

VINEYARD MID-ATLANTIC

CONSTRUCTION AND OPERATIONS PLAN VOLUME II APPENDIX

JANUARY 2025

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Vineyard Mid-Atlantic COP

Appendix II-Q Marine Archaeological Resources Assessment Summary

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Prepared for:
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**MARINE ARCHAEOLOGICAL RESOURCES
ASSESSMENT FOR THE
VINEYARD MID-ATLANTIC PROJECT
LOCATED ON THE
OUTER CONTINENTAL SHELF
OFFSHORE NEW YORK**

PUBLIC SUMMARY

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INTRODUCTION

Vineyard Mid-Atlantic, LLC (Proponent) submits this Marine Archaeological Resources Assessment (MARA) summary to advance the proposed development, construction, and operation of offshore renewable wind energy facilities in Lease Area OCS-A 0544 (Lease Area) along with associated offshore transmission systems (Figure 1). This proposed development is referred to as “Vineyard Mid-Atlantic.” This summary focuses on cultural resources within the Lease Area and the Offshore Export Cable Corridor (OECC). Offshore export cables installed within an OECC will transmit power from the renewable wind energy facilities to onshore transmission systems on Long Island, New York.

The Lease Area for Vineyard Mid-Atlantic is located within federal waters within the New York Bight, approximately 38 kilometers (km) (24 miles [mi]) south of Fire Island, New York, the closest point on land. The Lease Area encompasses 17,423.96 hectares (ha) (43,055.55 acres [ac]) within the New York Bight and exhibits water depths ranging from 39.5–47.1 meters (m) (130–155 feet [ft]). The OECC extends from the northern end of the Lease Area, continues west along the boundary of neighboring Lease Area OCS-A 0512, and then proceeds northwest towards the southern shore of Long Island, New York. As the Vineyard Mid-Atlantic OECC approaches shore, it splits into three variations to connect to three potential landfall sites (of which, up to two will be installed) on the southern shore of Long Island, New York; these include the Rockaway Beach Landfall Site, the Atlantic Beach Landfall Site, and the Jones Beach Landfall Site. The Proponent has also identified a “Western Landfall Sites OECC Variant” that may be used for routing offshore export cables to the Rockaway Beach and Atlantic Beach Landfall Sites. The OECC has a total area of 6,685.36 ha (16,519.89 ac); within federal waters the area is 3,861.47 ha (9,541.91 ac), and within state waters an area of 2,823.88 ha (6,977.98 ac).

Fugro USA Marine, Inc. completed the high-resolution geophysical (HRG) surveys in the Lease Area. TDI-Brooks International (TDI) completed the HRG surveys along with S.T. Hudson Engineers, Inc within the OECC. TDI, along with CR Environmental, completed the geotechnical work in the Lease Area and along the OECC. Gardline Ltd, completed preliminary HRG surveys in the Lease Area preceding the sale of lease blocks in the New York Bight.

Vineyard Mid-Atlantic planned the HRG surveys and geotechnical investigations in close coordination with R. Christopher Goodwin & Associates, Inc. This coordination ensured that the surveys were performed in accordance with guidelines issued by the New York State Historic Preservation Office and Bureau of Ocean Energy Management (BOEM) (2020a; 2020b). These data were reviewed by Qualified Marine Archaeologists (QMAs), who meet the “Professional Qualifications Standards” set forth in 36 Code of Federal Regulations (CFR) Part 61.

The work was performed in accordance with applicable federal guidance including Section 106 of the *National Historic Preservation Act* of 1966, as amended, and its implementing regulations (36 CFR Part 800); the *Archeological Resources Protection Act* of 1979; the *Abandoned Shipwrecks Act* of 1988 (43 USC 2101-2106), and the Secretary of the Interior’s Standards and Guidelines (48 FR44738–44739).

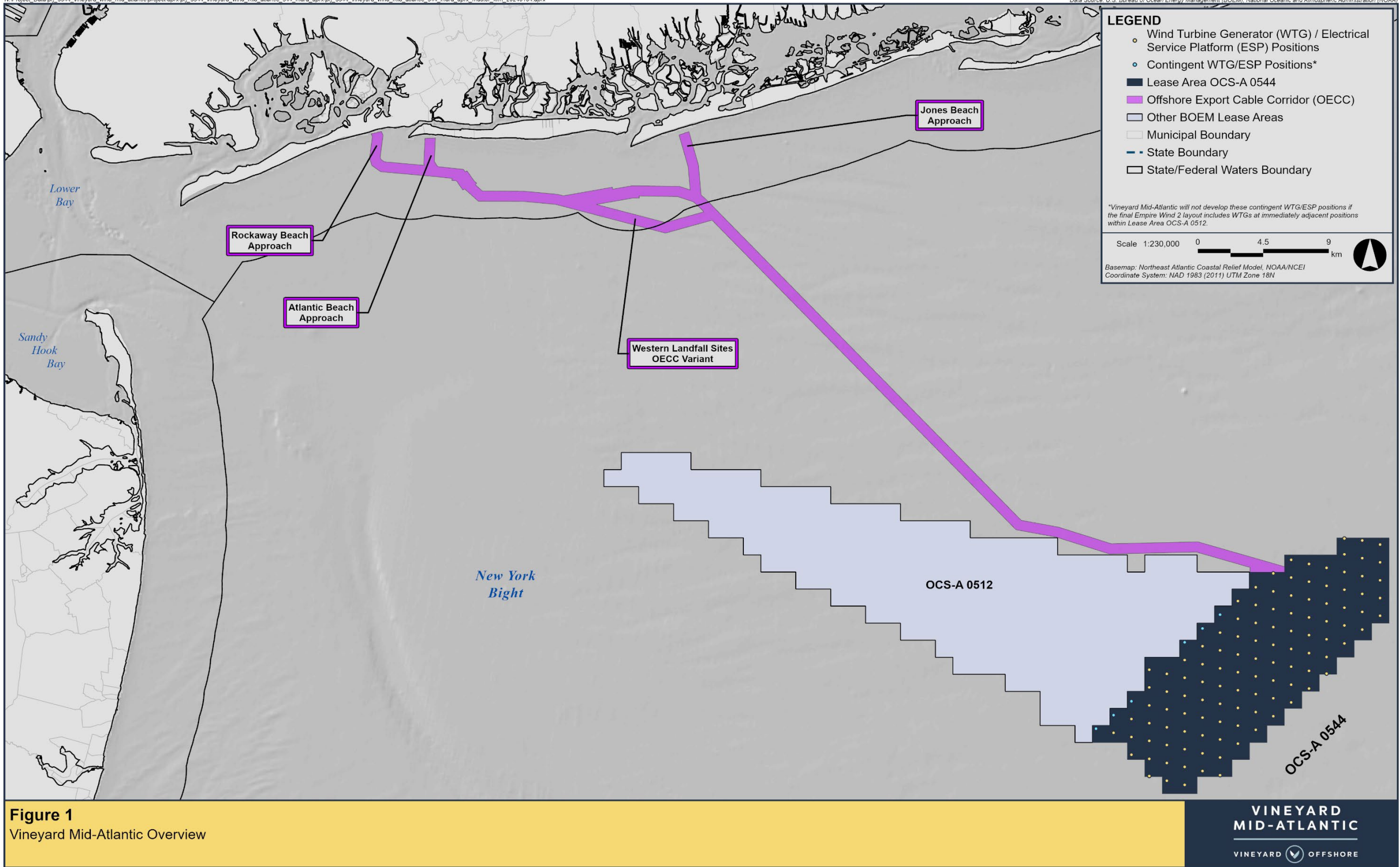


Figure 1. Vineyard Mid-Atlantic Overview

DESCRIPTION OF VINEYARD MID-ATLANTIC AND PRELIMINARY AREA OF POTENTIAL EFFECTS

Vineyard Mid-Atlantic is being developed and permitted using a Project Design Envelope (PDE) based on expected commercial and technological advancements. The PDE outlines a reasonable range of project design parameters (e.g., multiple foundation types) and installation techniques (e.g., use of various cable installation tools) (Table 1). For purposes of the MARA, the PDE includes activities that will result in impacting the seabed during the construction, operation, and decommissioning phases. The Proponent has developed the PDE and sited Vineyard's Mid-Atlantic facilities in consultation with multiple stakeholders.

Vineyard Mid-Atlantic includes 118 wind turbine generators (WTGs) and electrical service platform (ESP) positions within the Lease Area. One or two of those positions will be occupied by ESPs and the remaining positions will be occupied by WTGs. In accordance with Proponent's lease stipulations, the WTGs and ESP(s) will be oriented in west-northwest to east-southeast rows and north to south columns with 0.68 nautical mile (NM) (1.3 kilometer [km]) spacing between positions. The WTGs will be supported by monopiles and ESP(s) will be supported by monopiles or piled jacket foundations. The base of the foundations may be surrounded by scour protection.

Inter-Array Cables (IACs) will transmit power from groups of WTGs to the ESP(s). The IACs will be buried beneath the stable seafloor at a target depth of 1.2 m (4 ft) and the maximum trench depth for cable installation will be 3 m (10 ft). In the Lease Area there is a maximum anchor penetration depth of 3 m (10 ft).

Between the Lease Area and shore, the offshore export cables will be installed within the OECC. Up to six high voltage alternating current (HVAC) cables, two high voltage direct current (HVDC) cable bundles, or a combination of up to four HVAC cables/HVDC cable bundles will be installed within the OECC. The OECC extends from the northern end of the Lease Area, continues west along the boundary of neighboring Lease Area OCS-A 0512, and then proceeds northwest across towards the southern shore of Long Island, New York. As the OECC approaches shore, it splits into three approaches. From west to east, these approaches are: the Rockaway Beach Approach; the Atlantic Beach Approach; and the Jones Beach Approach. Vineyard Mid-Atlantic will use up to two of these approaches to reach up to two landfall sites. The Proponent has also identified a "Western Landfall Sites OECC Variant" that may be used for routing offshore export cables to the Rockaway Beach or, Atlantic Beach Landfall Sites.

The offshore export cables will be installed in an OECC with a width of up to 720 m (2,362 ft). and a target burial depth beneath the stable seafloor of 1.2 m (4 ft) in federal waters and 1.8 m (6 ft) in state waters, unless the final Cable Burial Risk Assessment (CBRA) indicates that a greater depth is necessary. The maximum trench depth and anchor penetration depth are listed in Table 1.

Table 1. Summary of PDE Parameters

Vineyard Mid-Atlantic Preliminary Area of Potential Effects (PAPE)	
Lease Area	
Location	Dimensions
Lease Area	17,424 ha (43,056 ac)
Maximum number of WTG/ESP positions	118
WTGs	
Max number of WTGs	117
Max rotor diameter	320 m (1,050 ft)
Max tip height	355 m (1,165 ft)
Min tip clearance	27 m (89 ft)
ESPs	
Number of ESPs	1 or 2
Max topside height above Mean Lower Low Water (MLLW) ¹	70 m (230 ft)
Foundations and Scour Protection	
Max pile diameter	Monopiles (WTGs and ESPs): 13 m (43 ft) Piled jackets (ESPs): 4.25 m (14 ft)
Max area of scour protection	WTG monopiles: 0.73–1.2 ha (1.8–2.9 ac) ² ESP monopiles: 0.73–1.2 ha (1.8–2.9 ac) ² ESP piled jackets: 3.3 ha (8.1 ac)
Offshore Cable Systems (Lease Area and OECC)	
Max total inter-array cables length	296 km (160 nautical miles [NM])
Max total inter-link cable length	83 km (45 NM)
Max number of offshore export cables	2–6 cables (up to 6 HVAC cables, 2 HVDC cable bundles, or a combination of up to 4 HVAC cables/HVDC cable bundles)
Max total offshore export cable length (includes the length within Lease Area) ³	594 km (321 NM)
Target burial depth beneath stable seafloor ⁴	1.2 m (4 ft) in federal waters 1.8 m (6 ft) in state waters
Lease Area PAPE (foundations)	
Max foundation installation depth	80 m (262 ft)
Max distance of work zone from WTG/ESP grid position for foundation installation	180 m (591 ft)
Lease Area PAPE (inter-array and inter-link cables)	
Max trench depth for cable installation	3 m (10 ft)
Max anchor penetration depth	3 m (10 ft)
OECC	
Location	Dimensions
OECC (length)	55–76 km (30–41 NM)
OECC (typical width)	720 m (2,362 ft)
OECC PAPE	
Max trench depth for cable installation	3.4 m (11 ft)
Max sand bedform leveling depth ⁵	5 m (16 ft)
Max anchor penetration depth	3 m (10ft)

¹ Height includes helipad (if present), but may not include antennae and other appurtenances.

² A range of the maximum area of scour protection is provided as detailed engineering of the foundations is ongoing. Feedback from New York Bight recreational fishermen indicate they are supportive of extending scour protection around foundations because it provides additional structured habitat for fish.

³ Includes the length of the offshore export cables within the Lease Area.

⁴ Based on a preliminary CBRA, in a limited portion of the OECC within the Nantucket to Ambrose Traffic Lane, the offshore export cables will have a greater target burial depth of 2.9 m (9.5 ft) beneath the stable seafloor. The target burial depths are subject to change if the final CBRA indicates that a greater burial depth is necessary and taking into consideration technical feasibility factors, including thermal conductivity. For the purposes of this assessment, a maximum trench depth of 3.4 m (11 ft) was considered, which is based on the target burial depth plus a 0.5 m (1.6 ft) allowance to account for the cable diameter, etc.

⁵ The average depth of disturbance where sand bedform leveling occurs is expected to be far less than 5 m (15 ft).

Vineyard Mid-Atlantic is anticipated to operate for a minimum of 30 years. Although much can be done remotely, regular maintenance and inspections will occur in person.

Vineyard Mid-Atlantic will decommission the Offshore Development Area in accordance with 30 CFR § 585.902 and 30 CFR §§ 585.905 through 585.912.

METHODS

Geophysical Surveys

Geophysical survey campaigns were completed in the Offshore Development Area between 2020 and 2023 to better inform the QMA’s review and the creation of the geological ground model (Tables 2 and 3).

Table 2. Overview of Work Performed in the Lease Area and OECC

Data Source	Date	Coverage Area	Data Types
Gardline (NYSERDA)	2020	Lease Area	Side scan sonar (SSS), sub-bottom profiler (SBP), transverse gradiometer (TVG), multibeam echo sounder (MBES), multi-channel ultra-high-resolution seismic (MUHRS)
Fugro	2022	Lease Area	MBES, SSS, TVG, SBP, single-channel ultra-high resolution seismic (SUHRS), MUHRS
TDI	2023	OECC	SUHRS, SBP, SSS, TVG, MBES
S. T. Hudson	2023	OECC	SUHRS, SSS, SBP, MBES, TVG

Table 3. Geophysical Survey Vessel Equipment Arrays in the Lease Area and OECC

	<i>M/V Ocean Endeavour</i>	<i>M/V Go Discovery</i>	<i>R/V Brooks McCall</i>	<i>M/V Bella Marie</i>
Navigation System	Fugro Starfix G2+	Fugro StarfixNG	QPS QINSy	QPS QINSy
Primary Positioning	Kongsberg Seatex Seapath 380	Kongsberg Seapath 380	Applanix POS MV/GNSS Aided IMU	Applanix POS MV/GNSS Aided IMU
MBES	Kongsberg EM 2040 dual Rx	Dual-head Kongsberg EM2040-04	Dual-head Norbit Winghead 340-440 kHz	Norbit Winghead i80s
TVG	2 x Geometrics G882 in TVG array	2 x Geometrics G-882 Marine Magnetometers	2 x Geometrics G882	2 x Geometrics G882
SSS	EdgeTech 4200 FS	EdgeTech 4205 230/540/850 kHz + V-Wing IxBlue NANO FOG	EdgeTech 4205	EdgeTech 4205
SBP	Innomar SES-2000 medium	Innomar SES-2000 medium- 100 parametric	SESWIN Innomar SES 2000	Innomar SES-2000 medium
SVP	AML MVP 30-350 (underway), Valeport 650 MkII (static), Mini SVS – SV & T	Valeport mini-SVP	CastAway CTD	AML Oceanographic ‘Mirco X’
SUHRS	-	GMSS Geo-Spark 2 kJ ultra-high-resolution sparker system with 400-tip geo-source	Geo-Spark 2000x Power Supply with Geo Source 400 tip sparker	GMSS Geo-Source 200 light weight multi-tip sparker
MUHRS	Applied Acoustics Dura Spark Sparker	Geo-Source Dual 400 Marine Muti-tip sparker system	-	-

Sources: Fugro 2023; Gardline 2021a, 2021b, 2021c; TDI 2023a, 2023b

Geotechnical Surveys

Geotechnical campaigns were completed in the Lease Area in 2022 and in the OECC in 2023 (Table 4). During the geotechnical campaigns, sediment vibracores (VCs) were placed at equal intervals to evaluate physical sediment properties throughout the Lease Area and the OECC. The QMA reviewed each proposed core location, including a 30 m (98.4 ft) radius analytical area, prior to the start of field operations to ensure that no cultural resources would be impacted during coring activities. Geoarchaeological cores were chosen based on the likelihood of the preservation of paleolandforms. Once the cores were collected, the sediment was analyzed for potential geoarchaeological interest. If there were areas of interest, samples were taken and analyzed in the lab for further review.

Table 5 shows how many geotechnical cores were undertaken in the PAPE.

Table 4. Geotechnical Equipment List

Equipment	Equipment Type
CPT	Neptune 5000 CPT System (N5K)
pVC	TDI designed pVC system
Remotely Operated Vehicle (ROV)	Deep Trekker Revolution ROV
VC	NAVCO Pneumatic Vibracore System

Table 5. Geotechnical Cores in the PAPE

Location	CPT	VC
Lease Area	35	39
OECC	53	53

BACKGROUND RESEARCH

A wide range of primary and secondary sources, obtained both electronically and as a result of on-site visits to relevant repositories, were utilized to support the conclusions presented in this cultural resource report. The objectives of the archival research undertaken in support of Vineyard Mid-Atlantic were to review: (1) the nature of previously identified cultural resources within the Offshore Development Area; (2) natural, historical, and geological context for the Offshore Development Area; and (3) the potential for submerged cultural resources within the Offshore Development Area.

GEOLOGIC SETTING AND SEA LEVEL HISTORY

The Vineyard Mid-Atlantic Preliminary Area of Potential Effects (PAPE) is located on the Outer Continental Shelf (OCS) along the northern margin of the New York Bight. The New York Bight, in turn,

is located within the larger Mid-Atlantic Bight, which extends along the United States (US) Atlantic margin from Massachusetts to North Carolina.

During the Last Glacial Maximum (LGM) 20,000 years before present (BP), which marks the end of the Pleistocene and the beginning of the Holocene, sea levels were approximately 130 m (426 ft) lower than present time, and the shoreline lay seaward of the shelf break ~170 km (106 mi) from the modern shoreface (Stubblefield et al. 1977). In this region, the glacial terminus extended westward along the crest of Long Island to New Jersey, and the modern site of the inner New York Bight served as an outwash plain. The ancestral Hudson River, which discharged through the modern Hudson Shelf Valley into the Hudson Canyon, likely received the bulk of drainage from the Great Lakes during glacial retreat (Stubblefield et al. 1977). A series of four terraces along the Mid-Atlantic shelf have provided evidence of Pleistocene-Holocene Sea level standstills (Figure 2), with intervening slopes between terraces, interpreted as paleoshorelines (Buck et al. 1999). The locations of the Fortune and Block Island shorelines relative to the PAPE supports that the Offshore Development Area was subaerially exposed for a significant period of time following the LGM, and was likely characterized by glaciofluvial and coastal outwash environments which could have been suitable for human occupation.

RESULTS

The HRG and geotechnical surveys provided data on the environmental contexts, and cultural resources of the Lease Area and the OECC. The resulting characterization of the seabed and subsurface supports planning, design and engineering including, layout and installation.

Archaeological Targets

The surveys in the Lease Area covered 17,423.96 ha (43,055.5 ac) and the OECC covered 6,685.36 ha (16,519.89 ac). High-resolution SSS data recorded along each survey transect identified 162 targets within the Lease Area and 486 targets within the OECC. Within the Lease Area there is one cultural resource that is potentially eligible for the NRHP. Within the OECC there are a total of three cultural resources that are potentially eligible for the NRHP. Recommended minimum avoidance zones for these resources were designed based on the visible extent of each resource, gleaned from SSS, MBES, SBP, seismic and magnetometer data. Vineyard Mid-Atlantic commits to avoiding all cultural resources.

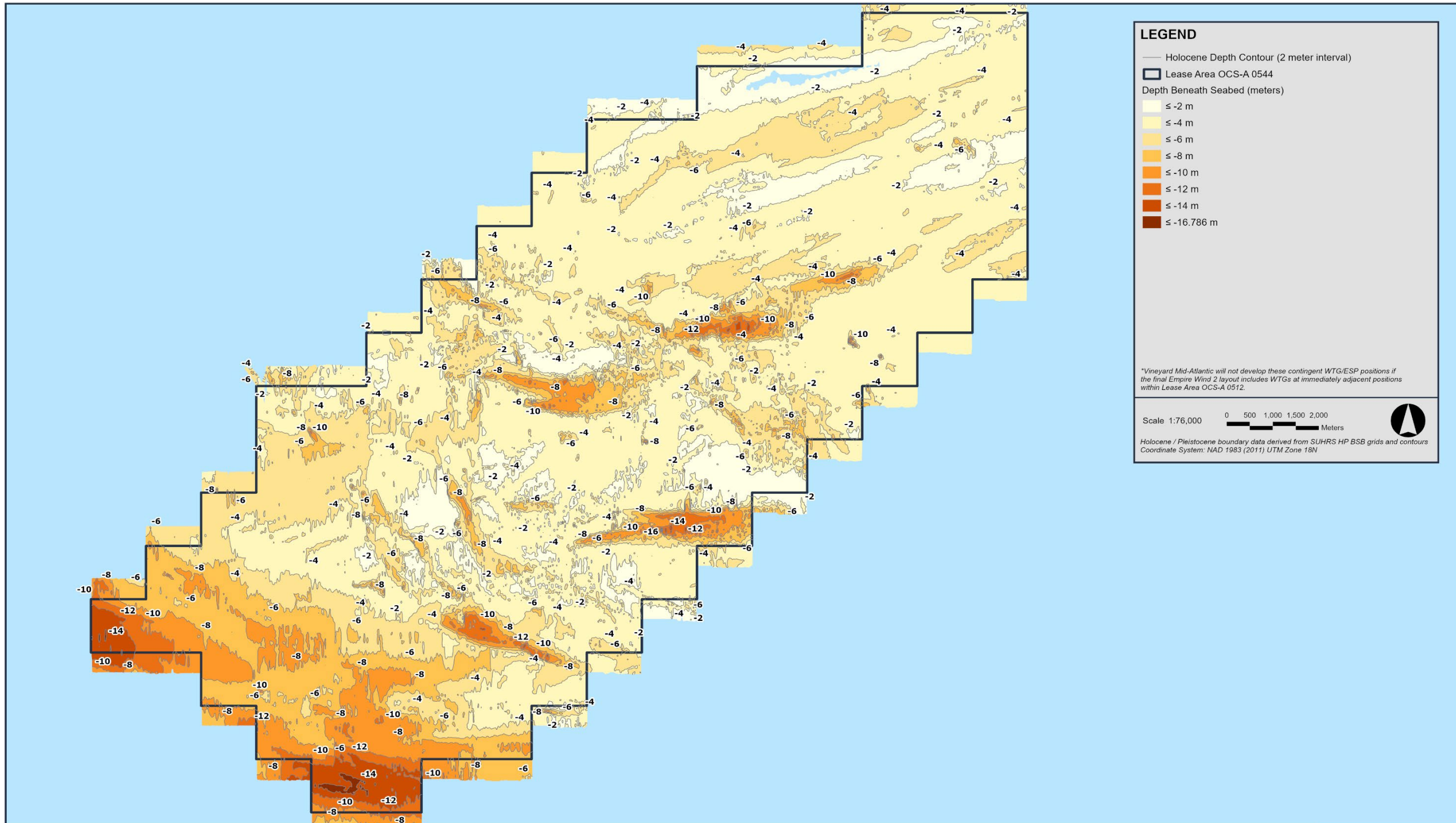


Figure 2
Holocene-Pleistocene Boundary Map



Figure 2. Holocene- Pleistocene Boundary map for the Vineyard Mid-Atlantic Lease Area

PALEOLANDSCAPE RECONSTRUCTION

The QMA conducted a review of HRG, geotechnical, and geoarchaeological datasets to determine whether Ancient Submerged Landform Features (ASLFs) are present within the PAPE. Seismic reflection profiles, sedimentology, geochronology, and stable isotope data were analyzed to determine the likelihood of material culture being preserved in sedimentary deposits within the zone of potential disturbance by Vineyard Mid-Atlantic. The QMA performed a detailed line-by-line analysis of seismic data using IHS Kingdom™ software. Seismic review by the QMA focused on the identification of ASLFs that could have had the potential to support human populations and preserve significant archaeological deposits. The QMA also used seismic data to guide geoarchaeological coring in areas with high preservation potential. Geoarchaeological coring serves as a method of ground-truthing seismic interpretations by providing information regarding sediment composition, radiometric dates, and pollen analysis.

Seismic analysis of the Lease Area PAPE found evidence for multiple potentially preserved features. The vibracoring campaign for cultural resources was guided by preliminary HRG data to attempt core collection near and within potentially preserved features. A total of two possible preserved ASLFs have been identified within the Lease Area. The Lease Area is considered to have a moderate to low potential to contain preserved pre-contact cultural resources.

Seismic analysis of the OECC also found evidence for multiple potentially preserved features. Paleochannel features are present in the seismic data throughout the OECC. A total of four possible preserved ASLFs have been identified within the OECC. The OECC is considered to have a moderate to low potential to contain preserved pre-contact cultural resources. Vineyard Mid-Atlantic commits to avoiding all ASLFs.

HISTORIC PROPERTIES TREATMENT PLAN AND UNANTICIPATED DISCOVERY PLANNING

Vineyard Mid-Atlantic commits to avoiding all cultural resources and ASLFs. Vineyard Mid-Atlantic will develop and adhere to a Historic Properties Treatment Plan if needed, which will define proposed measures implemented to avoid potential effects to historic properties and ASLFs within the PAPE.

Although remote sensing surveys conducted in accordance with current professional standards for cultural resource identification are expected to be highly effective in enabling recognition of submerged cultural resources, the possibility of encountering an unidentified and unanticipated submerged cultural resource is always present during construction activities. As a result, an Unanticipated Discoveries Plan, including archaeological resource identification training, will be developed and implemented.

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