Ocean Wind 1
An Ørsted & PSEG project

Ocean Wind 1 Offshore Wind Farm Project

Marine Archaeological Resources Assessment

Public Summary

Prepared by:

SEARCH, Inc.

January 2023

Table of Contents

1. Introduction

SEARCH, Inc. (SEARCH) completed a marine archaeological resources assessment (MARA) of geophysical and geotechnical survey data collected for Ocean Wind LLC (Ocean Wind), at the proposed Ocean Wind Offshore Wind Farm (Project) within the Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS A-0498 (Lease Area) and two unique offshore export cable route (ECR) corridors, which traverse federal and state waters. The purpose of the assessment was to identify submerged cultural resources or potential submerged cultural resources, that may be affected by seabed-disturbing Project activities, including site characterization surveys, and the construction, operation, and/or decommissioning of project facilities.

The U.S. Department of the Interior (DOI) is charged with managing the OCS under the Outer Continental Shelf Lands Act (43 U.S.C. 1337). DOI delegated certain responsibilities for regulation of renewable energy projects on the OCS to the Bureau of Ocean and Energy Management (BOEM), in the Energy Policy Act of 2005 (Pub. L. 109-58). Federal statutes and regulations require BOEM to identify historic properties and other significant cultural resources that may be affected by renewable energy projects on the OCS and to consider project effects to these properties prior to project approval. These requirements are established in the National Historic Preservation Act of 1966, as amended (NHPA; Title 54 U.S.C.), and the applicable procedures are outlined in the NHPA's implementing regulations (36 CFR § 800). The National Environmental Policy Act (NEPA; 42 U.S.C. 4321 et seq.) and NEPA's implementing regulations (40 CFR § 1500-1508) are also applicable.

BOEM has adopted regulations for the planning and development of renewable energy projects on the OCS in 30 CFR § 585. These regulations establish developers' responsibilities for the collection of information to support and facilitate the agency's compliance with the NHPA and NEPA. BOEM's Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR § 585 (May 2020) provides developers and their teams with information on how to comply with 30 CFR § 585. Additionally, stipulations in the OCS-A 0498 lease agreement, effective March 1, 2016, informed the work conducted by SEARCH.

Within the Lease Area, wind farm development will occur within a smaller footprint referred to as the Wind Farm Area (WFA). The WFA is located in federal waters on the Outer Continental Shelf (OCS), within BOEM Renewable Energy Lease Area OCS-A-0498 (Lease Area). The Lease Area is, at its closest point, approximately 20.9 kilometers (km) (13.0 miles [mi]) from the coast of New Jersey on the Atlantic OCS and encompasses 30,564 ha (75,525 ac) with water depths ranging from 16 to 38 m (52 to 125 ft). The preliminary area of potential effects (PAPE) for the WFA measures approximately 14,323.6 ha (35,394.3 ac). To allow for flexibility in siting of the offshore components, a PAPE larger than the WFA footprint was assessed. Within the WFA, the project's PAPE is defined as the depth and breadth of the seabed potentially affected by any proposed bottom-disturbing activities. The proposed Ocean Wind Offshore Wind Farm consists of up to 98 wind turbine generators (WTGs, turbines), submarine cables (Inter-array Cables [IACs]) connecting the WTGs, and up to three offshore substations (OSS) connected by an OSS interconnector cable.

The Project consists of up to three offshore export cables, one within the BL England export cable route (ECR) Corridor and two within the Oyster Creek ECR Corridor. ECR corridors vary in width between 265 and 950 m (869 and 3,117 ft). BL England Export Cable will extend northwest through federal and New Jersey state waters, approximately 51 km (32 mi) before making landfall near Ocean City, while two Oyster Creek Export Cables will extend north through federal and New Jersey state waters, approximately 114 km (71 mi) before making landfall near Lacey Township. The total ECR corridor PAPE acreage is approximately 5,980 ha (14,776.9 ac). BL England ECR Corridor measures approximately 1,378.3 ha (3,405.9 ac), while Oyster Creek ECR Corridor measures approximately 4,601.7 ha (11,371.0 ac). The maximum vertical seafloor impact from the export cable burial is approximately 1.8 m (6.0 ft) and 8.0 m (26 ft) for associated anchoring/spudding of

construction vessels. The project PAPE along the ECC corridors is defined as the depth and breadth of the seabed potentially affected by any proposed bottom-disturbing activities.

The assessment was conducted to satisfy the federal regulatory requirements as outlined in the Bureau of Ocean Energy Management (BOEM) Offshore Renewable Energy Program's Guidelines on Providing Archaeological and Historic Property Information (30 CFR 585). Consistent with BOEM guidelines, Ocean Wind will seek to avoid cultural resources and potential cultural resources during project development, construction, operation, and decommissioning, where feasible. To accommodate alternate locations for turbine placement or cable routing required to avoid affecting potentially significant cultural resources, survey efforts included an area larger than the designed footprint of the WFA and the ECR corridors.

2. Archaeological Assessment

The archaeological assessment for potential submerged resources included archival (background) research, geophysical (remote sensing) survey, geotechnical investigations, and laboratory analyses of sediment samples collected from the proposed WFA and ECR corridors. Archaeological investigations and laboratory analyses were conducted in coordination with three federally recognized Native American tribes. The methods and results of the integrated research are summarized below.

2.1 Archival Research

Background research included a review of historical documents, previous research reports, state site files, shipwreck inventories, and historical maps. SEARCH coordinated with the New Jersey Historic Preservation Office (NJHPO) to obtain materials concerning previous marine archaeological surveys and previously identified archaeological sites and shipwrecks within or near the PAPE. Relevant geological and paleoenvironmental sources were reviewed to assist in the effort to establish a baseline for the paleoenvironmental reconstruction of conditions during periods of potential pre-contact land use within the project area. These studies found that during the Last Glacial Maximum (LGM) much of the region was under the glacial ice sheet with coast lines extending hundreds of miles of beyond the modern-day coast. Portions of the WFA now underwater would have been habitable dry land. Terrestrial landscapes existed in portions of the proposed wind farm between approximately 24,000 and 8,000 calibrated Before Present (cal BP) and may have been occupied by Native American people. As the glaciers retreated, additional portions of the project area became available for occupation until being submerged by rising sea levels. Portions of the ECR corridors would have been subaerially exposed until around 4,000 cal BP as sea levels reached near modern levels.

2.2 Geophysical Surveys

Field investigations included a High Resolution Geophysical (HRG) marine survey utilizing a transverse gradiometer, side scan sonar, multibeam echo-sounder, single-channel and multichannel seismic, and shallow sub-bottom profilers. This instrument array provided data on objects and seabed features exposed on the seafloor as well as characteristics of buried sediments and potential preserved, ancient submerged landform features that may be affected by the Project. The maximum work area for the wind farm represents the PAPE for the Section 106 process and encompasses all areas of potential seabed disturbance associated with the wind turbine generators (WTGs), IACs linking the WTGs, and the offshore substations. A corridor was defined along the ECRs to encompass the PAPE for construction, operation, and decommissioning of the export cables linking the wind farm to the terrestrial electrical grid.

The transverse gradiometer consists of two marine magnetometers connected in a rigid frame utilized to detect anomalies in the earth's magnetic field produced by ferrous objects. Magnetic data were collected, saved, edited, processed, and plotted, and anomalies tabulated according to magnetic intensity (total deviation of the

magnetic background measured in gammas); detectable signature duration; signature characteristics (monopolar, dipolar, and multicomponent); and location. Per BOEM guidelines, an amplitude threshold of ±5.0 gammas was applied when analyzing magnetic anomaly significance. Most anomalies not meeting this threshold likely represent noise caused by a towfish heading error or an artifact of contouring. Actual sources producing such low-amplitude anomalies likely represent relatively small, insignificant debris sources. For the remaining magnetic anomalies above the ±5.0 gamma threshold, analysis of the characteristics of each was undertaken and comparisons were made to verified examples of shipwreck magnetic signatures.

A side-scan sonar utilizes acoustic signals to produce an image of the seabed and any objects protruding above it. This image is ideal for detecting and recognizing submerged cultural resources exposed above the sediment. Side-scan sonar data were collected at a 30-m (98.5-ft) transect spacing, with the instrument set to collect imagery to a range of 50 m (164 ft) to either side of the towfish path (i.e., total swath width = 100 m [328 ft]). The combination of survey line spacing, range, vessel speed, and cable out allowed for nearly 100-percent imagery coverage between adjacent survey lines, including the nadir region beneath the towfish path. Side-scan sonar data from the PAPE was processed; acoustic imagery and mosaic images were reviewed to locate acoustic contacts indicative of potential submerged cultural resources exposed above the seabed. Side-scan sonar mosaics were mapped and layered to correlate with other Project data (e.g., magnetic contour maps, nautical charts, shipwreck databases, etc.). The acoustic characteristics of each individual contact were reviewed and compared to the acoustic characteristics of known shipwreck sites and other submerged cultural resources. This analysis includes the determination of linear objects, concentrated debris fields, or a potential ship-shaped outline. Potential submerged cultural resources identified in side-scan sonar imagery may have buried and or magnetic components and, therefore, correlation of the datasets is necessary when assessing acoustic contacts.

A multibeam echo-sounder assessed the current seabed conditions and collected bathymetric data throughout the project area. The seabed within the WFA is dominated by sandy sediments that were deposited during the more recent glacial periods and subsequently submerged by marine transgression. Bathymetric changes appear gradual; open-marine processes dominated by storm events affect the current seabed composition and nature, which likely presents ridge and swale topography.

A sub-bottom profiler utilizes soundwaves to penetrate the seabed in an effort to image the subsurface stratigraphy. Both shallow and deep penetration sub-bottom profiler systems were utilized during the HRG survey. Environmental conditions allowed for a maximum vertical penetration of 40 m (131 ft) by the shallow penetration sub-bottom systems which utilized 30-m (98-ft) spaced lines and up to 80 m (262 ft) by the deep penetration systems which utilized 30-meter spaced lines with 500-meter spaced tie lines. Processed sub-bottom profiler imagery, as well as a preliminary ground-model of the PAPE, were reviewed and analyzed. The spatial extents of the various horizons were reviewed, select individual profiles were analyzed, and the results of the available geotechnical results were compared to the geophysical data to identify potential ancient submerged landform features (ASLFs) and man-made features that are indicative of potential submerged cultural resources buried beneath the seabed.

Sub-bottom imagery assists in the assessment of the preserved, submerged landscape and how it was affected by the dynamic environment. The sub-bottom horizons were mapped and layered with other Project data and correlated to the various datasets. Although the swath for data collected by the sub-bottom profiler is narrow, this subsurface dataset can also assist the assessment of potential submerged cultural resources observed in the magnetic and side-scan sonar records. If a potential resource is located directly beneath the sub-bottom, it may be displayed in the acoustic imagery. Processed sub-bottom profiler imagery could potentially indicate the burial depth of a magnetic anomaly’s source or the buried extent of an acoustic contact.

The HRG survey data record displayed an abundance of natural (i.e., boulders and hard bottom) and man-made features (i.e., tires, navigation buoys, commercial fishing equipment, and trawling scours). The majority of remaining acoustic contacts and magnetic anomalies likely represent small debris objects. Sub-bottom profiler imagery captured three geologic time spans within the Project footprint's buried stratigraphy: the Holocene and Pleistocene Epochs, and the Tertiary period. Many of the magnetic anomalies are considered geologic as their locations frequently correspond with boulders detected during processing.

Analysis of the HRG survey data identified 19 potential submerged cultural resources within the WFA and ECR corridors. Twelve targets are located along WTG corridors in the WFA; three targets are located in the BL England ECR Corridor; and four targets are located along the Oyster Creek ECR Corridor.

2.3 Geotechnical Investigations

The potential for ASLFs within the PAPE was assessed through the integration of vibracore sampling, ground modelling, and sub-bottom imagery. Based on analyses of the HRG survey data (2020 geophysical survey campaigns) and in consultation with tribal representatives, 16 shallow geotechnical samples (vibracores) were obtained for geoarchaeological assessment. Coring was used to identify possible ASLFs and ground truth the geophysical data. The combined geophysical and geotechnical datasets were critical in the development of the paleolandscape reconstruction describing the character of the once-exposed ancient landscapes within the project area and the refinement of the geologic context used by archaeologists to assess where parts of the ancient landscapes may be preserved.

Additionally, bathymetric data and seabed characterization provide initial windows into the potential preservation potential of buried paleolandscape features. The BL England ECR Corridor bathymetry increases fairly uniformly from 0 m (0 ft) MLLW at landfall to -25.6 m (-84.0 ft) MLLW as it enters the WFA. The Oyster Creek ECR Corridor bathymetry increases fairly uniformly from 0 m (0 ft) MLLW at landfall to -26.8 m (88.0 ft) MLLW and -20.2 m (66.3 ft) MLLW as its respective southern and northern entrances to the WFA. Water depths within the WFA range from -15.0 m (49.2 ft) to -38.0 m (-124.7 ft) MLLW. The seafloor along the WFA is primarily sand to gravelly sand with gravel and shell lag on the surface

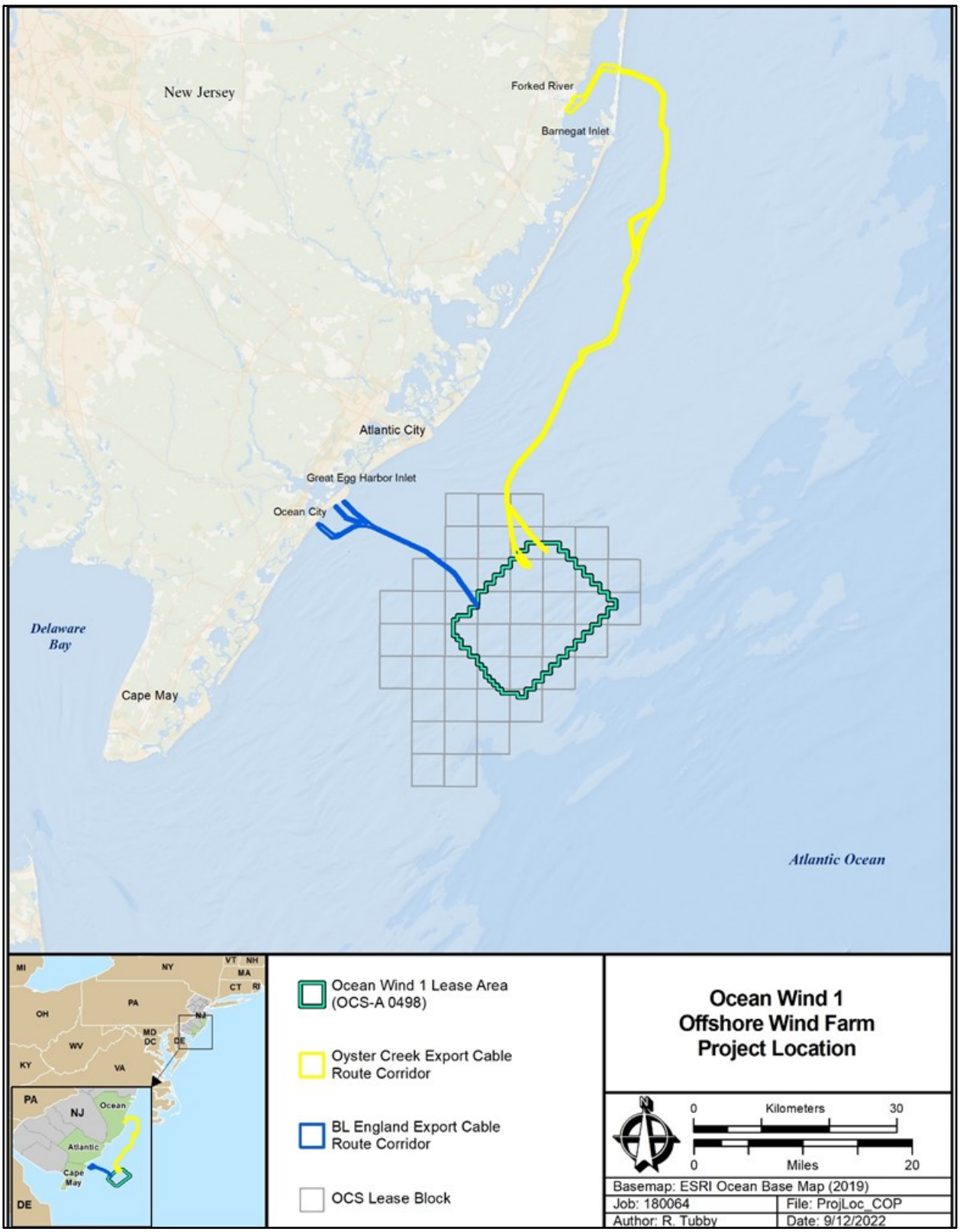
The completed MARA determined that ASLFs are present within the WFA and ECR corridors. A total of 16 ASLFs were identified within the PAPE, 13 within the WFA, one within the BL England ECR Corridor, and two within the Oyster Creek ECR Corridor.

The majority of the Project's seafloor disturbance is related to cable installation and limited to shallow burial depths of 1.2 to 1.8 m (4.0 to 6.0 ft) below seabed (bsb), approximately 5% of seafloor disturbance will be due to deep cable burial of up to 10 m (33 ft) bsb. Within the WFA, seafloor disturbance could be up to 50 m (164 ft) for WTG foundations. Three stratigraphic units were identified within the WFA and ECR corridors that have moderate to high potential to contain preserved buried paleolandscape features, horizons H30, H 45, and H50. Horizon H20, the upper most horizon, presents low archaeological potential. The underlying horizon H30 presents high archaeological potential, and the subsequent H45 and H50 horizons present moderate archaeological potential. Subsequent horizons H60 through H90 present low archaeological potential.

Horizon H30 was determined as the most likely unit to possess ASLFs. This stratigraphic complex likely dated to the terminal Pleistocene/Holocene boundary. Initial review of the HRG data suggested that within the WFA, horizons H45 and H50 may possess some evidence of preserved paleolandforms and been available for human occupation. Similarly, nearshore portions of horizon H20 within the ECR corridors may possess more recent evidence of human occupation. Lower stratigraphic units may have been subaerially exposed but are older than the archaeological framework for human settlement of North America. The archaeological geotechnical campaign intentionally targeted shallow areas of horizon H30 to characterize the micro-stratigraphic record associated with these deposits as they are the most likely to possess preserved ASLFs

originally available for human occupation. Correlation of the data recovered from the archaeological cores to the final ground model indicates that horizon H30 does possess intact paleolandforms. Although horizon H45 does possess preserved paleolandforms, the radiocarbon results dated to older than 31,000 cal BP throughout. The preserved horizon H30 paleolandforms correspond to the terminal Pleistocene and Early Holocene, as dated through 22 radiocarbon samples. These paleolandforms were subaerially exposed and available for human habitation during the conclusion of the Paleoindian period and beginning of the Archaic.

Identified ASLF targets represent discontinuous portions of Ocean Wind's horizon H30 stratigraphic complex. The nature of horizon H30 throughout the WFA and ECR corridors is highly discontinuous due to erosion of paleolandforms during marine transgression. At one point, identified ASLF targets were all part of the same landscape and represented similar biomes within a fluvial dominated landscape. The presence of a preserved paleolandform does not indicate humans existed there. The ASLFs do not represent archaeological sites, rather they are preserved portions of a paleolandform available for human occupation that may contain archaeological sites.


New Jersey
Forked River
Barnegat Inlet
Atlantic City
Great Egg Harbor Inlet
Ocean City
Delaware Bay
Cape May
Atlantic Ocean
Ocean Wind 1 Lease Area (OCS-A 0498)
Oyster Creek Export Cable Route Corridor
BL England Export Cable Route Corridor
OCS Lease Block
Ocean Wind 1 Offshore Wind Farm Project Location
0 Kilometers 30
0 Miles 20
Basemap: ESRI Ocean Base Map (2019)
Job: 180064
File: ProjLoc_COP
Author: R. Tubby
Date: 9/12/2022

3. Conclusions and Recommendations

SEARCH's analyses indicate several preserved ASLFs identified in the 2018-2019, 2019, 2019-2020, 2021, and 2022 surveys exist within the WFA and ECR corridors. While no direct evidence of pre-contact Native American settlements or other types of cultural sites were identified, the survey did indicate that the project area was an exposed terrestrial landscape following the LGM approximately 24,000 years ago, and before being inundated during marine transgression. Portions of the ECR corridors were exposed subaerial landforms until 4,000 years ago when sea levels neared modern levels. This suggests that the landscape could have supported Native American populations during the Paleoindian and Archaic periods. The identified ASLFs of interest within the WFA and ECR corridors have the potential to contain Native American sites associated with settlements or other uses of the formerly terrestrial landscapes. Ocean Wind anticipates avoiding three of the identified ASLFs; therefore, there will be no adverse effect to these targets during construction, operation and maintenance, or decommissioning of the Project. Ocean Wind anticipates that avoidance of 13 identified ASLFs is not possible; therefore, based on the current Project design, the Project will have an adverse effect to these targets. Further consultations among BOEM, Ocean Wind, Native American tribes, and other parties are needed if the landforms cannot be avoided as part of the Section 106 process.

Analysis of the HRG survey data identified 19 potential submerged historic cultural resources (shipwrecks or potential shipwrecks) within the WFA and ECR corridors. SEARCH recommends that all identified shipwreck sites be avoided by a minimum 50-meter (164-foot) buffer calculated from the maximum discernable extent of the remains to avoid potential adverse effects to these resources. No further archaeological investigations of the shipwrecks or possible shipwrecks are recommended unless these resources cannot be avoided.