (e.g., cofferdam and/or gravity cell) • Mayflower Wind will incorporate use of HDD at landing(s) and avoid disturbance to finfish and invertebrate EFH to the extent practicable	Finfish and Invertebrates	Best practice - not an enforceable measure

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• Mayflower Wind will incorporate use of HDD of subsea cables, as appropriate, to minimize spatial and temporal effects to benthic organisms		
Construction, Decommissioning	**Change in Ambient Lighting/Planned Discharges/Accidental Events** Displacement, harassment, and mortality	• Mayflower Wind will incorporate use of HDD at landings and avoid disturbance to finfish and invertebrate EFH to the extent practicable	Finfish and Invertebrates	Best practice - not an enforceable measure
O&M	**Change in Ambient Lighting/Planned Discharges/Accidental Events** Displacement, harassment and mortality	• Mayflower Wind will install offshore export cables and inter-array cables to target burial depths and use cable shielding materials to minimize effects of EMFs	Finfish and Invertebrates	BSEE
Construction, O&M, Decommissioning	**Introduced Sound into the Environment (in-air or underwater)** Behavioral disturbance	• When technically feasible, Mayflower Wind will employ a “ramp-up” of the HRG survey equipment at the start or re-start of HRG survey activities to minimize sound source effects. • Mayflower Wind will ensure that active acoustic sound sources will not be activated until the PSO has reported the clearance zone clear of all marine mammals after the appropriate amount of pre-clearance watch time has passed based on the proposed Project’s Incidental Take Authorization • Mayflower Wind will employ sound-attenuation measures (e.g., bubble curtains, insulated piles, etc.) • Mayflower Wind will limit duration of pile driving activities to reduce sound propagation/sound exposure • Mayflower Wind will incorporate soft start methods during initial pile driving activities to allow marine mammals to migrate away from the area of effect	Marine Mammals	BOEM, BSEE, and NMFS

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• Mayflower Wind will employ shut-down procedure when protected species are detected in their respective clearance zones in the Project Area • Mayflower Wind will ensure that Project activities adhere to NMFS-authorized Incidental Take Authorization for the proposed Project • Mayflower will implement measures as identified in Appendix O, Marine Mammal and Sea Turtle Monitoring and Mitigation Plan • To reduce impacts on NARW and other marine mammals, Mayflower Wind does not intend to conduct pile-driving activities from January 1 through April 30		
Construction, O&M, Decommissioning	**Vessel Operations** Serious injury or mortality	• Mayflower Wind will ensure all vessels maintain a separation distance of 328 feet (100 meters) or greater from any sighted ESA-listed whales or humpback whales (except NARW). Ensure that the following avoidance measures are taken if a vessel comes within 328 feet (100 meters) of whale: • If underway, the vessel must reduce speed and shift the engine to neutral and must not engage the engines until the whale has moved beyond 328 feet (100 meters). • If stationary, the vessel must not engage engines until the whale has moved beyond 328 feet (100 meters). • Mayflower Wind will ensure all vessels maintain a separation distance of 1,640 feet (500 meters) or greater from any sighted NARW or unidentified large marine mammal • If a vessel is stationary, the vessel must not engage engines until the NARW has moved beyond 328 feet (100 meters) • Mayflower Wind will ensure that all vessels underway do not divert to approach any marine mammals • Mayflower Wind will ensure that all vessels maintain a separation distance of 164 feet (50 meters) or greater from any sighted small cetacean or seal, except when a small cetacean or seal approaches the vessel	Marine Mammals	BOEM, BSEE, and NMFS

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• If a small cetacean or seal approaches any vessel underway, the Project vessel underway must avoid excessive speed or abrupt changes in direction to avoid injury to the animal • Mayflower Wind will require all vessels operating within and transiting to/from the Project Area comply with the vessel strike avoidance measures specified in lease stipulations, including: • Ensure that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid striking these protected species • Ensure that vessels 65 feet (19.8 meters) in length or greater that operate between November 1 through July 31, operate at speeds of 10 knots (11.5 mph) or less • Ensure that vessel operators monitor NMFS NARW reporting systems from November 1 through July 31 and whenever a Dynamic Management Area is established within any area vessels operate • Ensure that all vessel operators comply with 10-knot (18.5 kilometers per hour [km/hr]) speed restrictions in any Dynamic Management Area • Mayflower Wind will ensure that all vessel operators reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or large assemblages of marine mammals are observed near an underway vessel • Mayflower will implement measures as identified in Appendix O, Marine Mammal and Sea Turtle Monitoring and Mitigation Plan		
Construction, O&M, Decommissioning	**Seabed or Ground Disturbance** Displacement/ harassment **Habitat Disturbance and Modification**	• Habitat disturbance during the construction phase is expected to be temporary and reversible • Mayflower will implement measures as identified in Appendix O, Marine Mammal and Sea Turtle Monitoring and Mitigation Plan	Marine Mammals	BOEM, BSEE, and NMFS

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
	Habitat loss and artificial reef effect			
Construction, O&M, Decommissioning	**Entanglement** Harassment/mortality **Accidental Events** Ingestion/entanglement	• Mayflower Wind will adhere to all regulations under the EPA Clean Water Act • Mayflower will ensure that any structures or devices attached to the seafloor for continuous periods greater than 24 hours use the best available mooring systems (vertical and float lines, swivels, shackles, and anchor designs) for minimizing the risk of entanglement or entrainment of marine mammals while still ensuring the safety and integrity of the structure or device • Mayflower Wind will ensure that all mooring lines and ancillary attachment lines 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 or wrapping around animals, or entrapping protected species • If an entangled live or dead marine protected species is reported, Mayflower Wind personnel must provide any assistance to authorized stranding response personnel as requested by BOEM or NMFS • Mayflower will implement measures as identified in Appendix O, Marine Mammal and Sea Turtle Monitoring and Mitigation Plan	Marine Mammals	BOEM, BSEE, EPA and NMFS
Construction, O&M, Decommissioning	**Planned Discharges/ Accidental Events** Harassment/mortality	• Mayflower Wind will use approved OSRP mitigation measures to prevent animals from going to affected area including translocation to unaffected areas as necessary • Mayflower will implement measures as identified in Appendix O, Marine Mammal and Sea Turtle Monitoring and Mitigation Plan • To minimize potential impacts on zooplankton from impingement and entrainment, the northernmost HVDC	Marine Mammals	BOEM, BSEE, and NMFS

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		converter OSP will be located outside of a 10kilometer buffer of the 30-meter isobath from Nantucket Shoals.		
Construction, O&M, Decommissioning	**Introduced Sound into the Environment (in-air or underwater)** Behavioral disturbance	• Mayflower Wind will incorporate soft start methods during initial pile driving activities to allow sea turtles to migrate away from the area of effect • Mayflower Wind will ensure that active acoustic sound sources will not be activated until the PSO has reported the clearance zone clear of all sea turtles after the appropriate amount of pre-clearance watch time has passed based on the proposed Project's Incidental Take Authorization • Mayflower Wind will employ sound-attenuation measures (e.g., bubble curtains, insulated piles, etc.) • Mayflower Wind will limit duration of pile driving activities to reduce sound propagation/sound exposure • Mayflower Wind will employ shut-down procedure when protected species are detected in their respective clearance zones in the Project Area • Mayflower Wind will ensure that Project activities adhere to NMFS-authorized Incidental Take Authorization for the proposed Project • Mayflower will implement measures as identified in Appendix O, Marine Mammal and Sea Turtle Monitoring and Mitigation Plan	Sea Turtles	BOEM, BSEE, and NMFS
Construction, O&M, Decommissioning	**Vessel Operations** Serious injury or mortality	• Mayflower Wind will ensure that all vessels underway do not intentionally approach any sighted sea turtle • Mayflower Wind will ensure that all vessels maintain a separation distance of 164 feet (50 meters) or greater from any sighted sea turtles • Mayflower Wind will require all vessels operating within and transiting to/from the Lease Area comply with the vessel strike avoidance measures specified in lease stipulations or NMFS authorization, including:	Sea Turtles	BOEM, BSEE, and NMFS

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• Ensure that vessel operators and crews maintain a vigilant watch for sea turtles and slow down or stop their vessel to avoid striking these protected species • Employ reporting system to NMFS in the event of a vessel strike • Mayflower will implement measures as identified in Appendix O, Marine Mammal and Sea Turtle Monitoring and Mitigation Plan		
Construction, O&M, Decommissioning	**Habitat Disturbance and Modification** Reduced prey availability/habitat loss	• Mayflower Wind will design scour protection system to reduce and minimize scour and sedimentation • Mayflower will implement measures as identified in Appendix O, Marine Mammal and Sea Turtle Monitoring and Mitigation Plan	Sea Turtles	BOEM, BSEE, and NMFS
Construction, O&M, Decommissioning	**Entanglement** Harassment/mortality or ingestion/entanglement from marine debris	• Mayflower Wind will adhere to all regulations under the EPA Clean Water Act. Mayflower Wind will ensure that any structures or devices attached to the seafloor for continuous periods greater than 24 hours use the best available mooring systems (vertical and float lines, swivels, shackles, and anchor designs) for minimizing the risk of entanglement or entrainment of sea turtles, while still ensuring the safety and integrity of the structure or device • Mayflower Wind will ensure that all mooring lines and ancillary attachment lines will 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 or wrapping around animals or entrapping protected species • If an entangled live or dead marine protected species is reported, Mayflower Wind personnel must provide any assistance to authorized stranding response personnel as requested by BOEM or NMFS	Sea Turtles	BOEM, BSEE, EPA and NMFS

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• Mayflower will implement measures as identified in Appendix O, Marine Mammal and Sea Turtle Monitoring and Mitigation Plan		
Construction, O&M, Decommissioning	**Planned Discharges/ Accidental Events** Harassment/mortality	• Mayflower Wind will use approved OSRP mitigation measures to prevent animals from going to affected area including translocation to unaffected areas • Mayflower will implement measures as identified in Appendix O, Marine Mammal and Sea Turtle Monitoring and Mitigation Plan	Sea Turtles	BOEM, BSEE, and NMFS
O&M	**Changes in Ambient EMF** Displacement/ harassment	• Employ industry standard cable burial and cable shielding methods to reduce potential effects	Sea Turtles	Best practice - not an enforceable measure
Construction, O&M, Decommissioning	**Seabed or Ground Disturbance/Sediment Suspension and Deposition** Unanticipated discovery of underwater cultural heritage	• Mayflower Wind will maintain avoidance buffers around identified [marine archaeological resources], as appropriate • Mayflower Wind will mark identified [ASLFs] for avoidance, as appropriate • Mayflower Wind will continue to develop, in consultation with the [tribal nations] and applicable federal and state agencies, an Unanticipated Discovery Plan in the unlikely event unidentified and an unanticipated underwater cultural heritage [marine cultural resources and human remains] is encountered • Under the [UDP] (COP Volume II, Appendix Q.1; Mayflower Wind 2022), in the event that a potential cultural resource is discovered during construction activities, all bottom-disturbing activities in the area of discovery will cease and every effort will be made to avoid or minimize damage to the potential [marine] cultural resource(s) • Mayflower Wind will continue consultation with the relevant authorities and stakeholders to determine if addition mitigation measures are required	Cultural – Marine Archaeological Resources	BOEM, BSEE, and USACE

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• Training to identify archaeological resources will be provided by the QMA for resident engineers and contractor field supervisors prior to the implementation of Project and contractor personnel		
Construction	**Ground Disturbance** Unanticipated discovery of terrestrial archaeological resources from ground disturbance	• Mayflower Wind will site the onshore Project components in locations that minimize impacts on, or avoid, potential terrestrial archaeological resources, to the extent practicable • Mayflower Wind will work with the affected [tribal nations], BOEM, MHC, RIHPHC, and BUAR to thoroughly identify potential effects [on] terrestrial archaeological resources, as well as appropriate avoidance, minimization and mitigation measures • Mayflower Wind will monitor archaeological subsurface testing during construction in areas determined to have a moderate to high potential for undiscovered archaeological resources • Mayflower Wind will implement an Unanticipated Discovery Plan that will include stop-work and notification procedures to be followed if a cultural resource is encountered during installation • Mayflower Wind will conduct additional site-specific site evaluation and site mitigation if determined to be warranted due to the identification of archaeological resources that exhibit a potential for listing in the NRHP • Mayflower Wind will perform fieldwork in accordance with current standards and consultation with the MHC and RIHPHC • Mayflower Wind will work with a cultural resource consultant (CRC) to determine the need for a site visit by the CRC within 24 hours upon discovery of a potential cultural resource • Mayflower Wind will determine the duration of any work stoppages to be contingent upon the significance of the identified cultural resource(s) and consultation among	Cultural – Terrestrial Archaeological Resources	BOEM, BSEE, and USACE

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		Mayflower Wind, BOEM, the applicable SHPO, THPOs, and other parties, as appropriate and necessary • Mayflower Wind will conduct necessary archaeological investigations under archaeological permits issued by the MHC and/or RIHPHC • Mayflower Wind will handle any discoveries of human remains in accordance with the appropriate state requirements and if they appear to be Native American will be guided by the policy statement adopted by the [ACHP] • Mayflower Wind will ensure due care will be taken in the excavation, transport, and storage of any discovered remains to ensure their security and respectful treatment		
Construction, O&M, Decommissioning	**Accidental Events** Damage to unanticipated archaeological resources from accidental events	• Mayflower Wind will implement BMPs throughout the proposed Project phases to minimize potential effects, including accidental releases • Mayflower Wind will develop and implement a SMS and OSRP to avoid, control and address any accidental releases during all proposed Project activities • A SPCC plan will be developed for the Project, as appropriate	Cultural – Terrestrial Archaeological Resources	BOEM, BSEE, and USACE
Construction, O&M, Decommissioning	**Altered Visual Conditions/Changes to Ambient Lighting** Change in resource setting	• Mayflower Wind will determine avoidance, minimization, and mitigation measures for [cultural resources] within the Project Area in consultation with the Tribes, BOEM, MHC, RIHPHC, and the BUAR through the Section 106 process • Mayflower Wind will locate onshore infrastructure in previously disturbed sites to the extent feasible to reduce the risk of affected undiscovered archaeological resources • Mayflower Wind will consult with the [tribal nations], BOEM, MHC, [RIHPCP], and THPOs on additional ways to resolve the remaining adverse effects, including if necessary, the preparation of a Memorandum of Agreement stipulating treatment measures to provide a public benefit that balances the loss to the historic properties	Cultural – Visual Effects to Historic Properties	BOEM, BSEE, USACE, MassDEP and RIDEM

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• Mayflower Wind proposes to design the onshore substation to mitigate visual effects to the extent feasible, improving site aesthetics by adhering to landscape codes and edge treatments, and improving substation building architecture to fit local context • Mayflower Wind will work with the Towns of Falmouth, Somerset, and Portsmouth to ensure the lighting scheme complies with Town requirements • Mayflower Wind will ensure the design of outdoor light fixtures at the onshore substation complies with night sky lighting standards to the extent practicable • Mayflower Wind will keep lighting at the onshore substation to a minimum; only a few lights will be illuminated for security reasons on dusk-to-dawn sensors and other lights will utilize motion-sensing switches. The majority of lights will be switched on for emergency situations only • Mayflower Wind will implement ADLS to reduce nighttime visual impacts • Mayflower Wind will continue to develop Historic Property Treatment Plans to resolve any adverse visual effects to historic properties • Mayflower Wind will develop and implement a landscape vegetation and screening plan as part of the Historic Property Treatment Plan for the Oak Grove Cemetery in Falmouth, Massachusetts		
Construction, O&M, Decommissioning	**Altered Visual Conditions/Changes to Ambient Lighting** Change in seascape/ landscape	• Mayflower Wind proposes to design the substation and converter station to mitigate visual effects to the extent feasible, including height, location, and color • Mayflower Wind proposes to design the onshore substation and converter station to mitigate visual effects to the extent feasible, including improving site aesthetics by adhering to landscape codes and edge treatments, and improving building architecture to fit local context.	Visual Resources	BOEM and BSEE

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• Mayflower Wind will work with the Towns of Falmouth, Somerset, and Portsmouth to ensure the lighting scheme complies with town requirements • Mayflower Wind will design outdoor light fixtures at the onshore substation and converter station to comply with night sky lighting standards, to the extent practicable • Mayflower Wind will ensure lighting at the onshore substation and converter station will be keep to a minimum. Only a few lights will be illuminated for security reasons on dusk-to-dawn sensors and other lights will utilize motion-sensing switches. The majority of lights will be switched on for emergency situations only • Mayflower Wind will implement an ADLS		
Construction	**Activities that Introduce Sound into the Environment: In-Air Noise** HDD activities; Presence of onshore substation and converter stations	• Mayflower Wind will minimize the amount of work conducted outside of typical construction hours • Mayflower Wind will maintain construction equipment and use newer models to the extent practicable to provide the quietest performance • Mayflower Wind will, when possible, use enclosures on continuously operating equipment such as compressors and generators • Mayflower Wind will turn off construction equipment when not in use and minimize idling times; and • Mayflower Wind will mitigate the impact of noisy equipment on sensitive locations by using temporary barriers or buffering distances as practicable • Mayflower Wind will install a temporary noise barrier, if necessary, at edges of the site, where practicable and safe • Mayflower will use equipment silencers, where required, for drilling rig exhaust, mud cleaner generator exhaust, and mud pump exhaust	In-Air Acoustics	Best practice - not an enforceable measure

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
O&M	**Activities that Introduce Sound into the Environment: In-Air Noise** Onshore substation and converter stations	• Mayflower Wind will install noise barriers at edges of the site, where necessary, to meet regulatory requirements	In-Air Acoustics	Best practice - not an enforceable measure
Construction, Decommissioning	**Introduced Sound into the Environment** Displacement; Harassment; Potential injury; Avoidance	• Mayflower Wind will utilize noise abatement systems to decrease the sound levels produced by Project activities in the water • Mayflower Wind will employ soft-start measures allowing for a gradual increase in sound levels before the full pile driving hammer energy is reached	Underwater Acoustics	Best practice - not an enforceable measure
Construction, O&M, Decommissioning	**Workforce Hiring/ Procurement of Materials, Equipment and Services Including Port Use and Vessel Charters/Presence of Infrastructure/Influx of Non-Local Employees that Could Affect Housing** Increase in employment and economic opportunities	• Mayflower Wind will maintain a stakeholder engagement plan with outreach and communications mechanisms to share information and gather input from external stakeholders, including potential supply chain partners, educational institutions, and workforce training providers • Mayflower Wind will execute financial commitments pursuant to the Project's Section 83C proposal, in collaboration with the Massachusetts Clean Energy Center, including: $35 million ports and infrastructure, $10 million local innovation and entrepreneurship, $5 million applied research, $5 million workforce development, $10 million marine science, $7.5 million operations and maintenance port upgrades, and $5 million low income strategic electrification • Mayflower Wind will encourage the hiring of skilled and unskilled labor from the Project region	Demographics and Employment, and Economics	Best practice - not an enforceable measure
Construction, Decommissioning	**Workforce Hiring/ Procurement of Materials, Equipment and Services Including Port Use and Vessel**	• Mayflower Wind will maintain a stakeholder engagement plan with outreach and communications mechanisms to share information and gather input from external stakeholders, including EJ communities	Environmental Justice Minority and Lower Income Groups	Best practice - not an enforceable measure

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
	Charters/Presence of Infrastructure/ Influx of Non-Local Employees that Could Affect Housing/Vehicle Traffic/ Planned Discharges: Air Emissions Increase in employment opportunities; Contribution to the economy	• Mayflower Wind will execute financial commitments pursuant to the Project's Section 83C proposal, under the terms of an agreement with Massachusetts Clean Energy Center, for initiatives that benefit EJ communities, including: $5 million workforce development; and $5 million low income strategic electrification • Mayflower Wind will encourage the hiring of the skilled and unskilled labor from the Project region	and Subsistence Resources	
Construction, Decommissioning	**Presence of Infrastructure/Influx of Non-Local Employees that Could Affect Housing/Vehicle Traffic/ Planned Discharges: Air Emissions** Installation, construction, and decommissioning activities	• Mayflower Wind will develop and implement a Traffic Management Plan to minimize disruptions to the community in the vicinity of construction and installation activities, especially along the underground transmission route. The Traffic Management Plan will be developed in consultation with the municipalities and will be submitted for review and approval by municipal authorities • Mayflower Wind will develop and implement an onshore construction schedule to minimize effects to recreational uses and tourism-related activities to the extent practicable • Mayflower Wind will mandate one or more independent construction and environmental monitors to ensure compliance with the Traffic Management Plan and other environmental plans. Mayflower Wind will coordinate with the municipalities to determine the need for such monitoring	Environmental Justice Minority and Lower Income Groups and Subsistence Resources	BOEM, USACE, MassDEP and RIDEM
O&M	**Workforce Hiring/ Procurement of Materials, Equipment and Services Including Port Use and Vessel Charters**	• Mayflower Wind will execute commitment to make at least 75 percent of O&M local	Environmental Justice Minority and Lower Income Groups and Subsistence Resources	Best practice - not an enforceable measure

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
	Increase in employment opportunities			
Construction, O&M, Decommissioning	**Construction Areas and Traffic/Saturation of Tourism-related Services/ Influx of Non-Local Employees that Could Affect Housing/ Vehicle Traffic/Planned Discharges: Air Emissions** Accessibility disruption and reduced enjoyment of land-based resources due to vehicle traffic	• Mayflower Wind will develop and implement a Traffic Management Plan to minimize disruptions to residences and commercial establishments in the vicinity of onshore construction activities; pedestrian and bicycle safety and movement would also be addressed to minimize effects of construction • Mayflower Wind will develop an onshore construction schedule to minimize effects to recreational uses and tourism related activities to the extent feasible, such as scheduling nearshore construction activities to avoid the height of the summer tourist season and coordinating with stakeholders/ visitors' bureaus to schedule outside of major events taking place onshore	Recreation and Tourism	Best practice - not an enforceable measure
Construction, O&M, Decommissioning	Accessibility disruption due to saturation of tourism-related services	• Mayflower Wind will provide a 1 nm (1.9 km) space between offshore structures (WTGs and OSPs) providing room for anticipated vessels to transit through and safely maneuver within the proposed Offshore Project Area • Mayflower Wind will implement a comprehensive communication plan and a Fisheries Communication Plan to keep relevant marine stakeholders informed of the Project activities especially during the construction and decommissioning phases. This will include the distribution of notices to inform mariners of Project-related activities within the offshore export cable corridors and Lease Area • Mayflower Wind will utilize PATONs in accordance with IALA Guidance for the marking of man-made offshore structures (IALA, 2013), and USCG approval	Recreation and Tourism	Best practice - not an enforceable measure

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
Construction, O&M, Decommissioning	Reduced enjoyment of land-based resources due to noise and air emissions	• Mayflower Wind will implement BMPs throughout the Project phases to minimize potential effects • Mayflower Wind will develop an onshore construction schedule to minimize effects to recreational uses and tourism-related activities to the extent feasible	Recreation and Tourism	Best practice - not an enforceable measure
Construction, Decommissioning	**Vessel Activity/Presence of Infrastructure** Vessel traffic and construction	• Mayflower Wind will adhere to a 1 nm x 1 nm (1.9 km x 1.9 km) grid layout agreed upon with USCG will be the mitigation measure regarding this impact • Mayflower Wind will direct communications of vessel schedules and locations during construction activities to Fisheries Liaison Officer, Fisheries Representative, local ports, and other networks • Mayflower Wind will continue to participate in the MA/RI WEA joint developer Marine Affairs Working Group • Mayflower Wind will implement construction safety zones in consultation with USCG and communicate to local mariners regarding upcoming and ongoing construction activities • Mayflower Wind will work with fishermen to determine appropriate courses of action for areas that will be temporarily closed during specific construction activities • Where possible, the Mayflower Wind will avoid sensitive areas and common fishing grounds nearshore and offshore • Mayflower Wind will work with Port Agencies and Port agents to schedule and communicate activities to minimize impacts on fishing vessels coming in to not delay their ability to port and deliver their haul	Commercial and Recreational Fishing	BOEM and USCG
Construction, Decommissioning	**Actions that May Displace Biological Resources** Vessel activity and presence of infrastructure	• Mayflower Wind will avoid locating onshore facilities or landfall sites in or near important fish habitats to the extent practicable • Mayflower Wind will apply construction methods for cable laying activities that align with regulatory guidance	Commercial and Recreational Fishing	BOEM, BSEE and NMFS

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• To mitigate impacts of vibration from pile-driving activities, Mayflower Wind will utilize noise abatement systems around relevant construction activities • Certain construction activities have time-of-year restrictions to avoid, minimize, and mitigate impacts on marine organisms, such as sturgeon and winter flounder, which will also be protective of other demersal groundfish species • Mayflower Wind will work with municipal shellfish constables to coordinate shellfish seeding with planned activities prior to construction activities		
Construction, Decommissioning	**Gear Interactions** interactions	• Mayflower Wind is currently working with commercial and recreational fishermen as well as FRs to determine construction timing and locations with fishing vessels to anticipate and avoid/minimize/mitigate gear interactions that may occur during construction • Temporary safety zone restrictions associated with construction activities will limit direct access to areas with construction activity for the safety of mariners and Project employees, but these areas will be limited spatially and temporally • Mayflower Wind will implement construction safety zones around active construction areas in consultation with USCG • Mayflower Wind will notify mariners via LNMs of the presence and location of partially installed structures • The Mayflower Wind FLO proactively contacts fishermen if their gear is entangled by geophysical and geotechnical survey operations and will continue to do so in later phases of the proposed Project, including during construction • Mayflower Wind will consider the use of fixed mooring buoys at various strategic locations in the Project Area to avoid the need for anchoring	Commercial and Recreational Fishing	BOEM, NMFS, and USCG

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
O&M	**Vessel Activity/Presence of Infrastructure**	• Mayflower Wind will continue to ensure that all Project-related vessels follow appropriate navigational routes and other USCG requirements, communicate via USCG LNMs, issue regular mariner updates and/or direct offshore radio communications to help mitigate risks to the commercial and recreational fishing industries, as well as other mariners • Mayflower Wind will implement the 1 nm x 1 nm (1.9 km x 1.9 km) grid layout agreed upon with USCG and the MA/RI WEA developers • Mayflower Wind will work with Port Agencies and Port agents to schedule and communicate activities to minimize impacts on fishing vessels • Mayflower Wind will adopt best practice of an east-west orientation in the Lease Area with 1 nm (1.9 km) spacing between WTG/OSP rows. Layout orientation aligns with neighboring lease holders to provide fishermen consistent navigable routes to fishing grounds • Mayflower Wind, the Mayflower Wind FLO, and Mayflower Wind FRs have been in close communication with industry stakeholders to share information, and to avoid sensitive areas and common fishing grounds inshore and offshore to the extent practicable	Commercial and Recreational Fishing	BOEM and USCG
O&M	**Actions that May Displace Biological Resources** Vessel activity and presence of infrastructure	• Mayflower Wind will install subsea cables to target burial depth and consider use cable shielding materials to minimize potential but unlikely effects of EMF • Cable routing has been designed to minimize cable crossings, cable length, and overlap with known fishing areas, while also maximizing the portion of the cable that can be buried and maintained at target burial depth, in order to mitigate potential impacts on fishing activity	Commercial and Recreational Fishing	BSEE

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
O&M	**Gear Interactions** Entanglement and snags	• The target cable burial depths that have been established will mitigate the risk of potential impact for anticipated gear types, regardless of penetration depth • Safety zones surrounding each foundation will partially include the scour protection on the seabed within that zone, and it is unlikely that fixed or mobile gear will be set or towed close enough to interact with the scour protection surrounding each foundation, in the interest of vessel safety procedures • Mayflower Wind will work with fishermen through a gear loss claim application form to determine if reimbursement is warranted in a process similar to the compensation application process already in place for potential gear loss due to geophysical and geotechnical survey activity • Mayflower Wind has conducted a Cable Burial Risk Assessment to calculate the target cable lowering depth to minimize risks to the offshore export cables from damage, and to mitigate potential conflicts between commercial or recreational fishermen and the new structure • To minimize conflicts between fishing gear and the proposed Project's inter-array and offshore export cables, the inter-array cables will be buried at a target depth of 3.2 to 8.2 feet (1.0 to 2.5 meters), and the offshore export cables will be buried at a target depth of 3.2 to 13.1 feet (1.0 to 4.0 meters) • To minimize interference with fishing activities, Mayflower Wind has sited the export cable corridors to minimize overlap with known areas of high fishing activity • Long term monitoring of cable burial depth and condition will serve as another mitigation strategy, ensuring appropriate burial depth is maintained during the O&M phase • Where applicable, Mayflower Wind will record required cable protection on electronic charts to be distributed to fishermen	Commercial and Recreational Fishing	BSEE

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
Construction, Decommissioning	Change in zoning exception or relief for the installation of the landing location landfall site and onshore substation	• Mayflower Wind will work with the local authorities and MA EFSB and RI ESFB to facilitate the authorization of the required land use	Zoning and Land Use	Best practice - not an enforceable measure
Construction, Decommissioning	**Construction Areas and Vehicle Traffic** Accessibility disruption of neighboring land uses	• Mayflower Wind will develop and implement a Traffic Management Plan prior to construction to minimize disruptions to residences and commercial establishments in the vicinity of onshore construction activities; pedestrian and bicycle safety and movement would also be addressed to minimize effects of construction • Mayflower Wind will develop and implement a Construction Management Plan, including an onshore construction schedule, in consultation with the local authorities and relevant stakeholders to minimize effects to neighboring land uses to the extent feasible • Mayflower Wind will coordinate with stakeholders to schedule work activities outside of major events taking place onshore • Mayflower Wind will ensure that onshore construction activities comply with local regulatory authority requirements	Zoning and Land Use	BOEM, USACE, MassDEP and RIDEM
Construction, Decommissioning	Reduced enjoyment of neighboring land uses due to noise, vibration, and fugitive dust	• Mayflower Wind will implement BMPs throughout the proposed Project phases to minimize potential effects • Mayflower Wind will develop and implement an onshore construction schedule to minimize effects to neighboring land uses to the extent feasible • Mayflower Wind will ensure that onshore construction activities comply with local regulatory authority requirements	Zoning and Land Use	Best practice - not an enforceable measure
Construction, Decommissioning	Disruption of use due to accidental releases	• Mayflower Wind will implement BMPs throughout the proposed Project phases to minimize potential effects	Zoning and Land Use	Best practice - not an enforceable measure

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• Mayflower Wind will follow the approved SMS and OSRP to avoid, control, and address any accidental releases during all proposed Project activities		
O&M	Reduced enjoyment of neighboring land uses due to noise, vibration, and fugitive dust	• Mayflower Wind will implement best practices throughout the proposed Project phases to minimize potential effects • Mayflower Wind will develop and implement an onshore construction schedule to minimize effects to neighboring land uses to the extent feasible • Mayflower Wind will ensure that onshore construction activities comply with local regulatory authority requirements	Zoning and Land Use	Best practice - not an enforceable measure
O&M	Accessibility disruption of neighboring land uses due to construction areas and vehicle traffic	• If unscheduled repairs are required, Mayflower Wind will obtain an authorization from the local authorities as required • Mayflower Wind will coordinate with stakeholders to schedule unscheduled repairs outside of major events taking place onshore, to the extent possible • Mayflower Wind will ensure that unscheduled repairs comply with local regulatory authority requirements	Zoning and Land Use	Best practice - not an enforceable measure
O&M	Disruption of use due to accidental events	• Mayflower Wind will implement best practices throughout the proposed Project phases to minimize potential effects • Mayflower Wind will develop and implement an emergency response procedure to avoid, control and address any accidental releases during all proposed Project activities	Zoning and Land Use	Best practice - not an enforceable measure
Construction	**Actions that may Displace Human Uses/ Activities that may Displace or Impact Fishing and Recreation and Tourism/Accidental Events/Altered Visual Conditions**	• Mayflower Wind will coordinate directly with the USCG in response to distress/Search and Rescue events • Mayflower Wind will post LNMs on the Mayflower Wind website • Mayflower Wind will submit LNMs to the USCG and Fleet Command prior to the commencement of offshore construction activities	Navigation and Vessel Traffic	Best practice - not an enforceable measure

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
	Vessel operations and presence of offshore equipment	• Mayflower Wind will implement construction safety zones in consultation with USCG and communicate to local mariners regarding upcoming and ongoing construction activities. • Mayflower Wind will utilize on-scene safety vessel(s) and/or personnel to advise mariners of construction activity, as necessary • Mayflower Wind will investigate means to update navigation charts with NOAA to improve communications for on-water activities • Mayflower Wind will comply with regulatory requirements • Mayflower Wind will utilize on-scene safety vessel(s) and/or personnel to advise mariners of construction activity, as necessary		
Construction	**Change in Ambient Lighting** Construction lighting	• Mayflower Wind will utilize on-scene safety vessel(s) and/or personnel to advise mariners of construction activity, as necessary	Navigation and Vessel Traffic	Best practice - not an enforceable measure
O&M	**Actions that may Displace Human Uses/ Activities that may Displace or Impact Fishing and Recreation and Tourism/Accidental Events/Altered Visual Conditions** Vessel operations and presence of structures	• Mayflower Wind will coordinate directly with the USCG in response to distress/Search and Rescue events • Mariner diligence and offshore standard work safety practices will be established for all Project-related vessels • Mayflower Wind will adopt best practice of an east-west orientation in the Lease Area with 1 nm (1.9 km) spacing between WTG/OSP rows. Layout orientation aligns with neighboring lease holders to provide fishermen consistent navigable routes to fishing grounds • Mayflower Wind will include lighting and marking of offshore proposed Project structures according to permit requirements • Marking of structures will be aligned with letter and number marking of all offshore structures within the MA/RI WEA, improving SAR and general navigation • Mayflower Wind will maintain the Project's distance from the established Traffic Separation Scheme	Navigation and Vessel Traffic	Best practice - not an enforceable measure

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
O&M	**Changes in Ambient Lighting** Lighting of offshore structures	• Mayflower Wind will submit requests for PATON permits from the USCG that consider a range of issues related to navigational safety	Navigation and Vessel Traffic	USCG
Decommissioning	**Accidental Events** Vessel operations	• Mayflower Wind will utilize on-scene safety vessel(s) and/or personnel to advise mariners of decommissioning activity, as necessary	Navigation and Vessel Traffic	Best practice - not an enforceable measure
Decommissioning	**Actions that may Displace Human Uses/ Activities that may Displace or Impact Fishing and Recreation and Tourism/Accidental Events/Altered Visual Conditions** Presence of offshore equipment	• Mayflower Wind will coordinate directly with the USCG in response to distress/Search and Rescue events • Mayflower Wind will utilize on-scene safety vessel(s) and/or personnel to advise mariners of decommissioning activity, as necessary	Navigation and Vessel Traffic	Best practice - not an enforceable measure
Decommissioning	**Changes in Ambient Lighting** Decommissioning equipment lighting	• Mayflower Wind will utilize on-scene safety vessel(s) and/or personnel to advise mariners of decommissioning activity, as necessary	Navigation and Vessel Traffic	Best practice - not an enforceable measure
Construction, O&M, Decommissioning	**Changes in Ambient Lighting** Introduced lighting	• Mayflower Wind will comply with USCG, BOEM and FAA marking and lighting guidelines • Mayflower Wind will utilize PATONs approved by USCG and installed in accordance with IALA Guidance (IALA, 2013) for the marking of man-made offshore structures • Mayflower Wind will ensure marking of structures will be aligned with letter and number marking of all offshore structures within the MA/RI WEA, improving SAR and general navigation • Mayflower Wind will coordinate with the USCG, Air Force, Navy, NORAD, and other military and national security	Other Marine Uses	USCG

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		stakeholders to implement operational curtailment of WTGs during search and rescue operations, or other national security emergencies, near the Lease Area, as necessary • Mayflower Wind will avoid, minimize, or mitigate effects to navigation by equipping all Project-related vessels and relevant infrastructure with the required navigation marking and lighting and day shapes		
Construction, O&M, Decommissioning	**Installation and Maintenance of Infrastructure** Increased marine/vessel traffic and damage to existing cables/pipelines	• Mayflower Wind will use well established standard techniques for adequately protecting existing and newly installed cables • Mayflower Wind will develop cable crossing specifics in consultation with the cable owners as proposed Project planning continues • Mayflower Wind will utilize on-scene safety vessel(s) and/or personnel to advise mariners of construction/ decommissioning activity, as necessary • Mayflower Wind will investigate means to update navigation charts with NOAA to improve communications for on-water activities • Mayflower Wind will establish mariner diligence and offshore standard work safety practices for all Project-related vessels	Other Marine Uses	Best practice - not an enforceable measure
Construction, O&M, Decommissioning	**Presence of Infrastructure** Obstruction to air navigation, and interference with radar systems	• Mayflower Wind will work with the FAA and the owner/ operator of any affected systems to ensure that appropriate mitigation measures are identified and implemented • Mayflower Wind will use ADLS to reduce visual effects • Mayflower Wind will coordinate with the DoD Siting Clearinghouse, FAA, and NORAD to determine potential effects to radars and NAVAIDS and identify appropriate mitigation measures • Mayflower Wind will coordinate with NOAA and the Northeastern Regional Association of Coastal Ocean Observing Systems to determine potential effects to high	Other Marine Uses	USCG

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		frequency radars and identify appropriate mitigation measures, as necessary		
O&M	**Installation and Maintenance of Infrastructure/Presence of Infrastructure** Use conflicts—military	• Mayflower Wind will provide a 1 nm (1.9 km) space between offshore structures (WTGs and OSPs) providing room for anticipated vessels to transit through and safely maneuver within the proposed Offshore Project Area • Mayflower Wind will align marking of structures with letter and number marking of all offshore structures within the MA/RI WEA, improving SAR and general navigation • Mayflower Wind will liaise with the military and national security stakeholders to reduce potential conflicts. • Mayflower Wind will ensure mariner diligence and offshore standard work safety practices are established for all Project-related vessels	Other Marine Uses	Best practice - not an enforceable measure
Construction	**Unplanned Events** Allisions and collisions, unplanned releases, and occupational hazards	• Mayflower Wind will operate under an approved SMS • Mayflower Wind will utilize on-scene safety vessel(s) and/or personnel to advise mariners of decommissioning activity, as necessary • Mayflower Wind will investigate means to update navigation charts with NOAA to improve communications for on-water activities • Mayflower Wind will develop and implement an onshore Traffic Management Plan prior to construction to address vehicular, bicycle, and pedestrian safety • Mayflower Wind will ensure onshore work would also be planned to be performed primarily off-season when there are fewer people in the area • Mayflower Wind will operate under an approved OSRP that details prevention and control measures of unplanned releases in the Project Area	Public Health and Safety	BOEM, USCG, MassDEP and RIDEM

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• Mayflower Wind will ensure Project Vessels will adhere to USCG regulations surrounding planned and unplanned discharges • Mayflower Wind will prepare and submit an SWPPP for onshore construction activities before start of construction		
O&M	**Unplanned Events** Allisions and collisions, unplanned releases, and occupational hazards	• Mayflower Wind will maintain the northeast approach Traffic Separation Scheme • Mariner diligence and offshore standard work safety practices will be established for all Project-related vessels • Mayflower Wind will adopt best practice of an east-west orientation in the Lease Area with 1 nm (1.9 km) spacing between WTG/OSP rows. Layout orientation aligns with neighboring lease holders to provide fishermen consistent navigable routes to fishing grounds • Mayflower Wind will include lighting and marking of offshore proposed Project structures according to permit requirements • Marking of structures will be aligned with letter and number marking of all offshore structures within the MA/RI WEA, improving SAR and general navigation. • In the event that scheduled or unscheduled repairs are required that would impede onshore traffic flow, an authorization will be obtained from the local authorities as required. • Mayflower Wind will follow measures prescribed and detailed in the approved SMS and OSRP • Mayflower Wind will operate under an approved OSRP that details prevention and control measures of unplanned releases in the Project Area • Project Vessels will adhere to USCG regulations surrounding planned and unplanned discharges	Public Health and Safety	BOEM, USCG, MassDEP and RIDEM

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
Applicant Proposed Measures from COP Appendix O, Mayflower Wind Marine Mammal and Sea Turtle Monitoring and Mitigation Plan (Mayflower Wind 2022)				
PSO and Acoustic PSO (PAM Operator) Training, Experience and Responsibilities				
Construction	**Observer qualifications and training**	• PSOs and Acoustic PSOs (APSO / PAM Operators) will have met NMFS and BOEM training and experience requirements. • PSOs and APSOs will be employed by a third-party observer provider. Briefings between construction supervisors and crews and the PSO/APSO team will be held prior to the start of all pile driving activities, as well as when new personnel join the vessel(s). • At least one PSO on duty at all times will have prior experience working as a PSO. • APSOs responsible for determining if an acoustic detection originated from a NARW will be trained in identification of mysticete vocalizations.	Marine Mammals and Sea Turtles	BOEM, BSEE, and NMFS
	Responsibilities and authorities of PSOs	• PSOs will have no other responsibilities while on watch. • Any PSO or APSO on duty will have the authority to delay the start of operations or to call for a shutdown based on their observations or acoustic detection. • A clear line and method of communication between the PSOs/ APSOs and pile-driving crew will be established and maintained to ensure mitigation measures are conveyed without delay.		

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
Visual Monitoring				
Construction	**Number of PSOs**	• A sufficient number of PSOs will be stationed aboard the installation and/or nearby support vessels to meet the following criteria: ○ At least two PSOs on duty during all pre-clearance periods and active pile driving; - At least one PSO on duty during all other daylight periods. ○ A maximum of four consecutive hours on watch per PSO. ○ A maximum of 12 hours on watch during a 24-hour period.	Marine Mammals and Sea Turtles	BOEM, BSEE, and NMFS
	Visual monitoring methods	• Observations will be conducted from the best safe vantage point(s) on the construction or nearby support vessel to ensure visibility of the clearance zones. • When conducting observations during pile driving, PSOs will scan systematically with the unaided eye, high magnification (25x) binoculars, and/or standard handheld (7x) binoculars to search continuously for marine mammals during all observational periods. • When monitoring at night, PSOs will monitor for marine mammals and other protected species using night-vision goggles with thermal clip-ons and a hand-held spotlight. • PSOs will watch for and record all marine mammal sightings regardless of the distance from the observer and/or sound source. • Distances to observed animals will be estimated with range finders, reticule binoculars, or clinometers when possible and based on the best estimate of the PSO when necessary. • PSOs will record watch effort and environmental conditions on a routine basis.		

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
	Visual monitoring during vessel transit	• PSOs and/or trained vessel crew will observe for marine mammals and sea turtles at all times when vessels are transiting to/from and in the Project Area and port. • PSOs and/or vessel crew will request ship-strike avoidance measures if necessary (see below).		
Acoustic Monitoring				
Construction	**Number of APSOs**	• At least one APSO during all pre-clearance periods and active pile driving. • A maximum of 4 consecutive hours on watch per APSO. • A maximum of 12 hours of watch time per 24-hour period per APSO.	Marine Mammals and Sea Turtles	BOEM, BSEE, and NMFS
	Passive acoustic monitoring methods	• A real-time PAM system will be used to supplement visual monitoring during pre-piling clearance and throughout pile driving. • Use of PAM will allow initiation of pile driving when visual observation of the entire clearance zone is not possible due to poor visibility, including darkness. • A detailed description of the real-time PAM system will be developed during the Marine Mammal Protection Act Incidental Take Authorization process. • The PAM system may not be located on the pile-installation vessel to reduce masking of marine mammals sounds. • The APSOs will immediately communicate all acoustic detections of marine mammals to PSOs performing visual observations including any determination regarding species identification, distance, and bearing of the marine mammal.		

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
	Sound source verification	• A detailed plan for Sound Source Verification will be developed during the Marine Mammal Protection Act Incidental Take Authorization process. • Components of the plan will likely include: ○ Measurements of the largest of each pile type (monopiles and/or jacket piles) to be installed with and without noise attenuating systems to quantify the effectiveness of the system(s). ○ Measurements will be taken at distances designed to verify modeled distances to Level A and Level B thresholds and/or other mitigation action distances. ○ Measurement results will be used to modify, if necessary, distances to Level A and Level B thresholds and estimate effects in a post-construction monitoring report.		
Clearance Zones				
Construction	**Clearance zones for protected species**	• Because of the low probability of a long-term exposure event and for practical implementation reasons, it is anticipated that the Clearance Zones will be similar to those listed below, with the final distances to be determined during the MMPA ITA application process: • North Atlantic Right Whale: 1 km; - Mysticete whales (low-frequency cetaceans): 0.5 km; - Harbor porpoise (high-frequency cetaceans): 0.12 km; - All other marine mammals (mid-frequency cetaceans and pinnipeds): 0.05 km; and - Sea Turtles: 0.05 km.	Marine Mammals and Sea Turtles	BOEM, BSEE, and NMFS
Pre-start Clearance				
Construction	**Pre-start clearance**	• Prior to the beginning of each pile driving event, PSOs and APSOs will monitor for marine mammals and sea turtles for a minimum of 30 minutes and continue at all times during pile driving.	Marine Mammals and Sea Turtles	BOEM, BSEE, and NMFS

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		• If a marine mammal is detected within or approaching the clearance zone (via visual observation or PAM) during the preclearance period, pile driving will not begin until the animal(s) is confirmed to have exited the relevant clearance zone, or until an additional time period has elapsed with no further sighting of the animal. • Additional time period will be 15 minutes for odontocetes and pinnipeds and 30 minutes for mysticetes and sea turtles.		
Soft-Start				
Construction	**Soft-start**	• Soft-start procedures will be followed, to the extent practicable, at the beginning of each pile driving event or any time pile driving has stopped for longer than 30 minutes. • If a marine mammal is detected within or about to enter the clearance zone during the soft-start procedure, pile driving will be delayed and measures will be followed as stated in Section 7.	Marine Mammals and Sea Turtles	BOEM, BSEE, and NMFS
Shutdowns				
Construction	**Shutdowns**	• PSOs or APSOs will request a shutdown of pile driving if a marine mammal or sea turtle is detected within or about to enter the applicable clearance zone for that species (see Section 4). • If a shutdown is not feasible at that time in the installation process because of a risk to human or vessel safety or the risk of jeopardizing the installation process, a reduction in the hammer energy of the greatest extent possible will be considered and implemented. • Following shutdown, pile driving will restart using the same procedure described above during pre-start clearance.	Marine Mammals and Sea Turtles	BOEM, BSEE, and NMFS
Potential Additional Measure to Protect North Atlantic Right Whale				
Construction	**NARW protection measures**	• By concentrating construction activities when NARW are less likely to be present in the region (June 1 through November	Marine Mammals and Sea Turtles	BOEM, BSEE, and NMFS

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
		30), including the Lease Area, the amount of activity to occur when more NARW are likely to be present can be reduced, thereby reducing the total potential impacts on NARW. • To accomplish this, Mayflower Wind will propose additional monitoring and mitigation measures to support the start (or continuation) of pile driving at night or in poor visibility conditions during the period when NARW are less likely to be present. • Specific monitoring tools and plans will be developed as a part of the MMPA ITA process, but may include the use of advanced infrared systems, real-time PAM, autonomous underwater vehicles, autonomous aerial vehicles, or other advanced technologies.		
Vessel Strike Avoidance				
Construction	**General measures**	• A minimum of one PSO or trained vessel crew will be present on all vessels when transiting. • Observers will maintain a vigilant watch for all marine mammals and slow down or stop vessels to avoid striking protected species. • Monitoring the NMFS NARW reporting systems from November 1 through May 30 and whenever a DMA is established in the operational area.	Marine Mammals and Sea Turtles	BOEM, BSEE, and NMFS
	Separation distances	• Maintaining >500-meter distance from any sighted NARW or an unidentified large marine mammal. • Maintaining >100-meter from all ESA-listed whales or humpback whales. • Maintaining >50 meters from all other marine mammals, with the exception of delphinids and pinnipeds that approach the vessel, in which case the vessel operator must avoid excessive speed or abrupt changes in direction		

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
	Actions given observed marine mammal	• If underway, vessels will steer a course away from any NARW at 10 kts or less until the 500-meter minimum separation distance has been established. • If a NARW comes within 100 meters, then the vessel will reduce speed and shift the engines into neutral, if safe to do so. The vessel will not engage engines until the NARW has moved beyond 100 meters, in which case, any vessel will steer a course away from the animal at 10 knots or less until the 500-meter minimum separation distance has been established. • If the vessel is stationary, the vessel will not engage engines until the NARW has moved beyond 100 meters, in which case any vessel will steer a course away from the animal at 10 knots or less until the 500-meter minimum separation distance has been established. • Report sightings of all dead or injured marine mammals or sea turtles within 24 hours.		
	Speed reduction	• Reducing speed of all vessels, except CTVs, to ≤10 knots between November 1 through May 30. • From November 1 through May 30, CTVs may travel at over 10 knots. However, if a NARW is detected via visual observation within or approaching the transit route, all CTVs will travel at 10 knots or less for the remainder of that day. • Operating vessels, except CTVs, will travel at speeds ≤10 knots in any DMA. • Reducing vessel speeds to ≤10 knots when mother/calf pairs, pods, or large assemblages of marine mammals are observed. • Complying with speed restrictions (≤10 knots) in NARW management areas including SMAs and active DMAs, except as noted previously for CTVs.		

Project Phase	Impact Producing Factors Potential Effect or Category	Description	Resource Area Mitigated	Anticipated Enforcing Agency[1]
Reporting Dead or Injured Marine Mammals				
Construction, O&M, Decommissioning	**Actions given a marine mammal is taken in a prohibited manner by construction activities**	• The activity(ies) resulting in the injury/death will be stopped immediately. • The incident will be reported to the NMFS Office of Protected Resources and the NMFS New England Stranding Network Coordinator. • The report will include all available information required by the IHA or the NMFS stranding report form. • Mayflower Wind will not resume the activity which resulted in the injury until NMFS is able to review the circumstances of the prohibited take and authorize resumption of the activity(ies).	Marine Mammals and Sea Turtles	BOEM, BSEE, and NMFS
	Actions given an unknown and recent observed dead or injured marine mammal	• Mayflower Wind will immediately report the incident to the NMFS Office of Protected Resources and the NMFS New England Stranding Network Coordinator. • The report will include the same information identified for a take by construction activity. • Activities will continue while NMFS reviews the circumstances of the incident and works with Mayflower Wind to determine whether modifications to the activities are appropriate.		
	Actions given observation of a dead or injured marine mammal not associated with or related to construction activities	• Mayflower Wind will report the incident to the NMFS Office of Protected Resources and the NMFS New England Stranding Network Coordinator, within 24 hours of the discovery. • Mayflower Wind will include any documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network including photographs and video footage if available. • Construction activity may continue.		

ACHP = Advisory Council on Historic Preservation; ADLS = Aircraft Detection Lighting System; APSO = acoustic protected species observer; ASLF = ancient submerged landform feature; BMP = best management practice; BOEM = Bureau of Ocean Energy Management; BSEE = Bureau of Safety and Environmental Enforcement; BUAR = Board of Underwater Archaeological Resources; CFR = code of federal regulation; COP = Construction and Operations Plan; CRC = cultural resource consultant; CTV = crew transfer vessel;

DMA = dynamic management area; DP = dynamic positioning; EFH = essential fish habitat; EJ = environmental justice; EMF = electromagnetic fields; EPA = Environmental Protection Agency; ESA = Endangered Species Act; FAA = Federal Aviation Administration; FLO = fisheries liaison officer; FR = fisheries representative; HDD = horizontal directional drilling; HRG = high resolution geophysical; HVDC = high-voltage direct current; IALA = International Association of Marine Aids to Navigation and Lighthouse Authorities; IHA = Incidental Harassment Authorization; ITA = Incidental Take Authorization; km = kilometer; km/hr = kilometer per hour; LNM = local notice to mariners; MA = Massachusetts; MA EFSB = Massachusetts Energy Facilities Siting Board; MassDEP = Massachusetts Department of Environmental Protection; MHC = Massachusetts Historical Commission; mph = mile per hour; NARW = North Atlantic right whale; NAVAIDS = navigational aids; NHESP = Natural Heritage & Endangered Species Program; nm = nautical mile; NMFS = National Marine Fisheries Service; NOAA = National Oceanic and Atmospheric Administration; NORAD = North American Aerospace Defense Command; NOx = nitrogen oxides; NRHP = National Register of Historic Places; O&M = operations and maintenance; OSRP = oil spill response plan; OSP = offshore substation platform; PAM = passive acoustic monitoring; PATON = private aid to navigation; PSO = protected species observer; QMA = qualified marine archaeologist; RI = Rhode Island; RI EFSB = Rhode Island Energy Facility Siting Board; RIDEM = Rhode Island Department of Environmental Management; RIHPHC = Rhode Island Historical Preservation & Heritage Commission; SAR = search and rescue; SHPO = state historic preservation officer; SMS = safety management system; SPCC = spill prevention, control, and countermeasure; SWPPP = stormwater pollution prevention plan; THPO = Tribal Historic Preservation Officer; UDP = Unanticipated Discovery Plan; USCG = United States Coast Guard; USFWS = United States Fish and Wildlife Service; WEA = wind energy area; WTG = wind turbine generator

G.2 Agency-Proposed Mitigation Measures

Table G-2 identifies agency-proposed mitigation measures that have been proposed to mitigate and/or monitor potential impacts from the Project. The paragraphs below provide additional information regarding the mitigation measures.

CUL-1 Marine cultural resources avoidance or additional investigation. Mayflower Wind must establish and comply with requirements for all protective buffers recommended by the Qualified Marine Archaeologist for each marine cultural resource (i.e., archaeological resource and ASLFs) based on the size and dimension of the resource. Protective buffers extend outward from the maximum discernable limit of each resource and are intended to minimize the risk of disturbance during construction.

CUL-2 Ancient submerged landform feature monitoring program and post-review discovery plan. Mayflower Wind must establish and implement a monitoring program and post-review discovery plan to review impacts of construction or any seabed-disturbing activities on ASLFs if such landforms will not be avoided and will be impacted.

CUL-3 Terrestrial archaeological resource avoidance or additional investigation. Mayflower Wind must avoid any identified terrestrial archaeological resource. If avoidance of a resource is not feasible, additional investigations must be conducted for the purpose of determining eligibility for listing in the NRHP. If any such resource is determined eligible for listing, Mayflower Wind must conduct Phase III data recovery investigations for the purposes of resolving adverse effects in accordance with 36 CFR 800.6.

CUL-4 Terrestrial archaeological resource monitoring program and post-review discovery plan. Mayflower Wind must conduct archaeological monitoring during onshore construction in areas identified as having high or moderate archaeological sensitivity and must prepare and implement a terrestrial archaeological post-review discoveries plan.

CUL-5 Historic Properties Treatment Plans. BOEM, with the assistance of Mayflower Wind, will develop and implement one or more Historic Property Treatment Plans (HPTPs) to address effects on historic properties that cannot be avoided. The HPTP(s) will be developed in consultation with property owners and consulting parties who have demonstrated interest in specific historic properties. The HPTP(s) will provide details and specifications for mitigation measures to resolve adverse effects, including cumulative visual effects on aboveground historic properties.

BRT-1 Adaptive mitigation for birds and bats. If the reported post-construction bird and bat monitoring results (generated as part of Mayflower Wind's bird and bat Post-Construction Monitoring Plan [COP Volume 2, Table 16-1; Mayflower Wind 2022]) indicate bird and bat impacts deviate substantially from the impact analysis included in this EIS, then Mayflower Wind must make recommendations for new mitigation measures or monitoring methods.

BRT-2 Annual Bird and Bat Mortality Reporting. Annual Bird and Bat Mortality Reporting during construction and operation, and decommissioning – Mayflower Wind must submit an annual report covering each calendar year, due by January 31 of the following year, documenting any dead (or injured) birds or bats found on vessels and structures during construction, operations, and decommissioning. The report must be submitted to BOEM (at renewable_reporting@boem.gov) and BSEE (at OSWSubmittals@bsee.gov) and USFWS. The report must contain the following information: the name of species, date found, location, a picture to confirm species identity (if possible), and any other relevant information. Carcasses with federal or research bands must be reported to the United States Geological Survey Bird Band Laboratory. Any occurrence of dead ESA-listed birds or bats must be reported to BOEM, BSEE, and USFWS as soon as practicable (taking into account crew and vessel safety), but no later than 24 hours after the sighting, and if practicable, carefully collect the dead specimen and preserve the material in the best possible state.

NS-1 HVDC open-loop cooling system avoidance area. To minimize potential impacts on zooplankton from impingement and entrainment in offshore wind HVDC converter station open-loop cooling systems, no open-loop cooling systems will be permitted in the enhanced mitigation area of the Lease Area (Figure G-1). No geographic restrictions on the offshore export cable corridor, nor the installation of an HVAC OSP are included in this mitigation measure. Nantucket Shoals supports dense aggregations of zooplankton such as gammarid shrimp and copepods, which in turn, support higher tropic levels of wildlife. While the Mayflower Wind Project would not overlap with the highest modeled densities of zooplankton in the Nantucket Shoals region, BOEM is proposing a precautionary measure to reduce the magnitude of potential mortality from entrainment of zooplankton in an HVDC open-loop cooling system. This measure is anticipated to result in less mortality to prey species for higher trophic level animals than compared with project design envelope which could include HVDC OSP locations closer to Nantucket Shoals and thus closer to higher densities of zooplankton.

NS-2 Pile-driven foundations only. Only monopile or piled jacket foundations may be used in the enhanced mitigation area (Figure G-1), which would minimize the overall structure impact on benthic prey species. The foundation footprint, including scour protection, on the seabed would be reduced by a minimum of 8.94 acres (3.62 hectares) per foundation in comparison to if gravity-based foundations were used. This would mean a total reduction in seabed footprint of at least 206 acres (83 hectares) for the 23 WTGs located in the enhanced mitigation area. Nantucket Shoals is known to support shellfish species important to food supply for birds. To reduce the potential impact on shellfish populations adjacent to Nantucket Shoals, BOEM is proposing this measure to reduce the potential direct mortality, smothering, by the larger foundation footprint of suction-bucket and gravity foundations in this area when compared to the design envelope of the Proposed Action.

NS-3 Vessel-strike avoidance. A real-time detection and reporting PAM system must be implemented during the construction period. The PAM system must operate in the enhanced mitigation area (Figure G-1) 24 hours per day. The system must be capable of detection of NARW vocalizations, report the detections to a PAM operator in near-real time, and share all detections with NMFS. Upon a confirmed detection of a NARW, all Project construction and crew transfer vessels of all sizes must travel at 10 knots or less in a 10-square-kilometer area around the location of the detection. Speed restriction must remain in place until there are no PAM detections within 48 hours of implementation of the speed restrictions, or daily aerial surveys result in no NARW sightings within 48 hours of implementation of the speed restrictions. This precautionary measure would be in place during offshore construction no matter the time of year when such work is being done. While NARW occurrence around Nantucket Shoals is greatest in the fall and winter, this measure addresses avoidance during offshore construction throughout the year to reduce the potential of any interaction between vessels and NARWs.

NS-4 Pile-driving time-of-year restriction in enhanced mitigation area. Mayflower Wind must drive piles in the enhanced mitigation area (Figure G-1) only between June 1 to October 31 when NARW density is at its lowest. The most recent modeled density of NARW indicate higher densities of NARW on Nantucket Shoals in the fall and winter, with the highest densities in February. The enhanced mitigation area includes all areas where modeled NARW density is greater than or equal to 1 animal. This will further ensure that no NARW are exposed to injurious levels of noise from pile driving activity when combined with other measures such as protected species observers and acoustic attenuation devices.

NS-5 Pile Driving shut down provisions in enhanced mitigation area. Mayflower Wind will be required to implement a real-time monitoring system (PAM or aerial imagery) capable of detecting and localizing the direction of NARW calls in the enhanced mitigation area (Figure G-1). If directly measured or modeled Level A or Level B received sound levels from offshore pile driving occur in the enhanced mitigation area when NARW are detected, subsequent pile driving shall be suspended until NARWs are confirmed through acoustic monitoring or visual surveillance to be clear of the enhanced mitigation area for 48 hours.

OU-1 Federal survey mitigation implementation strategy for the Northeast U.S. region. BOEM is committed to working with NOAA toward a long-term regional solution to account for changes in survey methodologies because of offshore wind farms. NOAA Fisheries and BOEM published (December 2022) a Federal Survey Mitigation Strategy for the Northeast U.S. Region to address anticipated impacts of offshore wind energy development on NOAA Fisheries' scientific surveys. This strategy also defines stakeholders, partners, and other ocean users that will be engaged throughout the process and identifies potential resources for successful implementation. Activities described in the 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 will include survey-specific mitigation plans for each affected survey including both vessel and aerial surveys. The strategy is intended to guide the implementation of the mitigation program through the duration of wind energy development in the Northeast U.S. region.

OU-2 High frequency radar system mitigation. Mayflower Wind would develop a mitigation plan, to be reviewed and coordinated with the NOAA U.S. Integrated Ocean Observing System (IOOS) Office's Surface Currents Program. The plan would implement measures that correct for radar impacts, including Mayflower Wind sharing real-time telemetry of surface currents, waves, and other oceanographic data with the Surface Currents Program into the public domain, measured at locations in the Project area confirmed by the Surface Currents Program and its high-frequency radar operators as sufficient to allow NOAA IOOS mission objectives to be met.

CF-1 Compensation for gear loss and damage. The lessee shall implement a gear loss and damage compensation program consistent with BOEM's draft guidance for Mitigating Impacts to Commercial and Recreational Fisheries on the Outer Continental Shelf Pursuant to 30 CFR 585 or as modified in response to public comment.

CF-2 Compensation for lost fishing income. The lessee shall implement a compensation program for lost income for commercial and recreational fishermen and other eligible fishing interests for construction and operations consistent with BOEM's draft guidance for Mitigating Impacts to Commercial and Recreational Fisheries on the Outer Continental Shelf Pursuant to 30 CFR 585 or as modified in response to public comment.

CF-3 Mobile gear friendly cable protection measures. Cable protection measures should reflect the pre-existing conditions at the site. This mitigation measure chiefly ensures that seafloor cable protection does not introduce new hangs for mobile fishing gear. Thus, the cable protection measures should be trawl-friendly with tapered/sloped edges. If cable protection is necessary in "non-trawlable" habitat, such as rocky habitat, then the lessee should consider using materials that mirror the benthic environment.

CF-4 Fishing gear and anchor strike incident reporting. Mayflower Wind will report fishing gear and anchor strike incidents that fall below or are not captured by the regulatory thresholds outlined in 30 CFR §§ 585.832 and 585.833. Reports will be filed annually during construction and decommissioning, and every 5 years during operations.

NAV-1 Consult on aid to navigation impacts. Prior to cable installation, Mayflower Wind will consult with the USCG regarding potential impacts on federal aids to navigation from cable installation and maintenance.

NAV-2 Operations Center. Mayflower Wind will operate a 24-hour manned operations center with direct communications with the USCG.

NAV-3 Mariner Communication and Outreach Plan. Mayflower Wind will develop and implement a Mariner Communication and Outreach Plan that covers all project phases from pre-construction to decommissioning and that facilitates coordination with all mariners, including the commercial shipping industry, commercial and for-hire fishing industries, and other recreational users. The Mariner Communication and Outreach Plan will include the following components:

a. During Project design, coordinating in-water construction activities to avoid and minimize disruptions;

b. At least 90 days prior to commencing in-water construction activities in any construction season, consultation with stakeholders on an approximate schedule of activities and existing uses within the Project area. Make good faith efforts to accommodate those existing uses. The results of these good faith consultations can be summarized in a report and submitted to the federal agency(ies) prior to the start of each construction season;

c. Following COP approval, notice of proposed changes which have the potential to impact fishing or maritime resources or activities;

d. Notices to commence construction activities, conduct maintenance activities, and commence decommissioning;

e. Status reports during construction with specific information on construction activities and locations for upcoming activities in the next 1-2 weeks;

f. Post-construction notice of: (i) all cable protection measure locations (including protection type and charted location); (ii) any areas where the identified burial depth is less than target burial depth; and (iii) other obstructions to navigation created by the Project; and

g. Post all notices described above to the Project website with information on how to opt-in for alerts.

MA-1 Sand wave leveling and boulder clearance. Sand wave leveling and boulder clearance should be limited to the extent practicable. Best efforts should be made to microsite to avoid these areas.

MA-2 Long-term passive acoustic monitoring. Record long-term measurements of ambient noise, marine mammal, and cod vocalizations in the Lease Area before, during, and following construction. Continuous recording must occur during foundation pile driving, initial operation, and for at least 3 full calendar years of operation to monitor for potential impacts. At least three devices must be independently deployed within the lease area to maximize spatial coverage of the lease area based on 10-kilometer spacing between deployment locations. The three buoys must be deployed in coordination with the Regional Wildlife Science Collaborative prior to the plan being submitted to BOEM and BSEE. Devices must be placed outside the lease area in support of regional monitoring if existing PAM devices will be present in the lease area over the required recording period. The archival recorders must have a minimum capability of detecting and storing acoustic data on vessel noise, pile-driving, WTG operation, baleen whale vocalizations, and cod vocalizations in the lease area. No later than 180 days prior to buoy deployment and before any foundation pile driving begins, the Lessee must submit to BOEM and BSEE (renewable_reporting@boem.gov and OSWsubmittals@bsee.gov) the PAM plan, which describes all proposed equipment, deployment locations, detection review methodology, and other procedures and protocols related to the required use of PAM for monitoring. The PAM plan must detail mooring best practices, data management, storage, measurement, and data processing best practices that are required by BOEM for long-term PAM monitoring.[2] Other best practices consistent with COP approval should be detailed in the plan. The PAM Plan must include the proposed equipment, sample rate, mooring design, deployment locations, methods for baleen whale and cod detections, and metrics for ambient noise analysis. The long-term monitoring plan must be submitted to BOEM and BSEE (at renewable_reporting@boem.gov and OSWsubmittals@bsee.gov) for review and concurrence. DOI will review the PAM Plan and provide comments, if any, on the plan within 45 calendar days, but no later than 90 days of its submittal. The plan must satisfy all outstanding comments to DOI's satisfaction and

[2] Refer to Regional Wildlife Science Collaborative for Offshore Wind *Data Management & Storage Best Practices for Long-term and Archival Passive Acoustic Monitoring (PAM) Data*.

will need to receive written concurrence from BOEM and BSEE. If DOI does not provide comments on the PAM Plan within 90 calendar days of its submittal, the Lessee may conclusively presume DOI's concurrence with the PAM Plan. PAM monitoring results must be provided within 180 days of buoy collection and again within 180 days of the annual anniversaries of each the PAM device deployments. All raw data must be sent to NCEI for archiving no later than 6 months following the date of each recorder recovery.

BOEM-proposed mitigation and monitoring measures included in the NMFS BA. Refer to Table G-2 for a description of these measures.

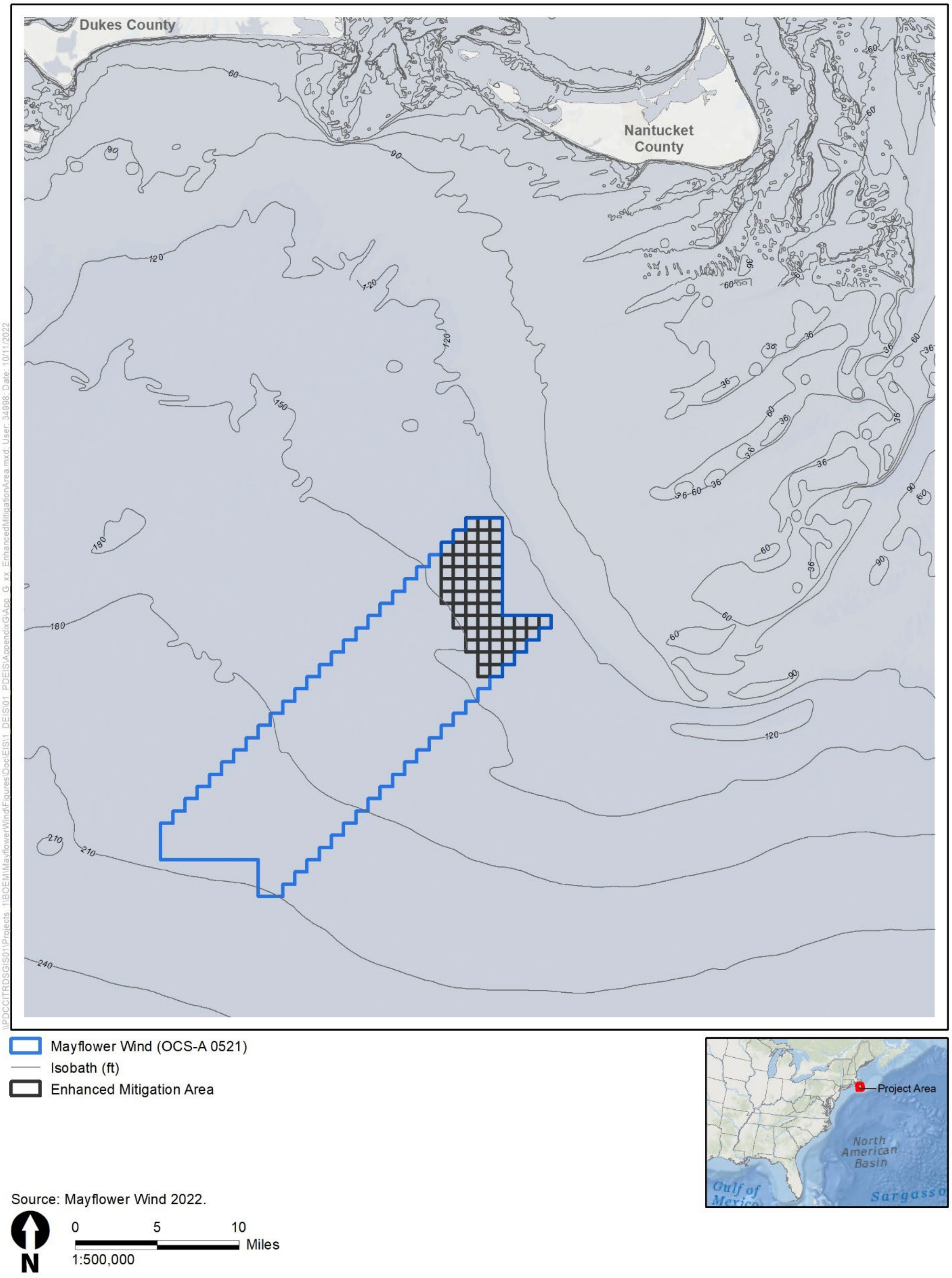

Figure G-1. Mayflower Wind enhanced mitigation area

Table G-2. Potential mitigation and monitoring measures analyzed

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
NHPA Section 106 Mitigation Measures					
CUL-1	C	Marine cultural resources avoidance or additional investigation	Mayflower Wind must establish and comply with requirements for all protective buffers recommended by the Qualified Marine Archaeologist for each marine cultural resource (i.e., archaeological resource and ASLFs) based on the size and dimension of the resource. Protective buffers extend outward from the maximum discernable limit of each resource and are intended to minimize the risk of disturbance during construction.	Cultural – Marine Cultural Resources	BOEM, BSEE, USACE, Massachusetts Board of Underwater Archaeological Resources, Rhode Island Historical Preservation & Heritage Commission
CUL-2	C	Ancient submerged landform feature monitoring program and post-review discovery plan	Mayflower Wind must establish and implement a monitoring program and post-review discovery plan to review impacts of construction or any seabed-disturbing activities on ancient submerged landform feature locations if such landforms will not be avoided and will be impacted.	Cultural – Marine Cultural Resources	BOEM, BSEE, USACE, Massachusetts Board of Underwater Archaeological Resources, Rhode Island Historical Preservation & Heritage Commission
CUL-3	C	Terrestrial archaeological resource avoidance or additional investigation	Mayflower Wind must avoid any identified terrestrial archaeological resource. If avoidance of a resource is not feasible, additional investigations must be conducted for the purpose of determining eligibility for listing in the NRHP. If any such resource is determined eligible for listing, Mayflower Wind must conduct Phase III data recovery investigations for the purposes of resolving adverse effects in accordance with 36 CFR 800.6.	Cultural – Terrestrial Archaeological Resources	BOEM, BSEE, Massachusetts Historical Commission, Massachusetts, Rhode Island Historical Preservation & Heritage Commission
CUL-4	C	Terrestrial archaeological resource monitoring program and post-review discovery plan	Mayflower Wind must conduct archaeological monitoring during onshore construction in areas identified as having high or moderate archaeological sensitivity and must prepare and implement a terrestrial archaeological post-review discoveries plan.	Cultural – Terrestrial Archaeological Resources	BOEM, BSEE, Massachusetts Historical Commission, Rhode Island Historical Preservation & Heritage Commission

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
CUL-5	Pre-C	Historic Properties Treatment Plans	BOEM, with the assistance of Mayflower Wind, will develop and implement one or more Historic Property Treatment Plans (HPTPs) to address impacts on historic properties that cannot be avoided. The HPTP(s) will be developed in consultation with property owners and consulting parties who have demonstrated interest in specific historic properties. The HPTP(s) will provide details and specifications for mitigation measures to resolve adverse visual effects, including cumulative effects on aboveground historic properties.	Cultural	BOEM, BSEE, Massachusetts Historical Commission, Massachusetts Board of Underwater Archaeological Resources, Rhode Island Historical Preservation & Heritage Commission
BOEM-Proposed Bird and Bat Mitigation Measures					
BRT-1	O&M	Adaptive mitigation for birds and bats	If the reported post-construction bird and bat monitoring results (generated as part Mayflower Wind's bird and bat Post-Construction Monitoring Plan [COP Volume 2, Table 16-1; Mayflower Wind 2022]) indicate bird and bat impacts deviate substantially from the impact analysis included in this EIS, then Mayflower Wind must make recommendations for new mitigation measures or monitoring methods.	Birds and Bats	BOEM, BSEE, and USFWS
BRT-2	C, O&M, D	Annual Bird and Bat Mortality Reporting	Annual Bird and Bat Mortality Reporting during construction and operation, and decommissioning – Mayflower Wind must submit an annual report covering each calendar year, due by January 31 of the following year, documenting any dead (or injured) birds or bats found on vessels and structures during construction, operations, and decommissioning. The report must be submitted to BOEM (at renewable_reporting@boem.gov) and BSEE (at OSWSubmittals@bsee.gov) and USFWS. The report must contain the following information: the name of species, date found, location, a picture to confirm species identity (if possible), and any other relevant information. Carcasses with federal or research bands must be reported to the United States Geological Survey Bird Band Laboratory. Any occurrence of dead ESA-listed birds or bats must be reported to BOEM, BSEE, and USFWS as soon as practicable (taking into account crew and vessel safety), but no	Birds and Bats	BOEM, BSEE, USFWS

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			later than 24 hours after the sighting, and if practicable, carefully collect the dead specimen and preserve the material in the best possible state.		
BOEM-proposed Nantucket Shoals Mitigation Measures					
NS-1	O&M	HVDC open-loop cooling system avoidance area	To minimize potential impacts on zooplankton from impingement and entrainment in offshore wind HVDC converter station open-loop cooling systems, no open-loop cooling systems would be permitted in the enhanced mitigation area of the Lease Area. No geographic restrictions on the offshore export cable corridor, nor the installation of an HVAC OSP are included in this mitigation measure.	Finfish and Invertebrates Marine Mammals	BOEM and NMFS
NS-2	C, O&M	Pile-driven foundations only	Only monopile or piled jacket foundations may be used in the enhanced mitigation area, which would minimize the overall structure impact on benthic prey species.	Benthic and Shellfish Resources	BOEM and NMFS
NS-3	C	Vessel-strike avoidance	A real-time detection and reporting PAM system must be implemented during the construction period. The PAM system must operate in the enhanced mitigation area 24 hours per day. The system must be capable of detection of NARW vocalizations, report the detections to a PAM operator in near-real time, and share all detections with NMFS. Upon a confirmed detection of a NARW, all project construction and crew transfer vessels of all sizes must travel at 10 knots or less in a 10-square-kilometer area around the location of the detection. Speed restriction must remain in place until there are no PAM detections within 48 hours of implementation of the speed restrictions, or daily aerial surveys result in no NARW sightings within 48 hours of implementation of the speed restrictions.	Marine Mammals	BOEM, BSEE, and NMFS
NS-4	C	Pile-driving time of Year restriction in enhanced mitigation area	Pile driving within the enhanced mitigation area will occur only between June 1 to October 31 when NARW presence is at its lowest.	Marine Mammals Sea Turtles, and Finfish and Invertebrates	BOEM, BSEE, and NMFS

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
NS-5	C	Pile driving shut down provisions in enhanced mitigation area	Mayflower Wind will be required to implement a real-time monitoring system (PAM or aerial imagery) capable of detecting and localizing the direction of NARW calls in the enhanced mitigation area (Figure G-1). If directly measured or modeled Level A or Level B received sound levels from offshore pile driving occur within the enhanced mitigation area when NARW are detected, subsequent pile driving shall be suspended until NARWs are confirmed through acoustic monitoring or visual surveillance to be clear of the enhanced mitigation area for 48 hours.	Marine Mammals	BOEM, BSEE, and NMFS
Other Agency-Proposed Mitigation Measures					
OU-1	C, O&M	Federal survey mitigation implementation strategy for the Northeast U.S. region	BOEM is committed to working with NOAA toward a long-term regional solution to account for changes in survey methodologies because of offshore wind farms. NOAA Fisheries and BOEM published (December 2022) a Federal Survey Mitigation Strategy for the Northeast U.S. Region to address anticipated impacts of offshore wind energy development on NOAA Fisheries' scientific surveys. This strategy also defines stakeholders, partners, and other ocean users that will be engaged throughout the process and identifies potential resources for successful implementation. Activities described in the 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 will include survey-specific mitigation plans for each affected survey including both vessel and aerial surveys. The strategy is intended to guide the implementation of the mitigation program through the duration of wind energy development in the Northeast U.S. region.	Other Uses – Scientific Research and Surveys	BOEM, BSEE, and NMFS
OU-2	C, O&M	High frequency radar system mitigation	Mayflower Wind would develop a mitigation plan, to be reviewed and coordinated with the NOAA U.S. Integrated Ocean Observing System (IOOS) Office's Surface Currents Program. The plan would implement measures that correct for radar impacts, including Mayflower Wind sharing real-time telemetry of surface currents, waves, and other oceanographic data with the Surface Currents	Other Uses – Radar Systems	BOEM and NOAA IOOS

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			Program into the public domain, measured at locations in the Project area confirmed by the Surface Currents Program and its high-frequency radar operators as sufficient to allow NOAA IOOS mission objectives to be met.		
CF-1	C, O&M	Compensation for gear loss and damage	The lessee shall implement a gear loss and damage compensation program consistent with BOEM's draft guidance for Mitigating Impacts to Commercial and Recreational Fisheries on the Outer Continental Shelf Pursuant to 30 CFR 585 or as modified in response to public comment.	Commercial Fisheries and For-Hire Recreational Fisheries	BOEM
CF-2	C, O&M	Compensation for lost fishing income	The lessee shall implement a compensation program for lost income for commercial and recreational fishermen and other eligible fishing interests for construction and operations consistent with BOEM's draft guidance for Mitigating Impacts to Commercial and Recreational Fisheries on the Outer Continental Shelf Pursuant to 30 CFR 585 or as modified in response to public comment.	Commercial Fisheries and For-Hire Recreational Fisheries	BOEM
CF-3	O&M	Mobile gear friendly cable protection measures	Cable protection measures should reflect the pre-existing conditions at the site. This mitigation measure chiefly ensures that seafloor cable protection does not introduce new hangs for mobile fishing gear. Thus, the cable protection measures should be trawl-friendly with tapered/sloped edges. If cable protection is necessary in "non-trawlable" habitat, such as rocky habitat, then the lessee should consider using materials that mirror the benthic environment.	Commercial Fisheries and For-Hire Recreational Fisheries	BOEM
CF-4	C, O&M, D	Fishing Gear and Anchor Strike Incident Reporting	Mayflower Wind will report fishing gear and anchor strike incidents that fall below or are not captured by the regulatory thresholds outlined in 30 CFR §§ 585.832 and 585.833. Reports will be filed annually during construction and decommissioning, and every 5 years during operations.	Commercial Fisheries and For-Hire Recreational Fisheries	BOEM, USACE, USCG
NAV-1	C, O&M	Consult on aid to navigation impacts	Prior to cable installation, Mayflower Wind will consult with USCG regarding potential impacts on federal aids to navigation from cable installation and maintenance.	Navigation	USCG
NAV-2	O&M	Operations Center	Mayflower Wind will operate a 24-hour manned operations center with direct communications with the USCG.	Navigation	USCG

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
NAV-3	Pre-C, C, O&M, D	Mariner Communication and Outreach Plan	Mayflower Wind will develop and implement a Mariner Communication and Outreach Plan that covers all project phases from pre-construction to decommissioning and that facilitates coordination with all mariners, including the commercial shipping industry, commercial and for-hire fishing industries, and other recreational users. The Mariner Communication and Outreach Plan will include the following components: a. During Project design, coordinating in-water construction activities to avoid and minimize disruptions; b. At least 90 days prior to commencing in-water construction activities in any construction season, consultation with stakeholders on an approximate schedule of activities and existing uses within the Project area. Make good faith efforts to accommodate those existing uses. The results of these good faith consultations can be summarized in a report and submitted to the federal agency(ies) prior to the start of each construction season; c. Following COP approval, notice of proposed changes which have the potential to impact fishing or maritime resources or activities; d. Notices to commence construction activities, conduct maintenance activities, and commence decommissioning; e. Status reports during construction with specific information on construction activities and locations for upcoming activities in the next 1–2 weeks; f. Post-construction notice of: (i) all cable protection measure locations (including protection type and charted location); (ii) any areas where the identified burial depth is less than target burial depth; and (iii) other obstructions to navigation created by the Project; and g. Post all notices described above to the Project website with information on how to opt-in for alerts.	Navigation	BOEM and BSEE

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
MA-1	C	Sand Wave Leveling and Boulder Clearance	Sand wave leveling and boulder clearance should be limited to the extent practicable. Best efforts should be made to microsite to avoid these areas.	Benthic Resources; EFH	Best practice
MA-2	C, O&M	Long-Term Passive Acoustic Monitoring	Record long-term measurements of ambient noise, marine mammal, and cod vocalizations in the Lease Area before, during, and following construction. Continuous recording must occur during foundation pile driving, initial operation, and for at least 3 full calendar years of operation to monitor for potential impacts. At least three devices must be independently deployed within the lease area to maximize spatial coverage of the lease area based on 10-kilometer spacing between deployment locations. The three buoys must be deployed in coordination with the Regional Wildlife Science Collaborative prior to the plan being submitted to BOEM and BSEE. Devices must be placed outside the lease area in support of regional monitoring if existing PAM devices will be present in the lease area over the required recording period. The archival recorders must have a minimum capability of detecting and storing acoustic data on vessel noise, pile-driving, WTG operation, baleen whale vocalizations, and cod vocalizations in the lease area. No later than 180 days prior to buoy deployment and before any foundation pile driving begins, the Lessee must submit to BOEM and BSEE (renewable_reporting@boem.gov and OSWsubmittals@bsee.gov) the PAM Plan, which describes all proposed equipment, deployment locations, detection review methodology, and other procedures and protocols related to the required use of PAM for monitoring. The PAM Plan must detail mooring best practices, data management, storage, measurement, and data processing best practices that are required by BOEM for long-term PAM monitoring.[3] Other best practices consistent with COP approval should be detailed in the plan. The PAM Plan must	Marine Mammals	BOEM, BSEE

[3] Refer to Regional Wildlife Science Collaborative for Offshore Wind *Data Management & Storage Best Practices for Long-term and Archival Passive Acoustic Monitoring (PAM) Data*.

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			include the proposed equipment, sample rate, mooring design, deployment locations, methods for baleen whale and cod detections, and metrics for ambient noise analysis. The long-term monitoring plan must be submitted to BOEM and BSEE (at renewable_reporting@boem.gov and OSWsubmittals@bsee.gov) for review and concurrence. DOI will review the PAM Plan and provide comments, if any, on the plan within 45 calendar days, but no later than 90 days of its submittal. The Plan must satisfy all outstanding comments to DOI's satisfaction and will need to receive written concurrence from BOEM and BSEE. If DOI does not provide comments on the PAM Plan within 90 calendar days of its submittal, the Lessee may conclusively presume DOI's concurrence with the PAM Plan. PAM monitoring results must be provided within 180 days of buoy collection and again within 180 days of the annual anniversaries of each the PAM device deployments. All raw data must be sent to NCEI for archiving no later than 6 months following the date of each recorder recovery.		
BOEM-proposed Mitigation and Monitoring Measures included in the NMFS BA					
BA-1	C	LOA Requirements	The measures required by the final MMPA LOA for Incidental Take Regulations would be incorporated into COP approval.	Marine Mammals	BOEM and BSEE
BA-2	C, O&M, D	Geophysical Surveys and ESA Species	Mayflower Wind must comply with all the Project Design Criteria and Best Management Practices for Protected Species at https://www.boem.gov/sites/default/files/documents//PDCs%20and%20BMPs%20for%20Atlantic%20Data%20Collection%2011222021.pdf that implement the integrated requirements for threatened and endangered species in the June 29, 2021, programmatic consultation under the ESA, revised November 22, 2021.	Marine Mammals, Sea Turtles, ESA Listed Species	BOEM and BSEE
BA-3	Pre-C, C, O&M	Fisheries and Benthic Habitat Monitoring Surveys	The Lessee must develop monitoring plans and conduct fisheries research and monitoring surveys, including the benthic survey. The Lessee must conduct these surveys for durations of, at a minimum, 1 year during pre-construction, 1 year during construction, and 2 years post-construction. The Lessee must submit an annual report within 90 days of the completion of each survey season to DOI	Benthic Resources, Commercial Fisheries	BOEM

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			(renewable_reporting@boem.gov) that includes results and analyses as described in the monitoring plans. The Lessee must share data in accordance with their data sharing plan.		
BA-4	C, O&M, D	Protected Species Detection and Vessel Strike Avoidance: Vessel Crew and Visual Observer Training Requirements	The Lessee must provide Project-specific training to all vessel crew members, Visual Observers, and Trained Lookouts on the identification of sea turtles and marine mammals, vessel strike avoidance and reporting protocols, and the associated regulations for avoiding vessel collisions with protected species. Reference materials for identifying sea turtles and marine mammals must be available aboard all Project vessels. Confirmation of the training and understanding of the requirements must be documented on a training course log sheet, and the Lessee must provide the log sheets to DOI upon request. The Lessee must communicate to all crew members its expectation for them to report sightings of sea turtles and marine mammals to the designated vessel contacts. The Lessee must communicate the process for reporting sea turtles and marine mammals (including live, entangled, and dead individuals) to the designated vessel contact and all crew members. The Lessee must post the reporting instructions including communication channels in highly visible locations aboard all Project vessels.	Marine Mammals, Sea Turtles	BOEM
BA-5	C, O&M, D	Protected Species Detection and Vessel Strike Avoidance: Vessel Observer Requirements	The Lessee must ensure that vessel operators and crew members maintain a vigilant watch for marine mammals and sea turtles, and reduce vessel speed, alter the vessel's course, or stop the vessel as necessary to avoid striking marine mammals or sea turtles. All vessels transiting to and from the Mayflower Wind wind farm must have a trained lookout for NARWs on duty at all times, during which the trained lookout must monitor a vessel strike avoidance zone around the vessel. The trained lookout must maintain a vigilant watch at all times a vessel is underway, and when technically feasible, be capable of monitoring the 500-meter Vessel Strike Avoidance Zone for ESA-listed species and to maintain minimum separation distances. Alternative monitoring technology	Marine Mammals, Sea Turtles	BOEM

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			(e.g., night vision, thermal cameras) must be available to maintain a vigilant watch at night and in any other low visibility conditions. If a vessel is carrying a trained lookout for the purposes of maintaining watch for NARWs, a trained lookout for sea turtles is not required, provided that the trained lookout maintains watch for marine mammals and sea turtles. If the trained lookout is a vessel crew member, the lookout obligations, as noted above, must be that person's designated role and primary responsibility while the vessel is transiting. Vessel personnel must be provided an Atlantic reference guide to help identify marine mammals and sea turtles that may be encountered. Vessel personnel must also be provided material regarding NARW Seasonal Management Areas (SMAs), Dynamic Management Areas (DMAs), and Slow Zones, sightings information, and reporting. All observations must be recorded per reporting requirements. Outside of active watch duty, members of the monitoring team must check NMFS' NARW sightings for the presence of NARWs in the Mayflower Wind wind farm. The trained lookout must check https://seaturtlesightings.org before each trip and report any detections of sea turtles in the vicinity of the planned transit to all vessel operators or captains and lookouts on duty that day. For all vessels operating north of the Virginia/North Carolina border, between June 1 and November 30, the Lessee must have a trained lookout posted on all vessel transits during all phases of the Project to observe for sea turtles. For all vessels operating south of the Virginia/North Carolina border, year-round, the Lessee must have a trained lookout posted on all vessel transits during all phases of the Project to observe for sea turtles. The trained lookout will communicate any sightings in real time to the captain to implement required avoidance measures.		
BA-6	Pre-C, C, O&M, D	Protected Species Detection and Vessel Strike	The Lessee must ensure that whenever multiple Project vessels are operating, any visual detections of ESA-listed species (marine mammals and sea turtles) are communicated in near real time to a	Marine Mammals, Sea Turtles	BOEM

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
		Avoidance: Communication of Threatened and Endangered Species Sightings	third-party Protected Species Observer (PSO), vessel captains, or both associated with other Project vessels.		
BA-7	C, O&M, D	Protected Species Detection and Vessel Strike Avoidance: Vessel Speed Requirements	Vessel captain and crew must maintain a vigilant watch for all protected species and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any listed species. The presence of a single individual at the surface may indicate the presence of submerged animals in the vicinity; therefore, precautionary measures should always be exercised upon the sighting of a single individual. Vessels underway must not divert their course to approach any protected species. During construction, vessels of all sizes will operate port to port at 10 knots or less between November 1 and April 30 and while operating in the lease area, along the export cable route, or transit area to and from ports. Regardless of vessel size, vessel operators must reduce vessel speed to 10 knots (11.5 mph) or less while operating in any Seasonal Management Area (SMA) or visually detected Slow Zones. This requirement does not apply when necessary for the safety of the vessel or crew. Any such events must be reported (see reporting requirements). Otherwise, these speed limits do not apply in areas of Narragansett Bay or Long Island Sound where the presence of NARWs is not expected. The Lessee may only request a waiver from any visually triggered Slow Zone/DMA vessel speed reduction requirements during operations and maintenance, by submitting a vessel strike risk reduction plan that details revised measures and an analysis demonstrating that the measure(s) will provide a level of risk reduction at least equivalent to the vessel speed reduction measure(s) proposed for replacement. The plan included with the request must be provided to NMFS Greater Atlantic Regional Fisheries Office, Protected Resources Division and BOEM at least 90	Marine Mammals, Sea Turtles	BOEM

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			days prior to the date scheduled for the activities for the waiver is requested. The plan must not be implemented unless NMFS and BOEM reach consensus on the appropriateness of the plan. BOEM encourages increased vigilance through voluntary implementation of best management practices to minimize vessel interactions with NARWs, and by voluntarily reducing speeds to 10 knots or less when operating within an acoustically triggered slow zone, and when feasible, avoid Slow Zones.		
BA-8	C, O&M, D	Vessel Strike Avoidance of Large Cetaceans	All vessel operators must check for information regarding mandatory or voluntary ship strike avoidance and daily information regarding NARW sighting locations. These media may include, but are not limited to: NOAA weather radio, U.S. Coast Guard NAVTEX and Channel 16 broadcasts, Notices to Mariners, the Whale Alert app, or WhaleMap website. Information about active SMAs and Slow Zones can be accessed at: https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-vessel-strikes-north-atlantic-right-whales If an ESA-listed whale or large unidentified whale is identified within 500 meters of the forward path of any vessel (90 degrees port to 90 degrees starboard), the vessel operator must immediately implement strike avoidance measures and steer a course away from the whale at 10 knots (18.5 km/hr) or less until the vessel reaches a 500-meter separation distance from the whale. Trained lookouts, visual observers, vessel crew, or PSOs must notify the vessel captain of any whale observed or detected within 1,640 feet (500 meters) of the survey vessel. Upon notification, the vessel captain must immediately implement vessel strike avoidance procedures to maintain a separation distance of 1,640 feet (500 meters) or reduce vessel speed to allow the animal to travel away from the vessel. If a whale is observed but cannot be confirmed as a species other than a NARW, the vessel operator must assume that it is a NARW and execute the required vessel strike avoidance measures to avoid the animal.	Marine Mammals	BOEM, NMFS

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			If an ESA-listed large whale is sighted within 200 meters of the forward path of a vessel, the vessel operator must initiate a full stop by reducing speed and shift the engine to neutral. Engines must not be engaged until the whale has moved outside of the vessel's path and beyond 500 meters. If stationary, the vessel must not engage engines until the ESA-listed large whale has moved beyond 500 meters.		
BA-9	C, O&M, D	Vessel Strike Avoidance of Small Cetaceans and Seals	If pinnipeds or small delphinids of the genera *Delphinus, Lagenorhynchus, Stenella*, or *Tursiops* are visually detected approaching the vessel (i.e., to bow ride) or towed equipment, vessel speed reduction, course alteration, and shutdown are not required. For small cetaceans and seals, all vessels must maintain a minimum separation distance of 164 feet (50 meters) to the maximum extent practicable, except when those animals voluntarily approach the vessel. When marine mammals are sighted while a vessel is underway, the vessel operator must endeavor to avoid violating the 164-foot (50-meter) separation distance by attempting to remain parallel to the animal's course and avoiding excessive speed or abrupt changes in vessel direction until the animal has left the area, except when taking such measures would threaten the safety of the vessel or crew. If marine mammals are sighted within the 164-foot separation distance, the vessel operator must reduce vessel speed and shift the engine to neutral, not engaging the engines until animals are beyond 164 feet (50 meters) from the vessel.	Marine Mammals	BOEM
BA-10	C, O&M, D	Vessel Strike Avoidance of Sea Turtles	The Lessee must slow down to 4 knots if a sea turtle is sighted within 100 meters of the operating vessel's forward path. The vessel operator must then proceed away from the turtle at a speed of 4 knots or less until there is a separation distance of at least 100 meters at which time the vessel may resume normal operations. If a sea turtle is sighted within 50 meters of the forward path of the operating vessel, the vessel operator must shift to neutral when	Sea Turtles	BOEM

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			safe to do so and then proceed away from the individual at a speed of 4 knots or less until there is a separation distance of at least 100 meters, at which time normal vessel operations may be resumed. Between June 1 and November 30, all vessels must avoid transiting through areas of visible jellyfish aggregations or floating vegetation (e.g., sargassum lines or mats). In the event that operational safety prevents avoidance of such areas, vessels must slow to 4 knots while transiting through such areas. All vessel crew members must be briefed on the identification of sea turtles and on regulations and best practices for avoiding vessel collisions. Reference materials must be available aboard all project vessels for identification of sea turtles. The expectation and process for reporting of sea turtles (including live, entangled, and dead individuals) must be clearly communicated and posted in highly visible locations aboard all project vessels, so that there is an expectation for reporting to the designated vessel contact (such as the lookout or the vessel captain), as well as a communication channel and process for crew members to so report.		
BA-11	Pre-C, C, O&M, D	Reporting of All NARW Sightings	The Lessee must immediately report all NARWs observed at any time by PSOs or vessel personnel on any Project vessels, during any Project- related activity, or during vessel transit. Reports must be sent to: BOEM (at renewable_reporting@boem.gov) and BSEE (at protectedspecies@bsee.gov); the NOAA Fisheries 24-hour Stranding Hotline number (866-755-6622); the Coast Guard (via Channel 16); and WhaleAlert (through the WhaleAlert app at http://www.whalealert.org/). The report must include the time, location, and number of animals.	Marine Mammals	BOEM
BA-12	Pre-C, C, O&M, D	Detected or Impacted Protected Species Reporting	The Lessee is responsible for reporting dead or injured protected species, regardless of whether they were observed during operations or due to Project activities. The Lessee must report any potential take, strikes, dead, or injured protected species caused by Project vessels or sighting of an injured or dead marine mammal or sea turtle, regardless of the cause, to the NMFS Greater Atlantic	Marine Mammals, Sea Turtles, ESA Listed Species	BOEM

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			Regional Fisheries Office, Protected Resources Division (at nmfs.gar.incidental-take@noaa.gov), NOAA Fisheries 24-hour Stranding Hotline number (866-755-6622), BOEM (at renewable_reporting@boem.gov), and BSEE (at protectedspecies@bsee.gov). Reporting must be as soon as practicable but no later than 24 hours from the time the incident took place (Detected or Impacted Protected Species Report). Staff responding to the hotline call will provide any instructions for the handling or disposing of any injured or dead protected species by individuals authorized to collect, possess, and transport sea turtles. Reports must include at a minimum: (1) survey name and applicable information (e.g., vessel name, station number); (2) GPS coordinates describing the location of the interaction (in decimal degrees); (3) gear type involved (e.g., bottom trawl, gillnet, longline); (4) soak time, gear configuration and any other pertinent gear information; (5) time and date of the interaction; and (6) identification of the animal to the species level. Additionally, the e-mail would transmit a copy of the NMFS Take Report Form and a link to or acknowledgement that a clear photograph or video of the animal was taken (multiple photographs are suggested, including at least one photograph of the head scutes). If reporting within 24 hours is not possible due to distance from shore or lack of ability to communicate via phone, fax, or email, reports would be submitted as soon as possible; late reports would be submitted with an explanation for the delay. At the end of each survey season, a report would be sent to NMFS that compiles all information on any observations and interactions with ESA-listed species. This report would also contain information on all survey activities that took place during the season including location of gear set, duration of soak/trawl, and total effort. The report on survey activities would be comprehensive of all activities, regardless of whether ESA-listed species were observed.		

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
BA-13	Pre-C, C, O&M, D	Detected or Impacted Dead Non-ESA-Listed Fish	Any occurrence of at least 10 dead non-ESA-listed fish within established shutdown or monitoring zones must also be reported to BOEM (at renewable_reporting@boem.gov) as soon as practicable (taking into account crew and vessel safety), but no later than 24 hours after the sighting.	ESA Listed Species	BOEM
BA-14	C	Wind Turbine Foundations Pile Driving/Impact Hammer Activity: Pile-Driving Time-of-Year Restriction	The Lessee must not conduct any foundation pile-driving activities between December 1 and April 30. Pile driving must not occur in December unless unanticipated delays due to weather or technical problems arise that necessitate extending pile driving through December, and the pile driving is allowed by BOEM in accordance with the following procedures. The Lessee must notify BOEM in writing by September 1 that the Lessee believes that circumstances necessitate pile driving in December. The Lessee must submit to BOEM (at renewable_reporting@boem.gov) for written concurrence an enhanced survey plan for December 1 through December 31 to minimize the risk of exposure of NARWs to pile-driving noise, including noise from daily pre-construction geophysical surveys. BOEM will review the enhanced survey plan and provide comments, if any, on the plan within 30 calendar days of its submittal. The Lessee must resolve all comments on the enhanced survey plan to BOEM's satisfaction and receive BOEM's written concurrence before any pile driving occurs. However, the Lessee may conclusively presume BOEM's concurrence with the enhanced survey plan if BOEM provides no comments on the plan within 90 calendar days of its submittal. The Lessee must also follow the time-of-year enhanced mitigation measures specified in the applicable Biological Opinion. The Lessee must confirm adherence to time-of-year restrictions on pile driving in the pile-driving reports submitted with the FIR.	Marine Mammals, ESA Listed Species	BOEM
BA-15	C	Wind Turbine Foundations Pile	The Lessee must ensure effective visual monitoring in all directions and must not commence foundation pile-driving until at least 1 hour after civil sunrise to minimize the effects of sun glare on	Marine Mammals, ESA Listed Species	BOEM

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
		Driving/Impact Hammer Activity: Pile-Driving Weather, Time, and Visibility Restrictions	visibility. The Lessee must not commence pile-driving within 1.5 hours of civil sunset to minimize the potential for pile-driving to continue after civil sunset when visibility will be impaired. Pile driving may continue after dark only when the installation of the same pile began during daylight (1.5 hours before (civil) sunset), when clearance zones were fully visible for at least 30 minutes (as described under condition, and must proceed for human safety or installation feasibility reasons. The Lessee may commence pile driving only when all clearance zones are fully visible (e.g., not obscured by darkness, rain, fog, or snow) for at least 30 minutes between civil sunrise and civil sunset. The lead PSO must determine when sufficient light exists to allow effective visual monitoring in all cardinal directions. If light is insufficient, the lead PSO must call for a delay until the clearance zone is visible in all directions. If conditions such as darkness, rain, fog, or snow impede the visual detection of marine mammals in the clearance zones, the Lessee must not initiate construction activities until all parts of all clearance zones are fully visible as determined by the lead PSO. The Lessee must develop and implement an Alternative Monitoring Plan in the event that poor visibility conditions unexpectedly arise and pile-driving cannot be stopped if stopping pile driving would pose risks to human safety or pile instability. If necessary, the Lessee must prepare and submit an Alternative Monitoring Plan (AMP) to NMFS (at nmfs.gar.incidental-take@noaa.gov) and BOEM (at renewable_reporting@boem.gov) at least 90 calendar days before beginning any pile-driving activities for the Project. DOI will review the AMP and will provide any comments on the plan within 30 calendar days of its submittal. The Lessee must resolve all comments on the AMP to DOI's satisfaction before implementing the plan. If BOEM provides no comments on the AMP within 90 calendar days of its submittal, then the Lessee may conclusively presume BOEM's concurrence with the plan. The Lessee is encouraged to include additional observers or alternative		

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			monitoring technologies in the AMP such as night vision, thermal, infrared, or PAM technologies if including these will help to ensure that.		
BA-16	Pre-C, C, O&M, D	Wind Turbine Foundations Pile Driving/Impact Hammer Activity: PSO Requirements	The Lessee must use PSOs provided by a third party. PSOs must have no Project- related tasks other than to observe, collect and report data, and communicate with and instruct relevant vessel crew regarding the presence of protected species and mitigation requirements (including brief alerts regarding maritime hazards). PSOs or any PAM operators serving as PSOs must have completed a commercial PSO training program for the Atlantic with an overall examination score of 80 percent or greater. The Lessee must provide training certificates for individual PSOs to BOEM upon request. And PSOs and PAM operators must be approved by NMFS before the start of a survey. Application requirements to become a NMFS-approved PSO for construction activities can be found online or for geological and geophysical surveys by sending an inquiry to nmfs.psoreview@noaa.gov. Specific PSO Requirements include: • At least one PSO must be on duty at all times as the lead PSO or as the PSO monitoring coordinator during pile driving. Total PSO coverage must be adequate to ensure effective monitoring to reliably detect whales and sea turtles in the identified clearance and shutdown zones and execute any pile driving delays or shutdown requirements. • At least one lead PSO must be present on each High Resolution Geophysical (HRG) survey vessel. PSOs on transit vessels must be approved by NMFS but need not be authorized as a lead PSO. Lead PSOs must have prior approval from NMFS as an unconditionally approved PSO. • All PSOs on duty must be clearly listed and the lead PSO identified on daily data logs for each shift.	Marine Mammals, Sea Turtles, ESA Listed Species	BOEM, NMFS

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			• A sufficient number of PSOs, consistent with the Biological Opinion and as prescribed in the final Incidental Take Authorization (ITA), must be deployed to record data in real time and effectively monitor the required clearance, shutdown, or monitoring zone for the Project. • The duties of these PSOs include visual surveys in all directions around a pile; PAM; and continuous monitoring of sighted NARWs. • Where applicable, the number of PSOs deployed must meet the NARW enhanced seasonal monitoring requirements. A PSO must not be on watch for more than 4 consecutive hours and must be granted a break of no fewer than 2 hours after a 4-hour watch.		
BA-17	C	Wind Turbine Foundations Pile Driving/Impact Hammer Activity: Pile-Driving Monitoring Plan Requirements	At least 90 calendar days before beginning the first pile-driving activities for the Project, the Lessee must submit a Pile-Driving Monitoring (PDM) Plan for review to BOEM (at renewable_reporting@boem.gov), BSEE (at OSWsubmittals@bsee.gov), and NMFS. DOI will review the PDM Plan and provide any comments on the plan within 90 calendar days of its submittal. The Lessee must resolve all comments on the PDM Plan to DOI's satisfaction before implementing the plan. If DOI provides no comments on the PDM Plan within 90 calendar days of its submittal, then the Lessee may conclusively presume DOI's concurrence with the plan. The PDM Plan must: • Contain information on the visual and PAM components of the monitoring describing all equipment, procedures, and protocols; • The PAM system must demonstrate a near-real-time capability of detection to the full extent of the 160 dB distance from the pile-driving location; • The PAM plan must include a detection confidence that a vocalization originated from within the clearance and shutdown	Marine Mammals, Sea Turtles	BOEM, NMFS

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			zones to determine that a possible NARW has been detected. Any PAM detection of a NARW within the clearance/shutdown zone surrounding a pile must be treated the same as a visual observation and trigger any required delays in pile installation. • Ensure that the full extent of the harassment distances from piles are monitored for marine mammals and sea turtles to document all potential take; • Include number of PSOs or Native American monitors, or both, that will be used, the platforms or vessels upon which they will be deployed, and contact information for the PSO providers; • Include measures for enhanced monitoring capabilities in the event that poor visibility conditions unexpectedly arise, and pile driving cannot be stopped. • Include an Alternative Monitoring Plan that provides for enhanced monitoring capabilities in the event that poor visibility conditions unexpectedly arise, and pile driving cannot be stopped. The Alternative Monitoring Plan must also include measures for deploying additional observers, using night vision goggles, or using PAM with the goal of ensuring the ability to maintain all clearance and shutdown zones in the event of unexpected poor visibility conditions. Describe a communication plan detailing the chain of command, mode of communication, and decision authority must be described. PSOs as determined by NMFS and BOEM must be used to monitor the area of the clearance and shutdown zones. Seasonal and species-specific clearance and shutdown zones must also be described in the PDM Plan including time-of-year requirements for NARWs. A copy of the approved PDM Plan must be in the possession of the lessee representative, the PSOs, impact-hammer operators, and any other relevant designees operating under the authority of the approved COP and carrying out the requirements on site.		
BA-18	C	Wind Turbine Foundations Pile	The Lessee must implement soft start techniques for all impact pile-driving, both at the beginning of a monopile installation and at	ESA Listed Species	BOEM

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
		Driving/Impact Hammer Activity: Soft Start for Pile Driving	any time following the cessation of impact pile-driving of 30 minutes or longer. The soft start procedure must include a minimum of 20 minutes of 4-6 strikes/minute at 10-20 percent of the maximum hammer energy.		
BA-19	C	Wind Turbine Foundations Pile Driving/Impact Hammer Activity: Pile-Driving Sound Field Verification Plan	The Lessee must ensure that the distance to the Level A harassment and Level B harassment thresholds, sea turtle injury and harassment thresholds, and Atlantic sturgeon injury and harassment thresholds are no larger than those modelled assuming 10 dB re 1 µPa noise attenuation is met by conducting field verification during pile-driving. At least 90 calendar days before beginning the first pile-driving activities for the Project, the Lessee must submit a Sound Field Verification Plan (SFVP) for review and comment to the USACE, BOEM (at renewable_reporting@boem.gov), and NMFS (at nmfs.gar.incidental-take@noaa.gov). DOI will review the SFVP and provide any comments on the plan within 30 calendar days of its submittal. The Lessee must resolve all comments on the SFVP to DOI's satisfaction before implementing the plan. The Lessee may conclusively presume DOI's concurrence with the SFVP if DOI provides no comments on the plan within 90 calendar days of its submittal. The Lessee must execute the SFVP and report the associated findings to BOEM for 3 monopile foundations, or as specified under the corresponding IHA for this action. The Lessee must conduct additional field measurements if it installs piles with a diameter greater than the initial piles, if it uses a greater hammer size or energy, or if it measures any additional foundations to support any request to decrease the distances specified for the clearance and shutdown zones. The Lessee must implement the SFVP requirements for verification of noise attenuation for at least 3 foundations for BOEM, in consultation with NMFS, to consider reducing zone distances. The Lessee must ensure that locations identified in the SFVP for each pile type are representative of other piles of that type to be installed and that the results are representative for predicting actual installation noise propagation	Sea Turtles, ESA Listed Species	BOEM, NMFS, USACE

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			for subsequent piles. The SFVP must describe how the effectiveness of the sound attenuation methodology will be evaluated. The SFVP must be sufficient to document impacts in Level B harassment zones for marine mammals and injury and behavioral disturbance zones for sea turtles and Atlantic sturgeon.		
BA-20	C	Wind Turbine Foundations Pile Driving/Impact Hammer Activity: Adaptive Refinement of Clearance Zones, Shutdown Zones, and Monitoring Protocols	The Lessee must reduce any unanticipated impacts on marine mammals and sea turtles by adjusting pile-driving monitoring protocols for clearance and shutdown zones, taking into account weekly monitoring results. Any proposed changes to monitoring protocols must be concurred with by DOI and NMFS before those protocols are implemented. Any reduction in the size of the clearance and shutdown zones for each foundation type must be based on at least 3 measurements submitted to BOEM for review. For each 1,500 meters that a clearance or shutdown zone is increased based on the results from SFVP, the Lessee must deploy additional platforms and must deploy additional observers on those platforms. Should the shutdown zone for sei, fin, humpback, and sperm whales be decreased, it must not be less than 1,000 meters and the full extent of the Level B harassment distance must be monitored. Decreases in the distance of the clearance or shutdown zones for NARW and sea turtles are not permitted.	Marine Mammals, Sea Turtles	BOEM, NMFS
BA-21	C	Wind Turbine Foundations Pile Driving/Impact Hammer Activity: Pile-Driving Clearance Zones (No-go Zones) for Sea Turtles	The Lessee must minimize the exposure of ESA-listed sea turtles to noise that may result in injury or behavioral disturbance during pile-driving operations by tasking the PSOs to establish a clearance and shutdown zone for sea turtles during all pile-driving activities that is no less than 1,640 feet (500 meters) between 60 minutes before pile-driving activities, during pile driving and 30 minutes post-completion of pile-driving activity. Adherence to the 1,640-foot (500-meter) clearance and shutdown zones must be confirmed in the PSO reports.	Sea Turtles	BOEM
BA-22	C	Wind Turbine Foundations Pile Driving/Impact	The Lessee must use visual monitoring by at least two PSOs and PAM during impact pile-driving activities following the standard protocols and data collection requirements. The Lessee must	Marine Mammals	BOEM

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
		Hammer Activity: Impact Pile-Driving Clearance Zones (No-go Zones) for Marine Mammals	ensure that at least two PSOs are on duty on the impact pile driving platform and at least two PSO are on duty on a dedicated PSO vessel and establish the following clearance zones for NARWs to be used between 60 minutes before pile-driving activities and 30 minutes post-completion of pile-driving activity: • The Lessee must establish the following clearance zones using visual monitoring for impact pile driving: 1.37 miles (2.2 kilometers) for large whales other than NARW (including blue, fin, sei, minke, humpback, and sperm whales); 1,476 feet (450 meters) for harbor porpoises; 492 feet (150 meters) for seals; and 328 feet (100 meters) for dolphins and pilot whales. • The Lessee must also establish a PAM clearance zone of 3.1 miles (5 kilometers) and a PAM shutdown zone of 1.23 miles (2 kilometers) for NARWs. • Impact pile driving activity must be delayed when a NARW is visually observed by PSOs at any distance from the pile. Impact pile driving for all foundations must be delayed upon a confirmed PAM detection of a NARW, if the detection is confirmed to have been located within the 5 kilometer clearance zone. Any unidentified whale sighted by a PSO within 6,562 feet (2,000 meters) of the pile must be treated as if it were a NARW and trigger any required pre-construction delay or shutdowns during pile installation. • No pile driving may begin unless all clearance zones have been free of NARW for 30 minutes immediately before pile driving. The Lessee must deploy a real-time PAM system designed and verified to maintain a PAM clearance zone of 3.1 miles (5 kilometers) and a shutdown zone of 1.23 miles (2 kilometers) for all monopile foundations. • Real-time PAM must begin at least 60 minutes before pile driving to monitor a 3.1 mile (5 kilometer) clearance zone. • The real-time PAM system must be configured to ensure that the PAM operator is able to review acoustic detections within		

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			approximately 15 minutes of the original detection in order to verify whether a NARW has been detected. Impact pile driving must be suspended upon a confirmed PAM NARW vocalization within the 1.2 mile (2 kilometer) PAM shutdown Zone detected and identified as a NARW. The detection will be treated as a NARW detection for mitigation purposes.		
BA-23	C	Wind Turbine Foundations Pile Driving/Impact Hammer Activity: Vibratory Pile-Driving Clearance Zones (No-go Zones) for ESA-listed Species and Marine Mammals	The Lessee must use visual monitoring by at least two PSOs during vibratory pile-driving activities. The Lessee must ensure that PSOs are on a dedicated PSO vessel and establish the following clearance zones for NARWs to be used between 30 minutes before pile-driving activities and 30 minutes post-completion of pile-driving activity: 4,921 feet (1,500 meters) for all Mysticete whales and sperm whales; 1,640 feet (500 meters) for sea turtles, 492 feet (150 meters) for seals, 328 feet (100 meters) for harbor porpoises; and 164 feet (50 meters) for dolphins and pilot whales. • Vibratory pile driving may begin only after PSOs have confirmed all clearance zones are clear of marine mammals. Vibratory pile driving must be suspended if a marine mammal is visually observed by PSOs within the shutdown zone in the above table. • At all times of the year, any unidentified whale sighted by a PSO within 6,562 feet (2,000 meters) of the pile must be treated as if it were a NARW and trigger any required pre-construction delay or shutdowns during pile installation. Vibratory pile driving may begin only if all clearance zones are fully visible (e.g., not obscured by darkness, rain, fog, or snow) for at least 30 minutes as determined by the lead PSO. If conditions such as darkness, rain, fog, or snow prevent the visual detection of marine mammals in the clearance zones, construction activities must not begin until the full extent of all clearance zones are fully visible as determined by the lead PSO.	Marine Mammals, ESA Listed Species	BOEM
BA-24	C	Wind Turbine Foundations Pile Driving/Impact	The Lessee must apply noise reduction technologies during all impact pile driving to minimize marine species noise exposure. The ranges measured to the Level B harassment threshold when noise	ESA Listed Species	BOEM

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
		Hammer Activity: Noise Mitigation for Impact Pile Driving	mitigation devices are in use must be consistent with or less than the ranges modeled assuming 10 dB attenuation, determined via sound field verification of the modeled isopleth distances (e.g., Level B harassment distances). If a bubble curtain is used, the following requirements apply: • Bubble curtains must distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column. • The lowest bubble ring must be in contact with the seafloor for the full circumference of the ring, and the weights attached to the bottom ring must ensure 100 percent seafloor contact. • No parts of the ring or other objects may prevent full seafloor contact of the lowest bubble ring. • The Lessee must train personnel in the proper balancing of air flow to the bubblers. The Lessee must submit an inspection and performance report to DOI within 72 hours following the performance test. Any modifications to attenuation devices to meet the performance standards must occur before impact driving occurs and maintenance or modifications completed must be included in the report. The Lessee must ensure PSOs follow all pile driving reporting instructions and requirements.		
BA-25	C	Wind Turbine Foundations Pile Driving/Impact Hammer Activity: Pile-Driving Noise Reporting and Clearance or Shutdown Zone Adjustment	The Lessee must measure pile-driving noise in the field for at least three monopile foundations and submit initial results to NMFS, USACE, and BOEM (at renewable_reporting@boem.gov) as soon as they are available. BOEM will discuss the results as soon as feasible. The Lessee may request modification of the clearance and shutdown zones based on these results but must meet or exceed minimum distances for threatened and endangered species specified in the Biological Opinion (e.g., 1,000 meters for large whales and 500 meters for sea turtles). If the field measurements indicate that the isopleths for noise exposure are larger than those considered in the approved COP, the Lessee must coordinate with BOEM, BSEE, NMFS, and USACE to implement additional sound	ESA Listed Species	BOEM, BSEE, NMFS, and USACE

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			attenuation measures or larger clearance or shutdown zones before driving any additional piles. NMFS does not anticipate considering any reductions in the clearance or shutdown zones for NARWs.		
BA-26	C	Wind Turbine Foundations Pile Driving/Impact Hammer Activity: Pile-Driving Work Within a Slow Zone	If a visually-triggered NARW Slow Zone overlaps with the NARW Shutdown Zone, the PAM system detection must extend to the largest practicable detection zone, and any clearance and shutdown zones that may have been adjusted (i.e., increased in size) as a result of sound field verification must be no less than 2 km. PSOs must treat any PAM detection of NARWs in the clearance and shutdown zones the same as a visual detection, and call for the required delays or shutdowns in pile installation.	Marine Mammals	BOEM
BA-27	C	Wind Turbine Foundations Pile Driving/Impact Hammer Activity: Submittal of Raw Field Data Collected for Marine Mammals and Sea Turtles in the Pile-Driving Shutdown Zone	Within 24 hours of detection, the Lessee must report to BOEM (at renewable_reporting@boem.gov) and BSEE (at protectedspecies@bsee.gov) the sighting of any marine mammal or sea turtle in the shutdown zone that results in a shutdown or a power-down. In addition, PSOs must submit the raw data collected in the field and daily report forms including the date, time, species, pile identification number, GPS coordinates, time and distance of the animal when sighted, time the shutdown or power-down occurred, behavior of the animal, direction of travel, time the animal left the shutdown zone, time the pile driver was restarted or powered back up, and any photographs.	Marine Mammals, Sea Turtles, ESA Listed Species	BOEM
BA-28	C	Wind Turbine Foundations Pile Driving/Impact Hammer Activity: Weekly and Final Pile-Driving Reports	The Lessee must submit weekly PSO and PAM monitoring reports to DOI and NMFS during pile-driving. Weekly reports must document the daily start and stop times of all pile-driving, the daily start and stop times of associated observation periods by the PSOs, details on the deployment of PSOs, and all detections of marine mammals and sea turtles. The weekly reports must be submitted to BOEM (at renewable_reporting@boem.gov), BSEE (at OSWsubmittals@bsee.gov) and NMFS Greater Atlantic Regional Fisheries Office, Protected Resources Division (at nmfs.gar.incidental- take@noaa.gov) every Wednesday during	ESA Listed Species	BOEM, BSEE, NMFS

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			construction for the previous week (Sunday through Saturday) of monitoring of pile-driving activity. Weekly monitoring reports must include: • Summaries of pile-driving activities and piles installed including, start and stop times, pile locations, and PSO coverage; • Vessel operations (including port departures, number of vessels, type of vessel(s), and route); • All protected species sightings; • Vessel strike-avoidance measures taken; and any equipment shutdowns or takes that may have occurred. Weekly reports can consist of raw data. Required data and reports provided to DOI may be archived, analyzed, published, and disseminated by BOEM. PSO data must be reported weekly (Sunday through Saturday) from the start of visual and/or PAM efforts during pile-driving activities, and every week thereafter until the final reporting period upon conclusion of pile-driving activity. Any editing, review, and quality assurance checks must be completed only by the PSO provider prior to submission to NMFS and DOI. The Lessee must submit to DOI at renewable_reporting@boem.gov and OSWsubmittals@bsee.gov a final summary report of PSO monitoring 90 days following the completion of pile driving.		
BA-29	Pre-C, C, O&M, D	Marine Debris Awareness and Elimination: Marine Debris Awareness Training	The Lessee must ensure that vessel operators, employees, and contractors engaged in offshore activities pursuant to the approved COP complete marine trash and debris awareness training annually. The training consists of two parts: (1) viewing a marine trash and debris training video or slide show (described below); and (2) receiving an explanation from management personnel that emphasizes their commitment to the requirements. The marine trash and debris training videos, training slide packs, and other marine debris related educational material may be obtained at https://www.bsee.gov/debris or by contacting BSEE. The training videos, slides, and related material may be downloaded directly from the website. Operators engaged in marine survey activities	ESA Listed Species	BOEM, BSEE

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			must continue to develop and use a marine trash and debris awareness training and certification process that reasonably assures that their employees and contractors are in fact trained. The training process would include the following elements: • Viewing of either a video or slide show by the personnel specified above; • An explanation from management personnel that emphasizes their commitment to the requirements; • Attendance measures (initial and annual); and • Recordkeeping and the availability of records for inspection by DOI. By January 31 of each year, the Lessee would submit to DOI an annual report that describes its marine trash and debris awareness training process and certifies that the training process has been followed for the previous calendar year. The Lessee would send the reports via email to BOEM (at renewable_reporting@boem.gov) and to BSEE (at OSWsubmittals@bsee.gov).		
BA-30	Pre-C, C, O&M, D	Marine Debris Awareness and Elimination: Marine Debris Reporting	The Lessee must report to DOI (using the email address listed on DOI's most recent incident reporting guidance) all lost or discarded marine trash and debris. This report must be made monthly and submitted no later than the fifth day of the following month. The Lessee is not required to submit a report for those months in which no marine trash and debris was lost or discarded. In addition, the Lessee must submit a report within 48 hours of the incident (48-hour Report) if the marine trash or debris could: (a) cause undue harm or damage to natural resources, including their physical, atmospheric, and biological components, with particular attention to marine trash or debris that could entangle or be ingested by marine protected species; or (b) significantly interfere with OCS uses (e.g., because the marine trash or debris is likely to snag or damage fishing equipment or presents a hazard to navigation).	ESA Listed Species	BOEM, BSEE

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			The information in the 48-hour report must be the same as that listed for the monthly report, but only for the incident that triggered the 48-hour Report. The Lessee must report to DOI via email to BOEM (at renewable_reporting@boem.gov) and BSEE (at OSWsubmittals@bsee.gov) if the object is recovered and, as applicable, describe any substantial variance from the activities described in the Recovery Plan that were required during the recovery efforts. The Lessee must include and address information on unrecovered marine trash and debris in the description of the site clearance activities provided in the decommissioning application required under 30 C.F.R. § 585.906. Materials, equipment, tools, containers, and other items used in OCS activities which are of such shape or properly secured to prevent loss overboard. All markings must clearly identify the owner and must be durable enough to resist the effects of the environmental conditions to which they may be exposed.		
BA-31	O&M, D	Marine Debris: Periodic Underwater Surveys, Reporting of Monofilament and Other Fishing Gear Around WTG Foundations	The Lessee must monitor indirect impacts associated with charter and recreational fishing gear lost from expected increases in fishing around WTG foundations by surveying at least 10 different WTGs in the Mayflower Wind lease area annually. Survey design and effort may be modified based upon previous survey results with review and concurrence by DOI. The Lessee must conduct surveys by remotely operated vehicles, divers, or other means to determine the frequency and locations of marine debris. The Lessee must report the results of the surveys to BOEM (at renewable_reporting@boem.gov) and BSEE (at OSWsubmittals@bsee.gov) in an annual report, submitted by April 30 for the preceding calendar year. Reports must be submitted in Word format. Photographic and videographic materials will be provided on a drive in a lossless format such as TIFF or Motion JPEG 2000. Reports must include daily survey reports that include the survey date, contact information of the operator, location, and pile identification number, photographic and/or video documentation	ESA Listed Species	BOEM, BSEE

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			of the survey and debris encountered, any animals sighted, and the disposition of any located debris (i.e., removed or left in place). Required data and reports may be archived, analyzed, published, and disseminated by BOEM.		
BA-32	C	Establishment of Shutdown Zones for Vibratory Pile Driving	Ensure that impact pile-driving operations are carried out in a way that minimizes the exposure of listed sea turtles to noise that may result in injury or behavioral disturbance, PSOs will establish a 1,640-foot (500-meter) shutdown zone for all pile-driving activities. Adherence to the 1,640-foot (500-meter) shutdown zones must be reflected in the PSO reports. Any visual detection of sea turtles the 500-meter shutdown zones must trigger the required shutdown in pile installation. Upon a visual detection of a sea turtles entering or within the shutdown zone during pile-driving, Mayflower Wind must shut down the pile-driving hammer (unless activities must proceed for human safety or for concerns of structural failure) from when the PSO observes, until: 1) The lead PSO verifies that the animal(s) voluntarily left and headed away from the clearance area; or 2) 30 minutes have elapsed without re-detection of the sea turtle(s) by the lead PSO Additionally, if shutdown is called for but Mayflower Wind determines shutdown is not technically feasible due to human safety concerns or to maintain installation feasibility, reduced hammer energy must be implemented, when the lead engineer determines it is technically feasible to do so.	Sea Turtles	BOEM
BA-33	C, O&M, D	Sea turtle disentanglement	Vessels deploying fixed gear (e.g., pots/traps) must have adequate disentanglement equipment onboard, such as a (i.e., knife and boathook) onboard. Any disentanglement must occur consistent with the Northeast Atlantic Coast STDN Disentanglement Guidelines at https://www.reginfo.gov/public/do/DownloadDocument?objectID=102486501 and the procedures described in "Careful Release Protocols for Sea Turtle Release with Minimal Injury" (NOAA Technical Memorandum 580; https://repository.library.noaa.gov/view/noaa/3773).	Sea Turtles, ESA Listed Species	BOEM, BSEE, NMFS

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
BA-34	C, O&M, D	Sea turtle/Atlantic sturgeon identification and data collection	Any sea turtles or Atlantic sturgeon caught or retrieved in any fisheries survey gear must first be identified to species or species group. Each ESA-listed species caught or retrieved must then be documented using appropriate equipment and data collection forms. Biological data collection, sample collection, and tagging activities must be conducted as outlined below. Live, uninjured animals must be returned to the water as quickly as possible after completing the required handling and documentation. a. The Sturgeon and Sea Turtle Take Standard Operating Procedures must be followed (https://media.fisheries.noaa.gov/2021-11/ Sturgeon%20%26%20Sea%20Turtle%20Take%20SOPs_external_11032021.pdf). b. Survey vessels must have a passive integrated transponder (PIT) tag reader onboard capable of reading 134.2 kHz and 125 kHz encrypted tags (e.g., Biomark GPR Plus Handheld PIT Tag Reader). This reader must be used to scan any captured sea turtles and sturgeon for tags, and any tags found must be recorded on the take reporting form (see below). c. Genetic samples must be taken from all captured Atlantic sturgeon (alive or dead) to allow for identification of the DPS of origin of captured individuals and tracking of the amount of incidental take. This must be done in accordance with the Procedures for Obtaining Sturgeon Fin Clips (https://media.fisheries.noaa.gov/dam-migration/ sturgeon_genetics_sampling_revised_june_2019.pdf). i. Fin clips must be sent to a NMFS-approved laboratory capable of performing genetic analysis and assignment to DPS of origin. Mayflower Wind must cover all reasonable costs of the genetic analysis. Arrangements for shipping and analysis must be made before samples are submitted and confirmed in writing to NMFS within 60 days of the receipt of the Project BiOp with ITS. Results of genetic analyses,	Sea Turtles, ESA Listed Species	BOEM, BSEE, NMFS

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			including assigned DPS of origin must be submitted to NMFS within 6 months of the sample collection. ii. Subsamples of all fin clips and accompanying metadata forms must be held and submitted to a tissue repository (e.g., the Atlantic Coast Sturgeon Tissue Research Repository) on a quarterly basis. The Sturgeon Genetic Sample Submission Form is available for download at: https://media.fisheries.noaa.gov/2021-02/Sturgeon%20Genetic%20Sample%20Submission%20sheet%20for%20S7_v1.1_Form%20to%20Use.xlsx?nullhttps://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-take-reporting-programmatics-greater-atlantic. d. All captured sea turtles and Atlantic sturgeon must be documented with required measurements and photographs. The animal's condition and any marks or injuries must be described. This information must be entered as part of the record for each incidental take. Particularly, a NMFS Take Report Form must be filled out for each individual sturgeon and sea turtle (download at: https://media.fisheries.noaa.gov/2021-07/Take%20Report%20Form%2007162021.pdf?null) and submitted to NMFS as described in the take notification measure below.		
BA-35	C, O&M, D	Sea turtle/ Atlantic sturgeon handling and resuscitation guidelines	Any sea turtles or Atlantic sturgeon caught and retrieved in gear used in fisheries surveys must be handled and resuscitated (if unresponsive) according to established protocols provided at-sea conditions are safe for those handling and resuscitating the animal(s) to do so. Specifically: a. Priority must be given to the handling and resuscitation of any sea turtles or sturgeon that are captured in the gear being used. Handling times for these species must be minimized, and if possible, kept to 15 minutes or less to limit the amount of stress placed on the animals.	Sea Turtles, ESA Listed Species	BOEM, BSEE, NMFS

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			b. All survey vessels must have onboard copies of the sea turtle handling and resuscitation requirements (found at 50 CFR 223.206(d)(1)) before begging any on-water activity (download at: https://media.fisheries.noaa.gov/dam-migration/sea_turtle_handling_and_resuscitation_measures.pdf). These handling and resuscitation procedures must be carried out any time a sea turtle is incidentally captured and brought onboard the vessel during survey activities. c. If any sea turtles that appear injured, sick, or distressed, are caught and retrieved in fisheries survey gear, survey staff must immediately contact the Greater Atlantic Region Marine Animal Hotline at 866-755-6622 for further instructions and guidance on handling the animal, and potential coordination of transfer to a rehabilitation facility. If survey staff are unable to contact the hotline (e.g., due to distance from shore or lack of ability to communicate via phone), the USCG must be contacted via VHF marine radio on Channel 16. If required, hard-shelled sea turtles (i.e., non-leatherbacks) may be held on board for up to 24 hours and managed in accordance with handling instructions provided by the Hotline before transfer to a rehabilitation facility. d. Survey staff must attempt resuscitate any Atlantic sturgeon that are unresponsive or comatose by providing a running source of water over the gills as described in the Sturgeon Resuscitation Guidelines (https://media.fisheries.noaa.gov/dam-migration/sturgeon_resuscitation_card_06122020_508.pdf). e. If appropriate cold storage facilities are available on the survey vessel, any dead sea turtle or Atlantic sturgeon must be retained on board the survey vessel for transfer to an appropriately permitted partner or facility on shore unless NMFS indicates that storage is unnecessary, or storage is not safe. f. Any live sea turtles or Atlantic sturgeon caught and retrieved in gear used in any fisheries survey must ultimately be released		

#	Proposed Project Phase [a]	Mitigation & Monitoring Measures	Description	Resource Area Mitigated	Anticipated Enforcing Agency
			according to established protocols including safety considerations.		
BA-36	C, O&M, D	Lost Survey Gear	If any survey gear is lost, all reasonable efforts that do not compromise human safety would be undertaken to recover the gear. All lost gear would be reported to NMFS (nmfs.gar.incidental-take@noaa.gov) and BSEE (OSWsubmittals@bsee.gov) within 24 hours of the documented time of missing or lost gear. This report would include information on any markings on the gear and any efforts undertaken or planned to recover the gear.	ESA Listed Species	NMFS, BSEE

[a] Pre-C = prior to construction; C = construction; O&M = operations and maintenance; D = Decommissioning

AMP = alternative monitoring plan; ASLF = ancient submerged landform feature; BiOP = biological opinion; BOEM = Bureau of Ocean Energy Management; BSEE = Bureau of Safety and Environmental Enforcement; CFR = code of federal regulations; COP = Construction and Operations Plan; dB = decibel; DMA = Dynamic Management Area; DOI = Department of the Interior; DPS = distinct population segment; ESA = Endangered Species Act; GPR = global pocket reader; GPS = global positioning system; HPTP = Historic Property Treatment Plan; HVAC = high-voltage alternating current; HVDC = high-voltage direct current; IHA = Incidental Harassment Authorization; IOOS = Integrated Ocean Observing System; ITA = incidental take authorization; ITS = incidental take statement; JPEG = joint photographic experts group; km = kilometer; km/hr = kilometer per hour; LOA = Letter of Authorization; mph = mile per hour; MMPA = Marine Mammal Protection Act; NARW = North Atlantic right whale; NAVTEX = Navigational Telex; NCEI = National Centers for Environmental Information; NMFS = National Marine Fisheries Service; NOAA = National Oceanic and Atmospheric Administration; NRHP = National Register of Historic Places; OCS = Outer Continental Shelf; OSP = offshore substation platform; PAM = passive acoustic monitoring; PDM = pile-driving monitoring; PIT = passive integrated transponder; PSO = protected species observer; SFVP = Sound Field Verification Plan; SMA = Seasonal Management Area; STDN = Sea Turtle Disentanglement Network; TIFF = tag image file format; USACE = United States Army Corp of Engineers; USCG = United States Coast Guard; USFWS = United States Fish and Wildlife Service; VHF = Very High Frequency; WTG = wind turbine generator

References Cited

Mayflower Wind Energy, LLC (Mayflower Wind). 2022. Mayflower Wind Construction and Operations Plan. Available: https://www.boem.gov/renewable-energy/state-activities/mayflower-wind.

Attachment G-1: Mayflower Wind Request for Incidental Take Regulations Mitigation Measures

This attachment contains the mitigation measures proposed by Mayflower Wind in its Request for Incidental Take Regulations application. BOEM anticipates that BOEM, BSEE, and NMFS would be the enforcing agencies for these measures.

11 Mitigation Measures

The monitoring and mitigation methods described below are intended to reduce or eliminate exposure of marine mammals to underwater sound levels that could constitute “take” under the MMPA. Many of the monitoring and mitigation methods are applicable across all Project activities while others will be specific to the following activities:

- WTG and OSP foundation installation using impact pile driving,
- WTG and OSP foundation installation using vibratory pile driving,
- High resolution geophysical (HRG) and remotely operated vehicle (ROV) surveys, and
- UXO detonation.

11.1 Standard Mitigation and Monitoring Requirements for all Project Activities

11.1.1 Protected Species Observer (PSO) and Acoustic Protected Species Observer (APSO) Experience and Responsibilities

11.1.1.1 Observer Qualifications and Training

- All PSOs and APSOs will have met NMFS and BOEM training and experience requirements (including a NMFS-approved PSO training course).
- PSOs and APSOs will be employed by a third-party observer provider.
- Briefings between construction supervisors and crews and the PSO/APSO team will be held prior to the start of all Project activities as well as when new personnel join the vessel(s).
- The PSO team and the APSO team will each have a lead observer (Lead PSO and Lead APSO) with prior experience working as a PSO and/or APSO in the northwestern Atlantic Ocean on similar projects.
- APSOs responsible for determining if an acoustic detection originated from a NARW will be trained in identification of mysticete vocalizations.

11.1.1.2 *Responsibilities and Authorities of PSOs and APSOs*

- PSOs will not have tasks other than to conduct observational effort, collect data, and communicate with and instruct relevant vessel crew with regard to the presence of marine mammals and mitigation requirements.
- Any PSO or APSO on duty will have authority to delay the start of operations or to call for a shutdown based on their observations or acoustic detections.
- A clear line and method of communication between the PSOs and APSOs will be established and maintained to ensure mitigation measures are conveyed without delay.

11.1.2 Visual Monitoring

- PSOs and APSOs will be on watch for a maximum of four consecutive hours followed by a break of at least two hours between watches and will conduct a maximum of 12 hours of observation per 24-hour period.
- Each PSO and APSO will be provided with one 8-hour break per 24-hour period to sleep.
- Observations will be conducted (or electronic monitoring equipment installed) from the best safe vantage point(s) on the vessel or base of operations to ensure visibility of the shutdown zones.
- Mayflower Wind is exploring opportunities to use currently available technologies to conduct monitoring using PSOs and APSOs who may be stationed in locations other than offshore vessels (e.g., onshore).
    - Onshore monitoring may include the use of imagery or data transmitted in real time (or very near real time) from sensors located offshore. For example, EO, IR, or PAM sensors may be located on a variety of potential platforms.
- When conducting observations during Project activities, PSOs will scan systematically with the unaided eye, high-magnification (25 x 150 mm) binoculars, and/or standard handheld (7 x 50 mm) binoculars or other electronic methods to search continuously for marine mammals during all observational periods.

    - When monitoring at night, or in low visibility conditions, PSOs will monitor for marine mammals and other protected species using night-vision devices with thermal clip-ons, a hand-held spotlight, and/or a mounted thermal camera system or other electronic methods.
    - PSOs will watch for and record all marine mammal sightings regardless of the distance from the observer and/or sound source.
    - Distances to observed animals will be estimated with range finders, reticle binoculars, clinometers when possible, or other electronic methods and based on the best estimate of the PSO when necessary.
- PSOs will record watch effort and environmental conditions on a routine basis.
- Members of the PSO and/or APSO team will consult with NMFS' NARW reporting system for the presence of NARWs in the Project Area.

11.1.3 Visual Monitoring During Vessel Transit

- PSOs and/or trained vessel crew will observe for marine mammals at all times when vessels are transiting to/from and within the Project Area and port.
- PSOs and/or vessel crew will request vessel-strike avoidance measures if necessary (Section 11.1.5).

11.1.4 Acoustic Monitoring

Acoustic monitoring and mitigation measures stated below will be followed during WTG and OSP foundation installation requiring pile driving only.

11.1.4.1 Passive Acoustic Monitoring Methods

- APSOs will rotate on a 4-hour basis when monitoring from a 24-hour operation vessel or base of operations.
- A real-time PAM system will be used to supplement visual monitoring during all pre-start clearance, piling, and post-piling monitoring periods.
- Use of PAM will allow initiation of pile driving when visual observation of the entire pre-start clearance zone is not possible due to poor visibility, including darkness during nighttime operations.
- There will be one APSO on duty during both daytime and nighttime/low visibility monitoring.
- APSOs will immediately communicate all acoustic detections of marine mammals to PSOs performing visual observations including any determination regarding species identification, distance, and bearing of the marine mammal.
- The PAM system will not be located on the pile installation vessel to reduce masking of marine mammal sounds.
- A detailed description of the real-time PAM system will be developed and submitted to NMFS and BOEM for review and approval.

11.1.4.2 *Sound Source Verification*

A detailed plan for Sound Source Verification (SSV) will be developed and submitted to NMFS prior to planned start of pile driving and UXO detonations.

- Pile Driving

    - Measurement of each pile type (monopiles and/or piled jackets) to be installed to determine the sound levels produced and effectiveness of the NAS(s).
    - Procedures for how measurement results will be used to justify any requested changes to planned monitoring and mitigation distances.
    - Measurements of received levels will be taken at various distances and azimuths relative to the pile location designed to gather data on sounds produced during installation scenarios specific to the Project (Figure 16). These measurements are designed to assess whether or not the distances to the Level A and Level B harassment isopleths and/or other mitigation action distances align with the distances modelled.
        - SSV will include at least one recorder in each of the four azimuths around the pile (to capture potential directivity of the sound field). Additionally, there will be 3-4 recorders along one azimuth to capture the propagation loss in at least one direction to allow assessment of the modelled Level A and Level B isopleths.
- <u>UXO Detonation</u>
    - Measurements will be made of at least one detonation for each charge weight class that must be detonated using the method described above for pile driving.

○

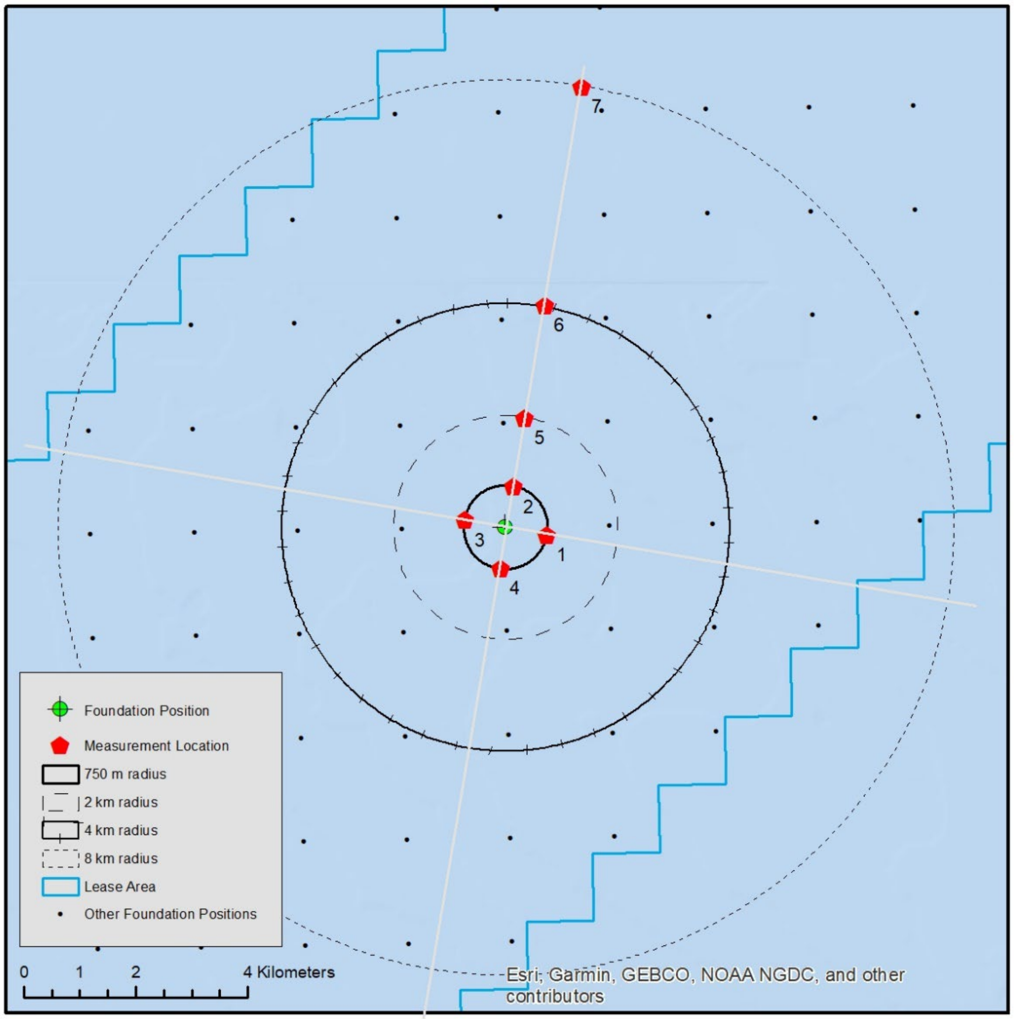

Figure 16. Conceptual design of sound source verification measurement locations relative to a foundation installation.

11.1.5 Vessel Strike Avoidance

All vessels, including those transiting to and from local ports and the Project Area, will follow the vessel strike avoidance measures outlined below, except in cases where following these requirements would put the safety of the vessel or crew at risk.

11.1.5.1 General Measures

- Captain, first mate, and/or designated vessel personnel working offshore will receive training on marine mammal awareness and vessel strike avoidance measures.
- A minimum of one PSO or trained vessel crew member will be present on all vessels when transiting.
- Observers will maintain a vigilant watch for all marine mammals and slow down, change course, slow down or stop vessels to avoid striking protected species.

- Observers will monitor the NMFS NARW reporting systems from November 1 through May 30 and whenever a dynamic management area (DMA) is established in the operational area.

11.1.5.2 Separation Distances

- Vessels will maintain, to the extent practicable, separation distances of:
    - >500 m distance from any sighted NARW or an unidentified large marine mammal,
    - >100 m from sperm whales and all other baleen whales,
    - >50 m from all other marine mammals, with the exception of animals approaching the vessel (e.g., delphinids and pinnipeds), in which case the vessel operator must avoid excessive speed or abrupt changes in direction.

11.1.5.3 Actions given observed marine mammal

- If underway, vessels will steer a course away from any NARW at 10 kts or less until the 500 m minimum separation distance has been established:
    - If a NARW comes within 100 m, then the vessel will reduce speed and shift the engines into neutral, if safe to do so. The vessel will not engage engines until the NARW has moved beyond 100 m in which case any vessel will steer a course away from the animal at 10 kts or less until the 500 m minimum separation distance has been established.
    - If the vessel is stationary, the vessel will not engage engines until the NARW has moved beyond 100 m in which case any vessel will steer a course away from the animal at 10 kts or less until the 500 m minimum separation distance has been established.
- If a vessel comes within 100 m of a non-NARW whale:
    - If underway, the vessel must attempt to remain parallel to the animal's course, reduce speed and shift the engine to neutral, if safe to do so, and must not engage the engines until the whale (e.g., large whale and/or ESA-listed whales besides NARW) has moved beyond 100 m.
    - If stationary, the vessel must not engage engines until the whale has moved beyond 100 m.
    - If underway, vessels must not divert to approach any small cetacean, seal, sea turtle, or giant manta ray.
- All sightings of dead or injured marine mammals or sea turtles will be reported within 24 hours (Section 11.1.7).

11.1.5.4 Speed Reduction

- Vessels will comply with NMFS regulations and speed restrictions (≤10 kts) in NARW management areas including SMAs and active DMAs during migratory and calving periods from November 1 to April 30, except for CTVs.
- Operating vessels, except CTVs, will travel at speeds ≤10 kts in any DMA.
- All vessel speeds will be reduced to ≤10 kts when mother/calf pairs, pods, or large assemblages of marine mammals are observed.
- To facilitate the safe transit of CTVs at >10 kts in SMAs and DMAs Mayflower Wind will implement (or participate in a joint program, if developed) a PAM system designed to detect NARW within the transit corridor and additional visual monitoring measures as described

below. A Vessel Strike Avoidance Plan that provides a more detailed description of the equipment and methods to conduct the monitoring summarized here will be provided to NMFS at least 90-days prior to commencement of vessel movements associated with the activities covered by the requested incidental take regulations.

- Acoustic Monitoring
    - A PAM system consisting of near real-time bottom mounted and/or mobile acoustic monitoring systems will be installed such that NARW and other large whale calls made in or near the corridor can be detected and transmitted to the transiting vessel (either directly or through an operations base).
    - The detections will be used to determine areas along the transit corridor where the CTV would be allowed to travel at >10 kts if no detections had occurred in the previous 12 hrs, or required to transit at <10 kts if detections had been made in the previous 12 hrs.
- Visual Monitoring
    - All CTVs operating at >10 kts will have a dedicated observer on watch (NMFS-approved PSO or trained crew member with no other duties) with standard equipment for daytime monitoring (handheld binoculars) and alternative equipment for low visibility conditions (night-vision devices and/or IR sensor). The dedicated observers will be trained in detection and identification of protected species, vessel strike minimization procedures and how and when to communicate with the vessel operator.
- If the PAM system temporarily stops working the following procedures will be followed.
    - CTVs will transit at <10 kts in all SMAs (applicable November 1st to April 30th) and DMAs (at any time of year).
    - Between May 1 and October 31, CTVs will transit at >10 kts and implement the visual monitoring measures with a dedicated observers as described above.

11.1.6 Data Recording

- All data will be recorded based on standard PSO collection requirements using industry-standard software.
- Data recorded will include information related to ongoing operations, observation methods and effort, visibility conditions, marine mammal detections, and any mitigation actions requested and enacted.

11.1.7 Reporting

The following situations would require reporting as defined below:

- If a stranded, entangled, injured, or dead protected species is observed, the sighting will be reported immediately and within 24 hours to NMFS Sighting Advisory System (SAS) hotline.
- Any NARW sightings will be reported as soon as feasible and no later than within 24 hours to the NMFS Right Whale Sighting Advisory System (RWSAS) hotline (866-755-6622) or via the Whale Alert Application.

- If a marine mammal is taken in a prohibited manner by Project activities, the following actions will occur:
    - Activity operations resulting in the injury/death will cease immediately.
    - The incident will be reported to the NMFS OPR (301-427-8401), NMFS New England Stranding Network Coordinator, and the Greater Atlantic Regional Fisheries Office (GARFO) no later than within 24 hours.
    - Additional reporting by the vessel captain or PSO onboard will be to NMFS Fisheries Marine Mammal and Sea Turtle Stranding and Entanglement Hotline (866-775-6622), or alternative electronic reporting systems as approved by the NMFS stranding program, as well as the U.S. Coast Guard (USCG).
    - The report will include all available information required by the ITR or the NMFS stranding report form.
    - Mayflower Wind will not resume the activity which resulted in the injury until NMFS OPR is able to review the circumstances of the incident determine the appropriate course of action.
- Actions given an unknown and recent observed dead or injured marine mammal:
    - Mayflower Wind will immediately report the incident to the NMFS OPR and the NMFS New England Stranding Network Coordinator (as stated above).
    - The report will include the same information identified for a take by construction activity.
    - Activities will continue while NMFS reviews the circumstances of the incident and works with Mayflower Wind to determine whether modifications to the activities are appropriate.
- Actions given observation of a dead or injured marine mammal not associated with or related to construction activities:
    - Mayflower Wind will report the incident to the NMFS OPR and the NMFS New England Stranding Network Coordinator, within 24 hours of the discovery.
    - Mayflower Wind will include any documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network including photographs and video footage if available.
    - Construction activities may continue.

11.1.7.1 Data and Final Reports will be prepared using the following protocols:

- All vessels will utilize a standardized data entry format.
- A quality assurance/ quality control (QA/QC'd) database of all sightings and associated details (e.g., distance from vessel, behavior, species, group size/composition) within and outside of the designated shutdown zone, monitoring effort, environmental conditions, and Project-related activity will be provided after field operations and reporting are complete.
- During all pile driving activities, weekly reporting summarizing sightings, detections, and activities will be provided to NMFS and BOEM on the Wednesday following a Sunday-Saturday period.
- Final reports will follow a standardized format for PSO reporting from activities requiring marine mammal mitigation and monitoring.

- An annual report summarizing the prior year's activities will be provided to NMFS and BOEM 90-days after completion of each 12-month period during the effectiveness of the ITRs.

11.2 WTG and OSP Foundation Installation

Monitoring and mitigation protocols applicable to impact and vibratory pile driving during Mayflower Wind construction are described further in the following subsections. Impact and vibratory pile driving may be initiated after dark or during daytime reduced visibility periods following the protocols in Section 11.2.3 and Section 11.2.4.

11.2.1 Monitoring Equipment

The following types of equipment will be used to monitor for marine mammals from one or more locations.

- Reticle binoculars
- Mounted thermal/IR camera system
    - The camera systems will be automated with detection alerts that will be checked by a PSO on duty; however, cameras will not be manned by a dedicated observer.
- Mounted "big-eye" binocular
- Monitoring station for real time PAM system (impact pile driving only)
- The selected PAM system will transmit real time data to PAM monitoring stations on the vessels and/or shore side monitoring station.
- Hand-held or wearable NVDs
- IR spotlights
- Data collection software system
- PSO-dedicated VHF radios
- Digital single-lens reflex camera equipped with 300-mm lens

11.2.2 Daytime Visual Monitoring

Visual monitoring will occur from the construction vessel or other base of operations. Daytime visual monitoring is defined by the period between nautical twilight rise and set for the region. Visual monitoring measures below intend to provide complete visual coverage of the pre-start clearance zone during the pre-start clearance period prior to pile driving and the shutdown zones during impact and vibratory pile driving. The following visual monitoring protocols include:

- Two PSOs on duty will keep watch on a construction vessel during the pre-start clearance period, throughout pile driving, and 30 minutes after piling is completed.
- At least one PSO on duty during all other daylight periods.
- PSOs will monitor for 30 minutes before and after each piling event.
- One PSO will monitor the shutdown zone with the naked eye, reticle binoculars and/or other electronic method(s) while one PSO periodically scans outside the shutdown zone using the mounted big eye binoculars and/or other electronic method(s).
- PSO will monitor the NMFS NARW reporting systems including WhaleAlert and SAS once every 4-hour shift during Project related activities.

11.2.3 Daytime Periods of Reduced Visibility

These measures will apply during the pre-start clearance period, during active pile driving, and 30 minutes after piling is completed.

- If the Level B harassment zone is obscured, the two PSOs on watch will continue to monitor the shutdown zone utilizing thermal camera systems and/or other electronic method(s) and PAM.
- During nighttime or low visibility conditions, the two PSOs on watch will monitor the shutdown zone with the mounted IR camera (further described in 11.2.4), available handheld night vision, and/or other electronic method(s).
- All on-duty PSOs will be in contact with the APSOs who will monitor the PAM systems for acoustic detections of marine mammals that are vocalizing in the area (impact pile driving only).

11.2.4 Nighttime Visual Monitoring

During nighttime operations, night vision equipment (night vision goggles) and infrared/thermal imaging technology will be used. Recent studies have concluded that the use of infrared/thermal imaging technology allow for the detection of marine mammals at night (Verfuss et al. 2018). Guazzo et al (2019) showed that probability of detecting a large whale blow by a commercially available infrared camera was similar at night as during the day; camera monitoring distance was 2.1 km (1.3 mi) from an elevated vantage point at night versus 3 km (1.9 mi) for daylight visual monitoring from the same location. The following nighttime piling monitoring and mitigation methods use the best currently available technology to mitigate potential impacts and result in the least practicable adverse impact.

- During nighttime operations, visual PSOs on-watch will rotate in pairs: one PSO observing with an NVD and one monitoring the IR thermal imaging camera system. There will also be an APSO on duty conducting acoustic monitoring in coordination with the visual PSOs.
- The PSOs on duty will monitor for marine mammals and other protected species using night-vision goggles with thermal clip-ons, a hand-held spotlight (one set plus a backup set) and/or other electronic method(s), such that PSOs can focus observations in any direction.
- If possible, deck lights will be extinguished or dimmed during night observations when using the NVDs (strong lights compromise the NVD detection abilities); alternatively, if the deck lights must remain on for safety reasons, the PSO will attempt to use the NVDs in areas away from potential interference by these lights.

Mayflower will prepare a more detailed description of the anticipated efficacy of the technologies it intends to use during nighttime monitoring and describe how they will be used to monitor the pre-start clearance and shutdown zones. This will be provided to NMFS after publication of the draft ITRs so that it can be considered during preparation of the Final ITRs.

11.2.5 Acoustic Monitoring

Since visual observations within the applicable shutdown zones can become impaired at night or during daylight hours due to fog, rain, or high sea states, visual monitoring with thermal and NVDs will be supplemented by PAM during these periods. An APSO will be on watch during all pre-start clearance, piling, and post-piling monitoring periods (daylight, reduced visibility, and nighttime monitoring). A combination of alternative monitoring measures, including PAM, has been demonstrated to have comparable detection rates (although limited to vocalizing individuals) to daytime visual detections for several species (Smith et al., 2020).

- There will be one APSO on duty during pre-start clearance, piling, and post-piling periods during both daytime and nighttime/low visibility conditions.
- All on-duty PSOs will be in contact with the APSO on duty, who will monitor the PAM systems for acoustic detections of marine mammals that are vocalizing in the area.
- For real-time PAM systems, at least one APSO will be designated to monitor each system by viewing data or data products that are streamed in real-time or near real-time to a computer workstation and monitor located on a Project vessel or onshore.
- The PAM operator will inform the PSOs on duty, who will be responsible for requesting that the Lead PSO implement the necessary mitigation procedures, of animal detections approaching or within the applicable mitigation zones to the pile location via the data collection software system (i.e., Mystcetus or similar system).
- The PAM system will be deployed with a capability of monitoring up to 10 km radii from the pile.
- A PAM Plan will be submitted to NMFS and BOEM prior to the planned start of pile driving.

11.2.6 Pre-Start Clearance

A 30-minute pre-start clearance period will be implemented for impact and vibratory pile driving activities. Visual PSOs will begin surveying the pre-start clearance zone at least 30 minutes prior to the start of pile driving. For impact pile driving, PAM will begin 30-minutes prior to the start of pile driving. Pre-start clearance zones will follow the same zone sizes as presented below in Section 11.2.9.

- All pre-start clearance zones will be confirmed to be free of marine mammals through the use of visual monitoring (including the use of IR and NVD systems, as appropriate) and PAM for at least 30 minutes prior to commencing soft-start.
- If a marine mammal is observed entering or within the relevant pre-start clearance zones prior to the initiation of pile driving activity, pile driving activity will be delayed.
- An acoustic detection localized to a position within the pre-start clearance zone(s) will trigger a delay.
- Impact and/or vibratory pile driving may commence when either the marine mammal(s) has voluntarily left the respective pre-start clearance zones and been visually or acoustically confirmed beyond that pre-start clearance zone, or, when the additional time period has elapsed with no further sighting or acoustic detection (i.e., 15 minutes for small odontocetes and seals and 30 minutes for all other species).

11.2.7 Soft Start

- Soft start procedures will be followed, to the extent practicable, at the beginning of each pile driving event or any time pile driving has stopped for longer than 30 minutes.
- A soft start procedure will not begin until the shutdown zone has been cleared by the visual PSO or APSOs.
- If a marine mammal is detected within or about to enter the shutdown zone, prior to or during the soft-start procedure, pile driving will be delayed until the animal has been observed

exiting the relevant shutdown zone or until an additional time period has elapsed with no further sighting (i.e., 15 minutes for odontocetes and seals and 30 minutes for all other species).

11.2.8 Shutdowns

- If a marine mammal is detected entering or within the respective shutdown zone after pile driving has commenced, an immediate shutdown of pile driving will be requested unless the PSOs or APSOs determine shutdown is not feasible.
- If a shutdown is not feasible at that time in the installation process because of a risk to human or vessel safety or the risk of jeopardizing the installation process, a reduction in the hammer energy of the greatest extent possible will be implemented.
- The shutdown zone will be continually monitored by PSOs and APSOs during any pauses in pile driving.
- If a marine mammal is sighted within the shutdown zone during a pause in piling, resumption of pile driving will be delayed until the animal(s) has exited the relevant shutdown zone or an additional time period has elapsed with no further sighting of the animal that triggered the shutdown (15 minutes for small odontocetes and seals and 30 minutes for all other marine mammals).
- Following shutdown, pile driving will restart using the same procedure described above in Section 11.2.7.

11.2.9 Shutdown Zones

The shutdown zones below (Section 11.2.9.1 through 11.2.9.6) are based upon the Level A exposure ranges with 10 dB of noise attenuation for Scenarios 1 – 2 (further details in Section 6.3). Scenarios 1 and 2 include all 4.5 m diameter jacket pin piles driven by a 3,500-kJ impact hammer. Additionally, Scenarios 1 and 2 include 9/16 m (tapered) diameter WTG monopiles and 4.5 m WTG jacket pin piles installed initially using vibratory hammers HX-CV640, hexa CV640 and S-CV640, single CV640 and then completed using impact hammers. The shutdown zones are the largest zone sizes expected to result from foundation installations for each Scenario. If smaller diameter piles, lower maximum hammer energies and/or total strikes per pile, or more effective NAS are decided upon and used during the construction activities, modeled Level A exposure ranges applicable to those revised parameters would be used, likely to result in smaller maximum distances to the Level A harassment isopleths, relative to those on which the shutdown distances below are based.

11.2.9.1 WTG Monopile (Scenario 1) and Jacket (Scenario 2) Foundations using Combined Vibratory and Impact Driving in Summer (WTG foundation installations when not concurrent with OSP installations)

WTG Monopile during Impact driving

- Low-Frequency Cetaceans: 3,500 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
- Seals: 200 m

WTG Monopile during Vibratory driving

- Low-Frequency Cetaceans: 200 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
- Seals: NAS perimeter

WTG Jacket during Impact driving

- Low-Frequency Cetaceans: 1,900 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
- Seals: NAS perimeter

WTG Jacket during Vibratory driving

- Low-Frequency Cetaceans: NAS perimeter
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
- Seals: NAS perimeter

11.2.9.2 WTG Monopile (Scenario 1) and Jacket (Scenario 2) Foundations using Impact Driving in Winter (WTG foundation installations when not concurrent with OSP installations)

WTG Monopile during Impact driving

- Low-Frequency Cetaceans: 4,000 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
- Seals: 200 m

WTG Jacket during Impact driving

- Low-Frequency Cetaceans: 2,100 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
  Seals: NAS perimeter

11.2.9.3 Concurrent Installation of Two WTG Monopiles and Four OSP Jacket Pin Piles in Summer (Scenario 1)

WTG Monopile during Impact driving

- Low-Frequency Cetaceans: 3,800 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
- Seals: 300 m

11.2.9.4 Concurrent Installation of Four WTG Jacket Pin Piles and Four OSP Jacket Pin Piles in Summer (Scenario 2)

WTG Monopile during Impact driving

- Low-Frequency Cetaceans: 2,600 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter

- Seals: 200 m

11.2.9.5 WTG Monopile, WTG Jacket, and OSP Foundations Using Only Impact Driving in Summer (WTG foundation installations Not Concurrent with OSP Installations)

WTG Monopile Impact driving
- Low-Frequency Cetaceans: 3,500 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
- Seals: 200 m

WTG Jacket Impact Driving
- Low-Frequency Cetaceans: 2,000 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
- Seals: NAS perimeter

OSP Jacket Impact Driving
- Low-Frequency Cetaceans: 2,600 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
- Seals: 500 m

11.2.9.6 WTG Monopile, WTG Jacket, and OSP Foundations Using Only Impact Driving in Winter (WTG foundation installations Not Concurrent with OSP Installations)

WTG Monopile Impact driving
- Low-Frequency Cetaceans: 4,000 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
- Seals: 200 m

WTG Jacket Impact Driving
- Low-Frequency Cetaceans: 2,300 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
- Seals: 400 m

OSP Jacket Impact Driving
- Low-Frequency Cetaceans: 2,800 m
- Mid-Frequency Cetaceans: NAS perimeter
- High-Frequency Cetaceans: NAS perimeter
- Seals: 400 m

11.2.10 Post-Piling Monitoring

- PSOs will continue to survey the shutdown zone throughout the duration of pile installation and for a minimum of 30 minutes after piling has been completed.

11.2.11 Noise Attenuation

Several recent studies summarizing the effectiveness of noise attenuation systems (NAS) have shown that broadband sound levels are likely to be reduced by anywhere from 7 to 17 dB, depending on the environment, pile size, and the size, configuration and number of systems used (Buehler et al. 2015; Bellmann et al. 2020a). The single bubble curtain applied in shallow water environments regularly achieves 7-8 dB broadband attenuation (Lucke et al. 2011; Rustemeier et al. 2012; Bellmann 2014, 2019). More recent in situ measurements during installation of large monopiles (~8 m) for WTGs in comparable water depths and conditions indicate that attenuation levels of 10 dB are readily achieved for a single bubble curtain (Bellmann 2019; Bellmann et al. 2020b). Large bubble curtains tend to perform better and more reliably, particularly when deployed with two rings (Koschinski and Ludemann 2013; Bellmann 2014; Nehls et al. 2016). A California Department of Transportation study tested several small, single, bubble curtain systems and found that the best attenuation systems resulted in 10-15 dB of attenuation (Buehler et al. 2015). Buehler et al. (2015) concluded that attenuation greater than 10 dB could not be reliably predicted from small, single, bubble curtains because sound transmitted through the seabed and re-radiated into the water column is the dominant sound in the water for bubble curtains deployed immediately around the pile. Combinations of systems (e.g., double big bubble curtain, hydrodsound damper plus single big bubble curtain) potentially achieve much higher attenuation. The type and number of NAS to be used during construction have not yet been determined. Based on prior measurements this combination of NAS are reasonably expected to achieve far greater than 10 dB broadband attenuation of impact pile driving sounds.

11.2.12 Sound Source Verification

- SSV measures will be followed as stated in Section 11.1.4.2.

11.2.13 Potential Additional Measures to Protect North Atlantic Right Whales

To complete installation within as few years as possible during the multiple year installation campaign expected for the entire Lease Area build-out, impact pile driving 24-hours per day is deemed necessary.

- The period from January through April is when the highest number of NARW are present in the region which means foundation installations during this period would likely result in greater potential impacts to this species. To reduce the need for foundation installations during this period and associated impacts to the NARW, Mayflower Wind may conduct nighttime impact pile driving of monopile or piled jacket foundations during time periods when the fewest number of NARW are likely to be present in the region. Specific measures will include:
    - o Concentrating construction activities when NARW are less likely to be present within the region (May 1 through December 31), including in the Lease Area.
    - o Specific monitoring tools and plans will be developed as a part of the ongoing ITR Application process, but may include the use of advanced infrared systems, real-time PAM, autonomous underwater vehicles, autonomous aerial vehicles, or other advanced technologies that could improve the probability of detecting marine mammals at night.

11.3 HRG Surveys

HRG survey activities may be required during construction and the operations and maintenance (O&M) phases of the Project. When necessary, HRG survey operations will be conducted 24-hours per day, although some vessels may only operate during daylight hours. The following mitigation and monitoring measures for HRG surveys apply only to sound sources with operating frequencies below 180 kHz. There are no mitigation or monitoring protocols required for sources operating >180 kHz.

Additionally, shutdown, pre-start clearance, and ramp-up procedures will not be conducted during HRG operations using only non-impulsive sources (e.g., USBL and parametric sub-bottom profilers) other than non-parametric sub-bottom profilers (e.g., CHIRPs). Pre-start clearance and ramp-up, but not shutdown will be conducted when using non-impulsive, non-parametric sub-bottom profilers.

11.3.1 Monitoring Equipment

- Two pairs of reticle binoculars;
- Two hand-held or wearable night vision devices (NVDs);
- Two IR spotlights;
- One data collection software system;
- Two PSO-dedicated very high frequency (VHF) radios;
- One digital single-lens reflex camera equipped with a 300-mm lens.

11.3.2 Visual Monitoring

- Four PSOs on board any 24-hour survey vessels.
- Two PSOs on board any daylight survey vessels.
- One PSO on watch during all daylight surveying.
- Two PSOs on watch during nighttime surveying.
- Vessels conducting activities in very-shallow waters:
  - One visual PSO will be onboard
  - The vessel captain (or crew member on watch) will conduct observations when the PSO is on required breaks;
  - The PSO on duty will remain available to confirm sightings and any related mitigation measures while on break.
- PSOs will begin observation of the shutdown zones prior to initiation of HRG survey operations and will continue throughout the survey activity and/or while equipment operation below 180 kHz is in use.
- PSO will monitor the NMFS NARW reporting systems including WhaleAlert and SAS once every 4-hour shift during Project related activities.

11.3.3 Daytime Visual Monitoring

The following protocols will be applied to visual monitoring during daytime surveys:

- One PSO on watch during pre-start clearance periods and all source operations.
- PSOs will use reticle binoculars and the naked eye to scan the shutdown zone for marine mammals.

11.3.4 Nighttime and Low Visibility Monitoring

Visual monitoring during nighttime surveys or periods of low visibility will utilize the following protocols:

- The Lead PSO will determine if conditions warrant implementing reduced visibility protocols.
- Two PSOs on watch during pre-start clearance periods, all operations, and for 30 minutes following use of HRG sources operating below 180 kHz.
- Each PSO will monitor for marine mammals and other protected species using night-vision goggles with thermal clip-ons and a hand-held spotlight (one set plus a back-up set), such that PSOs can focus observations in any direction.

11.3.5 Shutdown Zones

PSOs will establish and monitor marine mammal shutdown zones. Distances to shutdown zones will be from any acoustic sources, not the distance from the vessel. Shutdown zones will be as follows:

- 500 m from NARW for use of impulsive acoustic sources (e.g., boomers and/or sparkers) and non-impulsive nonparametric sub-bottom profilers; and
- 100 m from all other marine mammals for use of impulsive acoustic sources (e.g., boomers and/or sparkers), except for delphinids when approaching the vessel or towed acoustic sources, shutdown is not required.

11.3.6 Pre-Start Clearance

PSOs will establish and monitor pre-start clearance zones. Distances to pre-start clearance zones for HRG surveys will be the same as those for shutdown zones described above.

- PSOs will conduct 30 minutes of pre-start clearance observation prior to the initiation of HRG operations.
- The pre-start clearance zones must be visible using the naked eye or appropriate technology during the entire pre-start clearance period for operations to start. If the pre-start clearance zones are not visible, source operations <180 kHz will not commence.
- Ramp-up may not be initiated if any marine mammal(s) is detected within its respective pre-start clearance zone.
- If a marine mammal is observed entering or within the pre-start clearance zones during the pre-start clearance period, relevant acoustic sources must not be initiated until the marine mammal(s) is confirmed by visual observation to have exited the relevant zone, or, until an additional time period has elapsed with no further sighting of the animal (15 minutes for small odontocetes and seals and 30 minutes for all other species).

11.3.7 Ramp-Up

- The ramp-up procedure will not be initiated during periods of inclement conditions or if the pre-start clearance zones cannot be adequately monitored by the PSOs, using the appropriate visual technology for a 30-minute period immediately prior to ramp-up.
- Ramp-up will begin with the power of the smallest acoustic equipment at its lowest practical power output. When technically feasible, the power will then be gradually turned up and other acoustic sources added in a way such that the source level would increase gradually.

- Ramp-up activities will be delayed if marine mammal(s) enters its respective shutdown zone.
- Ramp-up will continue if the animal(s) has been observed exiting its respective shutdown zone, or until an additional time period has elapsed with no further sighting of the animal (15 minutes for odontocetes and 30 minutes for all other marine mammals).

11.3.8 Shutdowns

- Immediate shutdown of impulsive, non-parametric HRG survey equipment other than CHRIP sub-bottom profilers operating at frequencies <180 kHz is required if a marine mammal is observed within or entering the relevant shutdown zone.
- Any PSO on duty has the authority to call for shutdown of acoustic sources. When there is certainty regarding the need for mitigation action on the basis of visual detection, the relevant PSOs must call for such action immediately.
- Upon implementation of a shutdown, survey equipment may be reactivated when all marine mammals that triggered the shutdown have been confirmed by visual observation to have exited the relevant shutdown zone or an additional time period has elapsed with no further sighting of the animal that triggered the shutdown (15 minutes for small odontocetes and 30 minutes for all other marine mammals).
- If the acoustic source is shutdown for reasons other than mitigation (e.g., mechanical difficulty) for less than 30 minutes, the acoustic sources may be reactivated as soon as is practicable at full operational level if PSOs have maintained constant visual observation during the shutdown and no visual detections of marine mammals occurred within the applicable shutdown zone during that time.
- If the acoustic source is shutdown for a period longer than 30 minutes or PSOs were unable to maintain constant observation, then ramp-up and pre-start clearance procedures will be initiated as described in Sections 11.3.6 and 11.3.7.
- If delphinids are visually detected approaching the vessel or towed acoustic sources, shutdown is not required.

11.3.9 Sound Source Verification

- In 2019, NMFS expressed concerns with HRG sound source verification measurements previously collected in offshore wind leases in the Northeast and recommended developers requesting incidental take authorization to estimate zones of potential impact using standard modeling guidance (NMFS 2020e) Mayflower Wind did not collect SSV measurements for 2019-2021 surveys and does not plan to collect SSV measurements as part of the planned surveys pre- and post-construction.

11.4 UXO Detonation

For UXOs that are positively identified in proximity to planned activities on the seabed, several alternative strategies will be considered prior to detonating the UXO in place. These may include relocating the activity away from the UXO (avoidance), moving the UXO away from the activity (lift and shift), cutting the UXO open to apportion large ammunition or deactivate fused munitions, using shaped charges to reduce the net explosive yield of a UXO (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 detonate the UXO in place be made. If deflagration is conducted, mitigation and a monitoring measure would be implemented as if it was a high order detonation based on UXO size. Decision on removal method will be made in consultation with a UXO specialist and in coordination with the agencies with regulatory oversite of UXO. For detonations that cannot be avoided due to safety considerations, a number of mitigation measures will be employed by Mayflower Wind. No more than a single UXO will be detonated in a 24-hour period.

11.4.1 Monitoring Equipment

The equipment to be used during UXO detonations is shown in the table below (Table 50).

Table 50: Equipment use for all marine mammal monitoring vessels during pre-start clearance and post-detonation monitoring.

Item	Daytime Number on Each PSO Vessel
Reticle binoculars	2
Mounted “big-eye” binocular	1
Monitoring station for real time PAM system[1]	1
Data collection software system	1
PSO-dedicated VHF radios	2
Digital single-lens reflex camera equipped with 300-mm lens	1

PSO = protected species observer; VHF=very high frequency.

[1]The selected PAM system will transmit real time data to PAM monitoring stations on the vessels and/or a shore side monitoring station.

11.4.2 Pre-Start Clearance

All mitigation and monitoring zones assume the use of an NAS resulting in a 10 dB reduction of noise levels. Mitigation and monitoring zones specific to marine mammal hearing groups for the five different charge weight bins are presented in Table 51.

Table 51: Mitigation and Monitoring Zones Associated with In-Situ UXO Detonation of Binned Charge Weights, with a 10 dB Noise Attenuation System.

Marine Mammal Hearing Groups	UXO Charge Weight[1]				
	E4 (2.3 kg)	E6 (9.1 kg)	E8 (45.4 kg)	E10 (227 kg)	E12 (454 kg)
	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone (m)	Pre-Start Clearance Zone (m)	Pre-Start Clearance Zone (m)	Pre-Start Clearance Zone (m)
Export Cable Corridor					
Low-Frequency Cetaceans	600	1,000	1,800	3,000	3,800
Mid-Frequency Cetaceans	50	80	200	400	500
High-Frequency Cetaceans	1,900	2,600	3,900	5,400	6,200
Phocid Pinnipeds	200	400	700	1,200	1,600
Lease Area					
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

kg = kilograms; m = meters

[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). For this assessment, four project sites (S1-S4) were chosen and modeled (see Hannay and Zykov 2021) 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). The chosen values were the most conservative per charge weight bin across each of the four modeled sites.

Table 52: Mitigation and Monitoring Zones Associated with In-Situ UXO Detonation of Binned Charge Weights, without a Noise Attenuation System.

Marine Mammal Hearing Group	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 Zone2 (m)	Level B Monitoring Zone3 (m)	Pre-Start Clearance Zone (m)	Level B Monitoring Zone (m)	Pre-Start Clearance Zone (m)	Level B Monitoring Zone (m)	Pre-Start Clearance Zone (m)	Level B Monitoring Zone (m)	Pre-Start Clearance Zone (m)	Level B Monitoring Zone (m)
Export Cable Corridor										
Low-Frequency Cetaceans	1,710	7,340	2,810	10,300	4,880	13,900	7,520	17,500	8,880	19,200
Mid-Frequency Cetaceans	214	1,520	385	2,290	714	3,460	1,220	5,020	1,540	5,860
High-Frequency Cetaceans	4,290	11,200	5,750	13,400	7,810	16,000	10,200	19,100	11,300	20,200
Phocid Pinnipeds	804	4,200	1,310	6,200	2,190	9,060	3,660	11,900	4,500	13,300
Lease Area										
Low-Frequency Cetaceans	1,540	7,000	2,720	9,850	4,750	13,600	7,280	17,400	8,540	19,300
Mid-Frequency Cetaceans	161	1,450	358	2,210	684	3,490	1,140	5,040	1,480	5,840
High-Frequency Cetaceans	4,300	10,700	5,750	13,000	7,710	15,800	9,890	18,700	10,900	20,200
Phocid Pinnipeds	607	4,070	1,120	6,070	2,170	8,780	3,740	12,000	4,520	13,300

* = denotes species listed under the Endangered Species Act; 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). For this assessment, four project sites (S1-S4) were chosen and modeled (see Hannay and Zykov 2021, 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). The chosen values were the most conservative per charge weight bin across each of the four modeled sites.

[3] Level B monitoring zones were calculated by selecting the largest TTS threshold (the larger of either the PK or SEL noise metric). The chosen values were the most conservative per charge weight bin across each of the four modeled sites.

- A 30-minute pre-start clearance period will be implemented prior to any UXO detonation
- The pre-start clearance zone (see distances to low-frequency cetacean thresholds in Table 51 and Table 52) must be fully visible for at least 30 minutes prior to commencing detonation
- All marine mammals must be confirmed to be out of the pre-start clearance zone prior to initiating detonation
- If a marine mammal is observed entering or within the relevant pre-start clearance zones prior to the initiation of detonation, the detonation must be delayed
- The detonation may commence when either the marine mammal(s) has voluntarily left the respective pre-start clearance zone and been visually confirmed beyond that pre-start clearance zone, or when 30 minutes have elapsed without redetection for whales, including the NARW, or 15 minutes have elapsed without redetection of dolphins, porpoises, and seals.

11.4.3 Visual Monitoring

- The number of vessels deployed will depend on monitoring zone size and safety set back distance from the detonation. A sufficient number of vessels will be deployed to cover the clearance and shutdown zones.
- PSOs will visually monitor the Low Frequency Cetacean pre-start clearance zone for a given charge weight. This zone encompasses the maximum Level A exposure ranges for all marine mammal species except harbor porpoise, where Level A take has been requested due to the large zone sizes associated with High Frequency cetaceans.

11.4.3.1 Primary Vessel Measures

- Two PSOs on duty on the primary vessel
- Visual PSOs will survey the monitoring zones at least 30 minutes prior to a detonation event
- Two PSOs will maintain watch at all times during the pre-start clearance period and 30 minutes after the detonation event
- There will be a PAM operator on duty conducting acoustic monitoring in coordination with the visual PSOs during all pre-start clearance periods and post-detonation monitoring periods

11.4.3.2 Secondary Vessel Measures

- Based on the pre-start clearance zones for low-frequency cetaceans shown in Table 51 and Table 52, a secondary vessel will be used for UXO charge weight bins E10 and E12.
- Visual monitoring will be conducted on a secondary vessel following the same methods as stated for the primary vessel.

11.4.4 Acoustic Monitoring

- There will be one PAM team for all deployed PSO vessels
- PAM will be conducted in the daylight only as no UXO will be detonated during nighttime hours
- There will be a PAM operator stationed on at least one of the dedicated monitoring vessels (primary or secondary) in addition to the PSO; or located remotely/onshore
- PAM will begin 30 minutes prior to a detonation event

- PAM operator will be on duty during all pre-start clearance periods and post-detonation monitoring periods
- Acoustic monitoring will extend beyond the Low Frequency Cetacean pre-start clearance zone for a given charge weight (Section 11.4.2)
- For real-time PAM systems, at least one PAM operator will be designated to monitor each system by viewing data or data products that are streamed in real-time or near real-time to a computer workstation and monitor located on a Project vessel or onshore
- PAM operator will inform the Lead PSO on duty of animal detections approaching or within applicable ranges of interest to the detonation activity via the data collection software system
- PAM devices used may include independent (e.g., autonomous or moored remote) systems

11.4.5 Noise Attenuation

Mayflower Wind will use an NAS for all detonation events as feasible and will strive to achieving the modeled ranges associated with 10 dB of noise attenuation (see Section 6.3.2). Zones without 10 dB attenuation would be implemented if use of a big bubble curtain was not feasible due to location, depth, or safety related constraints. If a NAS system is not feasible, Mayflower Wind will implement mitigation measures for the larger unmitigated zone sizes with deployment of vessels adequate to cover the entire pre-start clearance zones.

11.4.6 Seasonal Restriction

- No UXO detonations are planned between January and April.

11.4.7 Post UXO Detonation Monitoring

- Post-detonation monitoring will occur for 30 minutes.

11.4.8 Sound Source Verification

- SSV measurements will be made of at least one detonation for charge weight class that must be detonated using the method summarized in Section 11.1.4.2.
- A sound field verification plan for UXO detonation will be submitted to NMFS prior to planned start of UXO detonations.

Appendix H: Seascape, Landscape, and Visual Impact Assessment

H.1 Introduction

This appendix describes the Seascape, Landscape, and Visual Impact Assessment (SLVIA) methodology and key findings that the Bureau of Ocean Energy Management (BOEM) used to identify the potential impacts of offshore wind structures (wind turbine generators [WTGs] and offshore substation platforms [OSPs]) on scenic and visual resources in the geographic analysis area. This SLVIA methodology applies to any offshore wind energy development proposed for the Outer Continental Shelf (OCS) and incorporates by reference the detailed description of the methodology described in the *Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States* (BOEM 2021). Section H.2, *Method of Analysis*, describes the specific methodology used to apply the SLVIA methodology to the Mayflower Wind Construction and Operations Plan (COP) (Mayflower Wind 2022) and Section H.3, *Results,* summarizes the wind farm distances, fields of view (FOVs), noticeable elements, visual contrasts, scale of change, and prominence that contributed to the determination of impact levels for each key observation point (KOP) under the Proposed Action and each of the action alternatives that include modifications to WTG array layouts. Maps of scenic resources present in the geographic analysis area are included in Section 3.6.9, *Scenic and Visual Resources*. Visual simulations of the Proposed Action alone, other ongoing and planned offshore wind projects without the Proposed Action, and other offshore wind projects in combination with the Proposed Action are included in Attachment H-1, *Cumulative Visual Simulations*.

H.2 Method of Analysis

The seascape, open ocean, and landscape impact assessment (SLVIA) has two separate but linked parts: the SLIA and visual impact analysis (VIA). The SLIA analyzes and evaluates sensitivity, susceptibility, and magnitude of change in consideration of impacts on both the physical elements and features that make up a landscape, seascape, or open ocean; and the aesthetic, perceptual, and experiential aspects of the landscape, seascape, or open ocean that make it distinctive. These impacts affect the “feel,” “character,” or “sense of place” of an area of landscape, seascape, or open ocean, rather than the composition of a view from a particular place. In the SLIA, the impact receptors (the entities that are potentially affected by the proposed Project) are the seascape/open ocean/landscape itself and its components, both its physical features and its distinctive character.

The VIA analyzes and evaluates the impacts on people of adding the proposed development to views from selected viewpoints. The VIA evaluates the change to the composition of the view itself and assesses how the people who are likely to be at that viewpoint may be affected by the change to the view. Enjoyment of a particular view is dependent on the viewer and, in the VIA, the impact receptors are people. The inclusion of both the SLIA and VIA in the BOEM SLVIA methodology is consistent with the National Environmental Policy Act (NEPA)’s objective of providing Americans with aesthetically and culturally pleasing surroundings and its requirement to consider all potentially significant impacts of development.

The magnitude of effect in a seascape, open ocean, landscape, or view depends on the nature, scale, prominence, and visual contrast of the change and its experiential duration. The SLVIA offshore geographic analysis area consists of the earth curvature-based extent of the zone of theoretical visibility and zones of visual influence (COP Appendix T; Mayflower Wind 2022), as follows.

- The offshore turbine array area where the WTGs and OSP would be located plus a 42.8-mile (68.9-kilometer) radius area. This distance is the maximum extent within which a seascape, open ocean, landscape, or visual effect could occur, given visibility of the maximum height of the WTG rotor (1,066 feet [324.9 meters]).
- The OSP (maximum height of 344.5 feet [105 meters]) would potentially be visible to a distance of 25.5 miles (41.0 kilometers).

WTG visibility would be variable through the day depending on many factors. View angle, sun angle, and atmospheric conditions would affect the WTG visibility. Visual contrast of WTGs would vary throughout the day depending on the visual character of the horizon’s backdrop and whether the WTGs are backlit, side-lit, or front-lit. If less visual contrast is apparent in the morning hours, then it is likely that the visual contrast may be more pronounced in the afternoon. The inverse is possible, as well. These effects are also influenced by varying atmospheric conditions, direction of view, distance between the viewer and the WTGs, and elevation of the viewer.

At closer distances, approximately 12 miles or closer, the form of the WTG may be the dominant visual element creating the visual contrast regardless of color. At greater distances, color may become the dominant visual element creating visual contrast under certain visual conditions that gives visual definition to the WTG’s form and line.

As the elevation of the viewer increases, the lesser the effect Earth curvature (EC) has on the visible height of individual WTGs.

While the shoreline has a prevailing southward viewing direction, localized views may vary from southeast to west. All cardinal directions are conceivable when viewing from a lighthouse or a water vessel at sea. When viewing from onshore toward a southerly direction and scanning to the east and west, the color of the horizon backdrop often will vary. Variation will continue as the sun arcs across the sky from sunrise to sunset. Depending on sun angle, the backdrop sky color may have various intensities of white to gray and sky blue to pale blue to dark blue-gray. Partly cloudy to overcast conditions will also influence the color make-up of the horizon’s backdrop. The sunrise and sunset have varying degrees of light blue to dark blue, light and dark purples intermixed with oranges, yellows, and reds. Partly cloudy skies may increase the remarkable color effects during the sunset and sunrise periods of the day.

When placing WTGs offshore, the visual interplay and contrasting elements in form, line, color, and texture may vary with the ever-changing character of the backdrop. Front-lit WTGs may have strong color contrast against a darker gray sky, giving definition to the WTG’s vertical form and line contrast to the ocean's horizontal character and the line where the sea meets sky, or visually dissipates against a whiter backdrop created by high levels of evaporative atmospheric moisture during clear sunny days. Partly cloudy skies may create varying degrees of sunlight reflecting off the white wind turbines, placing some WTGs in the shadow and making them appear a darker gray and less conspicuous while highlighting others with a bright white color contrast. The level of noticeability would be directly proportional to the degree of visual contrast and scale of change between the WTGs and the corresponding backdrop.

These variations through the course of the day may result in periods of moderate to major visual effects while at other times of day would have minor or negligible effects.

The onshore geographic analysis area includes landfalls, buried onshore export cables, an onshore substation and a converter station, and transmission connections to the electric grid. The visual impacts of onshore components are assessed in Chapter 3, Section 3.6.9, *Scenic and Visual Resources*.

The SLVIA methodology and parameters consider local stakeholders' identity, culture, values, and issues and the understanding of baseline maritime conditions. Project activities for all stages of the Project life cycle (construction and installation, operations and maintenance [O&M], and decommissioning) are assessed against the environmental baseline to identify the potential interactions between the Project and the seascape, landscape, and viewers. Potential impacts are assessed to determine an impact level consistent with the definitions in Table H-1.

Table H-1. Definitions of Potential Adverse Impact Levels

Impact Level	Historic Properties under Section 106 of the NHPA	Visual Resources
Negligible	No historic properties affected, as defined at 36 CFR 800.4(d)(1).	SLIA: Very little or no effect on seascape/landscape unit character, features, elements, or key qualities either because unit lacks distinctive character, features, elements, or key qualities; values for these are low; or Project visibility is minimal. VIA: Very little or no effect on viewers' experiences because Project visibility/contrast/magnitude of change is minimal, or view receptor sensitivity/susceptibility/value is minimal.
Minor	No adverse effects on historic properties could occur, as defined at 36 CFR 800.5(b).	SLIA: The Project would introduce features that may have low to medium levels of visual prominence in 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, which may have minor to medium negative effects on the unit's features, elements, or key qualities, but the unit's features, elements, or key qualities have low susceptibility or value. 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

Impact Level	Historic Properties under Section 106 of the NHPA	Visual Resources
		level is justified. For instance, a KOP with a low magnitude of change, but a high level of viewer concern (combination of susceptibility/value), may justify adjusting to a moderate level of impact.
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.	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 on 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 or value. 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 level 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 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.
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.	SLIA: The Project would introduce features that would have dominant levels of visual prominence in 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 on the unit's features, elements, or key qualities. The concern for change (combination of susceptibility/value) to the character unit is high. 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 would 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, then evaluate the nature of the sensitivity to determine if elevating the impact to major is justified. If the sensitivity (combination of susceptibility/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.

H.3 Results

H.3.1 Proposed Action

Atmospheric conditions offshore and near the shoreline limit views more than the typically drier-air conditions in inland areas. Visual simulations from representative viewpoints included as Attachment 3 to the *Mayflower Wind Visual Impact Assessment Report* (COP Appendix T; Mayflower Wind 2022) indicate that daytime and nighttime visibility of WTGs and OSPs would be noticeable to the casual observer from seascape character areas, the open ocean character area, landscape character areas, and viewer viewpoints. Based on COP VIA Appendix T Table 5-5 (Mayflower Wind 2022), acreages of character areas overall in the offshore geographic analysis area and within the offshore wind farm viewshed are listed in Table H-2. Applicable effects from the Proposed Action and alternatives on seascape character units, the open ocean character unit, and landscape character units are listed throughout this appendix.

Table H-2. Area of Landscape/Seascape and Ocean Character Types within the Offshore Project Area Viewsheds

Landcover / Open Ocean	Acres (hectares) of Landscape/ Seascape and Ocean Character Type	Acres (hectares) within Area of Potential Visual Impact	Percentage of Landscape/Seascape Character Type in Area of Potential Visual Impact
Martha's Vineyard Viewshed			
Coastal Bluffs	100.92 (40.77)	31.81 (12.87)	31.52
Coastal Scrub	5,873.36 (2,372.84)	1,534.77 (621.10)	26.13
Commercial	278.91 (112.68)	0.41 (0.17)	0.15
Dunes	396.73 (160.28)	183.78 (74.37)	46.32
Environmental Justice Community	8,246.23 (3,331.48)	1315.42 (532.33)	15.95
Fields/Meadows	22.6 (9.13)	19.47 (7.88)	86.15
Forests/Woodlands	59,350.69 (23,977.68)	4,237.71 (1,714.94)	7.14
Historic	866.03 (349.88)	4.02 (1.63)	0.46
Light Industrial	866.59 (350.1)	1.56 (0.63)	0.18
Ocean Beach	469.48 (189.99)	469.48 (189.99)	64.20
Rural/Suburban Residential	56,058.02 (22,647.44)	5,461.30 (2,210.11)	9.74
Ponds/Tidal Marsh	10,221.75 (4,129.59)	3,340.65 (1,351.91)	32.68
Village/Town	2,254.34 (910.75)	2.85 (1.16)	0.13

Landcover / Open Ocean	Acres (hectares) of Landscape/ Seascape and Ocean Character Type	Acres (hectares) within Area of Potential Visual Impact	Percentage of Landscape/Seascape Character Type in Area of Potential Visual Impact
Nantucket Viewshed			
Coastal Bluffs	38.14 (15.41)	5.35 (2.17)	14.03
Coastal Scrub	17,529.77 (7,082.03)	4,331.89 (1,753.05)	24.71
Commercial	158.77 (64.14)	23.55 (9.53)	14.83
Dunes	500.4 (202.16)	363.07 (146.93)	72.56
Environmental Justice Community	2,287.93 (924.32)	236.79 (95.83)	10.35
Fields/Meadows	208.8 (84.35)	97.64 (39.52)	46.76
Forests/Woodlands	371.52 (150.1)	6.03 (2.44)	1.62
Historic	36,160.62 (14,608.89)	7,208.19 (2,917.05)	19.93
Light Industrial	631.99 (255.32)	458.88 (185.70)	72.61
Ocean Beach	677.76 (273.81)	393.93 (159.42)	58.12
Parks/Developed Recreation	1,157.75 (467.73)	335.89 (135.93)	29.01
Rural/Suburban Residential	3,800.08 (1,535.23)	867.69 (351.14)	22.83
Ponds/Tidal Marsh	5,620.06 (2,270.51)	104.94 (42.47)	1.87
Village/Town	1,694.94 (684.76)	9.73 (3.94)	0.57
Ocean Character Type			
Open Ocean	5,200,000 (2,100,000)	5,200,000 (2,100,000)	-

Source: COP Appendix T, Table 5-5; Mayflower Wind 2022

Distances from beach KOPs to the Proposed Action WTG and OSP array would range from the following.

- 37.2 miles (59.9 kilometers) from KOP-16-MV Squibnocket Beach on the western extent of the geographic analysis area.

- 23.3 miles (37.5 kilometers) from KOP-11-N Miacomet Beach, which is the closest KOP to the front edge of the WTG array,
- 26.5 miles (42.6 kilometers) from KOP-6-N Tom Nevers Beach on the eastern extent of the geographic analysis area.

The noticeable daytime and nighttime elements of the Project's WTGs and OSP and their viewshed distances are listed in Table H-3. Each WTG would have two L-864 flashing-red obstruction lights on the top of the nacelle, one of which is required to be lit (BOEM 2021). WTGs would have additional intermediate lighting on the tower utilizing low-intensity red-flashing (L-810) obstruction lighting. Line-of-sight calculations for onshore viewers (5.9-foot [1.8-meter] eye level) are based on intervening EC screening (7.98 inches [20.3 centimeters] height per mile). Heights of WTG and substation components are stated relative to MLLW and highest astronomical tide.

Atmospheric refraction of light rays causes fluctuations in the extents and appearances of offshore and onshore facilities. It results from the bending of light rays between viewers and objects due to current air temperature, water vapor, and barometric pressure (Bislins 2022). Based on the average sea level refraction calculation coefficient of 0.17 (Bislins 2022) applied to the turbine blade tip viewshed distance of 42.8 miles (68.9 kilometers), the 1,066.3-foot (325.0-meter) turbines may be projected upward to increased visibility from 0.0 feet (0.0 meters) to 192 feet (58.5 meters) above the horizon. The nearest beach viewers, located at 23.3 miles (37.5 kilometers) from the Lease Area, may see increased visibility of the 1,066.3-foot (325.0-meter) turbines from 790 feet (240.8 meters) to 844 feet (257.3 meters) above the horizon. Variability of daytime and nighttime atmospheric refraction-based visibility occurs with sea level's continuous increases and decreases in temperature, water vapor, and barometric pressure.

Table H-4 and Table H-5 indicate the Proposed Action's effects based on horizontal FOV and vertical FOV, respectively, defined as the earth curvature-based extent of the observable landscape seen at any given moment, usually measured in degrees (BOEM 2021). The horizontal FOV for each KOP is listed in COP Appendix T (Mayflower Wind 2022). FOVs are valid and reliable indicators of the magnitude of view occupation by Proposed Action facilities. Typical human perception extends to 124° in the horizontal axis and 55° in the vertical axis. The nearest shoreline viewers would be 23.3 miles (37.5 kilometers) from the Wind Farm Area. EC, at this distance, reduces the observable height above the horizon of the nearest WTG from 1,066 feet (324.9 meters) mean lower low water (MLLW) to 788 feet (244 meters), resulting in occupation of 0.4° and 0.7 percent of the vertical view. WTGs would further diminish in perceived size with distance and EC.

Table H-3. Heights of Noticeable [a] WTG Elements and Substations and Visible Distances [b]

Noticeable Element	Height in Feet (meters)	Visible Distance [b] in Miles (kilometers)
Rotor Blade Tip	1,066.3 (325.0) MLLW	0–42.8 (68.9)
Aviation Light	624 (190.2) MLLW	0–33.5 (53.9)
Nacelle	614 (187.1) MLLW	0–33.3 (53.6)
Hub	605.1 (184.4) MLLW	0–30.0 (48.3)
OSP	344.5 (105) MLLW	0–25.5 (41.0)
Mid-tower Light	302 (92) MLLW	0–24.2 (38.9)
Yellow Tower Base Color	50 (15) HAT	0–11.4 (18.3)

[a] Perception of Project elements, from 5.5 feet (1.7 meters) human eye level while standing at mean sea level, involves static distance-related sizes, forms, lines, colors, and textures; variable daytime lighting conditions; variable nighttime light conditions; and variable meteorological conditions.
[b] Based on intervening EC and clear-day conditions.
HAT = highest astronomical tide

Table H-4. Horizontal FOV Occupied by the Proposed Action

Noticeable Element	Width miles (kilometers)	Distance miles (kilometers)	Horizontal FOV	Human FOV	Percent of FOV
Wind Farm	9.8 (15.8)	23.3 (37.5)	22.8°	124°	18%

Table H-5. Vertical FOV Occupied by the Proposed Action

Noticeable Element	Height feet (meters)	Distance miles (kilometers)	Height Above Horizon [a] feet (meters)	Vertical FOV	Human FOV	Percent of FOV
Rotor Blade Tip	1,066 feet (324.9) MLLW	23.3 (37.5)	788 (244)	0.4°	55°	0.7%

[a] Based on intervening EC and clear-day conditions.

Table H-6 lists the wind farm's distances, horizontal FOVs, noticeable features based on their heights and EC, and visual contrasts. The analysis considers the introduction of WTGs and OSP to an open ocean baseline. The scale, size, contrast, and prominence of change focuses on the following.

- Arrangement of WTGs and OSP in the view.
- Horizontal FOV and vertical FOV scale of the wind farm array, based on WTG and OSP size and number.
- Position of the array in the open ocean.
- Position of the array in the view.
- Turbine array's distance from the viewer.

Visibility, character-changing effects, and visual contrasts reduce steadily with distance from the observation point. Visibility, character-changing effects, scale, prominence, and visual contrasts increase with elevated observer position in comparison with the wind farm. Distance and observer elevation considerations are informed by the VIA simulations (COP Appendix T; Mayflower Wind 2022), EC calculations, horizontal FOV, and vertical FOV in undeveloped open ocean. The wind farm and nearest WTGs would be:

- Unavoidably dominant features in the offshore view between 0 and 5 miles (0–8 kilometers) distance.
- Strongly pervasive features in the onshore to offshore view between 5 and 12 miles (8–19.3 kilometers) distance.
- Clearly visible features in the onshore to offshore view between 12 and 28 miles (19.3–45.1 kilometers) distance.
- Low on the horizon, but persistent features in the onshore to offshore view between 28 and 31 miles (45.1–49.9 kilometers) distance.
- Intermittently noticed features in the onshore to offshore view between 31 and 42.8 miles (49.9–68.9 kilometers) distance.
- Below the horizon beyond 42.8 miles (68.9 kilometers) distance.

Visual contrast determinations involve comparisons of characteristics of the seascape, open ocean, and landscape before and after Project implementation. The range of potential contrasts includes strong, moderate, weak, and none (BOEM 2021). The strongest daytime contrasts would result from tranquil and flat seas combined with sunlit WTG towers, nacelles, flickering rotors, and a yellow tower base color against a dark background sky and an undifferentiated foreground. There would be daily variation in WTG color contrast as sun angles change from back-lit to front-lit (sunrise to sunset) and the backdrop would vary under different lighting and atmospheric conditions. The weakest daytime contrasts would result from turbulent seas combined with overcast daylight conditions on WTG towers, nacelles, and rotors against an overcast background sky and a foreground modulated by varied landscape elements. The strongest nighttime contrasts would result from dark skies (absent moonlight) combined with aviation lights, activated lighting on the OSP, mid-tower lights, and Project lighting reflections on low clouds and active (non-reflective) surf, and the dark-sky light dome. The weakest nighttime contrasts would result from moonlit, cloudless skies; tranquil (reflective) seas; Aircraft Detection Lighting System (ADLS) activation; and only mid-tower lights.

The seascape character units, open ocean character unit, landscape character units, and viewer experiences would be affected by the Proposed Action’s noticeable features; applicable distances and FOV extents; open views versus view framing and intervening foregrounds; form, line, color, and texture contrasts; scale of change; and prominence in the characteristic seascape and landscape. Higher impact levels would stem from unique, extensive, and long-term appearance of strongly contrasting, large, and prominent vertical structures in the otherwise horizontal seascape environment, where structures are an unexpected element and viewer experience is of formerly open views of high-sensitivity seascape, open ocean, and landscape and from high sensitivity view receptors.

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Table H-6. Wind Farm Distances, FOVs, Noticeable Elements, Visual Contrasts, Scale of Change, and Prominence (Magnitude of Change)

KOP [a]	Distance in Miles (kilometers)						Proposed Action FOV Degrees (% of 124°)	Noticeable Elements [g] & Impact Level	Contrast, Scale of Change, and Prominence							
	Proposed Action	Alternative C-1	Alternative C-2	Alternative D	Alternative E	Alternative F			Proposed Action Form	Proposed Action Line	Proposed Action Color	Proposed Action Texture	Proposed Action Scale	Proposed Action Prominence [h]	Alternatives C-1, C-2, E, F	Alternative D
KOP-1-O [b]	0–42.8 (0–68.9)	0–42.8 (0–68.9)	0–42.8 (0–68.9)	0–42.8 (0–68.9)	0–42.8 (0–68.9)	0–42.8 (0–68.9)	124° (100%)	R, AL, N, H, O, M, and Y [g] **Major**	Strong	Strong	Strong	Strong	Large	6	Same as Proposed Action	Same as Proposed Action
KOP-2_O	5–42.8 (0–68.9)	5–42.8 (0–68.9)	5–42.8 (0–68.9)	5–42.8 (0–68.9)	5–42.8 (0–68.9)	5–42.8 (0–68.9)	124° (100%)	R, AL, N, H, O, M, and Y **Major**	Strong	Strong	Strong	Strong	Large	6	Same as Proposed Action	Same as Proposed Action
KOP-1-MV [c]	30.9 (49.7)	30.9 (49.7)	30.9 (49.7)	30.9 (49.7)	30.9 (49.7)	30.9 (49.7)	27° (22%)	R, AL, and N **Minor**	Weak	Weak	Weak	Weak	Small	2	Same as Proposed Action	Same as Proposed Action
KOP-2-MV	31.0 (49.8)	31.0 (49.8)	31.0 (49.8)	31.0 (49.8)	31.0 (49.8)	31.0 (49.8)	27° (22%)	R, AL, N, and H **Minor**	Weak	Weak	Weak	Weak	Small	1	Same as Proposed Action	Same as Proposed Action
KOP-3-MV	31.4 (50.5)	31.4 (50.5)	31.4 (50.5)	31.4 (50.5)	31.4 (50.5)	31.4 (50.5)	27° (22%)	R, AL, and N **Minor**	Weak	Weak	Weak	Weak	Small	2	Same as Proposed Action	Same as Proposed Action
KOP-4-MV	32.2 (51.8)	32.2 (51.8)	32.2 (51.8)	32.2 (51.8)	32.2 (51.8)	32.2 (51.8)	29° (24%)	R, AL, and N **Minor**	Weak	Weak	Weak	Weak	Small	2	Same as Proposed Action	Same as Proposed Action
KOP-6-MV	33.6 (54.1)	33.6 (54.1)	33.6 (54.1)	33.6 (54.1)	33.6 (54.1)	33.6 (54.1)	32° (26%)	R **Minor**	Weak	Weak	Weak	Weak	Small	2	Same as Proposed Action	Same as Proposed Action
KOP-9-MV	36.9 (59.4)	36.9 (59.4)	36.9 (59.4)	36.9 (59.4)	36.9 (59.4)	36.9 (59.4)	30° (24%)	R **Minor**	Weak	Weak	Weak	Weak	Small	1	Same as Proposed Action	Same as Proposed Action
KOP-16-MV	37.2 (59.9)	37.2 (59.9)	37.2 (59.9)	37.2 (59.9)	37.2 (59.9)	37.2 (59.9)	32° (26%)	R **Minor**	Weak	Weak	Weak	Weak	Small	2	Same as Proposed Action	Same as Proposed Action
KOP-19-MV [i]	41.2 (66.3)	41.2 (66.3)	41.2 (66.3)	41.2 (66.3)	41.2 (66.3)	41.2 (66.3)	30° (24%)	R, AL, N, and H **Minor**	Weak	Weak	Weak	Weak	Small	2	Same as Proposed Action	Same as Proposed Action
KOP-2-N [d]	24.4 (42.6)	24.4 (42.6)	24.4 (42.6)	24.7 (39.7)	24.4 (42.6)	24.4 (42.6)	24° (19%)	R, AL, N, H, and O **Moderate**	Weak	Moderate	Moderate	Weak	Medium	4	Same as Proposed Action	Same as Proposed Action
KOP-3-N	24.3 (39.1)	24.3 (39.1)	24.3 (39.1)	24.4 (39.3)	24.3 (39.1)	24.3 (39.1)	24° (19%)	R, AL, N, H, and O **Moderate**	Weak	Weak	Moderate	Weak	Small	2	Same as Proposed Action	Same as Proposed Action
KOP-6-N	26.5 (42.6)	26.5 (42.6)	26.5 (42.6)	27.2 (43.8)	26.5 (42.6)	26.5 (42.6)	17° (14%)	R, AL, N, and H **Moderate**	Weak	Weak	Moderate	Weak	Medium	3	Same as Proposed Action	Same as Proposed Action

KOP [a]	Distance in Miles (kilometers)						Proposed Action FOV Degrees (% of 124°)	Noticeable Elements [g] & Impact Level	Contrast, Scale of Change, and Prominence							
	Proposed Action	Alternative C-1	Alternative C-2	Alternative D	Alternative E	Alternative F			Proposed Action Form	Proposed Action Line	Proposed Action Color	Proposed Action Texture	Proposed Action Scale	Proposed Action Prominence [h]	Alternatives C-1, C-2, E, F	Alternative D
KOP-8-N (Day)	25.6 (41.2)	25.6 (41.2)	25.6 (41.2)	26.2 (42.2)	25.6 (41.2)	25.6 (41.2)	19° (15%)	R, AL, N, and H **Moderate**	Weak	Weak	Weak	Weak	Medium	3	Same as Proposed Action	Same as Proposed Action
KOP-8-N (Night)	25.6 (41.2)	25.6 (41.2)	25.6 (41.2)	26.2 (42.2)	25.6 (41.2)	25.6 (41.2)	19° (15%)	R, AL, N, and H **Moderate**	Weak	Weak	Strong	Weak	Medium	5	Same as Proposed Action	Same as Proposed Action
KOP-10-N	24.2 (38.9)	24.2 (38.9)	24.2 (38.9)	24.7 (39.7)	24.2 (38.9)	24.2 (38.9)	22° (18%)	R, AL, N, H, O, and M **Moderate**	Moderate	Moderate	Moderate	Weak	Medium	4	Same as Proposed Action	Same as Proposed Action
KOP-11-N	23.3 (37.5)	23.3 (37.5)	23.3 (37.5)	23.7 (38.1)	23.3 (37.5)	23.3 (37.5)	23° (19%)	R, AL, N, H, O, and M **Moderate**	Moderate	Weak	Moderate	Weak		3	Same as Proposed Action	Same as Proposed Action
KOP-12-N (Day)	23.5 (37.8)	23.5 (37.8)	23.5 (37.8)	23.8 (38.3)	23.5 (37.8)	23.5 (37.8)	24° (19%)	R, AL, N, H, O, and M **Moderate**	Moderate	Moderate	Moderate	Weak	Medium	4	Same as Proposed Action	Same as Proposed Action
KOP-12-N (Night)	23.5 (37.8)	23.5 (37.8)	23.5 (37.8)	23.8 (38.3)	23.5 (37.8)	23.5 (37.8)	24° (19%)	R, AL, N, H, O, and M **Moderate**	Moderate	Moderate	Strong	Weak	Medium	5	Same as Proposed Action	Same as Proposed Action
KOP-13-N	23.6 (38.0)	23.6 (38.0)	23.6 (38.0)	24.0 (38.6)	23.6 (38.0)	23.6 (38.0)	26° (21%)	R, AL, N, H, O, and M **Moderate**	Moderate	Moderate	Moderate	Weak	Medium	3	Same as Proposed Action	Same as Proposed Action
KOP-16-N	23.8 (38.3)	23.8 (38.3)	23.8 (38.3)	24.0 (38.6)	23.8 (38.3)	23.8 (38.3)	26° (21%)	R, AL, N, H, O, and M **Moderate**	Moderate	Weak	Moderate	Weak	Medium	4	Same as Proposed Action	Same as Proposed Action
KOP-17-N	24.0 (38.6)	24.0 (38.6)	24.0 (38.6)	24.4 (39.3)	24.0 (38.6)	24.0 (38.6)	24° (19%)	R, AL, N, H, O, and M **Moderate**	Moderate	Weak	Moderate	Weak	Medium	4	Same as Proposed Action	Same as Proposed Action
KOP-18-N	23.4 (37.7)	23.4 (37.7)	23.4 (37.7)	23.8 (38.3)	23.4 (37.7)	23.4 (37.7)	24° (19%)	R, AL, N, H, O, and M **Moderate**	Moderate	Weak	Moderate	Weak	Small	4	Same as Proposed Action	Same as Proposed Action
KOP-20-N	24.8 (39.9)	24.8 (39.9)	24.8 (39.9)	25.4 (40.9)	24.8 (39.9)	24.8 (39.9)	21° (17%)	R, AL, N, H, and O **Moderate**	Moderate	Weak	Moderate	Weak	Medium	2	Same as Proposed Action	Same as Proposed Action
KOP-21-N	29.4 (47.3)	29.4 (47.3)	29.4 (47.3)	29.9 (48.1)	29.4 (47.3)	29.4 (47.3)	17° (14%)	R, AL, N, H, O, and M **Minor**	Weak	Weak	Weak	Weak	Small	2	Same as Proposed Action	Same as Proposed Action
KOP-22-N	24.2 (38.9)	24.2 (38.9)	24.2 (38.9)	24.4 (39.3)	24.2 (38.9)	24.2 (38.9)	26° (21%)	R, AL, N, H, O, and M **Moderate**	Moderate	Weak	Moderate	Weak	Small	3	Same as Proposed Action	Same as Proposed Action
KOP-1-BP [e]	0.4 (0.7)	NA	NA	NA	NA	NA	NA	Unseen **Negligible**	Weak	Weak	Weak	Weak	Small	3	Same as Proposed Action	Same as Proposed Action

KOP [a]	Distance in Miles (kilometers)						Proposed Action FOV Degrees (% of 124°)	Noticeable Elements [g] & Impact Level	Contrast, Scale of Change, and Prominence							
	Proposed Action	Alternative C-1	Alternative C-2	Alternative D	Alternative E	Alternative F			Proposed Action Form	Proposed Action Line	Proposed Action Color	Proposed Action Texture	Proposed Action Scale	Proposed Action Prominence [h]	Alternatives C-1, C-2, E, F	Alternative D
KOP-3-BP	0.5 (0.8)	NA	NA	NA	NA	NA	NA	Unseen **Negligible**	Weak	Weak	Weak	Weak	Small	3	Same as Proposed Action	Same as Proposed Action
KOP-4-BP	0.8 (1.3)	NA	NA	NA	NA	NA	NA	Unseen **Negligible**	Weak	Weak	Weak	Weak	Small	3	Same as Proposed Action	Same as Proposed Action
KOP-44-C [f]	0.1 (0.2)	NA	NA	NA	NA	NA	NA	Structures **Major**	Strong	Strong	Strong	Strong	Large	6	Same as Proposed Action	Same as Proposed Action
KOP-46-C	0.2 (0.3)	NA	NA	NA	NA	NA	NA	Structures **Major**	Strong	Strong	Strong	Moderate	Large	5	Same as Proposed Action	Same as Proposed Action
KOP-47-C	0.2 (0.3)	NA	NA	NA	NA	NA	NA	Structures **Major**	Strong	Strong	Strong	Moderate	Large	5	Same as Proposed Action	Same as Proposed Action
KOP-49-C	0.3 (0.4)	NA	NA	NA	NA	NA	NA	Structures **Moderate**	Moderate	Weak	Moderate	Weak	Medium	3	Same as Proposed Action	Same as Proposed Action

[a] KOP-1-MV = Wasque Point. KOP-2-MV = Wasque Point Reservation. KOP-3-MV = Wasque Avenue, KOP-4-MV = South Beach, KOP-6-MV = Long Point Beach, KOP-9-MV = 322 South Road, KOP-16-MV = Squibnocket Beach, KOP-19-MV Gay Head Lighthouse, KOP-2-N = Sanford Farm Barn Overlook, KOP-3-N = Madaket Beach, KOP-6-N = Tom Nevers Beach, KOP-8-N = Tom Nevers Field, KOP-10-N = Nobadeer Beach, KOP-11-N = Miacomet Beach and Pond, KOP-12-N = Cisco Beach, KOP-13-N = Hummock Pond Road Bike Path, KOP-16-N = Head of Plains, KOP-17-N Bartlett's Farm, KOP-18-N = Ladies Beach, KOP-20-N = Madequecham 1, KOP-21-N Sankaty Head Lighthouse, KOP-22-N = Madaket Beach at Sunset, KOP-1-O Recreational Fishing, Pleasure, and Tour Boat Area, KOP-2-O Commercial and Cruise Ship Shipping Lanes, KOP-1-BP = Brayton Point Beach, KOP-3-BP = Sycamore Street, KOP-4-BP = Route 103 at Anthony Bridge, KOP-44-C = Oak Grove Cemetery, KOP-46-C = Goodwill Park, KOP-47-C = Lawrence Lynch Site Road - Gifford Street Substation Road, and KOP-49-C = Two Ponds

[b] O = Ocean

[c] MV = Martha's Vineyard

[d] N = Nantucket

[e] BP – Brayton Point

[f] C= Cape Cod

[g] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, O = OSP, M = mid-tower light, Y = yellow tower base color

[h] WTGs and OSP visibility: 0 = Not visible. 1 = Visible only after extended study; otherwise not visible. 2 = Visible when viewing in general direction of the wind farm; otherwise likely to be missed by casual observer. 3 = Visible after brief glance in general direction of the wind farm; unlikely to be missed by casual observer. 4 = Plainly visible; could not be missed by casual observer, but does not strongly attract visual attention or dominate view. 5 = Strongly attracts viewers' attention to the wind farm; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 = Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (NAEP 2012).

[i] Elevated lighthouse viewpoint

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Construction involving moving and stationary visual feature contrasts to forms, lines, colors, textures, scale, and prominence in formerly open ocean may have more effect on viewers than operational and decommissioning impacts, where the viewing context is existing WTGs and substations. Construction impacts would be temporary and would include the following.

- Daytime and nighttime movement of installation vessels, cranes, and other equipment visible in the open ocean in and around the Lease Area.
- Dawn, dusk, and nighttime construction lighting on WTGs and OSP.
- Beach, other sensitive land-based, and boat and cruise ship views of WTGs and OSP under construction.
- Laying of the offshore and onshore buried export cables and the connections between offshore and onshore export cables at landing sites.
- Activities along the onshore landfalls, export cable routes, and Brayton Point and Falmouth onshore converter station and substation sites.

Operational effects would be similar to those of end-stage construction and would be long term and fully reversible.

Proposed Action impacts on high-sensitivity open ocean character would be **major**. The daytime and nighttime (lighting) presence of the WTGs, OSP, and construction and O&M vessel traffic would change perception of this area from natural, undeveloped open ocean to a developed wind energy environment characterized by visually dominant WTGs and OSP.

Maintenance activities would cause **minor** effects on open ocean character by increased O&M vessel traffic to and from the Wind Farm Area. Increases in these vessel movements would be noticeable to offshore viewers but are unlikely to have a significant effect.

Decommissioning would involve the removal of all offshore structures and is expected to follow the reverse of the construction activity. Decommissioning activities would cause effects similar to those of construction activities.

Daytime lighting of WTGs is not required. ADLS would reduce nighttime impact levels from **major** or **moderate** to **negligible**, due to substantially limited hours of lighting. Residual impacts would result from the presence of continuously flashing lights, a sky light dome, and reflections on clouds during those limited hours. Lights of the up to five OSPs, when lit for maintenance, potentially would be visible from beaches and adjoining land and the built environment during hours of darkness. The nighttime sky light dome and cloud lighting caused by reflections from the water surface may be seen from distances beyond the 42.8-mile (68.9-kilometer) geographic analysis area, depending on variable ocean surface and meteorological reflectivity. The onshore substation and converter station’s nighttime lighting would be visible in their immediate neighborhoods during the hours of darkness and similar in magnitude and extent to existing conditions.

Table H-7 lists the Proposed Action’s noticeable features based on their heights, distances, and EC.

Table H-7. Noticeable Elements and Impacts by Seascape Character Unit, Open Ocean Character Unit, Landscape Character Unit, and KOP for the Proposed Action

Noticeable Elements [a] Impacts	Seascape Units, Open Ocean Unit, Landscape Units, and Offshore and Onshore Key Observation Points
R, AL, N, H, O, M, and Y **Major**	Open Ocean Character Unit KOP-1-O Recreational Fishing, Pleasure, and Tour Boat Area KOP-2-O Commercial and Cruise Ship Shipping Lanes
R, AL, N, H, O, and M **Major**	KOP-8-N Tom Nevers Field-Nighttime [b] KOP-12-N Cisco Beach-Nighttime [b]
R, AL, N, H, O, and M **Moderate**	Seascape and Landscape Character Units KOP-8-N Tom Nevers Field-Daytime KOP-10-N Nobadeer Beach KOP-11-N Miacomet Beach and Pond KOP-12-N Cisco Beach-Daytime KOP-13-N Hummock Pond Road Bike Path KOP-16-N Head of Plains KOP-17-N Bartlett's Farm KOP-18-N Ladies Beach KOP-22-N Madaket Beach at Sunset
R, AL, N, H, O, and M **Minor**	KOP-19-MV Gay Head Lighthouse (Elevated viewpoint)
R, AL, N, H, and O **Moderate**	KOP-2-N Sanford Farm Barn Overlook KOP-3-N Madaket Beach KOP-20-N Madequecham 1
R, AL, N, H, and O **Minor**	KOP-21-N Sankaty Head Lighthouse (Elevated viewpoint)
R, AL, N, and H **Minor**	KOP-2-MV Wasque Point Reservation KOP-6-N Tom Nevers Beach
R, AL, and N **Minor**	Landscape Character Units KOP-1-MV Wasque Point KOP-3-MV Wasque Avenue KOP-4-MV South Beach
R **Minor**	KOP-6-MV Long Point Beach KOP-9-MV 322 South Road KOP-16-MV Squibnocket Beach
R, AL, N, H, O, and M **Negligible**	KOP-8-N Tom Nevers Field-Nighttime [c] KOP-12-N Cisco Beach-Nighttime [c]
Onshore substation structures **Major**	KOP-44-C Oak Grove Cemetery KOP-46-C Goodwill Park KOP-47-C Lawrence Lynch Site Road - Gifford Street Substation Road
Onshore substation structures **Moderate**	KOP-49-C Two Ponds
Onshore substation structures **Negligible**	KOP-1-BP Brayton Point Beach KOP-3-BP Sycamore Street KOP-4-BP Route 103 at Anthony Bridge

[a] R = rotor, AL = aviation light, N = nacelle, H = hub, O = OSP, M = mid-tower light, Y = yellow tower base color
[b] Major impacts when ADLS is activated.
[c] Negligible impacts when ADLS is not activated.

Table H-8 summarizes the Proposed Action's wind farm distance, percent of FOV occupied by the wind farm, and effects on the seascape units, open ocean unit, landscape units, and KOPs.

Table H-8. Wind Farm Distance Effects by Seascape Character Unit, Open Ocean Character Unit, Landscape Character Unit, and KOP for the Proposed Action

Distance in Miles (km) Effects	Seascape Units, Open Ocean Unit, Landscape Units, and Offshore and Onshore Key Observation Points
0–40.0 (0–64.4) Dominant/Major to Minor Noticeability	Open Ocean Character Unit KOP-1-O Recreational Fishing, Pleasure, and Tour Boat Area
5.0–40.0 (8.0–64.4) Dominant/Major to Minor Noticeability	Open Ocean Character Unit KOP-2-O Cruise Ship Shipping Lanes
23.5-25.6 (37.8-41.2) Dominant/Major Noticeability	KOP-8-N Tom Nevers Field-Nighttime KOP-12-N Cisco Beach-Nighttime
23.3–24.2 (37.5–38.9) Moderate Noticeability	Seascape Character Units: • Ocean • Sound • Beachfront • Coastal Bluff • Coastal Dune • Boardwalk • Coastal Scrub • Commercial • Forests/Woodlands • Institutional • Park • Preserve • Residential • Salt Pond • Transportation • Village/Town KOPs: KOP-8-N Tom Nevers Field-Daytime KOP-10-N Nobadeer Beach KOP-11-N Miacomet Beach and Pond KOP-12-N Cisco Beach-Daytime KOP-13-N Hummock Pond Road Bike Path KOP-16-N Head of Plains KOP-17-N Bartlett's Farm KOP-18-N Ladies Beach KOP-20-N Madequecham 1 KOP-22-N Madaket Beach at Sunset

Distance in Miles (km) Effects	Seascape Units, Open Ocean Unit, Landscape Units, and Offshore and Onshore Key Observation Points
24.3–33.6 (39.1–54.1) Minor Noticeability	Seascape Character Units: • Ocean • Sound • Beachfront • Coastal Bluff • Coastal Dune • Boardwalk • Coastal Scrub • Commercial • Forests/Woodlands • Institutional • Park • Preserve • Residential • Salt Pond • Transportation • Village/Town Landscape Character Units: • Agriculture • Coastal Scrub • Commercial • Estuary • Forests/Woodlands • Institutional • Light Industrial • Marshland • Park • Preserve • Residential • Salt Pond • Pond Shoreline • Transportation • Village/Town KOPs: KOP-1-MV Wasque Point KOP-2-MV Wasque Point Reservation KOP-3-MV Wasque Avenue KOP-4-MV South Beach KOP-6-MV Long Point Beach KOP-9-MV 322 South Road KOP-16-MV Squibnocket Beach KOP-2-N Sanford Farm Barn Overlook KOP-3-N Madaket Beach KOP-6-N Tom Nevers Beach KOP-8-N Tom Nevers Field-Daytime

Distance in Miles (km) Effects	Seascape Units, Open Ocean Unit, Landscape Units, and Offshore and Onshore Key Observation Points
29.4-41.2 (47.3-66.3) Minor Noticeability	KOP-21-N Sankaty Head Lighthouse (elevated viewpoint) KOP-19-MV Gay Head Lighthouse (elevated viewpoint)
31.1–42.8 (50.1–68.9) Minor to Negligible Noticeability	Landscape Character Units: • Agriculture • Coastal Scrub • Commercial • Estuary • Forests/Woodlands • Institutional • Light Industrial • Marshland • Park • Preserve • Residential • Salt Pond • Pond Shoreline • Transportation • Village/Town

km = kilometers

Table H-9 summarizes the Proposed Action’s wind farm distance, percent of FOV occupied by the wind farm, and effects on the seascape units, landscape units, and KOPs’ viewer experience. FOV measures consider size, horizontal extent, and vertical extent of the facilities and indicate the scale of impact in comparison with the typical 124-degree human view cone. The WTG array’s configuration results in narrower angles and shorter distances from Nantucket and wider angles from Martha’s Vineyard’s greater distances. Thus, moderate to minor effects involve both distance’s noticeable elements and FOV measures.

Table H-9. Wind Farm Percent of FOV and Effects by Seascape Character Unit, Open Ocean Character Unit, Landscape Character Unit, and KOP for the Proposed Action

Percent (°) of 124° FOV POV [a] Effects [b]	Seascape Units, Open Ocean Unit, Landscape Units, and Offshore and Onshore Key Observation Points
100% (124°) to 16% (20°) Dominant/Major to Minor	Open Ocean Character Unit KOP-1-O Recreational Fishing, Pleasure, and Tour Boat Area KOP-2-O Cruise Ship Shipping Lanes
21% (26°) to 17% (19°) Moderate	Seascape Character Units: • Ocean • Sound • Beachfront • Coastal Bluff • Coastal Dune • Boardwalk • Coastal Scrub • Commercial • Forests/Woodlands

Percent (°) of 124° FOV POV [a] Effects [b]	Seascape Units, Open Ocean Unit, Landscape Units, and Offshore and Onshore Key Observation Points
	• Institutional • Park • Preserve • Residential • Salt Pond • Transportation • Village/Town Landscape Character Units: • Agriculture • Coastal Scrub • Commercial • Estuary • Forests/Woodlands • Institutional • Light Industrial • Marshland • Park • Preserve • Residential • Salt Pond • Pond Shoreline • Transportation • Village/Town KOP-8-N Tom Nevers Field-Daytime KOP-10-N Nobadeer Beach KOP-11-N Miacomet Beach and Pond KOP-12-N Cisco Beach-Daytime KOP-13-N Hummock Pond Road Bike Path KOP-16-N Head of Plains KOP-17-N Bartlett's Farm KOP-18-N Ladies Beach KOP-20-N Madequecham 1 KOP-22-N Madaket Beach at Sunset
26% (32°) to 14% (17°) Minor to Moderate	Seascape Character Units: • Ocean • Sound • Beachfront • Coastal Bluff • Coastal Dune • Boardwalk • Coastal Scrub • Commercial • Forests/Woodlands • Institutional • Park • Preserve

Percent (°) of 124° FOV POV [a] Effects [b]	Seascape Units, Open Ocean Unit, Landscape Units, and Offshore and Onshore Key Observation Points
	• Residential • Salt Pond • Transportation • Village/Town Landscape Character Units: • Agriculture • Coastal Scrub • Commercial • Estuary • Forests/Woodlands • Institutional • Light Industrial • Marshland • Park • Preserve • Residential • Salt Pond • Pond Shoreline • Transportation • Village/Town KOP-1-MV Wasque Point KOP-2-MV Wasque Point Reservation KOP-3-MV Wasque Avenue KOP-4-MV South Beach KOP-6-MV Long Point Beach KOP-9-MV 322 South Road KOP-16-MV Squibnocket Beach KOP-19-MV Gay Head Lighthouse (elevated viewpoint) KOP-2-N Sanford Farm Barn Overlook KOP-3-N Madaket Beach KOP-6-N Tom Nevers Beach KOP-21-N Sankaty Head Lighthouse (elevated viewpoint)

[a] Percent of view

[b] Wind farm array configuration results in narrower angles from Nantucket and wider angles from Martha's Vineyard's greater distances. Thus, overall moderate to minor effects involve distance and noticeable elements.

Foreground influence assessments, involving the presence of intervening or framing elements and their influence on effects of Project characteristics, are based on each KOP's locale photography and visual simulations (Attachment 3 of Appendix T; Mayflower Wind 2022) and summarized in Table H-10.

Table H-10. Foreground View Framing and Intervening Elements for the Proposed Action

Foreground Element(s) Influence	Seascape Units, Open Ocean Unit, Landscape Units, and Offshore and Onshore Key Observation Points
Open Ocean Negligible Influence	Open Ocean Character Unit KOP-1-O Recreational Fishing, Pleasure, and Tour Boat Area KOP-2-O Cruise Ship Shipping Lanes
Beach, Dunes, and Ocean Minor Influence	Seascape Character Units: • Ocean • Sound • Beachfront • Coastal Bluff • Coastal Dune • Boardwalk • Coastal Scrub • Commercial • Forests/Woodlands • Institutional • Park • Preserve • Residential • Salt Pond • Transportation • Village/Town KOP-1-MV Wasque Point KOP-4-MV South Beach KOP-6-MV Long Point Beach KOP-16-MV Squibnocket Beach KOP-6-N Tom Nevers Beach KOP-10-N Nobadeer Beach KOP-11-N Miacomet Beach and Pond KOP-12-N Cisco Beach-Daytime KOP-18-N Ladies Beach KOP-20-N Madequecham 1 KOP-22-N Madaket Beach at Sunset
Buildings, Vegetation, and Topography Moderate to Dominant Influence	Landscape Character Units: • Agriculture • Coastal Scrub • Commercial • Estuary • Forests/Woodlands • Institutional • Light Industrial • Marshland • Park • Preserve • Residential • Salt Pond • Pond Shoreline • Transportation

Foreground Element(s) Influence	Seascape Units, Open Ocean Unit, Landscape Units, and Offshore and Onshore Key Observation Points
	• Village/Town KOP-2-N Sanford Farm Barn Overlook KOP-3-N Madaket Beach

Proposed Action contrasts in the characteristic seascape and landscape, as perceived in views from each KOP, are based on visual simulations (COP Appendix T, Attachment 3; Mayflower Wind 2022). Seascape unit view contrasts are estimated based on similar open view conditions in ocean environments. Landscape and seascape compatibility and photography conditions for each viewpoint are presented in COP Appendix T, Table 5-6 and Table 5-7, and Attachment T.1, Table 3-1 (Mayflower Wind 2022). The COP landscape and seascape evaluation scale ranges from faint, apparent, conspicuous, and prominent to dominant. Onshore viewpoints Oak Grove Cemetery, Goodwill Park, and Lawrence Lynch site road would result in prominent and dominant conditions. Offshore potential viewpoints' evaluations range from faint to dominant. Visual contrast determinations involve comparisons of characteristics of the seascape and landscape before and after Proposed Action implementation. The range of potential contrasts includes strong, moderate, weak, and none. The strongest daytime contrasts would result from tranquil and flat seas combined with sunlit WTG towers, nacelles, flickering rotors, and the yellow tower base color against a dark background sky and an undifferentiated foreground. The weakest daytime contrasts would result from turbulent seas combined with overcast daylight conditions on WTG towers, nacelles, and rotors against an overcast background sky and a foreground modulated by varied landscape elements. The strongest nighttime contrasts would result from dark skies (absent moonlight) combined with aviation lights, activated lighting on the OSP mid-tower lights, and Project lighting reflections on low clouds and active (non-reflective) surf, and the dark-sky light dome. The weakest nighttime contrasts would result from moonlit, cloudless skies, tranquil (reflective) seas, ADLS activation, and only mid-tower lights.

Photographic comparisons of characteristics of the seascape's and landscape's existing conditions and Proposed Action implementation are included in COP Appendix T, Attachment 3 (Mayflower Wind 2022) for each of the KOPs in the following summary tables. Visual contrast determinations are listed in Table H-11.

Table H-11. Visual Contrasts to Seascape, Open Ocean, Landscape, and KOPs for the Proposed Action

Contrast Rating Effects	Seascape, Open Ocean, Landscape, and Offshore and Onshore Key Observation Points
Strong Contrasts **Major**	Open Ocean KOP-1-O Recreational Fishing, Pleasure, and Tour Boat Area KOP-2-O Cruise Ship Shipping Lanes

Contrast Rating Effects	Seascape, Open Ocean, Landscape, and Offshore and Onshore Key Observation Points
Strong Contrasts (Limited Timeframe) **Moderate**	KOP-8-N Tom Nevers Field-Nighttime (the limited timeframe due to ADLS results in downward rating from Major to Negligible) KOP-12-N Cisco Beach-Nighttime (the limited timeframe due to ADLS results in downward rating from Major to Negligible)
Moderate Contrasts **Moderate**	Seascapes and Landscapes within 28 miles (kilometers) in the Wind Farm Area viewshed KOP-3-N Madaket Beach KOP-6-N Tom Nevers Beach KOP-8-N Tom Nevers Field-Daytime KOP-10-N Nobadeer Beach KOP-11-N Miacomet Beach and Pond KOP-12-N Cisco Beach-Daytime KOP-13-N Hummock Pond Road Bike Path KOP-16-N Head of Plains KOP-17-N Bartlett's Farm KOP-18-N Ladies Beach KOP-20-N Madequecham 1 KOP-22-N Madaket Beach
Weak Contrasts **Minor**	Seascapes and Landscapes beyond 28 miles (kilometers) in the Wind Farm Area viewshed KOP-1-MV Wasque Point KOP-2-MV Wasque Point Reservation KOP-3-MV Wasque Avenue KOP-4-MV South Beach KOP-6-MV Long Point Beach KOP-9-MV 322 South Road KOP-16-MV Squibnocket Beach KOP-19-MV Gay Head Lighthouse (Elevated viewpoint) KOP-2-N Sanford Farm Barn Overlook KOP-21-N Sankaty Head Lighthouse (Elevated viewpoint)
None to very weak **Negligible**	Seascapes, Landscapes, and viewer locations not in the Wind Farm Development Area viewshed

Table H-12 summarizes sensitivity, susceptibility, and magnitude of change in consideration of Proposed Action impacts on the seascape character units, open ocean character unit, and landscape character units throughout the geographic analysis area. The seascape, open ocean, and landscape criteria listed in Table H-1 and consideration of the preceding assessments would result in impact levels for character units as shown in Table H-12.

Table H-12. Proposed Action Impact on Seascape Character, Open Ocean Character, and Landscape Character

Level of Impact	Seascape Character Units, Open Ocean Character Unit, and Landscape Character Units
Major	SLIA: Open Ocean Character Unit
Moderate	SLIA: Seascape Character Units and Landscape Character Units within the viewshed and within 28 miles of WTGs

Level of Impact	Seascape Character Units, Open Ocean Character Unit, and Landscape Character Units
Minor	SLIA: Seascape Character Units and Landscape Character Units within the viewshed and beyond 28 miles of WTGs
Negligible	SLIA: Seascape Character Units and Landscape Character Units outside of the WTG viewshed

SLIA = seascape, open ocean, and landscape impact assessment

Table H-13 summarizes Proposed Action impacts on viewer experience (KOP locations) throughout the geographic analysis area. The viewer experience criteria listed in Table H-1 and consideration of the preceding assessments would result in impact levels for KOPs as shown in Table H-13.

Table H-13. Impact Levels on Viewer Experience for the Proposed Action

Impact Level	Offshore and Onshore Key Observation Points
Major	VIA: KOP-1-O Recreational Fishing, Pleasure, and Tour Boat Area KOP-2-O Commercial and Cruise Ship Shipping Lanes KOP-8-N Tom Nevers Field-Nighttime [a] KOP-12-N Cisco Beach-Nighttime [a] KOP-44-C Oak Grove Cemetery KOP-46-C Goodwill Park KOP-47-C Lawrence Lynch Site
Moderate	VIA: KOP-8-N Tom Nevers Field-Daytime KOP-10-N Nobadeer Beach KOP-11-N Miacomet Beach and Pond KOP-12-N Cisco Beach-Daytime KOP-13-N Hummock Pond Road Bike Path KOP-16-N Head of Plains KOP-17-N Bartlett's Farm KOP-18-N Ladies Beach KOP-20-N Madequecham 1 KOP-22-N Madaket Beach at Sunset KOP-49-C Two Ponds
Minor	VIA: KOP-1-MV Wasque Point KOP-2-MV Wasque Point Reservation KOP-3-MV Wasque Avenue KOP-4-MV South Beach KOP-6-MV Long Point Beach KOP-9-MV 322 South Road KOP-16-MV Squibnocket Beach KOP-19-MV Gay Head Lighthouse (Elevated viewpoint) KOP-2-N Sanford Farm Barn Overlook KOP-3-N Madaket Beach KOP-6-N Tom Nevers Beach KOP-21-N Sankaty Head Lighthouse (Elevated viewpoint)

Impact Level	Offshore and Onshore Key Observation Points
Negligible	KOP-8-N Tom Nevers Field-Nighttime [b] KOP-12-N Cisco Beach-Nighttime [b] KOP-1-BP Brayton Point Beach KOP-3-BP Sycamore Street KOP-4-BP Route 103 at Anthony Bridge

[a] Major impacts when ADLS is activated.
[b] Negligible impacts when ADLS is not activated.

H.3.1.1 Cumulative Impacts of the Proposed Action

NEPA requires consideration of other reasonably foreseeable activities in the Project's viewshed and the Project's incremental effects on seascape character, open ocean character, landscape character, and viewer experience. These effects include direct physical effects on the seascape, open ocean, and landscape or changes to the distinct character of the seascape, open ocean, and landscape.

Effects on seascape character, open ocean character, and landscape character can occur in the following conditions (SLVIA Chapter 8; BOEM 2021).

- Multi-project WTGs and OSPs visible within or from the open ocean character unit as overlapping or adjacent features and elements.
- Multi-project WTGs and OSPs visible from seascape character units as overlapping or adjacent features and elements.
- Multi-project WTGs and OSPs visible from landscape character units as overlapping or adjacent features and elements.

Effects on viewer experience can occur in the following conditions (SLVIA Chapter 8; BOEM 2021).

- Multi-project WTGs and OSPs visible as overlapping features and elements.
- Multi-project WTGs and OSPs visible as adjacent features and elements.
- Multi-project WTGs and OSPs visible as viewers move through the seascape, open ocean, and landscape.

Attachment H-1 portrays simulations of the incremental effects of the Project in the context of other offshore wind projects, from a total of eight KOPs: five KOPs on Nantucket Island; an additional nighttime simulation for one of these KOPs (Cisco Beach); and two KOPs on Martha's Vineyard.

The visual simulations portray five incremental construction scenarios, as follows.

- Scenario 1: 2023–2025 Project Construction (Vineyard Wind, South Fork Wind, Revolution Wind, Sunrise Wind and New England Wind).
- Scenario 2: Mayflower Wind Project Construction with prior 2023–2025 Project Construction (from Scenario 1).

- Scenario 3: 2024–2030 Project Construction (New England Wind II, Vineyard Wind Northeast [formerly Liberty Wind], Beacon Wind and Bay State Wind) with prior 2023–2025 Project Construction (Vineyard Wind, South Fork Wind, Revolution Wind, Sunrise Wind and New England Wind) and Mayflower Wind Project Construction.
- Scenario 4 (full buildout): 2023–2025 Project Construction (Vineyard Wind, South Fork Wind, Revolution Wind, Sunrise Wind and New England Wind) and 2024–2030 Project Construction (New England Wind II, Vineyard Wind Northeast [formerly Liberty Wind], Beacon Wind and Bay State Wind) without Mayflower Wind Project Construction.
- Scenario 5: The Project without other foreseeable planned activities.

The number of offshore wind structures simulated in Attachment H-1 differs slightly from the number of structures assumed in Appendix D, *Planned Activities Scenario*. This is due to the timing of when these documents were developed and the assumptions used in developing the layouts for the simulations. While the number of structures in the individual lease areas vary, the total number of structures assumed across the Massachusetts and Rhode Island lease areas is very similar between the two documents, with Appendix D assuming development of 1,069 structures and the cumulative visual simulations assuming development of 1,063 structures, a difference of only six structures. The number of offshore structures identified in both documents are estimates of reasonably foreseeable offshore wind development and are subject to change as lessees submit COPs and refine their development plans. BOEM believes the simulations presented in Attachment H-1 provide a reasonable approximation of the scale of visual impacts that would occur from development of the Proposed Action in combination with other ongoing and planned offshore wind projects.

Consideration of effects of other wind farms on seascape character, open ocean character, and landscape character is listed in Table H-14.

Consideration of effects on viewer experience of other wind farms is listed in Table H-15.

Consideration of effects on seascape character, open ocean character, and landscape character of other wind farms in combination with the Proposed Action is listed in Table H-16.

Consideration of effects on viewer experience of other wind farms in combination with the Proposed Action is listed in Table H-17.

Table H-14. Other Wind Farms' Seascape, Open Ocean, and Landscape Units Cumulative Wind Farm Distances, FOVs, Noticeable Elements, Visual Contrasts, Scale of Change, and Prominence

Character Unit	Distance in miles (kilometers)[c]								FOV Degrees (% of 124°)	Noticeable Elements[d] & Impact Level	Visual Contrast, Scale of Change, and Prominence					
	BSW[a]	BW[a]	VWN[a]	NEW[a]	SFW[a]	SW[a]	RW[a]	VW[a]			Form	Line	Color	Texture	Scale	Prominence[e]
Martha's Vineyard Seascape (Beaches)[b]	15.0 (24.1)	29.2 (47.0)	45.6 (73.4)	22.9 (36.8)	21.9 (35.2)	16.8 (27.0)	12.2 (19.6)	19.2 (30.9)	134° (109%)	R, AL, N, H, O, and M **Major**	Strong	Strong	Strong	Strong	Large	6 to 0
Open Ocean	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	82° to 360° (66 to 290%)	R, AL, N, H, O, M, and Y to R **Major**	Strong to Weak to Screened	Strong to Weak to Screened	Strong to Weak Screened	Strong to Weak to Screened	Large to NA	6 to 0
Martha's Vineyard Landscape[f]	15.2 (24.4)	29.4 (47.3)	45.8 (73.7)	23.1 (37.1)	22.1 (35.5)	17.0 (27.3)	12.4 (19.9)	19.4 (31.2)	134° (109%)	R, AL, N, H, O, and M **Major**	Strong	Strong	Strong	Strong	Large	6 to 0
Nantucket Seascape (Beaches)[b]	17.4 (28.0)	19.4 (31.2)	32.0 (51.5)	29.1 (46.8)	47.2 (76.0)	35.2 (56.6)	34.6 (55.7)	15.5 (24.9)	104° (84%)	R, AL, N, H, O, and M **Major**	Strong	Strong	Strong	Strong	Large to NA	6 to 0
Nantucket Landscape[f]	17.6 (28.3)	19.6 (31.5)	32.2 (51.8)	29.3 (47.1)	47.4 (76.3)	35.4 (56.9)	34.8 (56.0)	15.7 (25.2)	104° (84%)	R, AL, N, H, O, and M **Major**	Strong	Strong	Strong	Strong	Large to NA	6 to 0

[a] BSW = Bay State Wind, BW = Beacon Wind, VWN = Vineyard Wind Northeast, NEW = New England Wind, SFW = South Fork Wind, SW = Sunrise Wind, RW = Revolution Wind, and VW = Vineyard Wind
[b] The most conservative onshore case involves the seaward edge of the beach nearest the projects. The seascape unit edge is 3.45 miles (kilometers) offshore (Massachusetts jurisdictional boundary).
[c] Due to Earth's curvature and known WTG heights, those WTGs beyond 42.8 miles (68.9 kilometers) would not be visible from ground level plus 5.5 feet (1.7meters).
[d] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, O = OSP, M = mid-tower light, Y = yellow tower base color.
[e] WTGs and OSP Prominence (visibility): 0 = Not visible. 1 = Visible only after extended study; otherwise not visible. 2 = Visible when viewing in general direction of the wind farm; otherwise likely to be missed by casual observer. 3 = Visible after brief glance in general direction of the wind farm; unlikely to be missed by casual observer. 4 = Plainly visible; could not be missed by casual observer, but does not strongly attract visual attention or dominate view. 5 = Strongly attracts viewers' attention to the wind farm; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 = Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (NAEP 2012).
[f] The seaward edge between landscape and seascape varies. The most conservative case is 0.2-mile (0.3-kilometer) landward distance from seaward beach edge.

Table H-15. Other Wind Farms' Cumulative Viewer Experience Wind Farm Distances, FOVs, Noticeable Elements, Visual Contrasts, Scale of Change, and Prominence

Viewer[a]	Distance in miles (kilometers)[d]								FOV Degrees (% of 124°)	Noticeable Elements[c] & Impact Level	Visual Contrast, Scale of Change, and Prominence					
	BSW[b]	BW[b]	VWN[b]	NEW[b]	SFW[b]	SW[b]	RW[b]	VW[b]			Form	Line	Color	Texture	Scale	Prominence[e]
KOP-1-MV	14.9 (24.0)	23.2 (37.3)	39.7 (63.9)	25.9 (40.7)	36.6 (58.9)	27.3 (43.9)	25.1 (40.4)	14.8 (23.8)	114° (92%)	R, AL, N, H, O, and M **Major**	Strong	Strong	Strong	Strong	Large	6
KOP-2-N	19.7 (31.7)	20.5 (33.0)	31.9 (51.3)	30.9 (49.7)	49.7 (80.0)	38.1 (61,3)	37.1 (59.7)	16.9 (27.2)	96° (77%)	R, AL, N, H, O, and M **Major**	Strong	Strong	Strong	Strong	Large	6
KOP-22-N	17.4 (28.0)	19.4 (31.2)	32.0 (51.5)	29.1 (46.8)	47.2 (76.0)	35.2 (56.6)	34.6 (55.7)	15.5 (24.9)	104° (84%)	R, AL, N, H, O, and M **Major**	Strong	Strong	Strong	Strong	Large	6
KOP-6-N	27.2 (43.8)	26.2 (42.2)	32.6 (52.5)	33.7 (54.2)	57.9 (93.2)	45.9 (73.9)	45.4 (73.1)	23.0 (37.0)	89° (72%)	R, AL, N, H, O, and M **Major**	Strong	Strong	Strong	Strong	Large	6
KOP-12-N Day	19.1 (30.7)	19.7 (31.7)	31.2 (50.2)	27.6 (44.4)	49.4 (79.5)	37.6 (60.5)	37.0 (59.5)	16.2 (26.1)	99° (80%)	R, AL, N, H, O, and M **Major**	Strong	Strong to Weak to NA	Strong to Weak to NA	Strong to Weak to NA	Large	6
KOP-12-N Night	19.1 (30.7)	19.7 (31.7)	31.2 (50.2)	27.6 (44.4)	49.4 (79.5)	37.6 (60.5)	37.0 (59.5)	16.2 (26.1)	99° (80%)	AL **Moderate**[e]	Strong	Strong	Strong	Strong	Large	6
KOP-16-MV	15.0 (24.1)	29.2 (47.0)	45.6 (73.4)	22.9 (36.8)	21.9 (35.2)	16.8 (27.0)	13.4 (21.6)	19.2 (30.9)	134° (109%)	R, AL, N, H, O, and M **Major**	Strong to Weak to NA	Strong to Weak to NA	Strong to Weak to NA	Strong to Weak to NA	Large	6
KOP-16-N	18.2 (29.3)	19.4 (31.2)	31.5 (50.7)	29.5 (47.5)	48.7 (78.4)	36.5 (58.7)	35.5 (57.1)	15.7 (25.3)	101° (81%)	R, AL, N, H, O, and M **Major**	Strong to Weak	Strong	Strong	Strong	Large	6
KOP-19-MV	17.3 (27.8)	32.9 (52.9)	49.4 (79.5)	25.9 (41.7)	20.6 (33.1)	18.2 (29.3)	13.7 (22.0)	23.9 (38.5)	127° (102%)	R, AL, N, H, O, and M **Major**	Strong	Strong	Strong	Moderate	Large	6

[a] KOP-1-MV Wasque Point, KOP-2-N Sanford Barn Overlook, KOP-22-N Madaket Beach at Sunset, KOP-6-N Tom Nevers Beach, KOP-12-N Cisco Beach, KOP-16-MV Squibnocket Beach, KOP-16-N Head of Plains, and KOP-19-MV Gay Head Lighthouse
[b] BSW = Bay State Wind, BW = Beacon Wind, VWN = Vineyard Wind Northeast, NEW = New England Wind, SFW = South Fork Wind, SW = Sunrise Wind, RW = Revolution Wind, and VW = Vineyard Wind
[c] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, O = OSP, M = mid-tower light, Y = yellow tower base color
[d] Due to earth's curvature and known WTG heights, those WTGs beyond 42.8 miles (68.9 kilometers) would not be visible from ground level plus 5.5 feet (1.7meters).
[e] WTGs and OSP (onshore) visibility: 0 = Not visible. 1 = Visible only after extended study; otherwise not visible. 2 = Visible when viewing in general direction of the wind farm; otherwise likely to be missed by casual observer. 3 = Visible after brief glance in general direction of the wind farm; unlikely to be missed by casual observer. 4 = Plainly visible; could not be missed by casual observer, but does not strongly attract visual attention or dominate view. 5 = Strongly attracts viewers' attention to the wind farm; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 = Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (NAEP 2012).

Table H-16. Mayflower Wind and Other Wind Farms' Seascape, Open Ocean, and Landscape Units Cumulative Wind Farm Distances, FOVs, Noticeable Elements, Visual Contrasts, Scale of Change, and Prominence

Character Unit	Distance in miles (kilometers) [c]									FOV Degrees (% of 124°)	Noticeable Elements [d] & Impact Level	Contrast, Scale of Change, and Prominence							
	BSW [b]	BW [b]	VWN [b]	MW [b]	NEW [b]	SFW [b]	SW [b]	RW [b]	VW [b]			Form	Line	Color	Texture	Scale	Prominence [e]	Alternatives C-1, C-2, E, F	Alternative D
Martha's Vineyard Seascape (Beaches) [a]	15.0 (24.1)	29.2 (47.0)	45.6 (73.4)	37.2 (59.9)	22.9 (36.8)	21.9 (35.2)	16.8 (27.0)	12.2 (19.6)	19.2 (30.9)	134° (109%)	R, AL, N, H, O, M **Major**	Strong to Weak	Moderate to Weak	Strong to Weak	Moderate to Weak	Large	6	Same as Proposed Action	Same as Proposed Action
Open Ocean	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	0 to 42.8 (0 to 68.9)	82° to 360° (66to 290%)	R, AL, N, H, O, M, and Y **Major**	Strong	Strong	Strong	Strong	Large	6	Same as Proposed Action	Same as Proposed Action
Martha's Vineyard Landscape [f]	15.2 (24.4)	29.4 (47.3)	45.8 (73.7)	37.2 (60.2)	23.1 (37.1)	22.1 (35.5)	17.0 (27.3)	12.4 (19.9)	19.4 (31.2)	134° (109%)	R, AL, N, H, O, M **Major**	Strong	Moderate	Strong	Moderate	Large	6	Same as Proposed Action	Same as Proposed Action
Nantucket Seascape (Beaches) [a]	17.4 (28.0)	19.4 (31.2)	32.0 (51.5)	24.3 (39.1)	29.1 (46.8)	47.2 (76.0)	35.2 (56.6)	34.6 (55.7)	15.5 (24.9)	104° (84%)	R, AL, N, H, O, M **Major**	Strong	Moderate	Strong	Moderate	Large	6	Same as Proposed Action	Same as Proposed Action
Nantucket Landscape [f]	17.6 (28.0)	19.6 (31.2)	32.2 (51.5)	24.5 (39.1)	29.3 (47.1)	47.4 (76.3)	35.4 (56.9)	34.8 (56.0)	15.7 (25.2)	104° (84%)	R, AL, N, H, O, M **Major**	Strong	Moderate	Strong	Moderate	Large	6	Same as Proposed Action	Same as Proposed Action

[a] The most conservative onshore case involves the seaward edge of the beach nearest the projects. The seascape unit edge is 3.45 miles (kilometers) offshore, (Massachusetts jurisdictional boundary).
[b] BSW = Bay State Wind, BW = Beacon Wind, VWN = Vineyard Wind Northeast, MW = Mayflower Wind, NEW = New England Wind, SFW = South Fork Wind, SW = Sunrise Wind, RW = Revolution Wind, and VW = Vineyard Wind
[c] Due to earth's curvature and known WTG heights, those WTGs beyond 42.8 miles (68.9 kilometers) would not be visible from ground level plus 5.5 feet (1.7meters).
[d] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, O = OSP, M = mid-tower light, Y = yellow tower base color
[e] WTGs and OSP (onshore) visibility: 0 = Not visible. 1 = Visible only after extended study; otherwise not visible. 2 = Visible when viewing in general direction of the wind farm; otherwise likely to be missed by casual observer. 3 = Visible after brief glance in general direction of the wind farm; unlikely to be missed by casual observer. 4 = Plainly visible; could not be missed by casual observer, but does not strongly attract visual attention or dominate view. 5 = Strongly attracts viewers' attention to the wind farm; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 = Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (NAEP 2012).
[f] The seaward edge between landscape and seascape varies. The most conservative case is 1.0-mile (1.6-kilometer) distance from seaward beach edge.

Table H-17. Mayflower Wind and Other Wind Farms' Cumulative Viewer Experience Wind Farm Distances, FOVs, Noticeable Elements, Visual Contrasts, Scale of Change, and Prominence

Viewer [a]	Distance in miles (kilometers) [c]									FOV Degrees (% of 124°)	Noticeable Elements [d] & Impact Level	Contrast, Scale of Change, and Prominence							
	BSW [b]	BW [b]	VWN [b]	MW [b]	NEW [b]	SFW [b]	SW [b]	RW [b]	VW [b]			Form	Line	Color	Texture	Scale	Prominence [e]	Alternatives C-1, C-2, E, F	Alternative D
KOP-1-MV	14.9 (24.0)	23.2 (37.3)	39.7 (63.9)	30.9 (49.7)	25.9 (40.7)	36.6 (58.9)	27.3 (43.9)	25.1 (40.4)	14.8 (23.8)	114° (92%)	R, AL, N, H, O, and M **Major**	Strong	Moderate	Strong	Moderate	Large	6	Same as Proposed Action	Same as Proposed Action
KOP-2-N	19.7 (31.7)	20.5 (33.0)	31.9 (51.3)	24.4 (42.6)	30.9 (49.7)	49.7 (80.0)	38.1 (61,3)	37.1 (59.7)	16.9 (27.2)	96° (77%)	R, AL, N, H, O, and M **Major**	Strong	Moderate	Strong	Moderate	Large	6	Same as Proposed Action	Same as Proposed Action
KOP-22-N	17.4 (28.0)	19.4 (31.2)	32.0 (51.5)	24.3 (39.1)	29.1 (46.8)	47.2 (76.0)	35.2 (56.6)	34.6 (55.7)	15.5 (24.9)	104° (84%)	R, AL, N, H, O, and M **Major**	Strong	Moderate	Strong	Moderate	Large	6	Same as Proposed Action	Same as Proposed Action
KOP-6-N	27.2 (43.8)	26.2 (42.2)	32.6 (52.5)	26.5 (42.6)	33.7 (54.2)	57.9 (93.2)	45.9 (73.9)	45.4 (73.1)	23.0 (37.0)	89° (72%)	R, AL, N, H, O, and M **Major**	Strong	Moderate	Strong	Moderate	Large	6	Same as Proposed Action	Same as Proposed Action
KOP-12-N Day	19.1 (30.7)	19.7 (31.7)	31.2 (50.2)	23.5 (37.8)	27.6 (44.4)	49.4 (79.5)	37.6 (60.5)	37.0 (59.5)	16.2 (26.1)	99° (80%)	R, AL, N, H, O, and M **Major**	Strong	Moderate	Strong	Moderate	Large	6	Same as Proposed Action	Same as Proposed Action

Viewer [a]	Distance in miles (kilometers) [c]									FOV Degrees (% of 124°)	Noticeable Elements [d] & Impact Level	Contrast, Scale of Change, and Prominence							
	BSW [b]	BW [b]	VWN [b]	MW [b]	NEW [b]	SFW [b]	SW [b]	RW [b]	VW [b]			Form	Line	Color	Texture	Scale	Prominence [e]	Alternatives C-1, C-2, E, F	Alternative D
KOP-12-N Night	19.1 (30.7)	19.7 (31.7)	31.2 (50.2)	23.5 (37.8)	27.6 (44.4)	49.4 (79.5)	37.6 (60.5)	37.0 (59.5)	16.2 (26.1)	99° (80%)	AL **Major**	Moderat e	Moderate	Moderate	Moderate	Large	6	Same as Proposed Action	Same as Proposed Action
KOP-16-MV	15.0 (24.1)	29.2 (47.0)	45.6 (73.4)	37.2 (59.9)	22.9 (36.8)	21.9 (35.2)	16.8 (27.0)	13.4 (21.6)	19.2 (30.9)	134° (109%)	R, AL, N, H, O, and M **Major**	Strong	Moderate	Strong	Moderate	Large	6	Same as Proposed Action	Same as Proposed Action
KOP-16-N	18.2 (29.3)	19.4 (31.2)	31.5 (50.7)	23.8 (38.3)	29.5 (47.5)	48.7 (78.4)	36.5 (58.7)	35.5 (57.1)	15.7 (25.3)	101° (81%)	R, AL, N, H, O, and M **Major**	Strong	Moderate	Strong	Moderate	Large	6	Same as Proposed Action	Same as Proposed Action
KOP-19-MV	17.3 (27.8)	32.9 (52.9)	49.4 (79.5)	41.2 (66.3)	25.9 (41.7)	20.6 (33.1)	18.2 (29.3)	13.7 (22.0)	23.9 (38.5)	127° (102%)	R, AL, N, H, O, and M **Major**	Strong	Moderate	Strong	Moderate	Large	6	Same as Proposed Action	Same as Proposed Action

[a] KOP-1-MV Wasque Point, KOP-2-N Sanford Barn Overlook, KOP-22-N Madaket Beach at Sunset, KOP-6-N Tom Nevers Beach, KOP-12-N Cisco Beach, KOP-16-MV Squibnocket Beach, KOP-16-N Head of Plains, and KOP-19-MV Gay Head Lighthouse.
[b] BSW = Bay State Wind, BW = Beacon Wind, VWN = Vineyard Wind Northeast, MW = Mayflower Wind, NEW = New England Wind, SFW = South Fork Wind, SW = Sunrise Wind, RW = Revolution Wind, and VW = Vineyard Wind.
[c] Due to earth's curvature and known WTG heights, those WTGs beyond 42.8 miles (68.9 kilometers) would not be visible from ground level plus 5.5 feet (1.7meters).
[d] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, O = OSP, M = mid-tower light, Y = yellow tower base color.
[e] WTGs and OSP (onshore) visibility: 0 = Not visible. 1 = Visible only after extended study; otherwise not visible. 2 = Visible when viewing in general direction of the wind farm; otherwise likely to be missed by casual observer. 3 = Visible after brief glance in general direction of the wind farm; unlikely to be missed by casual observer. 4 = Plainly visible; could not be missed by casual observer, but does not strongly attract visual attention or dominate view. 5 = Strongly attracts viewers' attention to the wind farm; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 = Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (NAEP 2012).

H.3.2 Alternative C

Under Alternative C, the export cable route to Brayton Point would be rerouted onshore and follow one of two alternative corridors to avoid sensitive fish habitat in the Sakonnet River. Installation of these onshore export cables and infrastructure would result in localized, temporary visual impacts near construction sites due to land disturbance for vegetation clearing, site grading or trenching, and construction staging. These impacts would last through construction and continue until disturbed areas are restored.

H.3.3 Alternative D

Table H-18 and Table H-19 list Alternative D wind farm width-, height-, and distance-related occupation of views from the nearest shoreline area. These results indicate slight changes to the FOV results compared to the Proposed Action (Table H-4 and Table H-5).

Table H-18 Horizontal FOV Occupied by Alternative D

Noticeable Element	Width miles (kilometers)	Distance miles (kilometers)	Horizontal FOV	Human FOV	Percent of FOV
D WTGs	12.3 (19.8)	23.6 (37.9)	26.2°	124°	21%

Table H-19 Vertical FOV Occupied by Alternative D

Noticeable Element	Height feet (m) MLLW	Distance miles (kilometers)	Visible Height [a] feet (m)	Vertical FOV	Human FOV	Percent of FOV
D Rotor Blade Tip	1,066.3 (325.0)	23.6 (37.9)	779 (237)	0.3°	55°	0.5%

[1] Based on intervening EC and clear-day conditions.
M = meters; km = kilometers; MLLW = mean lower low water.

H.3.4 Alternatives E and F

Installation of different foundation types under Alternatives E-1, E-2, and E-3 would not change the most prominent visible aspects of WTGs and OSPs (e.g., blade height, hub height) and, therefore, would have no meaningful difference in impacts on seascape, open ocean, and landscape character units and viewer experience compared to the Proposed Action. The reduction in the number of cables installed along the Falmouth offshore export cable route under Alternative F may reduce the number of vessel trips required to install the cables, but this slight reduction in vessel activity would have no meaningful difference in impacts compared to the Proposed Action.

H.4 Seascape, Open Ocean, and Landscape Impact Assessment Summary

The SLIA considers the impacts on the physical elements and features that make up a seascape, open ocean, or landscape and the aesthetic, perceptual, and experiential aspects of the seascape, open ocean, or landscape that contribute to its distinctive character. These impacts affect the feel, character, or sense of place of an area of seascape, open ocean, or landscape. Table H-20 summarizes the effects of the character of the offshore and onshore components of the Project with the aspects that contribute to the distinctive character of the seascape, open ocean, and landscape areas from which the Project would be visible (BOEM 2021).

H.5 Visual Impact Assessment Summary

The VIA considers the characteristics of the view receptor, characteristics of the view toward the Project facilities, and the experiential impacts of the Projects. Table H-21 summarizes the viewer sensitivity, view receptor susceptibility, view value, and summary of the measures of effects from the visible character and magnitude of the offshore and onshore components of the Project (BOEM 2021).

Table H-20. Seascape Character, Open Ocean Character, Landscape Character and Impact Levels

Character Unit	Affected Environment										Proposed Action									Impact Levels				
	Unit Susceptibility			Unit Value			Project Visibility				Character Key Feature Change [a]			Character Key Element Change [b]			Character Key Quality Change [c]			Proposed Action				Alternatives C, D, E, and F
	High	Medium	Low	High	Medium	Low	Dominant	Substantial	Low	Unseen	High	Medium	Low	High	Medium	Low	High	Medium	Low	Major	Moderate	Minor	Negligible	Impact Level
Open Ocean	X			X			X				X			X			X			X				Same as Proposed Action
Martha's Vineyard Seascape Ocean				X					X				X		X			X			X			Same as Proposed Action
Martha's Vineyard Seascape Beach				X					X			X			X			X				X		Same as Proposed Action
Nantucket Seascape Ocean	X			X				X				X			X		X			X				Same as Proposed Action
Nantucket Seascape Beach	X			X				X				X			X		X			X				Same as Proposed Action
Martha's Vineyard Landscape		X		X					X				X			X			X			X		Same as Proposed Action
Nantucket Landscape	X			X				X				X			X			X				X		Same as Proposed Action

[a] Key Features = The distinctive visual attributes of the seascape, open ocean, or landscape character area.
[b] Key Elements = The essential visual components of the seascape, open ocean, or landscape character area.
[c] Key Quality = The main value factor of the seascape, open ocean, or landscape character area.

Table H-21. Viewer Sensitivity, Receptor Susceptibility, View Value, Viewer Experience, and Impact Levels

KOP [a]	Affected Environment									Viewer Experience				Impact Levels				
	Viewer Sensitivity			Receptor Susceptibility			View Value			Distance-Noticeable Elements-HFOV-VFOV-Contrast-Scale-Prominence Effects				Proposed Action				Alternatives C, D, E, and F
	High	Medium	Low	High	Medium	Low	High	Medium	Low	Dominant	Substantial	Low	Unseen	Major	Moderate	Minor	Negligible	Impact Levels
KOP-1-O	X			X			X			X				X				Same as Proposed Action
KOP-2_O	X			X			X			X				X				Same as Proposed Action
KOP-1-MV	X			X			X					X				X		Same as Proposed Action
KOP-2-MV	X			X			X					X				X		Same as Proposed Action
KOP-3-MV	X			X			X					X				X		Same as Proposed Action
KOP-4-MV	X			X			X					X				X		Same as Proposed Action
KOP-6-MV	X			X			X					X				X		Same as Proposed Action
KOP-9-MV	X			X			X					X				X		Same as Proposed Action
KOP-16-MV	X			X			X					X				X		Same as Proposed Action
KOP-19-MV [b]	X			X			X					X				X		Same as Proposed Action
KOP-2-N	X			X			X				X				X			Same as Proposed Action
KOP-3-N	X			X			X				X				X			Same as Proposed Action
KOP-6-N	X			X			X				X				X			Same as Proposed Action

KOP [a]	Affected Environment									Viewer Experience				Impact Levels				
	Viewer Sensitivity			Receptor Susceptibility			View Value			Distance-Noticeable Elements-HFOV-VFOV-Contrast-Scale-Prominence Effects				Proposed Action				Alternatives C, D, E, and F
	High	Medium	Low	High	Medium	Low	High	Medium	Low	Dominant	Substantial	Low	Unseen	Major	Moderate	Minor	Negligible	Impact Levels
KOP-8-N (Day)	X			X			X				X				X			Same as Proposed Action
KOP-8-N (Night)	X			X			X				X				X			Same as Proposed Action
KOP-10-N	X			X			X				X				X			Same as Proposed Action
KOP-11-N	X			X			X				X				X			Same as Proposed Action
KOP-12-N (Day)	X			X			X				X				X			Same as Proposed Action
KOP-12-N (Night)	X			X			X				X				X			Same as Proposed Action
KOP-13-N	X			X			X				X				X			Same as Proposed Action
KOP-16-N	X			X			X				X				X			Same as Proposed Action
KOP-17-N	X			X			X				X				X			Same as Proposed Action
KOP-18-N	X			X			X				X				X			Same as Proposed Action
KOP-20-N	X			X			X				X				X			Same as Proposed Action
KOP-21-N	X			X			X					X				X		Same as Proposed Action
KOP-22-N	X			X			X				X				X			Same as Proposed Action
KOP-1-BP	X			X			X						X				X	Same as Proposed Action
KOP-3-BP	X			X			X						X				X	Same as Proposed Action
KOP-4-BP	X			X			X						X				X	Same as Proposed Action
KOP-44-C	X			X			X			X				X				Same as Proposed Action
KOP-46-C	X			X			X			X				X				Same as Proposed Action
KOP-47-C	X			X			X			X				X				Same as Proposed Action
KOP-49-C	X			X			X				X				X			Same as Proposed Action

HFOV = horizontal field of view; VFOV = vertical field of view

[a] KOP-1-MV = Wasque Point. KOP-2-MV = Wasque Point Reservation. KOP-3-MV = Wasque Avenue, KOP-4-MV = South Beach, KOP-6-MV = Long Point Beach, KOP-9-MV = 322 South Road, KOP-16-MV = Squibnocket Beach, KOP-19-MV Gay Head Lighthouse, KOP-2-N = Sanford Farm Barn Overlook, KOP-3-N = Madaket Beach, KOP-6-N = Tom Nevers Beach, KOP-8-N = Tom Nevers Field, KOP-10-N = Nobadeer Beach, KOP-11-N = Miacomet Beach and Pond, KOP-12-N = Cisco Beach, KOP-13-N = Hummock Pond Road Bike Path, KOP-16-N = Head of Plains, KOP-17-N Bartlett's Farm, KOP-18-N = Ladies Beach, KOP-20-N = Madequecham 1, KOP-21-N Sankaty Head Lighthouse, KOP-22-N = Madaket Beach at Sunset, KOP-1-O Recreational Fishing, Pleasure, and Tour Boat Area, KOP-2-O Commercial and Cruise Ship Shipping Lanes, KOP-1-BP = Brayton Point Beach, KOP-3-BP = Sycamore Street, KOP-4-BP = Route 103 at Anthony Bridge, KOP-44-C = Oak Grove Cemetery, KOP-46-C = Goodwill Park, KOP-47-C = Lawrence Lynch Site Road - Gifford Street Substation Road, and KOP-49-C = Two Ponds

[b] Elevated observation deck or lighthouse.

H.6 References

Bislins, Walter. 2022. Advanced Earth Curvature Calculator. Available: http://walter.bislins.ch/bloge/index.asp?page=Advanced+Earth+Curvature+Calculator.

Bureau of Ocean Energy Management (BOEM). 2021. Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States. OCS Study BOEM 2021-032. April.

Mayflower Wind Energy, LLC (Mayflower Wind). 2022. Mayflower Wind Construction and Operations Plan. Available: https://www.boem.gov/renewable-energy/state-activities/mayflower-wind.

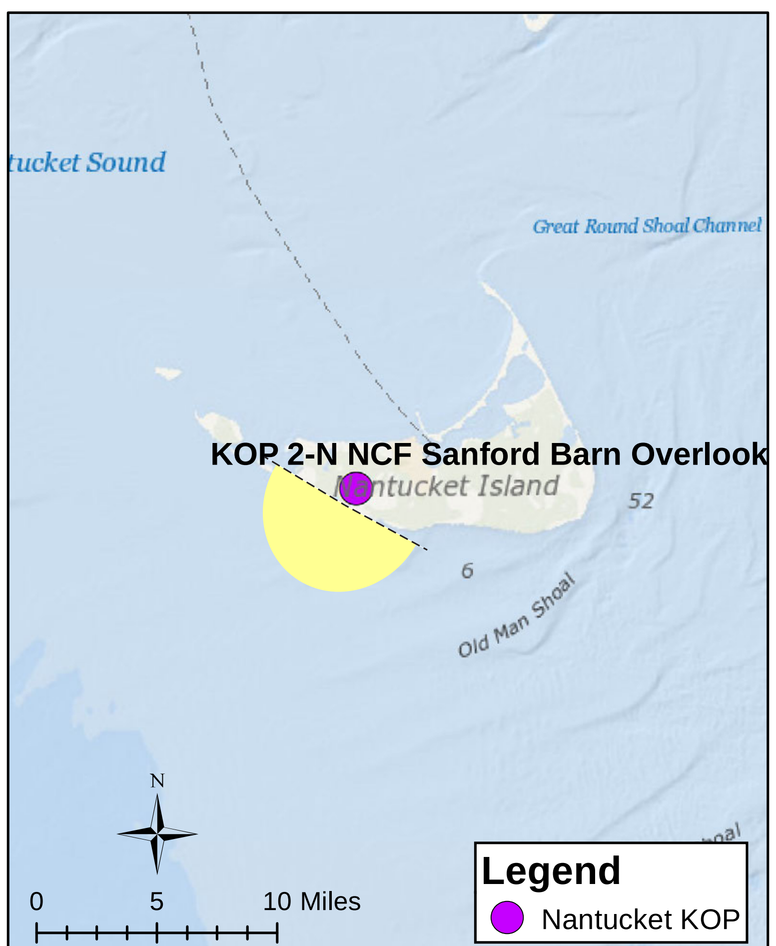
National Association of Environmental Professionals (NAEP). 2012. Offshore Wind Turbine Visibility and Visual Impact Thresholds. Available: https://blmwyomingvisual.anl.gov/docs/EnvPractice_Offshore%20Wind%20Turbine%20Visibility%20and%20Visual%20Impact%20Threshold%20Distances.pdf.

Attachment H-1: Mayflower Wind Cumulative Visual Simulations

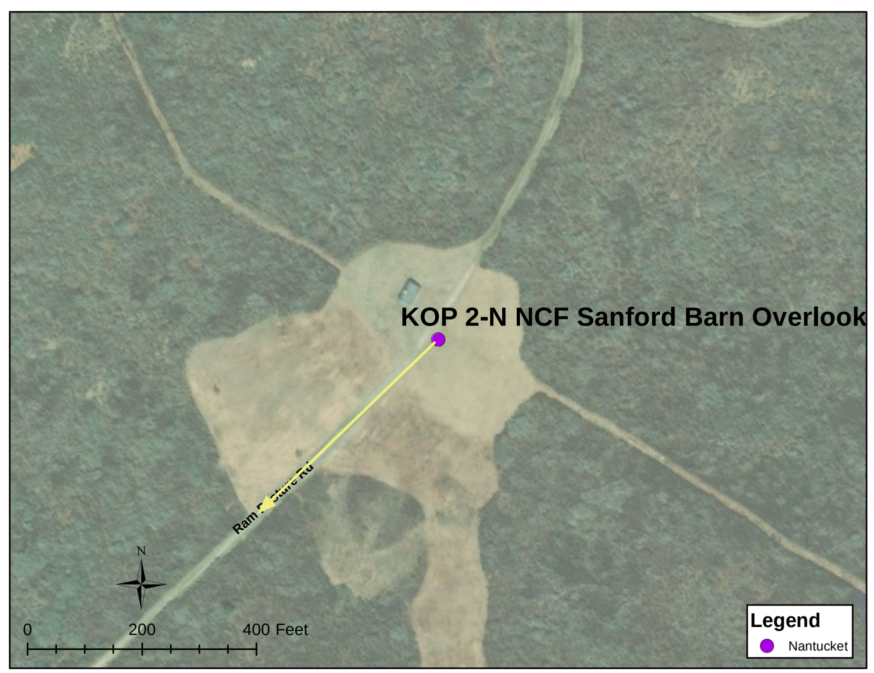
KOP 2-N Sanford Farm Barn - Scenario 1

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 182°
Vertical Field of View: 40°
Nearest WTG: 17 mi / 27 km
Furthest Visible WTG: 62 mi / 100 km
Potential Number of Structures Visible: 237
Potential Number of Structures Not Visible: 212

PHOTOGRAPH AND SITE

Time of photograph: 10:54AM
Date of photograph: 6-26-20
L/SCA: Ocean beach
Viewing direction: South (230°)
Latitude: 41.265608°N
Longitude: 70.150001°W
Lighting Direction: Backlit diffused

ENVIRONMENT

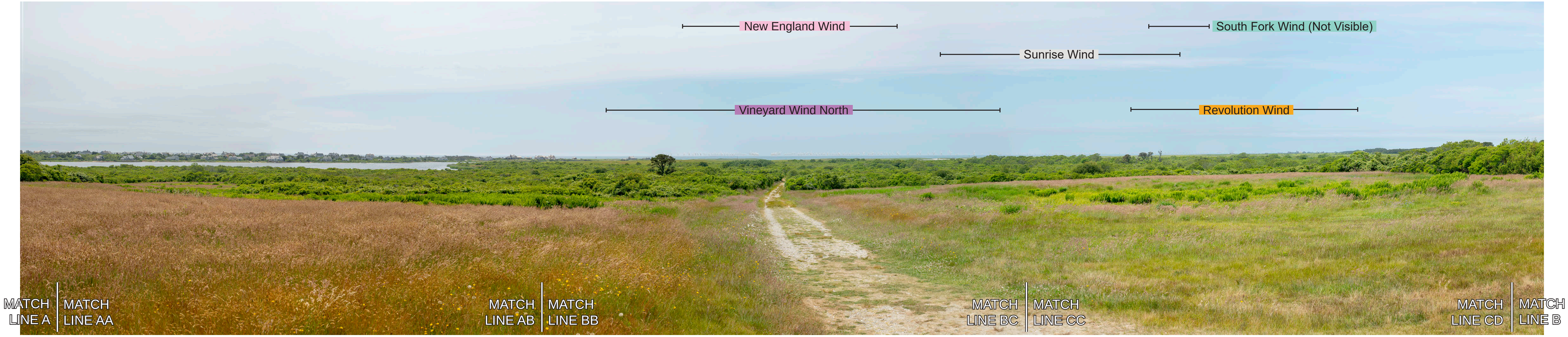
Temperature: 68° F
Humidity: 81%
Wind Dir & Speed: S 12 mph
Weather Condition: Hazy

CAMERA

Camera Elevation: 50 ft /15.2 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

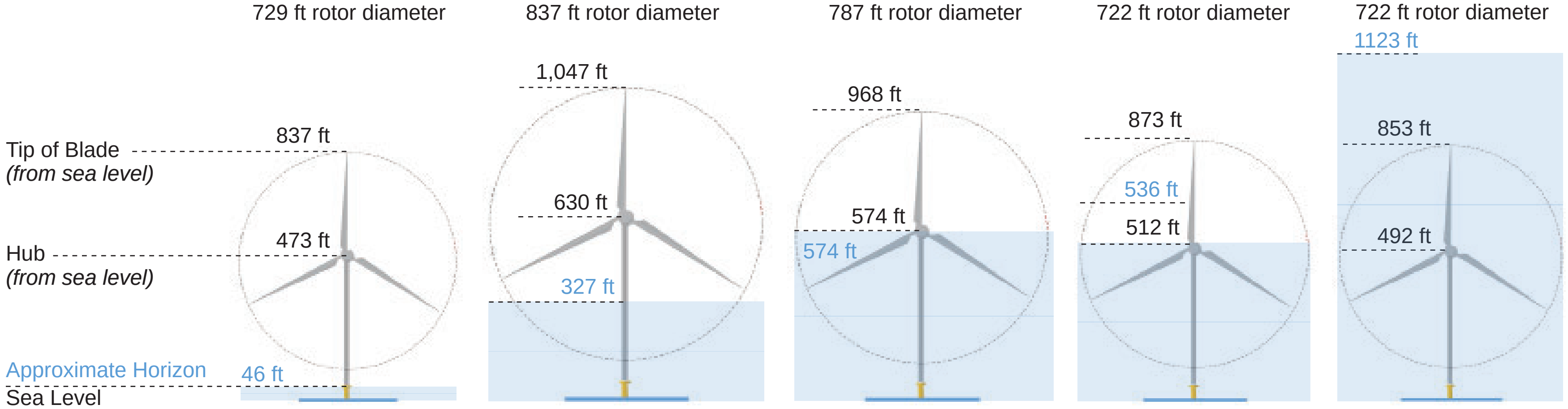
KOP 2-N Sanford Farm Barn - Scenario 1

SIMULATED CONDITIONS



VISIBILTY OF CLOSEST TURBINES

	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
	729 ft rotor diameter	837 ft rotor diameter	787 ft rotor diameter	722 ft rotor diameter	722 ft rotor diameter

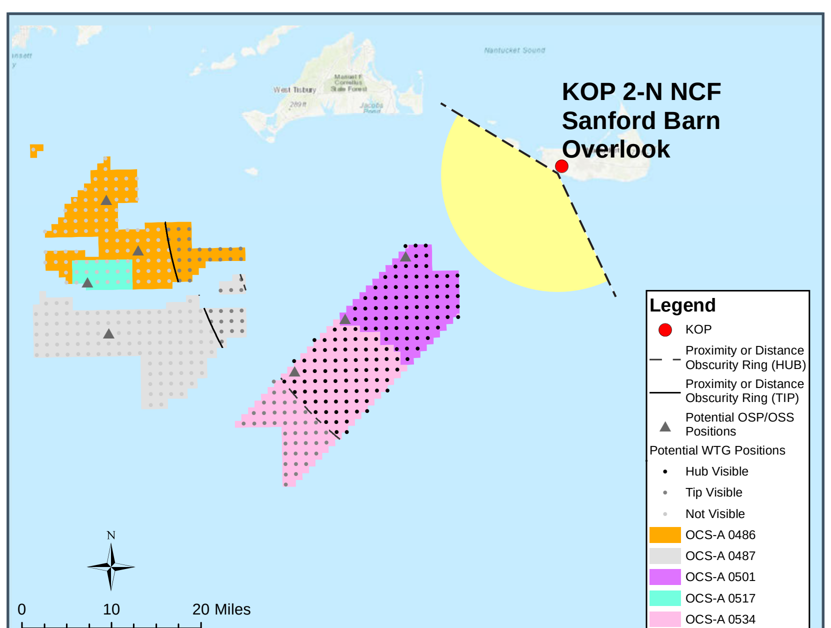


	Vineyard Wind North	New England Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	77	120	131	103	18
Number of Structures within View of KOP	77	120	16	24	0
Distance to Closest Structure	17 mi (27 km)	31 mi (50 km)	38 mi (61 km)	37 mi (60 km)	50 mi (80 km)
Distance to Furthest Structure	30 mi (48 km)	47 mi (76 km)	62 mi (100 km)	59 mi (95 km)	56 mi (90 km)

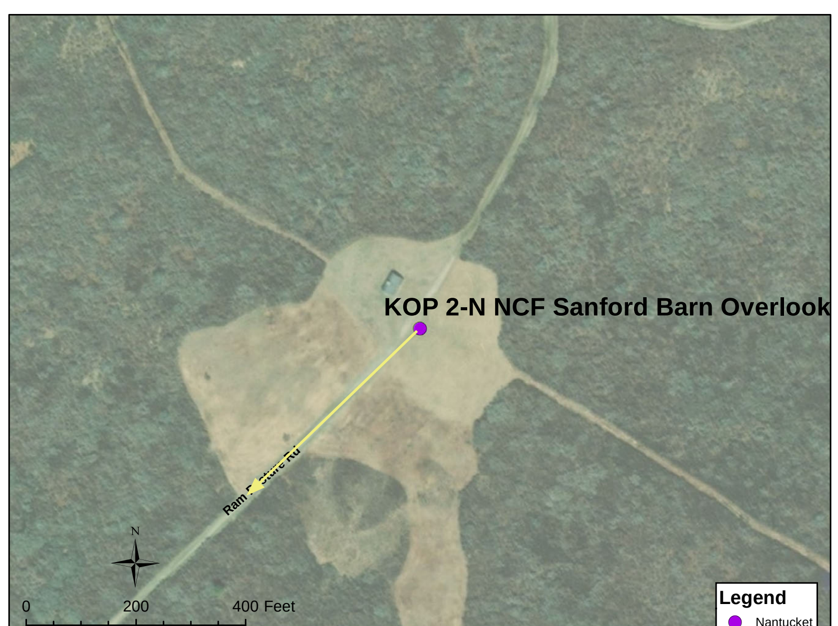
KOP 2-N Sanford Farm Barn - Scenario 1 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°

Vertical Field of View: 40°

Nearest WTG: 17 mi / 27 km

Furthest Visible WTG: 62 mi / 100 km

Potential Number of Structures Visible: 237

Potential Number of Structures Not Visible: 212

ENVIRONMENT

Temperature: 68° F

Humidity: 81%

Wind Dir & Speed: S 12 mph

Weather Condition: Hazy

PHOTOGRAPH AND SITE

Time of photograph: 10:54AM

Date of photograph: 6-26-20

L/SCA: Ocean beach

Viewing direction: South (194°)

Latitude: 41.265608°N

Longitude: 70.150001°W

Lighting Direction: Backlit diffused

CAMERA

Camera Elevation: 50 ft /15.2 m

Nikon D4

Nikon 50mm

ISO: 100

Fstop: f/7.1

Shutter: 1/1250 sec

Exposure bias: -0.7 step

MATCH LINE A

MATCH LINE AA

MATCH LINE AB

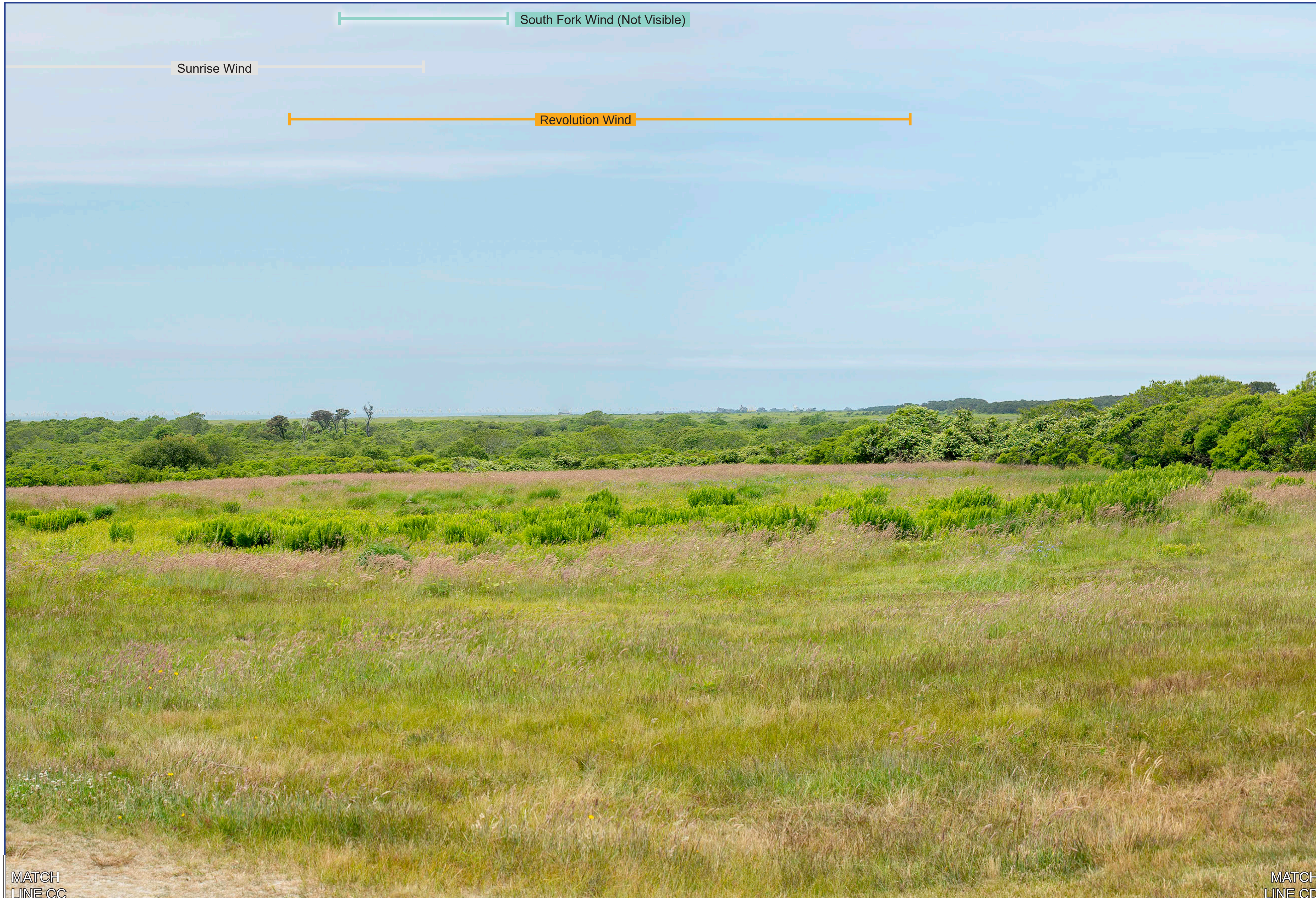
MATCH LINE BB

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

SIMULATED CONDITIONS

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

MATCH LINE BC



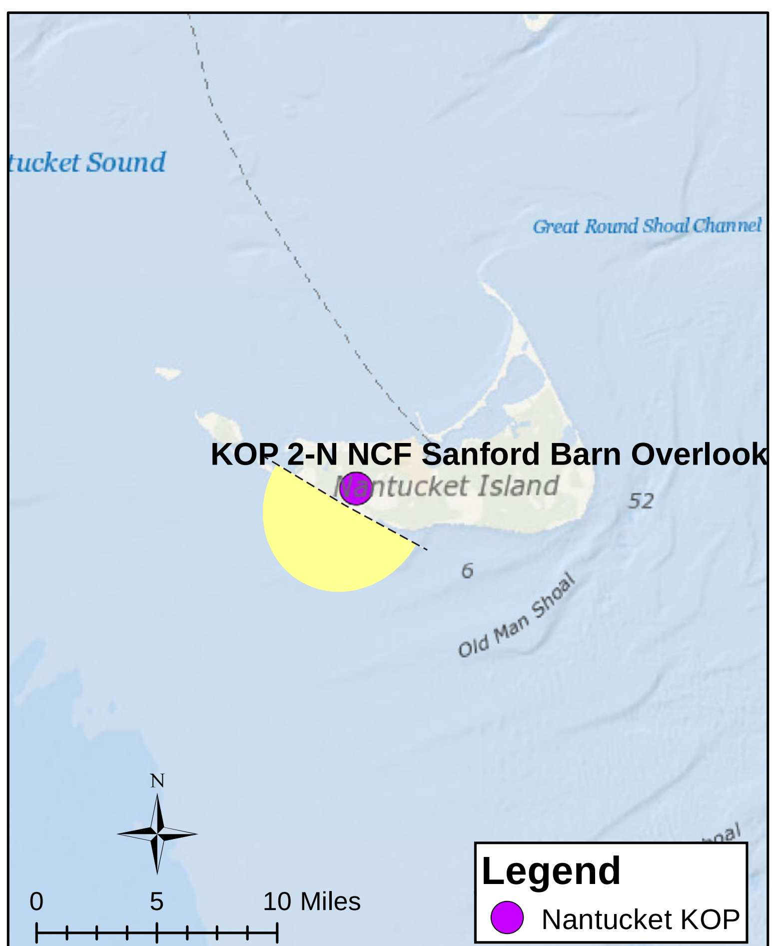
MATCH LINE B

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

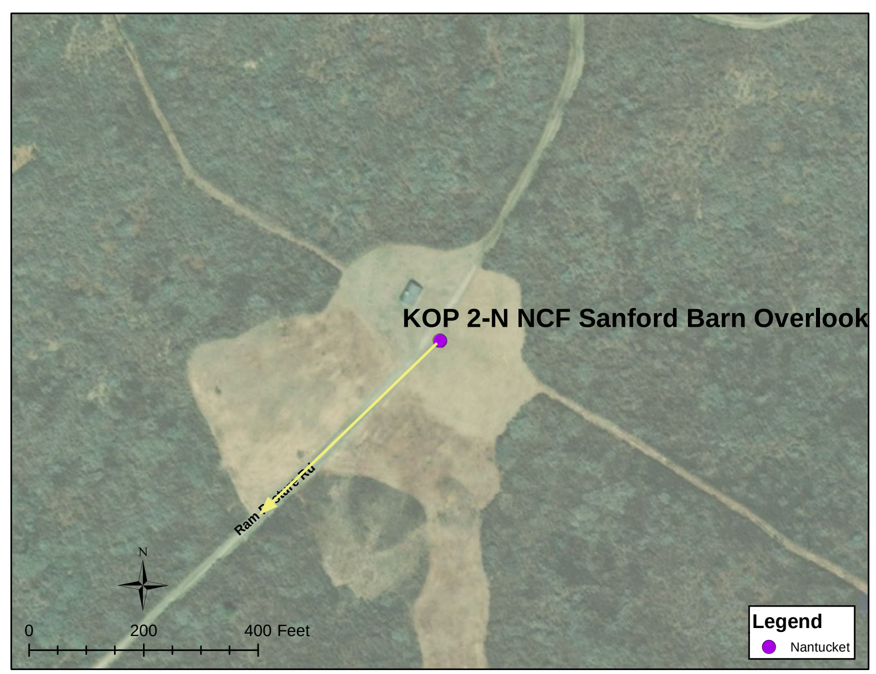
KOP 2-N Sanford Farm Barn - Scenario 2

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 182°
Vertical Field of View: 40°
Nearest WTG: 17 mi / 27 km
Furthest Visible WTG: 62 mi / 100 km
Potential Number of Structures Visible: 379
Potential Number of Structures Not Visible: 219

PHOTOGRAPH AND SITE

Time of photograph: 10:54AM
Date of photograph: 6-26-20
L/SCA: Ocean beach
Viewing direction: South (230°)
Latitude: 41.265608°N
Longitude: 70.150001°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 68° F
Humidity: 81%
Wind Dir & Speed: S 12 mph
Weather Condition: Hazy

CAMERA

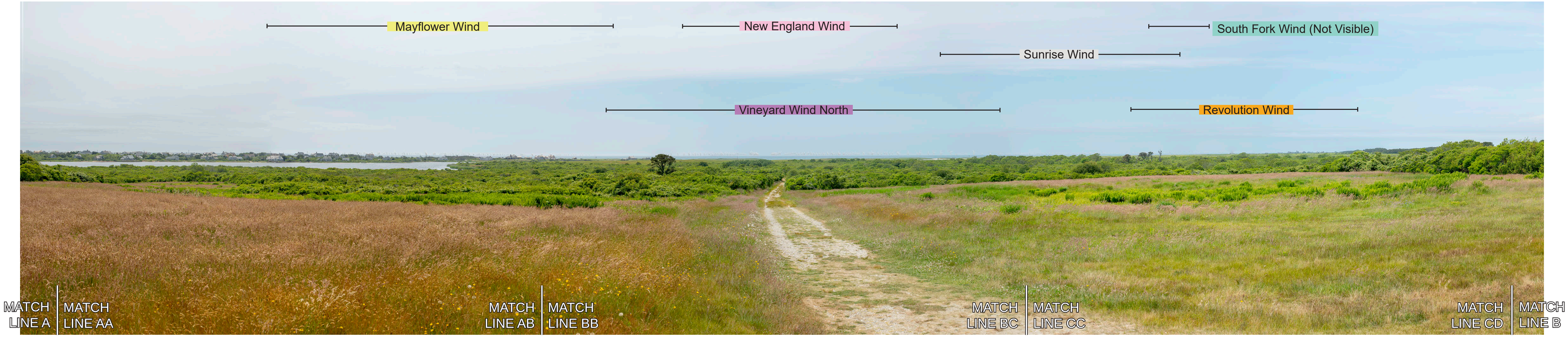
Camera Elevation: 50 ft /15.2 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 2-N Sanford Farm Barn - Scenario 2

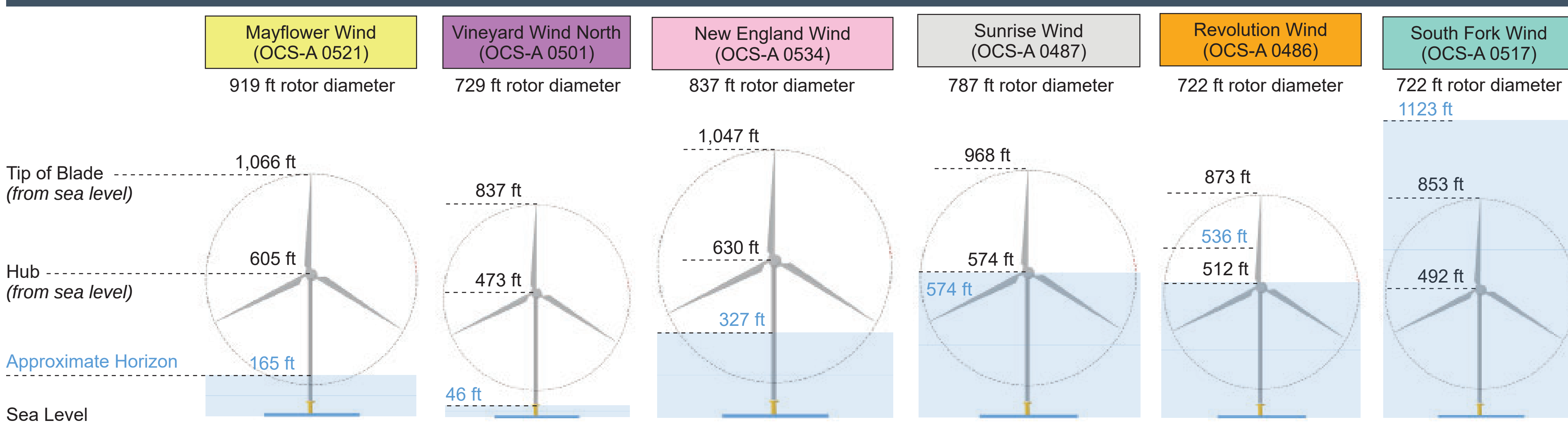
Nantucket

SIMULATED CONDITIONS

2



VISIBILTY OF CLOSEST TURBINES

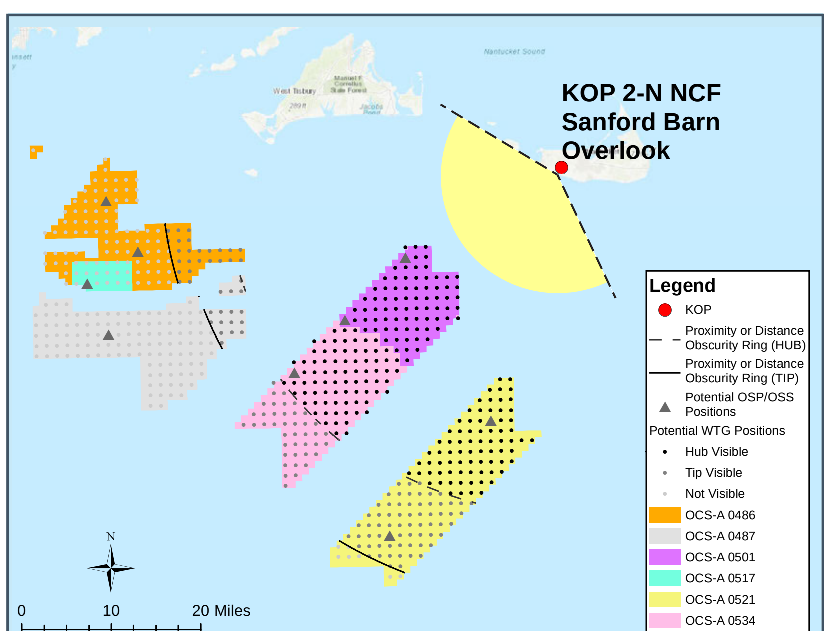


	Mayflower Wind	Vineyard Wind North	New England Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	149	77	120	131	103	18
Number of Structures within View of KOP	142	77	120	16	24	0
Distance to Closest Structure	24 mi (39 km)	17 mi (27 km)	31 mi (50 km)	38 mi (61 km)	37 mi (60 km)	50 mi (80 km)
Distance to Furthest Structure	49 mi (79 km)	30 mi (48 km)	47 mi (76 km)	62 mi (100 km)	59 mi (95 km)	56 mi (90 km)

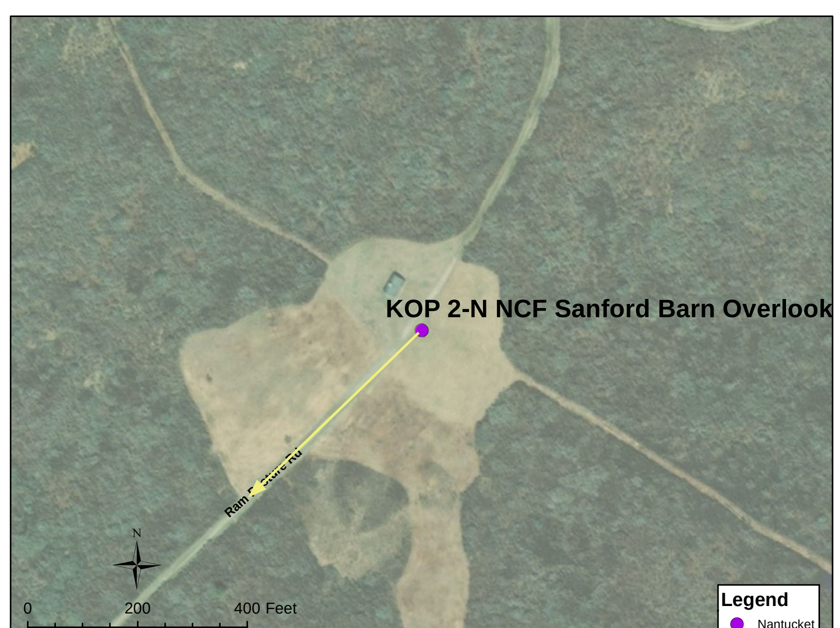
KOP 2-N Sanford Farm Barn - Scenario 2 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 17 mi / 27 km
Furthest Visible WTG: 62 mi / 100 km
Potential Number of Structures Visible: 379
Potential Number of Structures Not Visible: 219

ENVIRONMENT

Temperature: 68° F
Humidity: 81%
Wind Dir & Speed: S 12 mph
Weather Condition: Hazy

PHOTOGRAPH AND SITE

Time of photograph: 10:54AM
Date of photograph: 6-26-20
L/SCA: Ocean beach
Viewing direction: South (194°)
Latitude: 41.265608°N
Longitude: 70.150001°W
Lighting Direction: Backlit diffused

CAMERA

Camera Elevation: 50 ft /15.2 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

MATCH LINE A

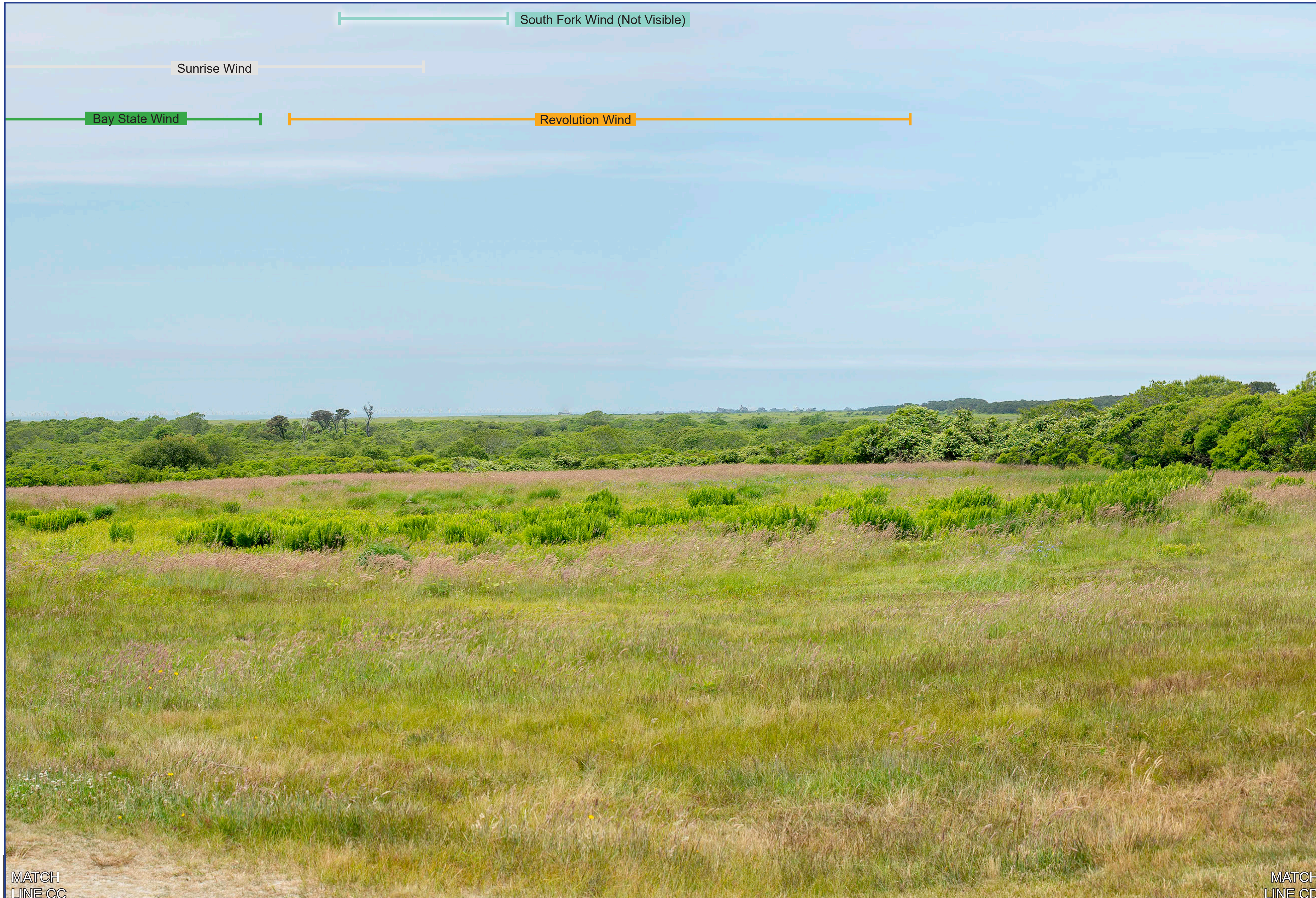
MATCH LINE BB

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 2-N Sanford Farm Barn - Scenario 2 (50mm view - 27° vertical / 40° horizontal) 2 of 3

SIMULATED CONDITIONS

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .



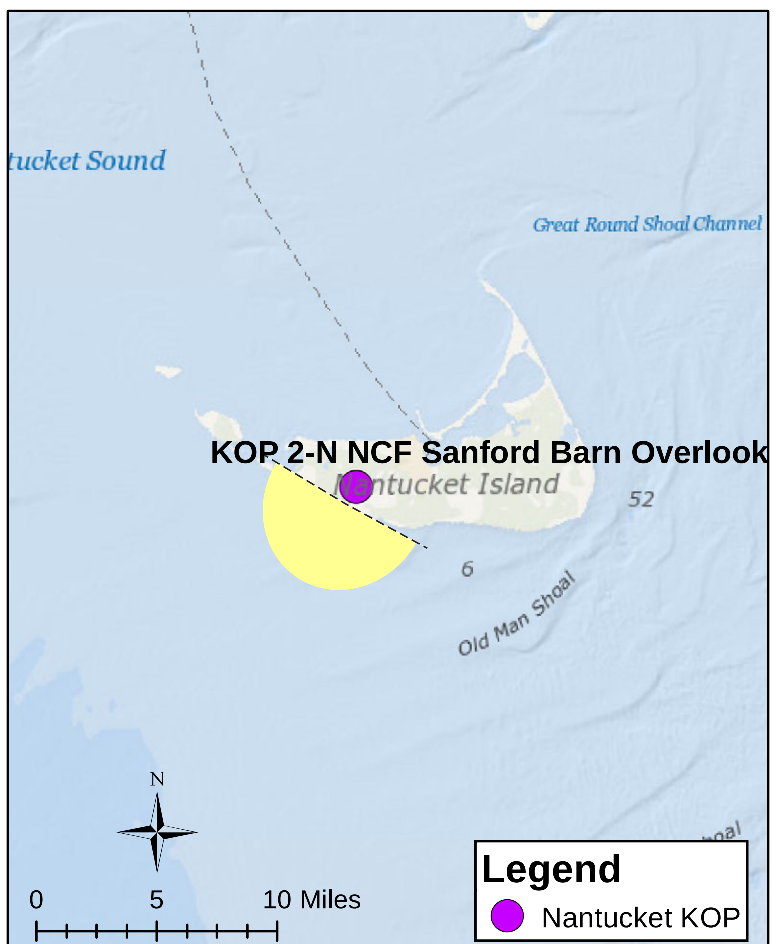
The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 2-N Sanford Farm Barn - Scenario 3

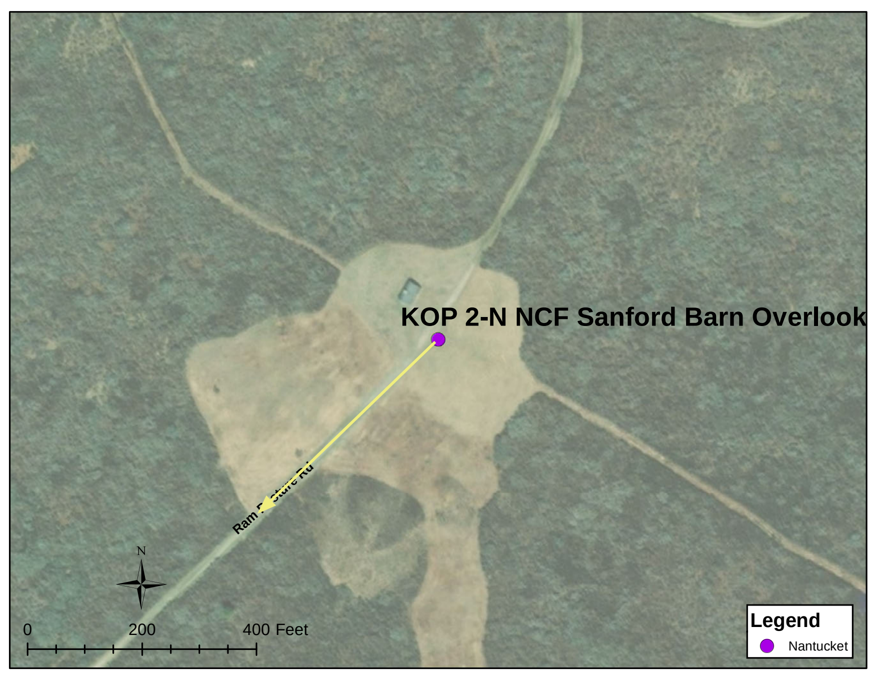
Nantucket

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 182°
Vertical Field of View: 40°
Nearest WTG: 20 mi / 33 km
Furthest Visible WTG: 49 mi / 79 km
Potential Number of Structures Visible: 392
Potential Number of Structures Not Visible: 73

PHOTOGRAPH AND SITE

Time of photograph: 10:54AM
Date of photograph: 6-26-20
L/SCA: Ocean beach
Viewing direction: South (230°)
Latitude: 41.265608°N
Longitude: 70.150001°W
Lighting Direction: Backlit diffused

ENVIRONMENT

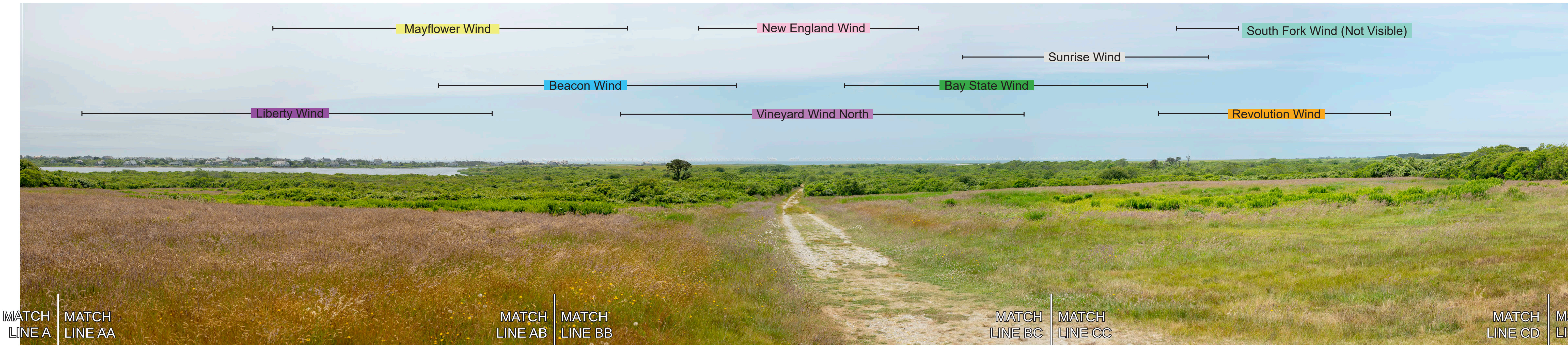
Temperature: 68° F
Humidity: 81%
Wind Dir & Speed: S 12 mph
Weather Condition: Hazy

CAMERA

Camera Elevation: 50 ft /15.2 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

SIMULATED CONDITIONS

2



VISIBILTY OF CLOSEST TURBINES

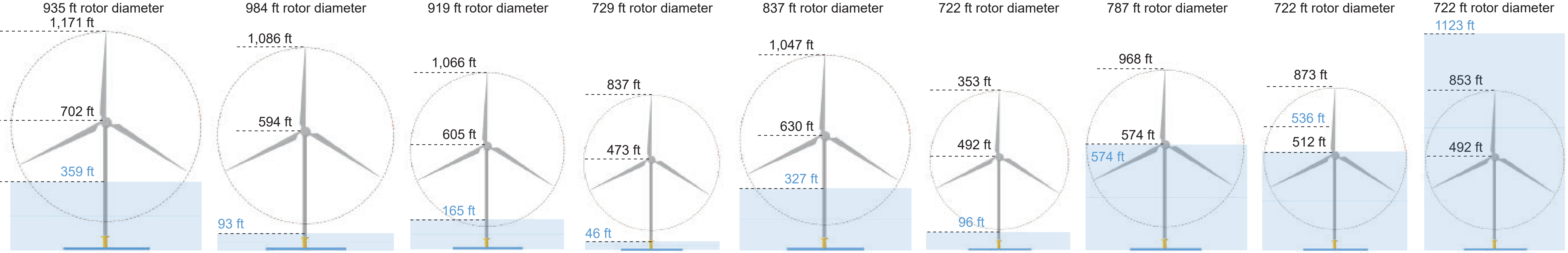
	Liberty Wind (OCS-A 0522)	Beacon Wind (OCS-A 0520)	Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Bay State Wind (OCS-A 0500)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
	935 ft rotor diameter	984 ft rotor diameter	919 ft rotor diameter	729 ft rotor diameter	837 ft rotor diameter	722 ft rotor diameter	787 ft rotor diameter	722 ft rotor diameter	722 ft rotor diameter

Tip of Blade
(from sea level)

Hub
(from sea level)

Approximate Horizon

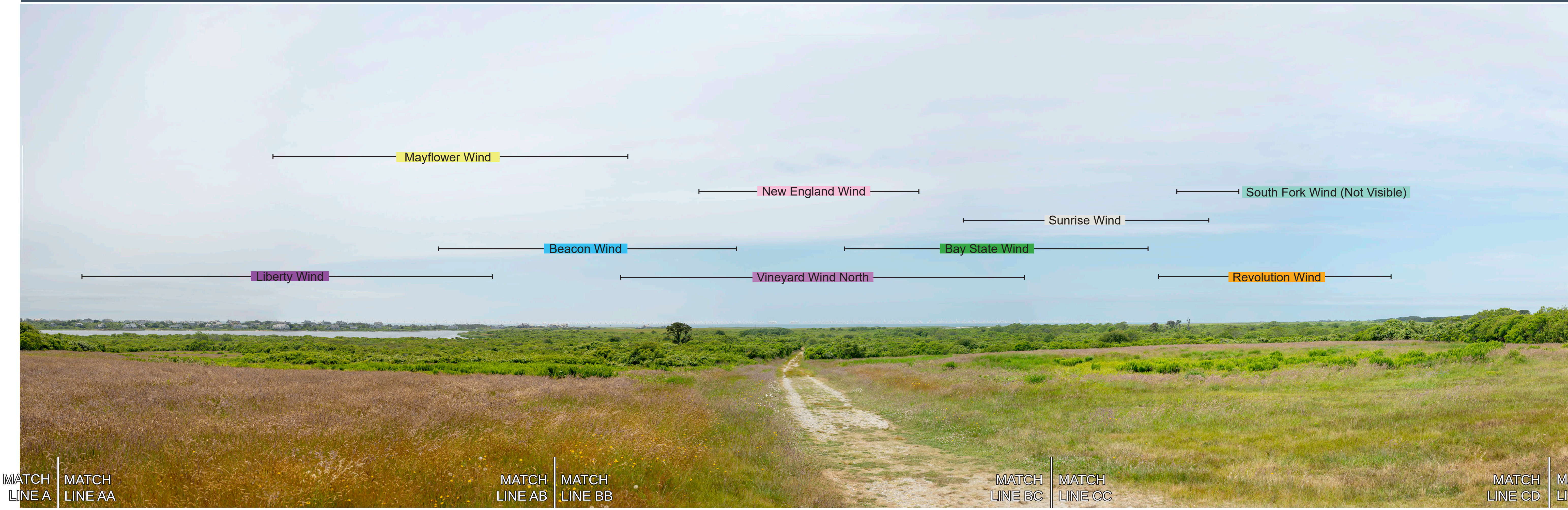
Sea Level



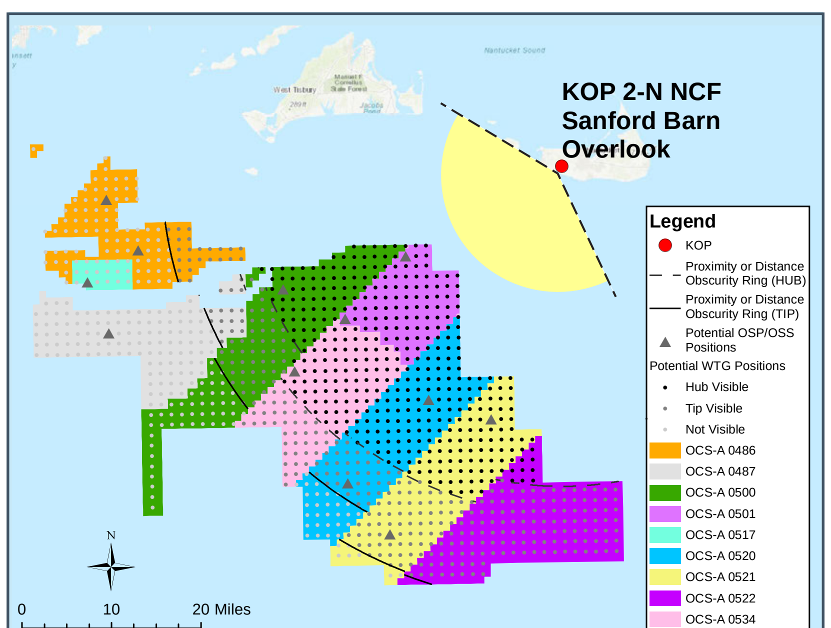
	Liberty Wind	Beacon Wind	Mayflower Wind	Vineyard Wind North	New England Wind	Bay State Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025-2030	2025-2030	2025	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	149	77	120	169	131	103	18
Number of Structures within View of KOP	139	129	142	77	120	124	16	24	0
Distance to Closest Structure	32 mi (51 km)	20 mi (33 km)	24 mi (39 km)	17 mi (27 km)	31 mi (50 km)	21 mi (33 km)	38 mi (61 km)	37 mi (60 km)	50 mi (80 km)
Distance to Furthest Structure	49 mi (79 km)	44 mi (81 km)	49 mi (79 km)	30 mi (48 km)	47 mi (76 km)	60 mi (97 km)	62 mi (100 km)	59 mi (95 km)	56 mi (90 km)

KOP 2-N Sanford Farm Barn - Scenario 3 (Human Field of View - 124°)

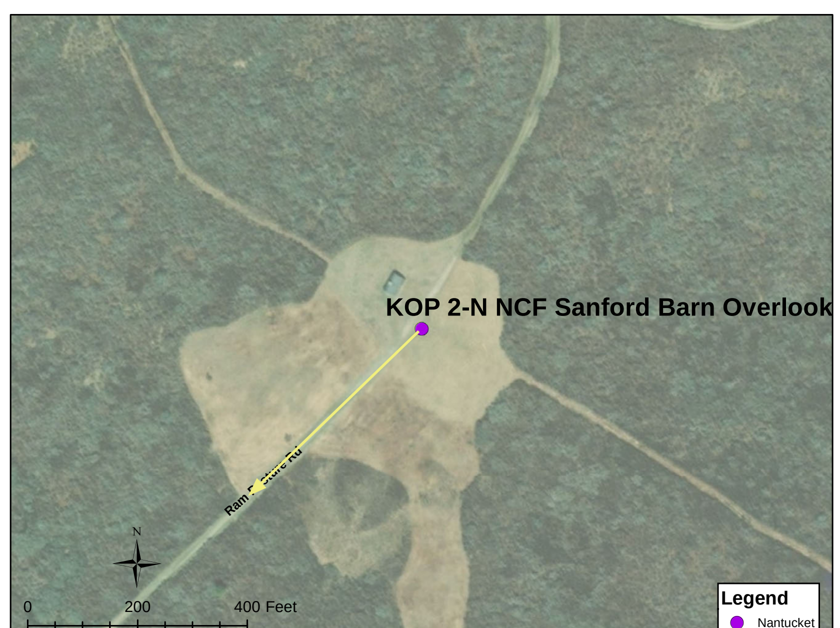
SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 20.mi / 33 km
Furthest Visible WTG: 49 mi / 79 km
Potential Number of Structures Visible: 392
Potential Number of Structures Not Visible: 73

PHOTOGRAPH AND SITE

Time of photograph: 10:54AM
Date of photograph: 6-26-20
L/SCA: Ocean beach
Viewing direction: South (194°)
Latitude: 41.265608°N
Longitude: 70.150001°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 68° F
Humidity: 81%
Wind Dir & Speed: S 12 mph
Weather Condition: Hazy

CAMERA

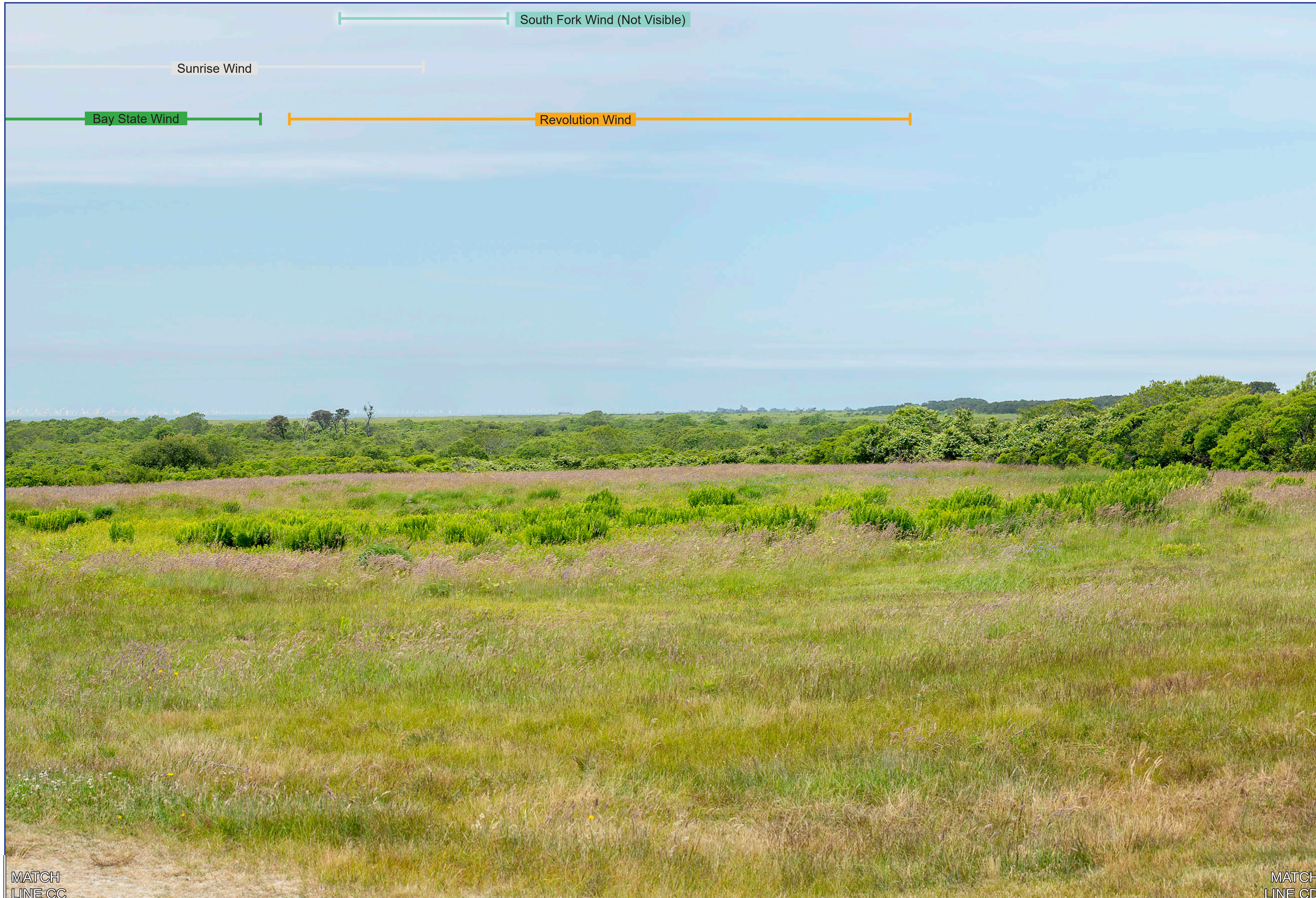
Camera Elevation: 50 ft /15.2 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

MATCH LINE AB

MATCH LINE CC

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

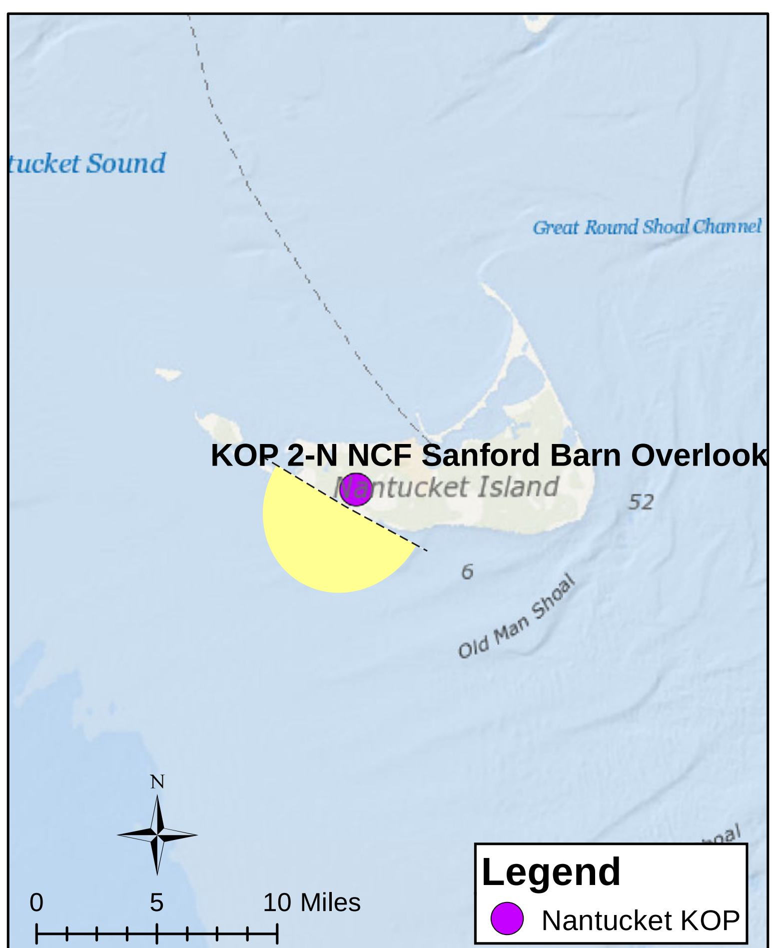


The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

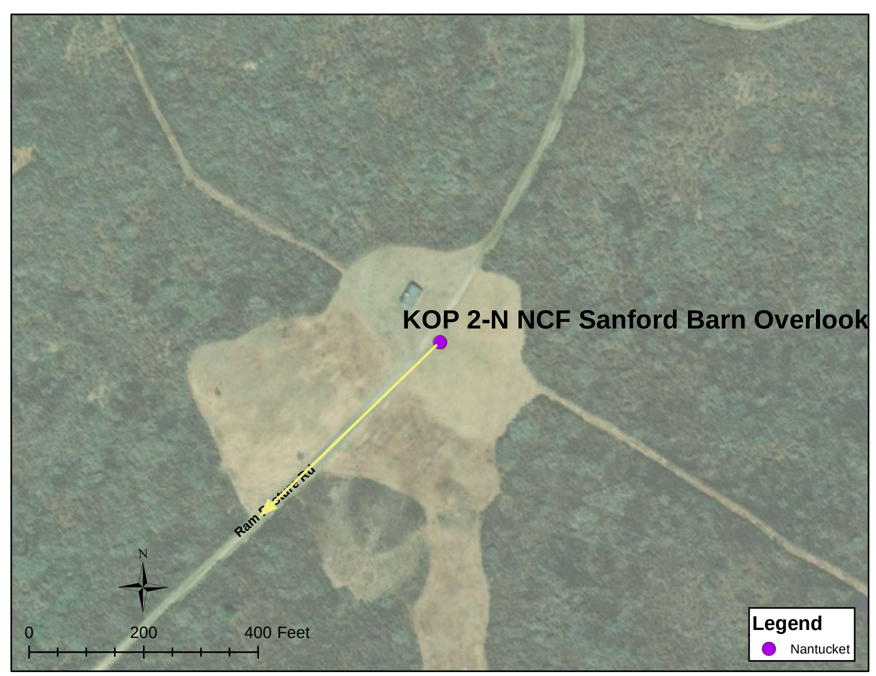
KOP 2-N Sanford Farm Barn - Scenario 4

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 182.3°
Vertical Field of View: 40°
Nearest WTG: 20 mi / 33 km
Furthest Visible WTG: 60 mi / 96 km
Potential Number of Structures isible: 534
Potential Number of Structures Not Visible: 80

PHOTOGRAPH AND SITE

Time of photograph: 10:54 AM
Date of photograph: 6-26-20
L/SCA: Ocean beach
Viewing direction: South (230°)
Latitude: 41.265608°N
Longitude: 70.150001°W
Lighting Direction: Backlit diffused

ENVIRONMENT

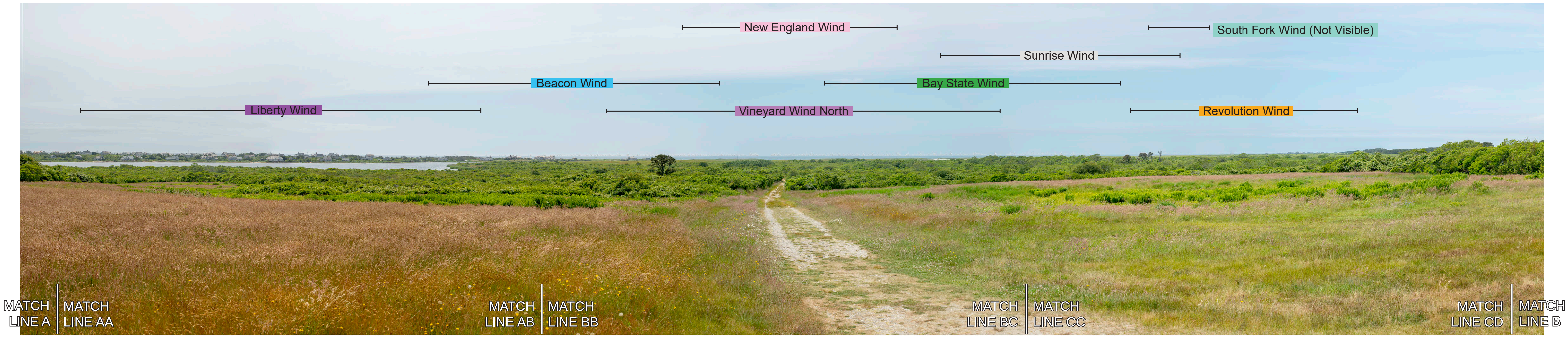
Temperature: 68° F
Humidity: 81%
Wind Dir & Speed: S 12 mph
Weather Condition: Hazy

CAMERA

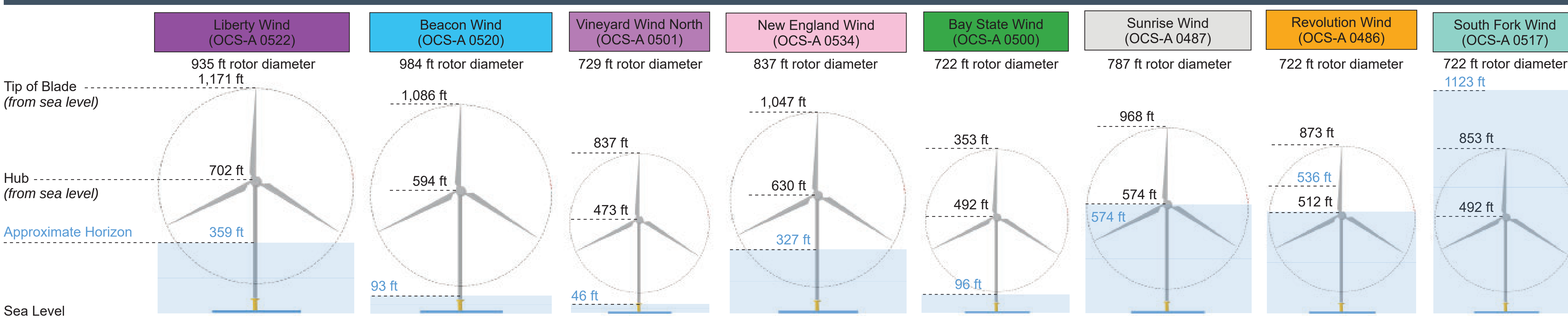
Camera Elevation: 50 ft /15.2 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 2-N Sanford Farm Barn - Scenario 4

SIMULATED CONDITIONS



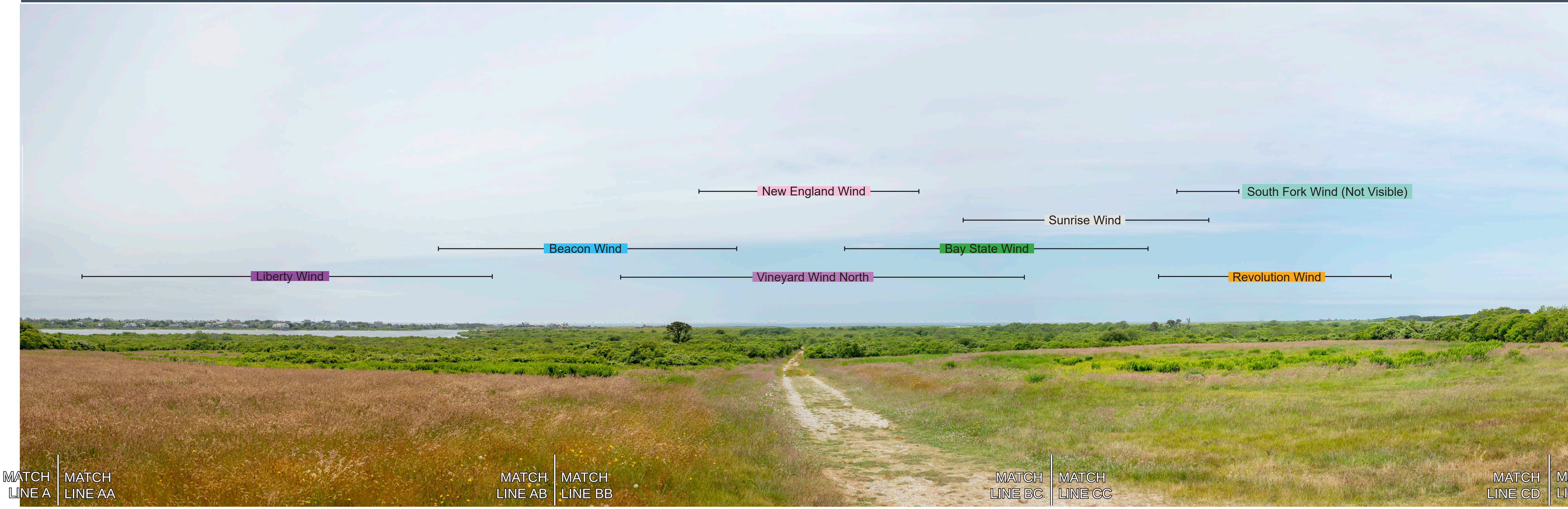
VISIBILTY OF CLOSEST TURBINES



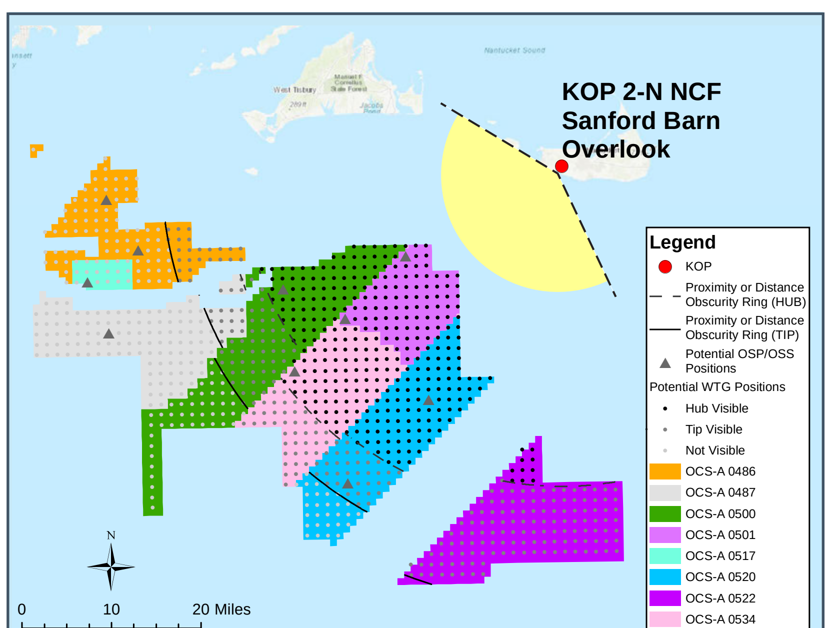
	Liberty Wind (OCS-A 0522)	Beacon Wind (OCS-A 0520)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Bay State Wind (OCS-A 0500)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2025-2030	2025-2030	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	77	120	169	131	103	18
Number of Structures within View of KOP	139	129	77	120	124	16	24	0
Distance to Closest Structure	32 mi (51 km)	20 mi (33 km)	17 mi (27 km)	31 mi (50 km)	21 mi (33 km)	38 mi (61 km)	37 mi (60 km)	50 mi (80 km)
Distance to Furthest Structure	49 mi (79 km)	44 mi (81 km)	30 mi (48 km)	47 mi (76 km)	60 mi (97 km)	62 mi (100 km)	59 mi (95 km)	56 mi (90 km)

KOP 2-N Sanford Farm Barn - Scenario 4 (Human Field of View - 124°)

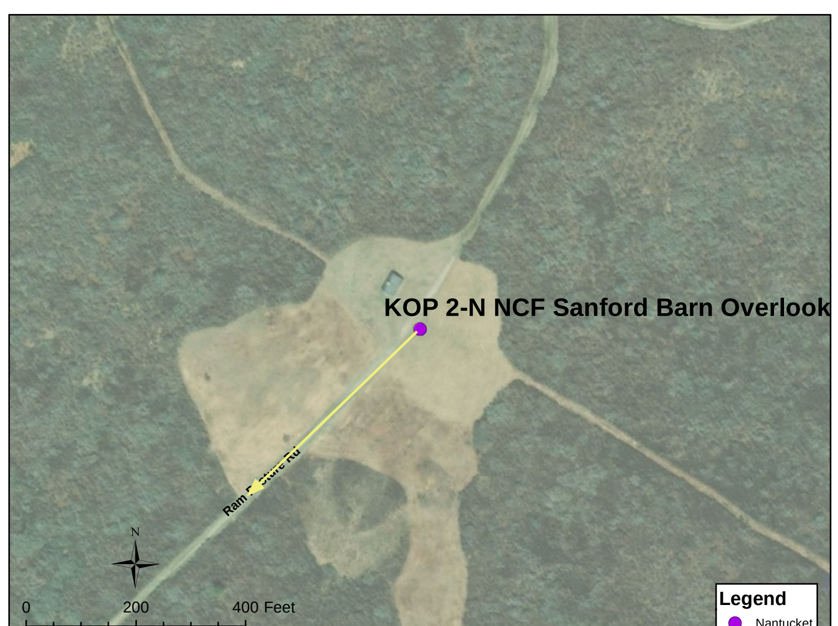
SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 182.3°
Vertical Field of View: 40°
Nearest WTG: 20 mi / 33 km
Furthest Visible WTG: 60 mi / 96 km
Potential Number of Structures isible: 534
Potential Number of Structures Not Visible: 80

ENVIRONMENT

Temperature: 68° F
Humidity: 81%
Wind Dir & Speed: S 12 mph
Weather Condition: Hazy

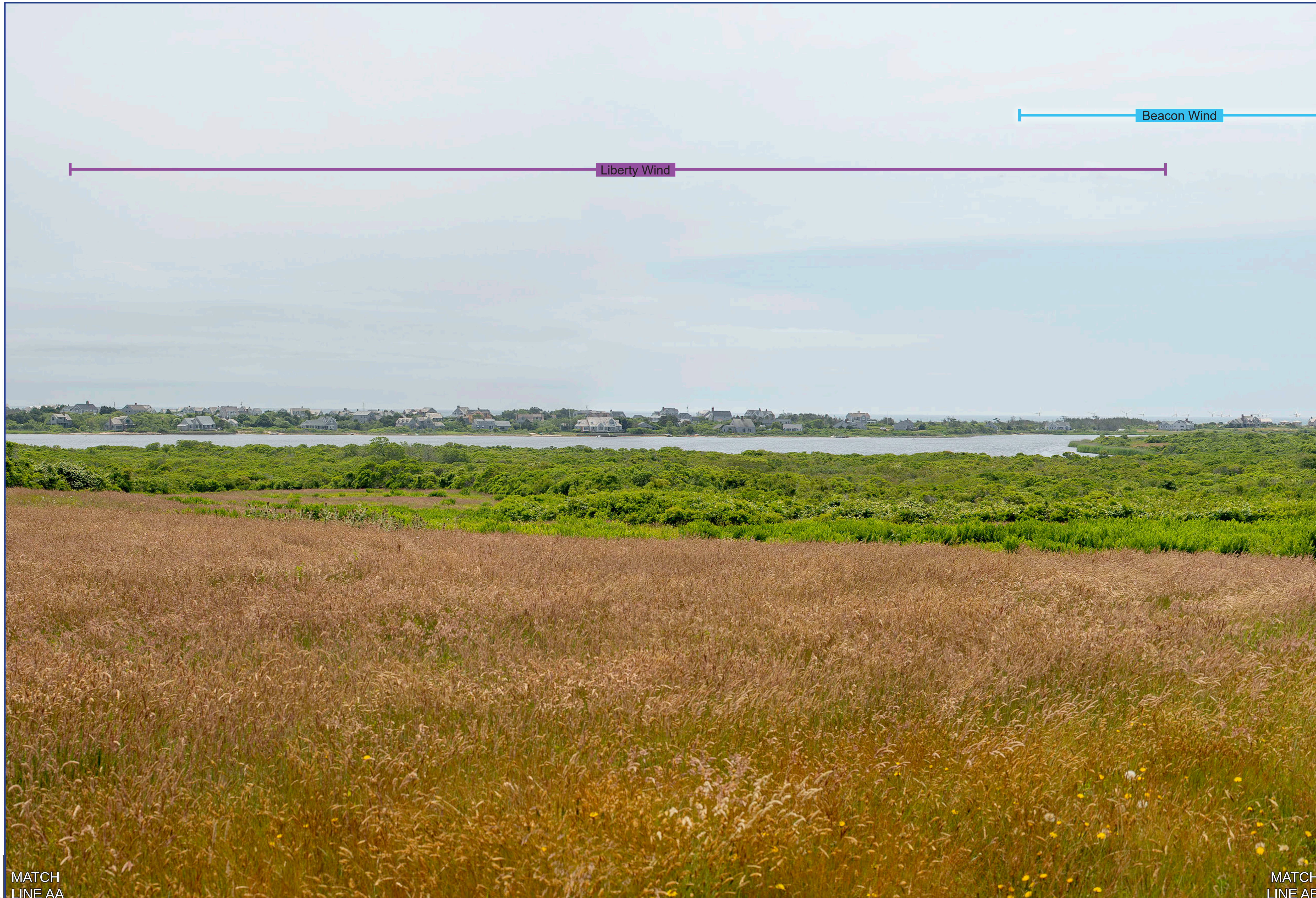
PHOTOGRAPH AND SITE

Time of photograph: 10:54 AM
Date of photograph: 6-26-20
L/SCA: Ocean beach
Viewing direction: South (194°)
Latitude: 41.265608°N
Longitude: 70.150001°W
Lighting Direction: Backlit diffused

CAMERA

Camera Elevation: 50 ft /15.2 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

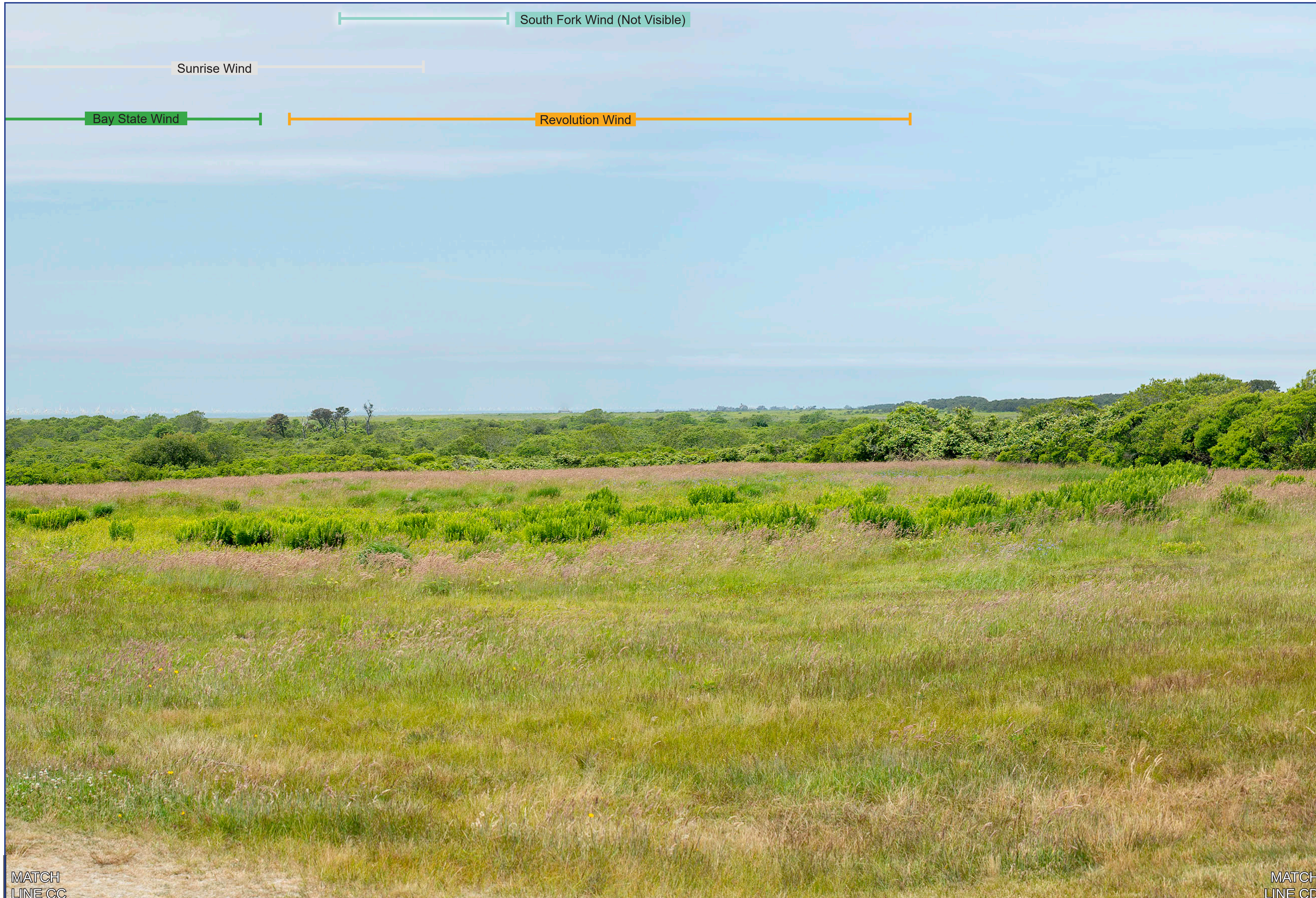
MATCH LINE A



MATCH LINE BB

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .



MATCH LINE BC

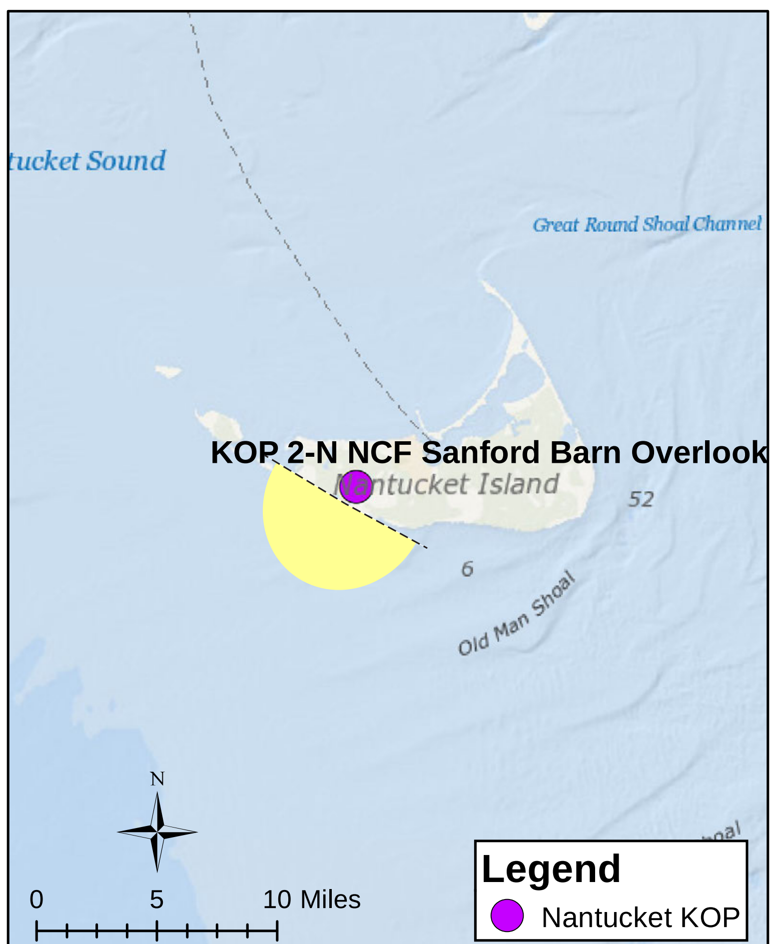
MATCH LINE B

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

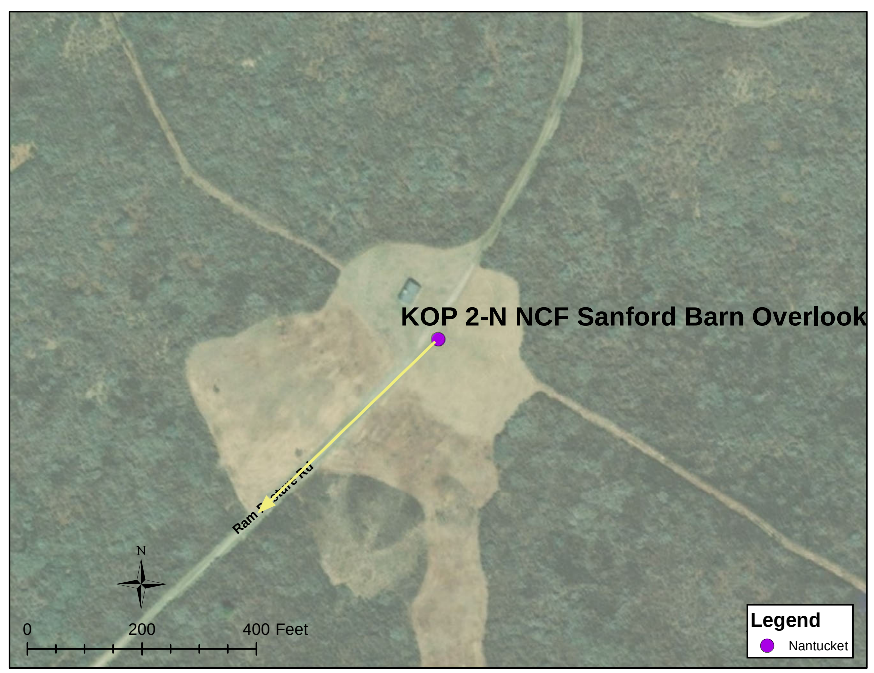
KOP 2-N Sanford Farm Barn - Scenario 5

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 182.3°
Vertical Field of View: 39.6°
Nearest WTG: 17 mi / 27.35 km
Furthest Visible WTG: 62.4 mi / 100.42 km
Potential Number of WTGs Visible: 629
Potential Number of WTGs Not Visible: 285

PHOTOGRAPH AND SITE

Time of photograph: 10:54 AM
Date of photograph: 6-26-20
L/SCA: Ocean beach
Viewing direction: South (194°)
Latitude: 41.265608°N
Longitude: 70.150001°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 68° F
Humidity: 81%
Wind Dir & Speed: S 12 mph
Weather Condition: Hazy

CAMERA

Camera Elevation: 50.5 ft /15.4 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

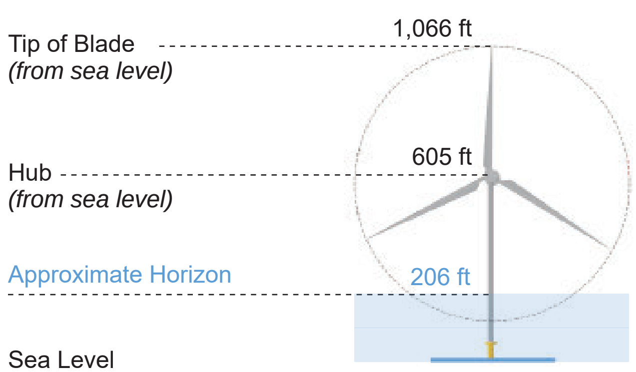
KOP 2-N Sanford Farm Barn - Scenario 5

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

Mayflower Wind (OCS-A 0521)

919 ft rotor

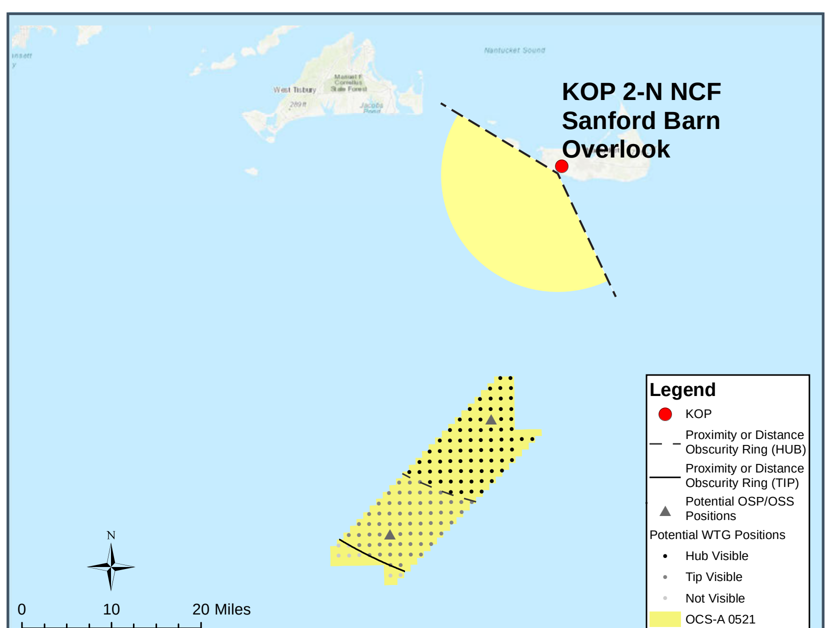


Year Forecasted for Development	2025
Number of Structures in Lease Area	149
Number of Structures within View of KOP	142
Distance to Closest Structure	24.4 mi (39.26 km)
Distance to Furthest Structure	50.3 mi (80.95 km)

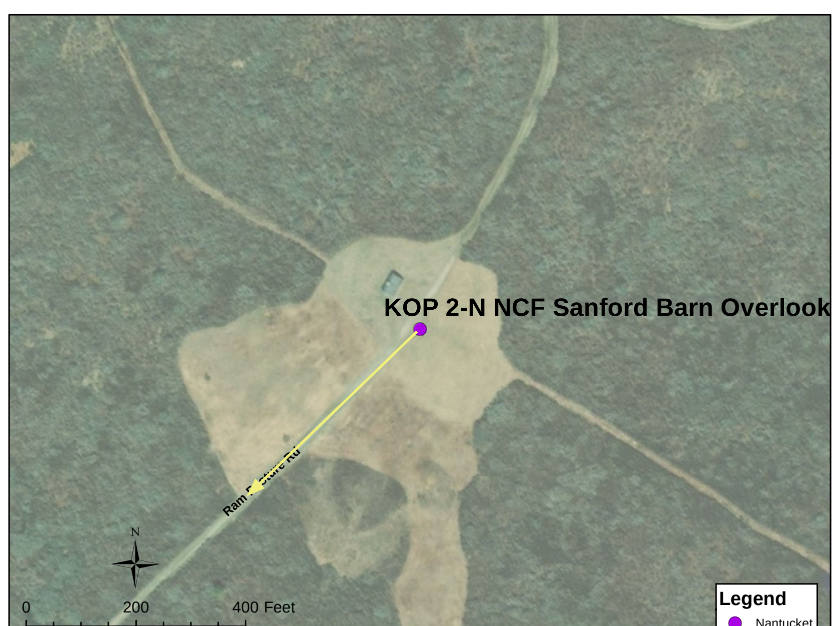
KOP 2-N Sanford Farm Barn - Scenario 5 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 39.6°
Nearest WTG: 17 mi / 27.35 km
Furthest Visible WTG: 62.4 mi / 100.42 km
Potential Number of WTGs Visible: 629
Potential Number of WTGs Not Visible: 285

ENVIRONMENT

Temperature: 68° F
Humidity: 81%
Wind Dir & Speed: S 12 mph
Weather Condition: Hazy

PHOTOGRAPH AND SITE

Time of photograph: 10:54 AM
Date of photograph: 6-26-20
L/SCA: Ocean beach
Viewing direction: South (194°)
Latitude: 41.265608°N
Longitude: 70.150001°W
Lighting Direction: Backlit diffused

CAMERA

Camera Elevation: 50.5 ft /15.4 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

MATCH LINE A

MATCH LINE BB

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 2-N Sanford Farm Barn - Scenario 5 (50mm view - 27° vertical / 39.6° horizontal) 3 of 3

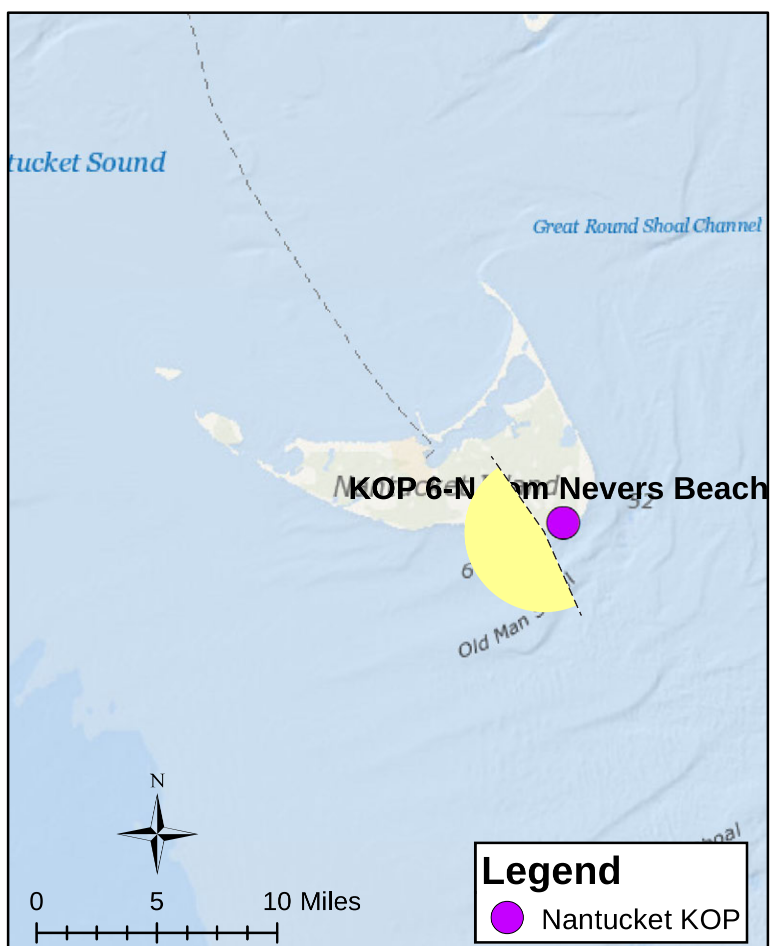
SIMULATED CONDITIONS

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 6-N Tom Nevers Beach - Scenario 1

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 169°
Vertical Field of View: 40°
Nearest WTG: 23 mi / 37 km
Furthest Visible WTG: 70 mi / 113 km
Potential Number of Structures Visible: 136
Potential Number of Structures Not Visible: 313

PHOTOGRAPH AND SITE

Time of photograph: 8:44AM
Date of photograph: 6-27-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (242°)
Latitude: 41.244577°N
Longitude: 69.985046°W
Lighting Direction: Sidelit diffused

ENVIRONMENT

Temperature: 68° F
Humidity: 90%
Wind Dir & Speed: S 10 mph
Weather Condition: Partly Cloudy

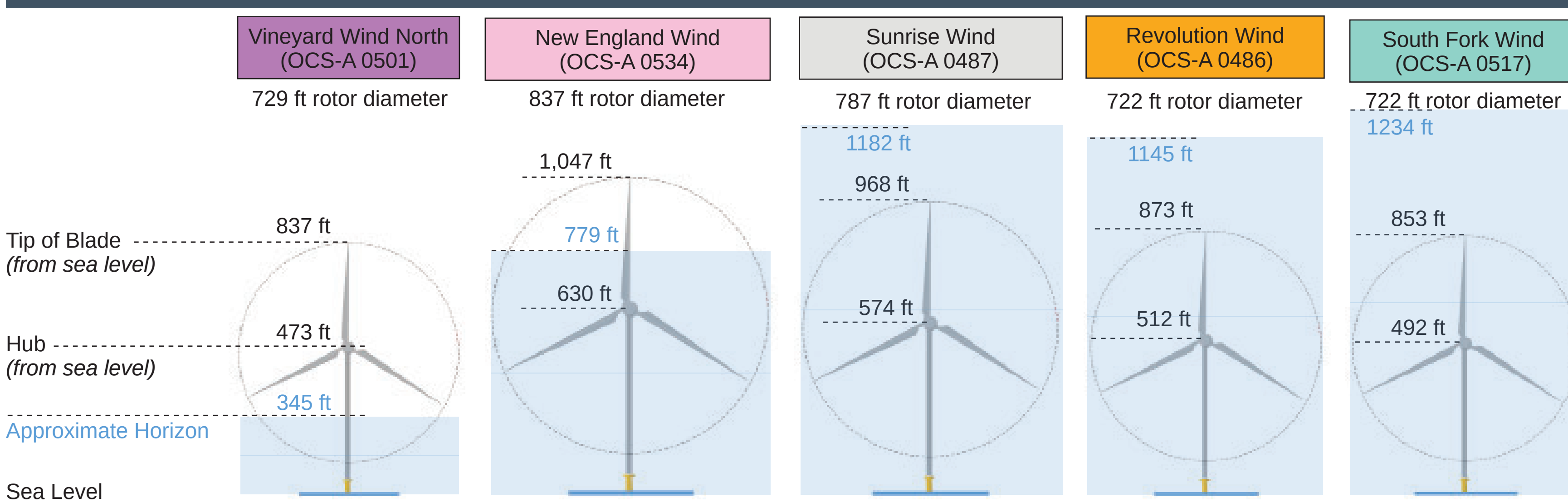
CAMERA

Camera Elevation: 6.5 ft /1.7 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 6-N Tom Nevers Beach - Scenario 1

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

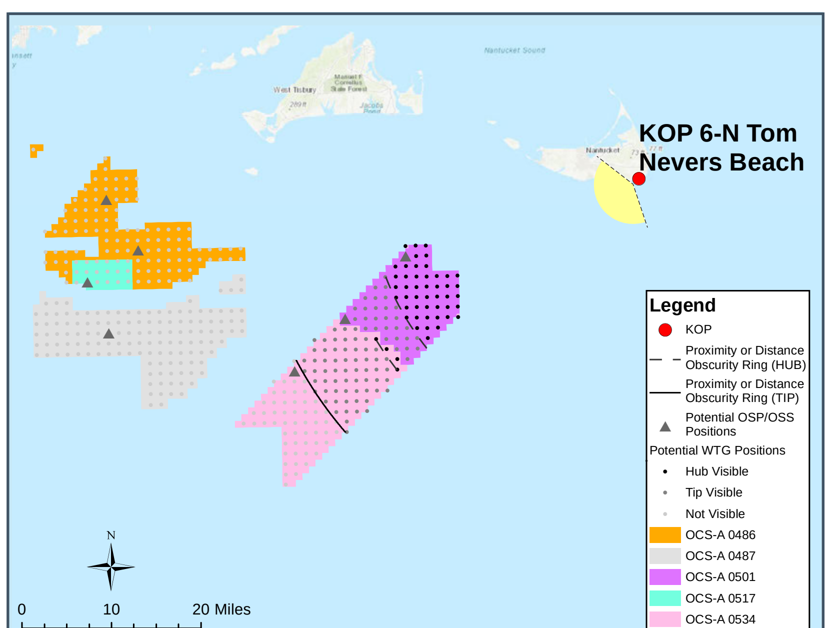


	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	77	120	131	103	18
Number of Structures within View of KOP	71	65	0	0	0
Distance to Closest Structure	23 mi (37 km)	38 mi (61 km)	46 mi (74 km)	45 mi (73 km)	47 mi (75 km)
Distance to Furthest Structure	36 mi (59 km)	52 mi (84 km)	70 mi (113 km)	109 mi (95 km)	64 mi (103 km)

KOP 6-N Tom Nevers Beach - Scenario 1 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°

Vertical Field of View: 40°

Nearest WTG: 23 mi / 37 km

Furthest Visible WTG: 70 mi / 113 km

Potential Number of Structures Visible: 136

Potential Number of Structures Not Visible: 313

PHOTOGRAPH AND SITE

Time of photograph: 8:44AM

Date of photograph: 6-27-20

L/SCA: Ocean Beach, Open Ocean, Dunes

Viewing direction: South (242°)

Latitude: 41.244577°N

Longitude: 69.985046°W

Lighting Direction: Sidelit diffused

ENVIRONMENT

Temperature: 68° F

Humidity: 90%

Wind Dir & Speed: S 10 mph

Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 6.5 ft /1.7 m

Nikon D4

Nikon 50mm

ISO: 100

Fstop: f/7.1

Shutter: 1/1250 sec

Exposure bias: -0.7 step

MATCH LINE A

MATCH LINE AA

MATCH LINE AB

MATCH LINE BB

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

MATCH LINE AB

MATCH LINE BB

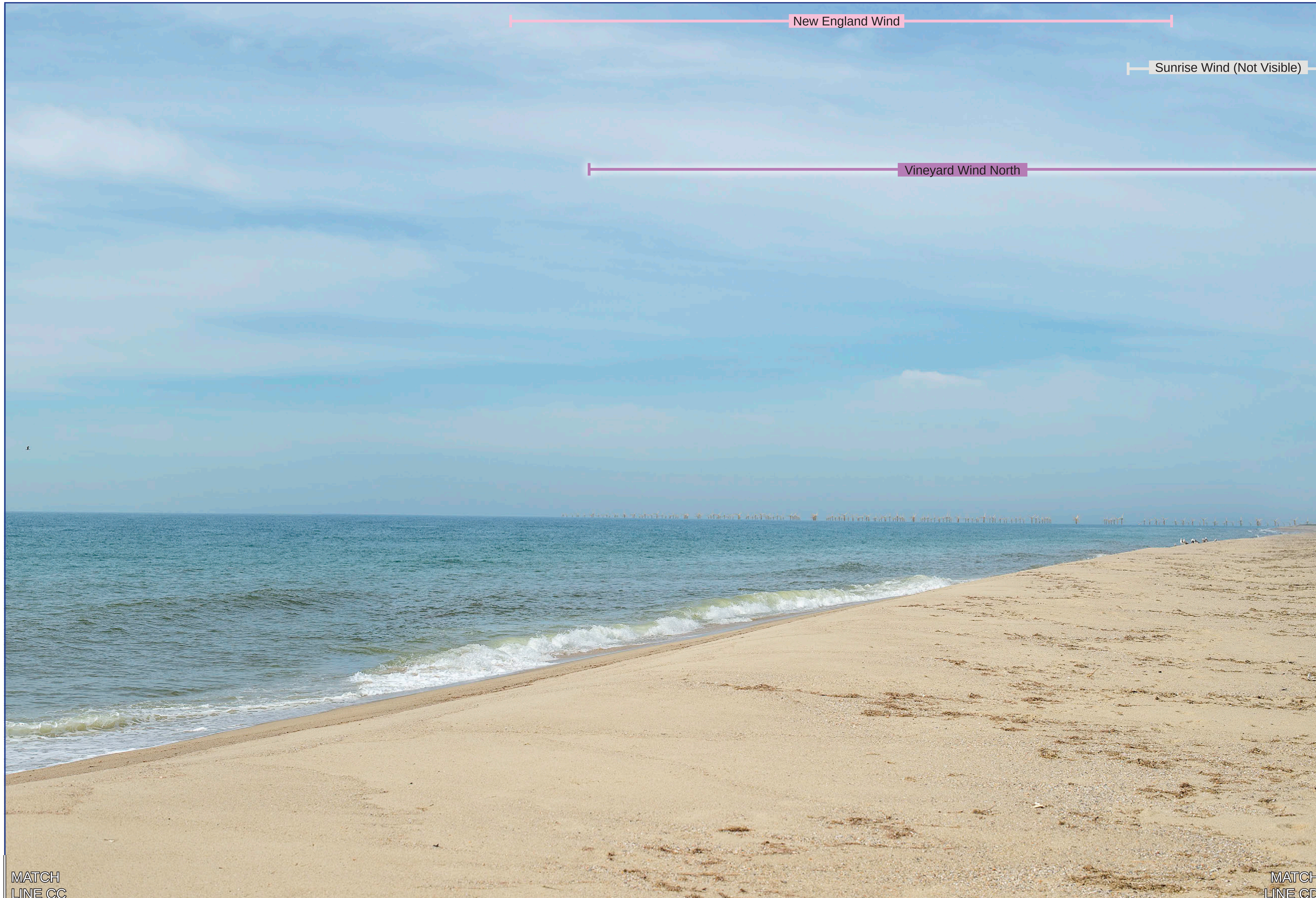
MATCH LINE BC

MATCH LINE CC

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 6-N Tom Nevers Beach - Scenario 1 (50mm view - 27° vertical / 40° horizontal) 3 of 3

SIMULATED CONDITIONS

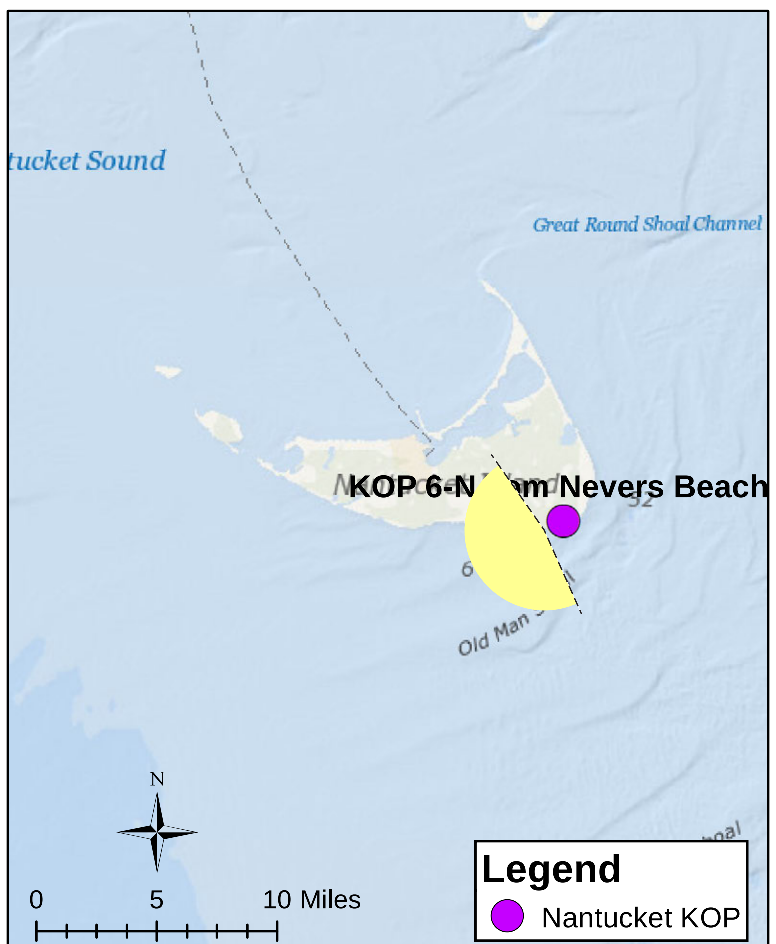


The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 6-N Tom Nevers Beach - Scenario 2

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 169°
Vertical Field of View: 40°
Nearest WTG: 23 mi / 37 km
Furthest Visible WTG: 70 mi / 113 km
Potential Number of Structures Visible: 228
Potential Number of Structures Not Visible: 370

PHOTOGRAPH AND SITE

Time of photograph: 8:44AM
Date of photograph: 6-27-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (242°)
Latitude: 41.244577°N
Longitude: 69.985046°W
Lighting Direction: Sidelit diffused

ENVIRONMENT

Temperature: 68° F
Humidity: 90%
Wind Dir & Speed: S 10 mph
Weather Condition: Partly Cloudy

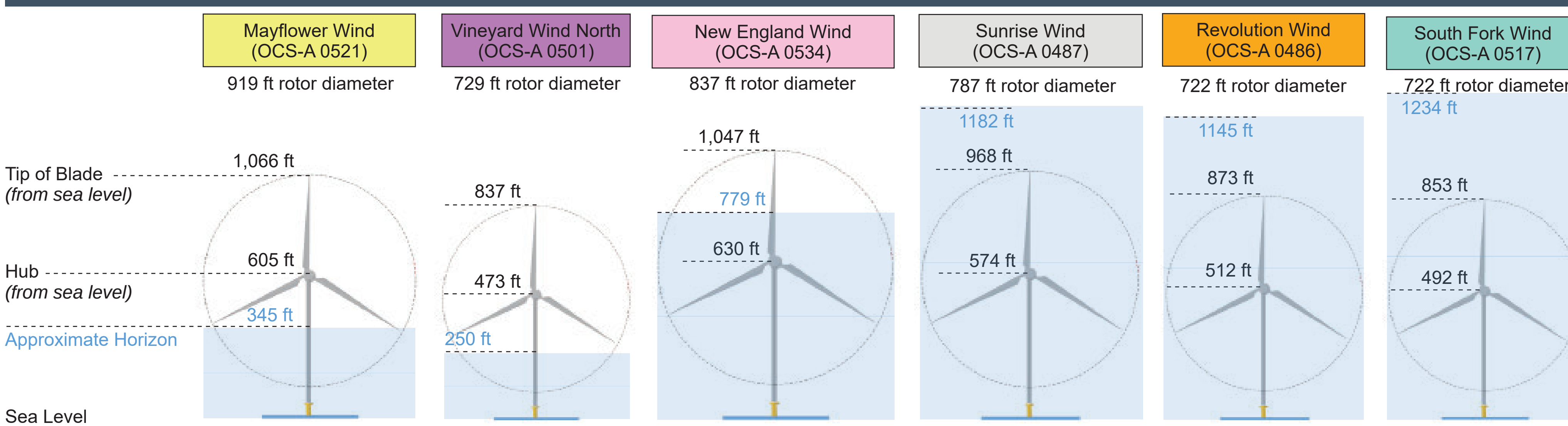
CAMERA

Camera Elevation: 6.5 ft /1.7 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 6-N Tom Nevers Beach - Scenario 2

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

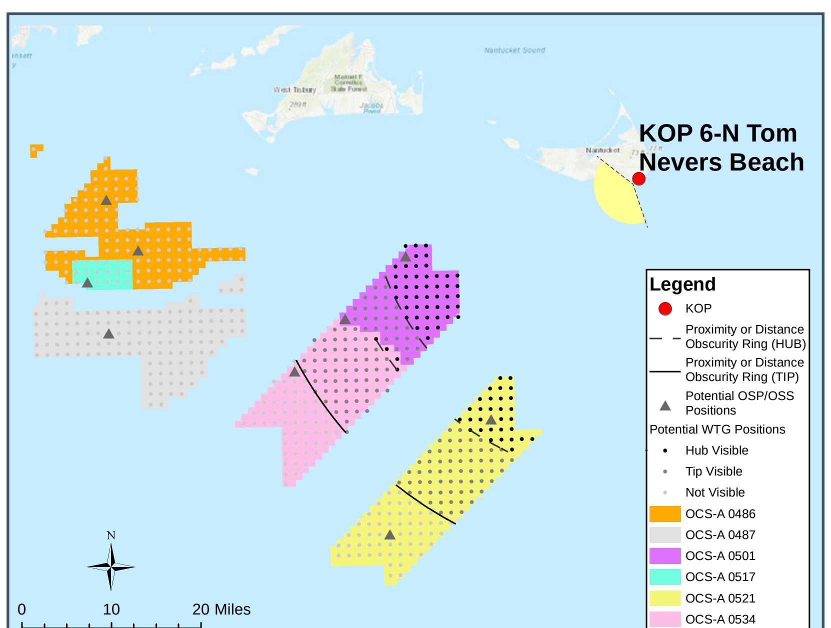


	Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2025	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	149	77	120	131	103	18
Number of Structures within View of KOP	92	71	65	0	0	0
Distance to Closest Structure	26 mi (43 km)	23 mi (37 km)	38 mi (61 km)	46 mi (74 km)	45 mi (73 km)	47 mi (75 km)
Distance to Furthest Structure	54 mi (87 km)	36 mi (59 km)	52 mi (84 km)	70 mi (113 km)	109 mi (95 km)	64 mi (103 km)

KOP 6-N Tom Nevers Beach - Scenario 2 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°

Vertical Field of View: 40°

Nearest WTG: 23 mi / 37 km

Furthest Visible WTG: 70 mi / 113 km

Potential Number of Structures Visible: 228

Potential Number of Structures Not Visible: 370

ENVIRONMENT

Temperature: 68° F

Humidity: 90%

Wind Dir & Speed: S 10 mph

Weather Condition: Partly Cloudy

PHOTOGRAPH AND SITE

Time of photograph: 8:44AM

Date of photograph: 6-27-20

L/SCA: Ocean Beach, Open Ocean, Dunes

Viewing direction: South (242°)

Latitude: 41.244577°N

Longitude: 69.985046°W

Lighting Direction: Sidelit diffused

CAMERA

Camera Elevation: 6.5 ft /1.7 m

Nikon D4

Nikon 50mm

ISO: 100

Fstop: f/7.1

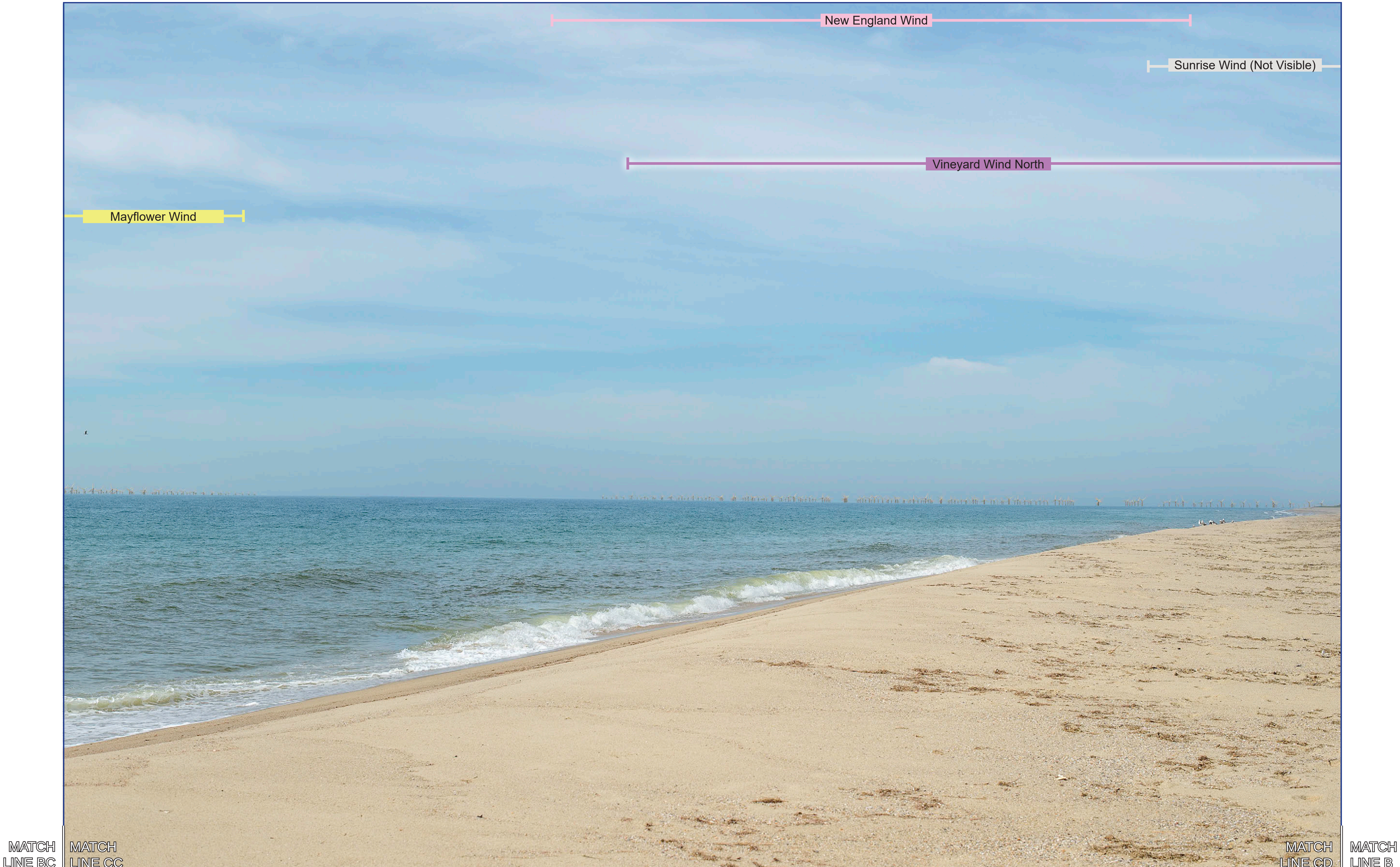
Shutter: 1/1250 sec

Exposure bias: -0.7 step

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 6-N Tom Nevers Beach - Scenario 2 (50mm view - 27° vertical / 40° horizontal) 3 of 3

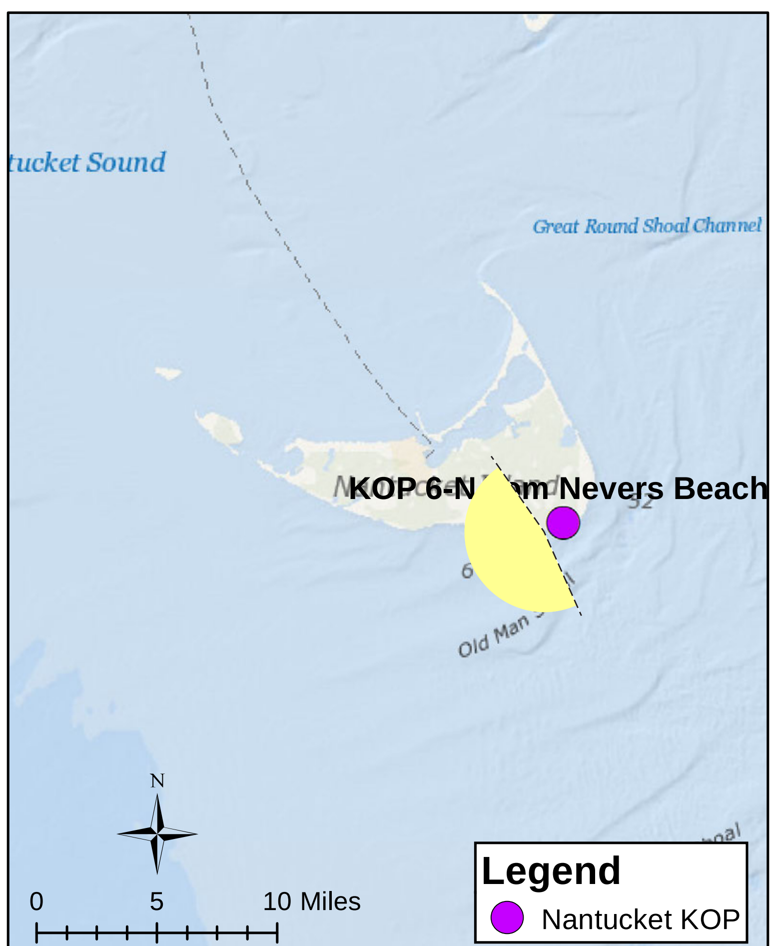


The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 6-N Tom Nevers Beach - Scenario 3

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 169°
Vertical Field of View: 40°
Nearest WTG: 23 mi / 37 km
Furthest Visible WTG: 70 mi / 113 km
Potential Number of WTGs Visible: 463
Potential Number of WTGs Not Visible: 600

PHOTOGRAPH AND SITE

Time of photograph: 8:44AM
Date of photograph: 6-27-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (242°)
Latitude: 41.244577°N
Longitude: 69.985046°W
Lighting Direction: Sidelit diffused

ENVIRONMENT

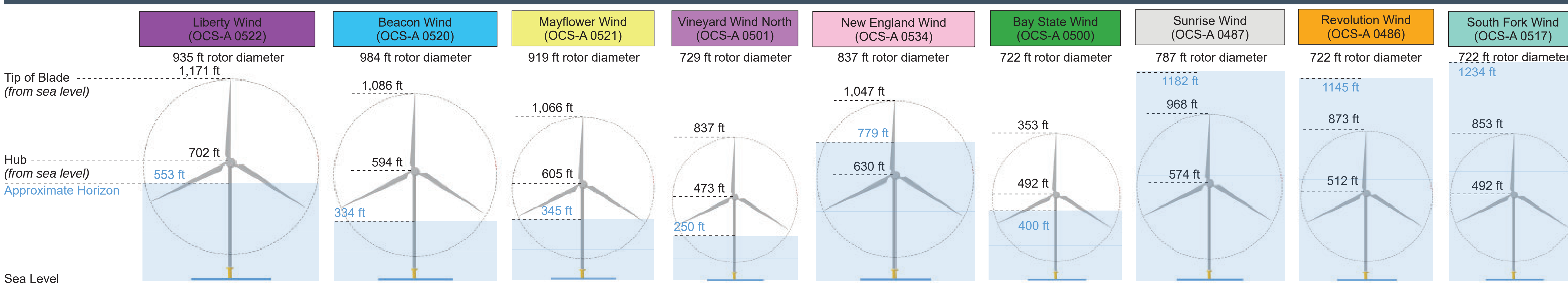
Temperature: 68° F
Humidity: 90%
Wind Dir & Speed: S 10 mph
Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 6.5 ft /1.7 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

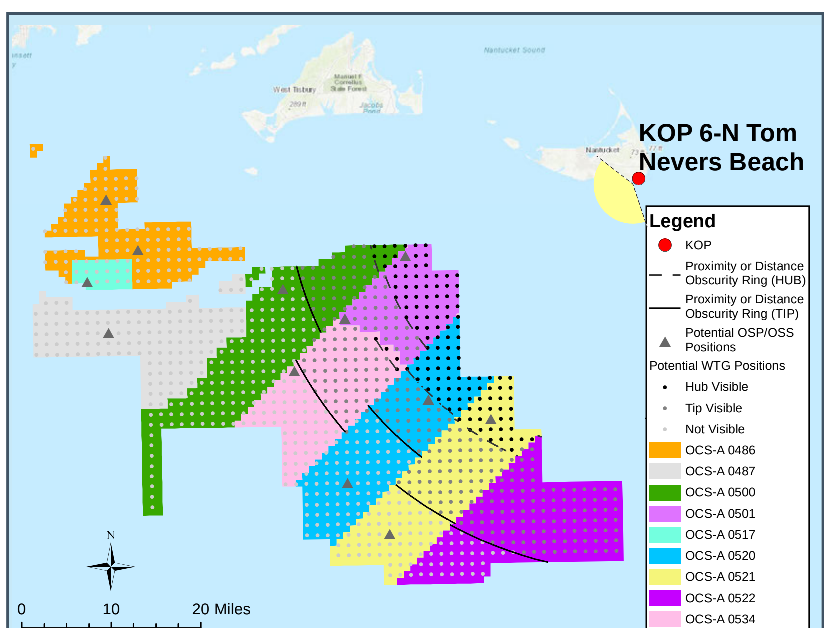


	Liberty Wind (OCS-A 0522)	Beacon Wind (OCS-A 0520)	Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Bay State Wind (OCS-A 0500)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2025-2030	2025-2030	2025	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	149	77	120	169	131	103	18
Number of Structures within View of KOP	107	74	92	71	65	48	0	0	0
Distance to Closest Structure	33 mi (52 km)	26 mi (42.08 km)	26 mi (43 km)	23 mi (37 km)	38 mi (61 km)	28 mi (45 km)	46 mi (74 km)	45 mi (73 km)	47 mi (75 km)
Distance to Furthest Structure	51 mi (83 km)	55 mi (88 km)	54 mi (87 km)	36 mi (59 km)	52 mi (84 km)	66 mi (106 km)	70 mi (113 km)	109 mi (95 km)	64 mi (103 km)

KOP 6-N Tom Nevers Beach - Scenario 3 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 23 mi / 37 km
Furthest Visible WTG: 70 mi / 113 km
Potential Number of WTGs Visible: 463
Potential Number of WTGs Not Visible: 600

PHOTOGRAPH AND SITE

Time of photograph: 8:44AM
Date of photograph: 6-27-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (242°)
Latitude: 41.244577°N
Longitude: 69.985046°W
Lighting Direction: Sidelit diffused

ENVIRONMENT

Temperature: 68° F
Humidity: 90%
Wind Dir & Speed: S 10 mph
Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 6.5 ft /1.7 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 6-N Tom Nevers Beach - Scenario 3 (50mm view - 27° vertical / 40° horizontal) 1 of 3

SIMULATED CONDITIONS

MATCH LINE A

MATCH LINE AA

MATCH LINE AB

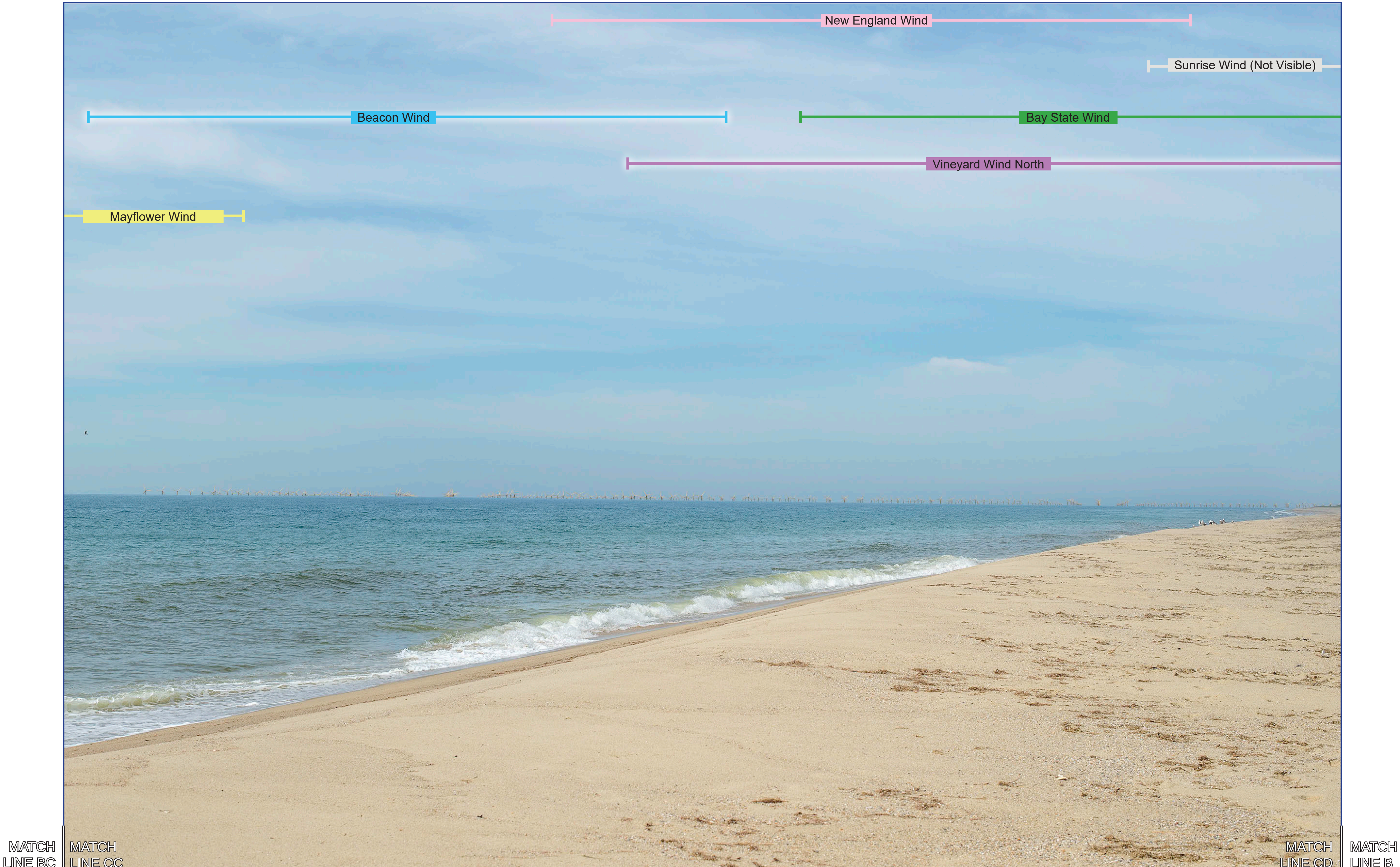
MATCH LINE BB

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 6-N Tom Nevers Beach - Scenario 3 (50mm view - 27° vertical / 40° horizontal) 3 of 3

SIMULATED CONDITIONS

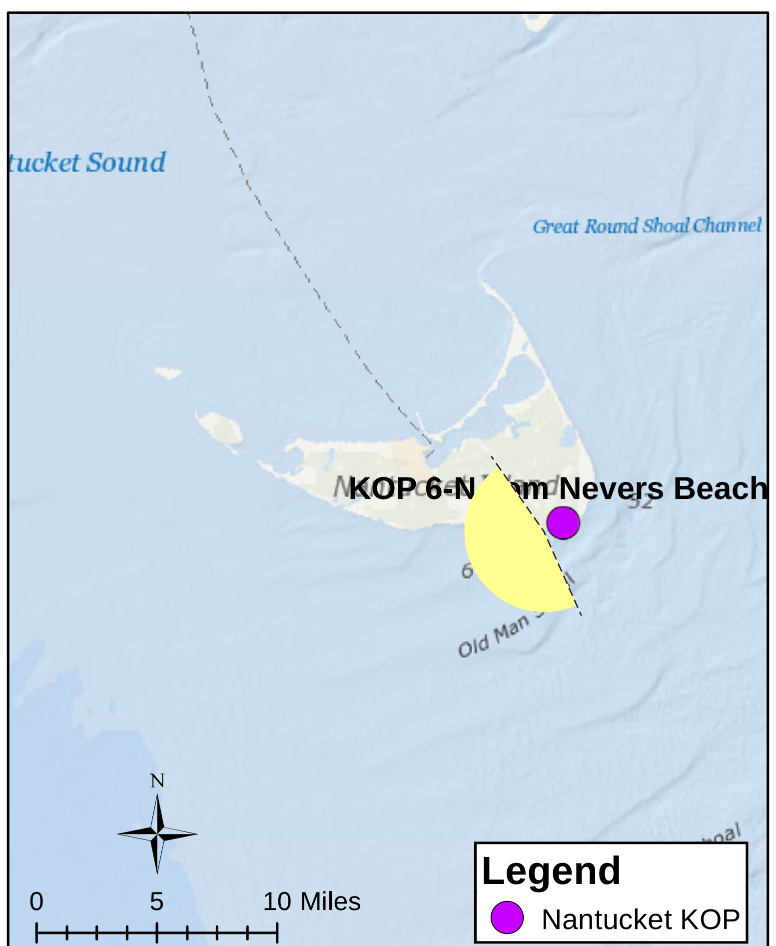


The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 6-N Tom Nevers Beach - Scenario 4

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 169°
Vertical Field of View: 40°
Nearest WTG: 23 mi / 37 km
Furthest Visible WTG: 70 mi / 113 km
Potential Number of Structures Visible: 365
Potential Number of Structures Not Visible: 549

PHOTOGRAPH AND SITE

Time of photograph: 8:44AM
Date of photograph: 6-27-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (242°)
Latitude: 41.244577°N
Longitude: 69.985046°W
Lighting Direction: Sidelit diffused

ENVIRONMENT

Temperature: 68° F
Humidity: 90%
Wind Dir & Speed: S 10 mph
Weather Condition: Partly Cloudy

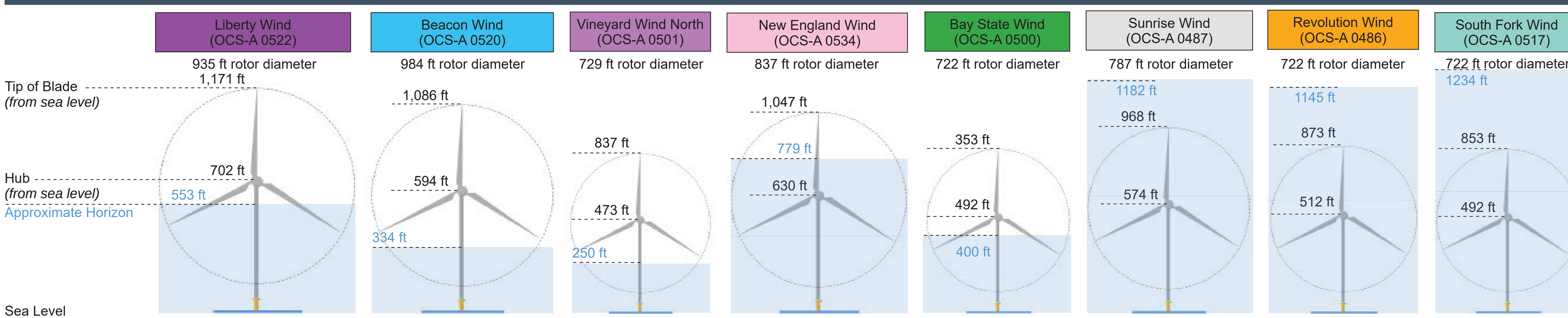
CAMERA

Camera Elevation: 6.5 ft /1.7 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 6-N Tom Nevers Beach - Scenario 4

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

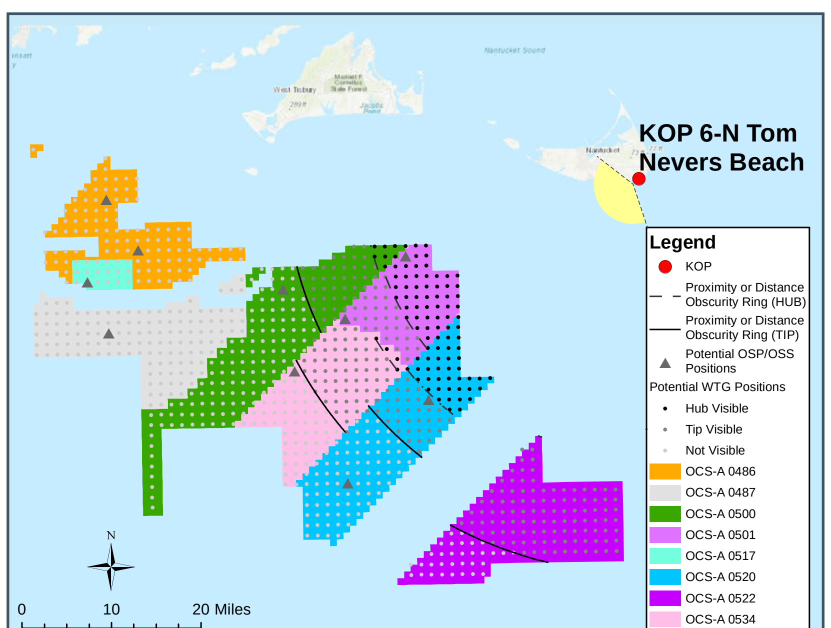


	Liberty Wind (OCS-A 0522)	Beacon Wind (OCS-A 0520)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Bay State Wind (OCS-A 0500)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2025-2030	2025-2030	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	77	120	169	131	103	18
Number of Structures within View of KOP	107	74	71	65	48	0	0	0
Distance to Closest Structure	33 mi (52 km)	26 mi (42.08 km)	23 mi (37 km)	38 mi (61 km)	28 mi (45 km)	46 mi (74 km)	45 mi (73 km)	46.77 mi (75.26 km)
Distance to Furthest Structure	51 mi (83 km)	55 mi (88 km)	36 mi (59 km)	52 mi (84 km)	66 mi (106 km)	70 mi (113 km)	109 mi (95 km)	63.9 mi (102.83 km)

KOP 6-N Tom Nevers Beach - Scenario 4 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°

Vertical Field of View: 40°

Nearest WTG: 23 mi / 37 km

Furthest Visible WTG: 70 mi / 113 km

Potential Number of WTGs Visible: 371

Potential Number of WTGs Not Visible: 543

ENVIRONMENT

Temperature: 68° F

Humidity: 90%

Wind Dir & Speed: S 10 mph

Weather Condition: Partly Cloudy

PHOTOGRAPH AND SITE

Time of photograph: 8:44AM

Date of photograph: 6-27-20

L/SCA: Ocean Beach, Open Ocean, Dunes

Viewing direction: South (242°)

Latitude: 41.244577°N

Longitude: 69.985046°W

Lighting Direction: Sidelit diffused

CAMERA

Camera Elevation: 6.5 ft /1.7 m

Nikon D4

Nikon 50mm

ISO: 100

Fstop: f/7.1

Shutter: 1/1250 sec

Exposure bias: -0.7 step

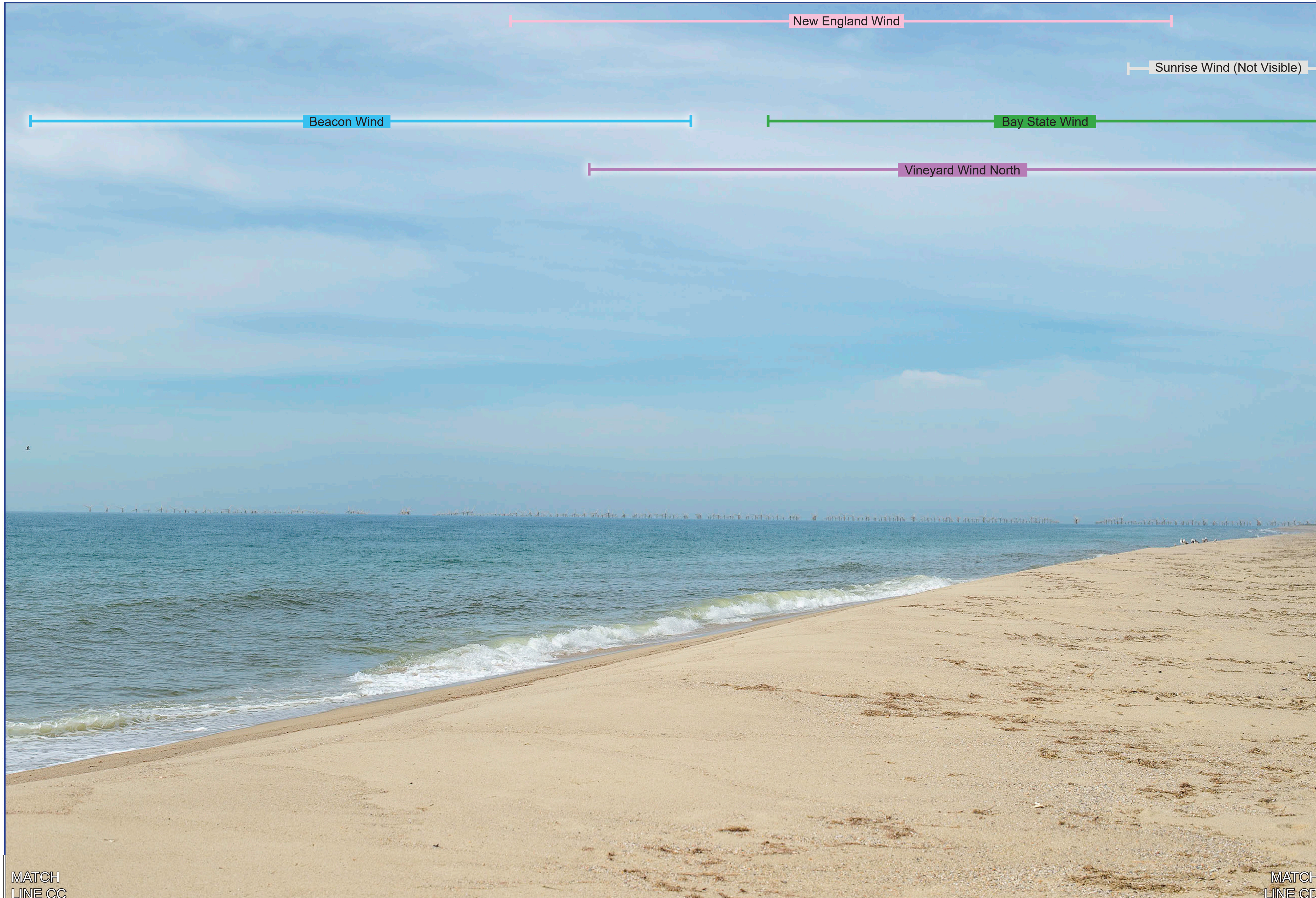
SIMULATED CONDITIONS

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 6-N Tom Nevers Beach - Scenario 4 (50mm view - 27° vertical / 40° horizontal) 3 of 3

SIMULATED CONDITIONS



MATCH LINE BC

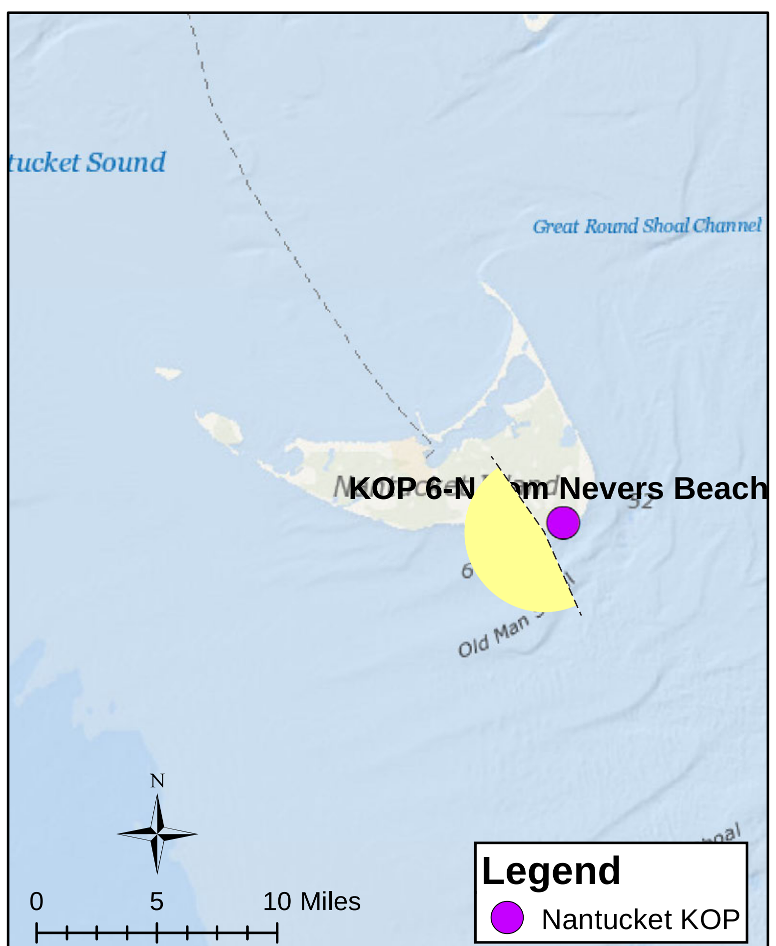
MATCH LINE B

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 6-N Tom Nevers Beach - Scenario 5

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 169°
Vertical Field of View: 40°
Nearest WTG: 26 mi / 43 km
Furthest Visible WTG: 54 mi / 87 km
Potential Number of Structures Visible: 92
Potential Number of Structures Not Visible: 57

PHOTOGRAPH AND SITE

Time of photograph: 8:44AM
Date of photograph: 6-27-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (242°)
Latitude: 41.244577°N
Longitude: 69.985046°W
Lighting Direction: Sidelit diffused

ENVIRONMENT

Temperature: 68° F
Humidity: 90%
Wind Dir & Speed: S 10 mph
Weather Condition: Partly Cloudy

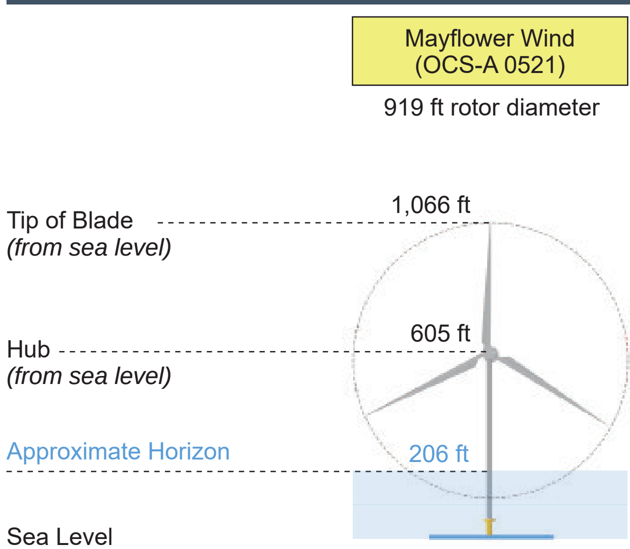
CAMERA

Camera Elevation: 6.5 ft /1.7 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 6-N Tom Nevers Beach - Scenario 5

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

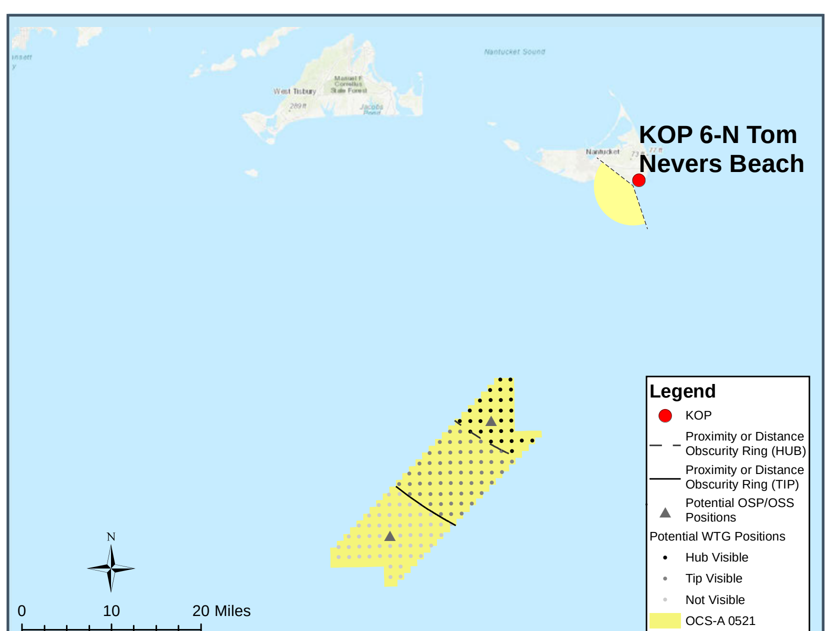


Year Forecasted for Development	2025
Number of Structures in Lease Area	149
Number of Structures within View of KOP	92
Distance to Closest Structure	26 mi (43 km)
Distance to Furthest Structure	54 mi (87 km)

KOP 6-N Tom Nevers Beach - Scenario 5 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°

Vertical Field of View: 40°

Nearest WTG: 26 mi / 43 km

Furthest Visible WTG: 54 mi / 87 km

Potential Number of WTGs Visible: 92

Potential Number of WTGs Not Visible: 57

ENVIRONMENT

Temperature: 68° F

Humidity: 90%

Wind Dir & Speed: S 10 mph

Weather Condition: Partly Cloudy

PHOTOGRAPH AND SITE

Time of photograph: 8:44AM

Date of photograph: 6-27-20

L/SCA: Ocean Beach, Open Ocean, Dunes

Viewing direction: South (242°)

Latitude: 41.244577°N

Longitude: 69.985046°W

Lighting Direction: Sidelit diffused

CAMERA

Camera Elevation: 6.5 ft /1.7 m

Nikon D4

Nikon 50mm

ISO: 100

Fstop: f/7.1

Shutter: 1/1250 sec

Exposure bias: -0.7 step

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

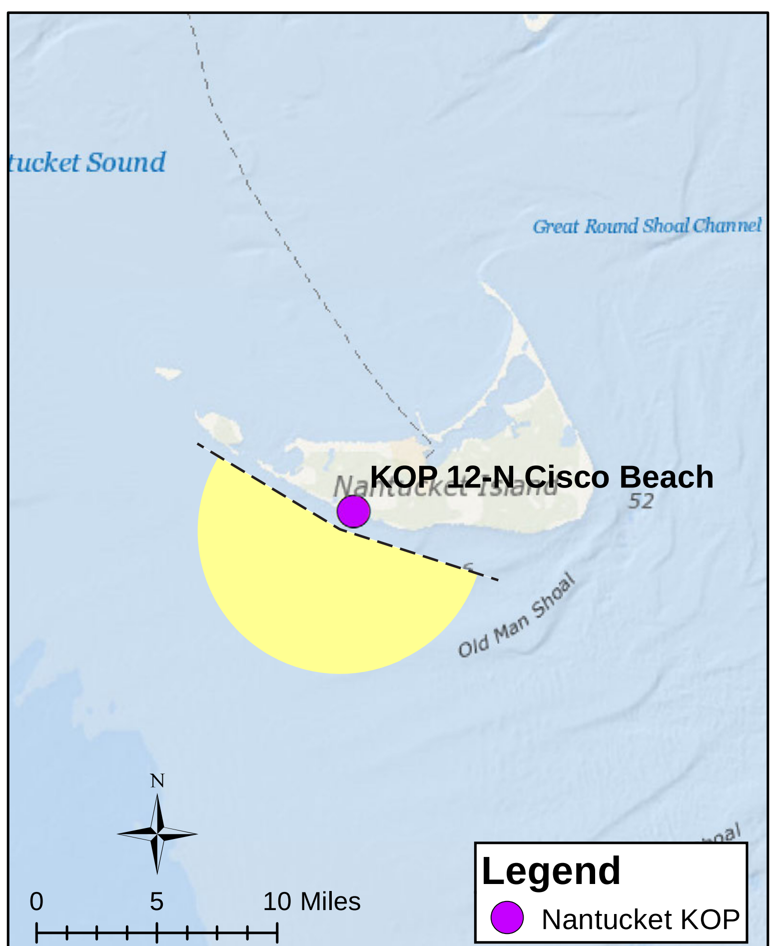
The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 12-N Cisco Beach - Scenario 1

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193.2°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

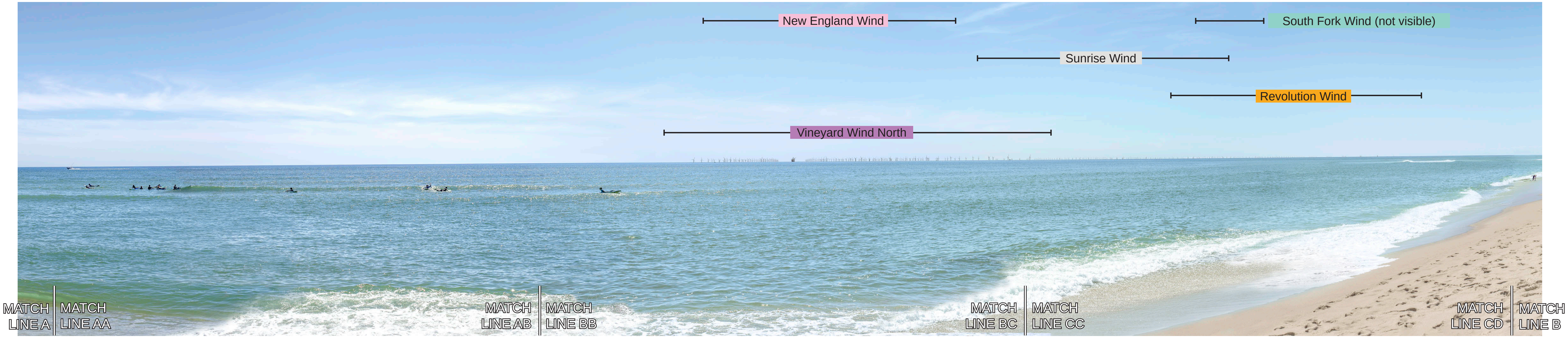
Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

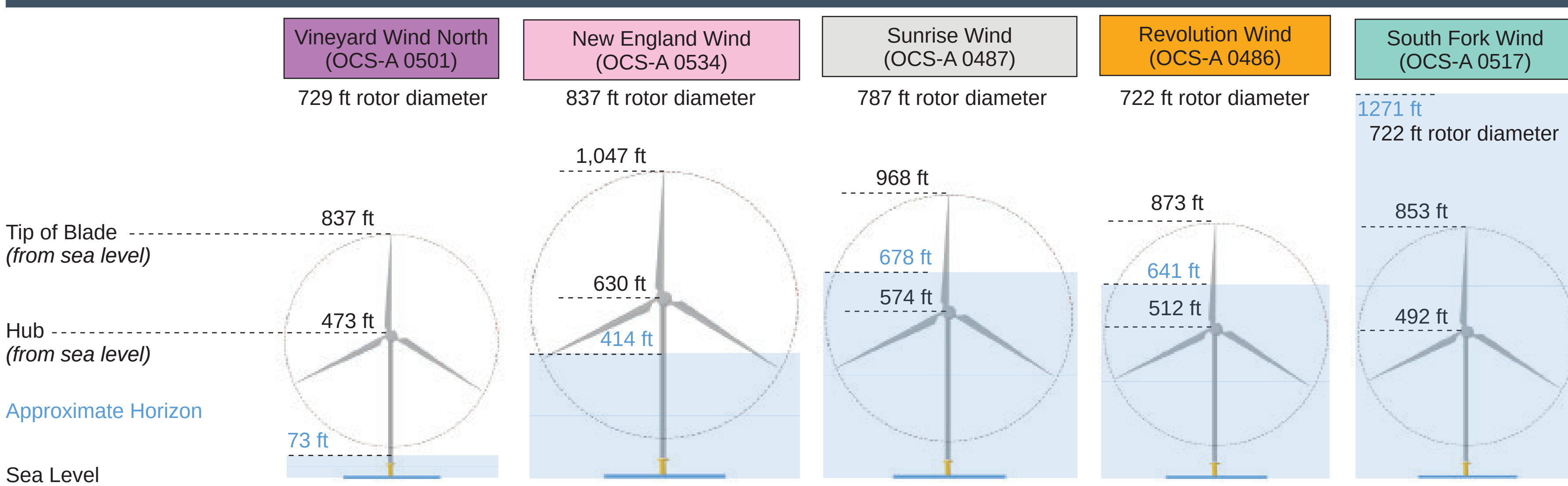
Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 12-N Cisco Beach - Scenario 1

SIMULATED CONDITIONS



VISIBILTY OF CLOSEST TURBINES

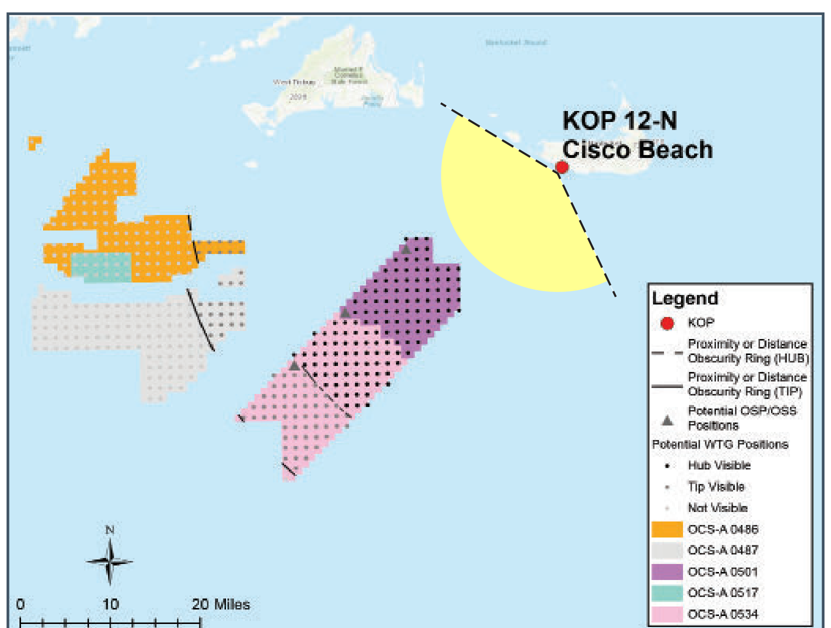


	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	77	120	131	103	18
Number of Structures within View of KOP	77	118	22	10	0
Distance to Closest Structure	16 mi (26 km)	31 mi (49 km)	38 mi (61 km)	38 mi (61 km)	49 mi (79.46 km)
Distance to Furthest Structure	29 mi (47 km)	48 mi (78 km)	62 mi (100 km)	59 mi (95 km)	56 mi (89 km)

KOP 12-N Cisco Beach - Scenario 1 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

MATCH LINE A

MATCH LINE BB

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

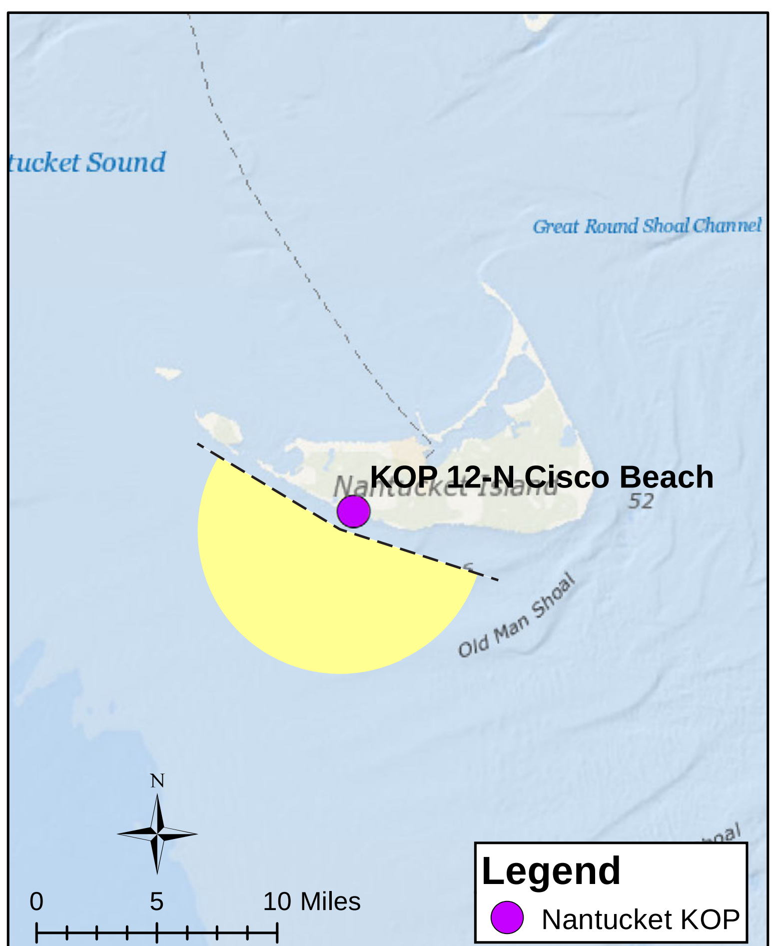
The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 12-N Cisco Beach - Scenario 2

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

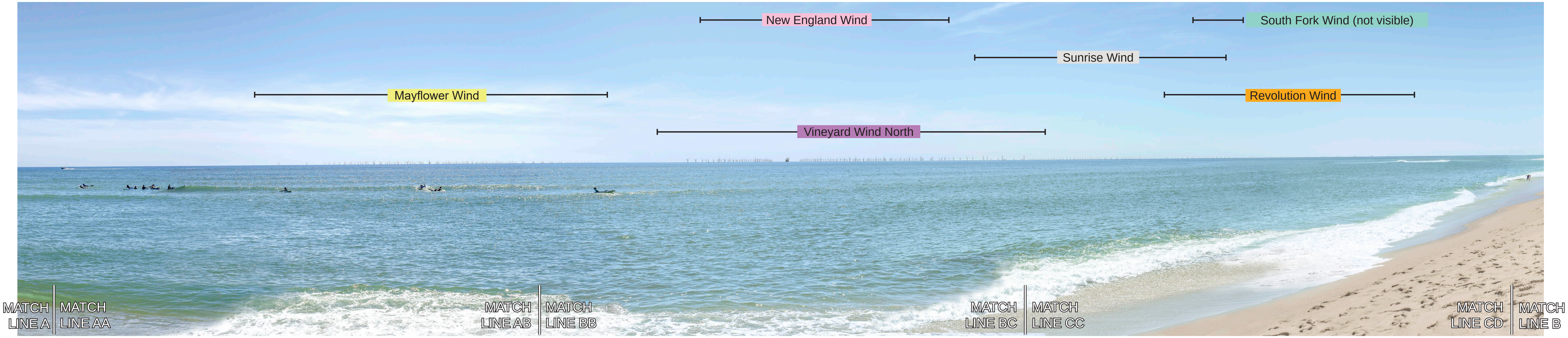
CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 12-N Cisco Beach - Scenario 2

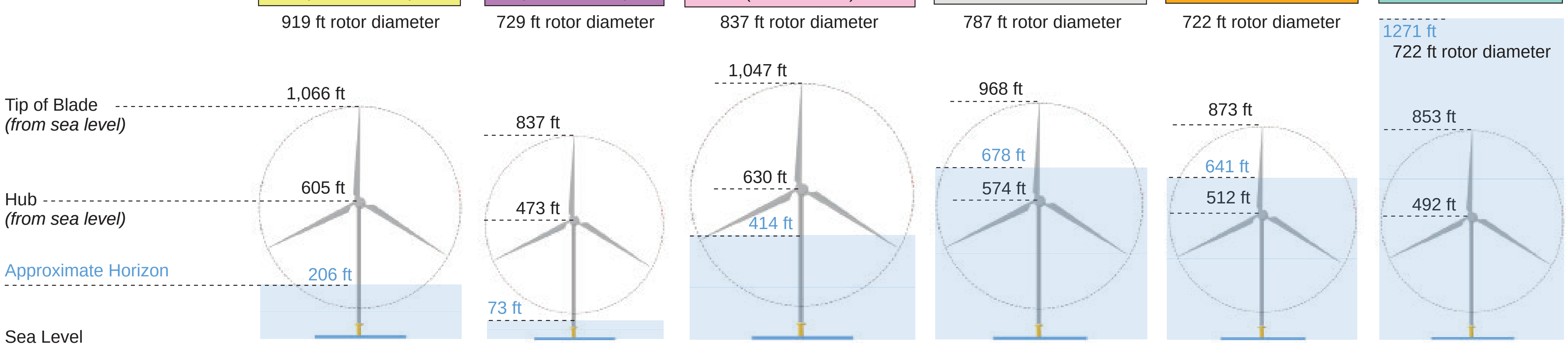
SIMULATED CONDITIONS

2



VISIBILTY OF CLOSEST TURBINES

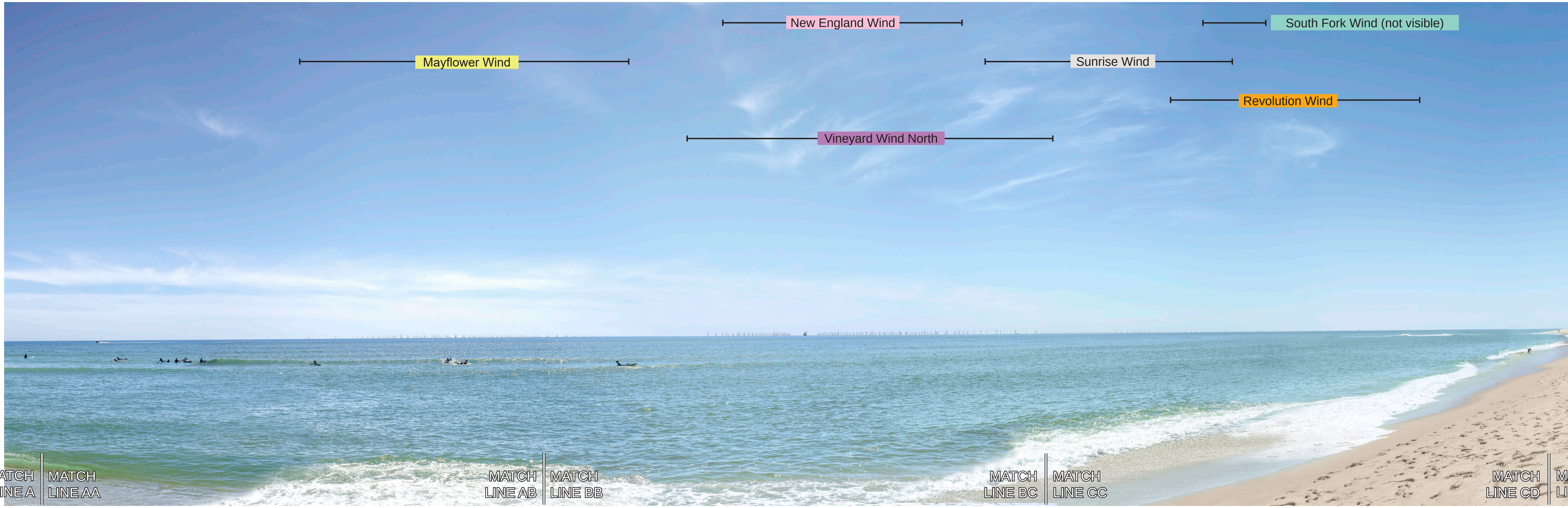
	Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)



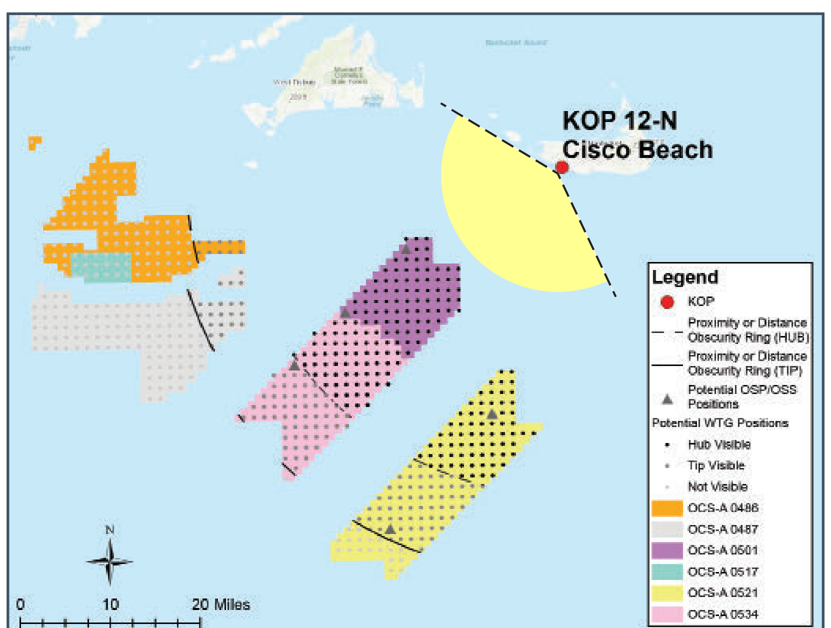
	Mayflower Wind	Vineyard Wind North	New England Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	149	77	120	131	103	18
Number of Structures within View of KOP	130	77	118	22	10	0
Distance to Closest Structure	23 mi (38 km)	16 mi (26 km)	31 mi (50 km)	38 mi (60.52 km)	38 mi (60.57 km)	49 mi (79 km)
Distance to Furthest Structure	49 mi (80 km)	29 mi (47 km)	48 mi (78 km)	62 mi (100 km)	59 mi (95 km)	56 mi (89 km)

KOP 12-N Cisco Beach - Scenario 2 (Human Field of View - 124°)

SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16.2 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

MATCH LINE AB

MATCH LINE BB

MATCH LINE BC

MATCH LINE CC

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 12-N Cisco Beach - Scenario 2 (50mm view - 27° vertical / 40° horizontal) 3 of 3

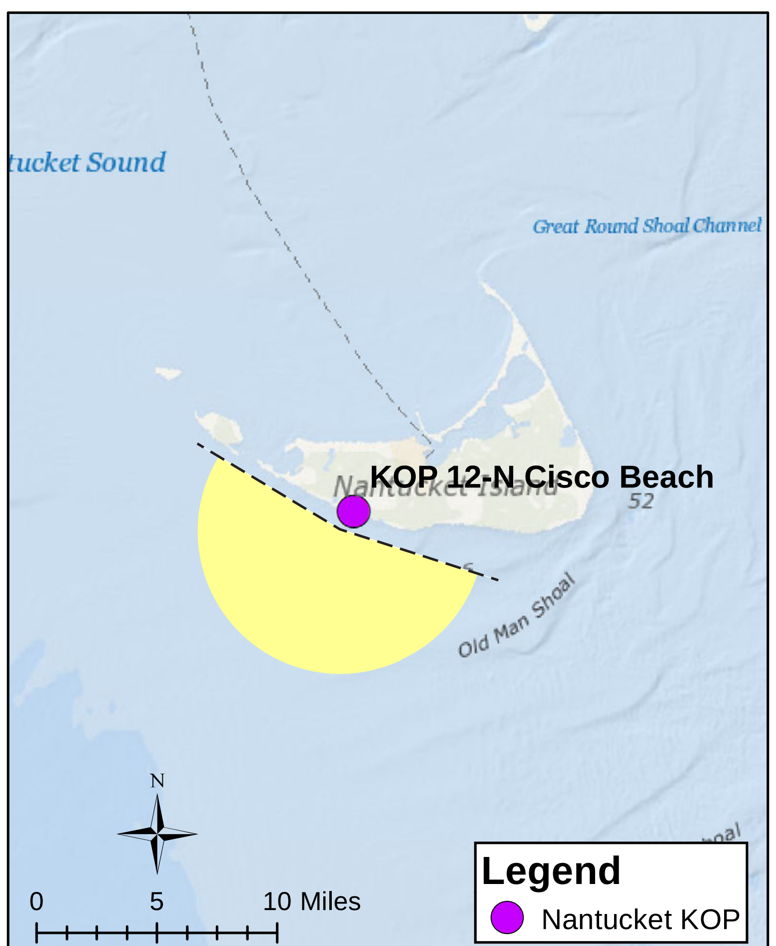
SIMULATED CONDITIONS

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 12-N Cisco Beach - Scenario 3

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km

Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential

Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

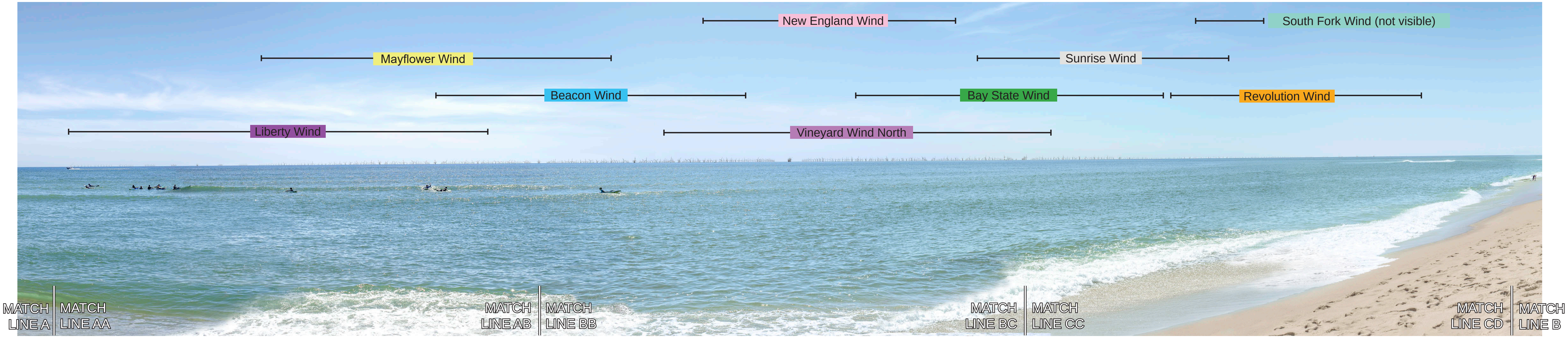
Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 12-N Cisco Beach - Scenario 3

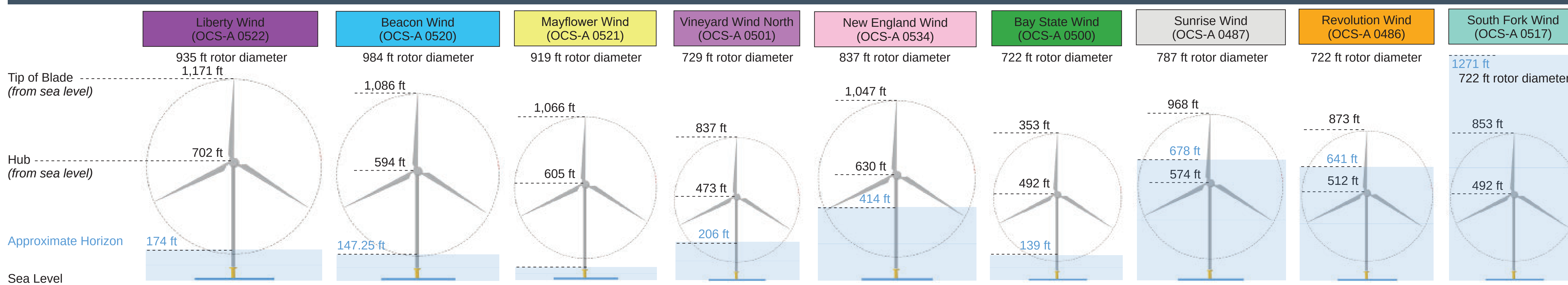
Nantucket

SIMULATED CONDITIONS

2



VISIBILTY OF CLOSEST TURBINES

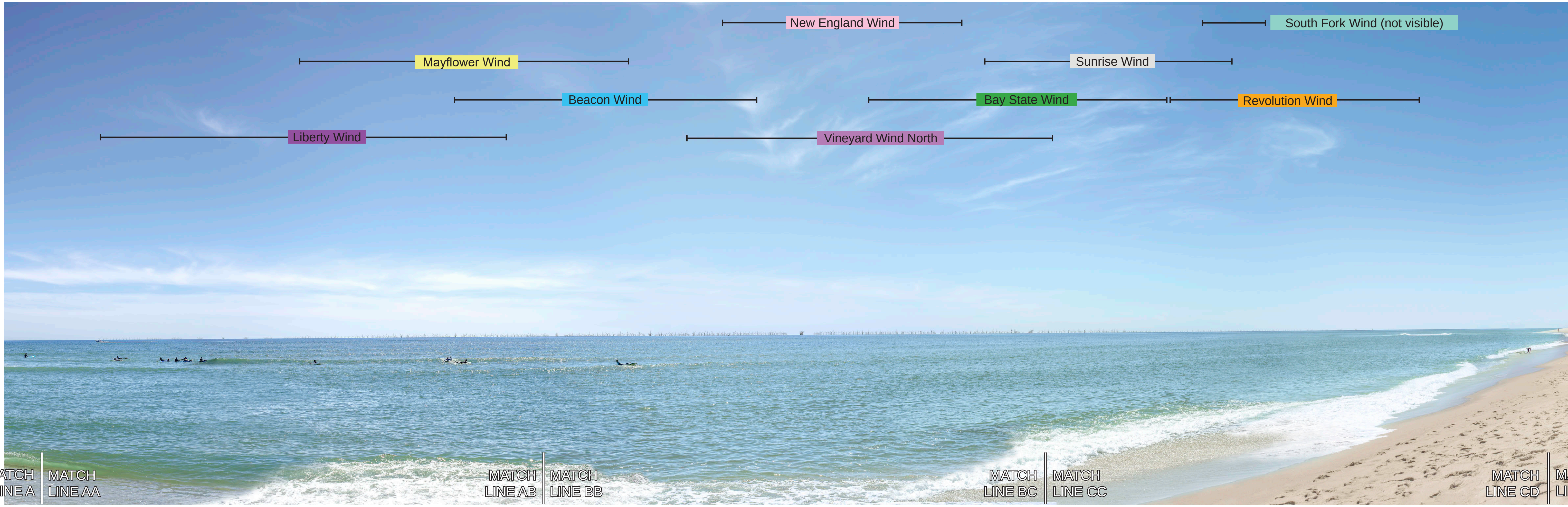


	Liberty Wind (OCS-A 0522)	Beacon Wind (OCS-A 0520)	Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Bay State Wind (OCS-A 0500)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2025-2030	2025-2030	2025	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	149	77	120	169	131	103	18
Number of Structures within View of KOP	94	145	130	77	118	111	22	10	0
Distance to Closest Structure	22 mi (35 km)	21 mi (33 km)	23 mi (38 km)	16 mi (26 km)	31 mi (49.32 km)	20 mi (32 km)	38 mi (61 km)	38 mi (61 km)	49 mi (79 km)
Distance to Furthest Structure	48 mi (77 km)	49 mi (80 km)	49 mi (80 km)	29 mi (47 km)	48 mi (78 km)	59 mi (95 km)	62 mi (100 km)	59 mi (95 km)	56 mi (89 km)

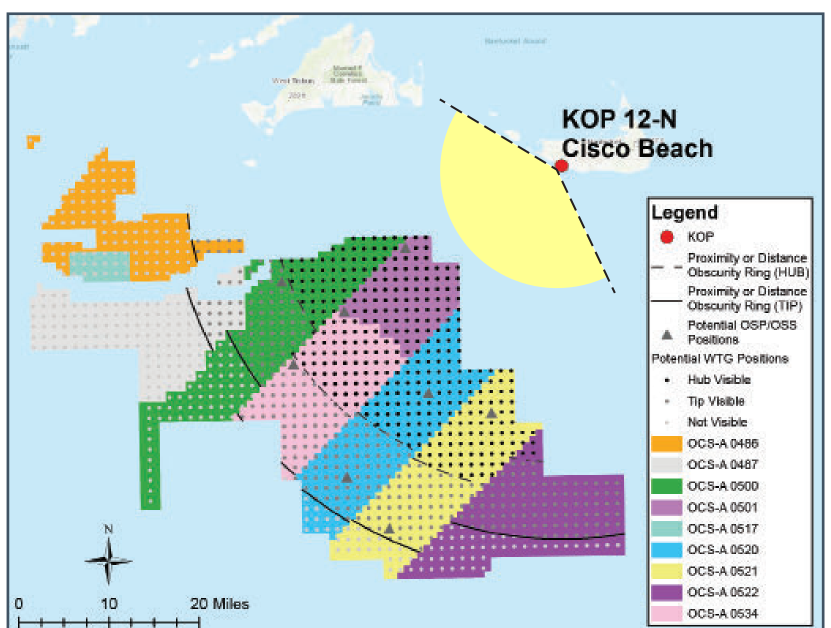
KOP 12-N Cisco Beach - Scenario 3 (Human Field of View - 124°)

Nantucket

SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

SIMULATED CONDITIONS

MATCH LINE A

MATCH LINE AA

MATCH LINE AB

MATCH LINE BB

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

MATCH LINE AB

MATCH LINE CC

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

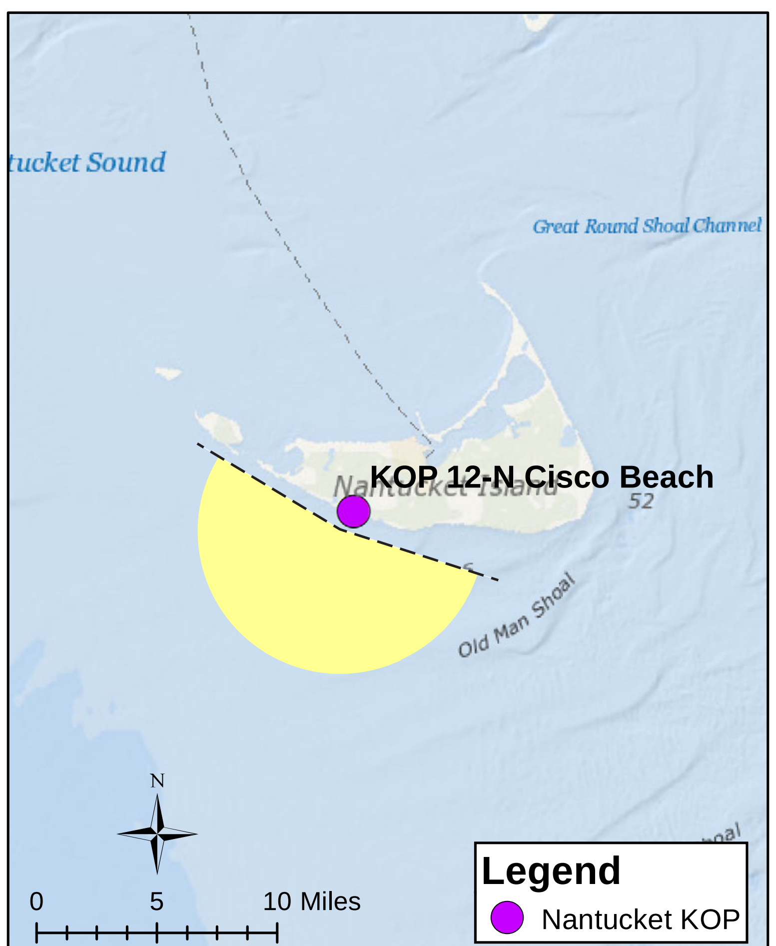
The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 12-N Cisco Beach - Scenario 4

Nantucket

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16.2 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

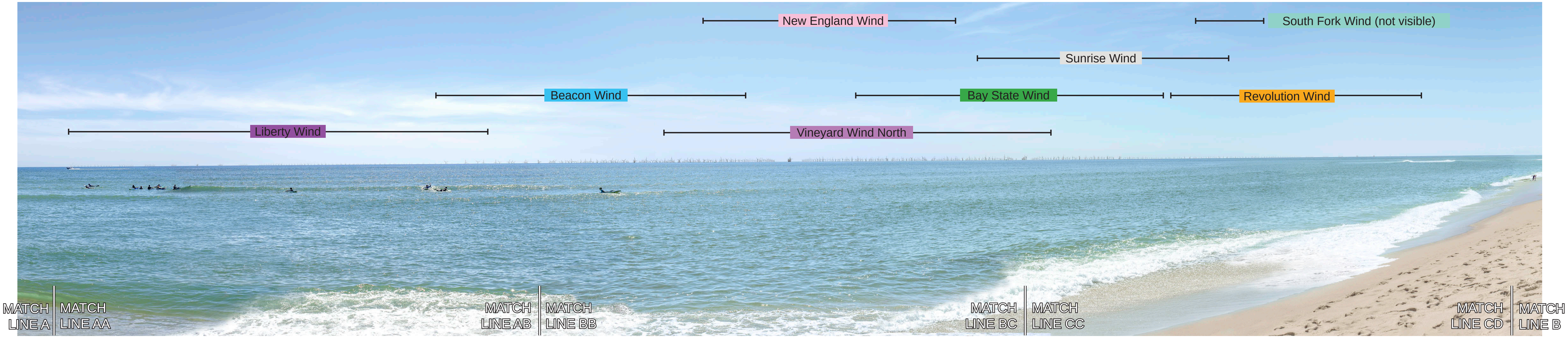
Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

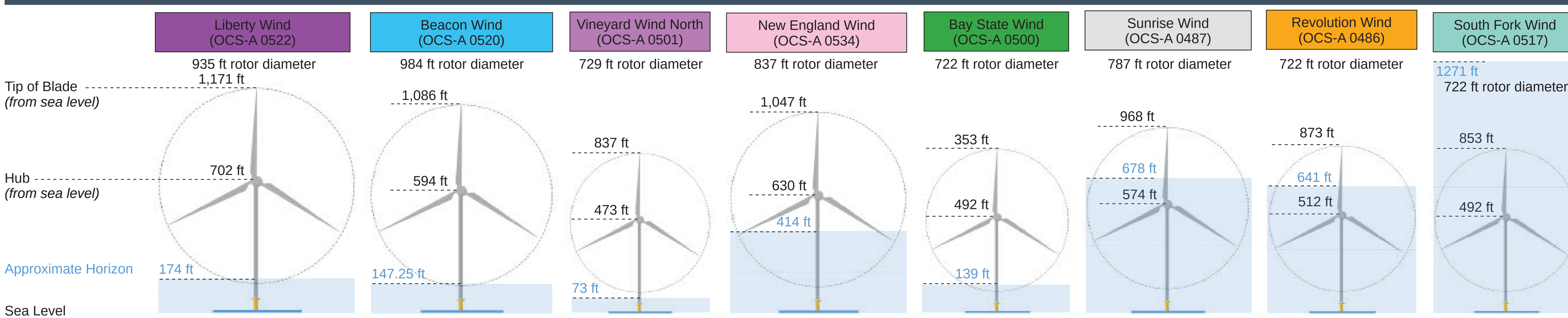
Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 12-N Cisco Beach - Scenario 4

SIMULATED CONDITIONS



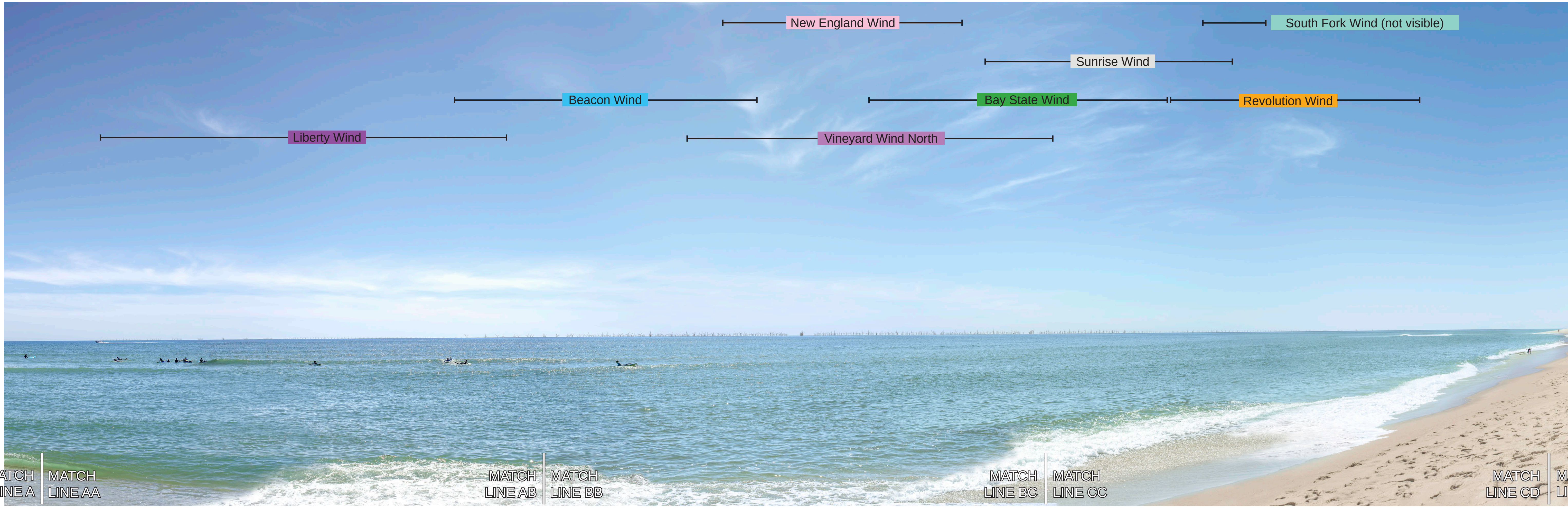
VISIBILTY OF CLOSEST TURBINES



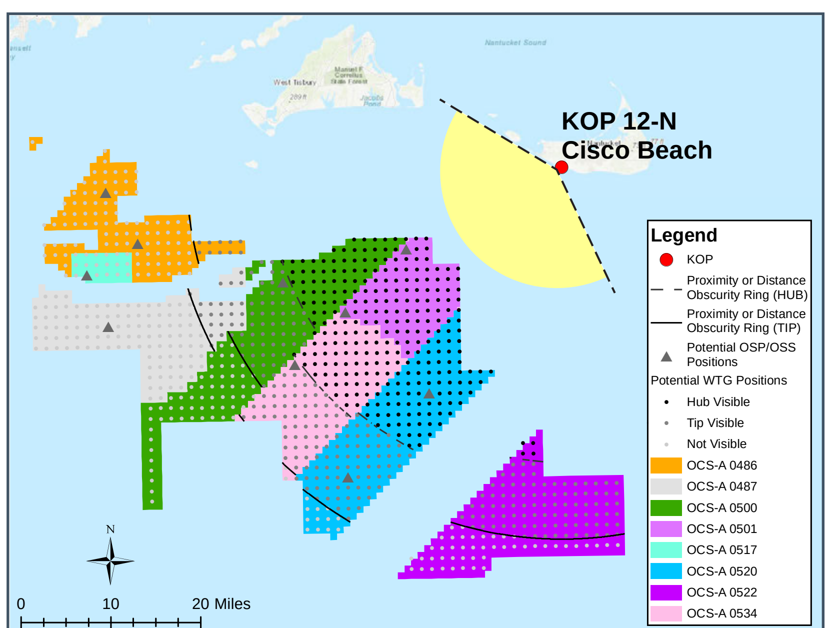
	Liberty Wind	Beacon Wind	Vineyard Wind North	New England Wind	Bay State Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025-2030	2025-2030	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	77	120	169	131	103	18
Number of Structures within View of KOP	94	145	77	118	111	22	10	0
Distance to Closest Structure	22 mi (35 km)	21 mi (33 km)	16 mi (26 km)	31 mi (49 km)	20 mi (32 km)	38 mi (61 km)	38 mi (61 km)	49 mi (79 km)
Distance to Furthest Structure	48 mi (77 km)	49 mi (80 km)	29 mi (47 km)	48 mi (78 km)	59 mi (95 km)	62 mi (100 km)	59 mi (95 km)	56 mi (89 km)

KOP 12-N Cisco Beach - Scenario 4 (Human Field of View - 124°)

SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

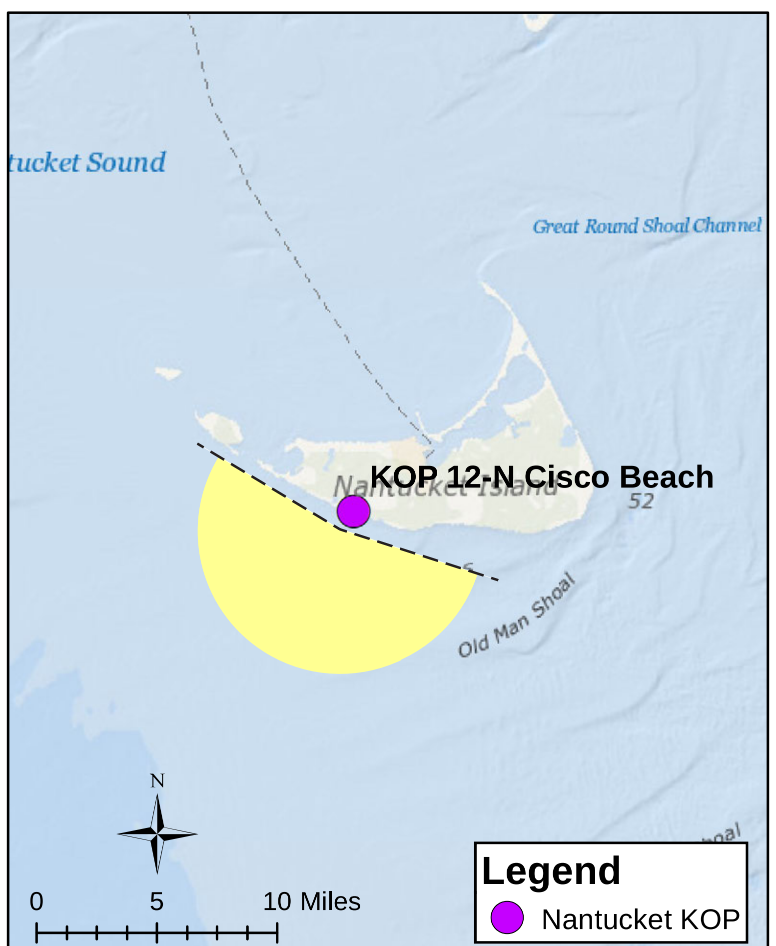
The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 12-N Cisco Beach - Scenario 5

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

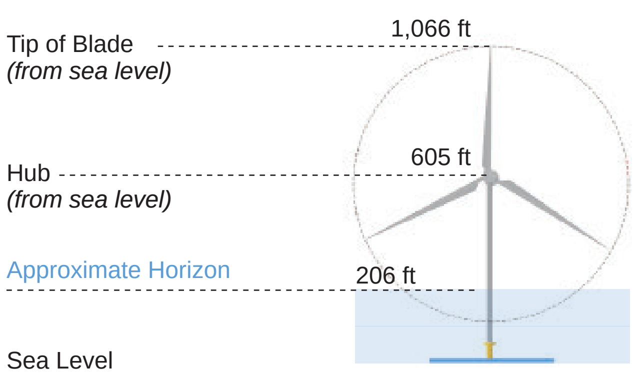
KOP 12-N Cisco Beach - Scenario 5

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

Mayflower Wind (OCS-A 0521)

919 ft rotor diameter

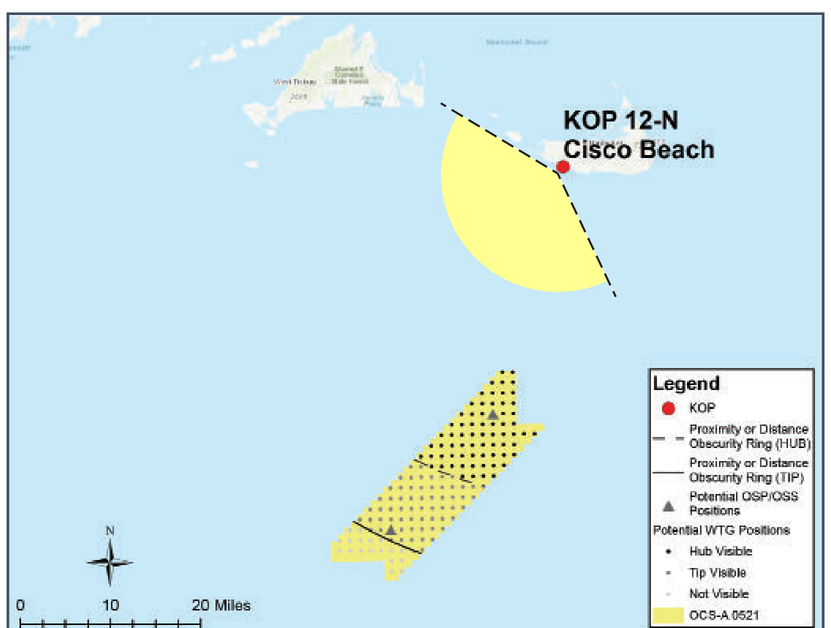


	Mayflower Wind (OCS-A 0521)
Year Forecasted for Development	2025
Number of Structures in Lease Area	149
Number of Structures within View of KOP	130
Distance to Closest Structure	23 mi (38 km)
Distance to Furthest Structure	49 mi (80 km)

KOP 12-N Cisco Beach - Scenario 5 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

SIMULATED CONDITIONS

MATCH LINE BC

MATCH LINE CC

MATCH LINE CD

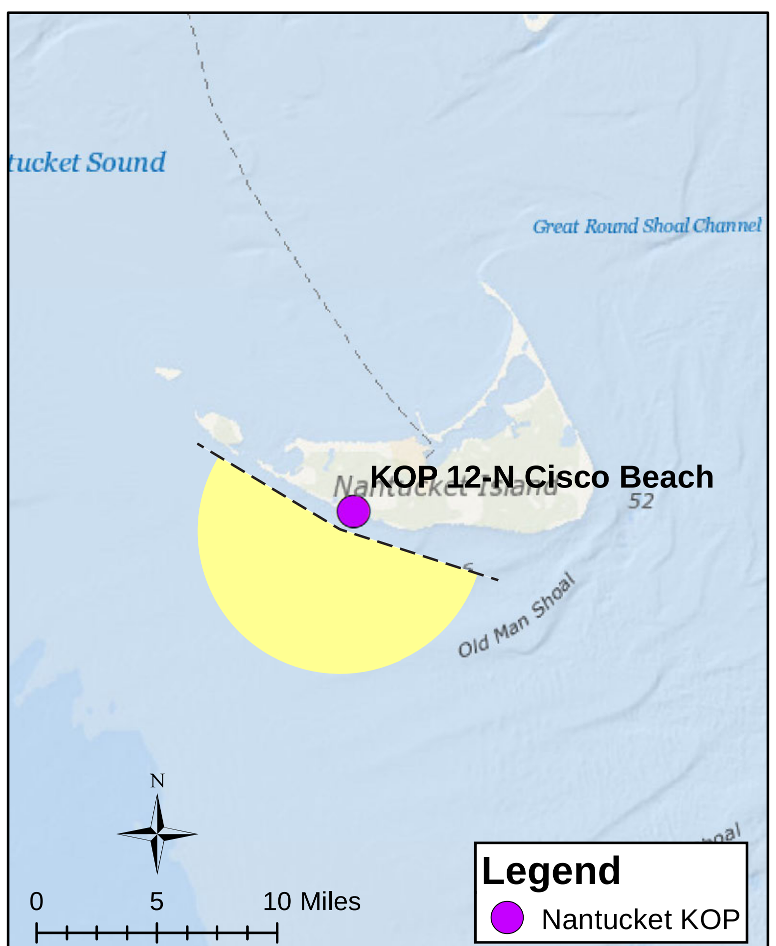
MATCH LINE B

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 12-N Cisco Beach Night - Scenario 1

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 9:00PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

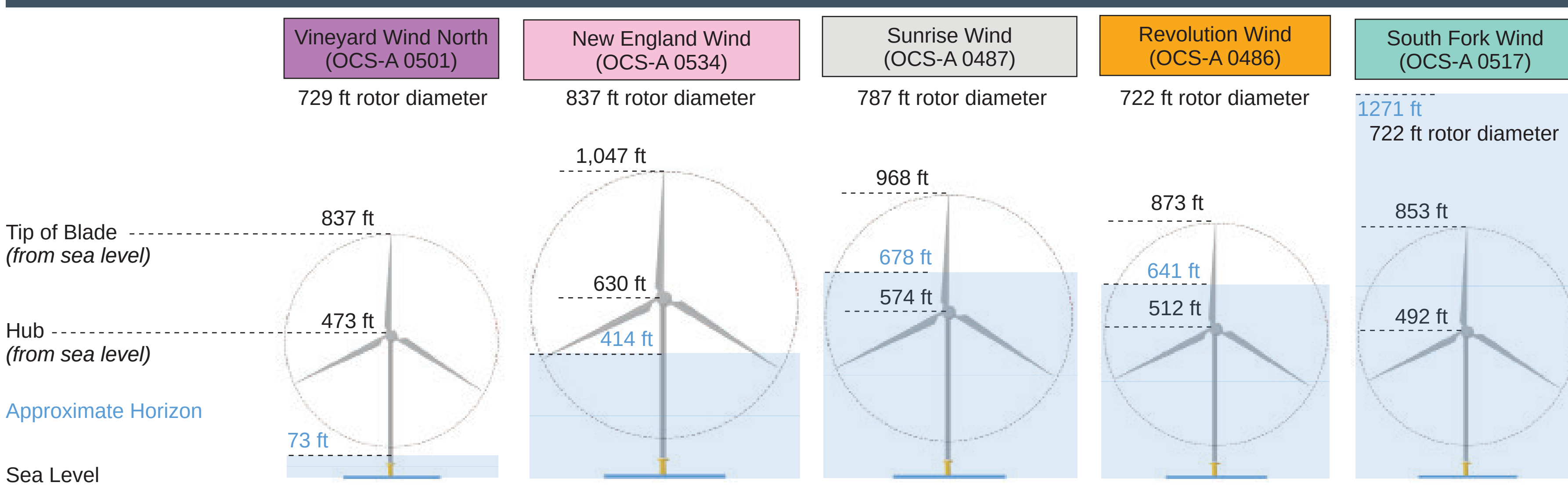
Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 12-N Cisco Beach Night - Scenario 1

Nantucket

SIMULATED CONDITIONS

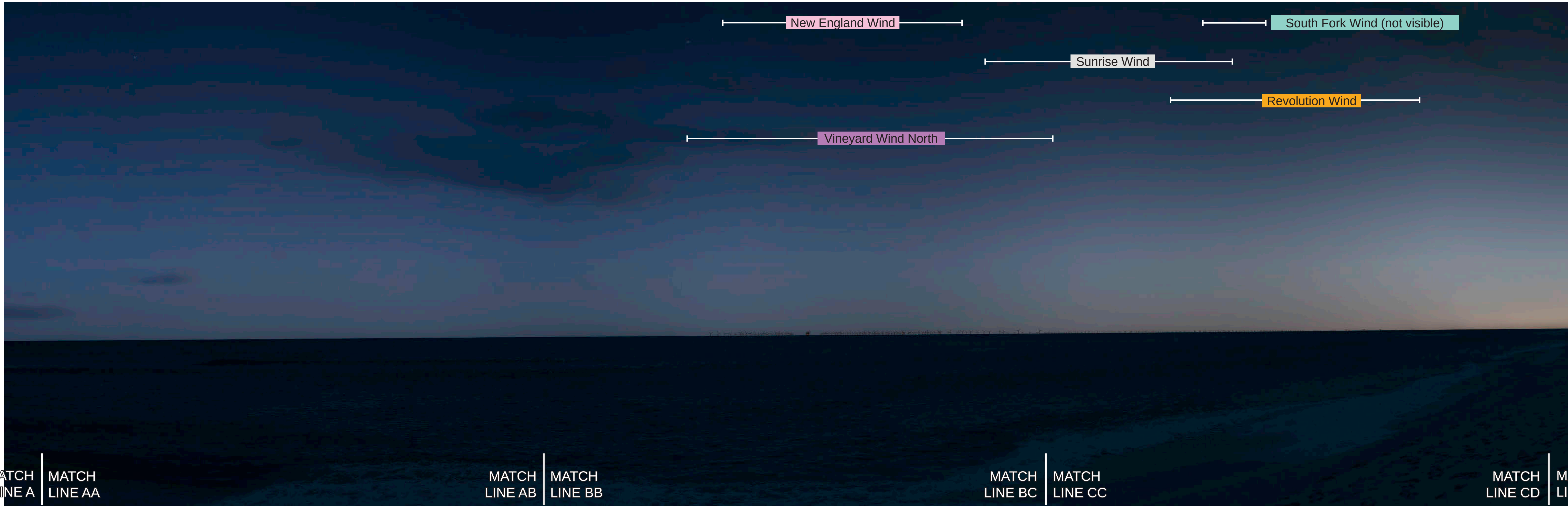
VISIBILTY OF CLOSEST TURBINES



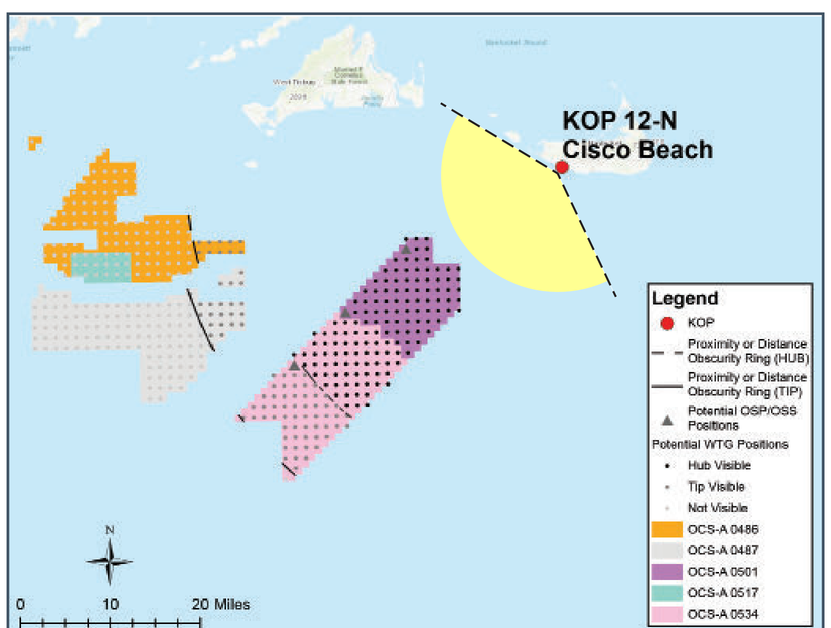
	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	77	120	131	103	18
Number of Structures within View of KOP	77	118	22	10	0
Distance to Closest Structure	16 mi (26 km)	31 mi (49 km)	38 mi (61 km)	38 mi (61 km)	49 mi (79 km)
Distance to Furthest Structure	29 mi (47 km)	48 mi (78 km)	62 mi (100 km)	59 mi (95 km)	56 mi (89 km)

KOP 12-N Cisco Beach Night - Scenario 1 (Human Field of View - 124°)

SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 12-N Cisco Beach Night - Scenario 1 (50mm view - 27° vertical / 40° horizontal) 1 of 3

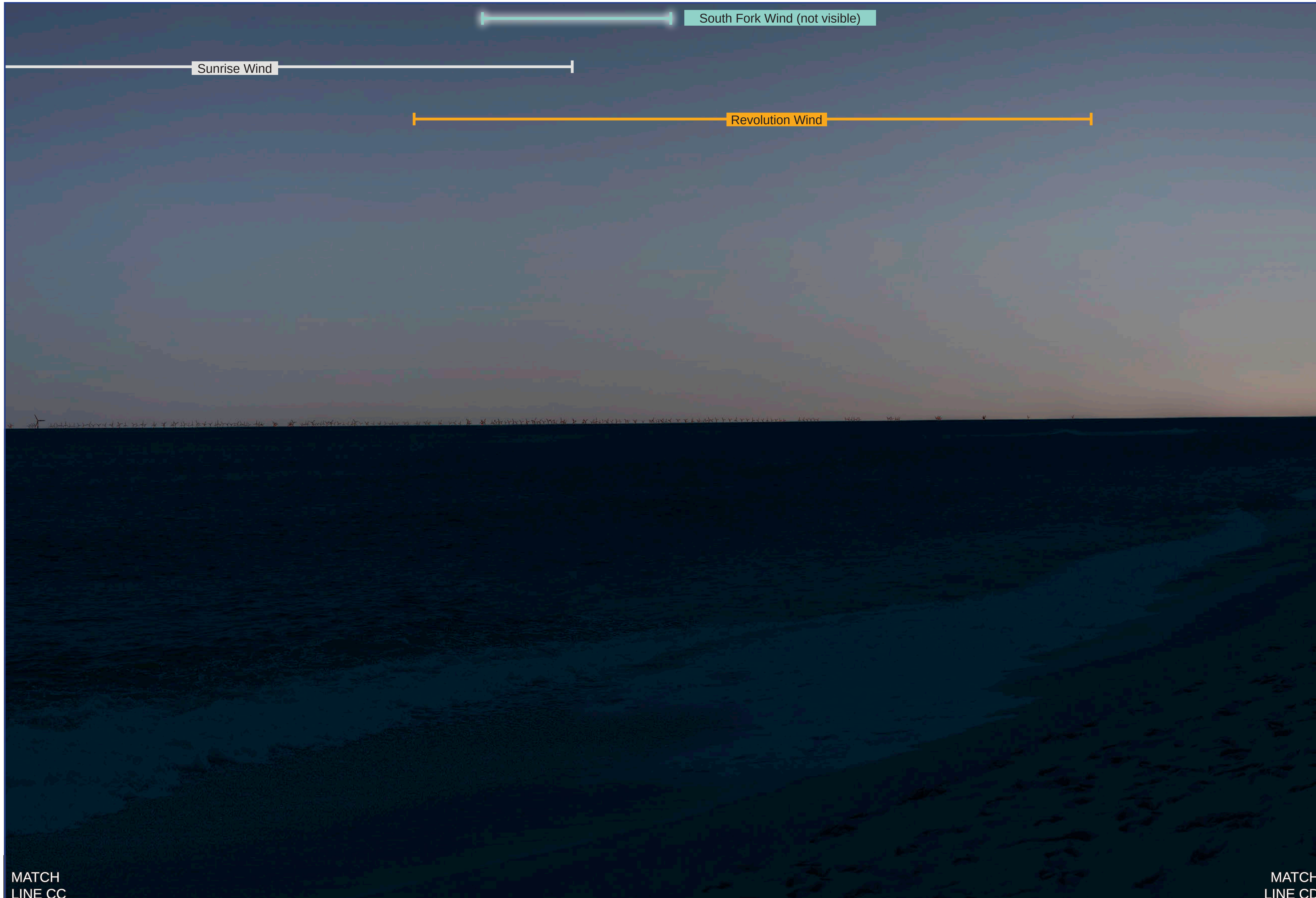
SIMULATED CONDITIONS

MATCH LINE A

MATCH LINE BB

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

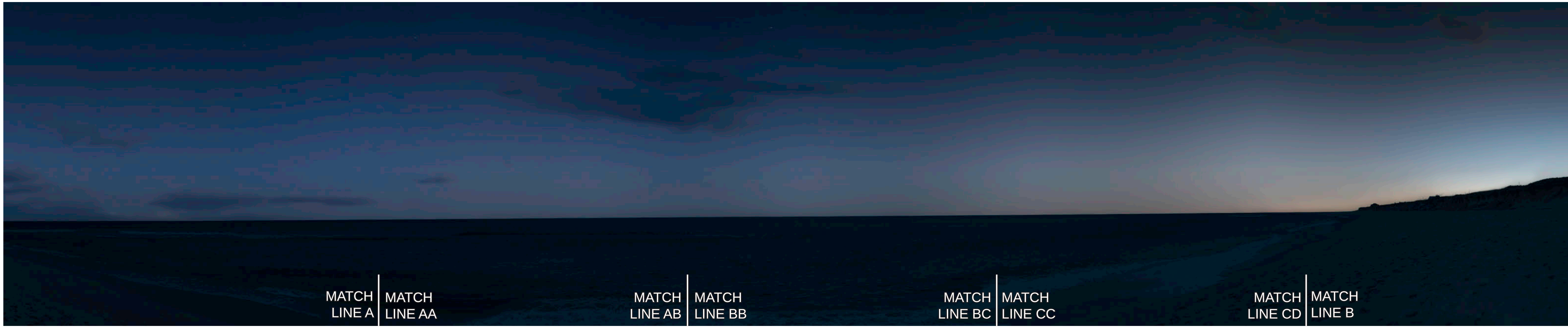
The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .



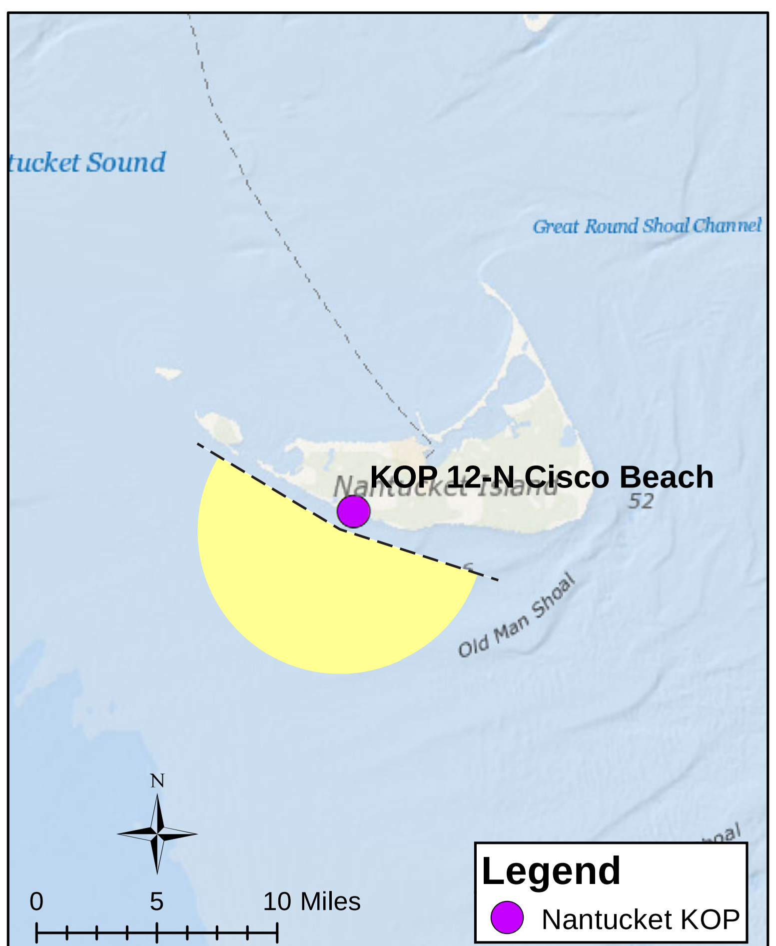
The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 12-N Cisco Beach Night - Scenario 1

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS



REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 9:00PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 12-N Cisco Beach Night - Scenario 1

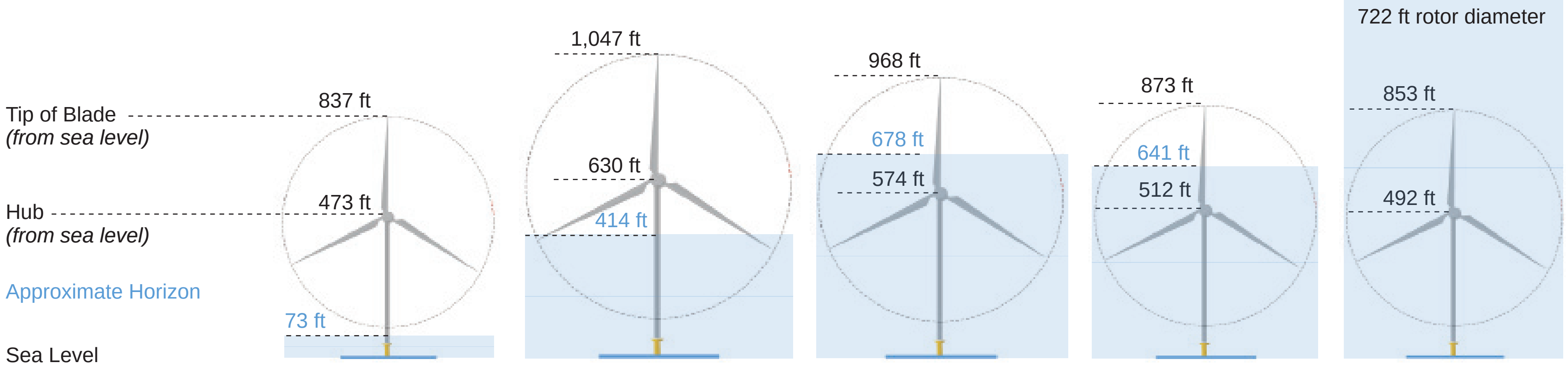
Nantucket

SIMULATED CONDITIONS

2

VISIBILTY OF CLOSEST TURBINES

Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
729 ft rotor diameter	837 ft rotor diameter	787 ft rotor diameter	722 ft rotor diameter	722 ft rotor diameter



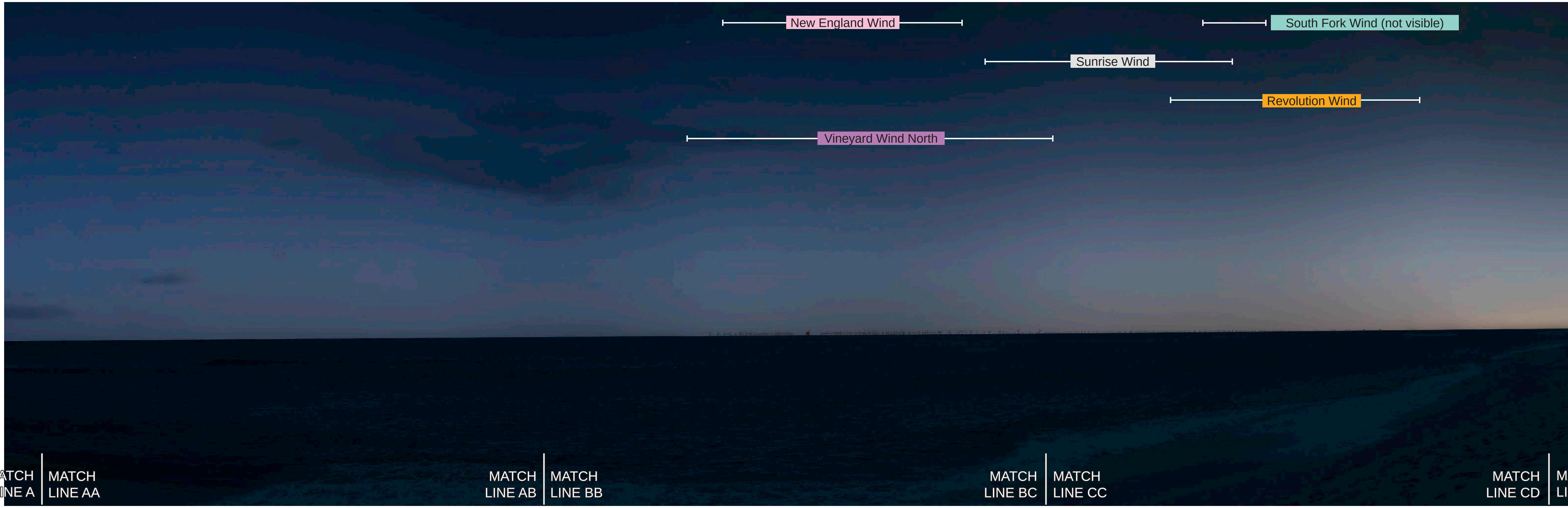
	Vineyard Wind North	New England Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	77	120	131	103	18
Number of Structures within View of KOP	77	118	22	10	0
Distance to Closest Structure	16 mi (26 km)	31 mi (49 km)	38 mi (61 km)	38 mi (61 km)	49 mi (79 km)
Distance to Furthest Structure	29 mi (47 km)	48 mi (78 km)	62 mi (100 km)	59 mi (95 km)	56 mi (89 km)

KOP 12-N Cisco Beach Night - Scenario 1 (Human Field of View - 124°)

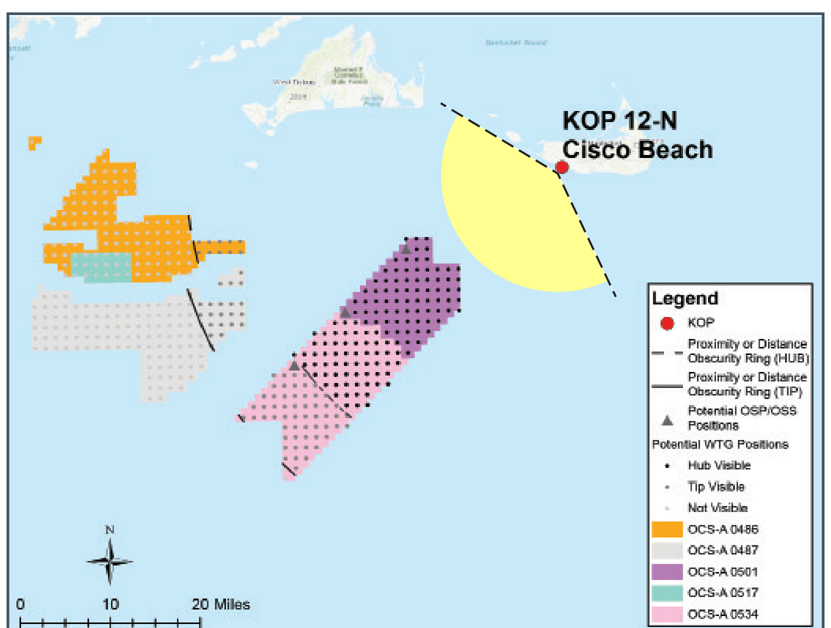
Nantucket

SIMULATED CONDITIONS

3



REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km

Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential

Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

MATCH
LINE A

MATCH
LINE BB

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

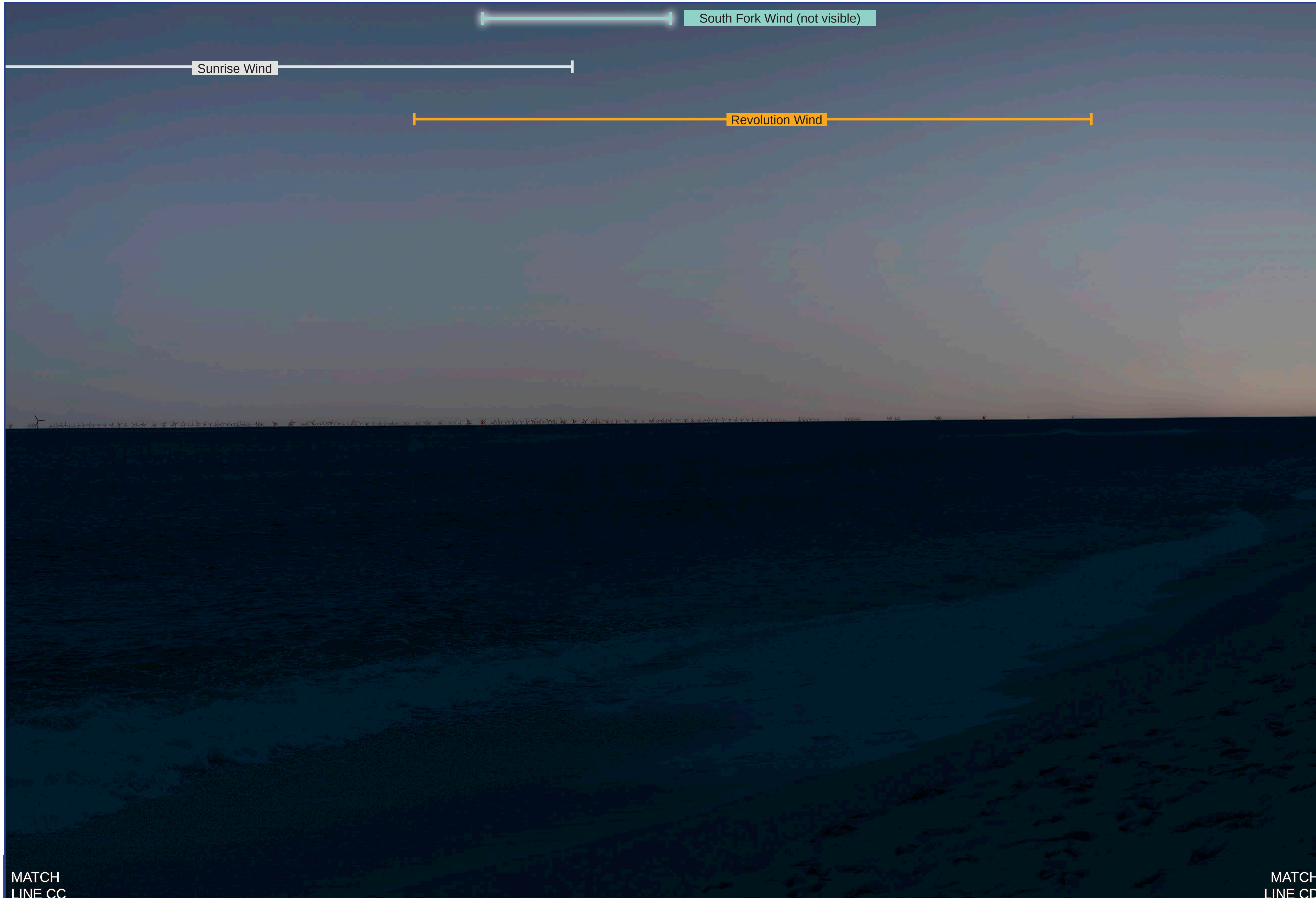
MATCH
LINE AB

MATCH
LINE CC

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 12-N Cisco Beach Night - Scenario 1 (50mm view - 27° vertical / 40° horizontal) 3 of 3

SIMULATED CONDITIONS



MATCH LINE BC

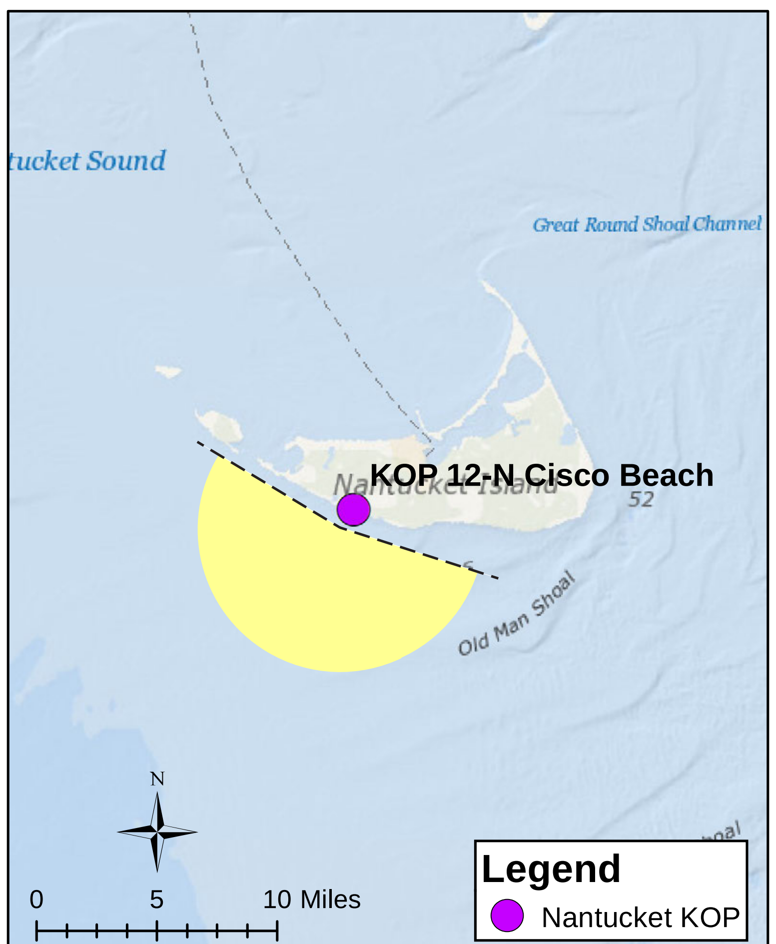
MATCH LINE B

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

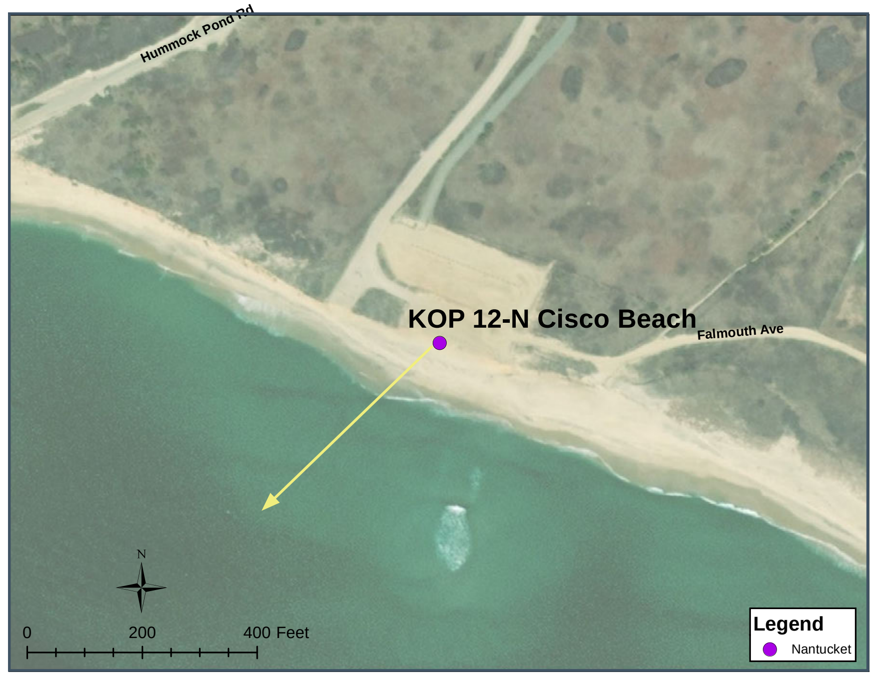
KOP 12-N Cisco Beach Night - Scenario 2

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 9:00 PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

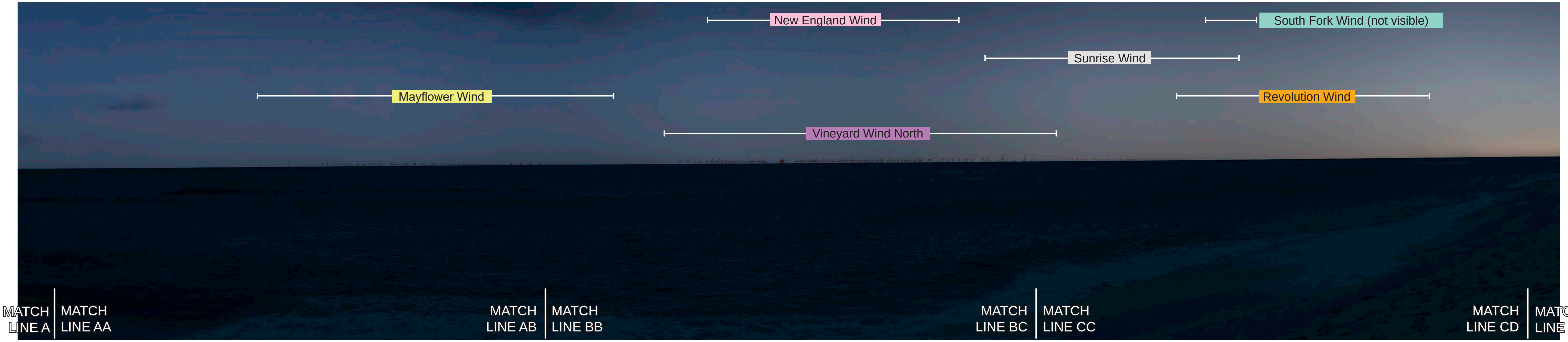
Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

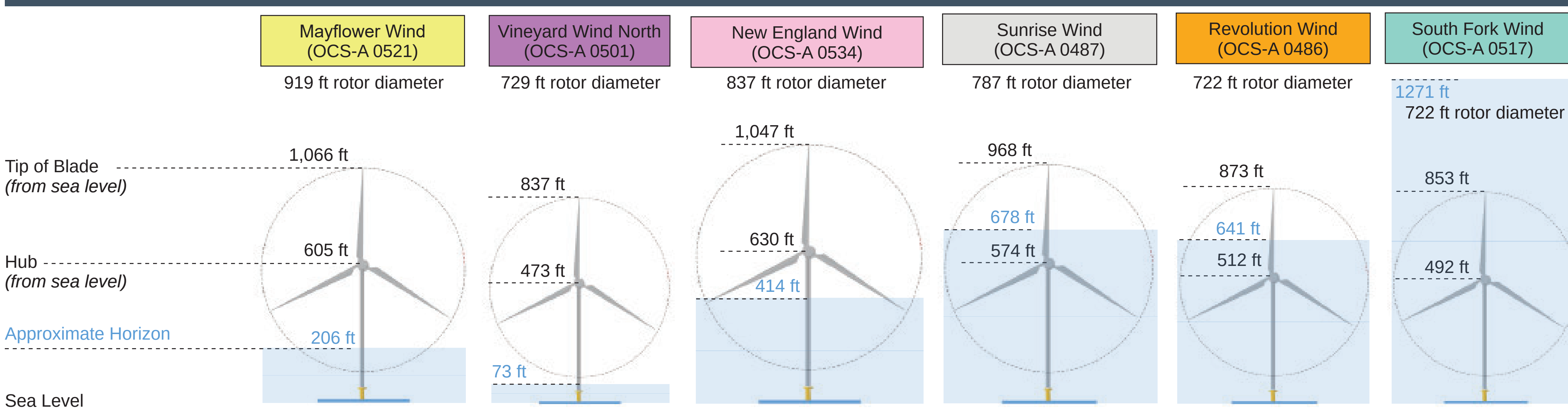
Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 12-N Cisco Beach Night - Scenario 2

SIMULATED CONDITIONS



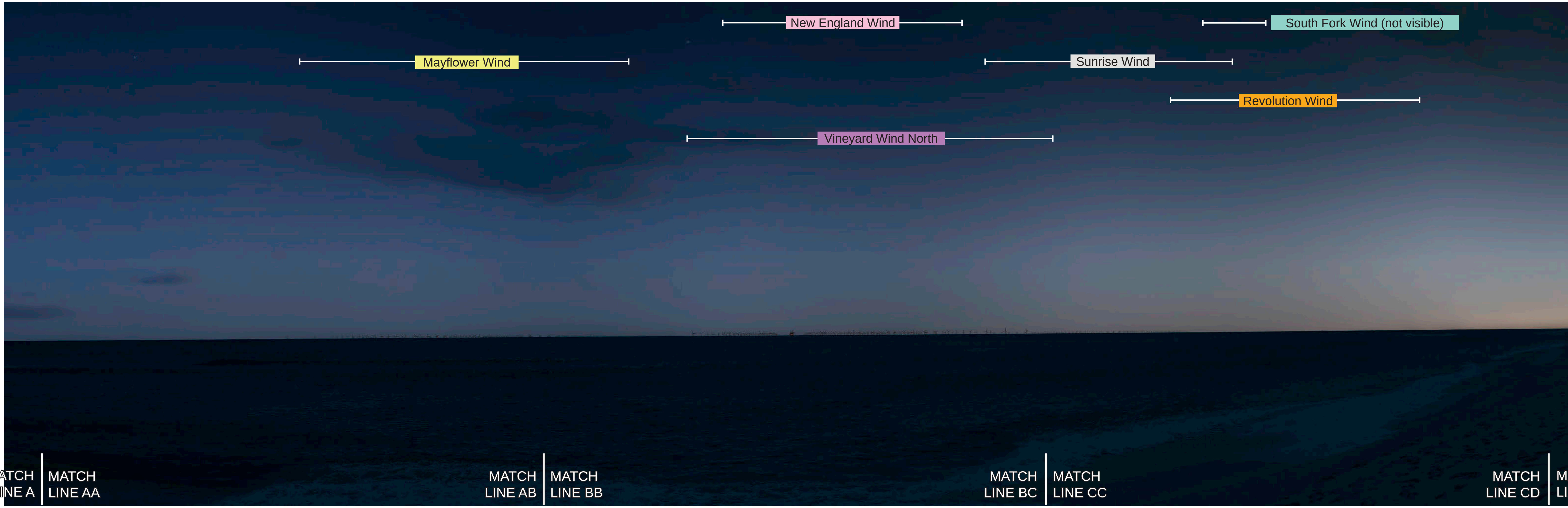
VISIBILTY OF CLOSEST TURBINES



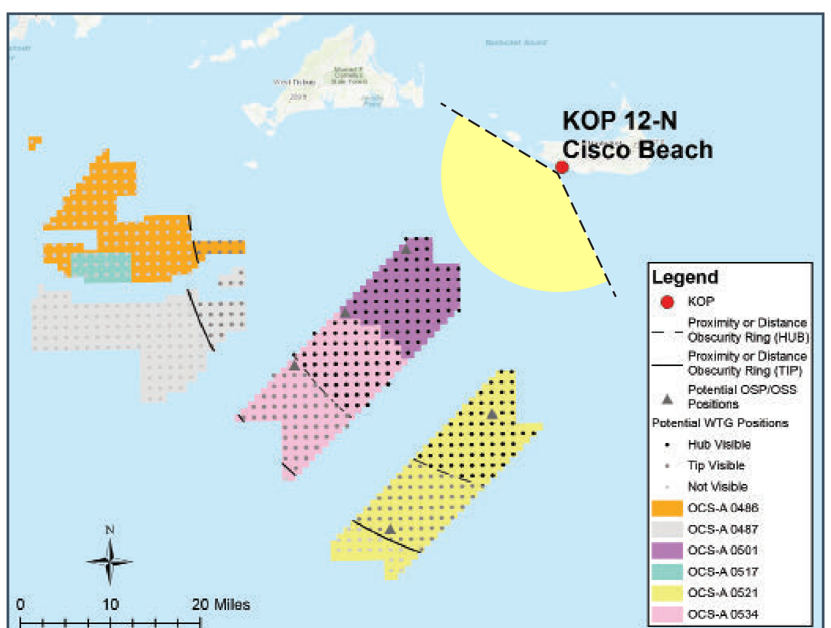
	Mayflower Wind	Vineyard Wind North	New England Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	149	77	120	131	103	18
Number of Structures within View of KOP	130	77	118	22	10	0
Distance to Closest Structure	23 mi (38 km)	16 mi (26 km)	31 mi (49 km)	38 mi (61 km)	38 mi (61 km)	49 mi (79 km)
Distance to Furthest Structure	49 mi (80 km)	29 mi (47 km)	49 mi (78 km)	62 mi (100 km)	59 mi (95 km)	56 mi (89 km)

KOP 12-N Cisco Beach Night - Scenario 2 (Human Field of View - 124°)

SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

CAMERA

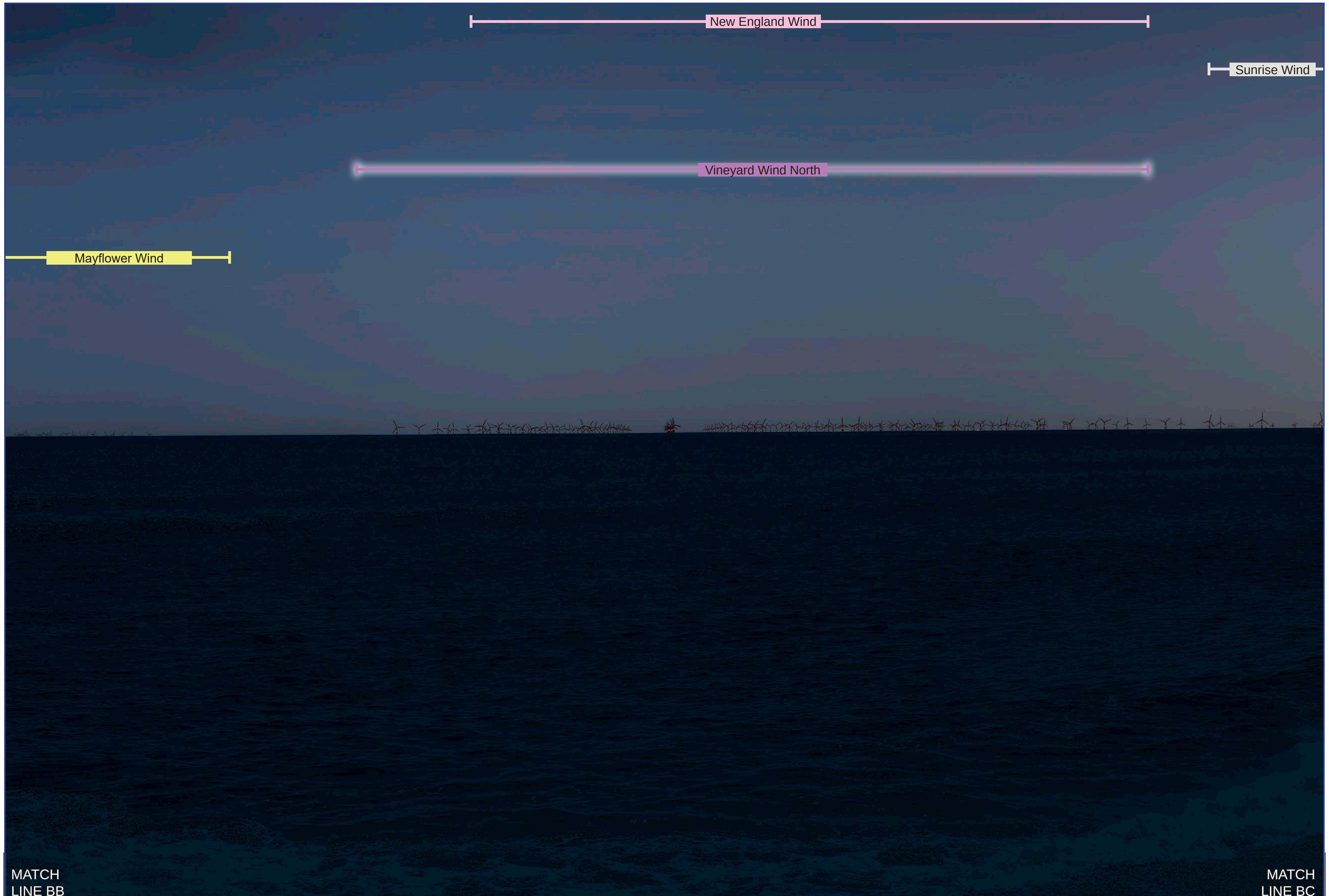
Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

MATCH
LINE A

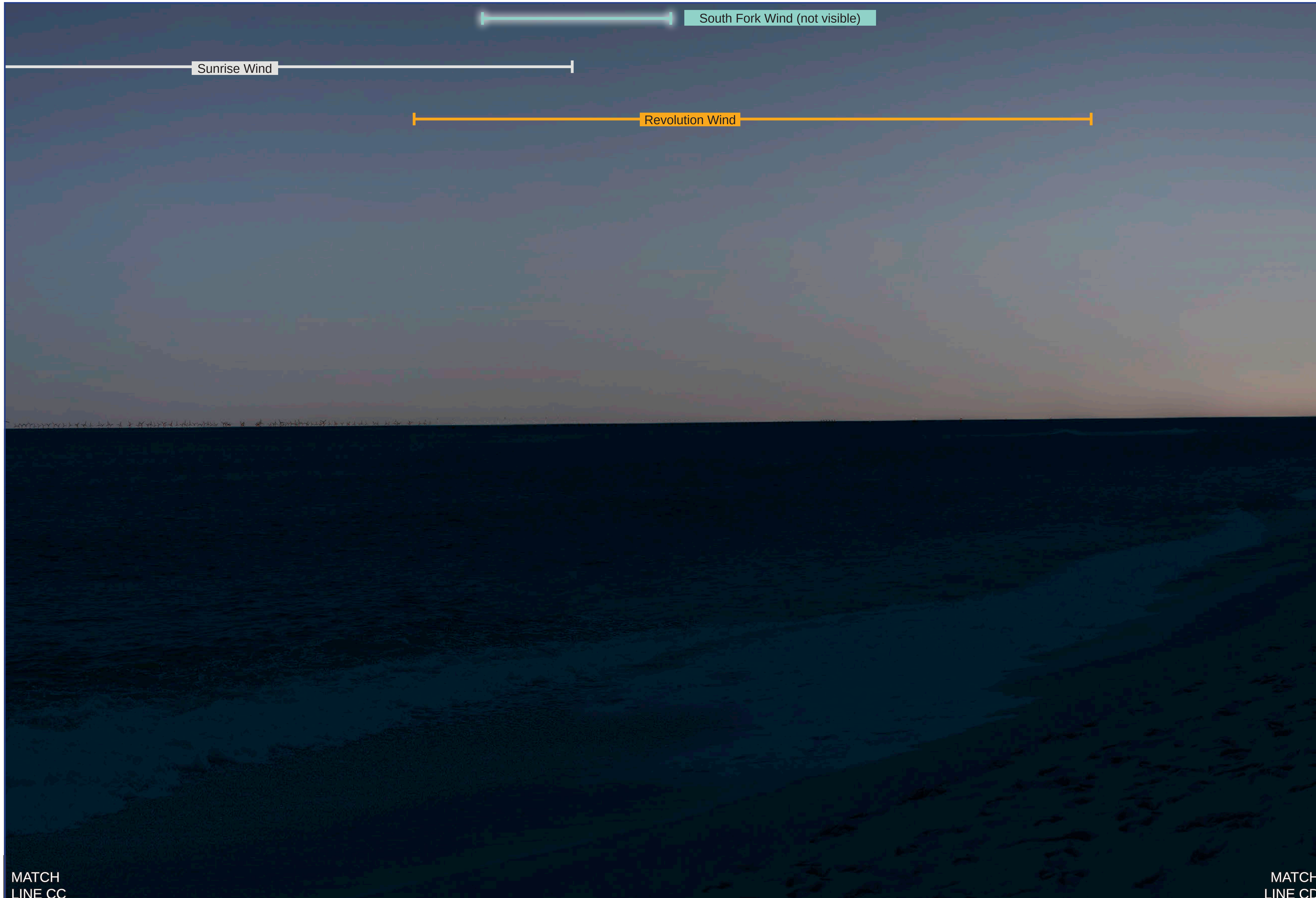
MATCH
LINE BB

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 12-N Cisco Beach Night - Scenario 2 (50mm view - 27° vertical / 40° horizontal) 2 of 3



The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .



MATCH LINE BC

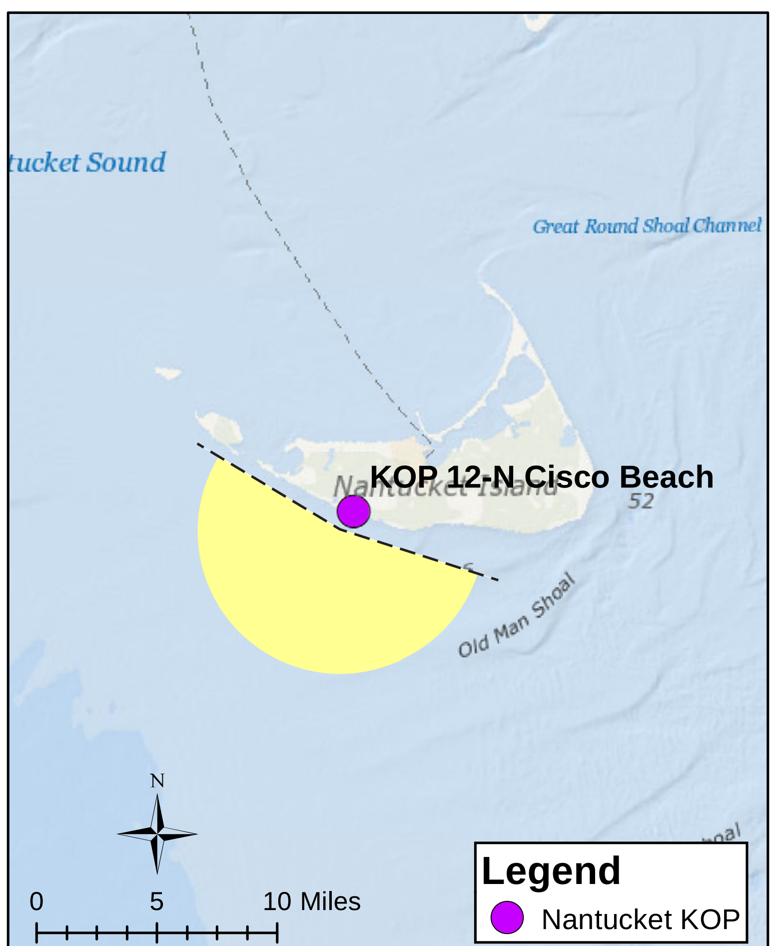
MATCH LINE B

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 12-N Cisco Beach Night - Scenario 3

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 9:00 PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

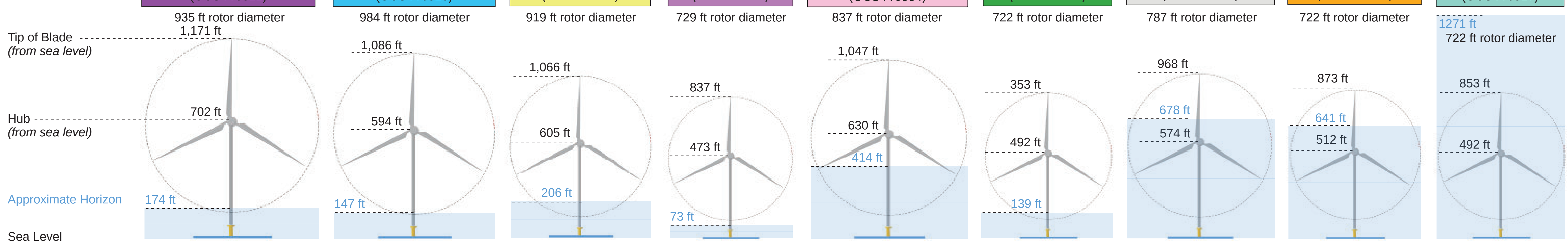
CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 12-N Cisco Beach Night - Scenario 3

SIMULATED CONDITIONS

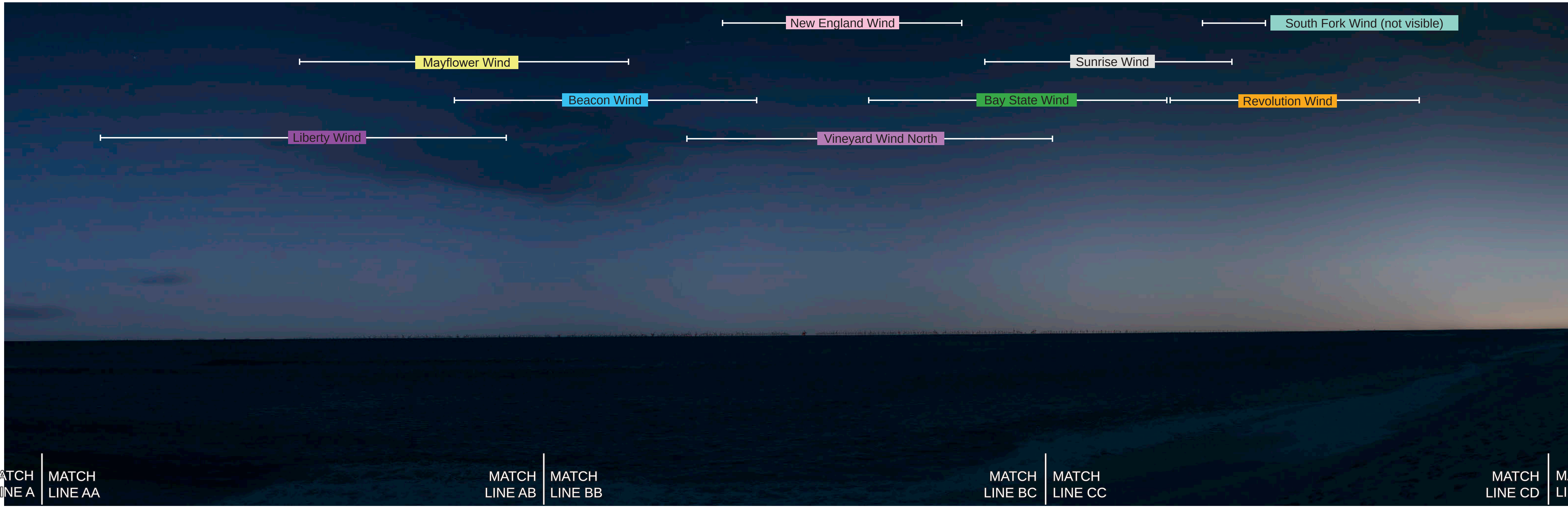
VISIBILTY OF CLOSEST TURBINES



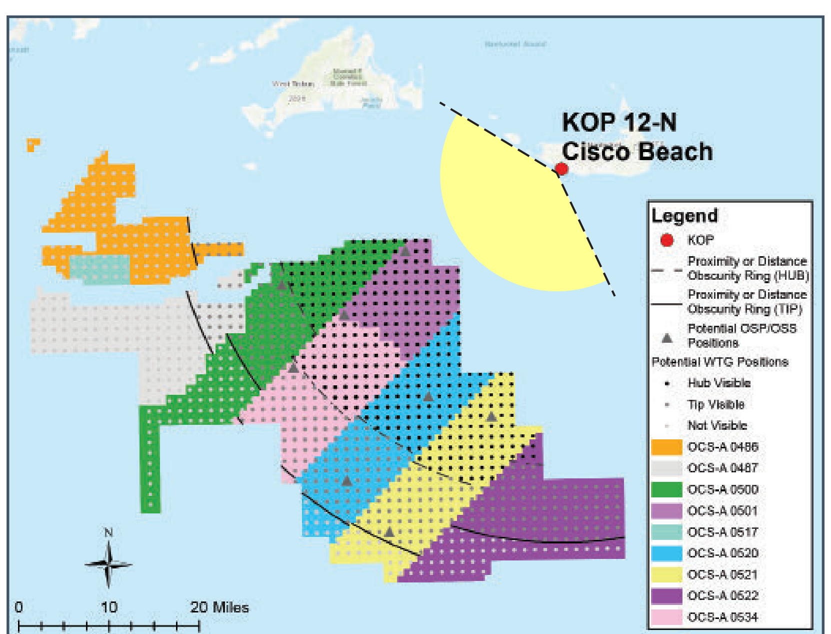
	Liberty Wind (OCS-A 0522)	Beacon Wind (OCS-A 0520)	Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Bay State Wind (OCS-A 0500)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2025-2030	2025-2030	2025	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	149	77	120	169	131	103	18
Number of Structures within View of KOP	94	145	130	77	118	111	22	10	0
Distance to Closest Structure	22 mi (35 km)	21 mi (33 km)	23 mi (38 km)	16 mi (26 km)	31 mi (49 km)	20 mi (32 km)	38 mi (61 km)	38 mi (61 km)	49 mi (79 km)
Distance to Furthest Structure	48 mi (77 km)	49 mi (80 km)	49 mi (80 km)	29 mi (47 km)	48 mi (78 km)	59 mi (95 km)	62 mi (100 km)	59 mi (95 km)	56 mi (89 km)

KOP 12-N Cisco Beach Night - Scenario 3 (Human Field of View - 124°)

SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

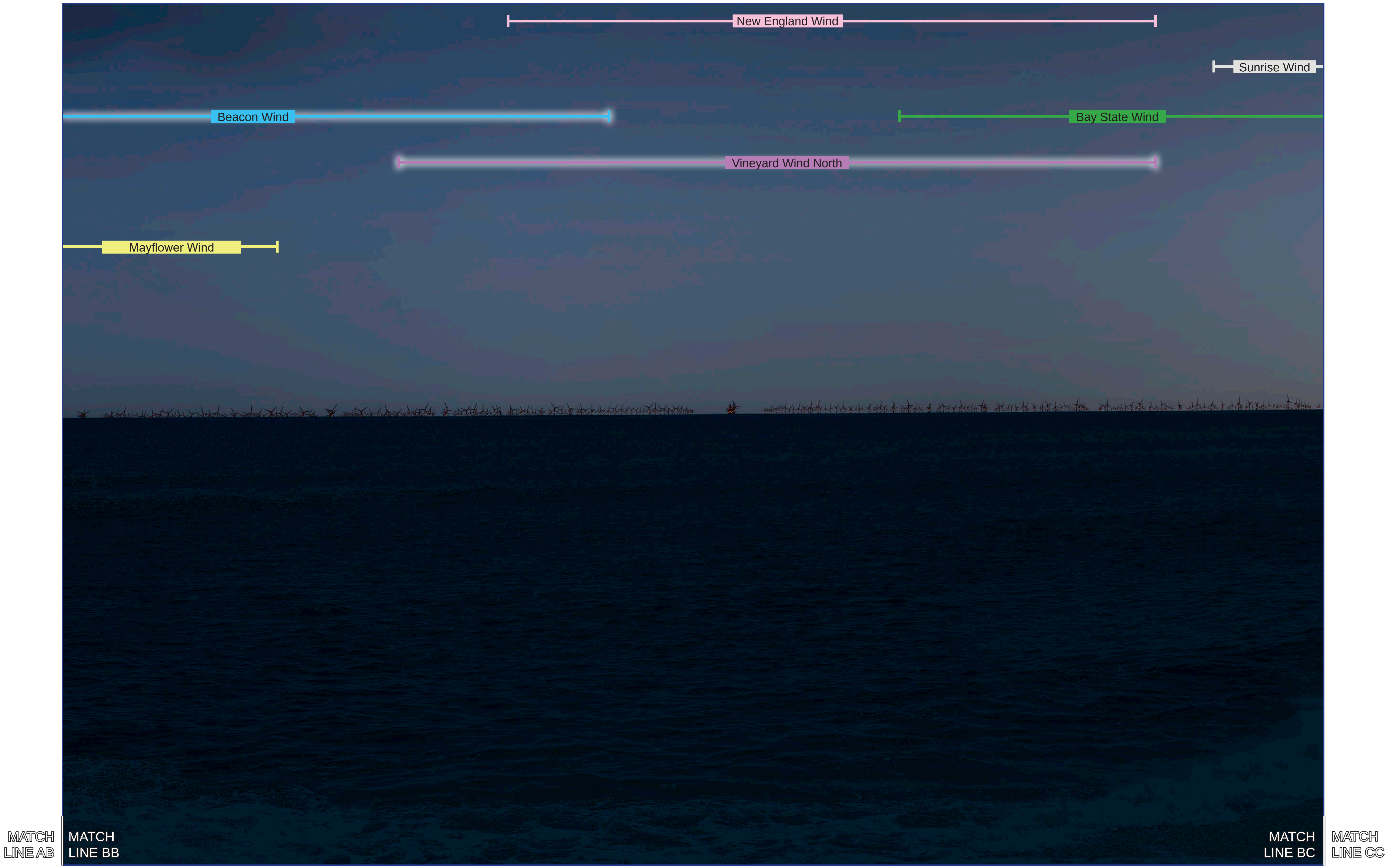
PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

CAMERA

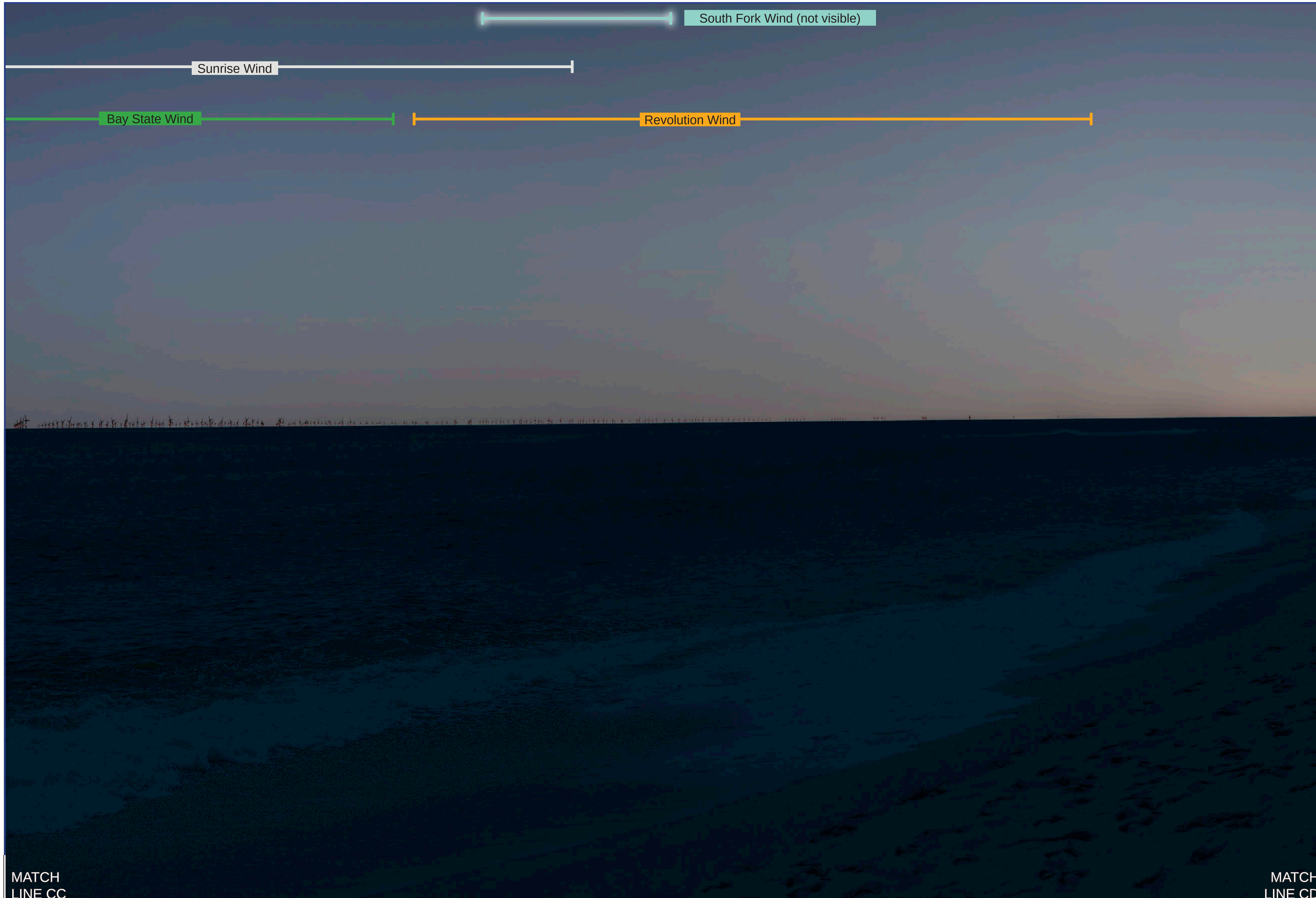
Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .



The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

SIMULATED CONDITIONS



MATCH LINE BC

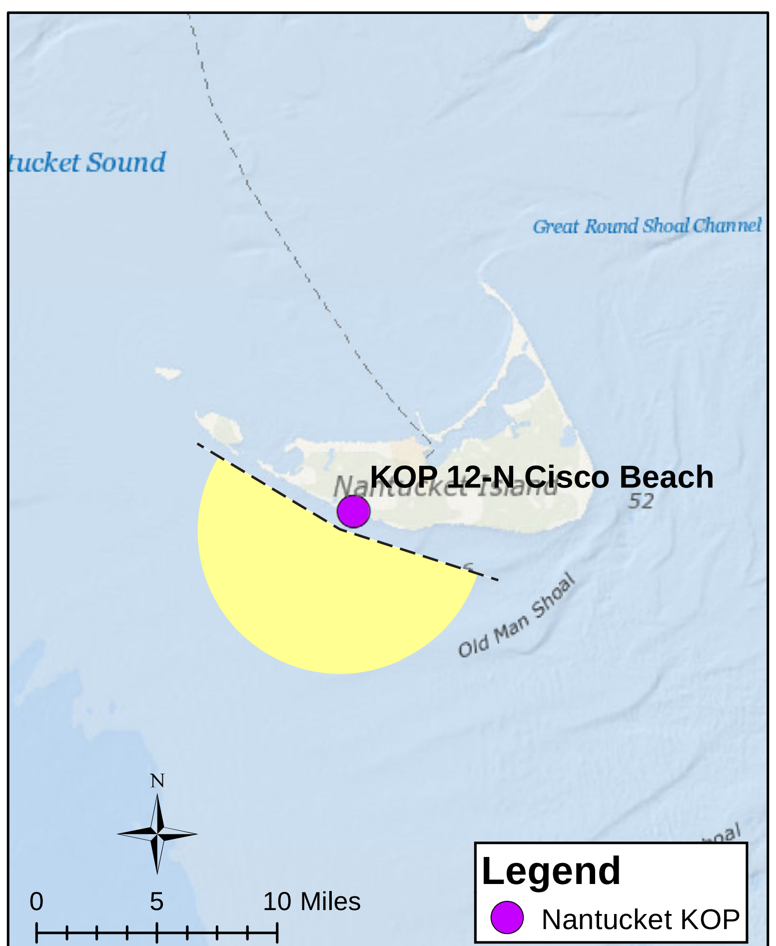
MATCH LINE B

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 12-N Cisco Beach Night - Scenario 4

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16.2 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 9:00PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

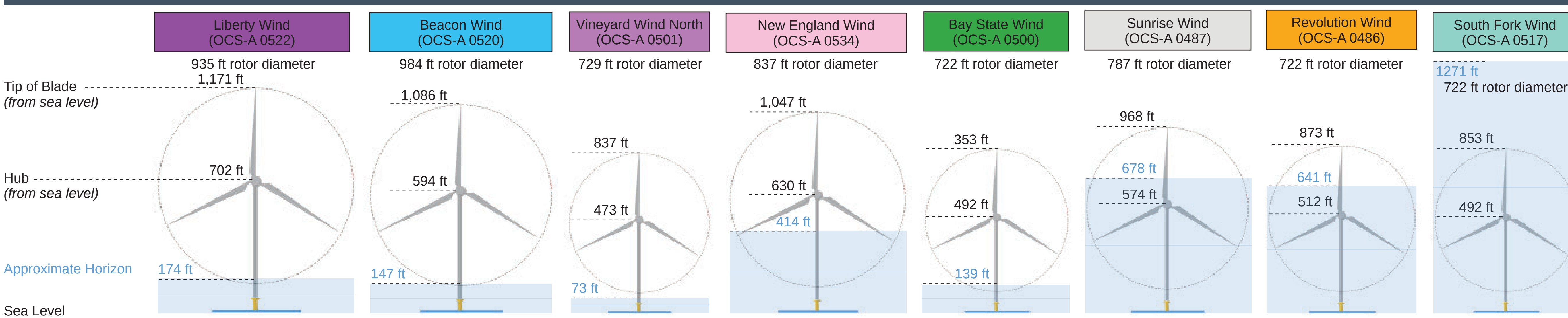
CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 12-N Cisco Beach Night - Scenario 4

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

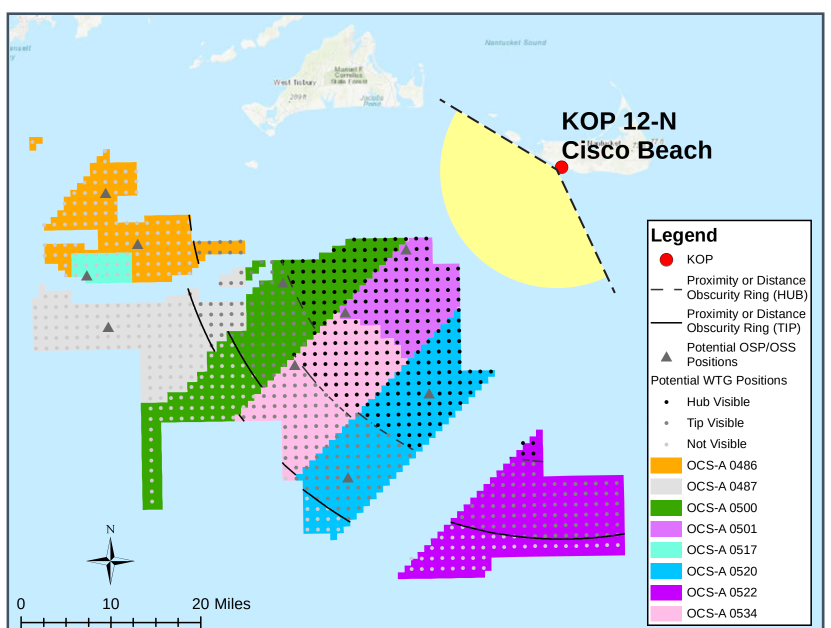


	Liberty Wind	Beacon Wind	Vineyard Wind North	New England Wind	Bay State Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025-2030	2025-2030	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	77	120	169	131	103	18
Number of Structures within View of KOP	94	145	77	118	111	22	10	0
Distance to Closest Structure	22 mi (35 km)	21 mi (33 km)	16 mi (26 km)	31 mi (49 km)	20 mi (32km)	38 mi (61 km)	38 mi (61 km)	49 mi (79 km)
Distance to Furthest Structure	48 mi (77 km)	49 mi (80 km)	29 mi (47 km)	48 mi (78 km)	59 mi (95 km)	62 mi (100 km)	59 mi (95 km)	56 mi (89 km)

KOP 12-N Cisco Beach Night - Scenario 4 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

MATCH LINE A

MATCH LINE BB

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

MATCH LINE BC

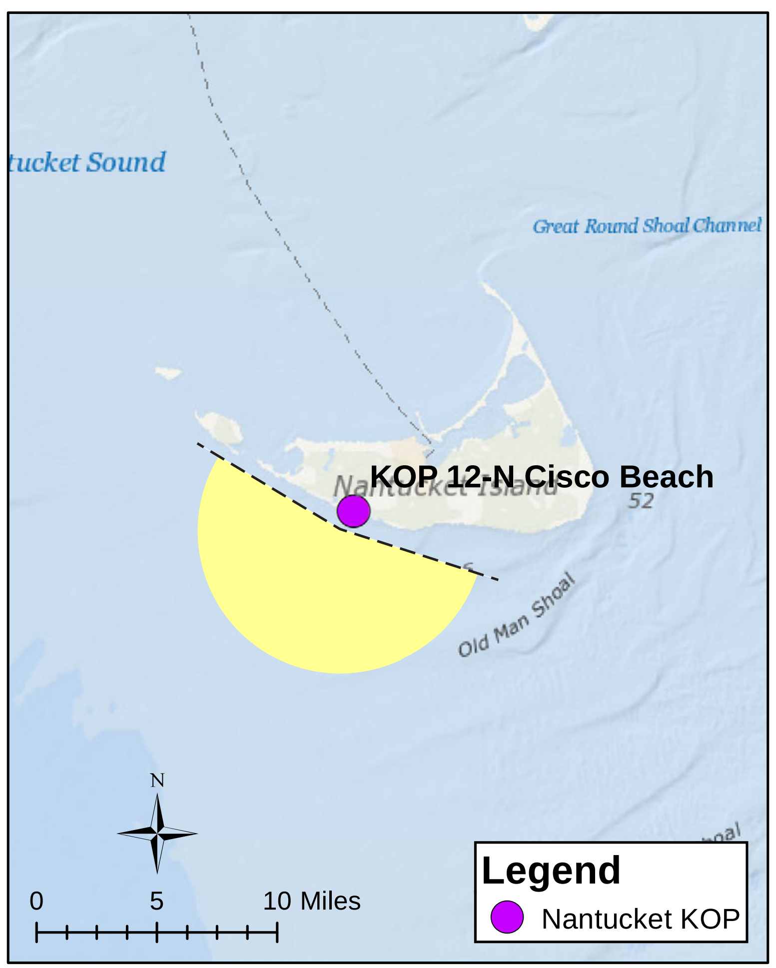
MATCH LINE B

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 12-N Cisco Beach Night - Scenario 5

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP

MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 9:00PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential
Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

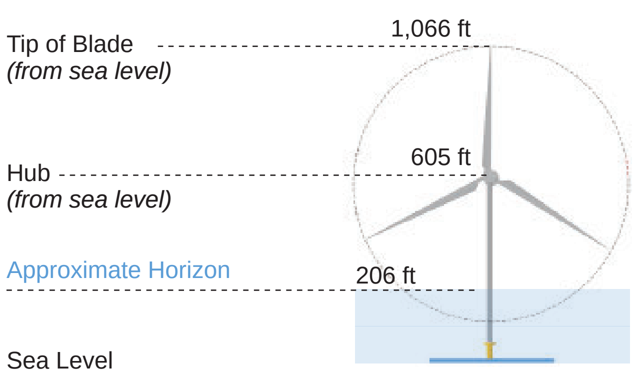
KOP 12-N Cisco Beach Night - Scenario 5

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

Mayflower Wind
(OCS-A 0521)

919 ft rotor diameter

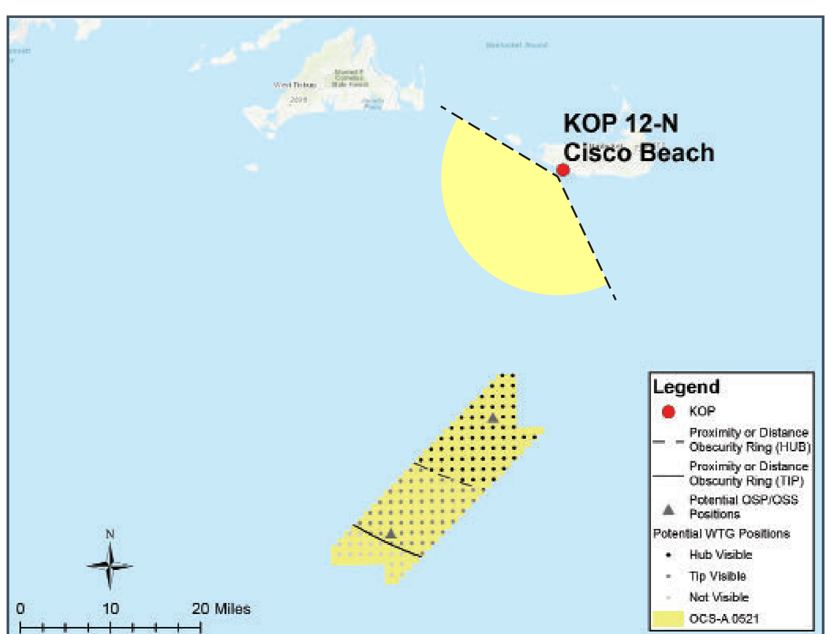


	Mayflower Wind (OCS-A 0521)
Year Forecasted for Development	2025
Number of Structures in Lease Area	149
Number of Structures within View of KOP	130
Distance to Closest Structure	23 mi (38 km)
Distance to Furthest Structure	49 mi (80 km)

KOP 12-N Cisco Beach Night - Scenario 5 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP

PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 26 km

Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 577
Potential Number of Structures Not Visible: 337

PHOTOGRAPH AND SITE

Time of photograph: 1:25PM
Date of photograph: 8-20-20
L/SCA: Open Ocean, Ocean Beach, Dunes, Salt Ponds/Tidal Marsh, Residential

Viewing direction: South (226°)
Latitude: 41.252490°N
Longitude: 70.154080°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 61° F
Humidity: 90%
Wind Dir & Speed: N 6 mph
Weather Condition: Partly Cloudy

CAMERA

Camera Elevation: 23.0 ft / 7.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 12-N Cisco Beach Night - Scenario 5 (50mm view - 27° vertical / 40° horizontal) 1 of 3

Nantucket

MATCH LINE A

MATCH LINE BB

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

MATCH LINE AB

MATCH LINE CC

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

MATCH
LINE BC

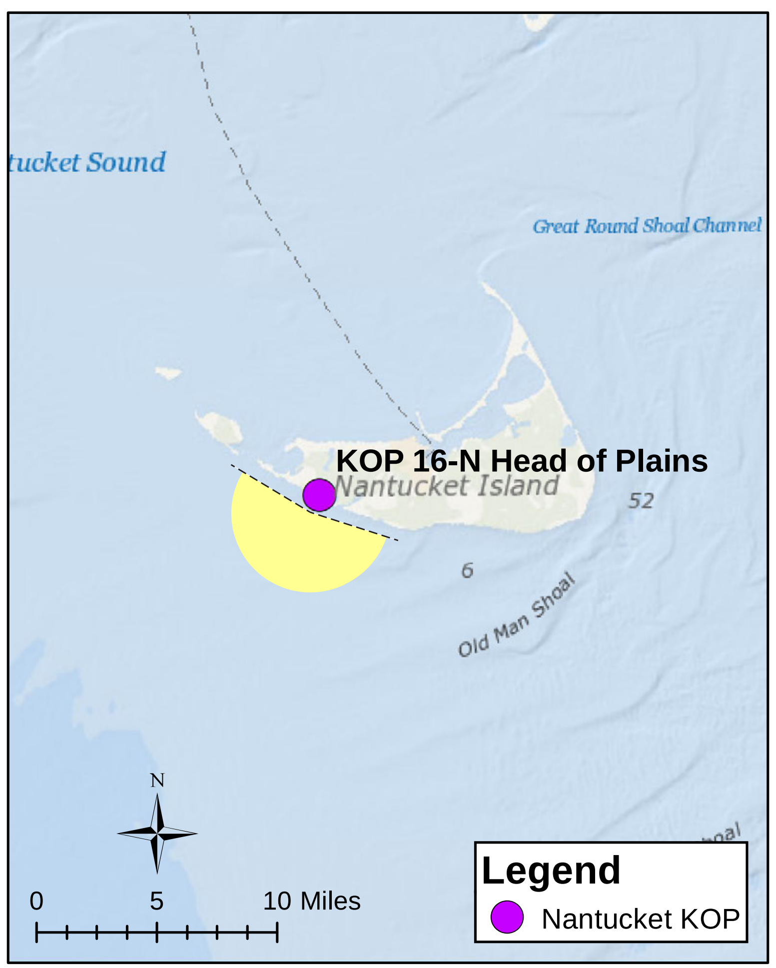
MATCH
LINE B

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

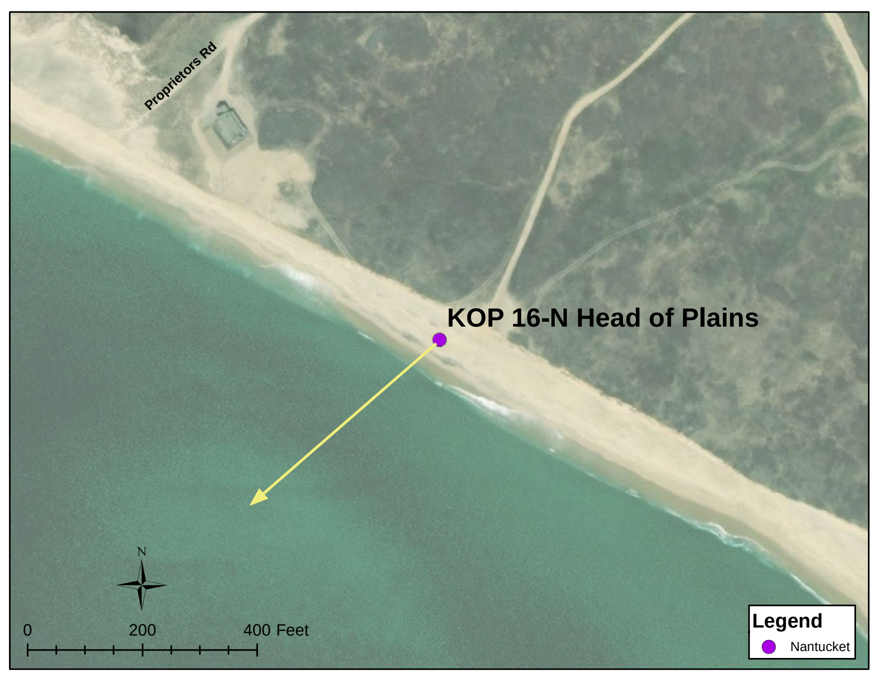
KOP 16-N Head of Plains - Scenario 1

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16 mi /25 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of WTGs Visible: 244
Potential Number of WTGs Not Visible: 205

PHOTOGRAPH AND SITE

Time of photograph: 3:54 PM
Date of photograph: 10-7-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (229°)
Latitude: 41.341724°N
Longitude: 70.179524°W
Lighting Direction: Sidelit

ENVIRONMENT

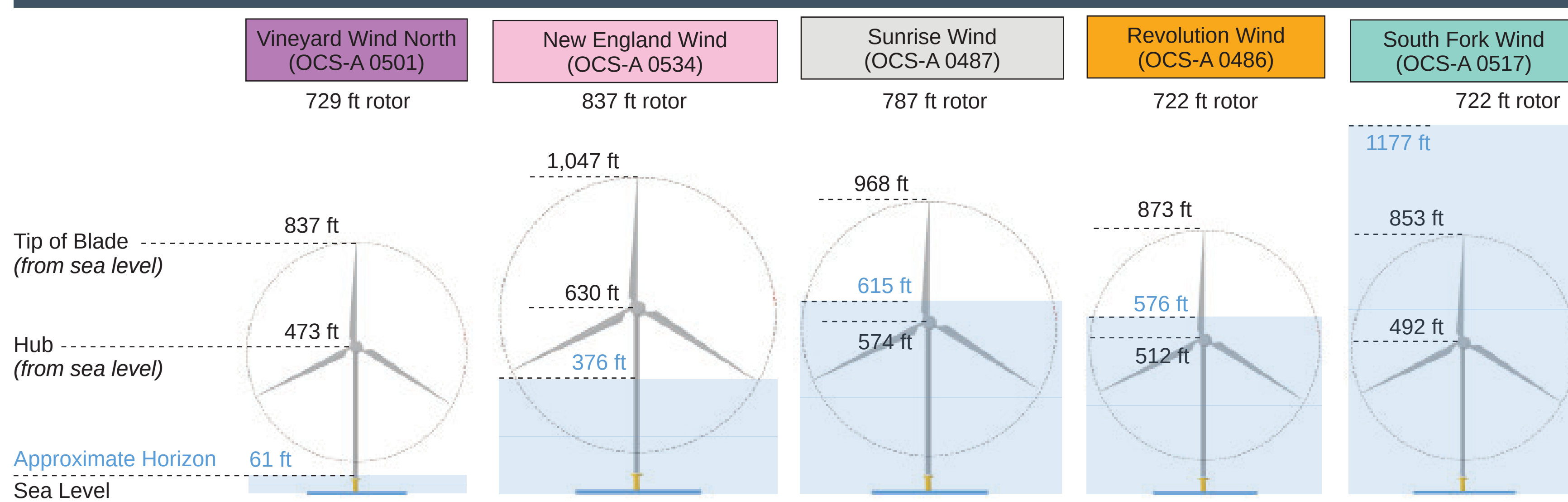
Temperature: 66° F
Humidity: 81%
Wind Dir & Speed: SW 21 mph
Weather Condition: Clear

CAMERA

Camera Elevation: 20.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

SIMULATED CONDITIONS

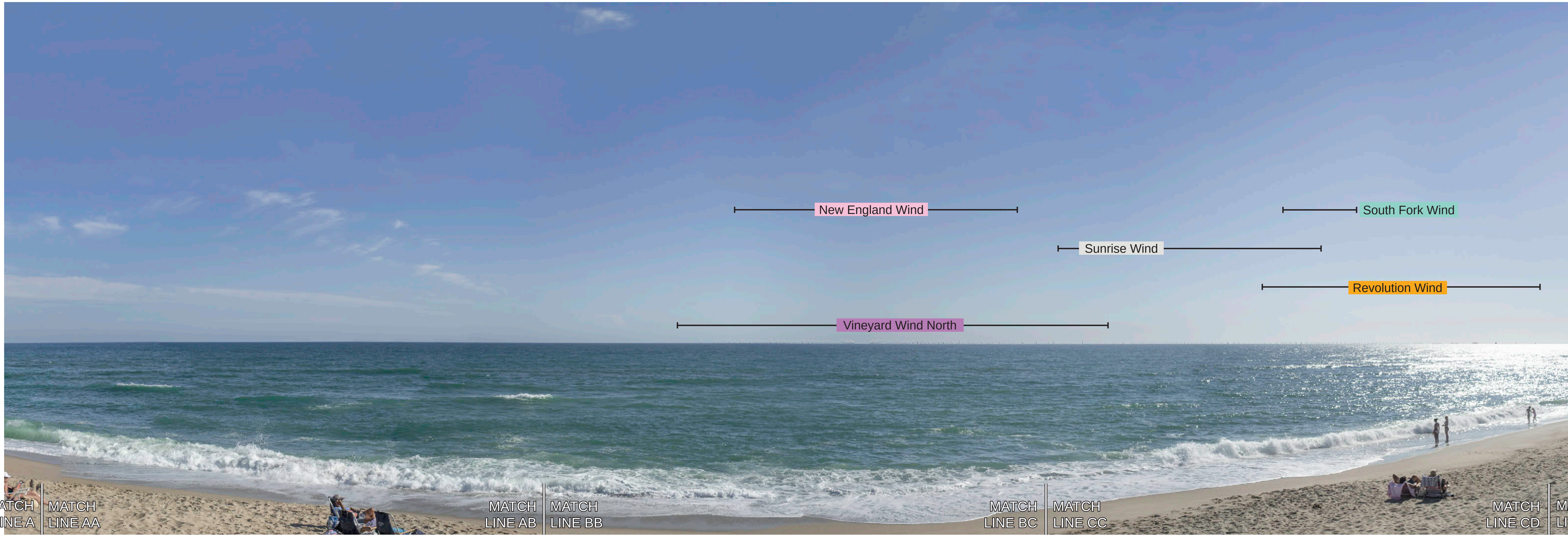
VISIBILTY OF CLOSEST TURBINES



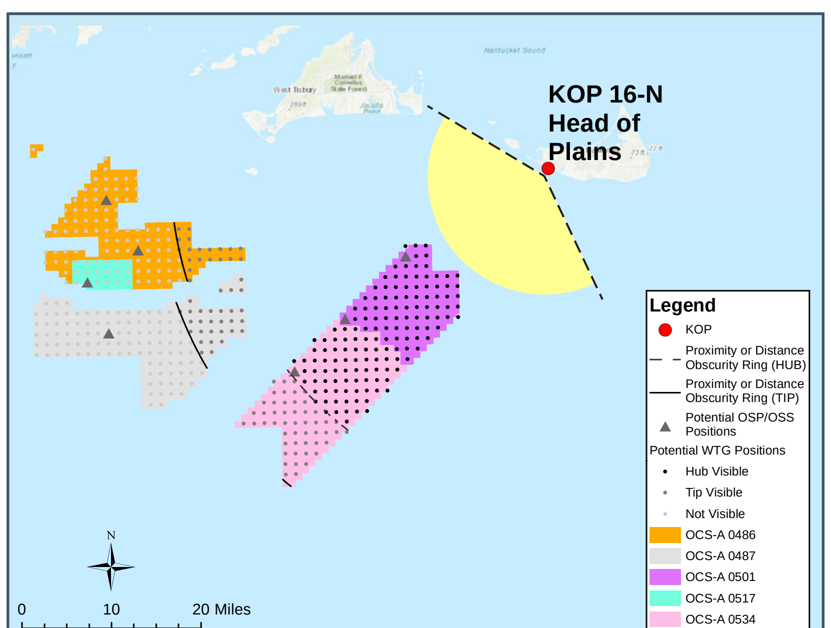
	Vineyard Wind North	New England Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	77	120	131	103	18
Number of Structures within View of KOP	77	119	29	19	0
Distance to Closest Structure	16 mi (25 km)	30 mi (48 km)	37 mi (59 km)	36 mi (57 km)	48 mi (77.45 km)
Distance to Furthest Structure	28 mi (46 km)	46 mi (74 km)	61 mi (98 km)	58 mi (93 km)	54 mi (87 km)

KOP 16-N Head of Plains - Scenario 1 (Human Field of View - 124°)

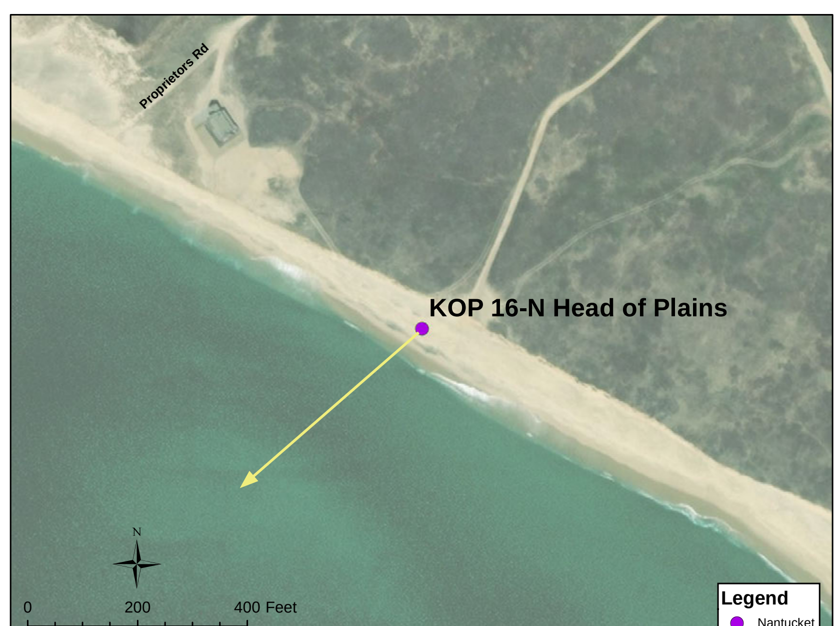
SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°

Vertical Field of View: 40°

Nearest WTG: 16 mi /25 km

Furthest Visible WTG: 46 mi / 74 km

Potential Number of WTGs Visible: 244

Potential Number of WTGs Not Visible: 205

ENVIRONMENT

Temperature: 66° F

Humidity: 81%

Wind Dir & Speed: SW 21 mph

Weather Condition: Clear

PHOTOGRAPH AND SITE

Time of photograph: 3:54PM

Date of photograph: 10-7-20

L/SCA: Ocean Beach, Open Ocean, Dunes

Viewing direction: South (229°)

Latitude: 41.341724°N

Longitude: 70.179524°W

Lighting Direction: Sidelit

CAMERA

Camera Elevation: 20.5 ft / 6.3 m

Nikon D4

Nikon 50mm

ISO: 100

Fstop: f/7.1

Shutter: 1/1250 sec

Exposure bias: -0.7 step

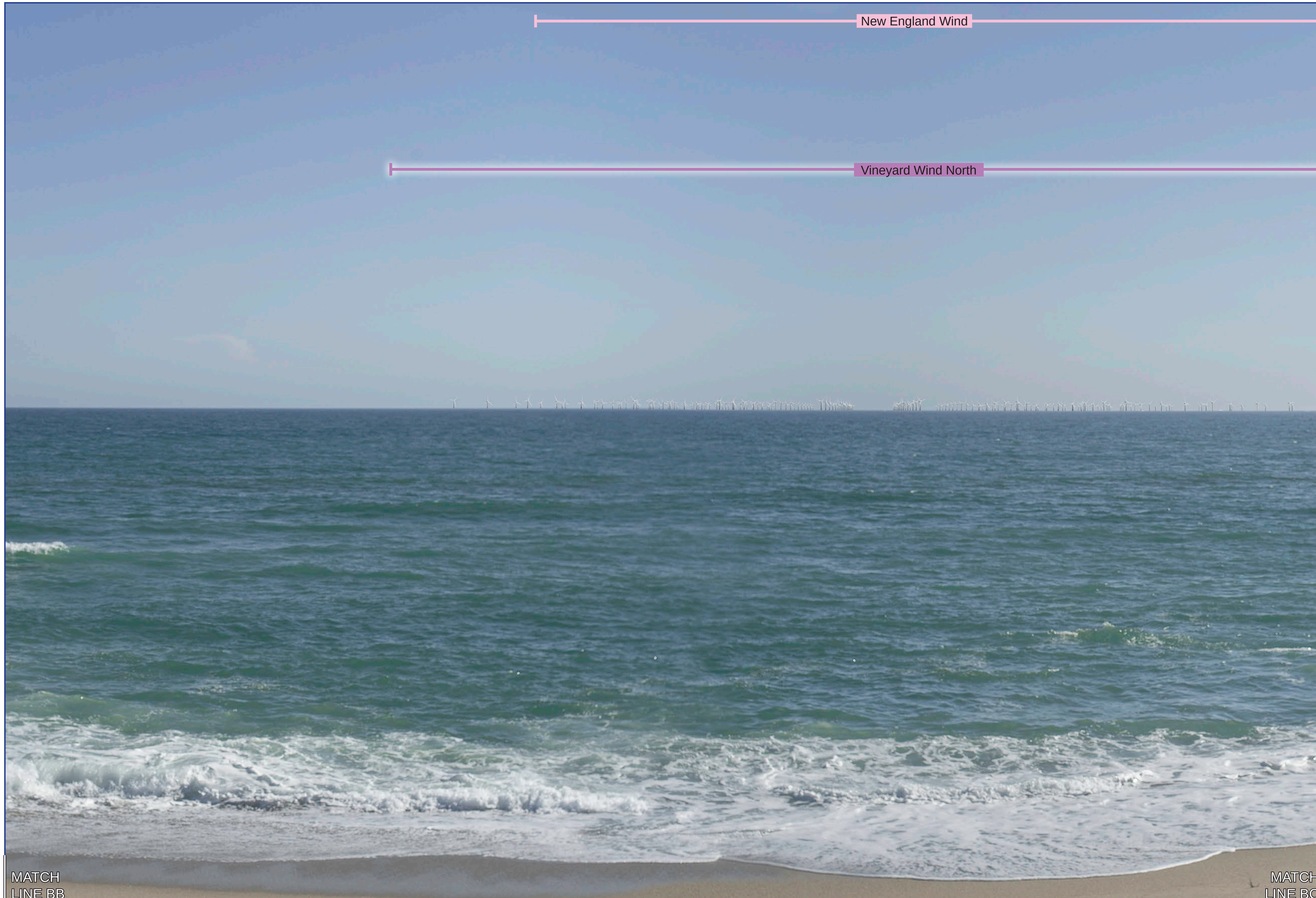
KOP 16-N Head of Plains - Scenario 1 (50mm view - 27° vertical / 40° horizontal) 1 of 3

MATCH LINE A

MATCH LINE BB

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

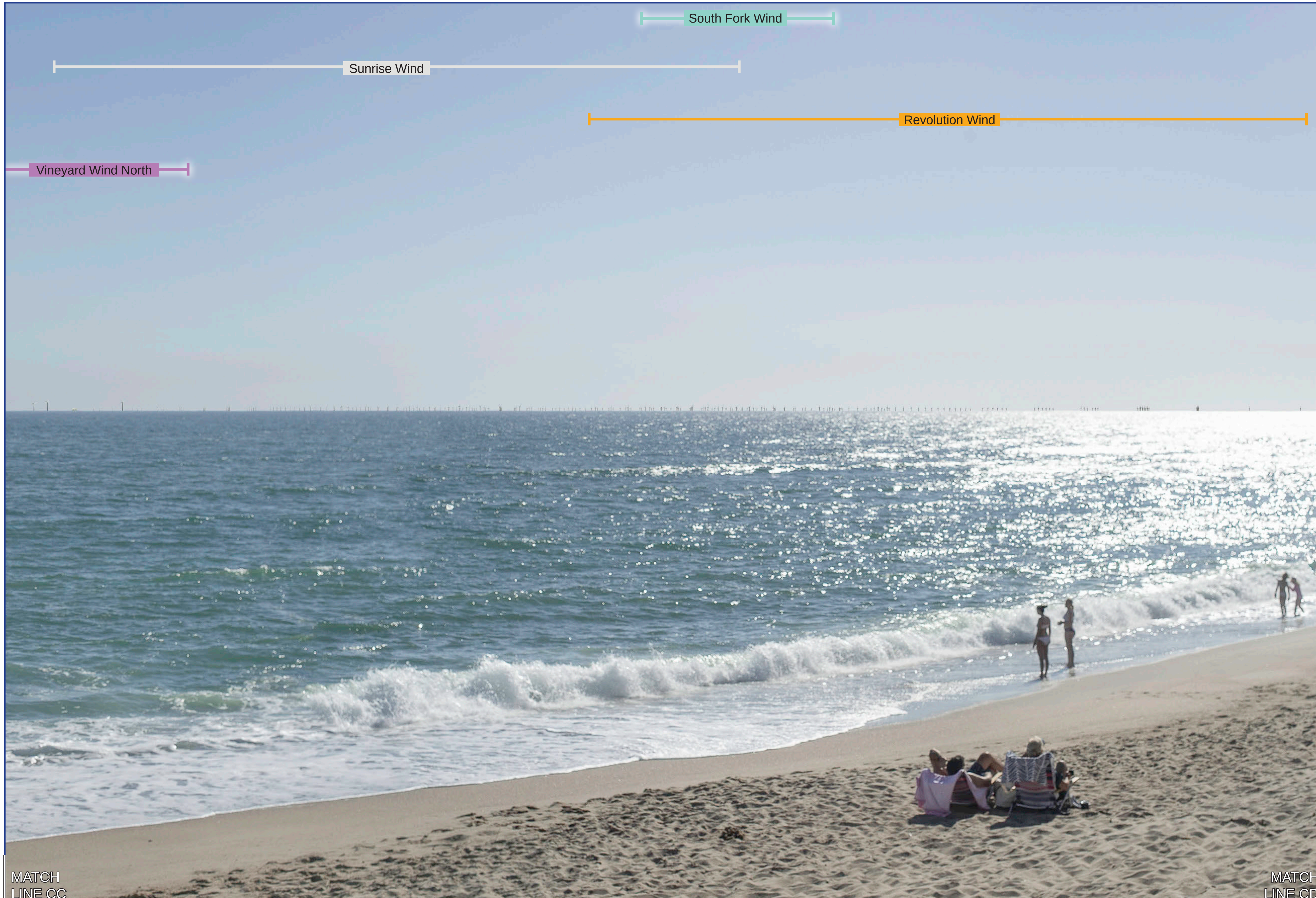
MATCH
LINE AB



MATCH
LINE CC

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 16-N Head of Plains - Scenario 1 (50mm view - 27° vertical / 40° horizontal) 3 of 3

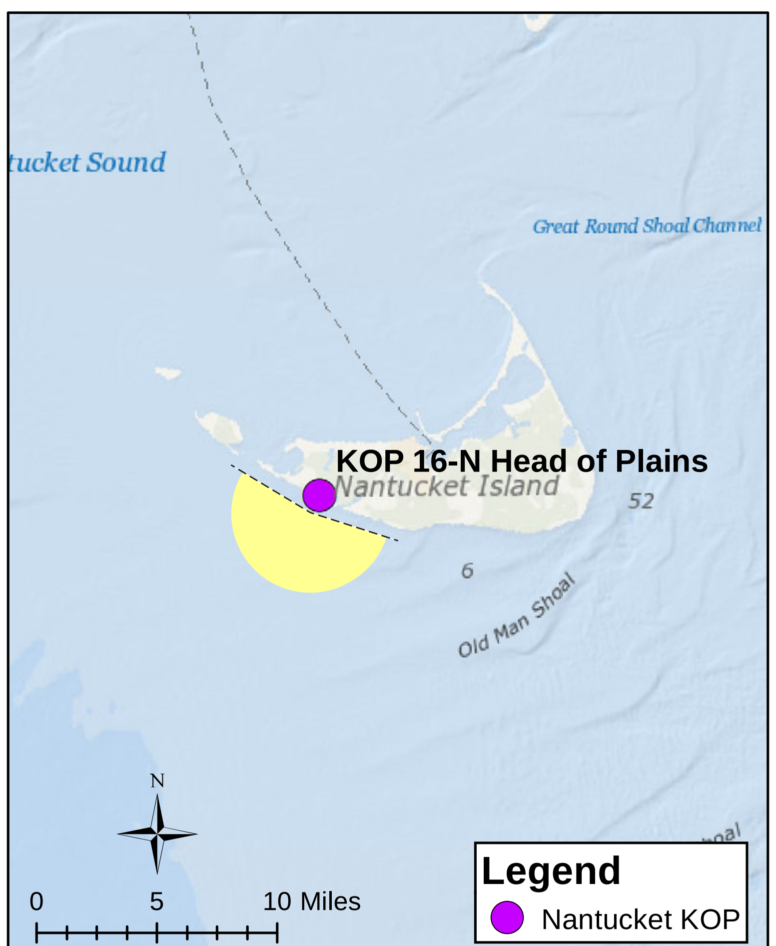


The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

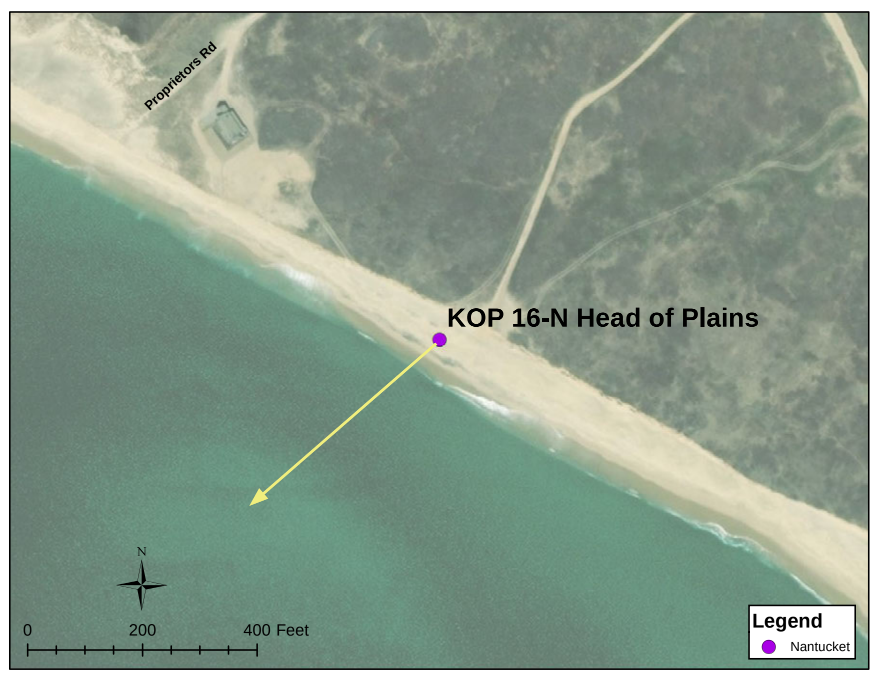
KOP 16-N Head of Plains - Scenario 2

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 25 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of WTGs Visible: 376
Potential Number of WTGs Not Visible: 222

PHOTOGRAPH AND SITE

Time of photograph: 3:54PM
Date of photograph: 10-7-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (229°)
Latitude: 41.341724°N
Longitude: 70.179524°W
Lighting Direction: Sidelit

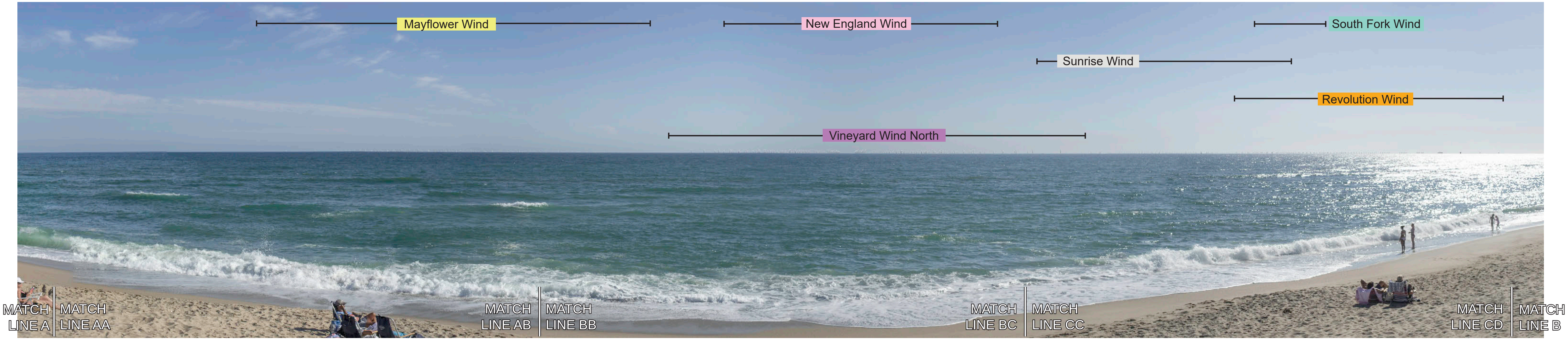
ENVIRONMENT

Temperature: 66° F
Humidity: 81%
Wind Dir & Speed: SW 21 mph
Weather Condition: Clear

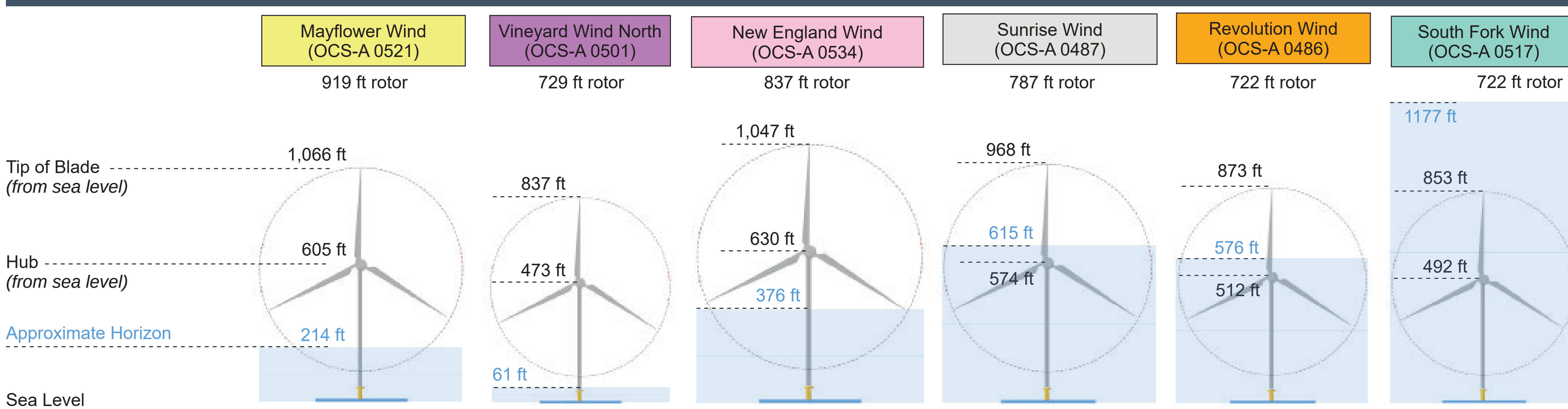
CAMERA

Camera Elevation: 20.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

SIMULATED CONDITIONS



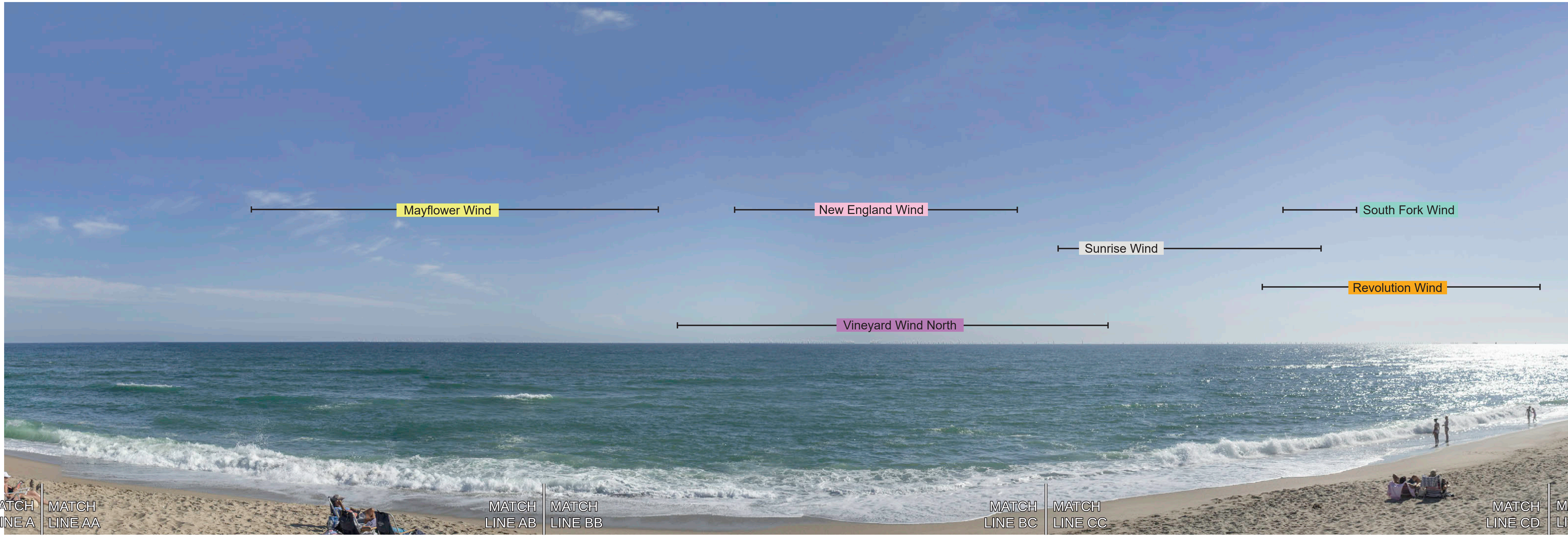
VISIBILTY OF CLOSEST TURBINES



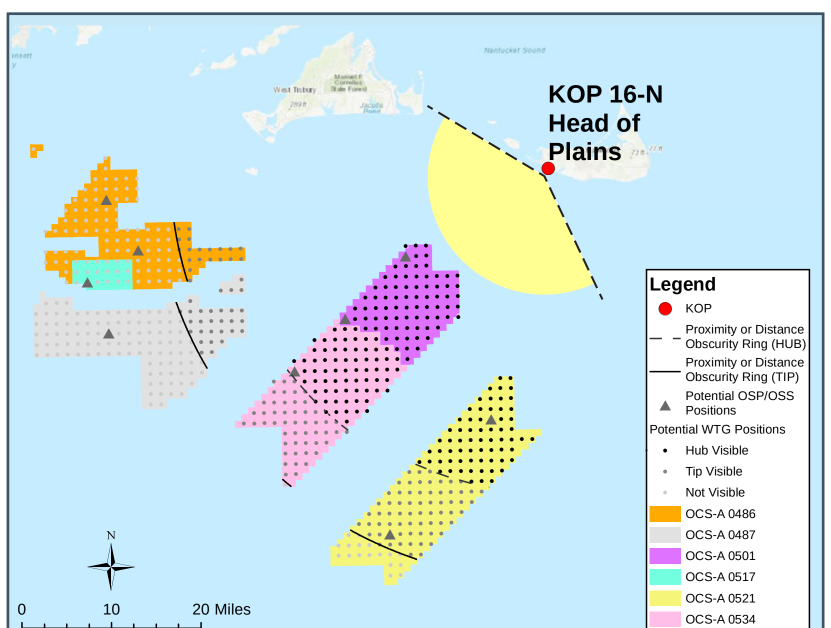
	Mayflower Wind	Vineyard Wind North	New England Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	149	77	120	131	103	18
Number of Structures within View of KOP	132	77	119	29	19	0
Distance to Closest Structure	24 mi (38.67 km)	16 mi (25 km)	30 mi (48 km)	37 mi (59 km)	36 mi (57 km)	48 mi (77.45 km)
Distance to Furthest Structure	49 mi (79 km)	28 mi (46 km)	46 mi (74 km)	61 mi (98 km)	58 mi (93 km)	54 mi (87 km)

KOP 16-N Head of Plains - Scenario 2 (Human Field of View - 124°)

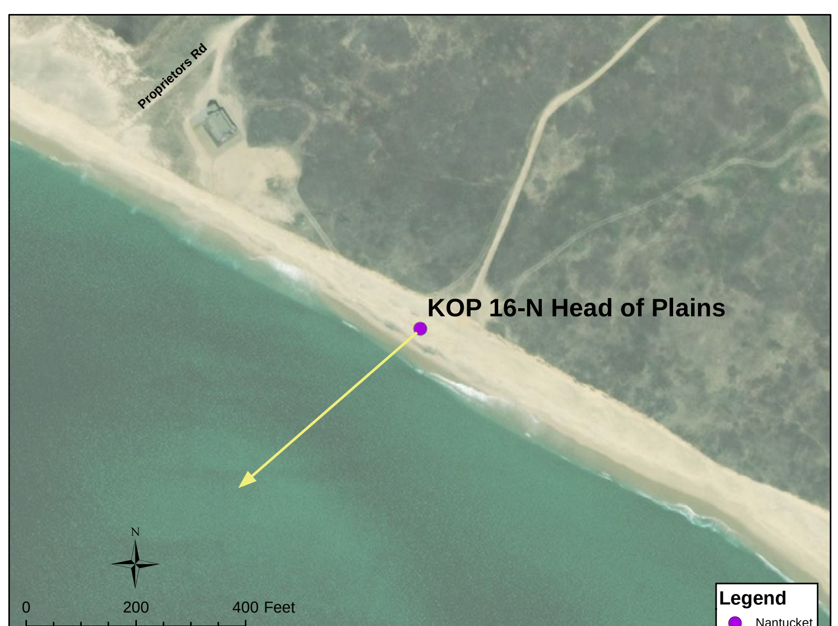
SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi /25 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of WTGs Visible: 376
Potential Number of WTGs Not Visible: 222

ENVIRONMENT

Temperature: 66° F
Humidity: 81%
Wind Dir & Speed: SW 21 mph
Weather Condition: Clear

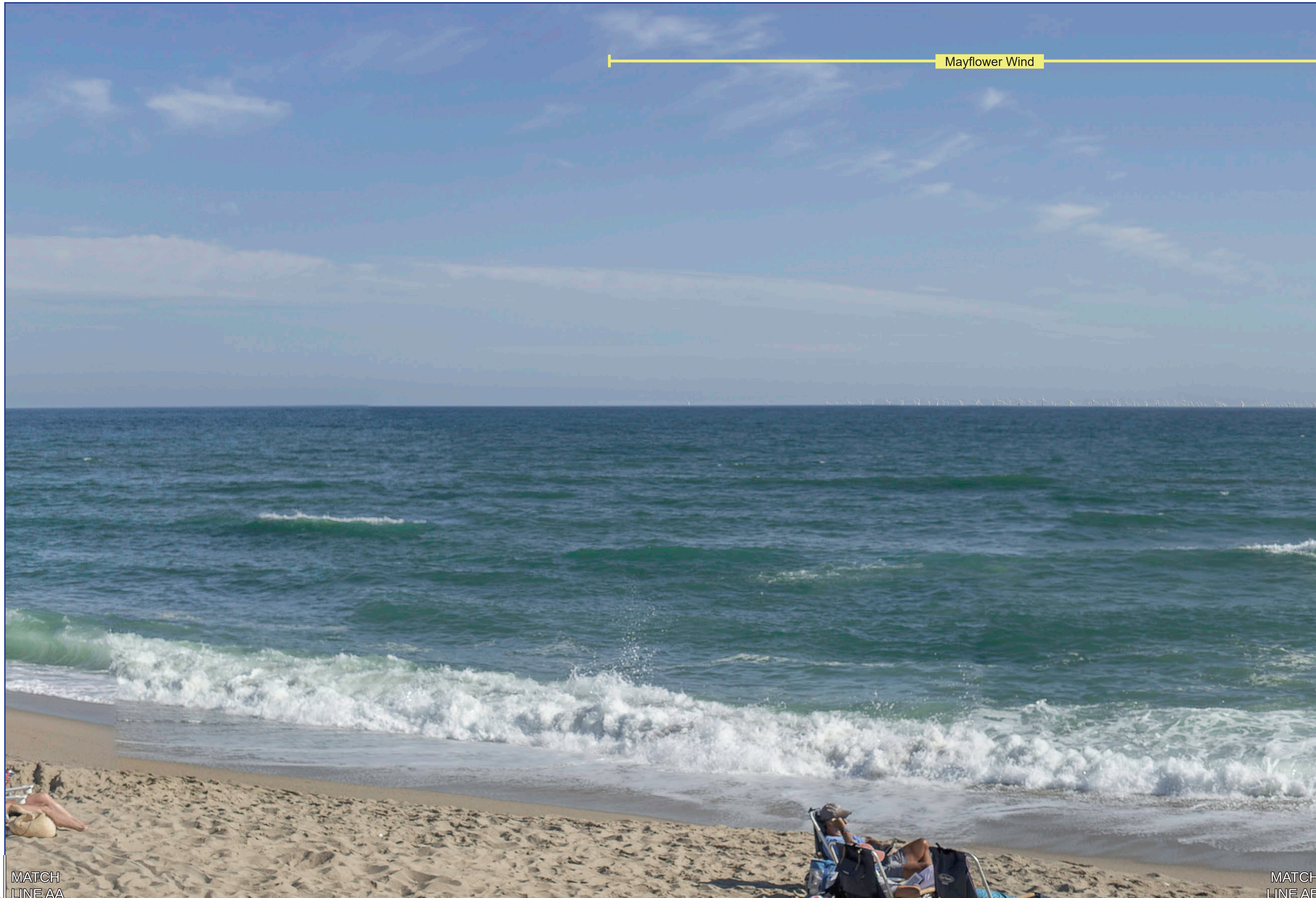
PHOTOGRAPH AND SITE

Time of photograph: 3:54PM
Date of photograph: 10-7-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (229°)
Latitude: 41.341724°N
Longitude: 70.179524°W
Lighting Direction: Sidelit

CAMERA

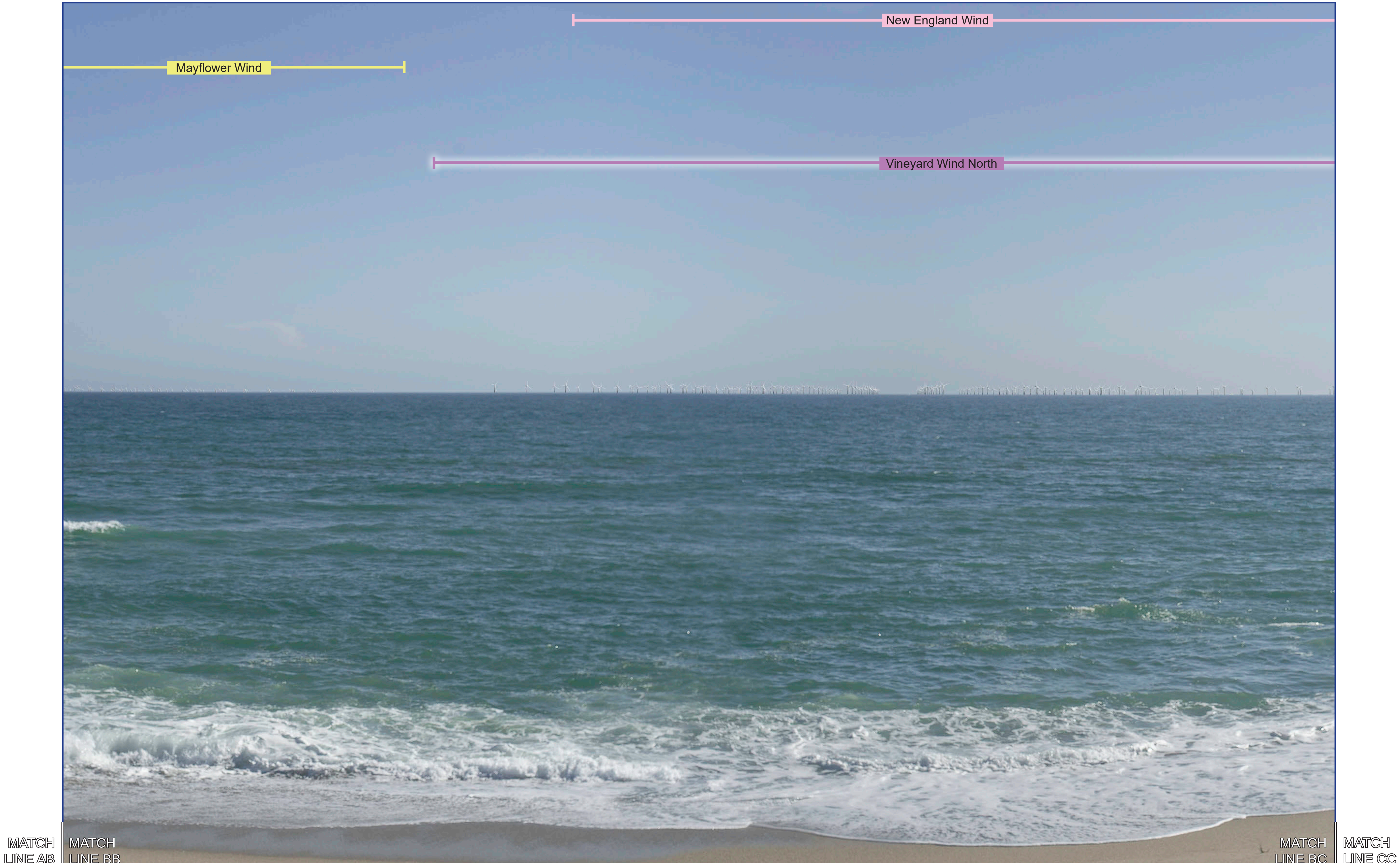
Camera Elevation: 20.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

MATCH
LINE A



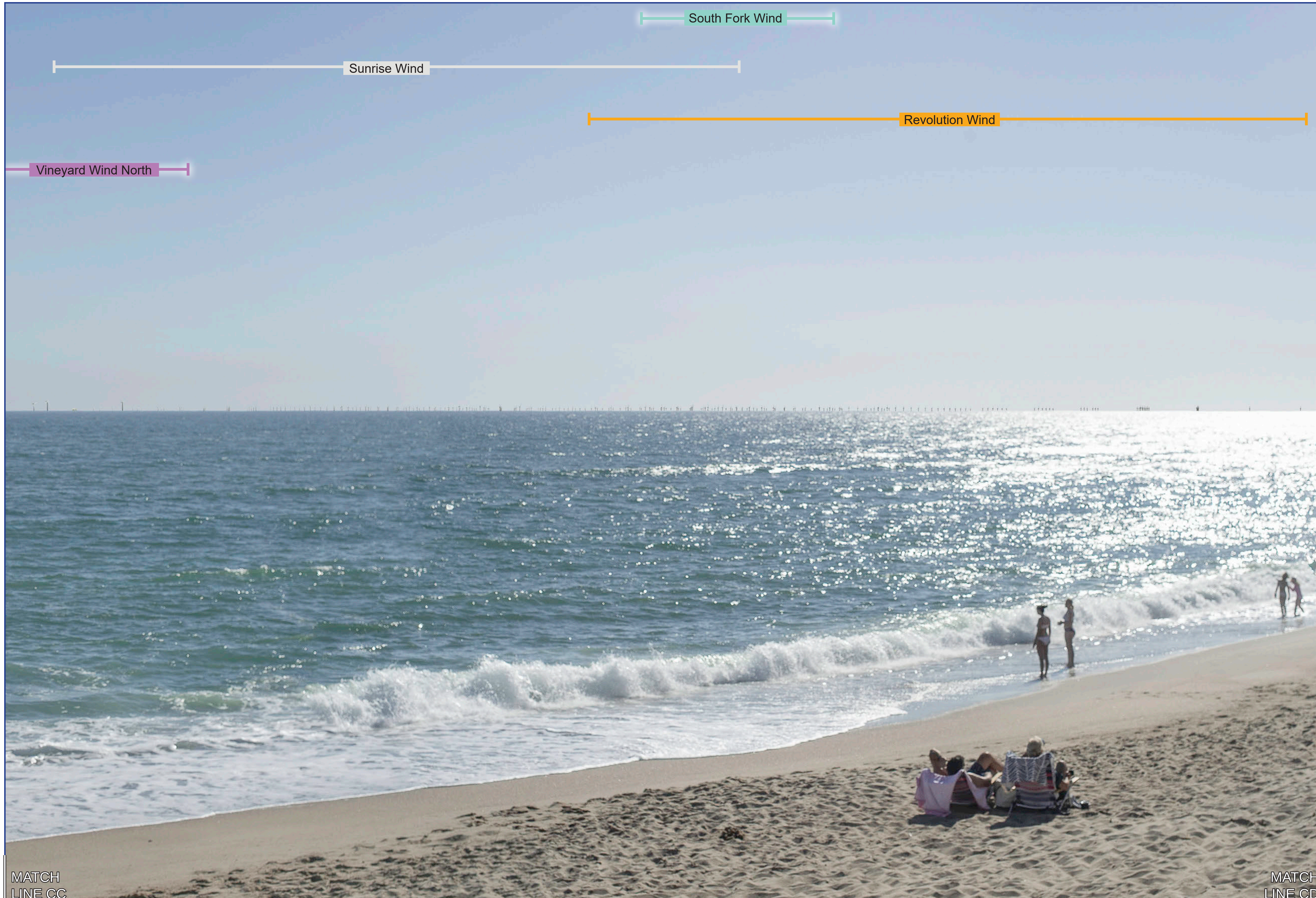
MATCH
LINE BB

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .



The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 16-N Head of Plains - Scenario 2 (50mm view - 27° vertical / 40° horizontal) 3 of 3

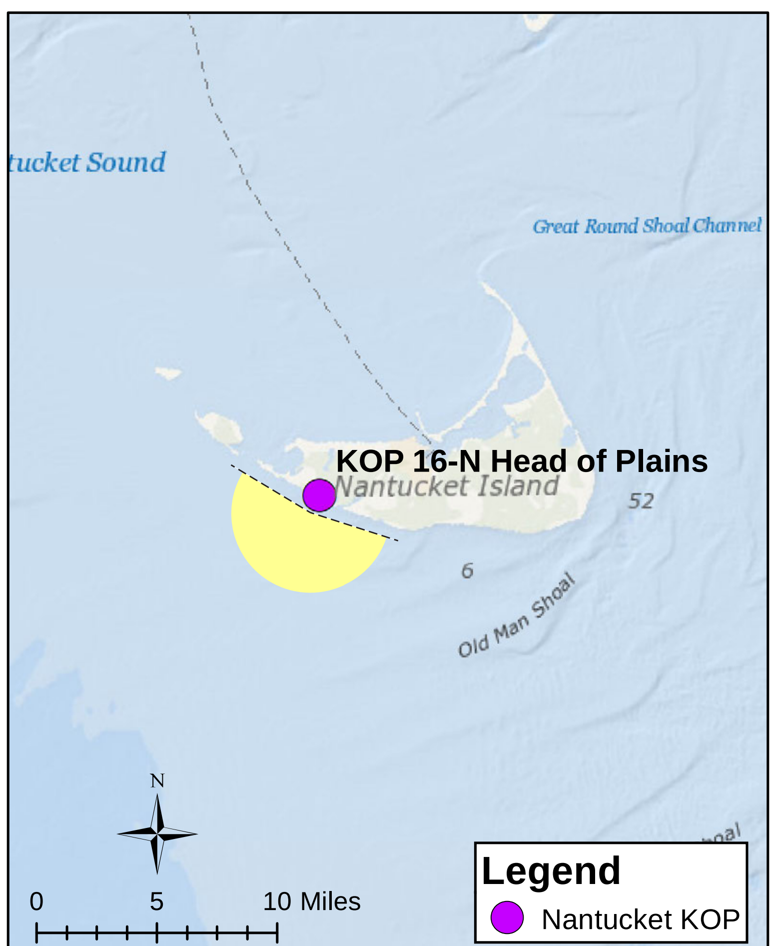


The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

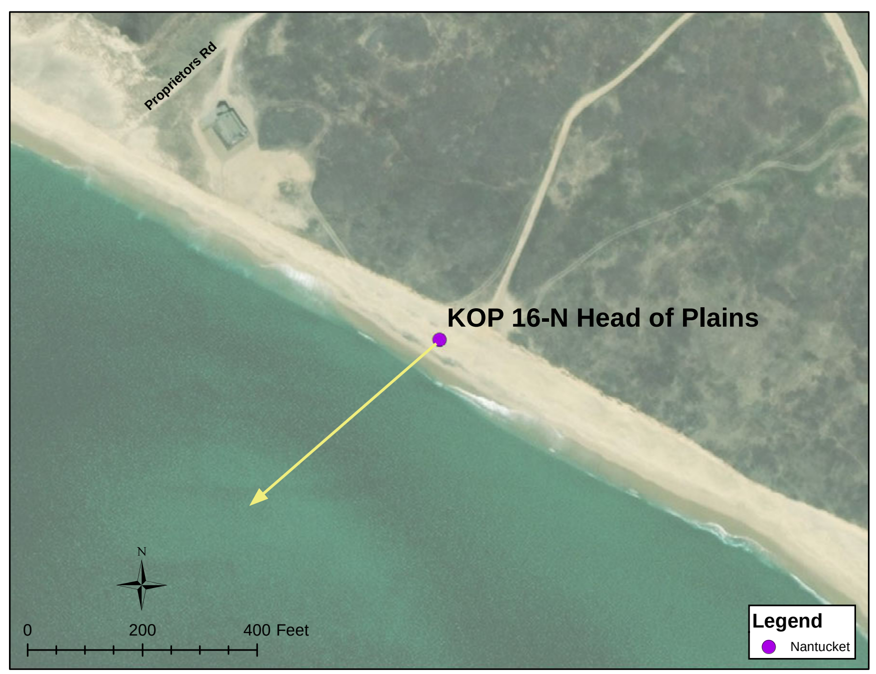
KOP 16-N Head of Plains - Scenario 3

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 25 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of WTGs Visible: 746
Potential Number of WTGs Not Visible: 317

PHOTOGRAPH AND SITE

Time of photograph: 3:54PM
Date of photograph: 10-7-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (229°)
Latitude: 41.341724°N
Longitude: 70.179524°W
Lighting Direction: Sidelit

ENVIRONMENT

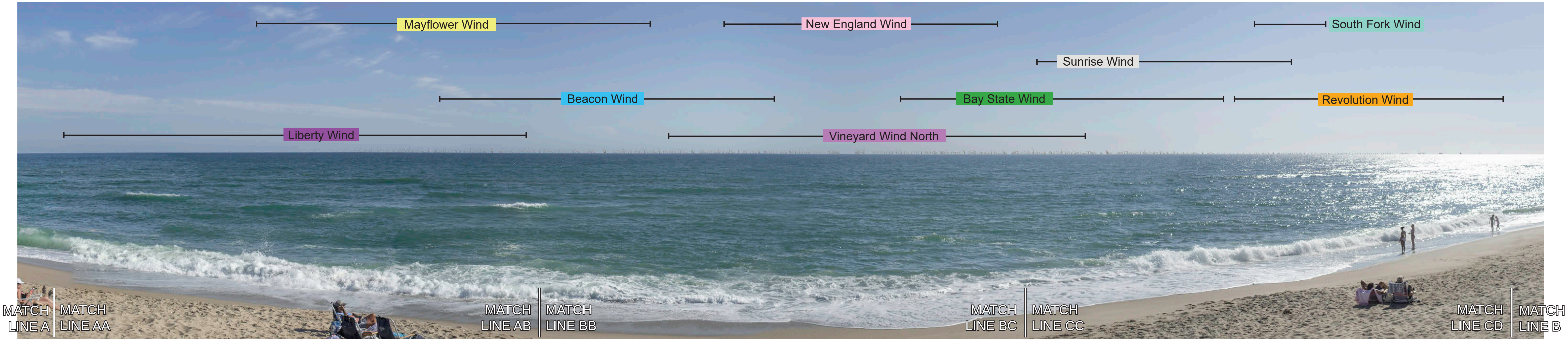
Temperature: 66° F
Humidity: 81%
Wind Dir & Speed: SW 21 mph
Weather Condition: Clear

CAMERA

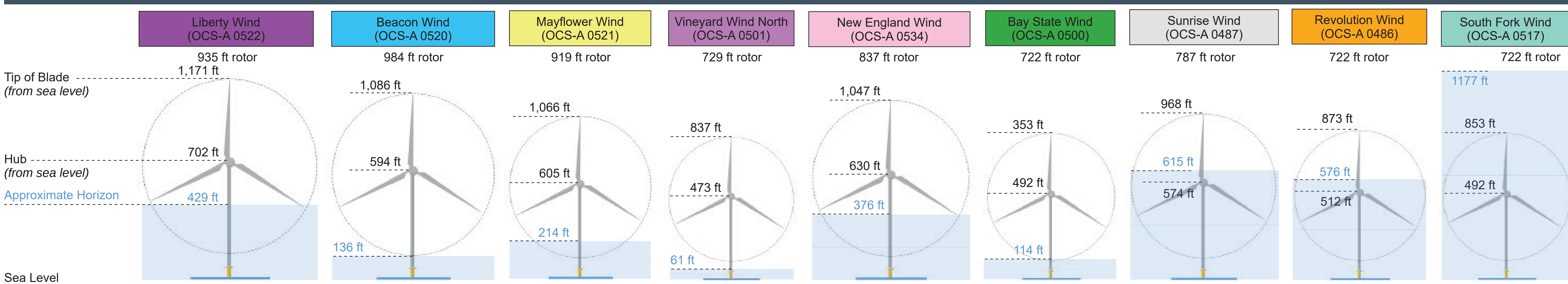
Camera Elevation: 20.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 16-N Head of Plains - Scenario 3

SIMULATED CONDITIONS



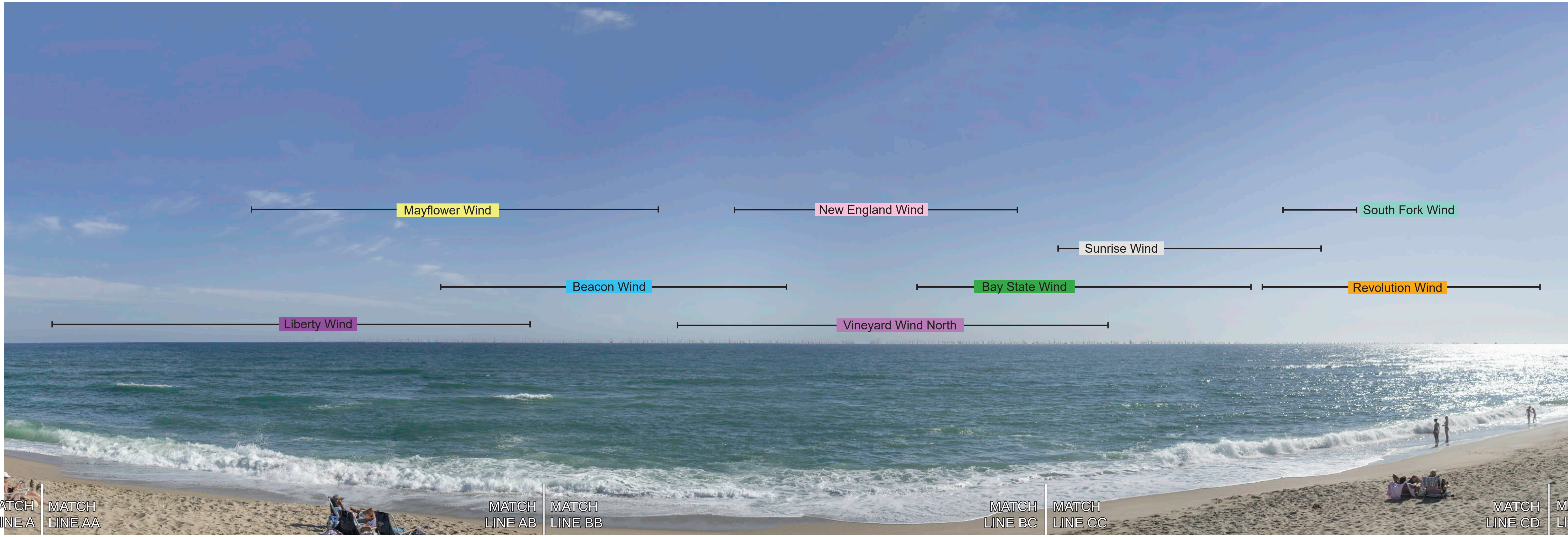
VISIBILTY OF CLOSEST TURBINES



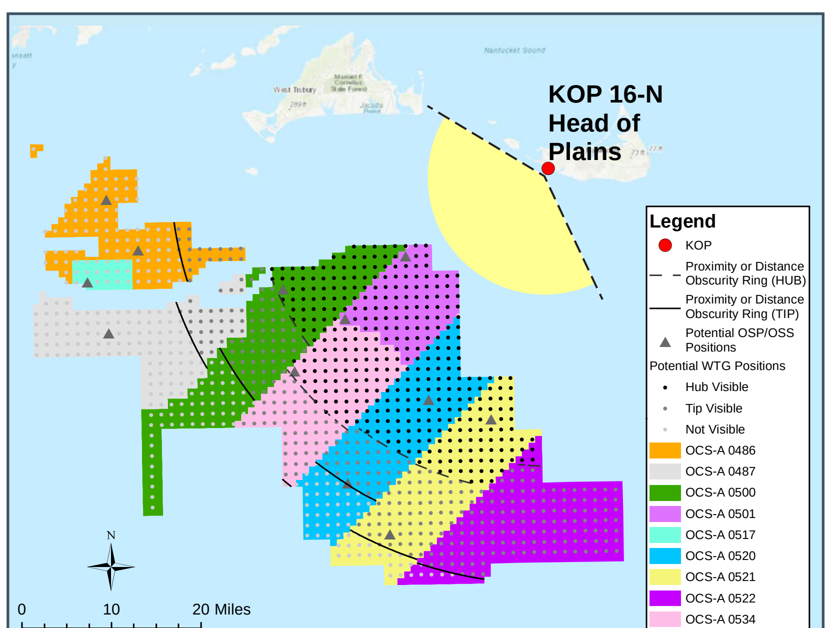
	Liberty Wind (OCS-A 0522)	Beacon Wind (OCS-A 0520)	Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Bay State Wind (OCS-A 0500)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2025-2030	2025-2030	2025	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	149	77	120	169	131	103	18
Number of Structures within View of KOP	132	120	132	77	119	118	29	19	0
Distance to Closest Structure	31 mi (51 km)	20 mi (32.81 km)	24 mi (38.67 km)	16 mi (25 km)	30 mi (48 km)	19 mi (31 km)	37 mi (59 km)	36 mi (57 km)	48 mi (77.45 km)
Distance to Furthest Structure	48 mi (77 km)	49 mi (79 km)	49 mi (79 km)	28 mi (46 km)	46 mi (74 km)	58 mi (94 km)	61 mi (98 km)	58 mi (93 km)	54 mi (87 km)

KOP 16-N Head of Plains - Scenario 3 (Human Field of View - 124°)

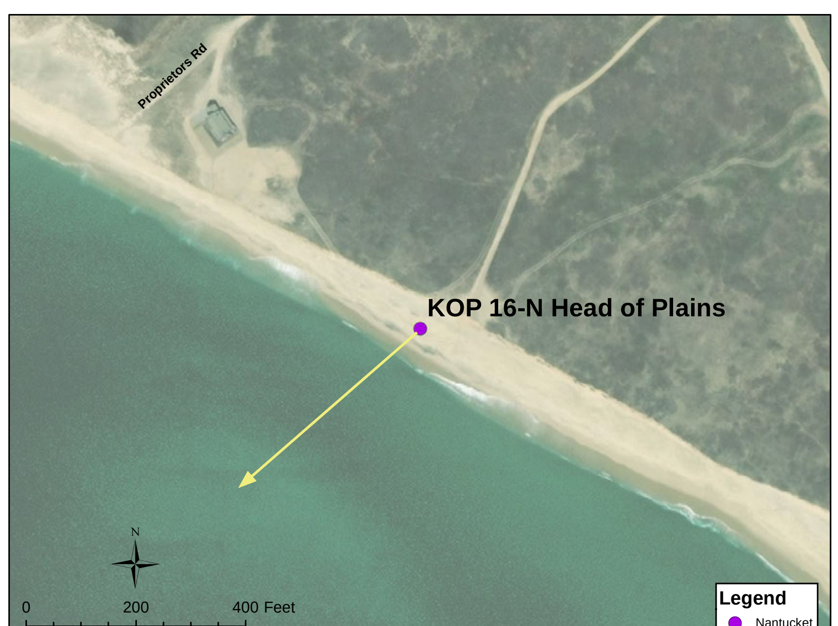
SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi /25 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of WTGs Visible: 746
Potential Number of WTGs Not Visible: 317

ENVIRONMENT

Temperature: 66° F
Humidity: 81%
Wind Dir & Speed: SW 21 mph
Weather Condition: Clear

PHOTOGRAPH AND SITE

Time of photograph: 3:54PM
Date of photograph: 10-7-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (229°)
Latitude: 41.341724°N
Longitude: 70.179524°W
Lighting Direction: Sidelit

CAMERA

Camera Elevation: 20.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 16-N Head of Plains - Scenario 3 (50mm view - 27° vertical / 40° horizontal) 1 of 3

SIMULATED CONDITIONS

MATCH LINE A

MATCH LINE BB

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

SIMULATED CONDITIONS

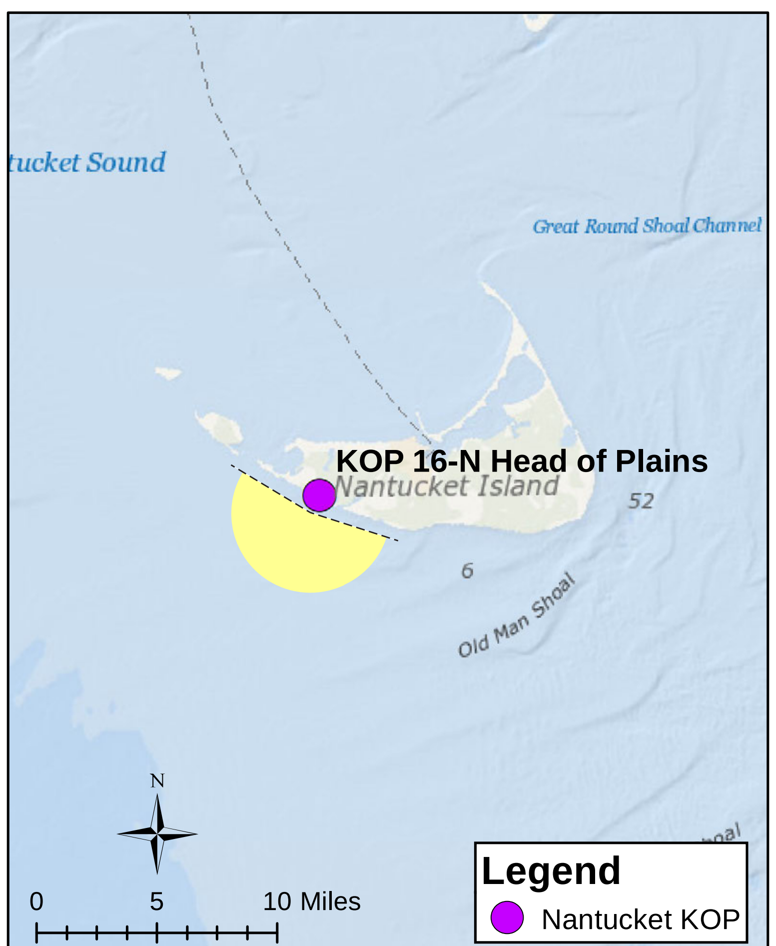
MATCH LINE BC | MATCH LINE CC | MATCH LINE CD | MATCH LINE B

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

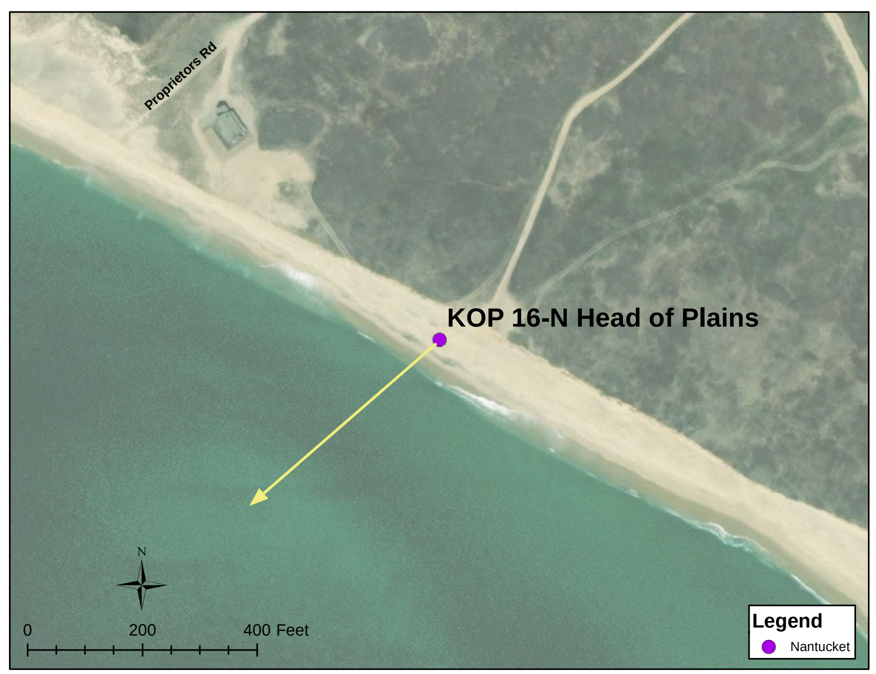
KOP 16-N Head of Plains - Scenario 4

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 25 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of WTGs Visible: 614
Potential Number of WTGs Not Visible: 300

PHOTOGRAPH AND SITE

Time of photograph: 3:54PM
Date of photograph: 10-7-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (229°)
Latitude: 41.341724°N
Longitude: 70.179524°W
Lighting Direction: Sidelit

ENVIRONMENT

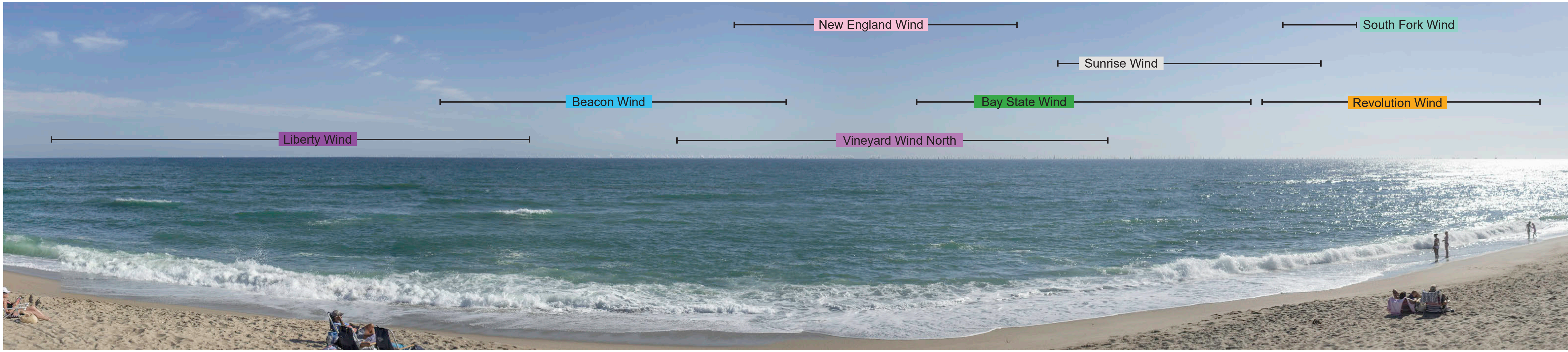
Temperature: 66° F
Humidity: 81%
Wind Dir & Speed: SW 21 mph
Weather Condition: Clear

CAMERA

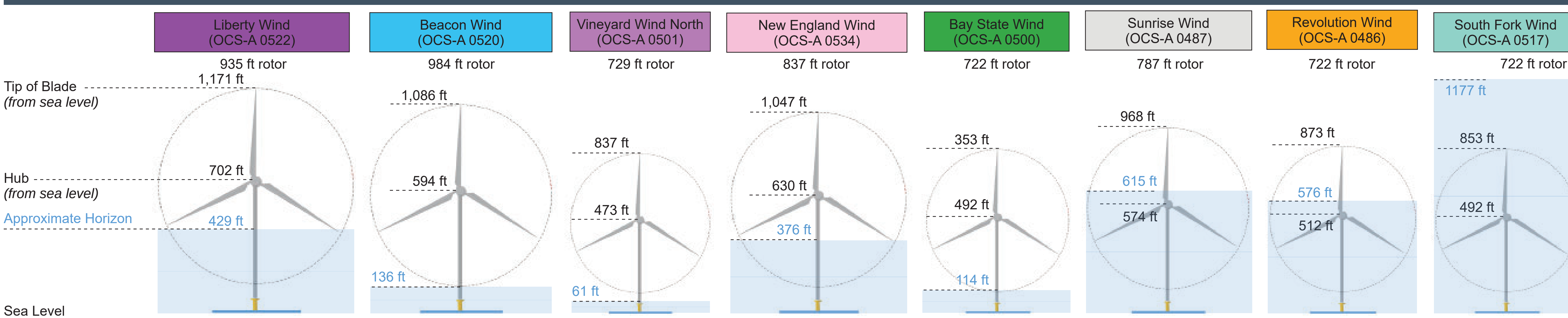
Camera Elevation: 20.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 16-N Head of Plains - Scenario 4

SIMULATED CONDITIONS



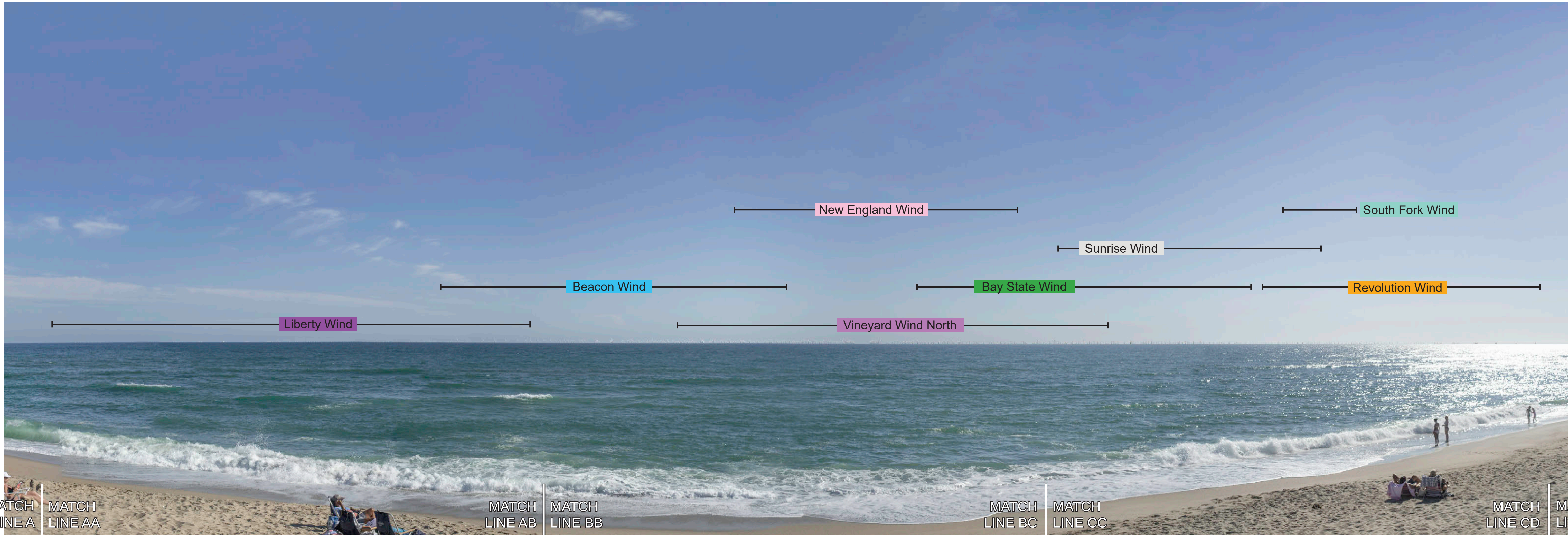
VISIBILTY OF CLOSEST TURBINES



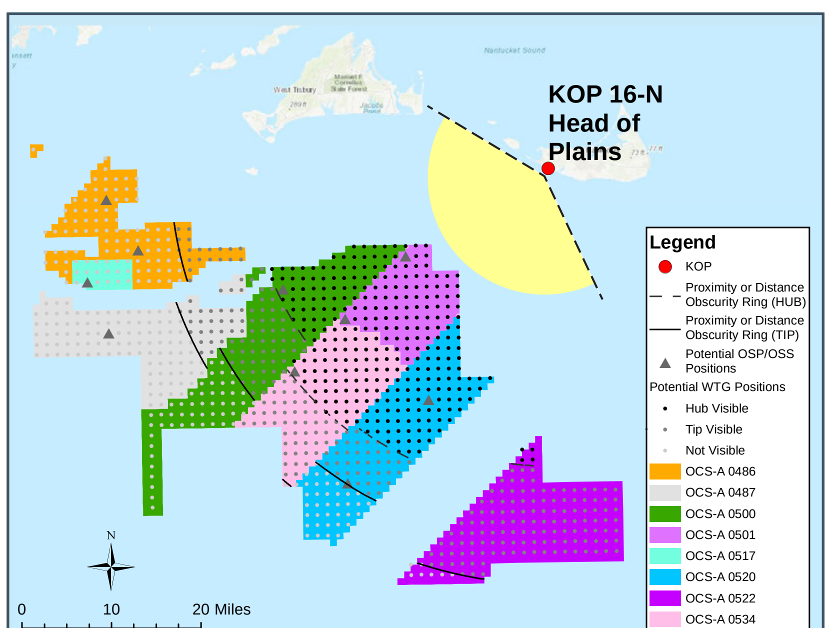
	Liberty Wind	Beacon Wind	Vineyard Wind North	New England Wind	Bay State Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025-2030	2025-2030	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	77	120	169	131	103	18
Number of Structures within View of KOP	132	120	77	119	118	29	19	0
Distance to Closest Structure	31 mi (51 km)	20 mi (32.81 km)	16 mi (25 km)	30 mi (48 km)	19 mi (31 km)	37 mi (59 km)	36 mi (57 km)	48 mi (77.45 km)
Distance to Furthest Structure	48 mi (77 km)	49 mi (79 km)	28 mi (46 km)	46 mi (74 km)	58 mi (94 km)	61 mi (98 km)	58 mi (93 km)	54 mi (87 km)

KOP 16-N Head of Plains - Scenario 4 (Human Field of View - 124°)

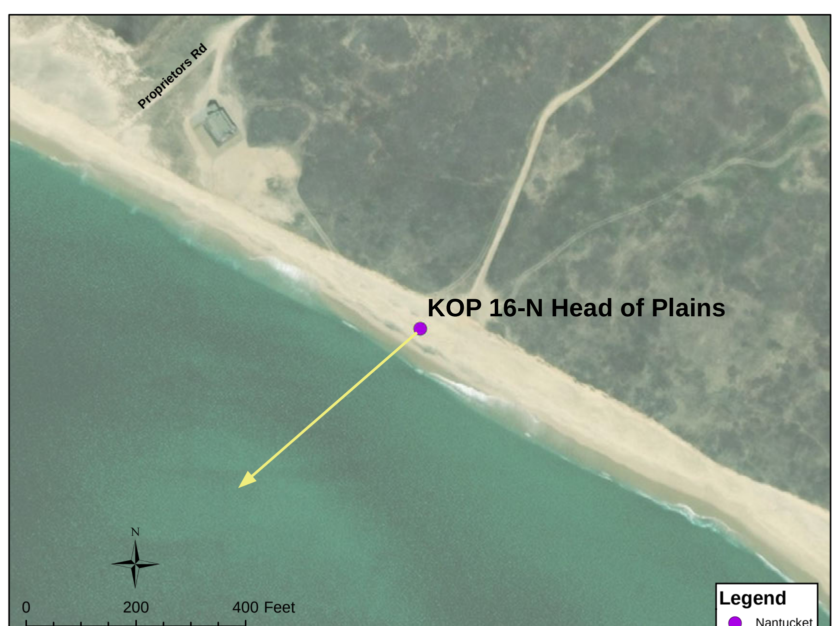
SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 16 mi / 25 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of WTGs Visible: 614
Potential Number of WTGs Not Visible: 300

ENVIRONMENT

Temperature: 66° F
Humidity: 81%
Wind Dir & Speed: SW 21 mph
Weather Condition: Clear

PHOTOGRAPH AND SITE

Time of photograph: 3:54PM
Date of photograph: 10-7-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (229°)
Latitude: 41.341724°N
Longitude: 70.179524°W
Lighting Direction: Sidelit

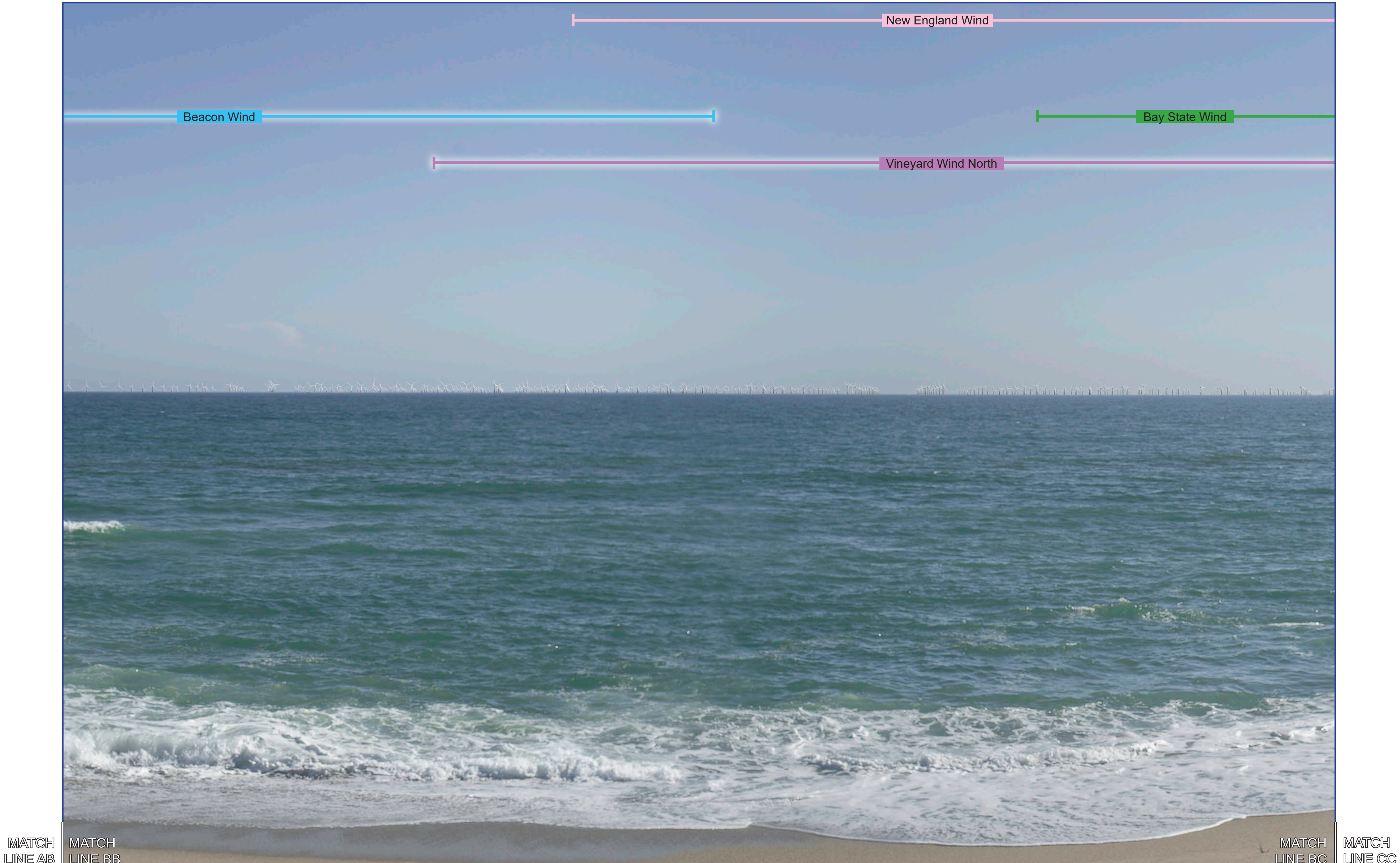
CAMERA

Camera Elevation: 20.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

SIMULATED CONDITIONS

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

SIMULATED CONDITIONS



The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

MATCH LINE BC

MATCH LINE CC

MATCH LINE CD

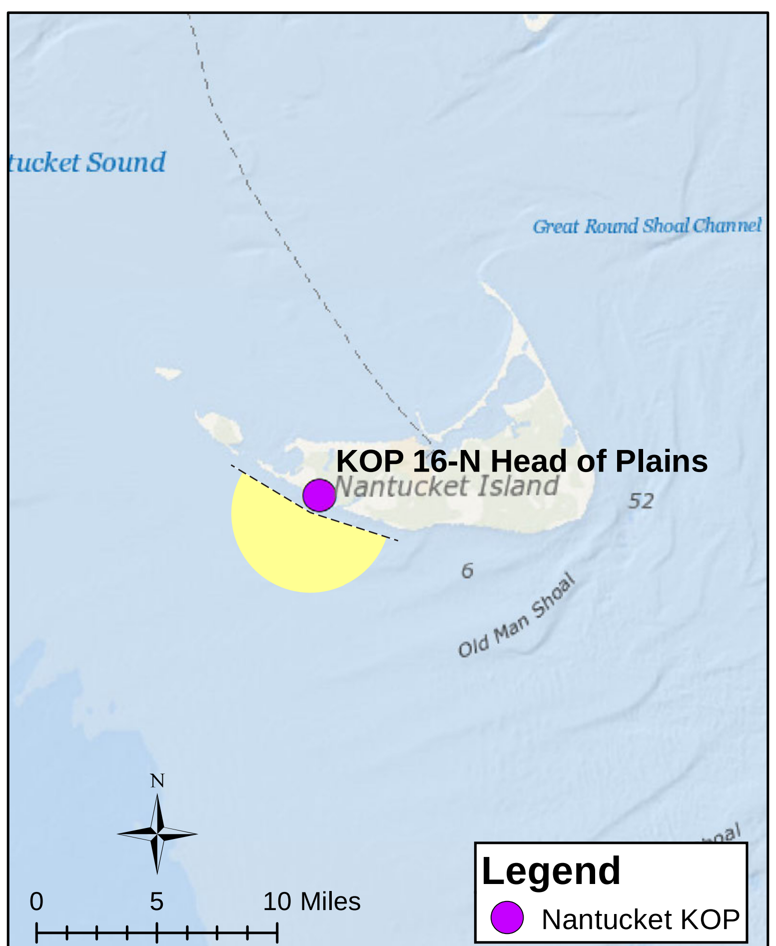
MATCH LINE B

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

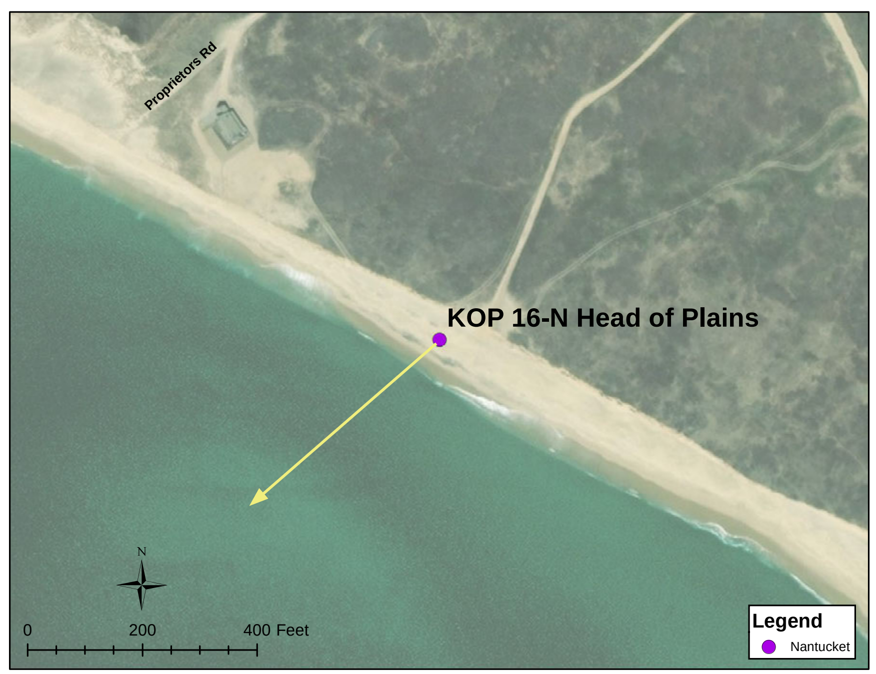
KOP 16-N Head of Plains - Scenario 5

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 24 mi / 38 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of WTGs Visible: 132
Potential Number of WTGs Not Visible: 17

PHOTOGRAPH AND SITE

Time of photograph: 3:54 PM
Date of photograph: 10-7-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (229°)
Latitude: 41.341724°N
Longitude: 70.179524°W
Lighting Direction: Sidelit

ENVIRONMENT

Temperature: 66° F
Humidity: 81%
Wind Dir & Speed: SW 21 mph
Weather Condition: Clear

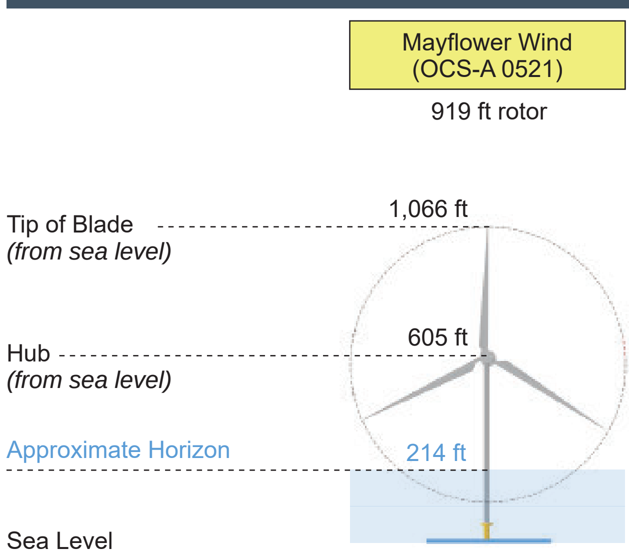
CAMERA

Camera Elevation: 20.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 16-N Head of Plains - Scenario 5

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

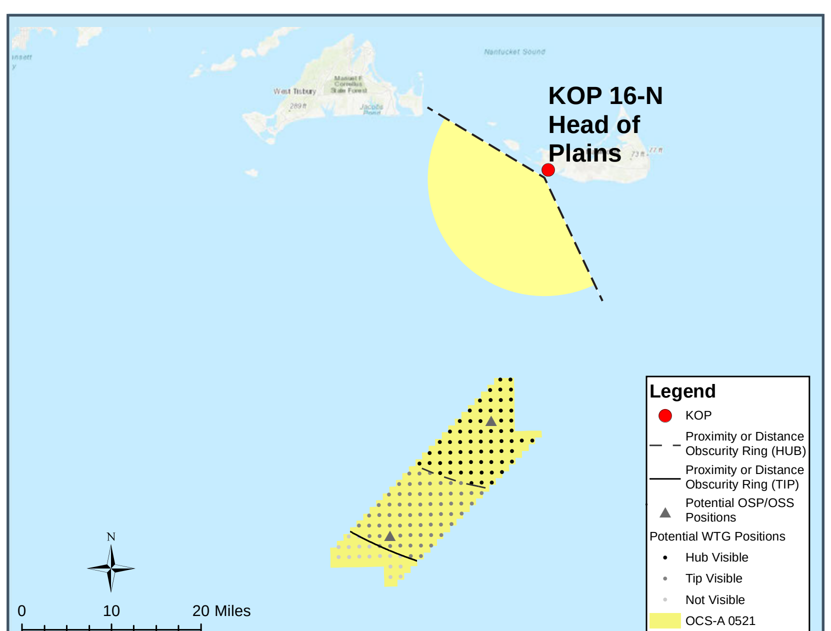


	Mayflower Wind (OCS-A 0521)
Year Forecasted for Development	2025
Number of Structures in Lease Area	149
Number of Structures within View of KOP	132
Distance to Closest Structure	24 mi (38.67 km)
Distance to Furthest Structure	49 mi (79 km)

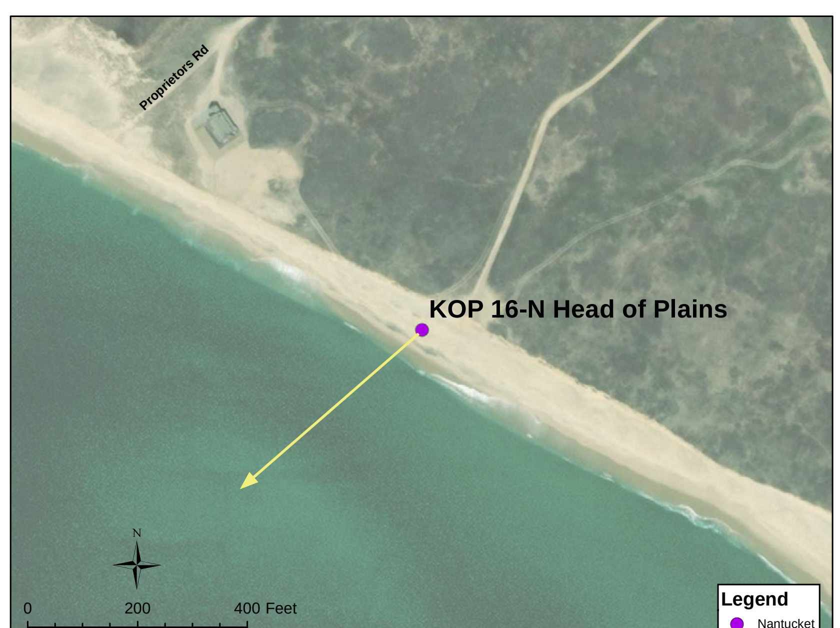
KOP 16-N Head of Plains - Scenario 5 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 24 mi / 39 km
Furthest Visible WTG: 49 mi / 79 km
Potential Number of WTGs Visible: 132
Potential Number of WTGs Not Visible: 17

ENVIRONMENT

Temperature: 66° F
Humidity: 81%
Wind Dir & Speed: SW 21 mph
Weather Condition: Clear

PHOTOGRAPH AND SITE

Time of photograph: 3:54PM
Date of photograph: 10-7-20
L/SCA: Ocean Beach, Open Ocean, Dunes
Viewing direction: South (229°)
Latitude: 41.341724°N
Longitude: 70.179524°W
Lighting Direction: Sidelit

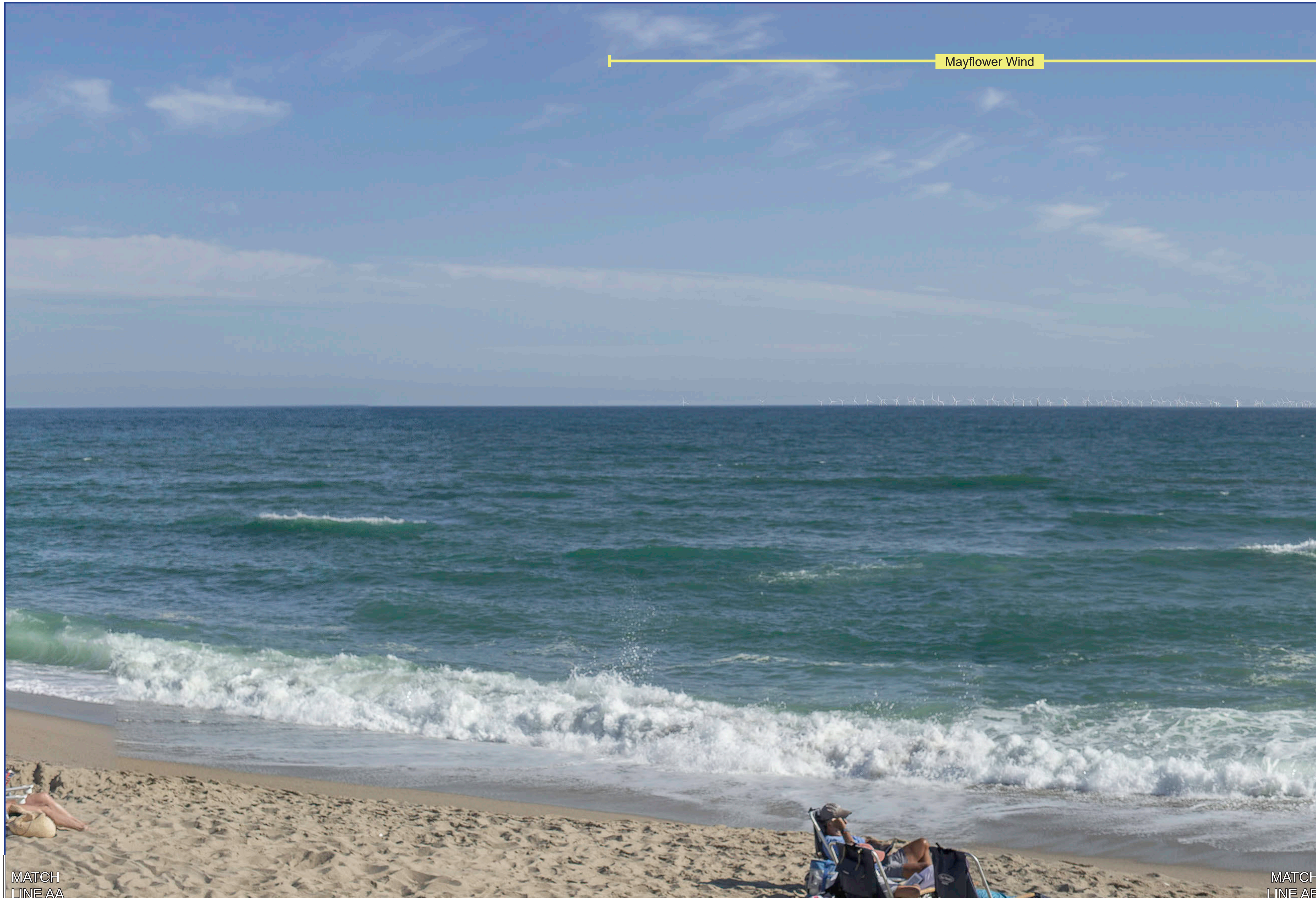
CAMERA

Camera Elevation: 20.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 16-N Head of Plains - Scenario 5 (50mm view - 27° vertical / 40° horizontal) 1 of 3

SIMULATED CONDITIONS

MATCH
LINE A



MATCH
LINE BB

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

KOP 16-N Head of Plains - Scenario 5 (50mm view - 27° vertical / 40° horizontal) 3 of 3

SIMULATED CONDITIONS

MATCH LINE BC

MATCH LINE B

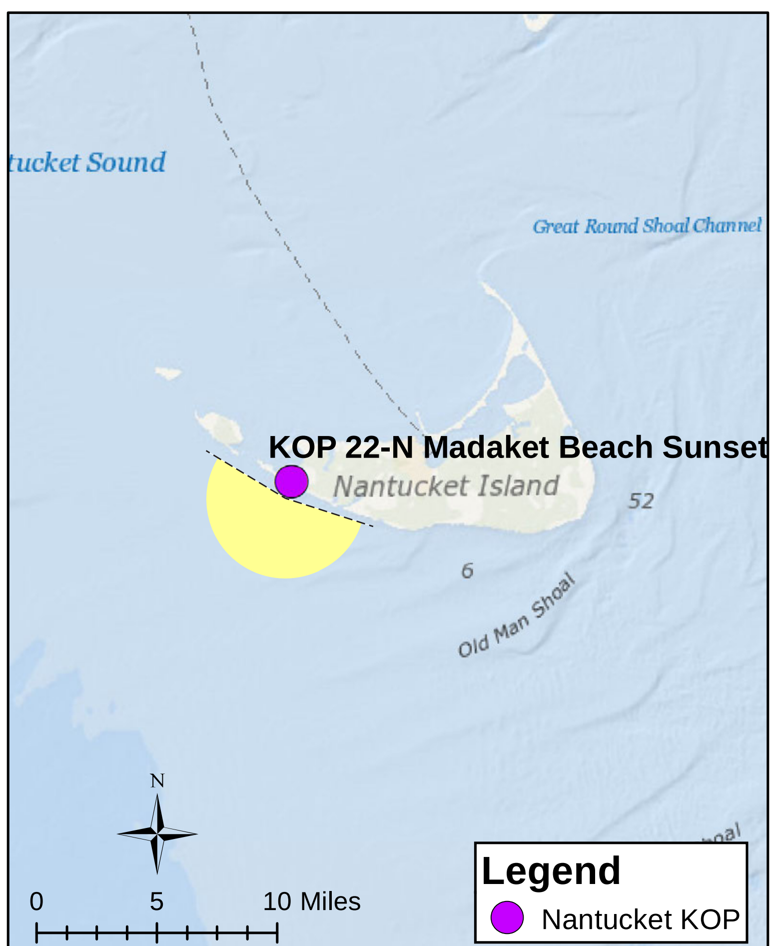
The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 22-N Madaket Beach at Sunset - Scenario 1

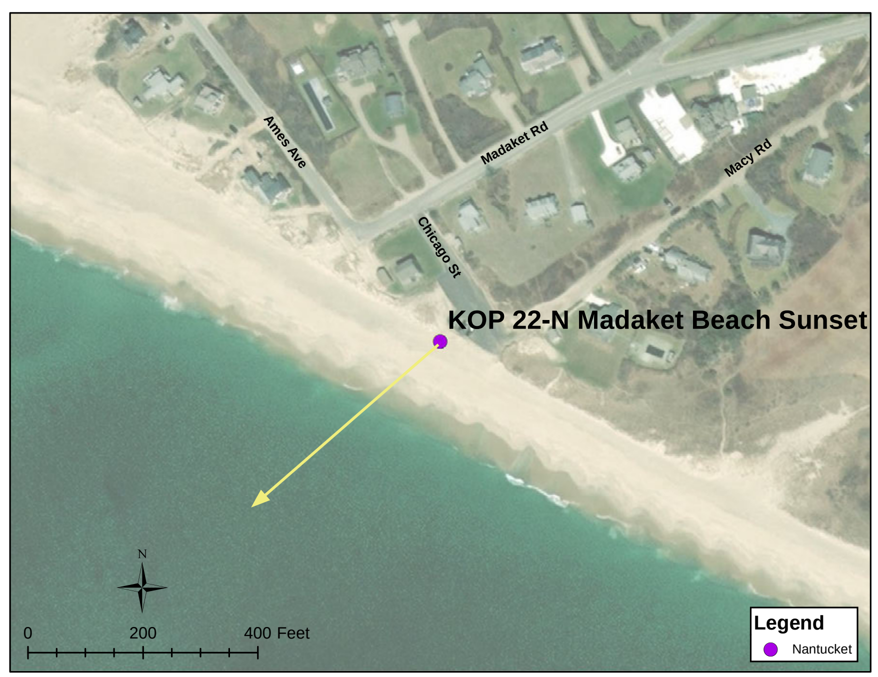
Nantucket

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 25 km
Furthest Visible WTG: 45 mi / 72 km
Potential Number of Structures Visible: 249
Potential Number of Structures Not Visible: 200

ENVIRONMENT

Temperature: 74° F
Humidity: 79%
Wind Dir & Speed: WNW 3 mph
Weather Condition: Clear

PHOTOGRAPH AND SITE

Time of photograph: 6:11PM
Date of photograph: 7-29-20
L/SCA: Ocean beach
Viewing direction: South (228°)
Latitude: 41.270282°N
Longitude: 70.201719°W
Lighting Direction: Backlit diffused

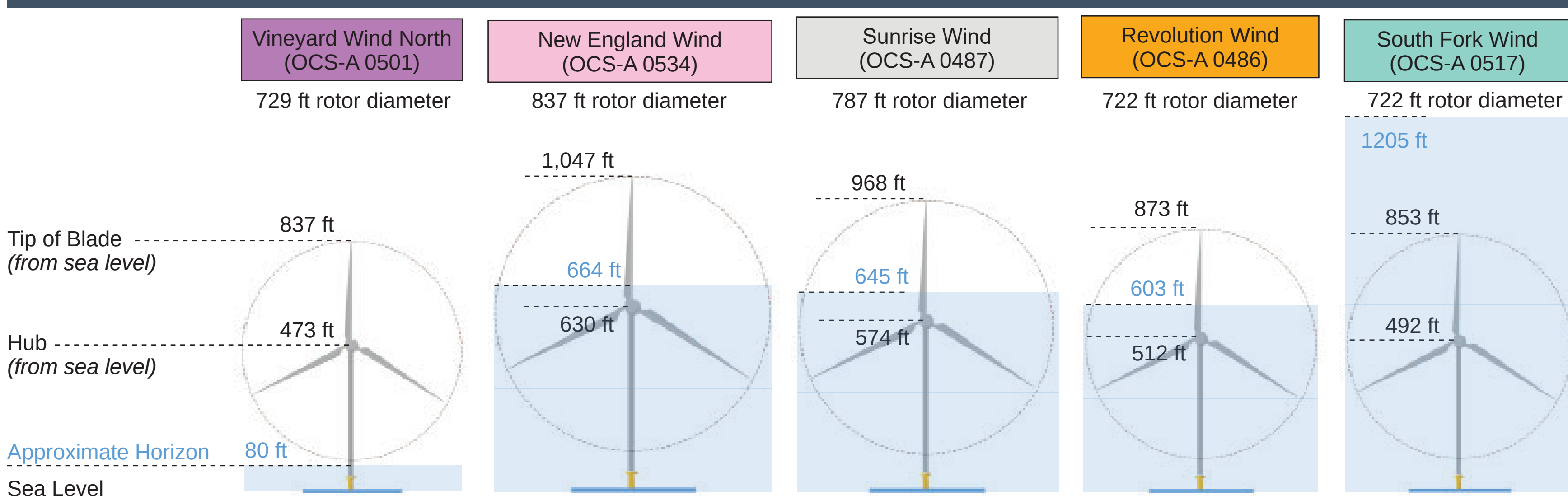
CAMERA

Camera Elevation: 13.5 ft / 4.1 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 22-N Madaket Beach at Sunset - Scenario 1

SIMULATED CONDITIONS

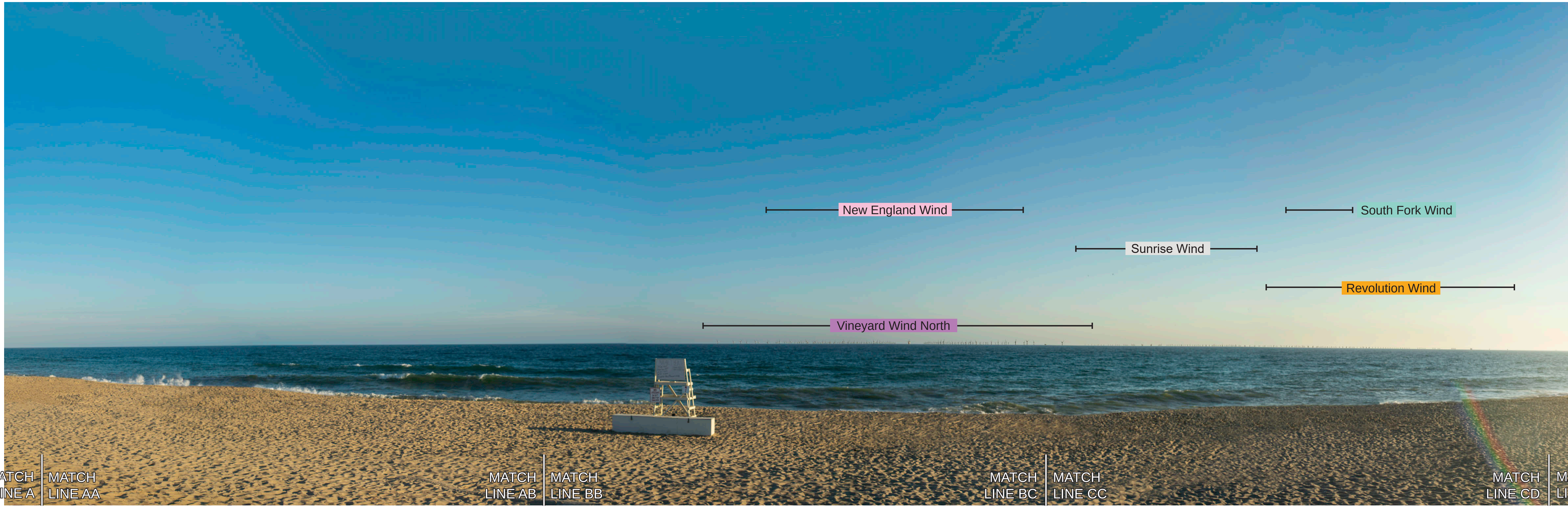
VISIBILTY OF CLOSEST TURBINES



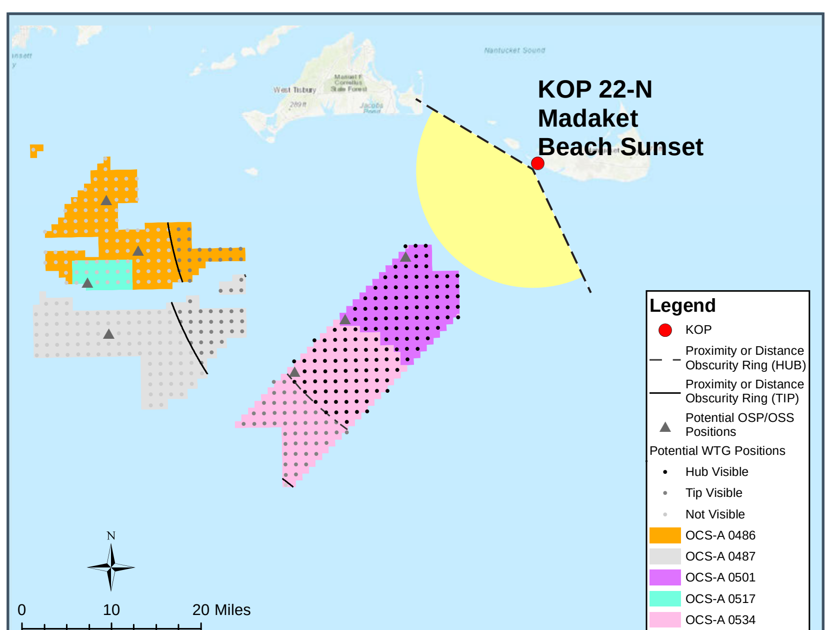
	Vineyard Wind North	New England Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	77	120	131	103	18
Number of Structures within View of KOP	77	119	32	21	0
Distance to Closest Structure	15 mi (25 km)	36 mi (58 km)	36 mi (57 km)	35 mi (56 km)	47 mi (76 km)
Distance to Furthest Structure	28 mi (45 km)	45 mi (72 km)	43.73 mi (70 km)	42 mi (67 km)	53 mi (85 km)

KOP 22-N Madaket Beach at Sunset - Scenario 1 (Human Field of View - 124°)

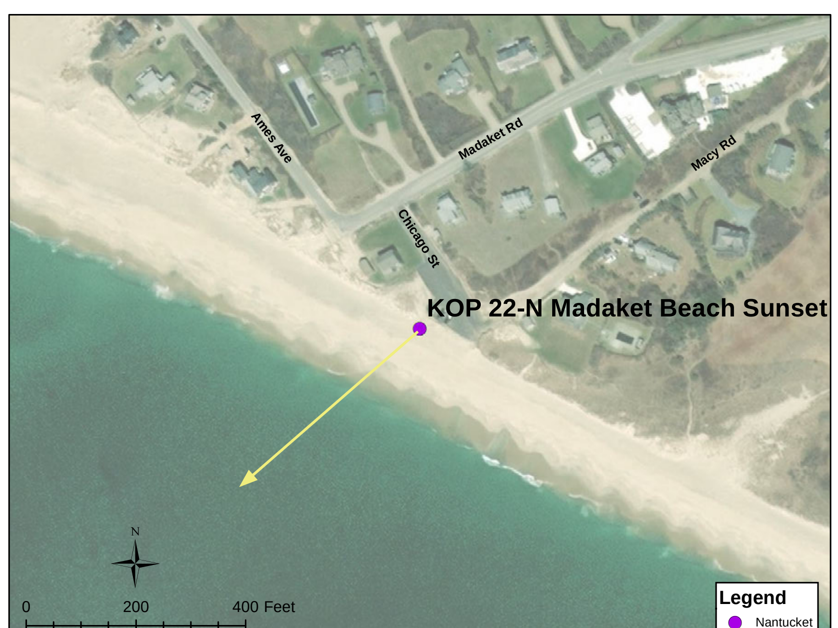
SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 25 km
Furthest Visible WTG: 45 mi / 72 km
Potential Number of Structures Visible: 249
Potential Number of Structures Not Visible: 200

PHOTOGRAPH AND SITE

Time of photograph: 6:11PM
Date of photograph: 7-29-20
L/SCA: Ocean beach
Viewing direction: South (228°)
Latitude: 41.270282°N
Longitude: 70.201719°W
Lighting Direction: Backlit diffused

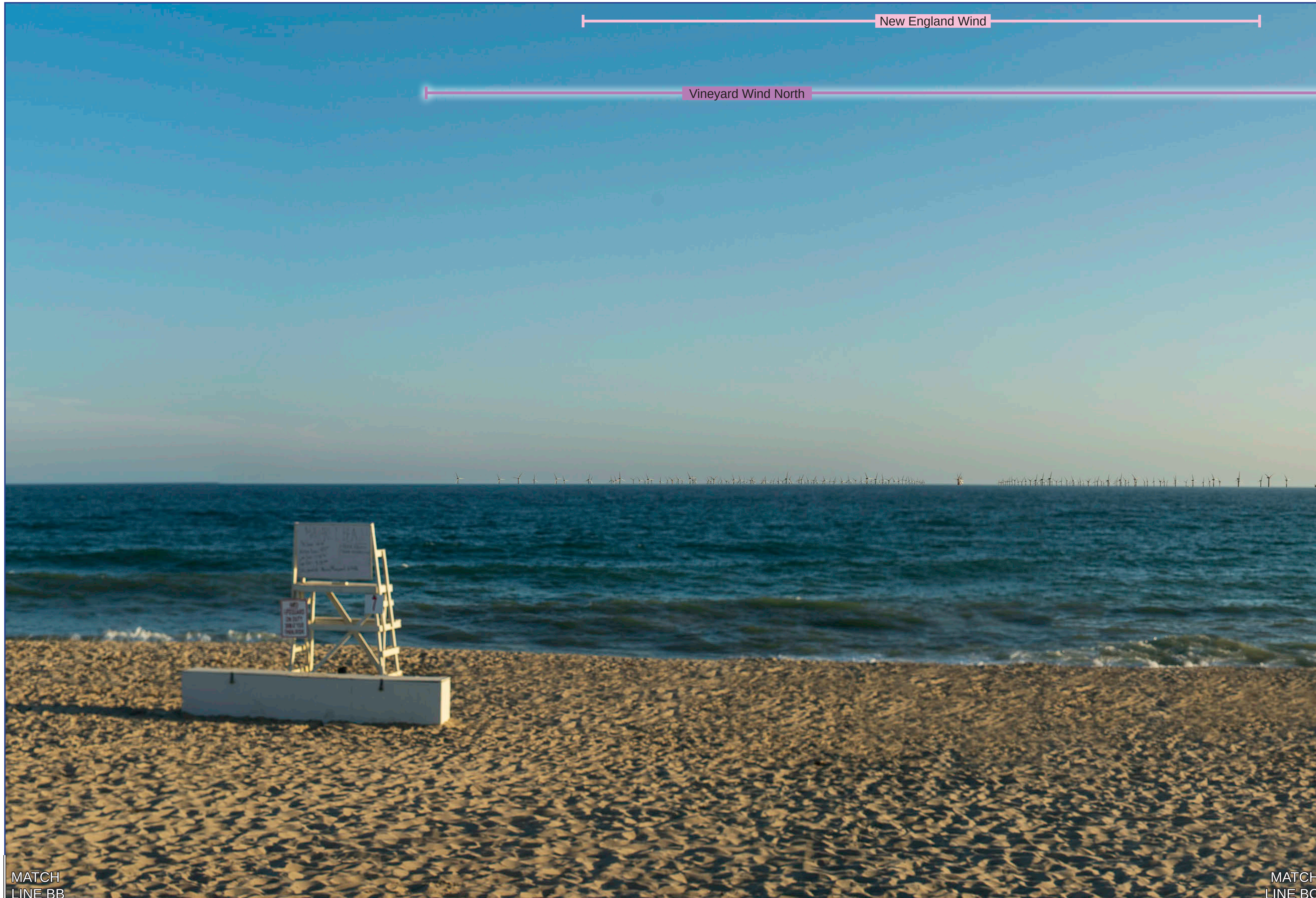
ENVIRONMENT

Temperature: 74° F
Humidity: 79%
Wind Dir & Speed: WNW 3 mph
Weather Condition: Clear

CAMERA

Camera Elevation: 13.5 ft / 4.1 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .



The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

MATCH LINE BC

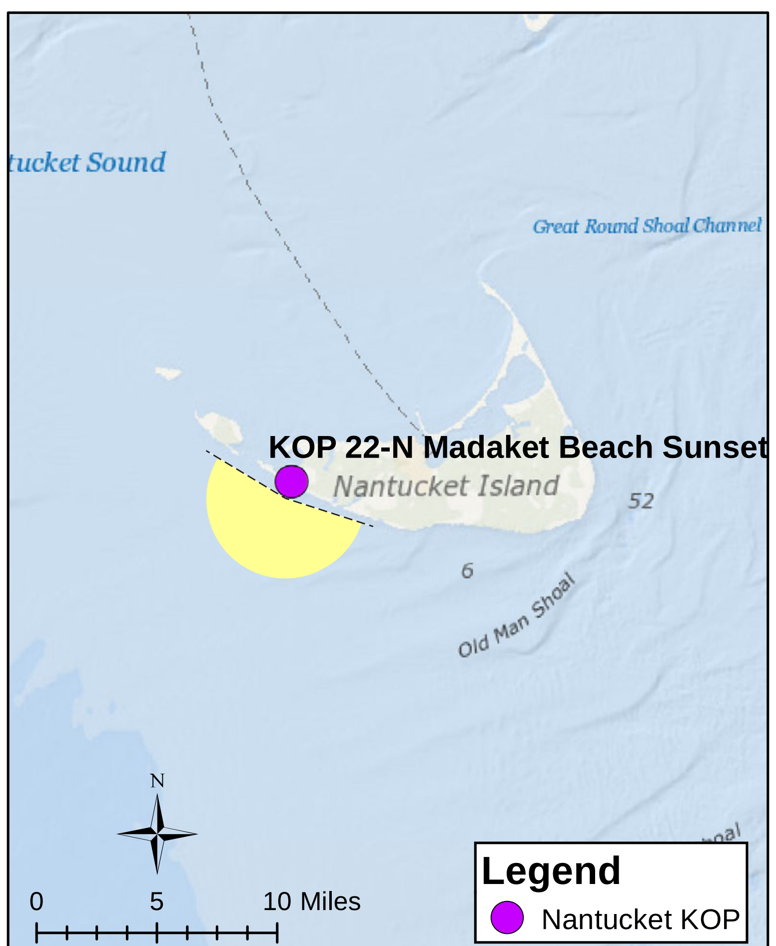
MATCH LINE B

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

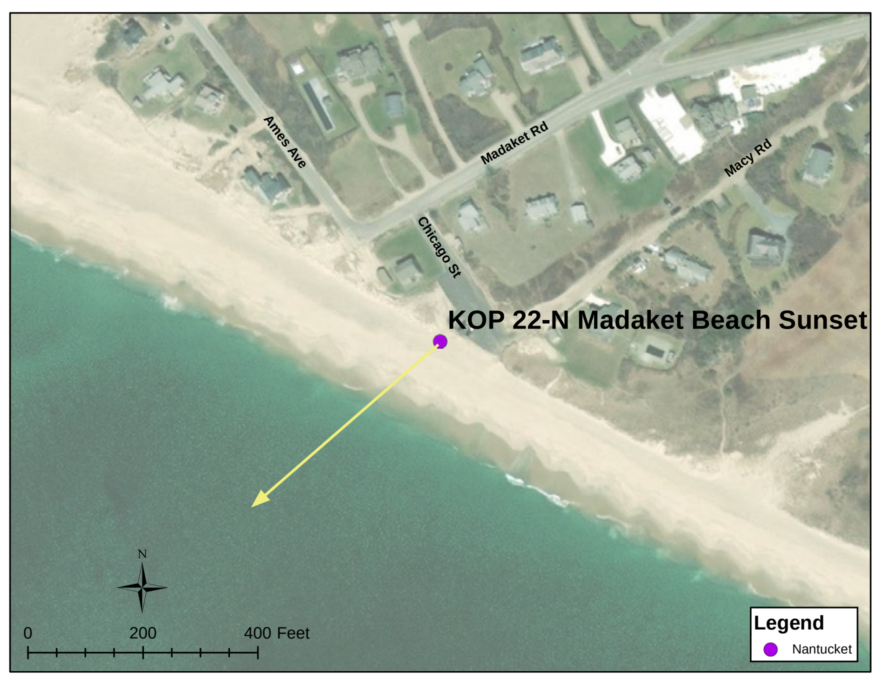
KOP 22-N Madaket Beach at Sunset - Scenario 2

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 25 km
Furthest Visible WTG: 46 mi / 73 km
Potential Number of Structures Visible: 378
Potential Number of Structures Not Visible: 220

PHOTOGRAPH AND SITE

Time of photograph: 6:11 PM
Date of photograph: 7-29-20
L/SCA: Ocean beach
Viewing direction: South (228°)
Latitude: 41.270282°N
Longitude: 70.201719°W
Lighting Direction: Backlit diffused

ENVIRONMENT

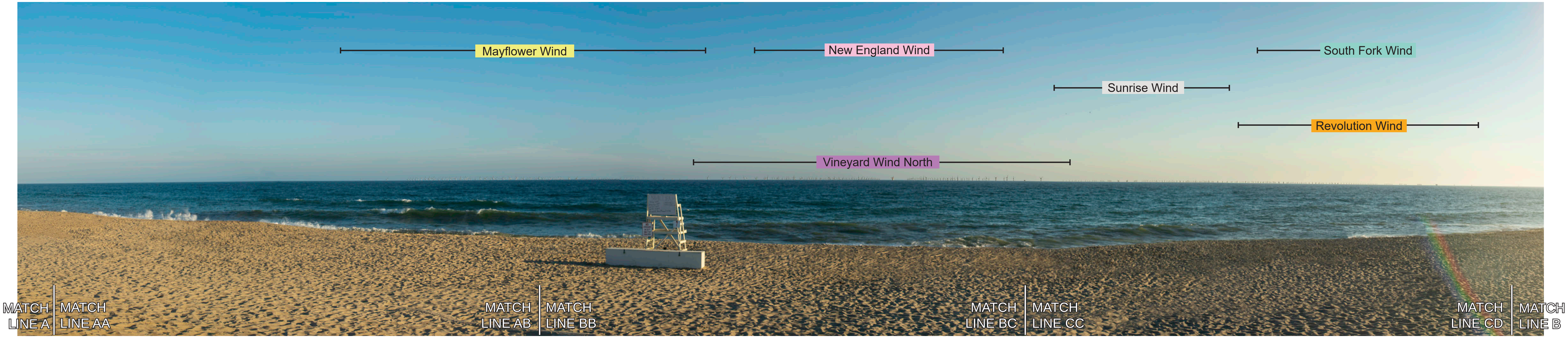
Temperature: 74° F
Humidity: 79%
Wind Dir & Speed: WNW 3 mph
Weather Condition: Clear

CAMERA

Camera Elevation: 13.5 ft / 4.1 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

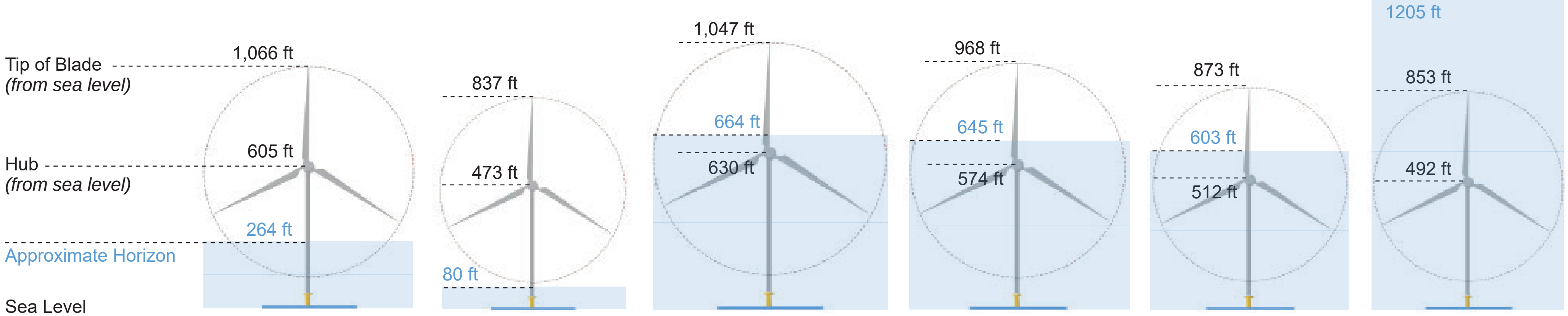
KOP 22-N Madaket Beach at Sunset - Scenario 2

SIMULATED CONDITIONS



VISIBILTY OF CLOSEST TURBINES

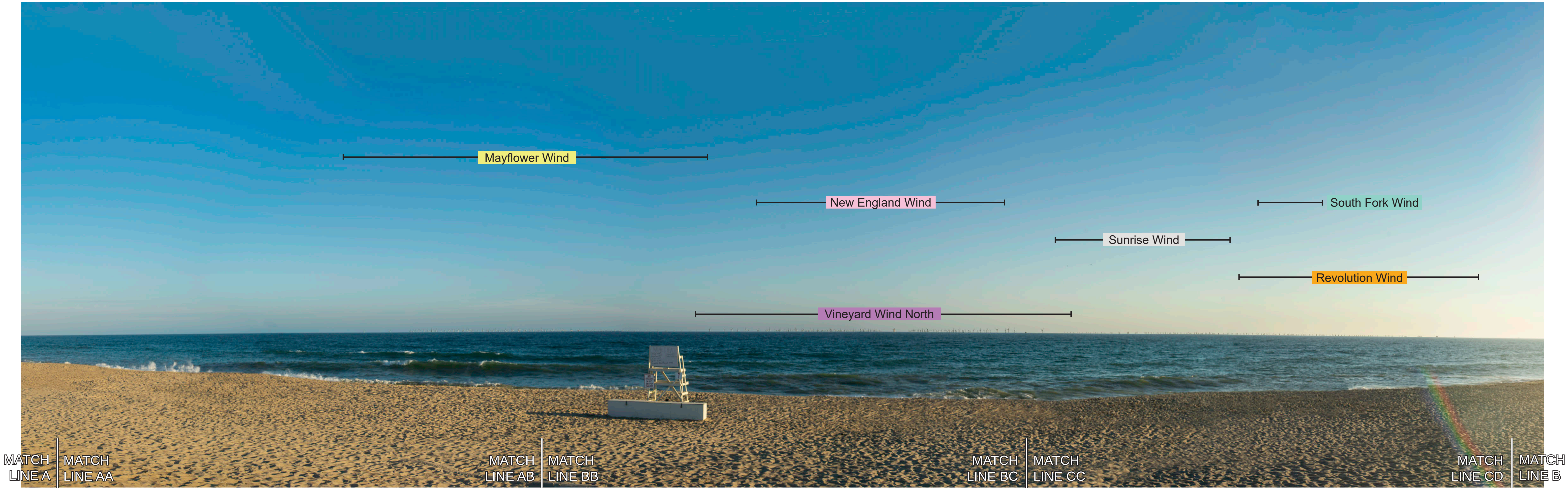
Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
919 ft rotor diameter	729 ft rotor diameter	837 ft rotor diameter	787 ft rotor diameter	722 ft rotor diameter	722 ft rotor diameter



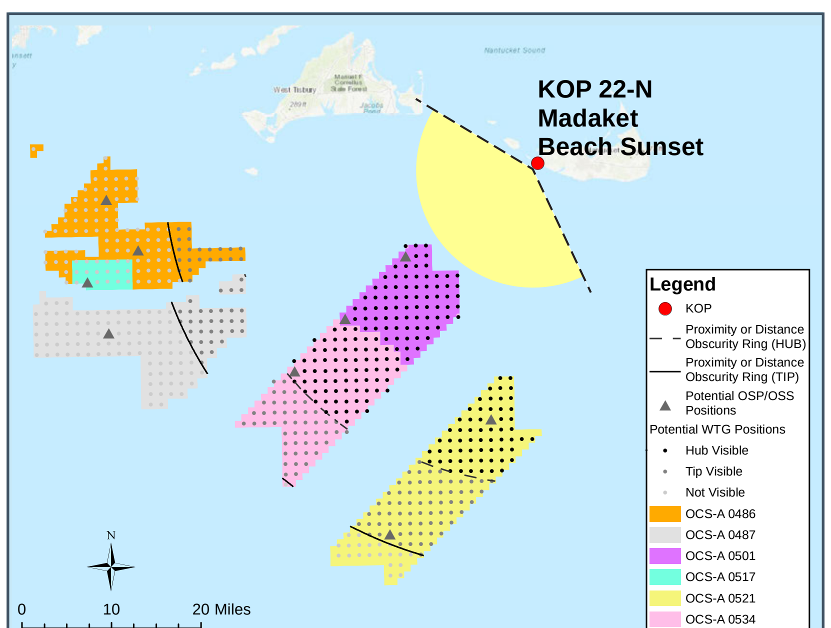
	Mayflower Wind	Vineyard Wind North	New England Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	149	77	120	131	103	18
Number of Structures within View of KOP	129	77	119	32	21	0
Distance to Closest Structure	24 mi (39 km)	15 mi (25 km)	36 mi (58 km)	36 mi (57 km)	35 mi (56 km)	47 mi (76 km)
Distance to Furthest Structure	46 mi (73 km)	28 mi (45 km)	45 mi (72 km)	43.73 mi (70 km)	42 mi (67 km)	53 mi (85 km)

KOP 22-N Madaket Beach at Sunset - Scenario 2 (Human Field of View - 124°)

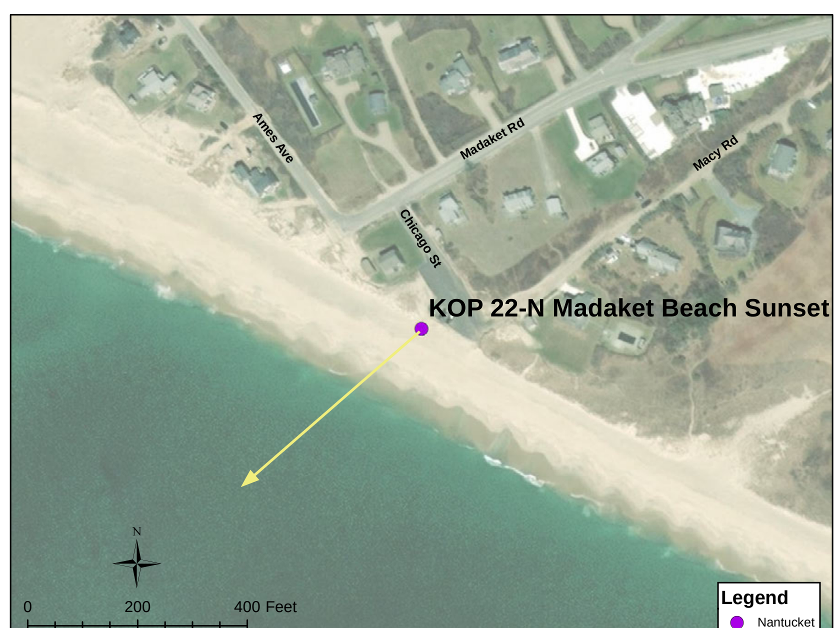
SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 25 km

Furthest Visible WTG: 46 mi / 73 km
Potential Number of Structures Visible: 378
Potential Number of Structures Not Visible: 220

ENVIRONMENT

Temperature: 74° F
Humidity: 79%
Wind Dir & Speed: WNW 3 mph
Weather Condition: Clear

PHOTOGRAPH AND SITE

Time of photograph: 6:11PM
Date of photograph: 7-29-20
L/SCA: Ocean beach

Viewing direction: South (228°)
Latitude: 41.270282°N
Longitude: 70.201719°W
Lighting Direction: Backlit diffused

CAMERA

Camera Elevation: 13.5 ft / 4.1 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

SIMULATED CONDITIONS

MATCH LINE BC

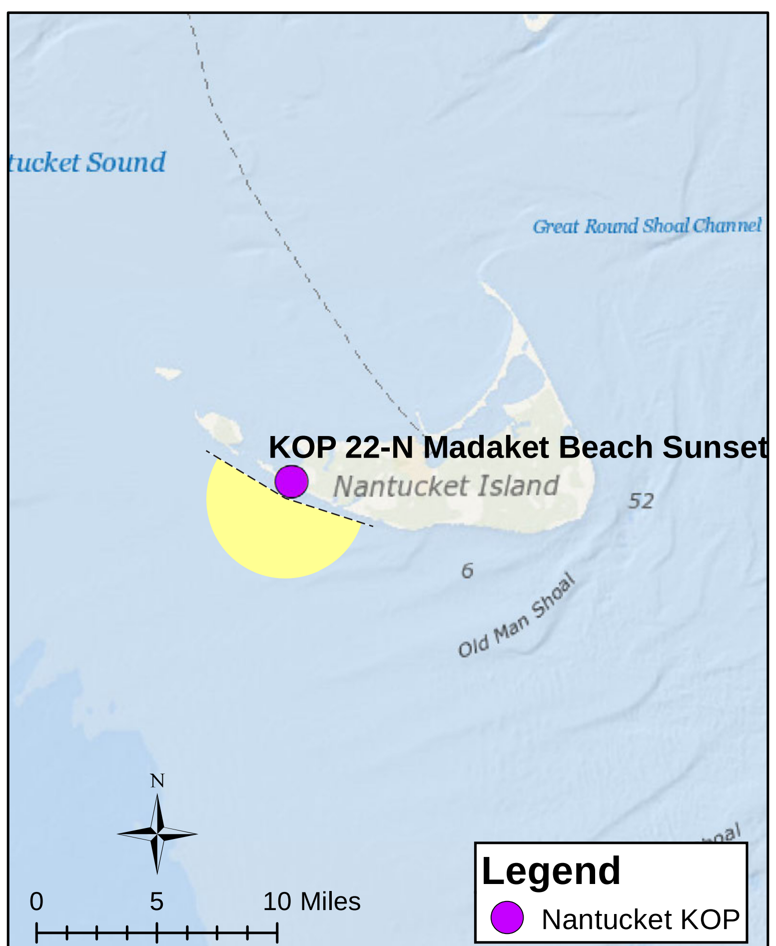
MATCH LINE B

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

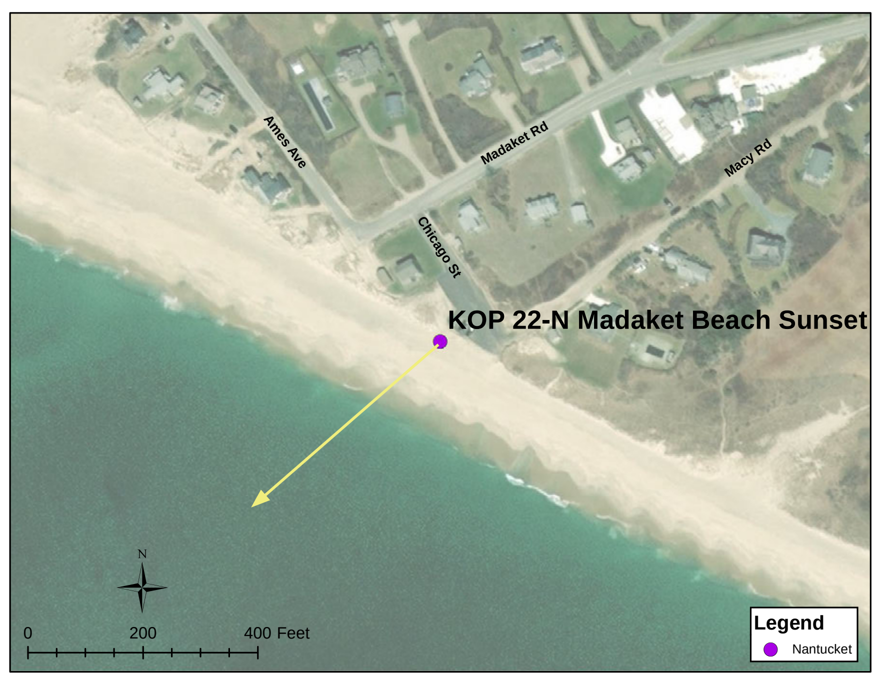
KOP 22-N Madaket Beach at Sunset - Scenario 3

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 25 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 743
Potential Number of Structures Not Visible: 320

PHOTOGRAPH AND SITE

Time of photograph: 6:11 PM
Date of photograph: 7-29-20
L/SCA: Ocean beach
Viewing direction: South (228°)
Latitude: 41.270282°N
Longitude: 70.201719°W
Lighting Direction: Backlit diffused

ENVIRONMENT

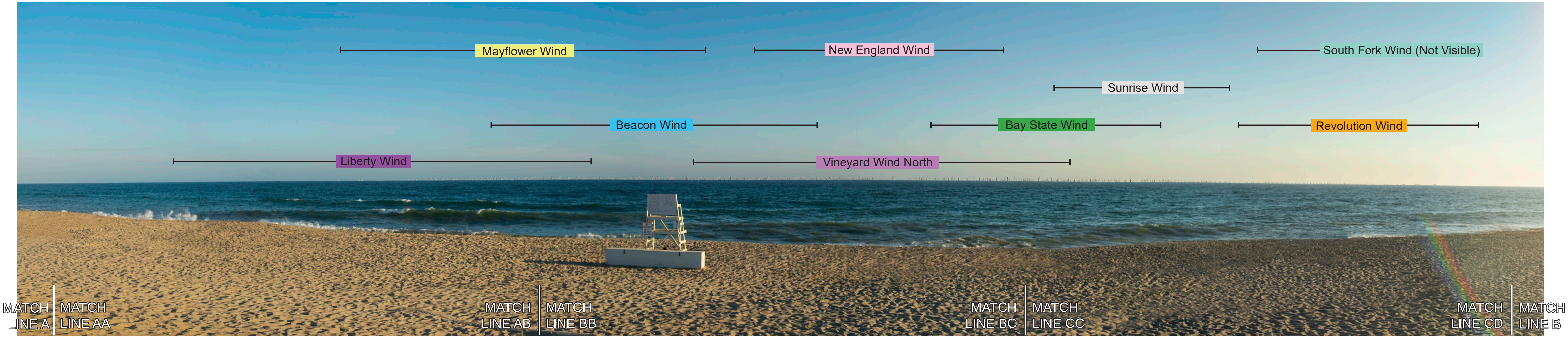
Temperature: 74° F
Humidity: 79%
Wind Dir & Speed: WNW 3 mph
Weather Condition: Clear

CAMERA

Camera Elevation: 13.5 ft / 4.1 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

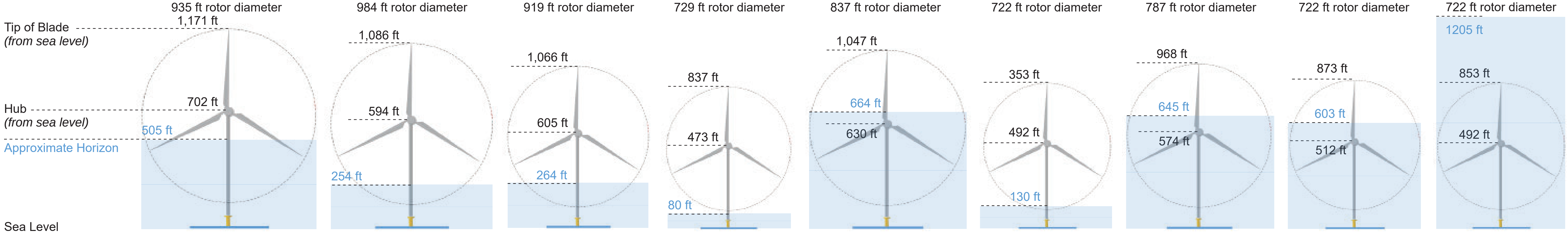
KOP 22-N Madaket Beach at Sunset - Scenario 3

SIMULATED CONDITIONS



VISIBILTY OF CLOSEST TURBINES

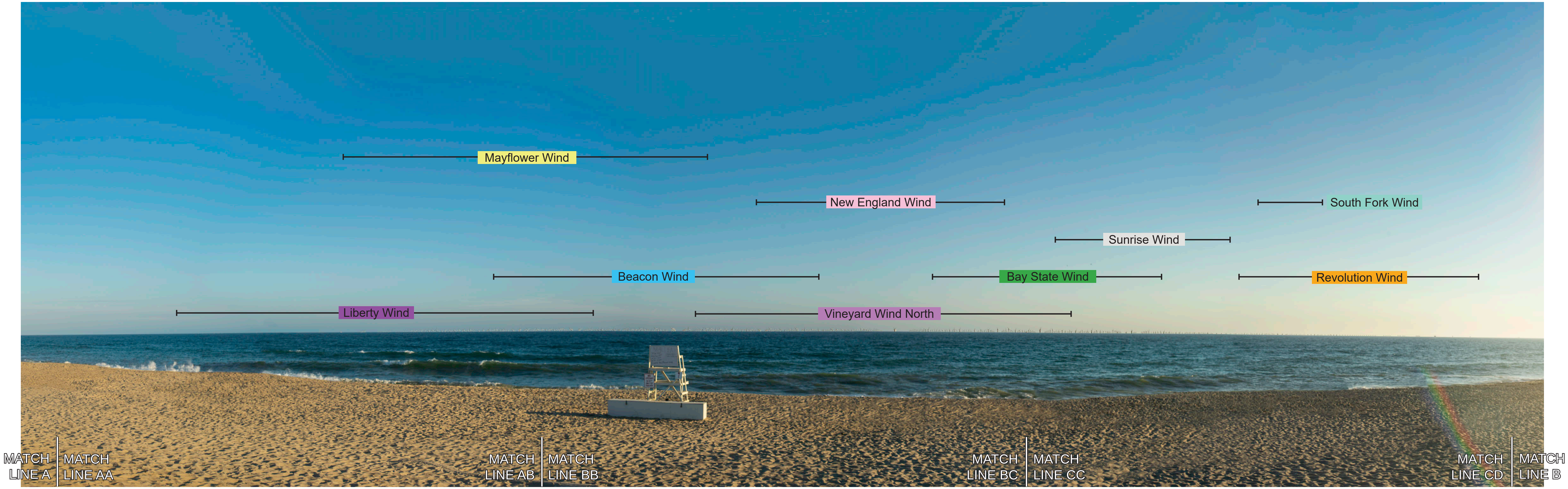
	Liberty Wind (OCS-A 0522)	Beacon Wind (OCS-A 0520)	Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Bay State Wind (OCS-A 0500)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
	935 ft rotor diameter	984 ft rotor diameter	919 ft rotor diameter	729 ft rotor diameter	837 ft rotor diameter	722 ft rotor diameter	787 ft rotor diameter	722 ft rotor diameter	722 ft rotor diameter



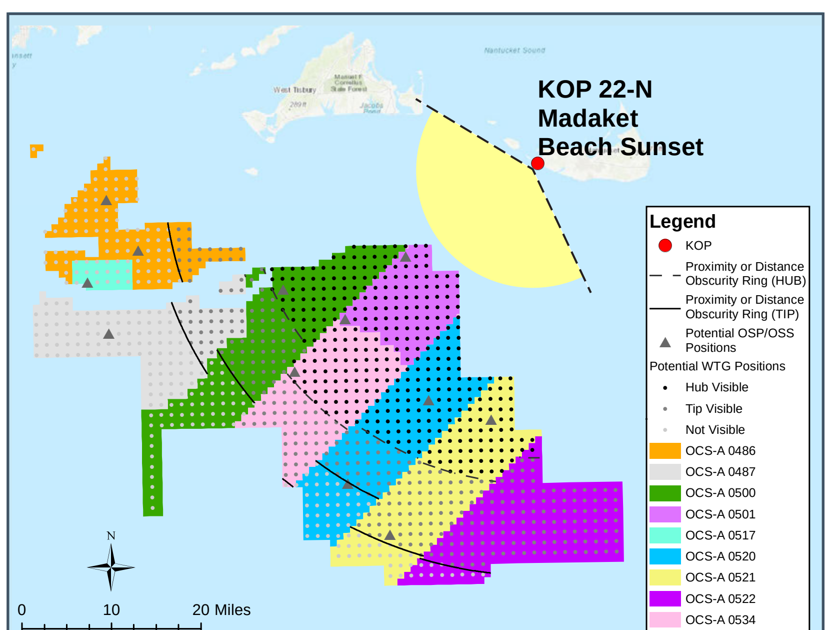
	Liberty Wind	Beacon Wind	Mayflower Wind	Vineyard Wind North	New England Wind	Bay State Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025-2030	2025-2030	2025	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	149	77	120	169	131	103	18
Number of Structures within View of KOP	127	119	129	77	119	119	32	21	0
Distance to Closest Structure	32 mi (52 km)	24 mi (39 km)	24 mi (39 km)	15 mi (25 km)	36 mi (58 km)	18 mi (30 km)	36 mi (57 km)	35 mi (56 km)	47 mi (76 km)
Distance to Furthest Structure	46 mi (78 km)	42 mi (67 km)	46 mi (73 km)	28 mi (45 km)	45 mi (72 km)	41 mi (67 km)	43.73 mi (70 km)	42 mi (67 km)	53 mi (85 km)

KOP 22-N Madaket Beach at Sunset - Scenario 3 (Human Field of View - 124°)

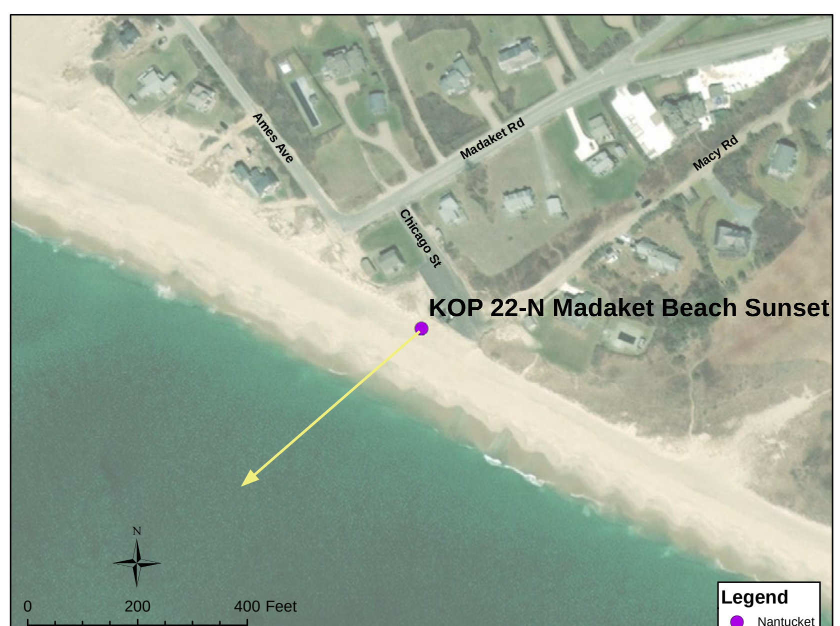
SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 25 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 743
Potential Number of Structures Not Visible: 320

ENVIRONMENT

Temperature: 74° F
Humidity: 79%
Wind Dir & Speed: WNW 3 mph
Weather Condition: Clear

PHOTOGRAPH AND SITE

Time of photograph: 6:11PM
Date of photograph: 7-29-20
L/SCA: Ocean beach
Viewing direction: South (228°)
Latitude: 41.270282°N
Longitude: 70.201719°W
Lighting Direction: Backlit diffused

CAMERA

Camera Elevation: 13.5 ft / 4.1 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

MATCH LINE A

MATCH LINE BB

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

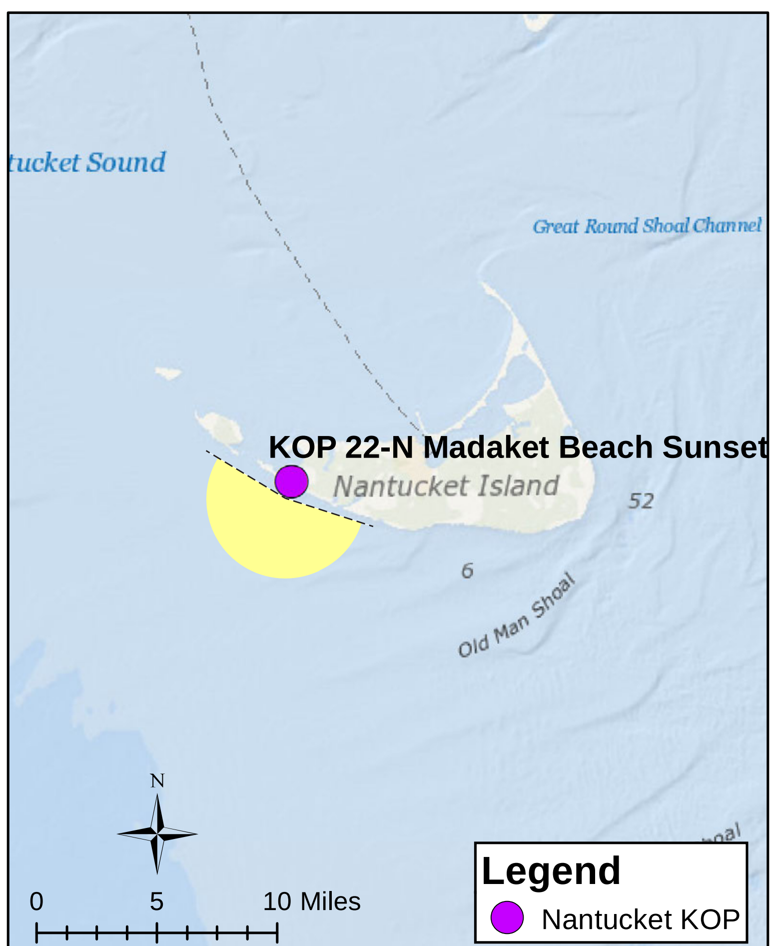
SIMULATED CONDITIONS

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

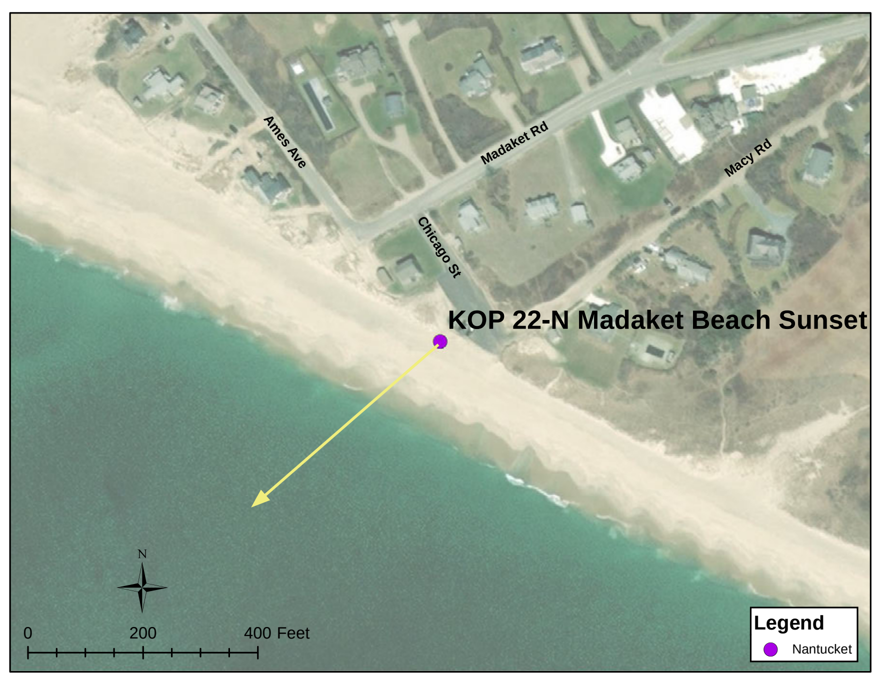
KOP 22-N Madaket Beach at Sunset - Scenario 4

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 25 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 614
Potential Number of Structures Not Visible: 300

PHOTOGRAPH AND SITE

Time of photograph: 6:11PM
Date of photograph: 7-29-20
L/SCA: Ocean beach
Viewing direction: South (228°)
Latitude: 41.270282°N
Longitude: 70.201719°W
Lighting Direction: Backlit diffused

ENVIRONMENT

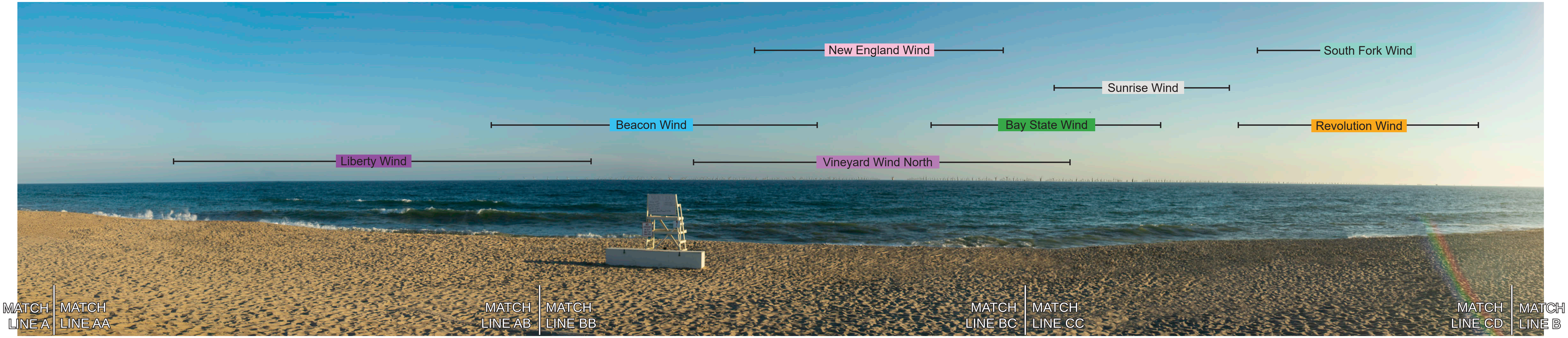
Temperature: 74° F
Humidity: 79%
Wind Dir & Speed: WNW 3 mph
Weather Condition: Clear

CAMERA

Camera Elevation: 13.5 ft / 4.1 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

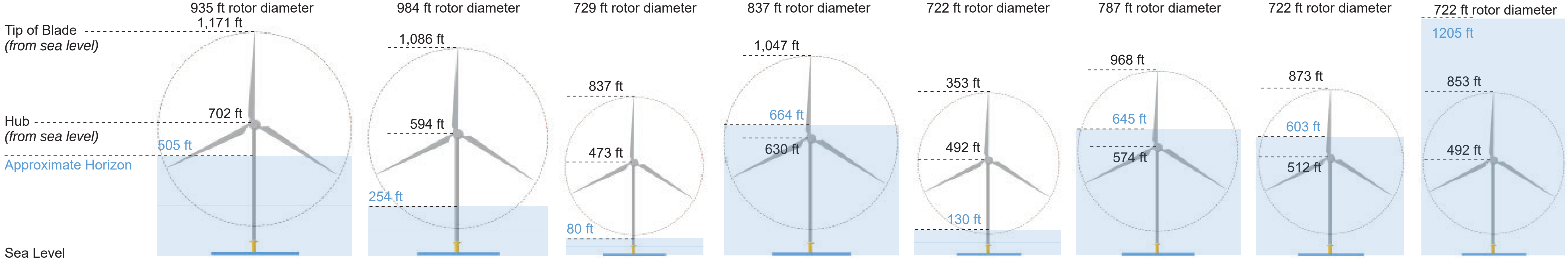
KOP 22-N Madaket Beach at Sunset - Scenario 4

SIMULATED CONDITIONS



VISIBILTY OF CLOSEST TURBINES

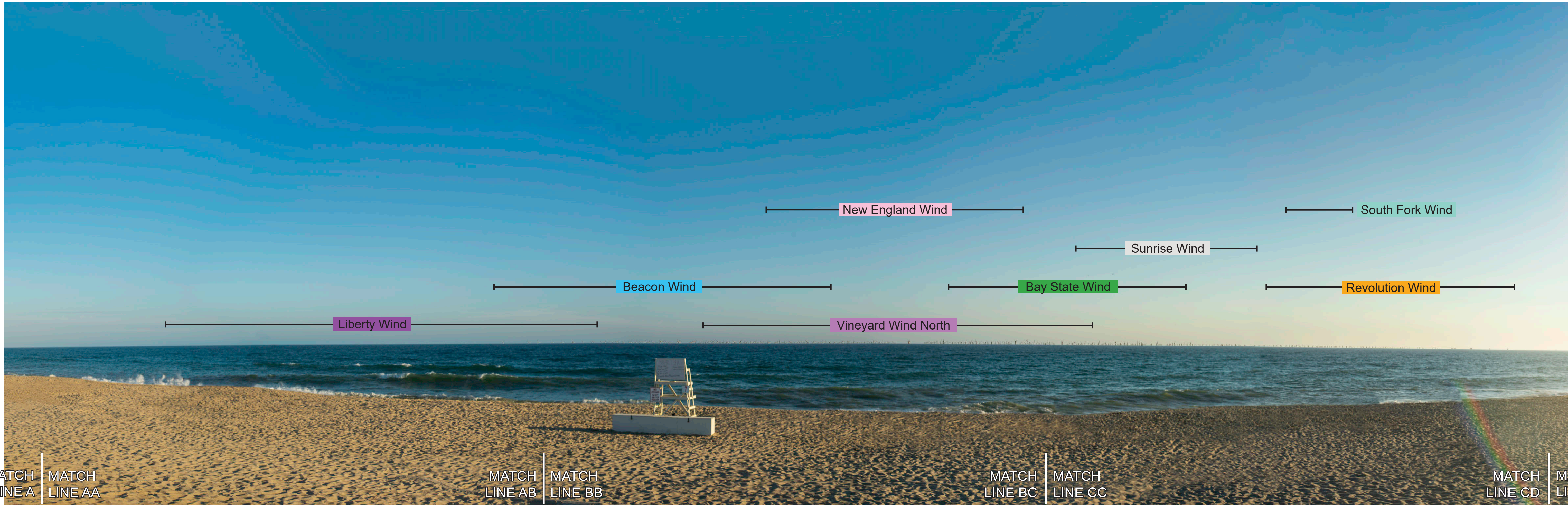
	Liberty Wind (OCS-A 0522)	Beacon Wind (OCS-A 0520)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Bay State Wind (OCS-A 0500)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
	935 ft rotor diameter	984 ft rotor diameter	729 ft rotor diameter	837 ft rotor diameter	722 ft rotor diameter	787 ft rotor diameter	722 ft rotor diameter	722 ft rotor diameter



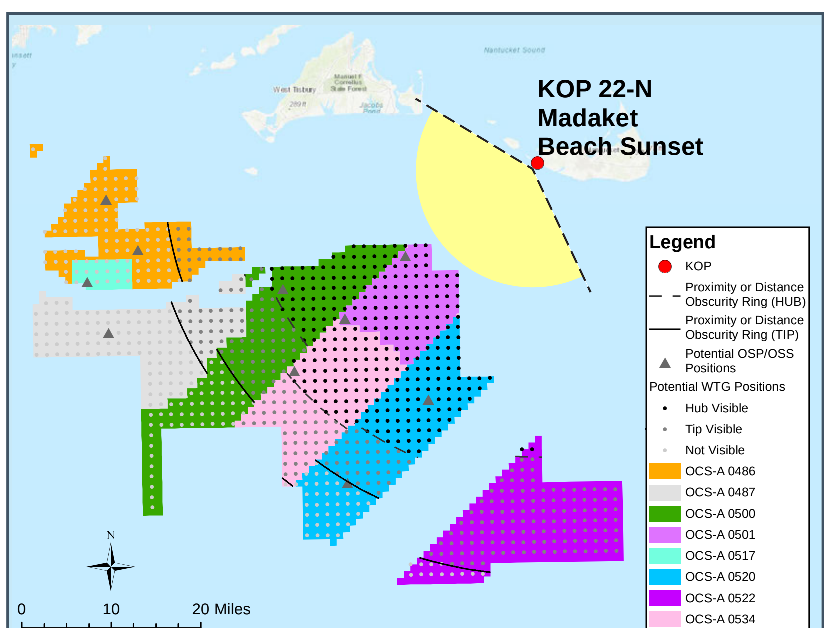
	Liberty Wind	Beacon Wind	Vineyard Wind North	New England Wind	Bay State Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025-2030	2025-2030	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	77	120	169	131	103	18
Number of Structures within View of KOP	127	119	77	119	119	32	21	0
Distance to Closest Structure	32 mi (52 km)	24 mi (39 km)	15 mi (25 km)	36 mi (58 km)	18 mi (30 km)	36 mi (57 km)	35 mi (56 km)	47 mi (76 km)
Distance to Furthest Structure	46 mi (78 km)	42 mi (67 km)	28 mi (45 km)	45 mi (72 km)	41 mi (67 km)	43.73 mi (70 km)	42 mi (67 km)	53 mi (85 km)

KOP 22-N Madaket Beach at Sunset - Scenario 4 (Human Field of View - 124°)

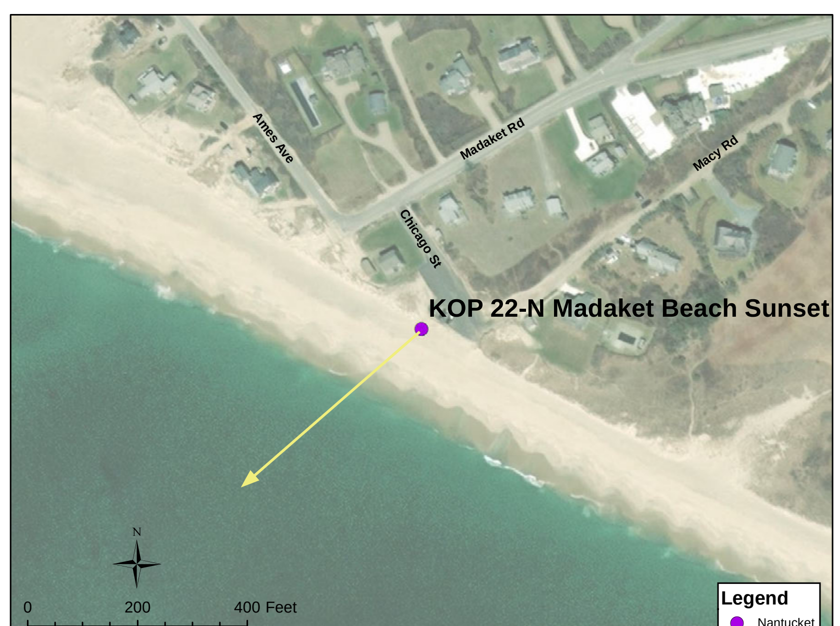
SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 25 km
Furthest Visible WTG: 46 mi / 74 km
Potential Number of Structures Visible: 614
Potential Number of Structures Not Visible: 300

ENVIRONMENT

Temperature: 74° F
Humidity: 79%
Wind Dir & Speed: WNW 3 mph
Weather Condition: Clear

PHOTOGRAPH AND SITE

Time of photograph: 6:11PM
Date of photograph: 7-29-20
L/SCA: Ocean beach
Viewing direction: South (228°)
Latitude: 41.270282°N
Longitude: 70.201719°W
Lighting Direction: Backlit diffused

CAMERA

Camera Elevation: 13.5 ft / 4.1 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 22-N Madaket Beach at Sunset - Scenario 4 (50mm view - 27° vertical / 39.6° horizontal) 2 of 3

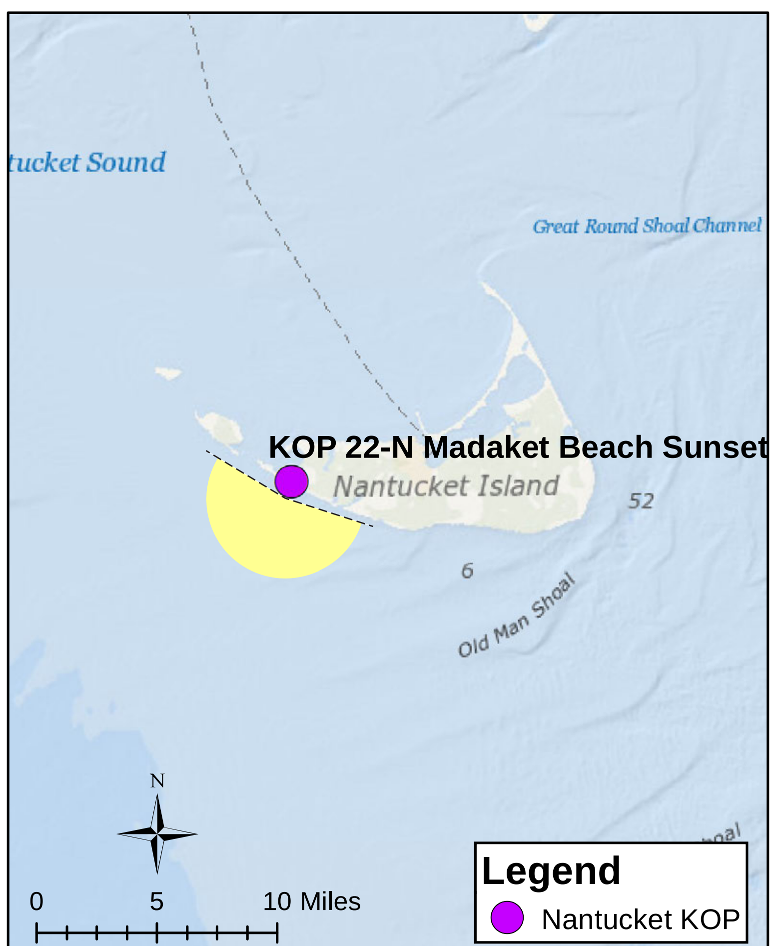
The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

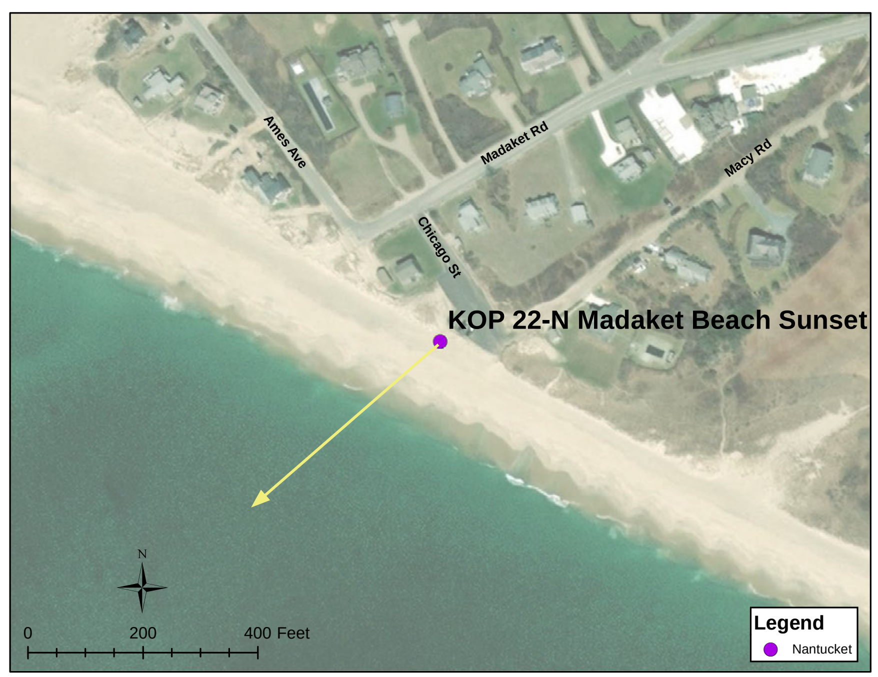
KOP 22-N Madaket Beach at Sunset - Scenario 5

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 24 mi / 39 km
Furthest Visible WTG: 46 mi / 73 km
Potential Number of StructuresVisible: 129
Potential Number of Structures Not Visible: 20

PHOTOGRAPH AND SITE

Time of photograph: 6:11PM
Date of photograph: 7-29-20
L/SCA: Ocean beach
Viewing direction: South (228°)
Latitude: 41.270282°N
Longitude: 70.201719°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 74° F
Humidity: 79%
Wind Dir & Speed: WNW 3 mph
Weather Condition: Clear

CAMERA

Camera Elevation: 13.5 ft / 4.1 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

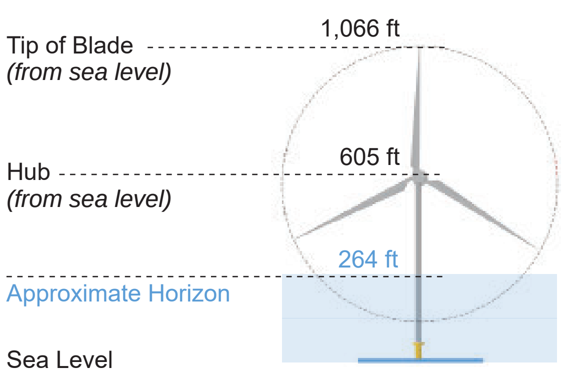
KOP 22-N Madaket Beach at Sunset - Scenario 5

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

Mayflower Wind (OCS-A 0521)

919 ft rotor diameter



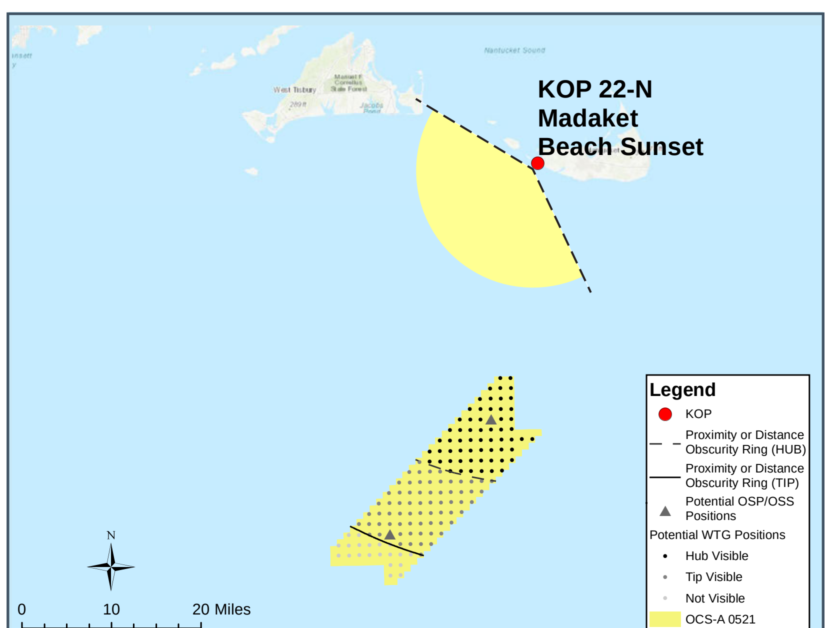
Year Forecasted for Development	2025
Number of Structures in Lease Area	149
Number of Structures within View of KOP	129
Distance to Closest Structure	24 mi (39 km)
Distance to Furthest Structure	46 mi (73 km)

KOP 22-N Madaket Beach at Sunset - Scenario 5 (Human Field of View - 124°)

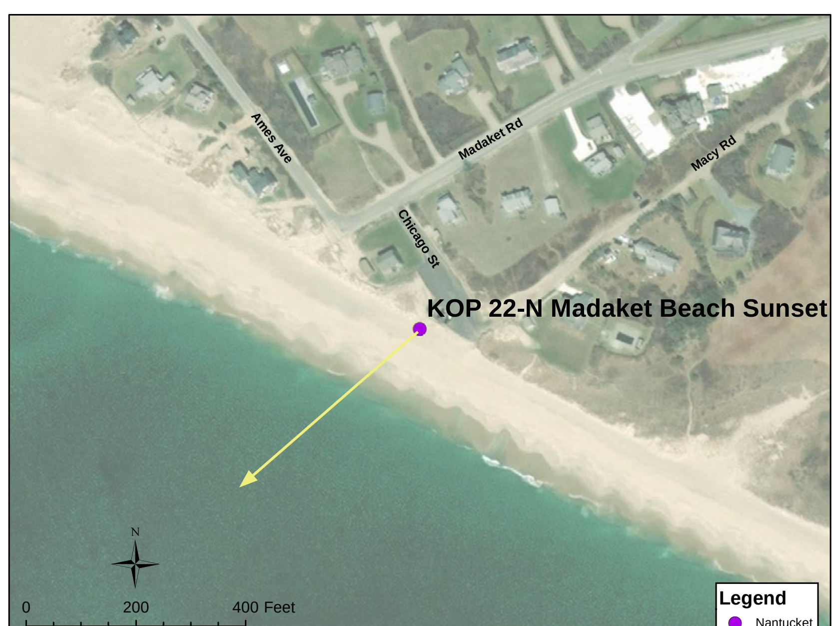
Nantucket

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 127°

Vertical Field of View: 40°

Nearest WTG: 24 mi / 39 km

Furthest Visible WTG: 46 mi / 73 km

Potential Number of Structures Visible: 129

Potential Number of Structures Not Visible: 20

ENVIRONMENT

Temperature: 74° F

Humidity: 79%

Wind Dir & Speed: WNW 3 mph

Weather Condition: Clear

PHOTOGRAPH AND SITE

Time of photograph: 6:11PM

Date of photograph: 7-29-20

L/SCA: Ocean beach

Viewing direction: South (228°)

Latitude: 41.270282°N

Longitude: 70.201719°W

Lighting Direction: Backlit diffused

CAMERA

Camera Elevation: 13.5 ft / 4.1 m

Nikon D4

Nikon 50mm

ISO: 100

Fstop: f/7.1

Shutter: 1/1250 sec

Exposure bias: -0.7 step

KOP 22-N Madaket Beach at Sunset - Scenario 5 (50mm view - 27° vertical / 40° horizontal) 1 of 3

MATCH LINE A

MATCH LINE BB

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

MATCH
LINE BC

MATCH
LINE B

The page should viewed at 11” x 17” approximately 15” from viewer’s eyes .

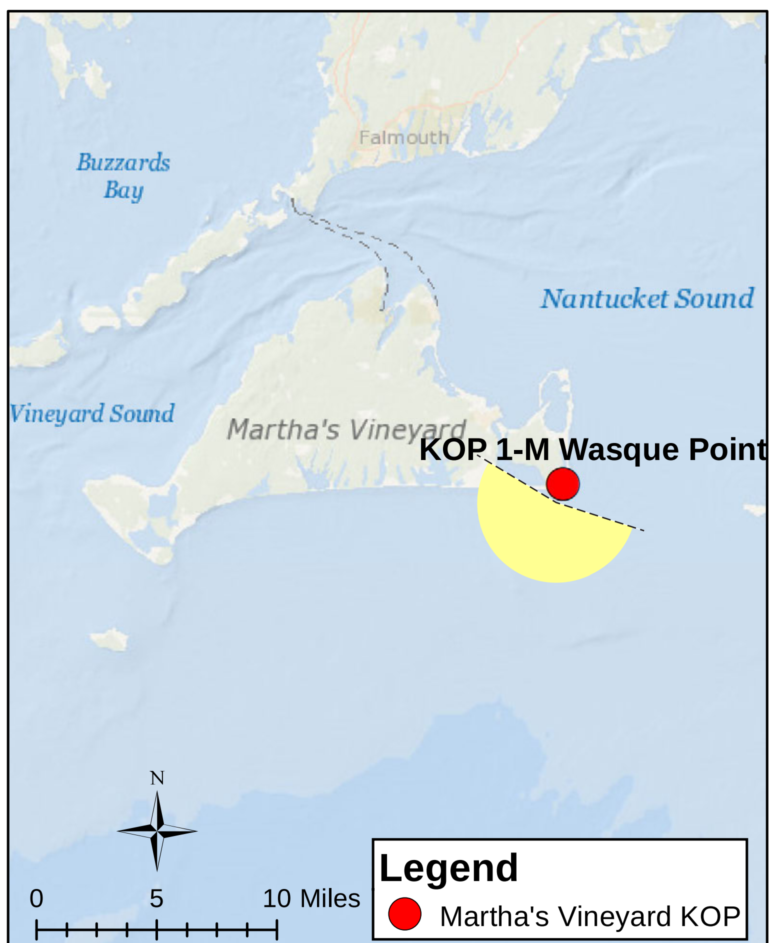
KOP 1-MV Wasque Point - Scenario 1

Martha's Vineyard

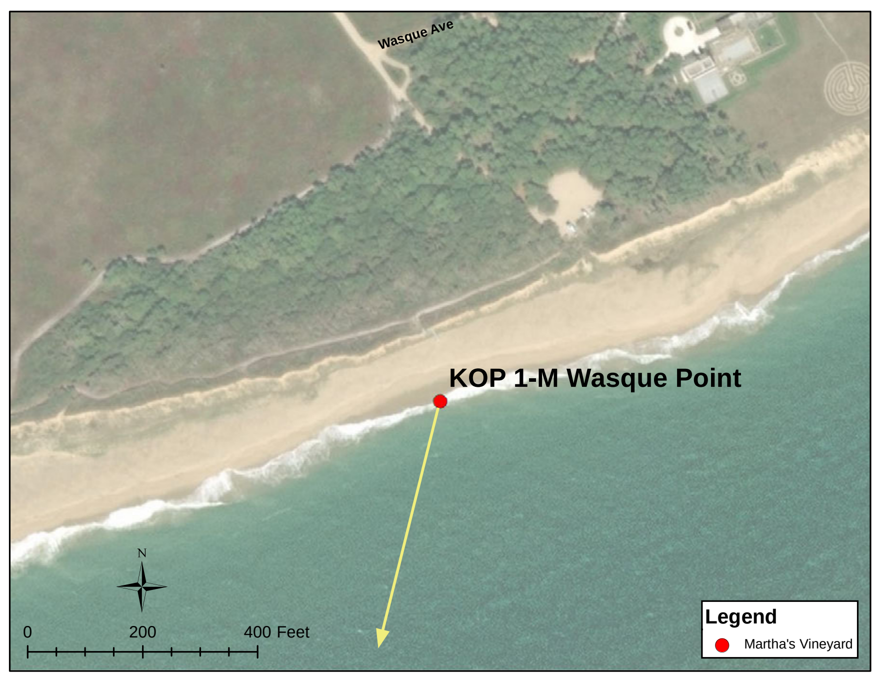
PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

1

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 24 km
Furthest Visible WTG: 43 mi / 69 km
Potential Number of Structures Visible: 352
Potential Number of Structures Not Visible: 95

PHOTOGRAPH AND SITE

Time of photograph: 9:01AM
Date of photograph: 6-25-20
L/SCA: Ocean Beach, Costal Scrub, Rural/Residential
Viewing direction: South (194°)
Latitude: 41.351077°N
Longitude: 70.454821°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 77° F
Humidity: 58%
Wind Dir & Speed: SSW 14mph
Weather Condition: Cloudy

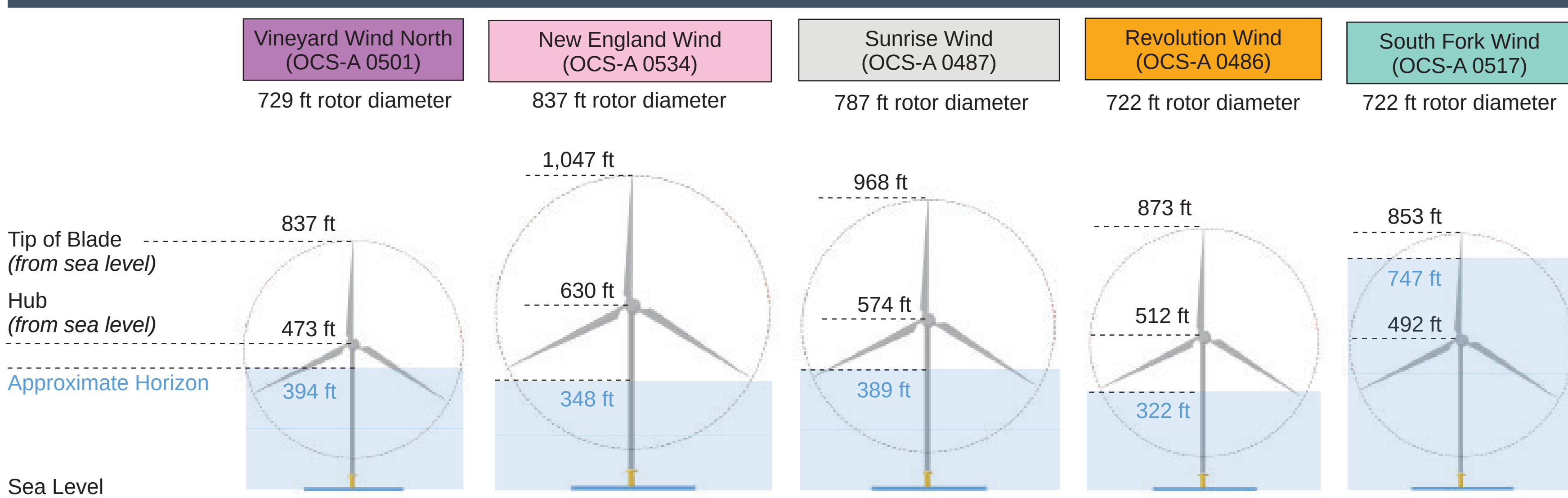
CAMERA

Camera Elevation: 6.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 1-MV Wasque Point - Scenario 1

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

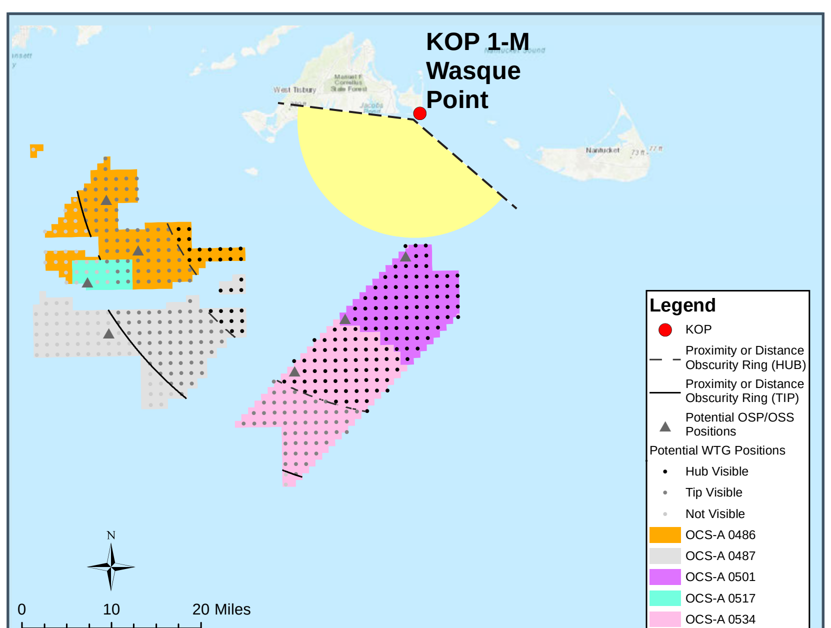


	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	77	120	131	103	18
Number of Structures within View of KOP	77	118	74	83	0
Distance to Closest Structure	15 mi (24 km)	26 mi (42 km)	27 mi (44 km)	25 mi (40 km)	37 mi (59 km)
Distance to Furthest Structure	27 mi (44 km)	43 mi (69 km)	41 mi (66 km)	39 mi (63 km)	43 mi (69 km)

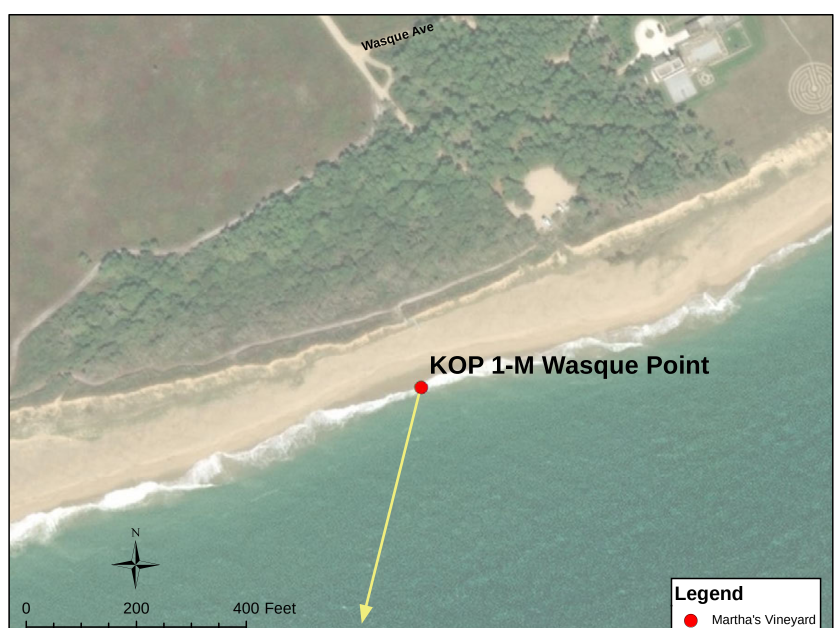
KOP 1-MV Wasque Point - Scenario 1 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°

Vertical Field of View: 40°

Nearest WTG: 15 mi / 24 km

Furthest Visible WTG: 43 mi / 69 km

Potential Number of Structures Visible: 352

Potential Number of Structures Not Visible: 95

PHOTOGRAPH AND SITE

Time of photograph: 9:01AM

Date of photograph: 6-25-20

L/SCA: Ocean Beach, Costal Scrub, Rural/Residential

Viewing direction: South (194°)

Latitude: 41.351077°N

Longitude: 70.454821°W

Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 77° F

Humidity: 58%

Wind Dir & Speed: SSW 14mph

Weather Condition: Cloudy

CAMERA

Camera Elevation: 6.5 ft / 6.3 m

Nikon D4

Nikon 50mm

ISO: 100

Fstop: f/7.1

Shutter: 1/1250 sec

Exposure bias: -0.7 step

MATCH
LINE A

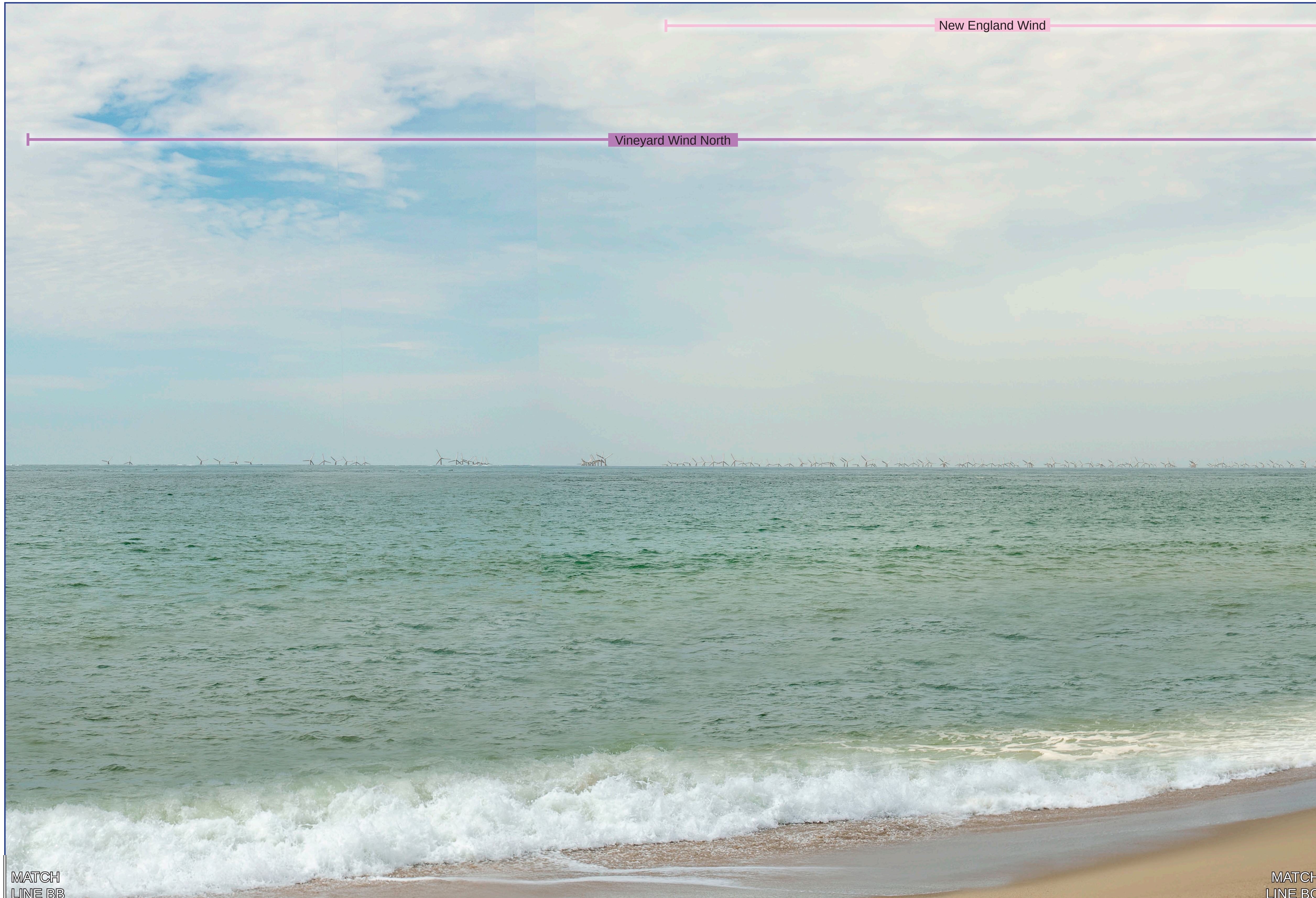
MATCH
LINE AA

MATCH
LINE AB

MATCH
LINE BB

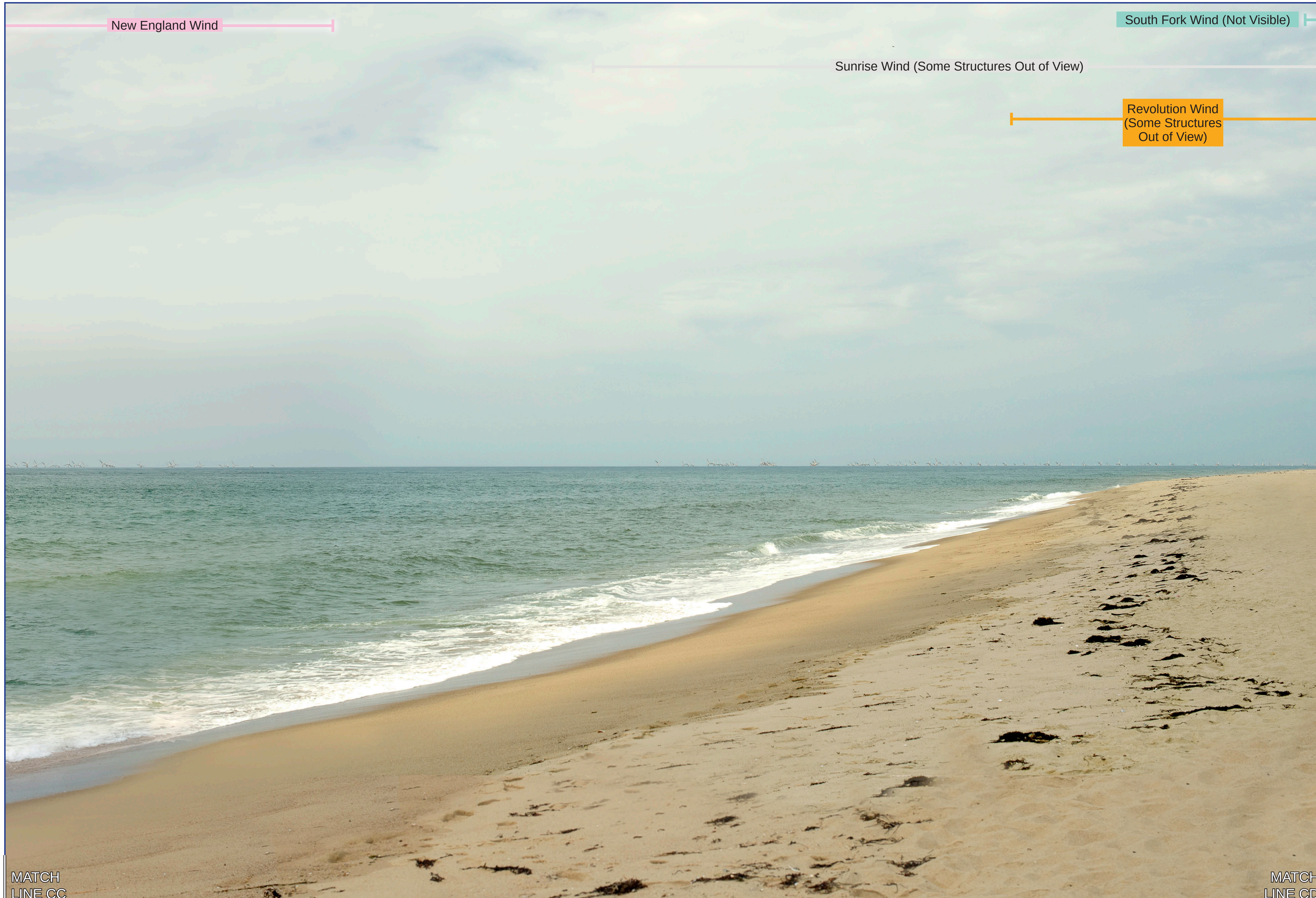
The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

MATCH LINE AB



MATCH LINE CC

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .



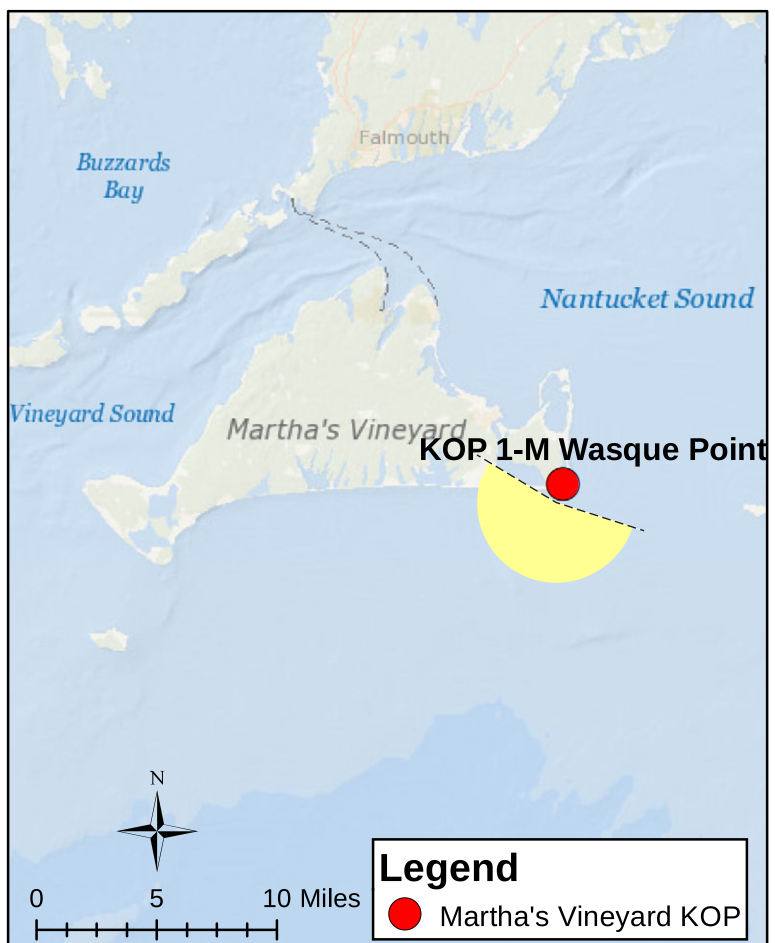
The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 1-MV Wasque Point - Scenario 2

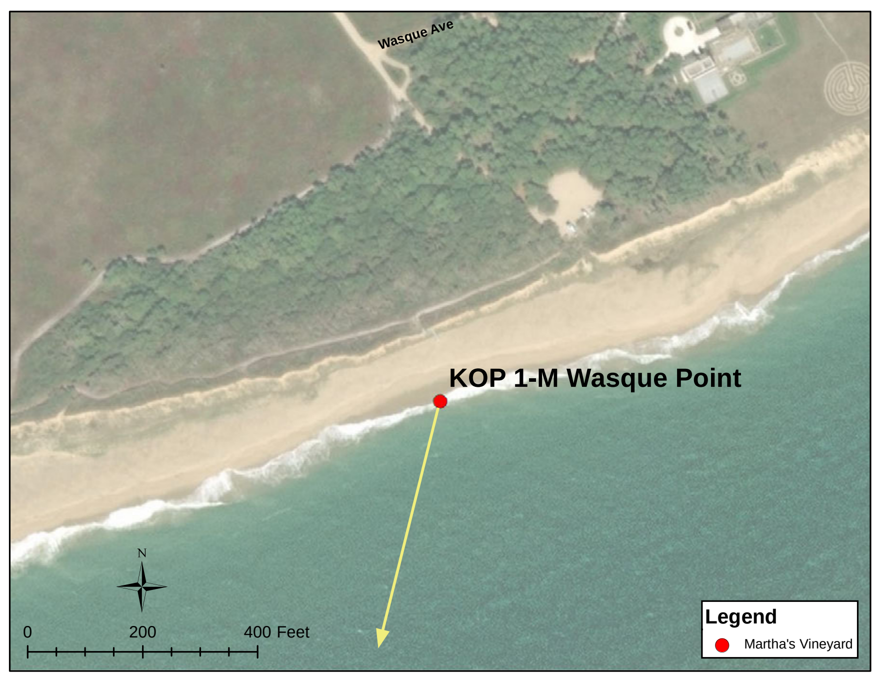
Martha's Vineyard

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 4 km
Furthest Visible WTG: 43 mi / 69 km
Potential Number of Structures Visible: 438
Potential Number of Structures Not Visible: 160

PHOTOGRAPH AND SITE

Time of photograph: 9:01AM
Date of photograph: 6-25-20
L/SCA: Ocean Beach, Costal Scrub, Rural/Residential
Viewing direction: South (194°)
Latitude: 41.351077°N
Longitude: 70.454821°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 77° F
Humidity: 58%
Wind Dir & Speed: SSW 14mph
Weather Condition: Cloudy

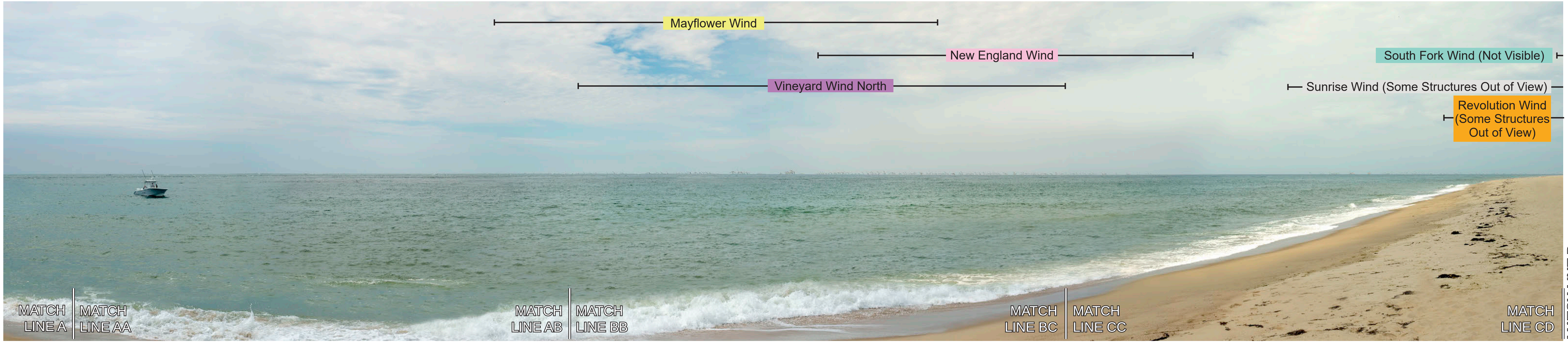
CAMERA

Camera Elevation: 6.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 1-MV Wasque Point - Scenario 2

Martha's Vineyard

SIMULATED CONDITIONS



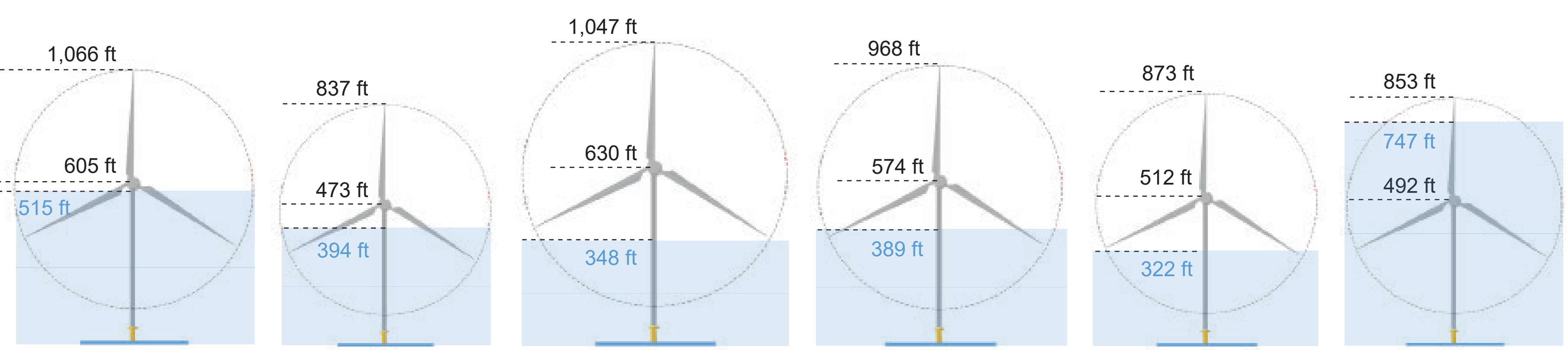
VISIBILTY OF CLOSEST TURBINES

	Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
	919 ft rotor diameter	729 ft rotor diameter	837 ft rotor diameter	787 ft rotor diameter	722 ft rotor diameter	722 ft rotor diameter

Tip of Blade
(from sea level)

Hub
(from sea level)

Approximate Horizon



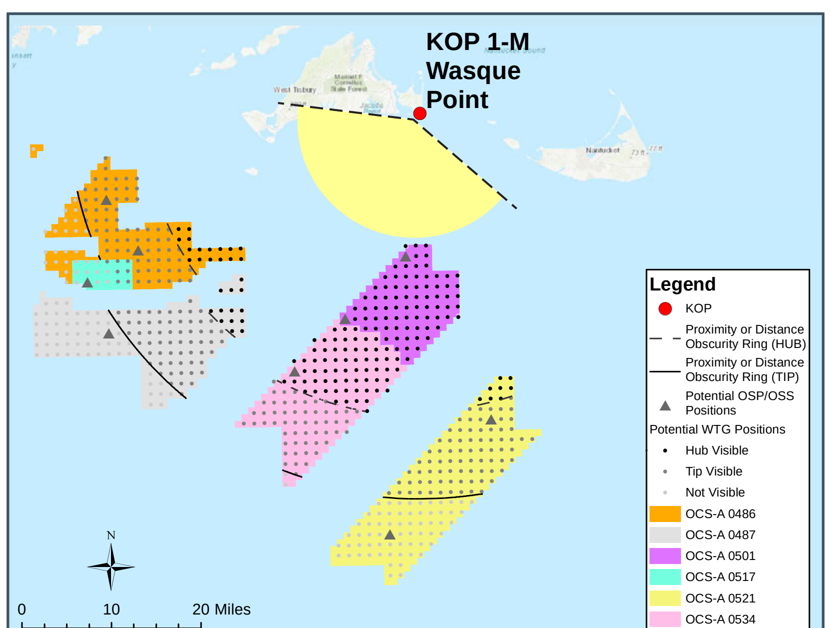
Sea Level

	Mayflower Wind	Vineyard Wind North	New England Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	149	77	120	131	103	18
Number of Structures within View of KOP	86	77	118	74	83	0
Distance to Closest Structure	20.92 mi (33.66 km)	15 mi (24 km)	26 mi (42 km)	27 mi (44 km)	25 mi (40 km)	37 mi (59 km)
Distance to Furthest Structure	42.84 mi (68.94 km)	27 mi (44 km)	43 mi (69 km)	41 mi (66 km)	39 mi (63 km)	43 mi (69 km)

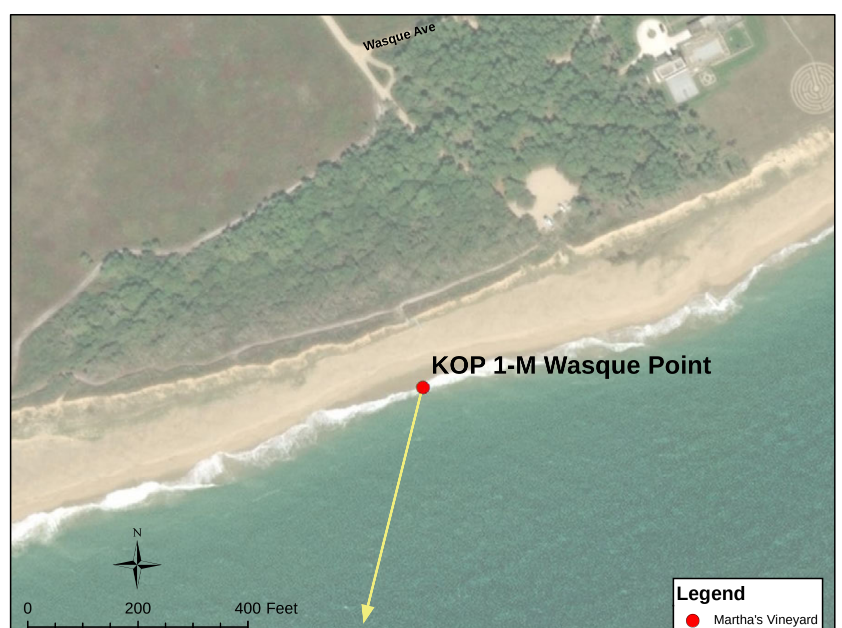
KOP 1-MV Wasque Point - Scenario 2 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 4 km
Furthest Visible WTG: 43 mi / 69 km
Potential Number of Structures Visible: 438
Potential Number of Structures Not Visible: 160

PHOTOGRAPH AND SITE

Time of photograph: 9:01AM
Date of photograph: 6-25-20
L/SCA: Ocean Beach, Costal Scrub, Rural/Residential
Viewing direction: South (194°)
Latitude: 41.351077°N
Longitude: 70.454821°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 77° F
Humidity: 58%
Wind Dir & Speed: SSW 14mph
Weather Condition: Cloudy

CAMERA

Camera Elevation: 6.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

MATCH LINE A

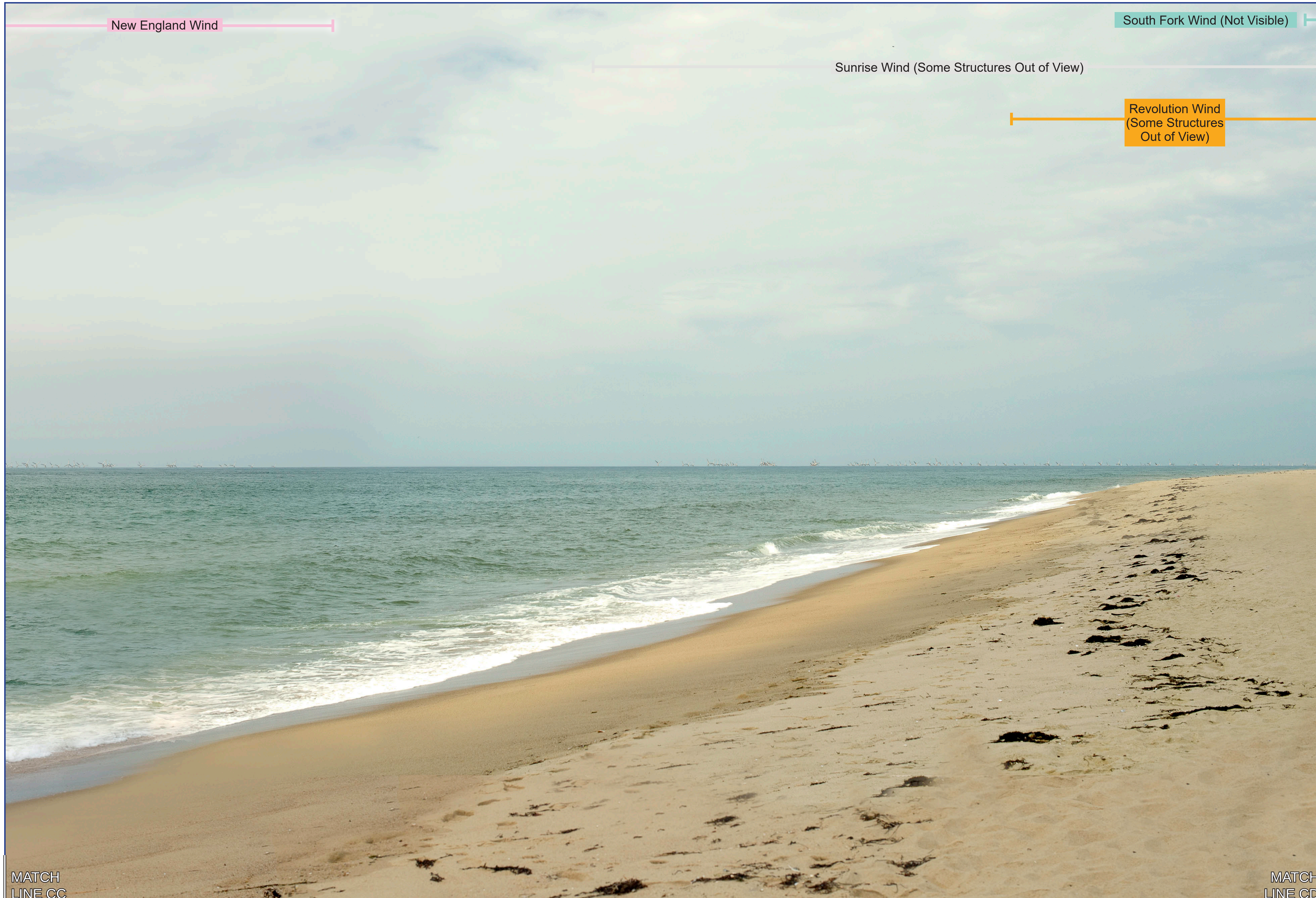
MATCH LINE BB

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

MATCH LINE AB
MATCH LINE BB
MATCH LINE BC
MATCH LINE CC

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

MATCH LINE BC



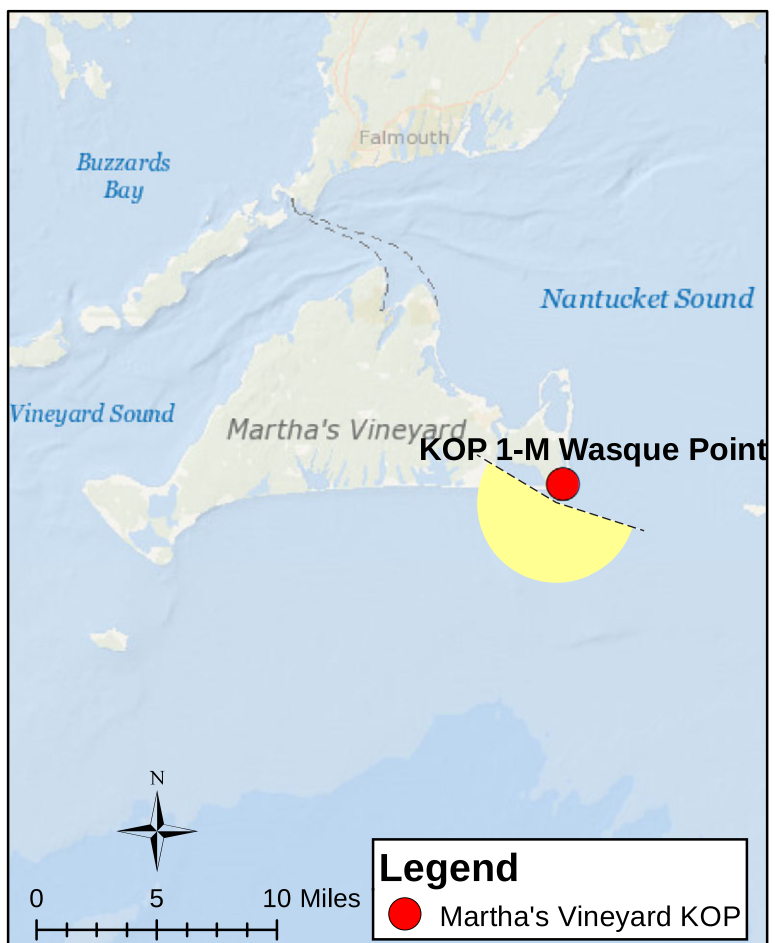
MATCH LINE B

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

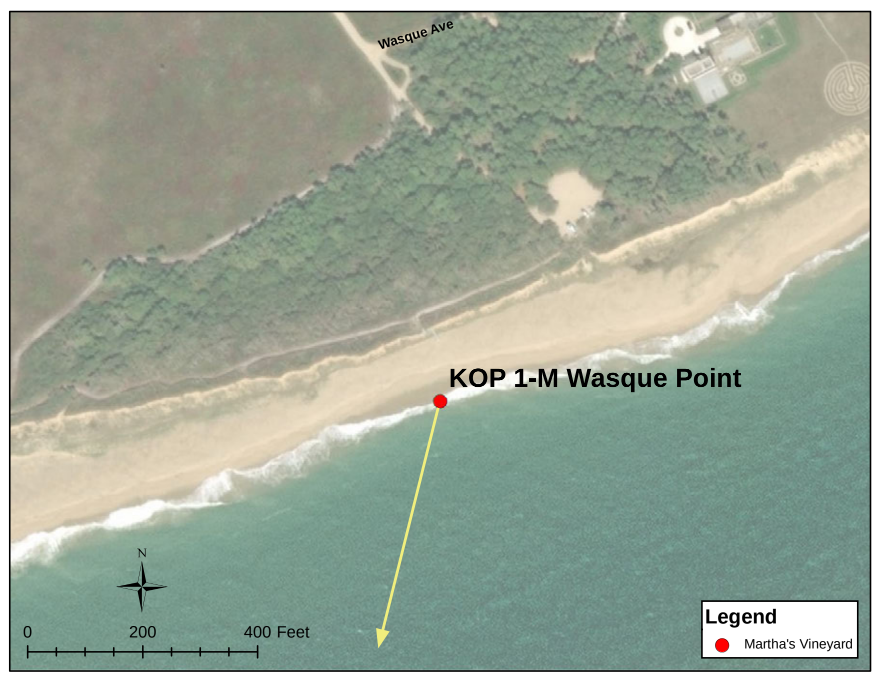
KOP 1-MV Wasque Point - Scenario 3

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 24 km
Furthest Visible WTG: 43 mi / 70 km
Potential Number of Structures Visible: 686
Potential Number of Structures Not Visible: 384

PHOTOGRAPH AND SITE

Time of photograph: 9:01AM
Date of photograph: 6-25-20
L/SCA: Ocean Beach, Costal Scrub, Rural/Residential
Viewing direction: South (194°)
Latitude: 41.351077°N
Longitude: 70.454821°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 77° F
Humidity: 58%
Wind Dir & Speed: SSW 14mph
Weather Condition: Cloudy

CAMERA

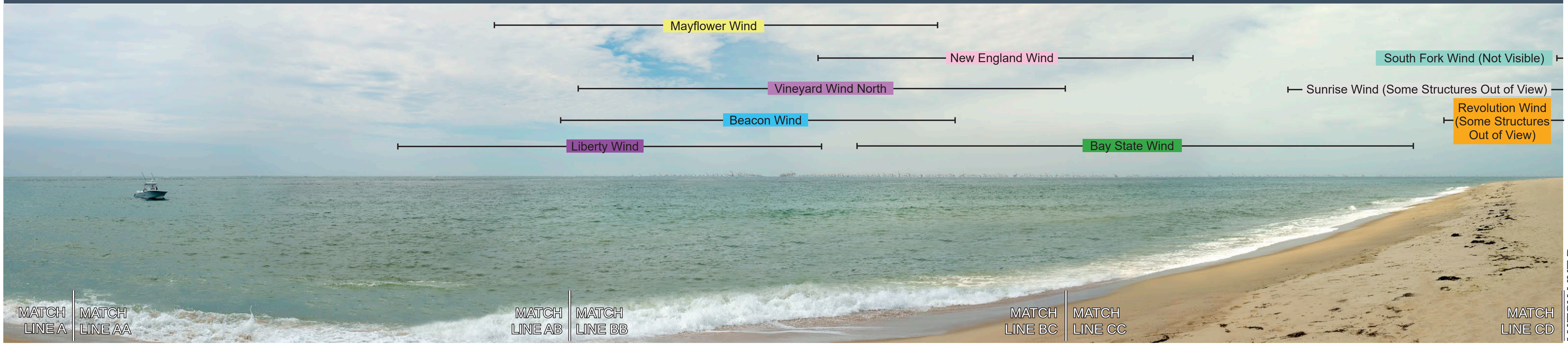
Camera Elevation: 6.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 1-MV Wasque Point - Scenario 3

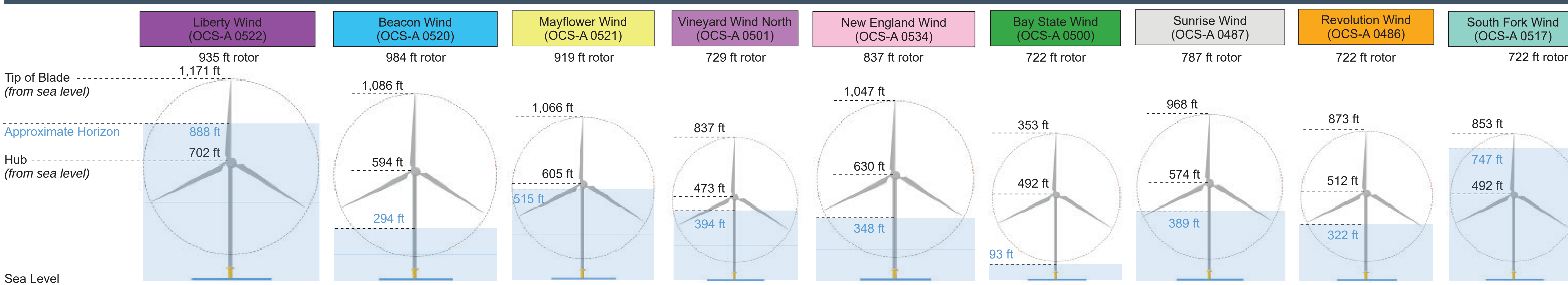
Martha's Vineyard

SIMULATED CONDITIONS

2



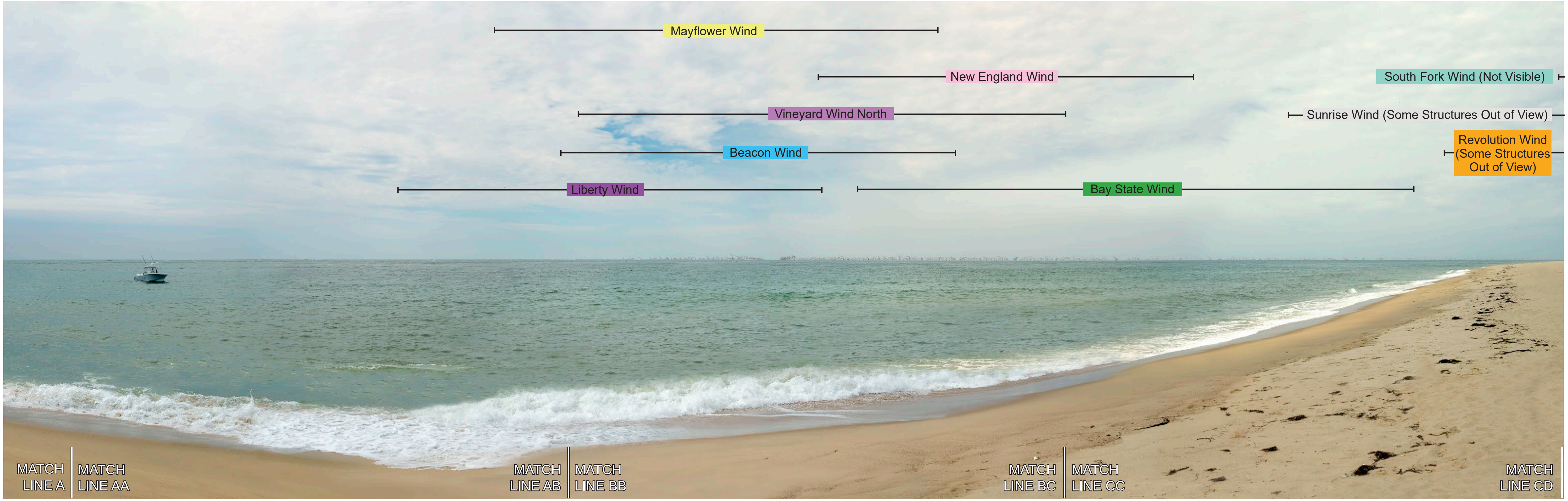
VISIBILTY OF CLOSEST TURBINES



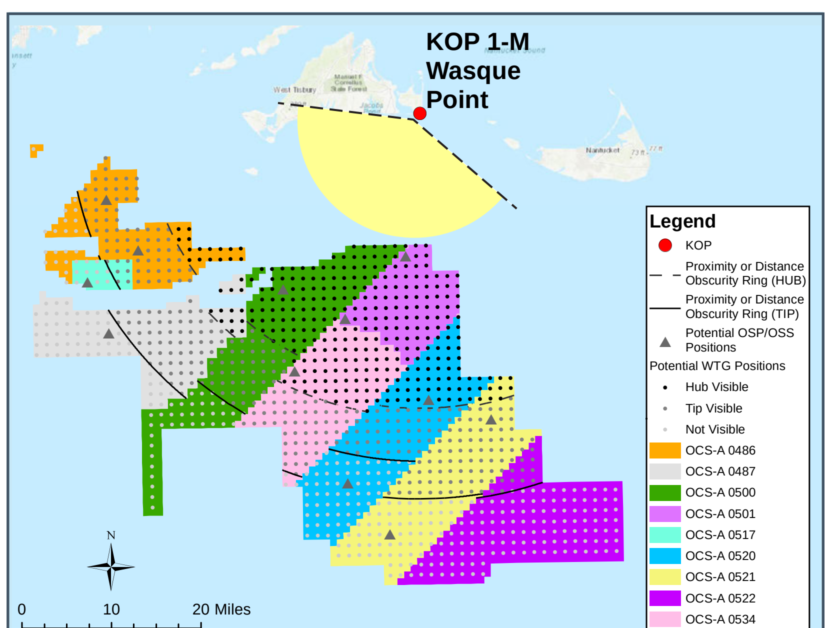
	Liberty Wind (OCS-A 0522)	Beacon Wind (OCS-A 0520)	Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Bay State Wind (OCS-A 0500)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2025-2030	2025-2030	2025	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	149	77	120	169	131	103	18
Number of Structures within View of KOP	13	95	86	77	118	133	74	83	0
Distance to Closest Structure	40 mi (64 km)	24 mi (39 km)	31 mi (50 km)	15 mi (24 km)	26 mi (42 km)	15 mi (24 km)	27 mi (44 km)	25 mi (40 km)	37 mi (59 km)
Distance to Furthest Structure	43 mi (70 km)	39 mi (62 km)	43 mi (69 km)	27 mi (44 km)	43 mi (69 km)	39 mi (62 km)	41 mi (66 km)	39 mi (63 km)	43 mi (69 km)

KOP 1-MV Wasque Point - Scenario 3 (Human Field of View - 124°)

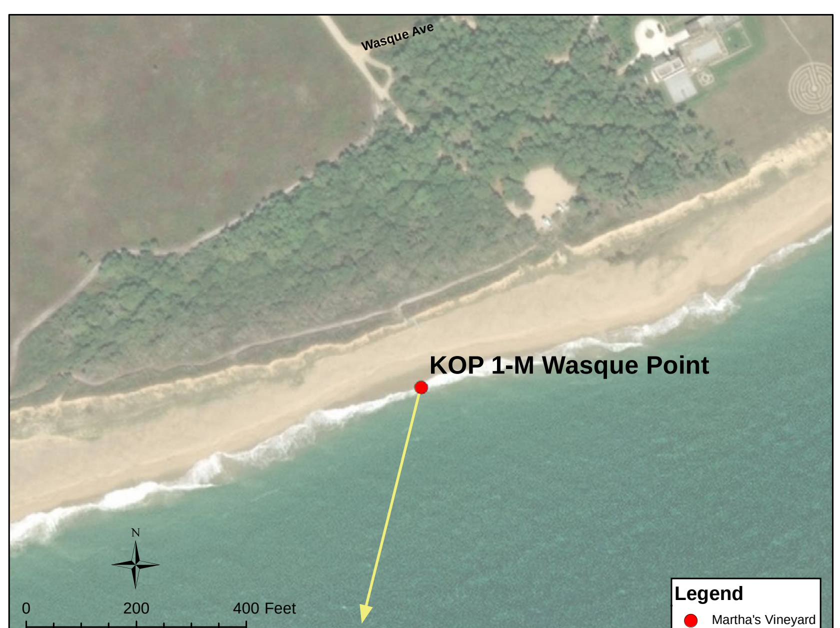
SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 24 km
Furthest Visible WTG: 43 mi / 70 km
Potential Number of Structures Visible: 686
Potential Number of Structures Not Visible: 384

PHOTOGRAPH AND SITE

Time of photograph: 9:01AM
Date of photograph: 6-25-20
L/SCA: Ocean Beach, Costal Scrub, Rural/Residential
Viewing direction: South (194°)
Latitude: 41.351077°N
Longitude: 70.454821°W
Lighting Direction: Backlit diffused

ENVIRONMENT

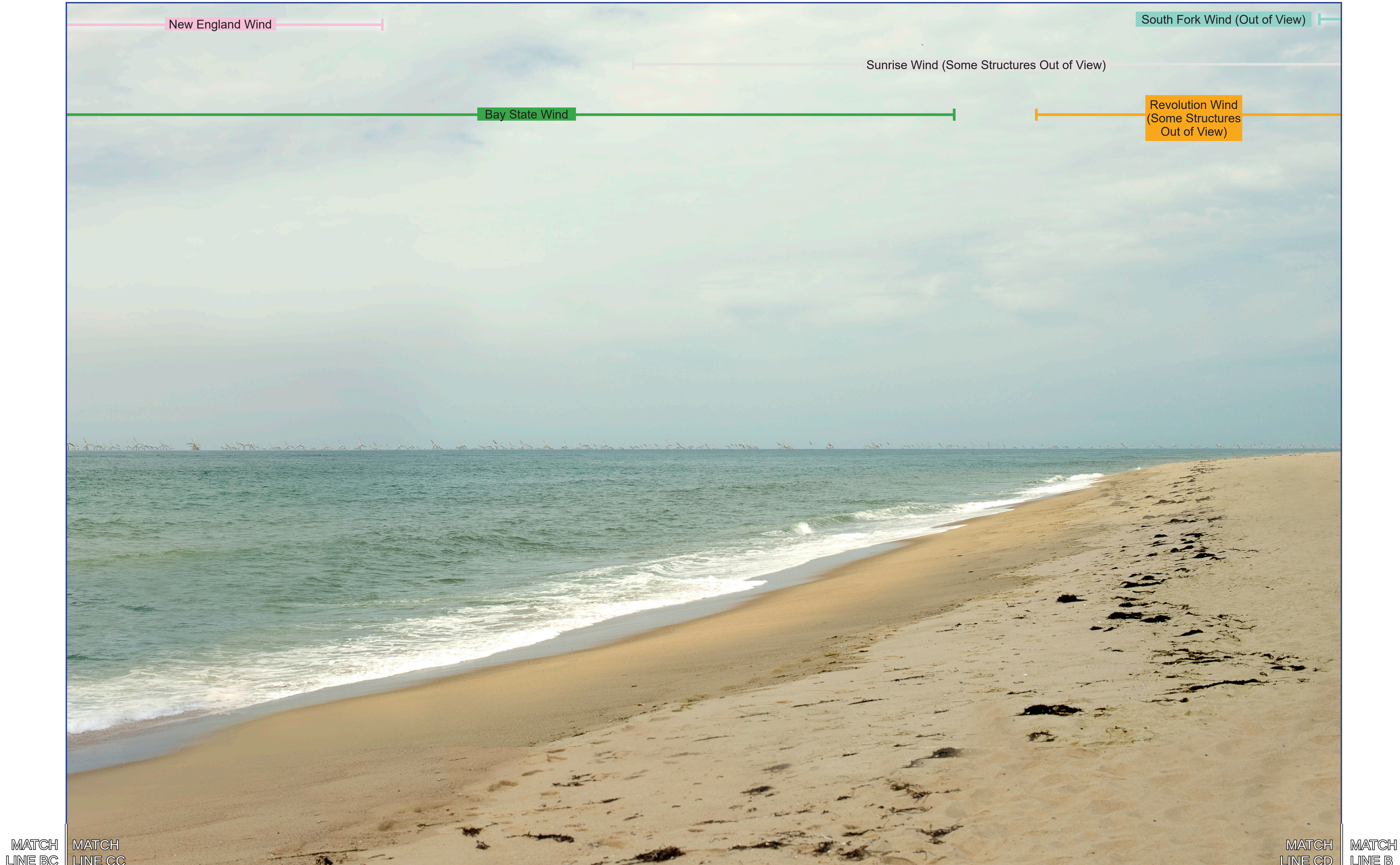
Temperature: 77° F
Humidity: 58%
Wind Dir & Speed: SSW 14mph
Weather Condition: Cloudy

CAMERA

Camera Elevation: 6.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .



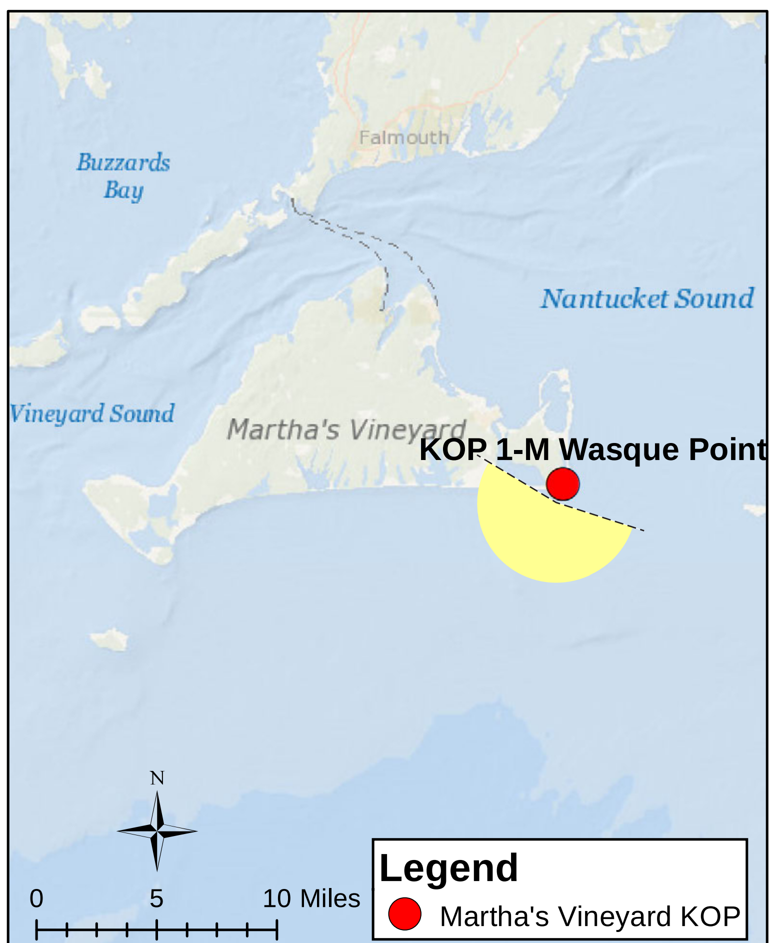
The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 1-MV Wasque Point - Scenario 4

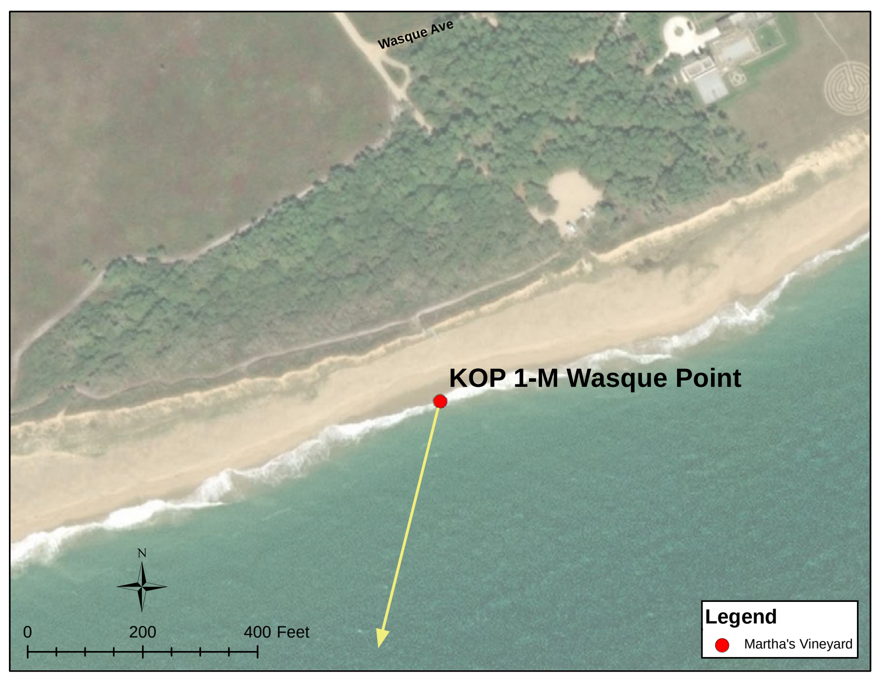
Martha’s Vineyard

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 24 km
Furthest Visible WTG: 43 mi / 70 km
Potential Number of Structures Visible: 593
Potential Number of Structures Not Visible: 321

PHOTOGRAPH AND SITE

Time of photograph: 9:01AM
Date of photograph: 6-25-20
L/SCA: Ocean Beach, Costal Scrub, Rural/Residential
Viewing direction: South (194°)
Latitude: 41.351077°N
Longitude: 70.454821°W
Lighting Direction: Backlit diffused

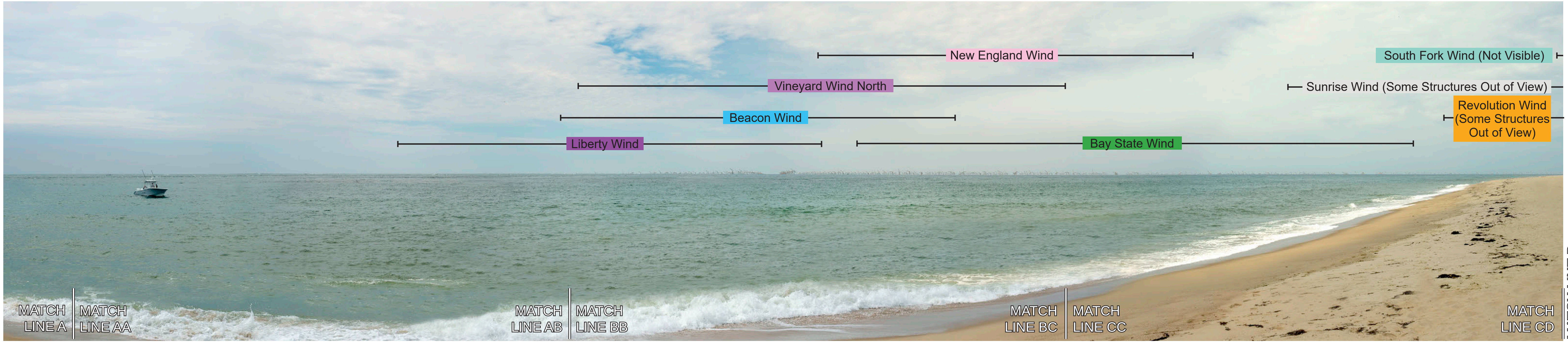
ENVIRONMENT

Temperature: 77° F
Humidity: 58%
Wind Dir & Speed: SSW 14mph
Weather Condition: Cloudy

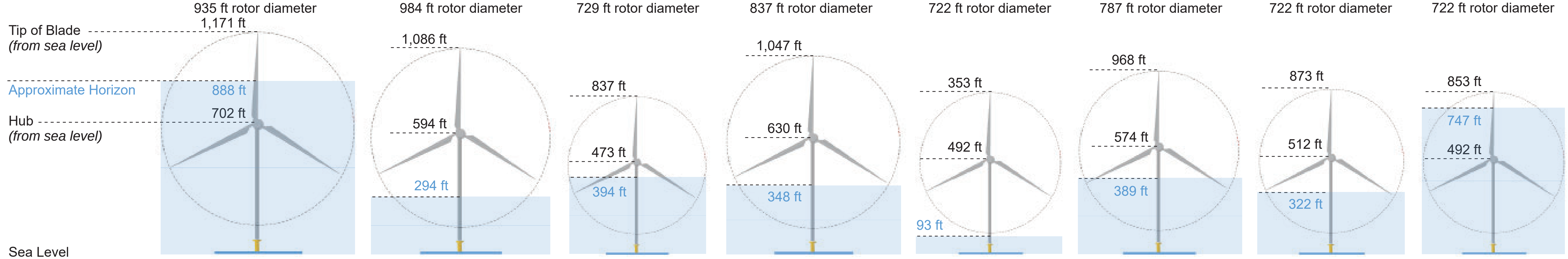
CAMERA

Camera Elevation: 6.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

SIMULATED CONDITIONS



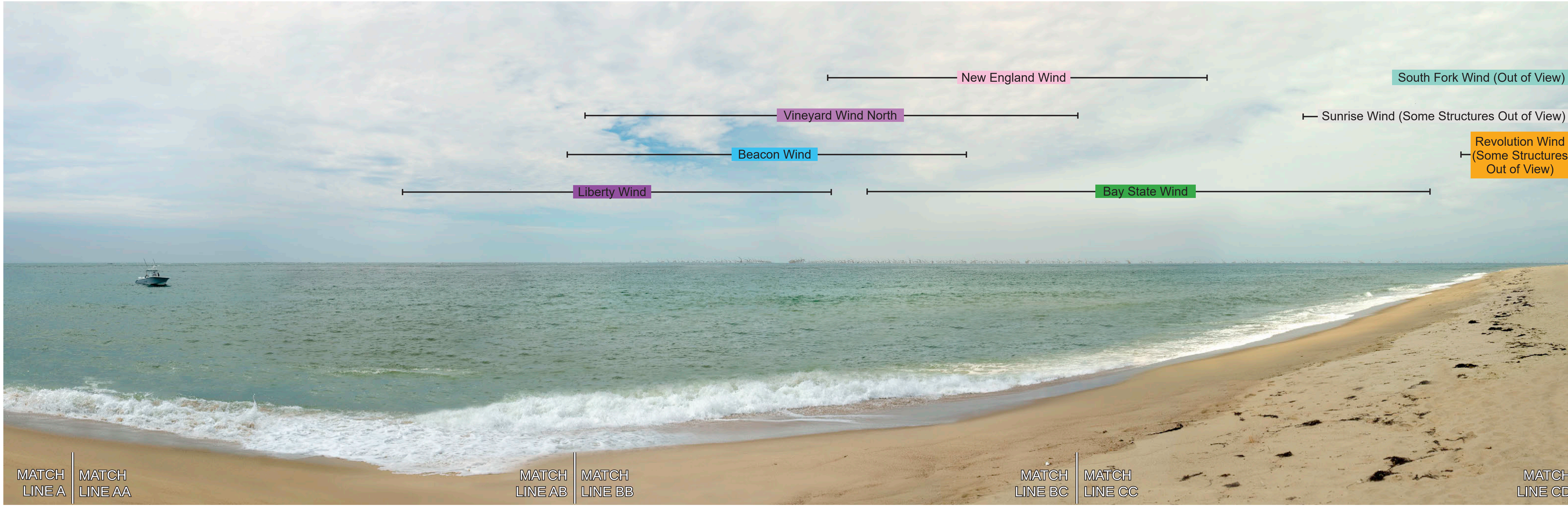
VISIBILTY OF CLOSEST TURBINES



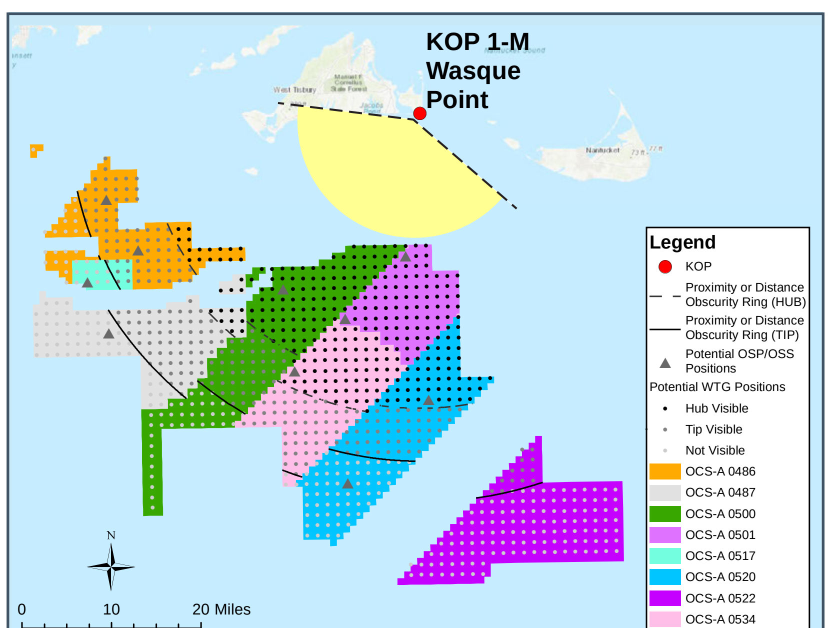
	Liberty Wind (OCS-A 0522) 935 ft rotor diameter	Beacon Wind (OCS-A 0520) 984 ft rotor diameter	Vineyard Wind North (OCS-A 0501) 729 ft rotor diameter	New England Wind (OCS-A 0534) 837 ft rotor diameter	Bay State Wind (OCS-A 0500) 722 ft rotor diameter	Sunrise Wind (OCS-A 0487) 787 ft rotor diameter	Revolution Wind (OCS-A 0486) 722 ft rotor diameter	South Fork Wind (OCS-A 0517) 722 ft rotor diameter
Year Forecasted for Development	2025-2030	2025-2030	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	77	120	169	131	103	18
Number of Structures within View of KOP	13	95	77	118	133	74	83	0
Distance to Closest Structure	40 mi (64 km)	24 mi (39 km)	15 mi (24 km)	26 mi (42 km)	15 mi (24 km)	27 mi (44 km)	25 mi (40 km)	37 mi (59 km)
Distance to Furthest Structure	43 mi (70 km)	39 mi (62 km)	27 mi (44 km)	43 mi (69 km)	39 mi (62 km)	41 mi (66 km)	39 mi (63 km)	43 mi (69 km)

KOP 1-MV Wasque Point - Scenario 4 (Human Field of View - 124°)

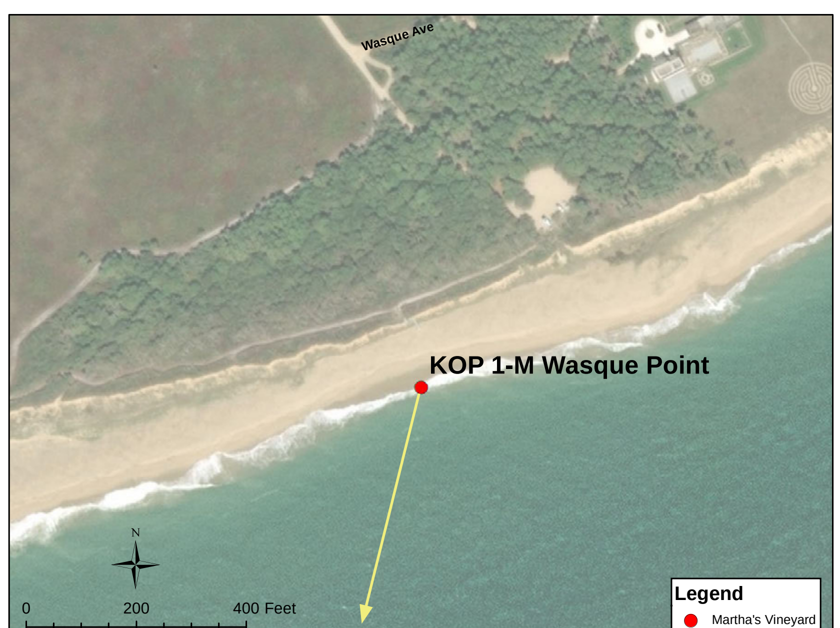
SIMULATED CONDITIONS



REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 15 mi / 24 km
Furthest Visible WTG: 43 mi / 70 km
Potential Number of Structures Visible: 593
Potential Number of Structures Not Visible: 321

PHOTOGRAPH AND SITE

Time of photograph: 9:01AM
Date of photograph: 6-25-20
L/SCA: Ocean Beach, Costal Scrub, Rural/Residential
Viewing direction: South (194°)
Latitude: 41.351077°N
Longitude: 70.454821°W
Lighting Direction: Backlit diffused

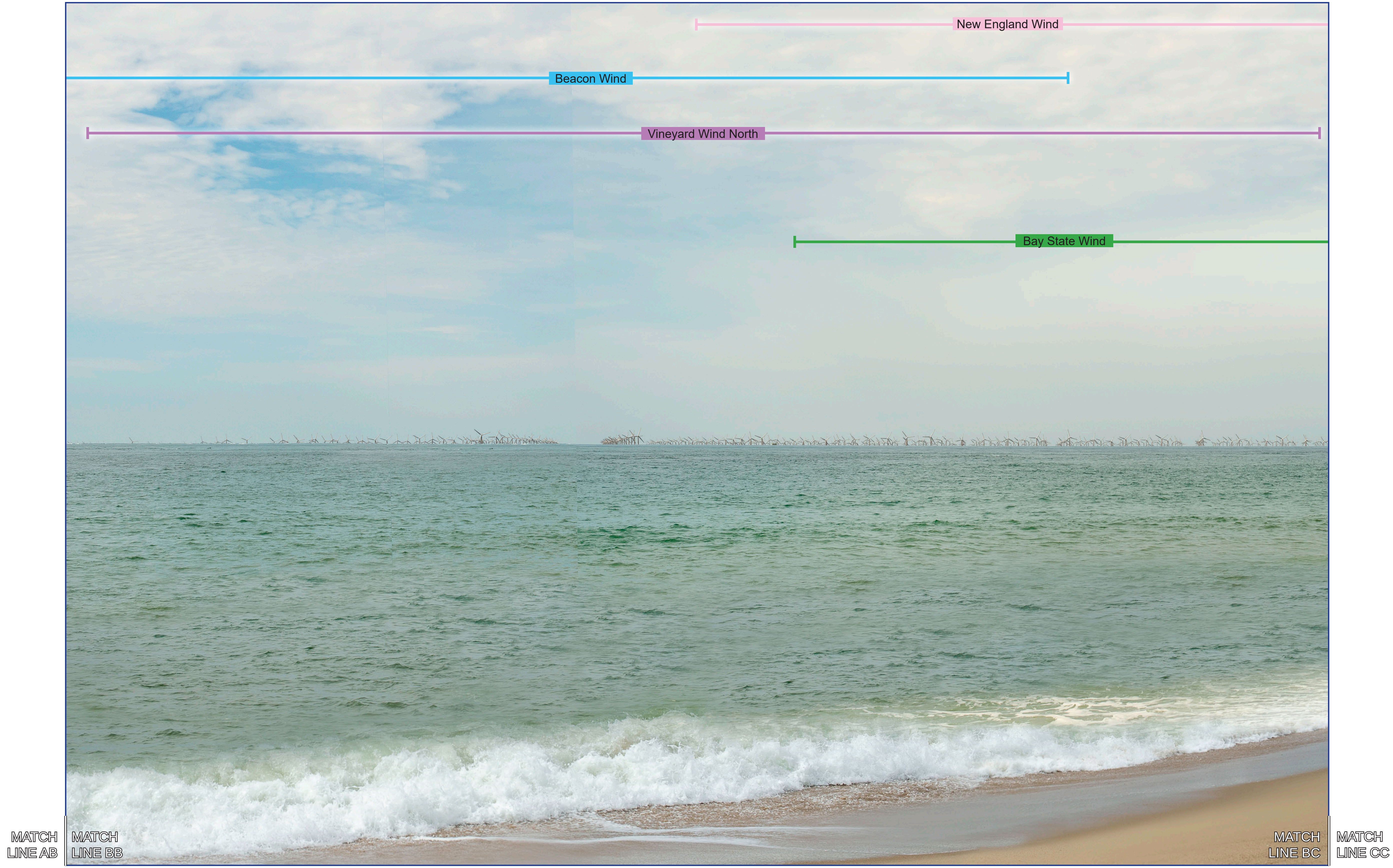
ENVIRONMENT

Temperature: 77° F
Humidity: 58%
Wind Dir & Speed: SSW 14mph
Weather Condition: Cloudy

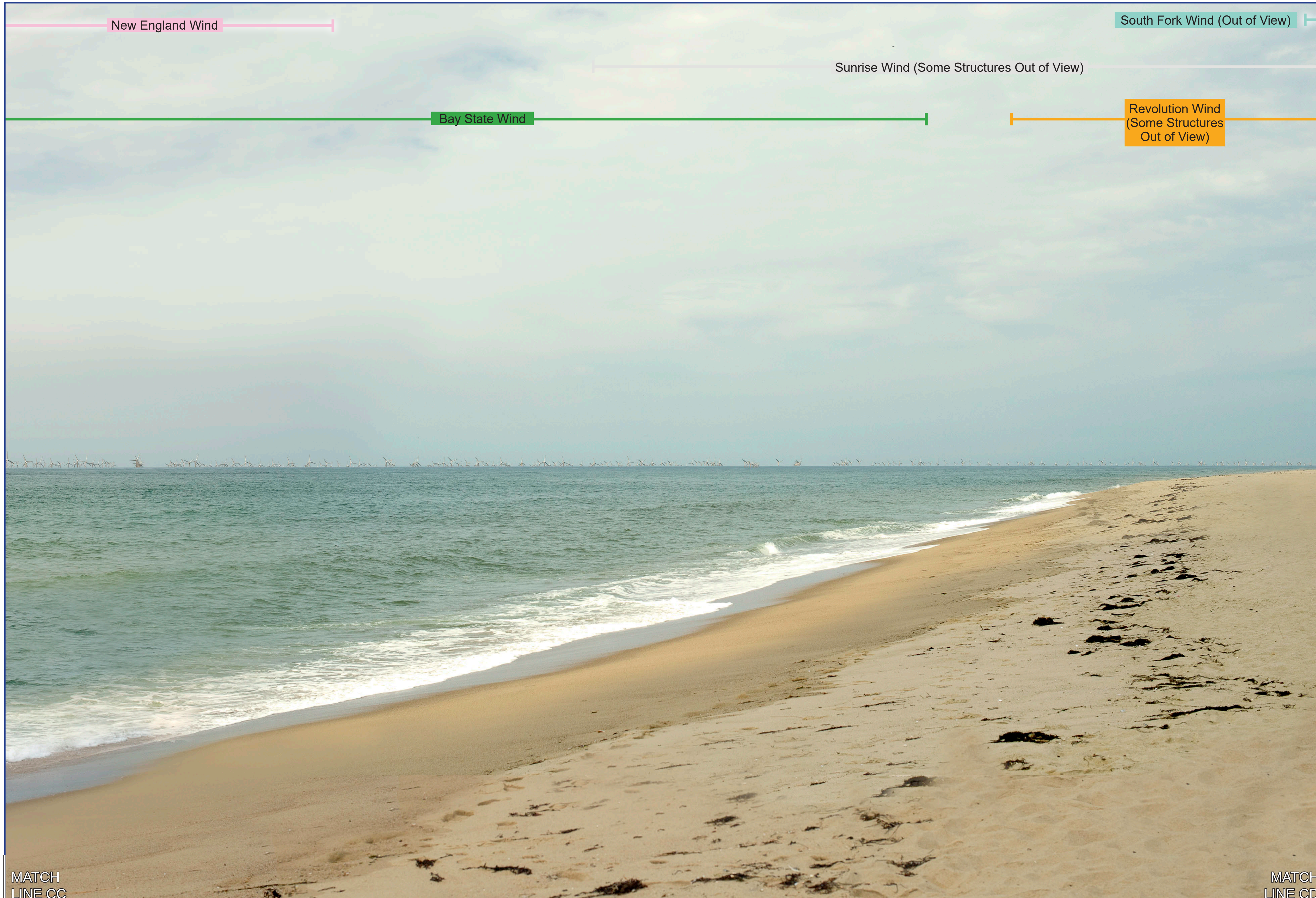
CAMERA

Camera Elevation: 6.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .



The page should viewed at 11" x 17" approximately 15" from viewer's eyes .



MATCH LINE BC

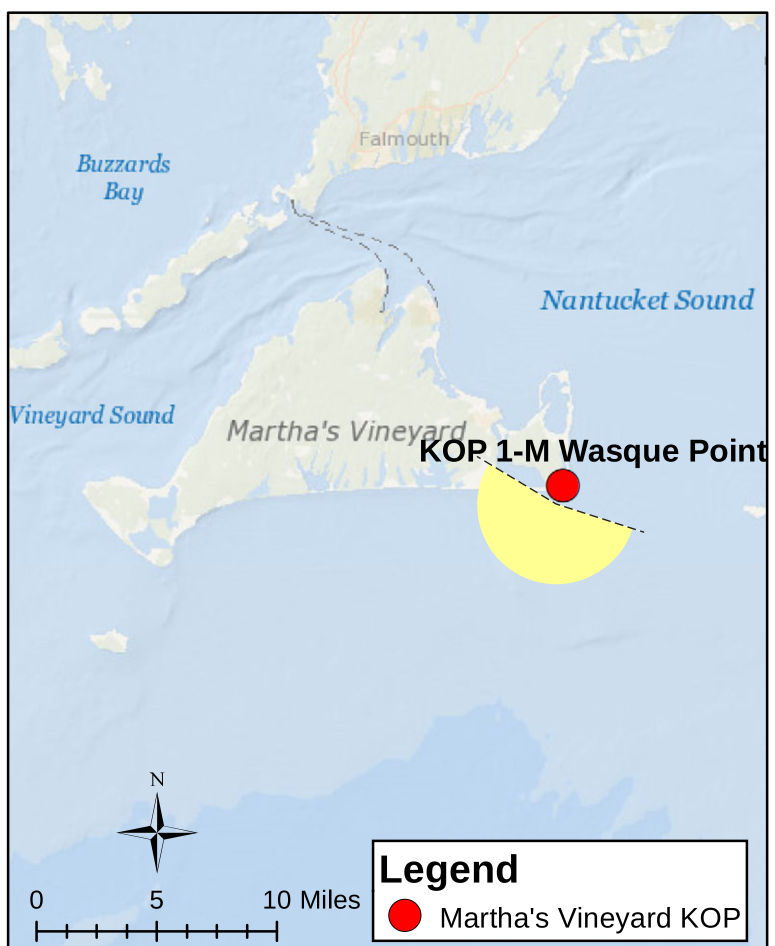
MATCH LINE B

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

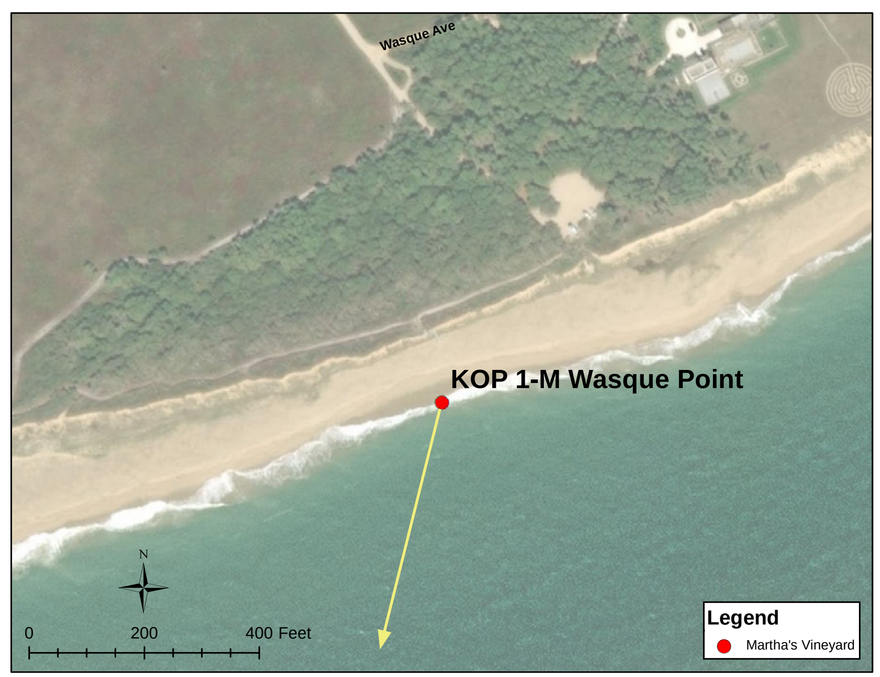
KOP 1-MV Wasque Point - Scenario 5

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 31 mi / 50 km
Furthest Visible WTG: 43 mi / 69 km
Potential Number of Structures Visible: 86
Potential Number of Structures Not Visible: 63

PHOTOGRAPH AND SITE

Time of photograph: 9:01AM
Date of photograph: 6-25-20
L/SCA: Ocean Beach, Costal Scrub, Rural/Residential
Viewing direction: South (194°)
Latitude: 41.351077°N
Longitude: 70.454821°W
Lighting Direction: Backlit diffused

ENVIRONMENT

Temperature: 77° F
Humidity: 58%
Wind Dir & Speed: SSW 14mph
Weather Condition: Cloudy

CAMERA

Camera Elevation: 20.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

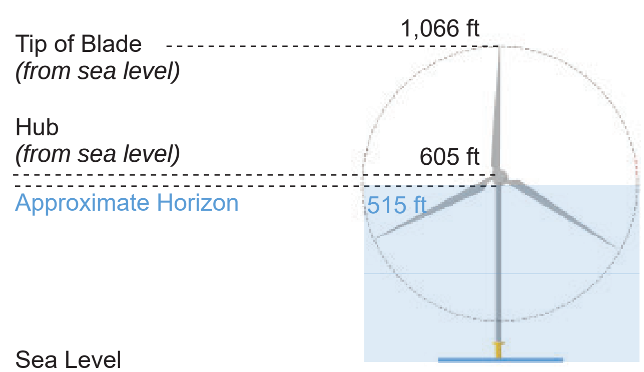
KOP 1-MV Wasque Point - Scenario 5

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

Mayflower Wind (OCS-A 0521)

919 ft rotor diameter



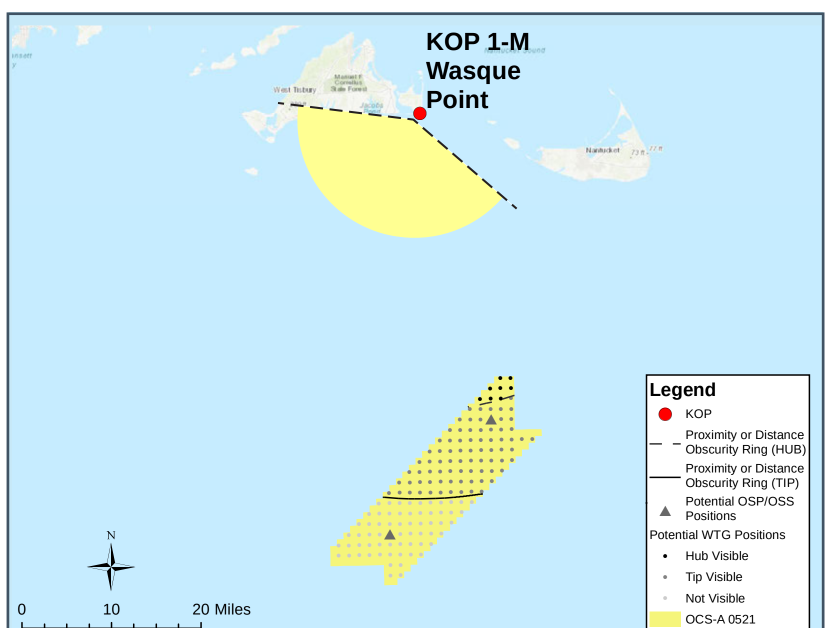
	Mayflower Wind (OCS-A 0521)
Year Forecasted for Development	2025
Number of Structures in Lease Area	149
Number of Structures within View of KOP	86
Distance to Closest Structure	20.92 mi (33.66 km)
Distance to Furthest Structure	42.84 mi (68.94 km)

KOP 1-MV Wasque Point - Scenario 5 (Human Field of View - 124°)

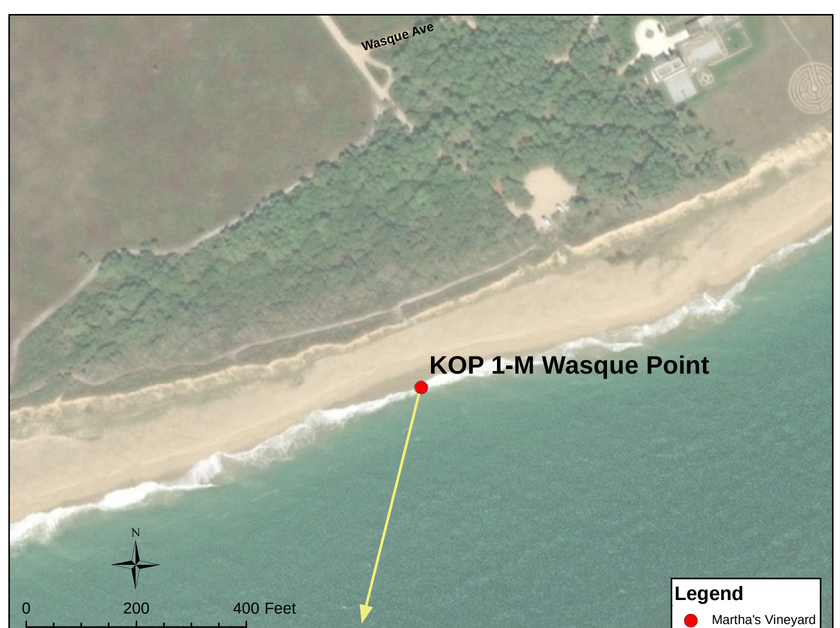
Martha's Vineyard

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 31 mi / 50 km
Furthest Visible WTG: 43 mi / 69 km
Potential Number of Structures Visible: 86
Potential Number of Structures Not Visible: 63

ENVIRONMENT

Temperature: 77° F
Humidity: 58%
Wind Dir & Speed: SSW 14mph
Weather Condition: Cloudy

PHOTOGRAPH AND SITE

Time of photograph: 9:01AM
Date of photograph: 6-25-20
L/SCA: Ocean Beach, Costal Scrub, Rural/Residential
Viewing direction: South (194°)
Latitude: 41.351077°N
Longitude: 70.454821°W
Lighting Direction: Backlit diffused

CAMERA

Camera Elevation: 20.5 ft / 6.3 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 1-MV Wasque Point - Scenario 5 (50mm view - 27° vertical / 40° horizontal) 2 of 3

SIMULATED CONDITIONS

MATCH LINE AB

MATCH LINE CC

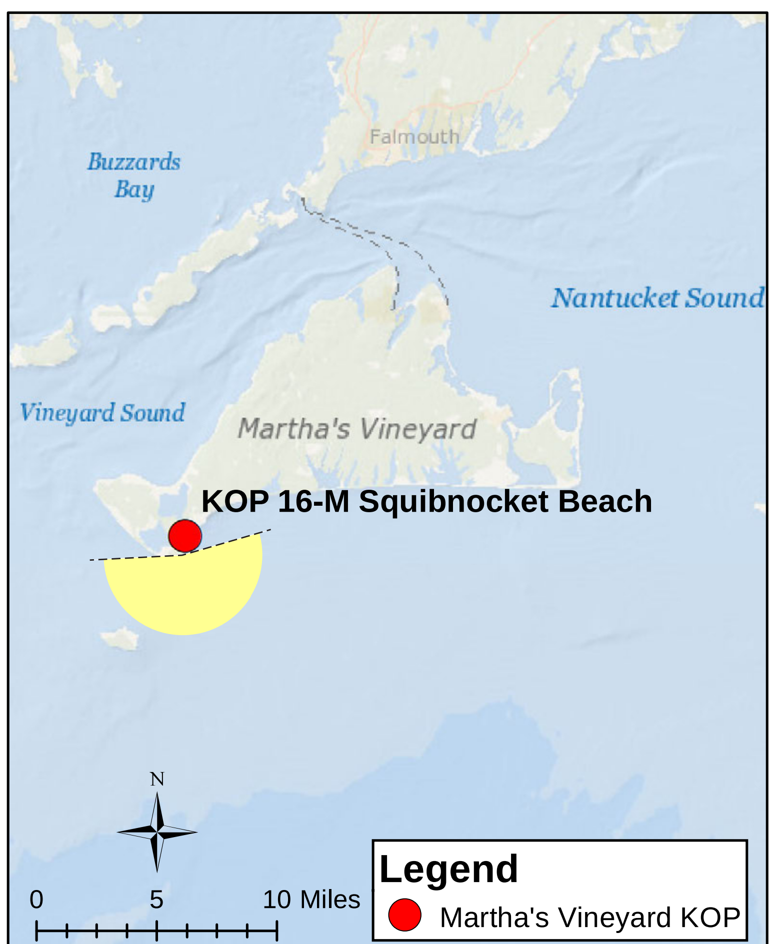
The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

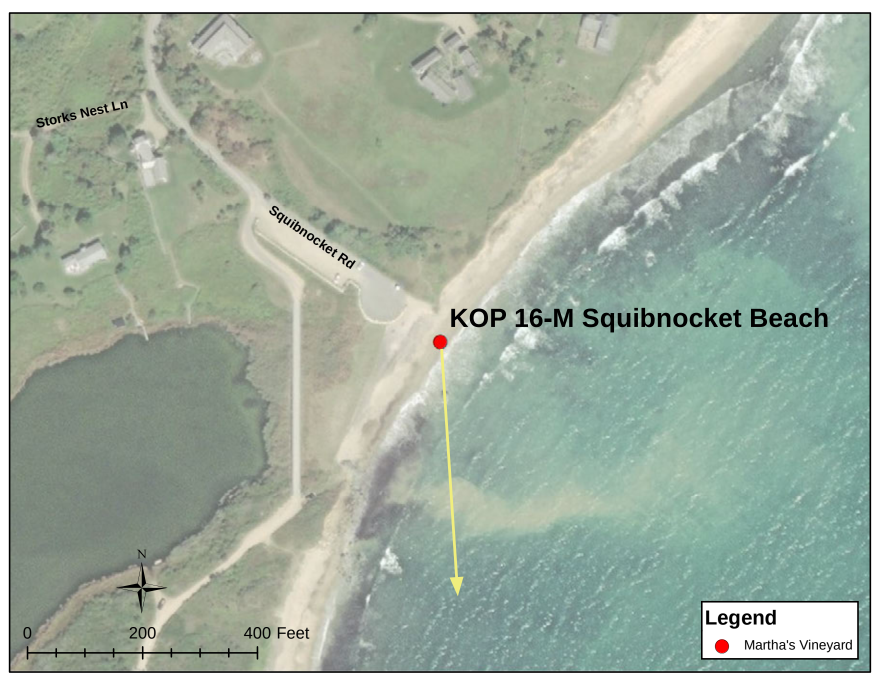
KOP 16-MV Squibnocket Beach - Scenario 1

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 13 mi / 22 km
Furthest Visible WTG: 39 mi / 63 km
Potential Number of Structures Visible: 191
Potential Number of Structures Not Visible: 258

ENVIRONMENT

Temperature: 65° F
Humidity: 78%
Wind Dir & Speed: SSW 16mph
Weather Condition: Hazy

PHOTOGRAPH AND SITE

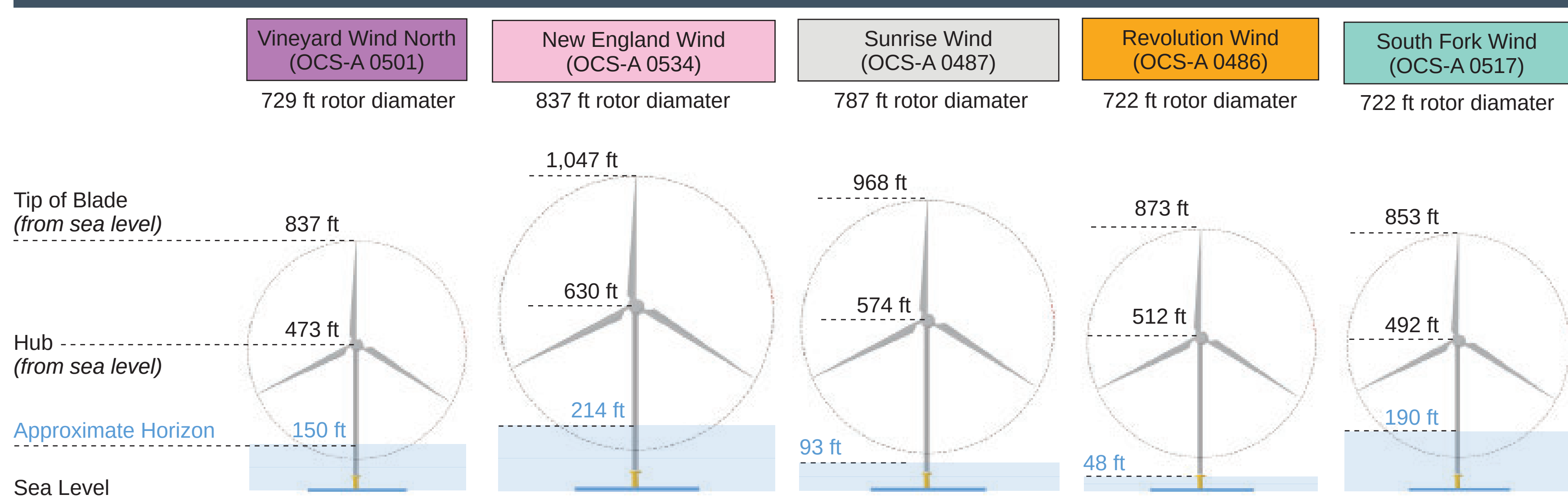
Time of photograph: 2:08PM
Date of photograph: 11-6-20
L/SCA: Ocean Beach, Open Ocean
Viewing direction: Southeast (176°)
Latitude: 41.318873°N
Longitude: 70.764908°W
Lighting Direction:Sidelit diffused

CAMERA

Camera Elevation: 16.5 ft / 5.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

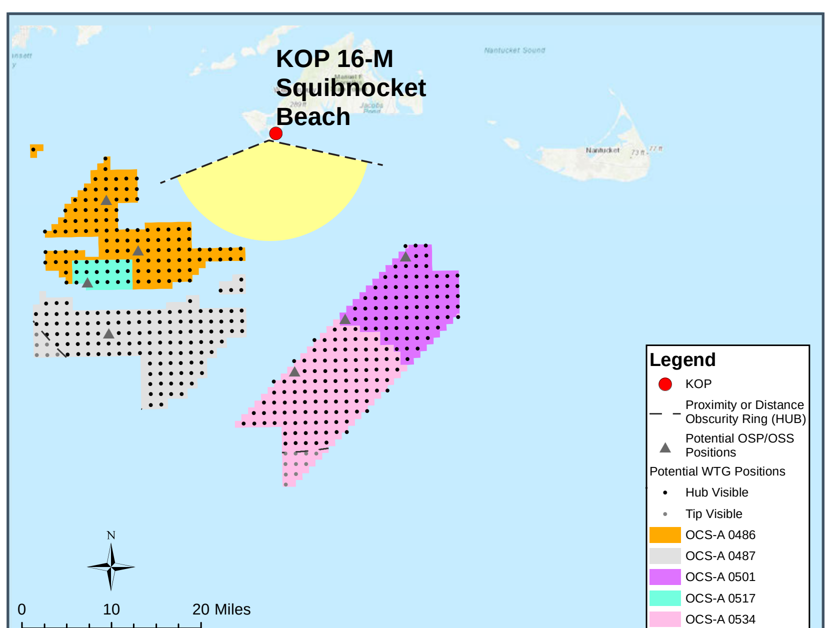


	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	77	120	131	103	18
Number of Structures within View of KOP	71	120	0	0	0
Distance to Closest Structure	20 mi (32 km)	23 mi (37 km)	17 mi (27 km)	13 mi (22 km)	22 mi (35 km)
Distance to Furthest Structure	29 mi (47 km)	39 mi (63 km)	36 mi (59 km)	30 mi (47 km)	28 mi (45 km)

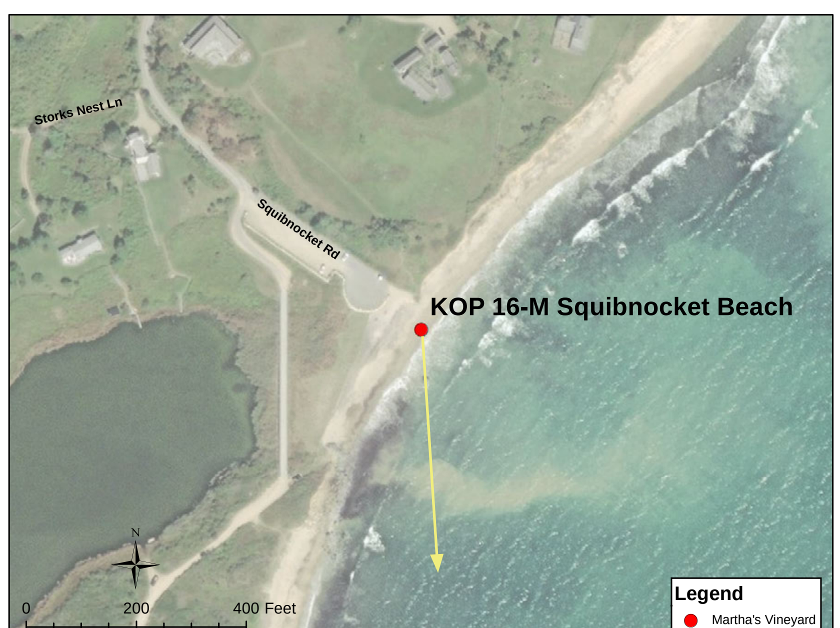
KOP 16-MV Squibnocket Beach - Scenario 1 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 13 mi / 22 km

Furthest Visible WTG: 39 mi / 63 km
Potential Number of Structures Visible: 191
Potential Number of Structures Not Visible: 258

ENVIRONMENT

Temperature: 65° F
Humidity: 78%
Wind Dir & Speed: SSW 16mph
Weather Condition: Hazy

PHOTOGRAPH AND SITE

Time of photograph: 2:08PM
Date of photograph: 11-6-20
L/SCA: Ocean Beach, Open Ocean

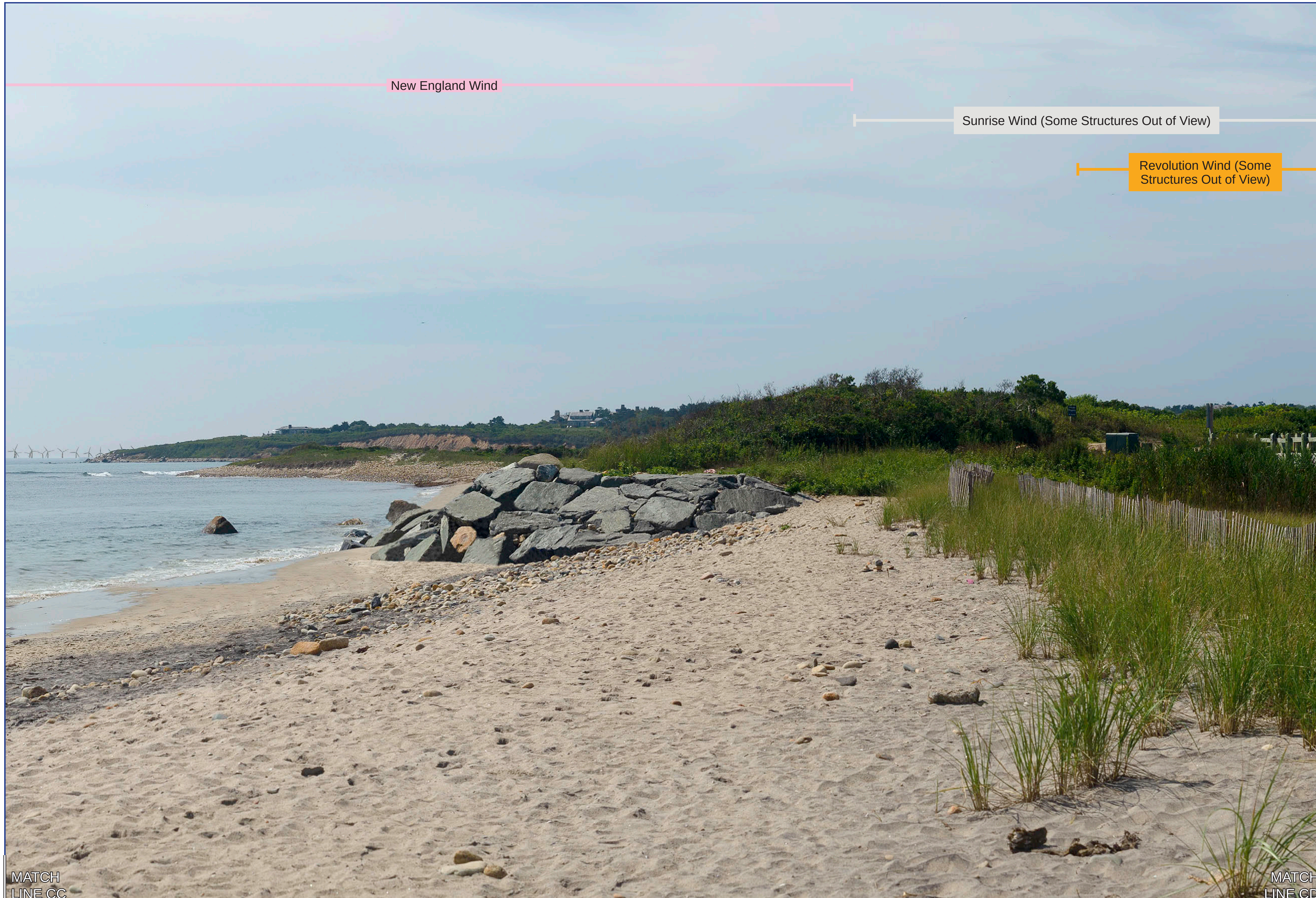
Viewing direction: Southeast (176°)
Latitude: 41.318873°N
Longitude: 70.764908°W
Lighting Direction:Sidelit diffused

CAMERA

Camera Elevation: 16.5 ft / 5.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

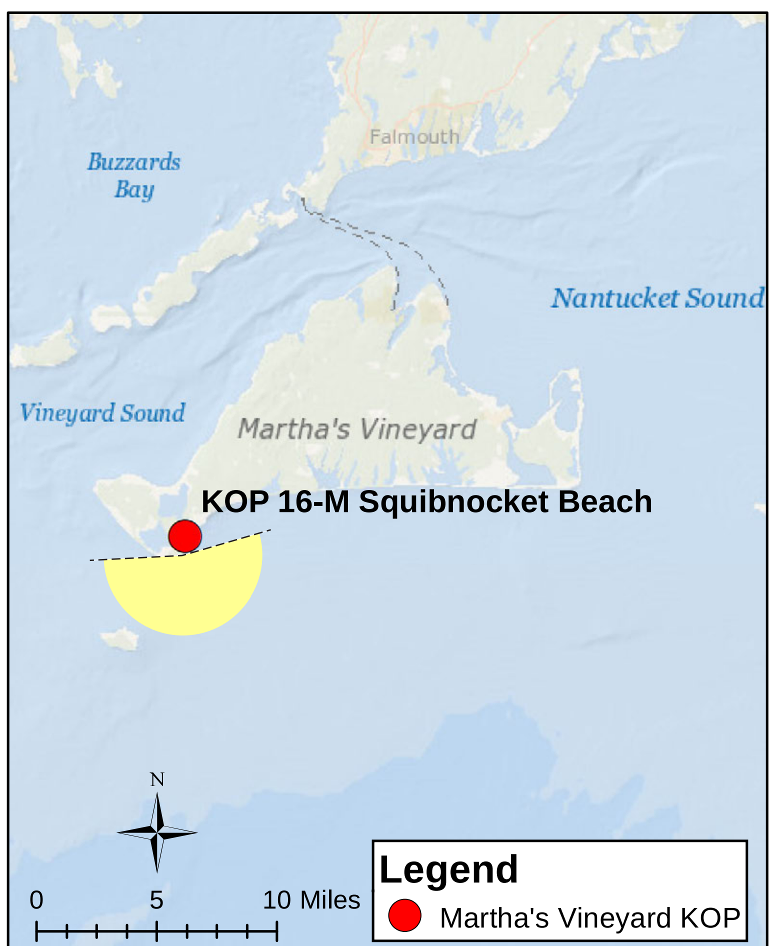


The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

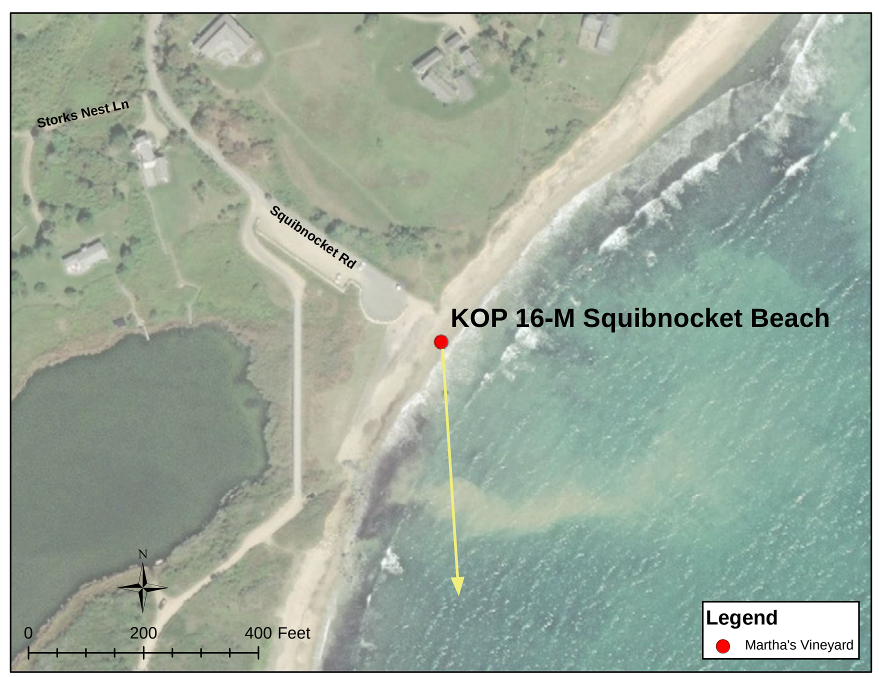
KOP 16-MV Squibnocket Beach - Scenario 2

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 12 mi / 20 km
Furthest Visible WTG: 45 mi / 72 km
Potential Number of Structures Visible: 239
Potential Number of Structures Not Visible: 359

PHOTOGRAPH AND SITE

Time of photograph: 2:08PM
Date of photograph: 11-6-20
L/SCA: Ocean Beach, Open Ocean
Viewing direction: Southeast (176°)
Latitude: 41.318873°N
Longitude: 70.764908°W
Lighting Direction:Sidelit diffused

ENVIRONMENT

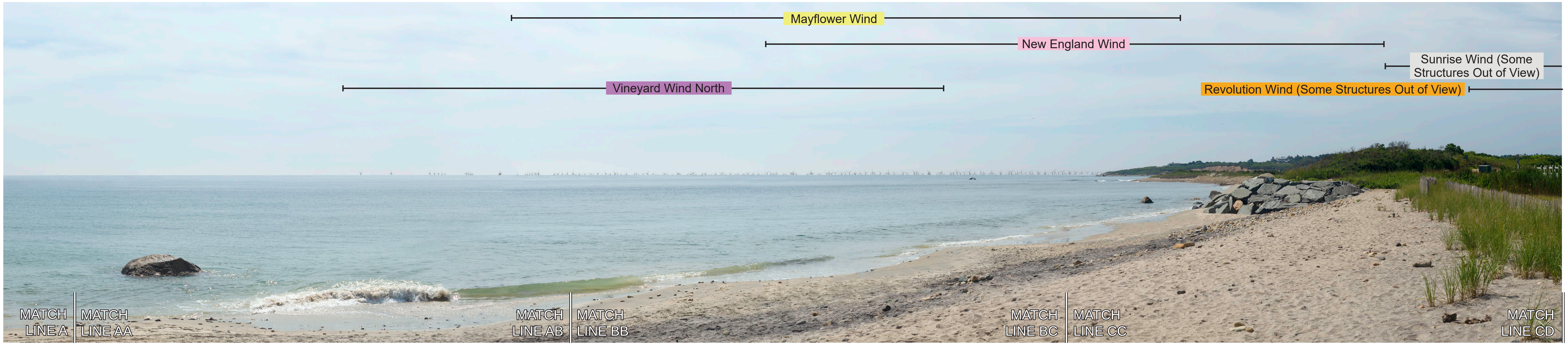
Temperature: 65° F
Humidity: 78%
Wind Dir & Speed: SSW 16mph
Weather Condition: Hazy

CAMERA

Camera Elevation: 16.5 ft / 5.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

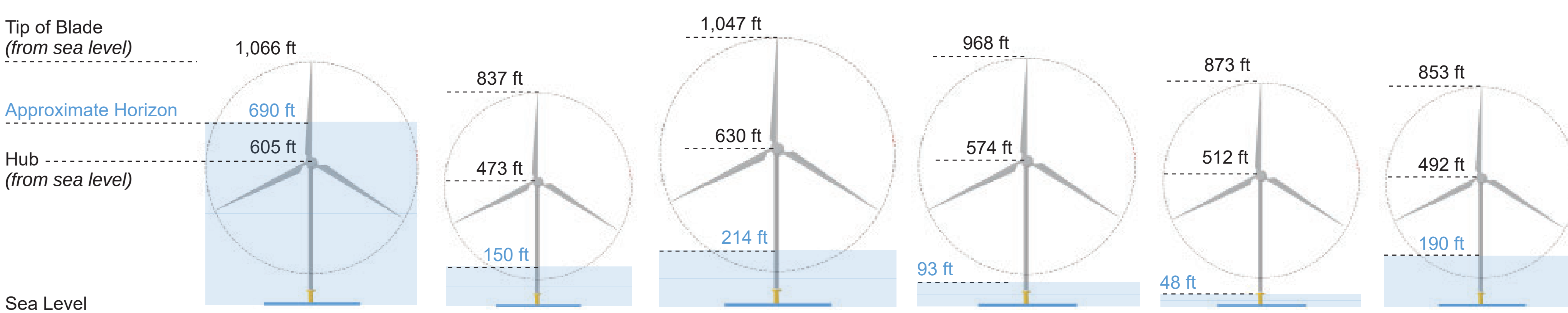
KOP 16-MV Squibnocket Beach - Scenario 2

SIMULATED CONDITIONS



VISIBILTY OF CLOSEST TURBINES

	Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
	919 ft rotor diamater	729 ft rotor diamater	837 ft rotor diamater	787 ft rotor diamater	722 ft rotor diamater	722 ft rotor diamater

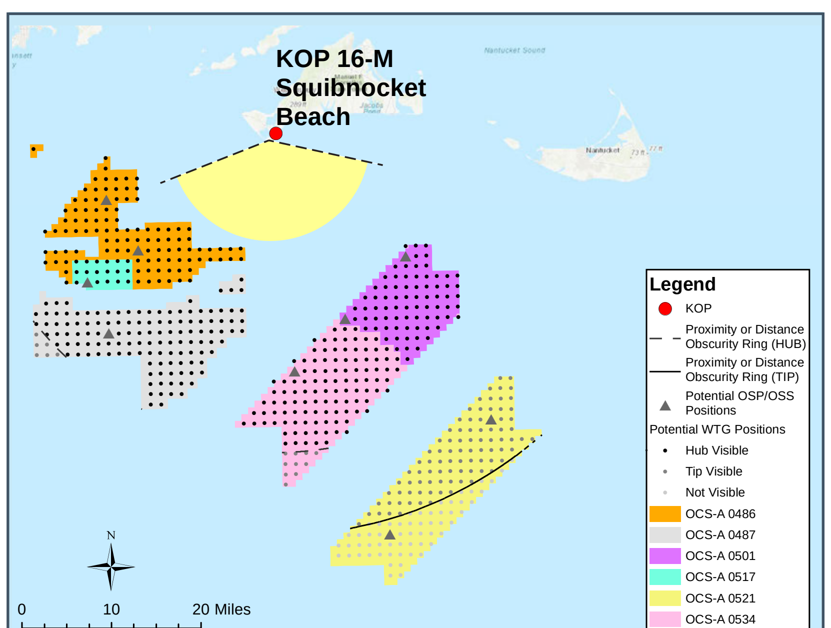


	Mayflower Wind	Vineyard Wind North	New England Wind	Sunrise Wind	Revolution Wind	South Fork Wind
Year Forecasted for Development	2025	2023	2024 Phase II 2026	2025	2023	2023
Number of Structures in Lease Area	149	77	120	131	103	18
Number of Structures within View of KOP	90	77	72	0	0	0
Distance to Closest Structure	37 mi (60 km)	20 mi (32 km)	23 mi (37 km)	17 mi (27 km)	13 mi (22 km)	22 mi (35 km)
Distance to Furthest Structure	45 mi (72 km)	29 mi (47 km)	39 mi (63 km)	36 mi (59 km)	30 mi (47 km)	28 mi (45 km)

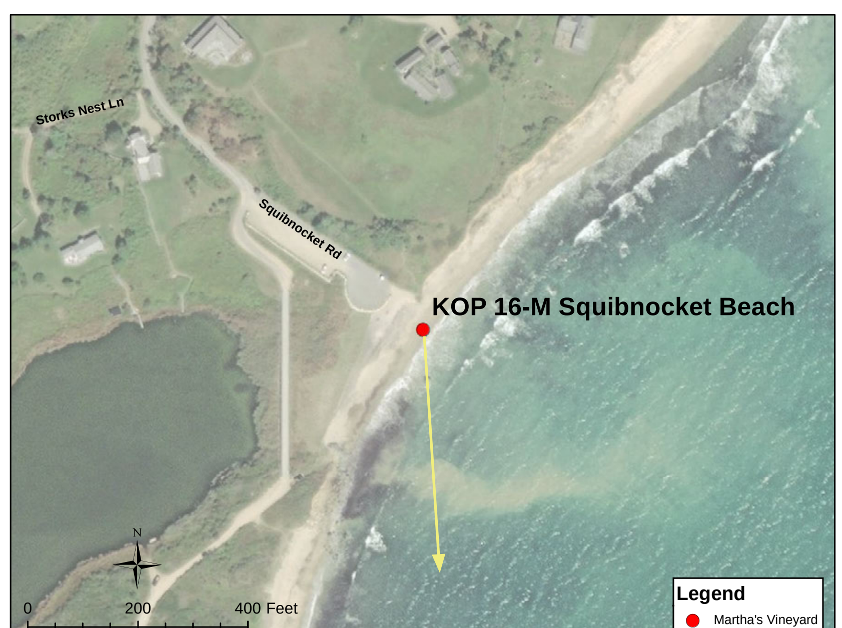
KOP 16-MV Squibnocket Beach - Scenario 2 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 12 mi / 20 km
Furthest Visible WTG: 45 mi / 72 km
Potential Number of Structures Visible: 239
Potential Number of Structures Not Visible: 359

ENVIRONMENT

Temperature: 65° F
Humidity: 78%
Wind Dir & Speed: SSW 16mph
Weather Condition: Hazy

PHOTOGRAPH AND SITE

Time of photograph: 2:08PM
Date of photograph: 11-6-20
L/SCA: Ocean Beach, Open Ocean
Viewing direction: Southeast (176°)
Latitude: 41.318873°N
Longitude: 70.764908°W
Lighting Direction:Sidelit diffused

CAMERA

Camera Elevation: 16.5 ft / 5.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

MATCH LINE A

MATCH LINE BB

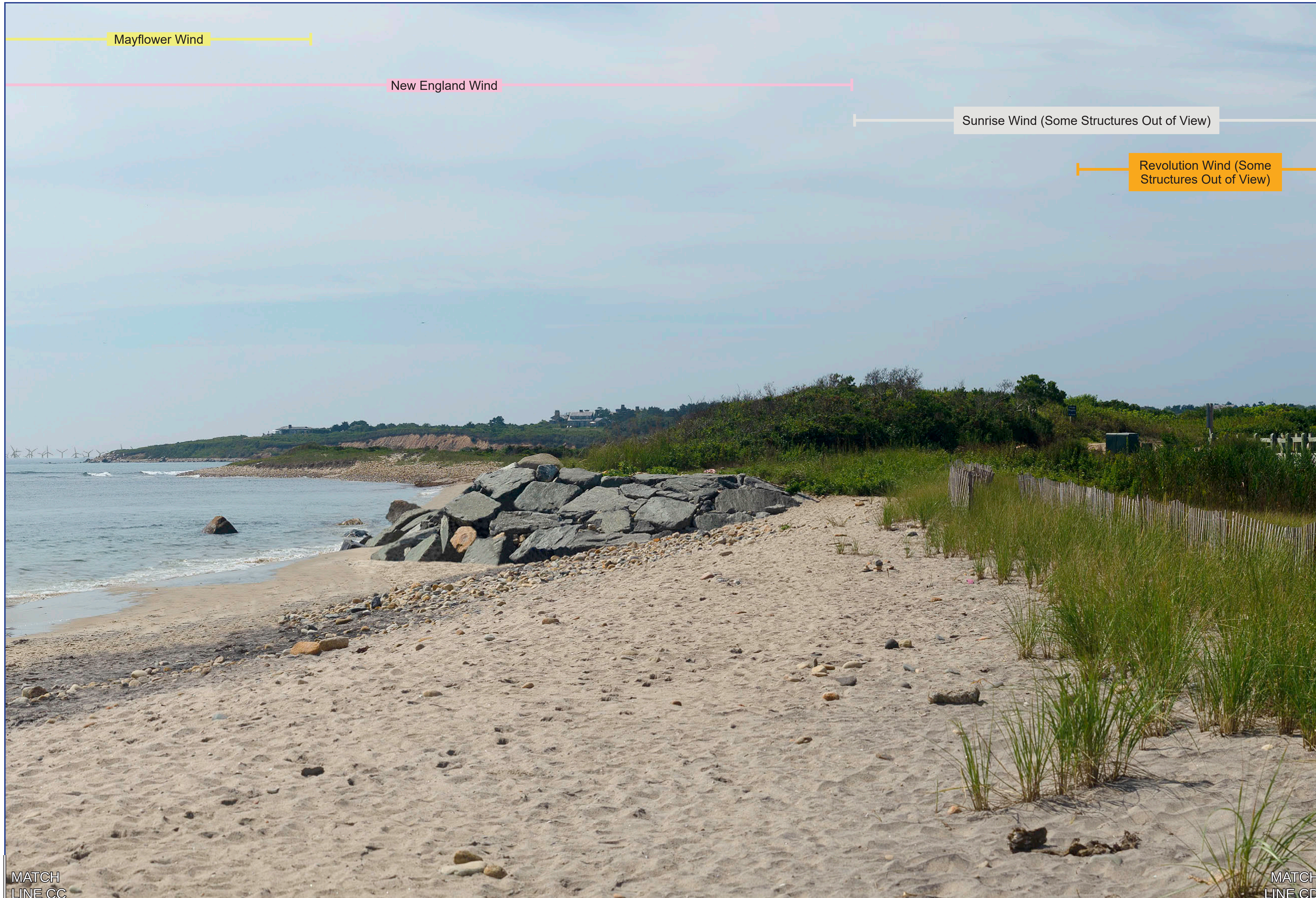
The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

MATCH LINE AB

MATCH LINE CC

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

SIMULATED CONDITIONS



MATCH LINE BC

MATCH LINE B

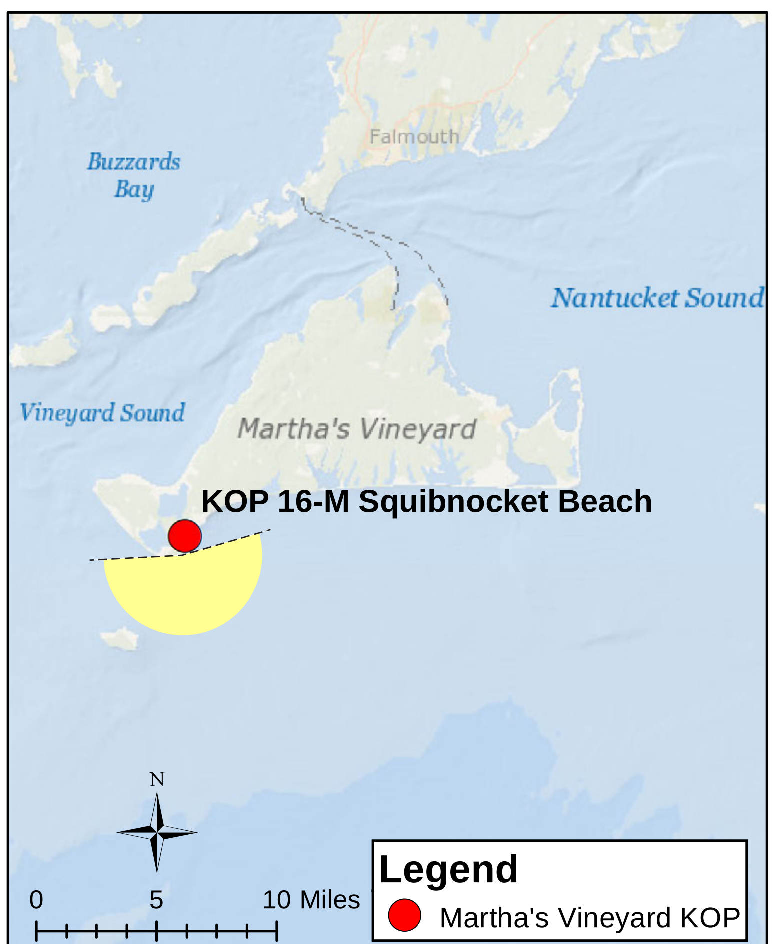
The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 16-MV Squibnocket Beach - Scenario 3

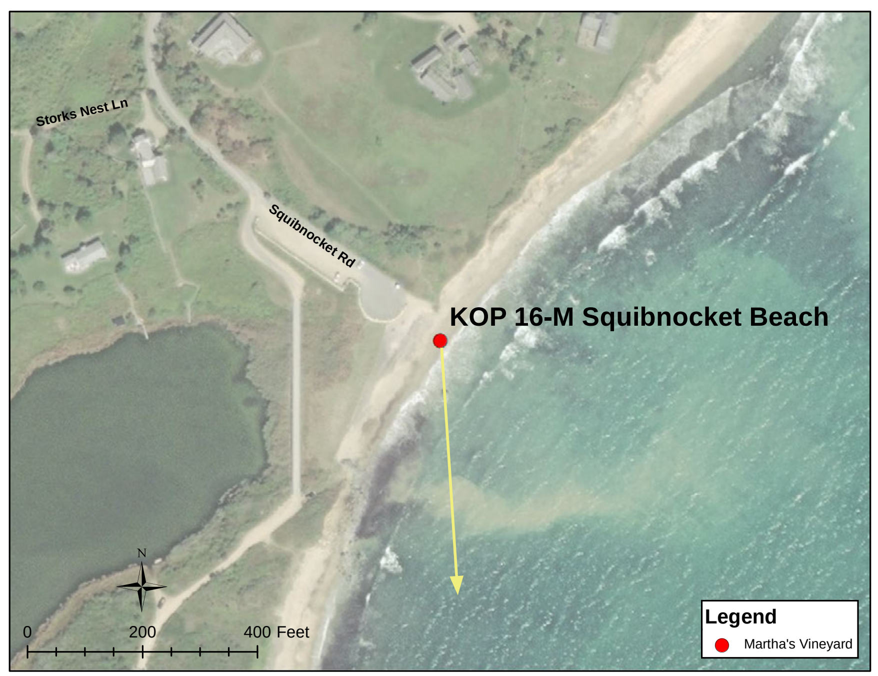
Martha's Vineyard

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 13 mi / 22 km
Furthest Visible WTG: 45 mi / 72 km
Potential Number of Structures Visible: 425
Potential Number of Structures Not Visible: 638

PHOTOGRAPH AND SITE

Time of photograph: 2:08PM
Date of photograph: 11-6-20
L/SCA: Ocean Beach, Open Ocean
Viewing direction: Southeast (176°)
Latitude: 41.318873°N
Longitude: 70.764908°W
Lighting Direction:Sidelit diffused

ENVIRONMENT

Temperature: 65° F
Humidity: 78%
Wind Dir & Speed: SSW 16mph
Weather Condition: Hazy

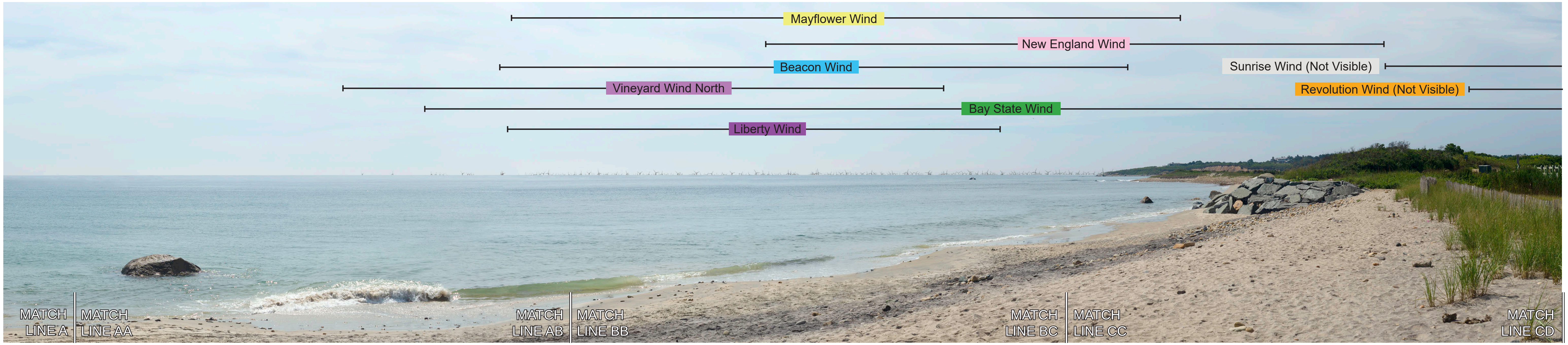
CAMERA

Camera Elevation: 16.5 ft / 5.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

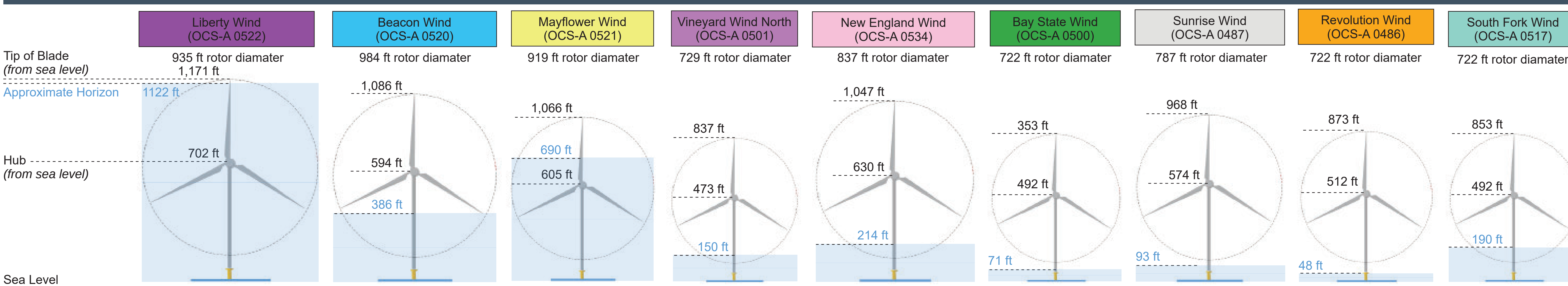
KOP 16-MV Squibnocket Beach - Scenario 3

Martha's Vineyard

SIMULATED CONDITIONS



VISIBILTY OF CLOSEST TURBINES



	Liberty Wind (OCS-A 0522)	Beacon Wind (OCS-A 0520)	Mayflower Wind (OCS-A 0521)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Bay State Wind (OCS-A 0500)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2025-2030	2025-2030	2025	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	149	77	120	169	131	103	18
Number of Structures within View of KOP	1	127	90	77	72	58	0	0	0
Distance to Closest Structure	46 mi (73 km)	29 mi (47 km)	37 mi (60 km)	20 mi (32 km)	23 mi (37 km)	15 mi (25 km)	17 mi (27 km)	13 mi (22 km)	22 mi (35 km)
Distance to Furthest Structure	60 mi (97 km)	41 mi (65 km)	45 mi (72 km)	29 mi (47 km)	39 mi (63 km)	40 mi (64 km)	36 mi (59 km)	30 mi (47 km)	28 mi (45 km)

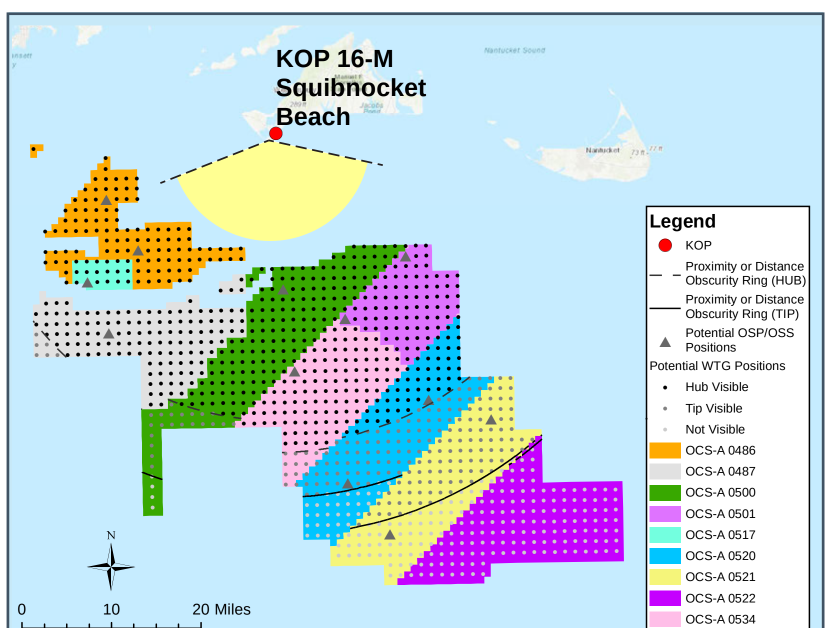
KOP 16-MV Squibnocket Beach - Scenario 3 (Human Field of View - 124°)

Martha's Vineyard

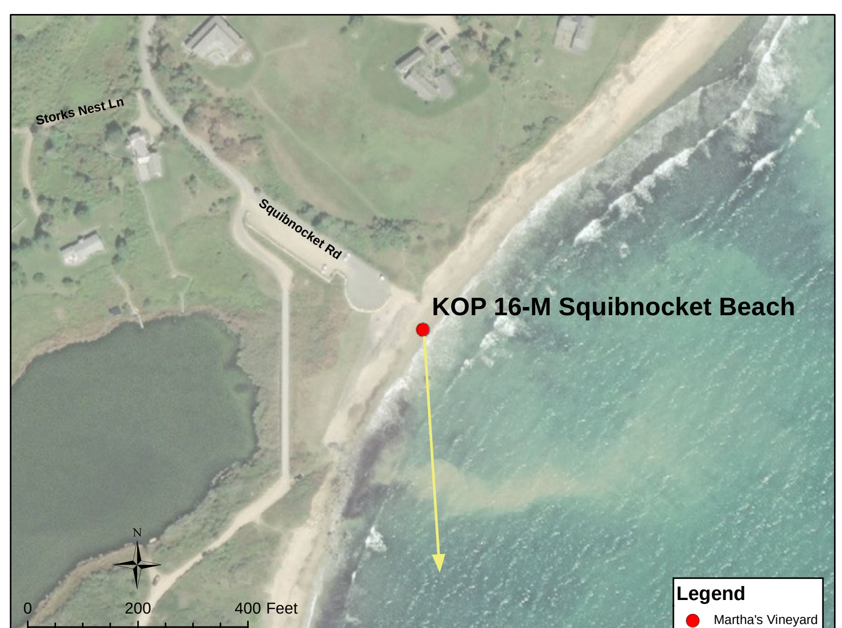
SIMULATED CONDITIONS

3

REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 124°
Vertical Field of View: 40°
Nearest WTG: 13 mi / 22 km
Furthest Visible WTG: 45 mi / 72 km
Potential Number of Structures Visible: 425
Potential Number of Structures Not Visible: 638

ENVIRONMENT

Temperature: 65° F
Humidity: 78%
Wind Dir & Speed: SSW 16mph
Weather Condition: Hazy

PHOTOGRAPH AND SITE

Time of photograph: 2:08PM
Date of photograph: 11-6-20
L/SCA: Ocean Beach, Open Ocean
Viewing direction: Southeast (176°)
Latitude: 41.318873°N
Longitude: 70.764908°W
Lighting Direction:Sidelit diffused

CAMERA

Camera Elevation: 16.5 ft / 5.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

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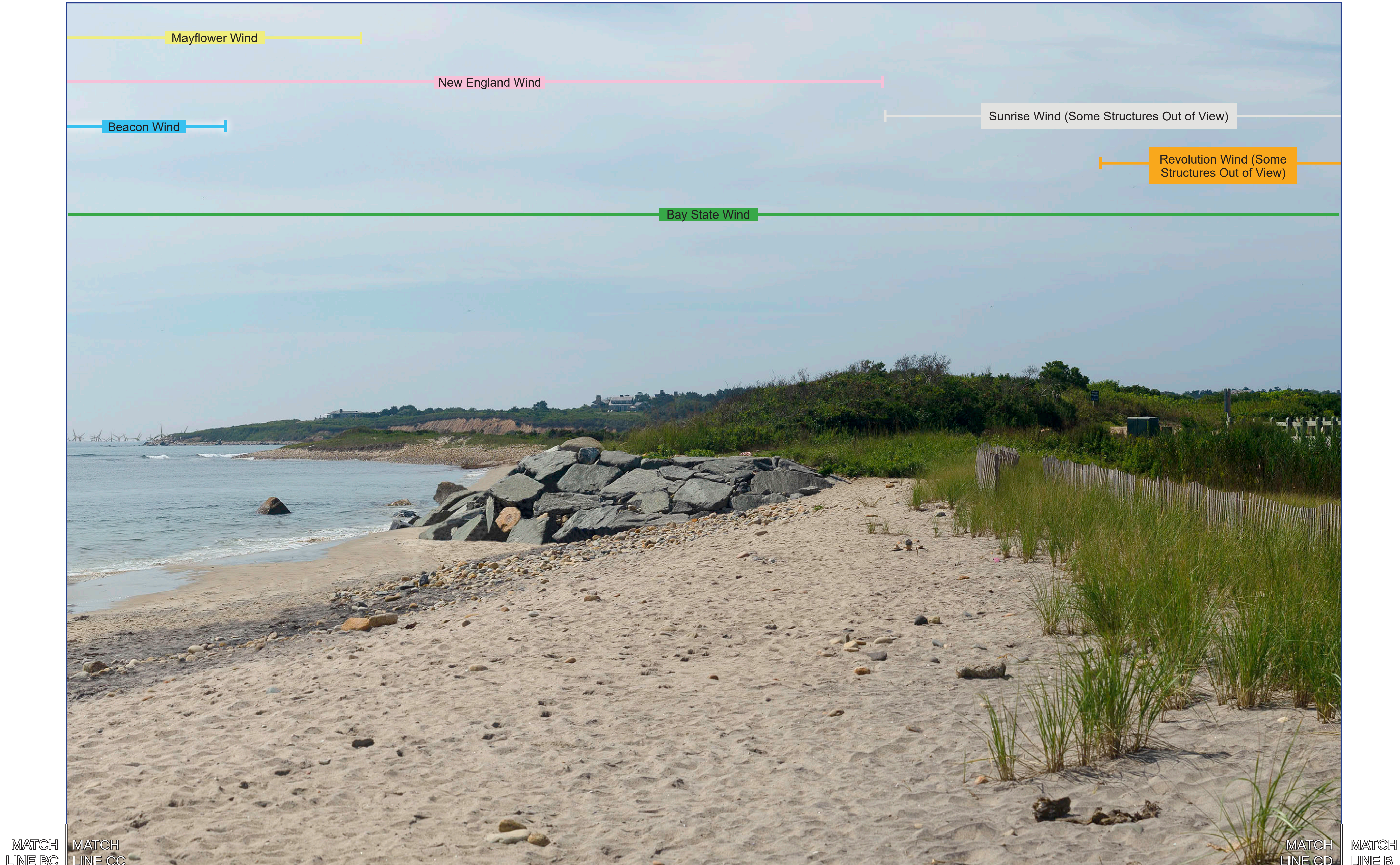


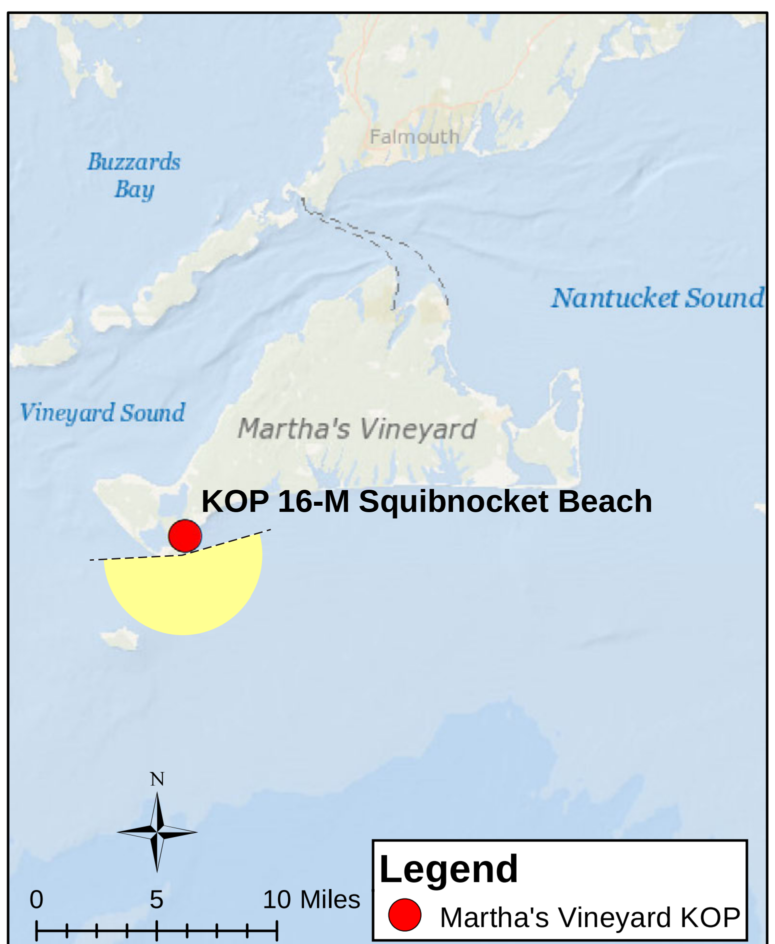
The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

KOP 16-MV Squibnocket - Scenario 4

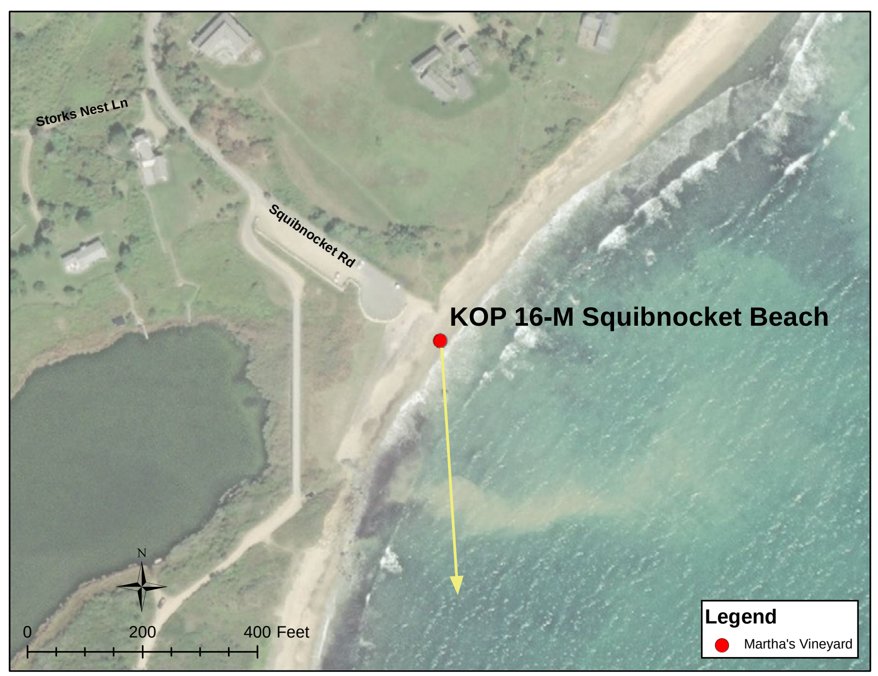
Martha's Vineyard

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 13 mi / 22 km
Furthest Visible WTG: 45 mi / 72 km
Potential Number of Structures Visible: 335
Potential Number of Structures Not Visible: 579

PHOTOGRAPH AND SITE

Time of photograph: 2:08PM
Date of photograph: 11-6-20
L/SCA: Ocean Beach, Open Ocean
Viewing direction: Southeast (176°)
Latitude: 41.318873°N
Longitude: 70.764908°W
Lighting Direction:Sidelit diffused

ENVIRONMENT

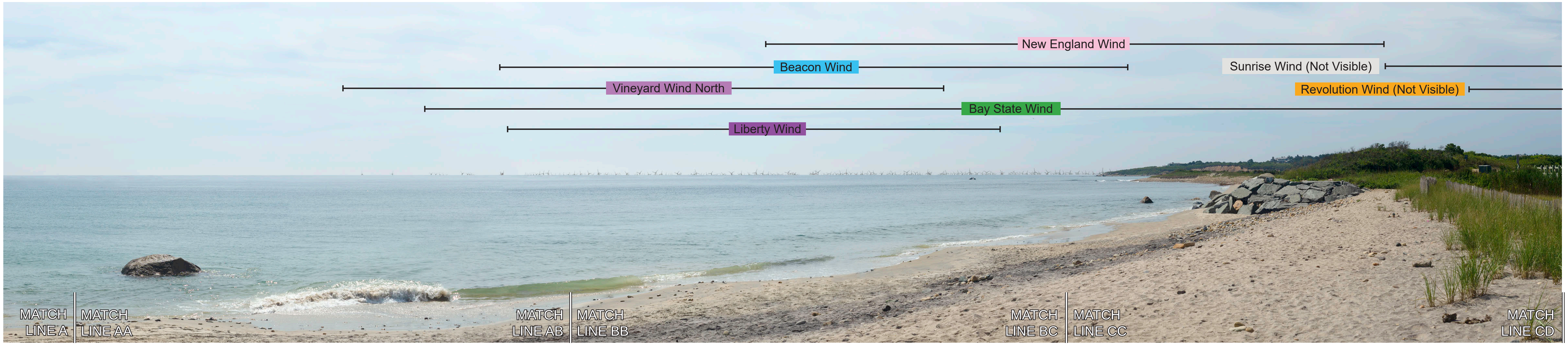
Temperature: 65° F
Humidity: 78%
Wind Dir & Speed: SSW 16mph
Weather Condition: Hazy

CAMERA

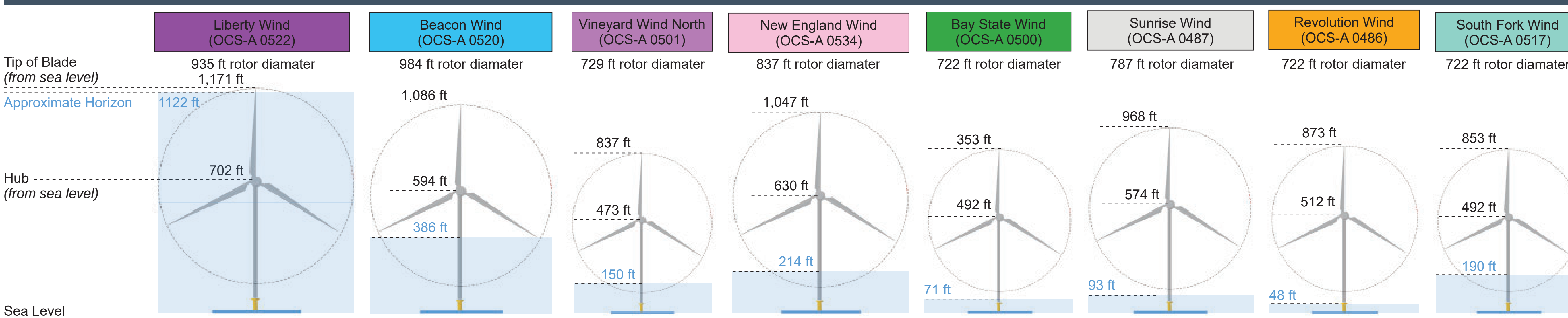
Camera Elevation: 16.5 ft / 5.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

KOP 16-MV Squibnocket - Scenario 4

SIMULATED CONDITIONS



VISIBILTY OF CLOSEST TURBINES

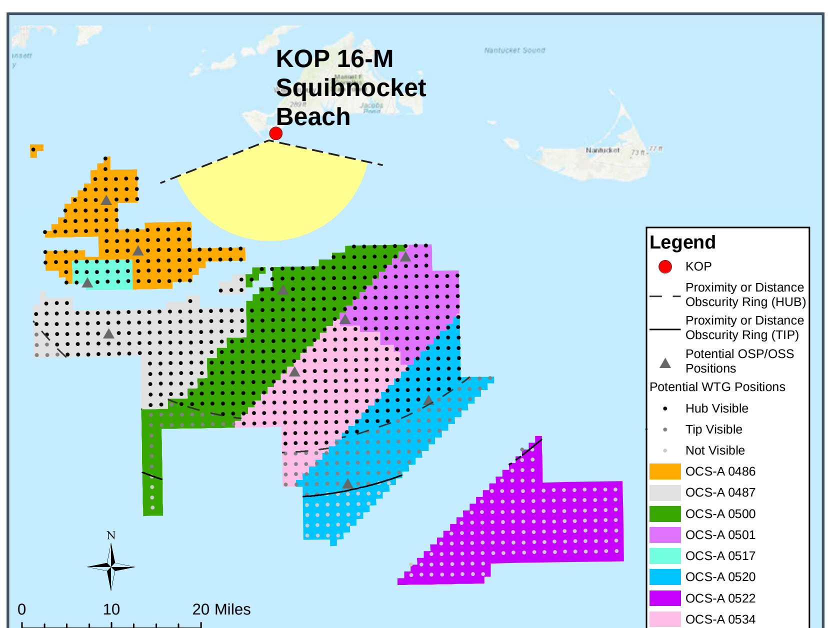


	Liberty Wind (OCS-A 0522)	Beacon Wind (OCS-A 0520)	Vineyard Wind North (OCS-A 0501)	New England Wind (OCS-A 0534)	Bay State Wind (OCS-A 0500)	Sunrise Wind (OCS-A 0487)	Revolution Wind (OCS-A 0486)	South Fork Wind (OCS-A 0517)
Year Forecasted for Development	2025-2030	2025-2030	2023	2024 Phase II 2026	2025-2030	2025	2023	2023
Number of Structures in Lease Area	139	157	77	120	169	131	103	18
Number of Structures within View of KOP	1	127	77	72	58	0	0	0
Distance to Closest Structure	46 mi (73 km)	29 mi (47 km)	20 mi (32 km)	23 mi (37 km)	15 mi (25 km)	17 mi (27 km)	13 mi (22 km)	22 mi (35 km)
Distance to Furthest Structure	60 mi (97 km)	41 mi (65 km)	29 mi (47 km)	39 mi (63 km)	40 mi (64 km)	36 mi (59 km)	30 mi (47 km)	28 mi (45 km)

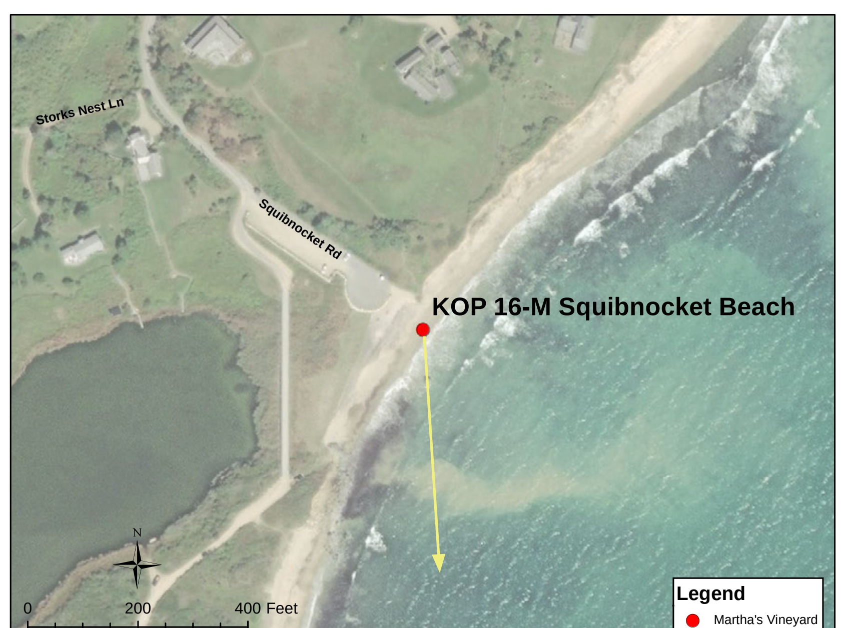
KOP 16-MV Squibnocket - Scenario 4 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP



PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 13 mi / 22 km

Furthest Visible WTG: 45 mi / 72 km
Potential Number of Structures Visible: 335
Potential Number of Structures Not Visible: 579

ENVIRONMENT

Temperature: 65° F
Humidity: 78%
Wind Dir & Speed: SSW 16mph
Weather Condition: Hazy

PHOTOGRAPH AND SITE

Time of photograph: 2:08PM
Date of photograph: 11-6-20
L/SCA: Ocean Beach, Open Ocean

Viewing direction: Southeast (176°)
Latitude: 41.318873°N
Longitude: 70.764908°W
Lighting Direction:Sidelit diffused

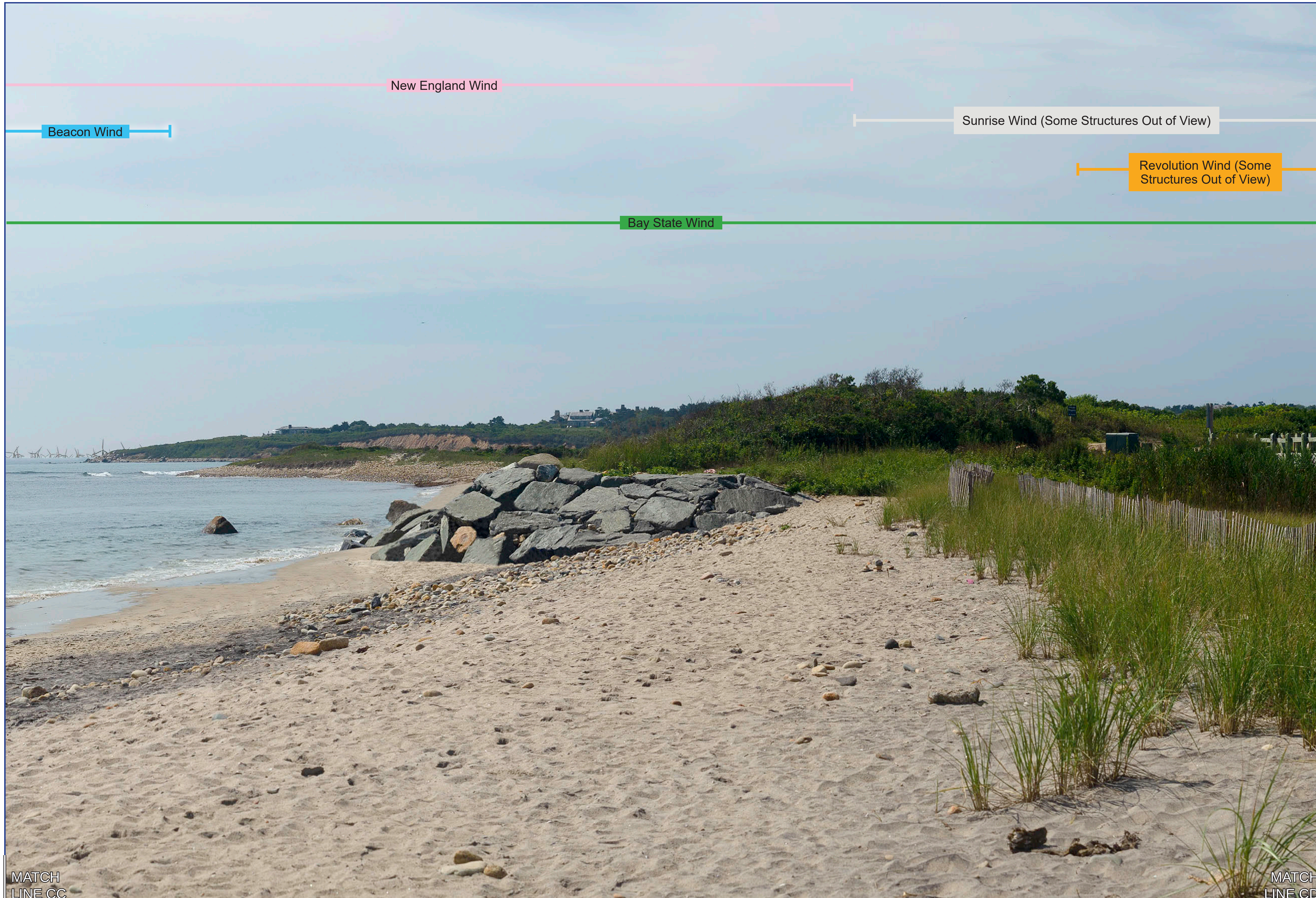
CAMERA

Camera Elevation: 16.5 ft / 5.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

MATCH LINE BC



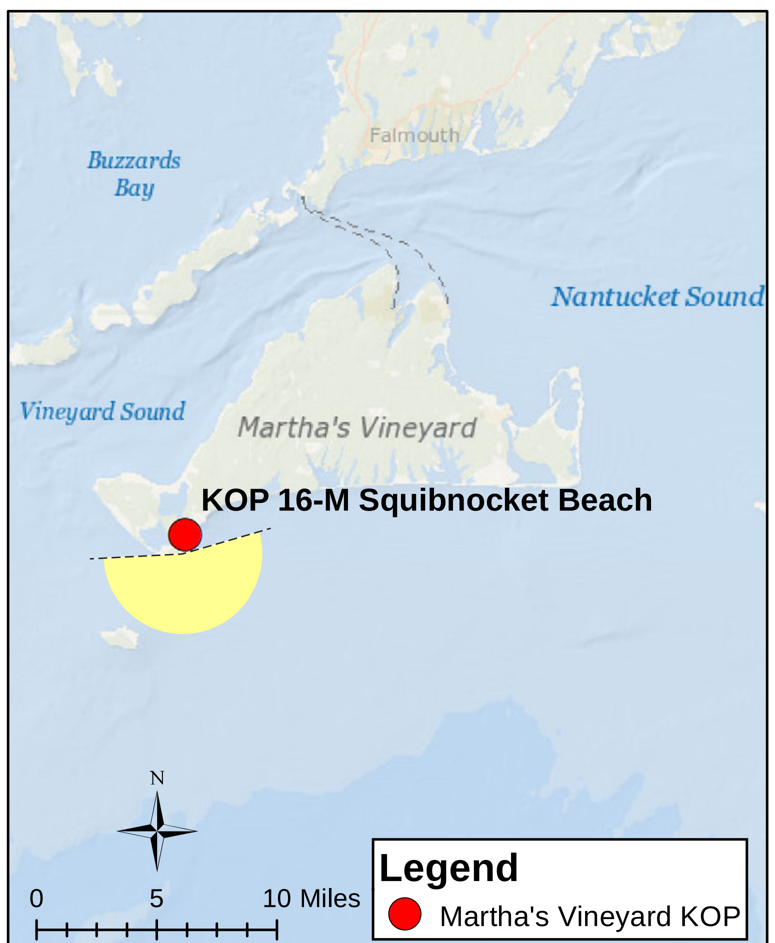
MATCH LINE B

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

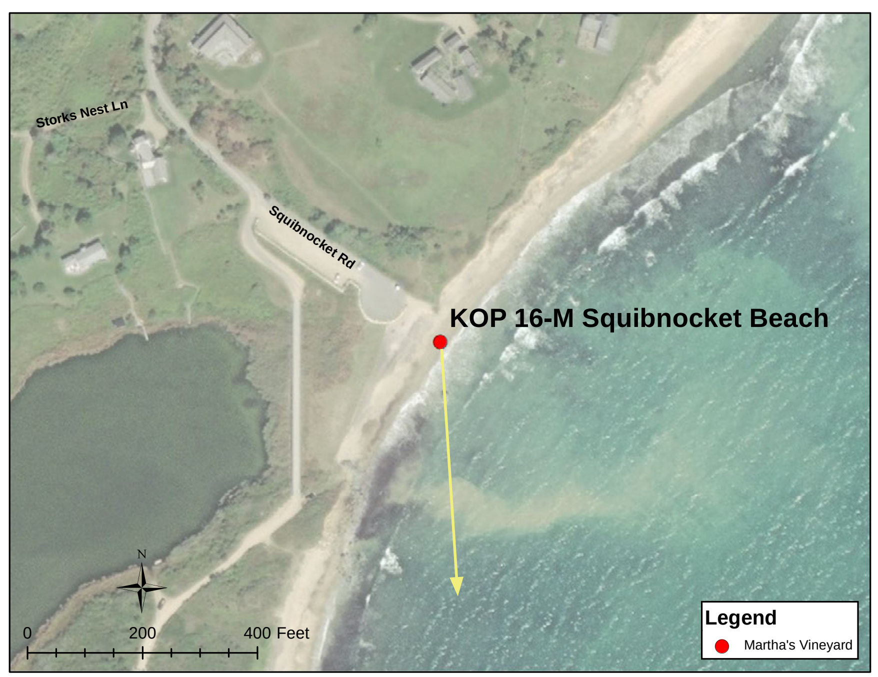
KOP 16-MV Squibnocket - Scenario 5

PANORAMIC PHOTOGRAPH - EXISTING CONDITIONS

REGIONAL MAP



SITE MAP



MATCH LINES define visual simulation detail areas

A-B is shown on pages 2-3
AA-AB is shown on page 4
BB-BC is shown on page 5
CC-CD is shown on page 6

PROJECT VIEW

Horizontal Field of View: 193°
Vertical Field of View: 40°
Nearest WTG: 37 mi / 60 km
Furthest Visible WTG: 45 mi / 72 km
Potential Number of Structures Visible: 90
Potential Number of Structures Not Visible: 59

PHOTOGRAPH AND SITE

Time of photograph: 2:08PM
Date of photograph: 11-6-20
L/SCA: Ocean Beach, Open Ocean
Viewing direction: Southeast (176°)
Latitude: 41.318873°N
Longitude: 70.764908°W
Lighting Direction:Sidelit diffused

ENVIRONMENT

Temperature: 65° F
Humidity: 78%
Wind Dir & Speed: SSW 16mph
Weather Condition: Hazy

CAMERA

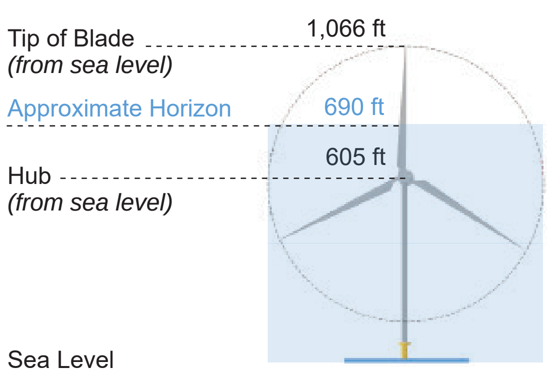
Camera Elevation: 16.5 ft / 5.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

SIMULATED CONDITIONS

VISIBILTY OF CLOSEST TURBINES

Mayflower Wind (OCS-A 0521)

919 ft rotor diamater

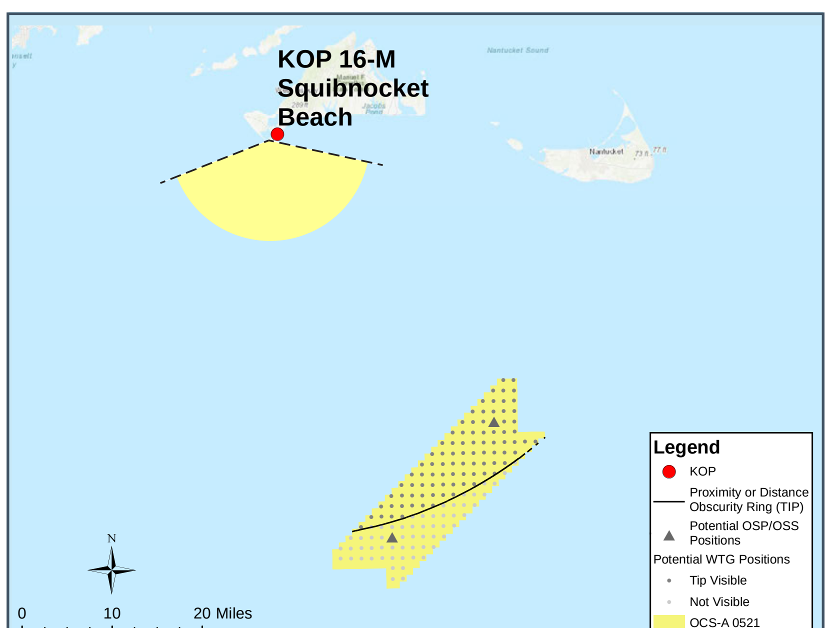


Year Forecasted for Development	2025
Number of Structures in Lease Area	149
Number of Structures within View of KOP	90
Distance to Closest Structure	37 mi (60 km)
Distance to Furthest Structure	45 mi (72 km)

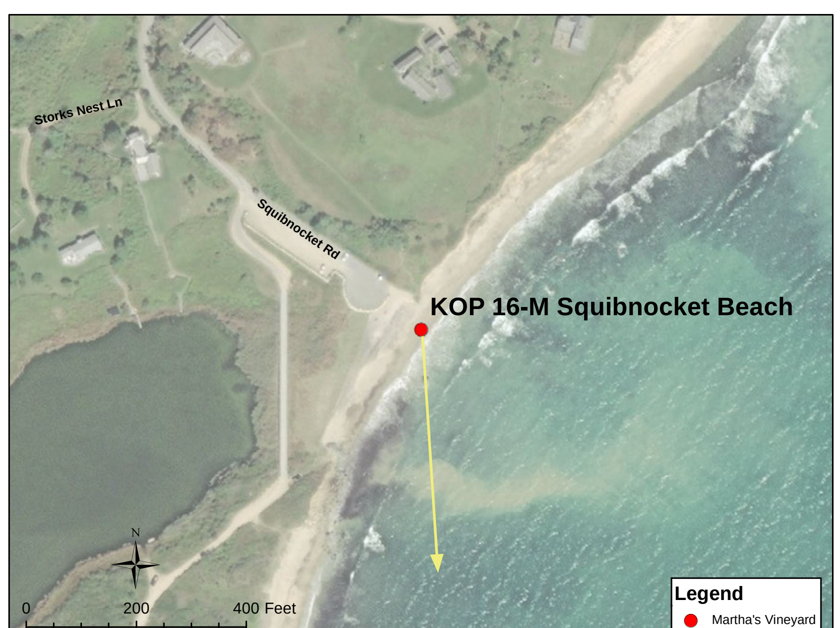
KOP 16-MV Squibnocket - Scenario 5 (Human Field of View - 124°)

SIMULATED CONDITIONS

REGIONAL MAP



SITE MAP



PROJECT VIEW

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Vertical Field of View: 40°
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Furthest Visible WTG: 45 mi / 72 km
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Lighting Direction:Sidelit diffused

ENVIRONMENT

Temperature: 65° F
Humidity: 78%
Wind Dir & Speed: SSW 16mph
Weather Condition: Hazy

CAMERA

Camera Elevation: 16.5 ft / 5.0 m
Nikon D4
Nikon 50mm
ISO: 100
Fstop: f/7.1
Shutter: 1/1250 sec
Exposure bias: -0.7 step

MATCH
LINE A

MATCH
LINE BB

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .

MATCH LINE AB

MATCH LINE BB

MATCH LINE BC

MATCH LINE CC

The page should viewed at 11” x 17” approximately 15” from viewer's eyes .

KOP 16-MV Squibnocket - Scenario 5 (50mm view - 27° vertical / 40° horizontal) 3 of 3

MATCH LINE BC

MATCH LINE B

The page should viewed at 11" x 17" approximately 15" from viewer's eyes .