UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Ocean Energy Management
Office of Renewable Energy Programs

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Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585

I. Introduction to Guidelines

The U.S. Department of the Interior, Bureau of Ocean Energy Management (BOEM), Office of Renewable Energy Programs (OREP) requires an applicant to submit a detailed plan of its proposed activities for review prior to approving the installation of any renewable energy facility, structure, or cable on the Outer Continental Shelf (OCS). Depending upon the nature of the proposed activities, these may include a site assessment plan, a construction and operations plan, a general activities plan, or other type of plan (collectively referred to as plans in these guidelines). As part of a plan submission, BOEM requires detailed information regarding the nature and location of historic properties that may be affected by the proposed activities. This information is used to assist the Bureau in meeting its obligations under Section 106 of the National Historic Preservation Act (NHPA) (36 CFR § 800) and the National Environmental Policy Act (NEPA).

The following guidelines provide recommendations on effective methods for identifying historic properties, as well as the format for providing this information to BOEM. These guidelines are intended for current and prospective lessees, developers, and the archaeologists and other historic preservation professionals working on their behalf. They are tailored to the site-specific surveys conducted to identify historic properties that may be impacted by offshore renewable energy activities. These guidelines are not intended as a one-size-fits-all methodology for conducting historic property identification. Rather, these guidelines provide a framework for applicants to design historic property identification surveys that will provide BOEM with information sufficient to conduct the necessary review of a plan.

Please be aware that the results of surveys submitted to BOEM that do not provide the necessary information or level of detail may be determined insufficient for the Bureau to conduct its review of a plan under NEPA and NHPA. Should BOEM determine that the submission is insufficient, BOEM may request additional information. If an applicant fails to provide the requested information, BOEM may disapprove the plan.

Elements of these guidelines may be required under the terms of a lease or conditions of a plan approval. Moreover, a lease or plan condition may also have requirements that are different from, or in addition to, those discussed in these guidelines. Applicants should note that while these guidelines and conditions in their lease(s) or plan(s) may be similar, applicants must comply with the terms of their respective lease(s) or plan conditions.

These guidelines may be updated periodically as new information or methods become available. This version replaces the guidelines published July 25, 2015. Previous versions of this document

included combined guidance for geophysical, geological, hazard, and archaeological surveys. This current version includes guidance specific to historic property identification. Guidelines related to geophysical, geological, and hazard surveys are now presented in the document *Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585.* These documents are intended to be used in tandem to inform the survey work an applicant conducts to gather the information required in a plan.

Additionally, this version incorporates feedback obtained at BOEM's workshop for industry and historic preservation professionals held in April 2016, and clarifies that the scope of data collection and reporting efforts should commensurate with the geographic extent and nature of the impact proposed, including examples for deployment of meteorological buoys. Finally, this version updates the recommendations for magnetometers to specify the use of gradiometer configuration.

The recommendations for use of gradiometer configuration are based upon both new and previously published scientific findings that magnetometers operating in gradiometer configuration are more sensitive. This heightened sensitivity enables them to more accurately identify small archaeological resources, while also reducing false positives by effectively removing external source noise (Carrier et al., 2016). This change will allow for improved precision in analytical interpretation of magnetic data for archaeological resource identification, and will potentially allow additional areas to be developed for renewable energy without risking impact to historical resources.

II. Historic Properties and Their Identification

What Are Historic Properties?

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 plan under Section 106 of NHPA (54 U.S.C. 306108). As defined in the regulations implementing Section 106 (36 CFR § 800.16(l)(1)),

> *Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. This term also includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria*.

Further information regarding the National Register of Historic Places and categories of historic properties can be found in *National Register Bulletin 15, How to Apply the National Register Criteria* (National Register of Historic Places, 2002).

Where Should Surveys Take Place?

Applicants should provide a detailed description of the activities proposed in their plans. The geographic area, or areas, in which these proposed activities take place is the Area of Potential Effects (APE). As defined in the regulations implementing Section 106 (36 CFR § 800.16(d)),

> Area of potential effects *means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.*

The scope of these geographic areas should include the following:

- The depth and breadth of the seabed potentially impacted by any bottom-disturbing activities;
- The depth and breadth of terrestrial areas potentially impacted by any ground disturbing activities;
- The viewshed from which renewable energy structures, whether located offshore or onshore, would be visible; and
- Any temporary or permanent construction or staging areas, both onshore and offshore.

The extent of the geographic areas surveyed for historic properties should be appropriate to the scale of the proposed activities. For example, with respect to site assessment activities, a proposed buoy likely would have a much smaller geographic area of impact than a proposed meteorological tower. This is because the nature and types of effects are generally lesser, and the extent of the area impacted by a buoy is likely smaller than that of a meteorological tower.

How Are Historic Properties Identified?

Applicants should provide a detailed description of the methods and results of the surveys they conduct to identify historic properties that may be located within the geographic area or areas (i.e., the APE) where their proposed activities will take place. The geographic area(s) within which an applicant's proposed activities have the potential to impact historic properties may include diverse environments, both onshore and underwater, that necessitate different approaches to historic property identification.

BOEM recommends the following:

- For the identification of historic properties on or within the seabed located on the OCS, historic property identification should be conducted and reported in accordance with Sections II and III of this document.
- For the identification of historic properties (1) on or within the seabed located in state submerged lands or within onshore terrestrial areas, or (2) within the viewshed of proposed renewable energy structures, historic property identification should be conducted and reported following the guidance published by the affected State Historic Preservation Office (SHPO) and provided through consultation with the affected SHPO.

- If the area of potential effects is located on tribal lands, historic property identification should be conducted following the guidance provided by the Tribal Historic Preservation Officer (THPO), if the tribe has designated such an official.

  As defined in the regulations implementing Section 106 (36 § CFR 800.16(w) and (x)), Tribal Historic Preservation Officer (THPO) *means the tribal official appointed by the tribe's chief governing authority or designated by a tribal ordinance or preservation program who has assumed the responsibilities of the SHPO for purposes of Section 106 compliance on tribal lands in accordance with Section 101(d)(2) of the [National Historic Preservation] Act.*

  Tribal lands *means all lands within the exterior boundaries of any Indian reservation and all dependent Indian communities*.

Prior to the initiation of any identification efforts, BOEM recommends that an applicant contact the appropriate SHPO (or THPO, if applicable) to learn about their guidelines for historic property identification, both in state waters and onshore. Please note that BOEM does not delegate its Section 106 and tribal (government-to-government) consultation responsibilities to lessees, applicants, or developers.

- Information regarding SHPOs can be found at: http://www.ncshpo.org/shpodirectory.shtml
- Information regarding THPOs can be found at: http://www.nps.gov/thpo

How is Historic Property Information Submitted to BOEM?

As noted above, the APE for proposed project activities may require the identification of historic properties onshore and/or in state waters, in addition to on the OCS. Section III below discusses the contents of Marine Archaeological Resource Assessment Reports, but applicants are encouraged to prepare other reports and analyses in a manner preferred by the state's SHPO(s) or THPO(s) (if the APE is located on tribal lands, as defined at 36 § CFR 800.16(w) and (x)), using specialists in appropriate fields (e.g., architectural history, landscape architecture, terrestrial archaeology).

BOEM recommends that applicants submit one or multiple stand-alone report(s) to support their plans, as appropriate to the APE and types of historic properties potentially affected therein. For example, applicants proposing a commercial scale facility whose APE includes areas of the OCS, state waters, and onshore areas, are advised to submit three separate reports:

- one marine archaeological resources assessment report, which includes efforts both on the OCS and in state waters;
- one terrestrial archaeological resources assessment report, which documents efforts to identify terrestrial archaeological sites; and
- one report presenting an assessment of visual effects to onshore historic properties.

Doing so facilitates BOEM's review and consultations for commercial-scale developments. By contrast, applicants proposing, for example, to place a meteorological buoy whose APE includes only a small area of the OCS with no onshore APE may wish to submit only one report.

Pre-survey Coordination with BOEM

Lessees and applicants should coordinate with BOEM before conducting survey activities through both the preparation and submission of a survey plan and participation in a pre-survey meeting. This coordination assists in ensuring that surveys are designed and conducted to provide the information required for BOEM to review a plan. Additionally, this coordination serves as an opportunity to address potential historic preservation issues or concerns well in advance of the date an applicant intends to mobilize for a survey. The goal being to prevent the possibility of costly re-mobilization or revision of reports prepared to support a plan. Finally, this coordination provides an opportunity for BOEM to share existing information held by the Bureau regarding known historic properties and the results of previous surveys or environmental studies of relevance to an applicant's project area, if available.

BOEM recommends that applicants include appropriate historic preservation staff or contractors (e.g., marine and terrestrial archaeologists, geomorphologists, architectural historians, and landscape architects) both in the preparation of the survey plan and as participants in the pre-survey meeting.

III. Guidelines for the Identification of Archaeological Sites on the Outer Continental Shelf

Archaeological sites that may be present on the OCS include two broad categories of resources: (1) historic period sites, such as shipwrecks and associated remains, sunken aircraft, and other maritime infrastructure; and (2) pre-contact period archaeological sites once part of the terrestrial landscape and since inundated by global sea level rise during the late Pleistocene and Holocene. Pre-contact period archaeological resources are those that date to the time before European contact with Native Americans.

Applicants should conduct archaeological survey on the OCS by employing both high-resolution geophysical (HRG) survey techniques and geotechnical testing. The archaeological survey should be designed, with input from a qualified marine archaeologist and specialists in other fields as appropriate (e.g., geology and geomorphology), in a manner that is capable of identifying the site types described in the preceding paragraph. A qualified marine archaeologist meets the *Secretary of the Interior's Professional Qualifications Standards* (48 FR 44738-44739) and has experience in conducting HRG surveys and processing and interpreting the resulting data for archaeological potential.

High-resolution Geophysical Survey Techniques

The area surveyed for archaeological identification purposes should be large enough to cover any portion of the project area affected by the activities proposed, including all seafloor-disturbing activities, whether temporary or permanent. Seafloor-disturbing activities may include, but are not limited to: geotechnical exploration (e.g., borings, vibracores, etc.), construction and installation activities (e.g., turbine foundation placement, transmission cable installation,

horizontal directional drilling, etc.), decommissioning, and any other associated anchoring or appurtenances related to these activities (e.g., anchor drop areas, anchor chain drag, jackup barges, etc.). In cases where uncertainty exists regarding the methods to be used during constructing, operating, maintaining, or decommissioning the proposed project, BOEM recommends that the survey area be as large as possible. A larger survey area will give the applicant greater flexibility for placement of structures and methods of construction, operation, and decommissioning in the future, without the need for costly remobilization.

Previously collected data may be suitable for incorporation with newly collected data. Applicants proposing to utilize previously collected data in support of a plan should consult with BOEM, prior to designing the archaeological survey and as part of the pre-survey meeting, to ensure appropriate data quality and coverage of the APE and to prevent the possibility of costly re-mobilization.

Line Spacing

Line spacing is of critical importance for archaeological identification surveys and paleolandscape reconstructions. The applicant should submit data, whether previously or newly acquired, from an archaeological survey conducted along a series of regularly spaced and parallel track lines. Tie-lines running perpendicular to the track lines should also be surveyed. The survey grid should be oriented with respect to the bathymetry, geologic structure, and proposed location of renewable energy construction activities.

Primary line spacing for archaeological identification surveys should not exceed 30 meters (m) throughout the project area for the gradiometer (two or more total field magnetometers operating in gradiometer configuration), and sub-bottom profiler. Survey line spacing for the side scan sonar is dependent upon a variety of factors, including water depth, the specific equipment employed, and the desired resolution of the survey data. In some instances, tighter line spacing may be warranted in order to better investigate a resource. For example, an applicant may wish to collect additional lines of survey data around a potential target in order to more clearly resolve the target for confirmation purposes.

Perpendicular tie-line spacing for archaeological identification surveys should not exceed 500 m. A minimum of at least three equidistant tie-lines should be surveyed; this may mean, in some instances, that spacing tighter than 500 m may be necessary for the tie-lines.

Project Siting Survey

A project siting survey should be completed to provide coverage of any area of bottom disturbing activities proposed within a potential project area. Within these areas, BOEM recommends a survey conducted in a grid pattern with primary line spacing at 30 m and a maximum tie-line spacing of 500 m. The survey should provide coverage of any seafloor area that could be physically disturbed by the proposed activities, including: geotechnical exploration; the installation of data collection structures (e.g., meteorological towers, buoys, or other site assessment equipment); the installation of wind turbine generators and any associated cables or equipment (e.g., electrical service platforms); and any other project-related activities that have the potential to physically impact the seafloor. The area surveyed should provide sufficient coverage to also account for anchors or any other equipment that may contact the seafloor during the proposed activities.

Transmission Cable Route Surveys

Cable route surveys should include a corridor following the full length of the transmission route. The survey pattern along the corridor should include a survey line run along the proposed cable route centerline, and parallel survey lines offset on each side of the centerline at a 30-meter line spacing. BOEM recommends a minimum of three offset parallel lines on each side of the centerline, and the ultimate number of parallel offset lines surveyed should be sufficient to cover the entire area of potential physical disturbance related to the proposed cable installation and operation. This potential area of disturbance includes, but is not limited to, areas where lay barge anchors may be placed during cable installation, areas where cable protection (e.g., rock berms, concrete mattresses, etc.) may be installed, areas of seafloor leveling, and areas of debris removal prior to cable installation. The survey lines immediately adjacent to the centerline must provide side scan sonar coverage of the nadir of the centerline to identify potential targets located directly on the cable route centerline. Perpendicular tie-lines at a maximum spacing of 500 m should also be surveyed throughout the cable corridor.

Archaeological Identification Survey Instrumentation

The geophysical survey instruments of primary importance in the identification of archaeological sites on the OCS are the gradiometer (two or more total field magnetometers operating in gradiometer configuration), side scan sonar, and sub-bottom profiler. Operational considerations and data quality recommendations that are of specific importance for their use in identifying archaeological sites on the OCS are described below. Refer to BOEM's *Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585* for further information regarding swath bathymetry systems and additional recommendations regarding geophysical survey methods.

Gradiometer, side scan sonar, and sub-bottom profiler systems, however, are not the only instruments that provide information useful in the identification and interpretation of archaeological resources. For example, bathymetry and cores can also provide valuable information regarding archaeological resources. Applicants and qualified marine archaeologists should utilize available geophysical data sets, including those previously acquired by BOEM or affected states and universities, as well as those acquired during a survey, to inform the archaeological analysis and reporting described in Section III below.

The applicant should deploy instrumentation in a manner that minimizes interference between systems and the survey vessel, results in the least environmental impact practicable, and records all data at the optimal sampling rate of the equipment used. Survey instruments should be towed at a speed appropriate for the equipment and in a manner that ensures acquisition of the highest quality data possible (typically not exceeding 4-5 knots). All systems should interface with the navigation system to ensure proper integration of positioning information.

A state-of-the-art navigation system with sub-meter accuracy should continuously determine the surface position of the survey vessel. Position fixes should be digitally logged continuously along the vessel track. Geodesy information should be clearly presented and consistent across all data types.

BOEM recommends the use of a vessel-mounted acoustic positioning system, such as ultra-short baseline (USBL) positioning, to improve the reliability of positioning towed sensors. If a vessel-

mounted acoustic positioning system is not utilized, layback distances should be calculated, recorded, and cross-checked with feature-mating techniques to provide accurate positioning of towed sensors. Refer to BOEM's *Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585* for further information.

Gradiometer

For HRG surveys conducted in water depths of 100 m or less, a gradiometer (two or more total field magnetometers operating in gradiometer configuration) should be employed to detect ferrous metals or other magnetically susceptible materials. Overhauser or optically pumped systems are preferred. The gradiometer should be towed as near as possible to the seafloor and in a way that minimizes interference from the vessel hull and the other survey instruments. The gradiometer altitude should not exceed 6 m above the seafloor. An altimeter should be used to ensure the proper height of the gradiometer in the water column. The altitude of the gradiometer should be continuously recorded during data acquisition along the survey.

Gradiometer sensitivity should be 1.0 gamma (γ; 1.0 nano-Tesla [nT]) or less. Background noise level should not exceed a total of 3.0 γ peak to peak. The data sampling rate should be greater than 4.0 Hz to ensure sufficient data point density. Gradiometer data should be recorded on a digital medium in such a way that can be linked electronically to the positioning data. Survey line, time, position, altitude, and speed should be annotated on all output data.

Side Scan Sonar

A side scan sonar system should be used to provide continuous planimetric imagery of the seafloor to identify potential archaeological resources. To provide sufficient resolution of seafloor features, BOEM encourages the use of a system that operates at as high a frequency as practicable based on the factors of line spacing, instrument range, and water depth. For archaeological resource surveys, a system that operates at a 500-kilohertz frequency or greater is recommended. The sonar system must be capable of resolving small, discrete targets 0.5 m in length at maximum range.

The instrument range should be set to provide at least 100 percent overlapping coverage (i.e., 200% seafloor coverage) between adjacent primary survey lines. The side scan sonar sensor should be towed above the seafloor at a height that is 10 to 20 percent of the range of the instrument (Table 1).

Data should be digitally recorded and visually displayed to monitor data quality and identify targets of interest during acquisition. The data should be post-processed to improve data quality for interpretation and mapping, for example, adjusting for slant range effects and variable speed along line.

Table 1
Side Scan Sonar Coverage Area

Instrument Range in Meters/per Channel	Height of instrument in Meters above Seafloor at 10% of Range	Height of Instrument in Meters above Seafloor at 20% of Range
30	3	6
50	5	10
60	6	12
75	7.5	15
100	10	20
200	20	40

Sub-Bottom Profiler

A sub-bottom profiler system should be used for identifying and mapping buried geomorphological features of archaeological potential that may exist within the horizontal and vertical footprint of a proposed project. The selection of the appropriate sub-bottom frequency, or frequencies, and system to achieve this goal should be based on an understanding of both the geomorphology of the area an applicant is operating within (including the potential depth of the Holocene-Pleistocene unconformity) and the parameters of the proposed project (including the maximum depth of disturbance from the proposed renewable energy activities).

The sub-bottom system should be capable of achieving a depth of penetration and resolution of vertical bed separation that is sufficient to allow for the identification and cross-track mapping of features of archaeological potential (e.g., shell middens, paleochannels, levees, inset terraces paleolagoon systems, etc.). As a minimum standard, the sub-bottom profiler system employed should be capable of achieving a resolution of vertical bed separation of at least 0.3 m in the uppermost 10 to 15 m of sediments, depending on the substrate.

High frequency Compressed High Intensity Radar Pulse (CHIRP) systems alone may be suitable for achieving this level of resolution and depth of penetration to adequately image the APE, and thereby providing suitable archaeological information. However, in some circumstances medium penetration seismic systems, such as a boomer, bubble pulser, medium-penetration CHIRP, or other lower frequency system, may also be necessary to provide archaeological information on sedimentary structure that exceeds the depth limitations of high frequency CHIRP systems. Key to selecting an appropriate sub-bottom system is awareness both of the depth of the proposed APE and capacity of the system to penetrate the seafloor in that geographic area. When in doubt, BOEM recommends operating, post-processing, and integrating geological and archaeological interpretations using multiple sub-bottom systems at the recommended line spacing, in order to avoid costly remobilization. For all sub-bottom systems used, the data should be digitally recorded to allow signal processing to improve data quality, and exported to a workstation for integrated interpretation and mapping. Additional considerations regarding selection of appropriate sub-bottom systems and data processing methods, including appropriate paleolandscape reconstruction considerations, are discussed in Sullivan et al.'s 2016 *Virginia Ocean Geophysical Survey Phase II Analyses: Offshore Virginia Wind Energy Area*.

Geotechnical Investigation

Geotechnical testing is a bottom-disturbing activity that has the potential to impact archaeological sites, if present, within the area of disturbance. Conversely, geotechnical testing is a method for identifying and testing potential archaeological sites (e.g., through vibracores, grab samples, gravity cores, etc.). To accommodate both of these scenarios, BOEM recommends that applicants conduct the HRG survey *prior* to geotechnical testing and utilize the results of the HRG survey in planning the geotechnical testing strategy. BOEM recommends that applicants allow sufficient time for geophysical data processing and interpretation activities to occur prior to executing geotechnical testing in order to avoid potential archaeological sites during geotechnical investigation or, if part of an archaeological testing strategy, to properly plan the location, methods, and subsequent laboratory analyses to be completed towards the assessment of potential sites.

If an applicant intends to impact a potential archaeological site, they should provide BOEM with written notification of these activities. This notification should include a detailed description of the potential site or sites identified through geophysical survey (including maps and geophysical data samples) and a research design for the proposed testing activities. The research design should include a discussion of the goals and purpose of the testing, description of the testing methodology, illustration of the location and extent of the testing, and description of the analytical methods that will be employed to further characterize and investigate the samples.

BOEM encourages applicants to coordinate with its qualified marine archaeologist during the planning for geotechnical testing and, to the extent possible, incorporate the relevant results of geotechnical investigation into the archaeological analysis. Applicants should note that the information gathered during geotechnical investigation for engineering or siting purposes may provide information that informs the archaeological investigation and paleolandscape reconstruction, and greatly informs interpretation of sub-bottom profiler data, even if not explicitly designed to do so. Refer to BOEM's *Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585* for further information regarding geotechnical exploration.

<u>Direct Sampling Methods</u>

Geophysical survey alone may not provide sufficient information to identify all potential archaeological sites on the OCS, particularly buried geomorphic features of archaeological interest identified via sub-bottom profiler survey. Direct sampling of these features may be necessary to gather additional site-specific information that corroborates the interpretation of the sub-bottom profiler data. In some cases, direct sampling may be the only available method of confirming the presence or absence of horizons of archaeological potential within features of interest identified during geophysical survey.

The method of direct sampling selected should reflect the bottom type to be sampled and the burial depth of the feature of interest. BOEM recommends that applicants utilize methods that will gather the most information practicable while causing the least impact to a potential site, if present.

Laboratory Testing

Direct samples should be inventoried and logged. Logs should include documentation of stratigraphy, sediment type, Munsell color, and other relevant attributes. Copies of all logs should be included in the archaeological report; see Section III below. If direct samples are archived, the storage repository should be documented in the archaeological report. If samples are not archived, the report should state this.

For further testing or sub-sampling, applicants should consider the full suite of analyses available and select those that will best inform the archaeological interpretation. These methods may include, but are not limited to, macro-sedimentary analysis, point count analysis, radiometric dating, pollen analysis, faunal analysis, P-wave velocity, magnetic susceptibility, foraminifera analysis, and geochemical analysis.

Other Methods of Direct Investigation

In addition to geophysical survey and geotechnical investigation, other methods of direct investigation may be warranted for confirming the presence or absence of archaeological sites on the OCS. These methods may include diver investigation, remotely operated underwater vehicle (ROV) survey, underwater excavation, etc. BOEM recommends that applicants contact OREP for further guidance on additional methods of direct investigation prior to initiating any such activities.

IV. Contents of Marine Archaeological Resources Assessment Reports

The Marine Archaeological Resource Assessment Report (Report) should be a stand-alone document submitted with a plan. The Report represents an evaluation and synthesis of the data (including desktop research, HRG survey, and geotechnical testing), whether previously acquired or gathered during survey activities, for the purpose of identifying potential archaeological resources on the OCS. The Report and analyses presented therein should be prepared by a qualified marine archaeologist and specialists in other fields as appropriate (e.g., geology, geomorphology, etc.). Applicants should note that while data collected by a lessee may be utilized in support of multiple plans, reports should be specific to the activities proposed within an individual plan. This, in turn, facilitates Section 106 review by BOEM and the consulting parties.

The Report should be prepared in a manner that describes the activities proposed in the plan, the area(s) that may be affected by the proposed activities, the methods of identifying archaeological resources within those areas, and the results of those identification efforts. The investigations conducted and the resulting Report should be appropriate to the scope of the proposed activities. For example, with respect to site assessment activities, a proposed buoy may have a much smaller APE and, therefore, a correspondingly smaller investigation effort and Report than a proposed meteorological tower. This is because the nature of the effects and extent of the APE for a buoy is far less than that of a meteorological tower.

Regardless of the scope of the project or extent of the APE, applicants should submit a complete Report to BOEM. Any changes to an applicant's plan(s) that may occur after submittal of a report to BOEM, because of either changes in the design of the proposed project or a request for

additional information made by BOEM, should be incorporated into a revised report and resubmitted to BOEM to ensure continued compliance with Section 106 of the NHPA.

The Report should include the following sections, organized in the following manner:

a) Front Matter
b) Introduction
c) Cultural and Environmental Context
d) Field and Processing Methodology
e) Results and Interpretation
f) Paleolandscape Reconstruction
g) Summary and Conclusion
h) Back Matter
i) Archaeological Resource Charts
j) Digital Data

Below is a detailed description of the recommended contents of each section.

Front Matter

This section of the Report includes the cover, executive summary, non-technical summary, table of contents, and lists. Lists include tables, figures, and appendices.

The non-technical summary is a stand-alone description of the survey that is appropriate for public dissemination. The non-technical summary should exclude specific information on the exact geographic coordinates of potential archaeological sites identified during the survey, specific traditional religious use information, or proprietary information. The purpose of the non-technical summary is to provide a general description of the survey activities, results, and any potential archaeological resources identified that BOEM may choose to share with the public. The non-technical summary should not contain information pertaining to the locations of archaeological sites.

Introduction

This section of the Report should provide a clear and detailed description of the activities considered under the plan, including both: a description and illustration of all proposed bottom-disturbing activities and a description and illustration of the surveyed area including the OCS lease number(s), block number(s), and lease area(s). This section also introduces the findings of the Report, including how many potential historic properties were identified and how many historic properties may be impacted by the proposed undertaking. The narrative should be accompanied, as appropriate, by maps, charts, and plan drawings, illustrating these points. This includes at least one reproducible geographic area map (generally page size = 8.5” x 11” and/or 11” x 17” fold-out) orienting the proposed facility and/or transmission cable route relative to the coastline and nearby geographic features.

Cultural and Environmental Context

This section of the Report includes an analysis of the potential for pre-contact and historic period sites to be located within the survey area and its immediate vicinity. In addition to desktop

research, archival research and other methods of conducting background research, applicants are also encouraged to contact BOEM for additional information held by the Bureau regarding known historic properties and the results of previous surveys or environmental studies of relevance to an applicant's project area, if available.

For pre-contact period sites, the context should include:

- A review of relevant literature on late Pleistocene and Holocene geology, paleogeography, marine and coastal prehistory, and previous archaeological resource reports for the area, if available.
- A detailed analysis and reconstruction of regional sea level rise and discussion of the sea level rise curves or other models used in the analysis. Sea level rise simulations should model and predict the evolution of the shoreline within the survey area at various time intervals.
- Discussion of onshore archaeological site distribution patterns that may serve as analogies for modeling settlement patterns on formerly subaerial portions of the survey area.
- A synthesis of the above information into a model that reconstructs portions of the survey area that may have been subaerially exposed, when this exposure would have occurred, and what cultural groups and site types could be expected within these areas. This includes discussion of the types of relict geomorphic features that may exist in the survey area and consideration of the archaeological potential of these features. This section should also include consideration of the potential for these landscape features to have survived marine transgression.
- A discussion of the potential to identify and evaluate pre-contact sites that may be present, based on the capabilities of current technology, the thickness and composition of overlying sediments, or other factors.

For historic period sites, the context should include:

- A review of existing records for known or reported shipwrecks or other sites within and adjacent to the survey area.
- Review of previous archaeological resource reports for the area, if available.
- A discussion of the potential for shipwreck preservation in terms of bottom sediment type and thickness, and the effects of past and present marine processes in the survey area.
- A discussion of the potential to identify and evaluate shipwreck sites that may be present, based on the capabilities of current survey technologies, the thickness and composition of overlying sediments, or other factors.

Field and Processing Methodology

This section of the Report discusses the methods used to obtain the survey data, the exact equipment used, dates the survey took place, and other salient features of the survey.

Discussion of the survey methods should include:

- A list describing the functional responsibilities and duties of the personnel involved in survey planning, fieldwork, and Report preparation.
- A description of survey instrumentation including, as appropriate, scale and sensitivity settings, sampling rates, frequency, and tow heights above the seafloor.
- A description or diagram of the survey vessel, including its size, sensor configuration, and navigation antenna location.
- A summary of field operations including vessel speed, course changes, sea state, weather conditions, and unusual incidents.
- A description of survey procedures including a statement of survey and record quality and a comparison of data from survey line crossings.
- A discussion of any data acquisition problems or issues that may have affected the ability of the archaeologist to identify and analyze potential cultural resources in the surveyed area.

This section of the Report also discusses the processing methodologies used for visualizing, correcting, filtering, and mathematically transforming all data, to include side scan sonar, magnetometer, bathymetric, and sub-bottom profiler datasets.

Results and Interpretation

This section of the Report provides lists, narratives, and charts detailing the results of the survey. The applicant should key potential archaeological resources to charts. Representative data samples from each survey instrument should be included to demonstrate the quality of the records. At a minimum, the results should include the following information:

- A table of all magnetic anomalies greater than 5 γ identified during the survey keyed to the Archaeological Resource Charts. At a minimum, the table should include:
    - Anomaly ID
    - Lease block
    - Survey line number
    - Gamma intensity of each identified anomaly (peak gradient amplitude)
    - Duration (m)
    - Characterization of the anomaly as a dipole, positive (+) or negative (-) monopole, or complex signature, based on the magnetic traces
    - Gradiometer height above the seafloor
    - Horizontal position, indicated as North American Datum 1983 (NAD 83) coordinates of the interpreted location of each unidentified anomaly in decimal degrees to 5 decimal places, based on magnetic traces and contoured data
    - Vertical position, indicated as estimated depth using half-width rule, Euler equation, or other means as described in the methodology section
    - Association with side scan sonar contacts, bathymetric features, and/or sub-bottom features
    - Recommended avoidance distance, if applicable

- Analysis and interpretation of contoured magnetic data keyed to the Archaeological Resource Charts. This should include discussion of the methods used to process and present the data including the contour interval used.
- A table of all side scans sonar contacts identified during the survey keyed to the Archaeological Resource Charts. At a minimum, the table should include:
    - Side scan sonar contact ID
    - Lease block
    - Survey line number
    - Target length (m)
    - Target width (m)
    - Target height (m)
    - Target shadow (m)
    - Target description
    - Associated magnetic anomalies
    - NAD 83 coordinates of the target in decimal degrees to 5 decimal places
    - Original source file name
    - Recommended avoidance distance, if applicable
- An image of all side scan sonar contacts identified during the survey. These images may be included as part of the side scan sonar table or attached separately if properly keyed to the table. The images should be large enough to illustrate the target and include a scale. Interpretive highlighting or annotation of the side scan sonar data should be provided on a separate image. Small thumbnail images or images that are obscured by the target selection icon from the processing software may not be acceptable for BOEM archaeologists to review.
- Analysis and interpretation of side scan sonar mosaics.
- A discussion of any correlation between magnetic anomalies or side scan sonar contacts and known or probable sources.
- A discussion of any magnetic anomalies, side scan sonar contacts, or other targets of interest identified in the remote sensing data of unknown source, in terms of their potential as cultural resources. This should include a description of the criteria used to determine targets as potential cultural resources and correlation of these targets to any reported shipwrecks or other sites in the area.
- For potential archaeological resources identified from remote-sensing data, an analysis of National Register eligibility and recommendations for any further research or special precautions that may be necessary. If avoidance buffers are recommended, a justification and rationale for the avoidance distance presented should be provided.
- A discussion of the data and results from any additional investigations that BOEM may have directed the applicant to conduct.

Paleolandscape Reconstruction

A paleolandscape reconstruction that presents and illustrates the analysis and identification of areas of high potential for the presence of pre-contact archaeological sites should be included in the Report. The paleolandscape reconstruction should be based on an approach that synthesizes the sea-level history and terrestrial site patterning gathered in the Cultural and Environmental Context, above, with the acoustic remote sensing and direct sampling data gathered during the survey. This information should be developed into a model that delineates the archaeological

potential of the formerly subaerial landscape within the survey area (after CEI 1977; Evans 2015; Faught 2014; TRC 2012; Westley et al. 2011).

The paleolandscape reconstruction should include analysis and interpretation of the sub-bottom profiler data, geotechnical testing data, or other acoustic remote sensing data to determine whether archaeologically sensitive elements of the formerly subaerial landscape are buried beneath more recent seabed sediments. This analysis includes identification of geomorphic features of archaeological potential (e.g., lagoons, terraces, levees, paleochannels, etc.). This analysis should also include discussion of preservation potential based on consideration of the depth of erosion caused by the transgressive zone and the potential for intact archaeological horizons to be present beneath the ravinement surface. If no features are identified, or if it is interpreted that there is no potential for the preservation of potential sites based on the depth of erosion from subsequent sea level rise, this should be clearly demonstrated and illustrated through data samples.

The paleolandscape reconstruction should also include the analysis of cores or direct samples, if collected, to support the interpretation presented in the archaeological analysis. This should include illustration and interpretation of the samples and discussion of the results from any sediment analyses conducted. The location of cores or other direct samples should be clearly indicated on the Archaeological Resource Charts.

The paleolandscape reconstruction provided in the Report should include the following elements:

- Samples of sub-bottom profiler data for each type of landform of archaeological interest identified. Each data sample should be readable and should include horizontal and vertical scales, in addition to event markers, survey line number, or some other means to geographically locate the data samples within the survey area. The data samples should include both an unannotated sample and an interpreted sample with highlighting or annotation that clearly illustrates the relevant features to support the analysis presented in the paleolandscape reconstruction (Figure 1).
- Features of archaeological potential depicted on the Archaeological Resource Charts. These should include illustration of the horizontal and vertical extent of the features (e.g., depth below seafloor of channel margins and thalwegs).
- If areas of high archaeological potential are identified, additional landscape modeling of the features should be conducted to further illustrate and delinate the extent of the landscape components. Digitally tracing, geo-referencing, and interpolating land surface contours from the acoustic data should be completed to produce a land surface model of the feature. The results of this should be depicted in one or more map-based models such as contoured plan views or three-dimensional wire frames (Figures 2 and 3).

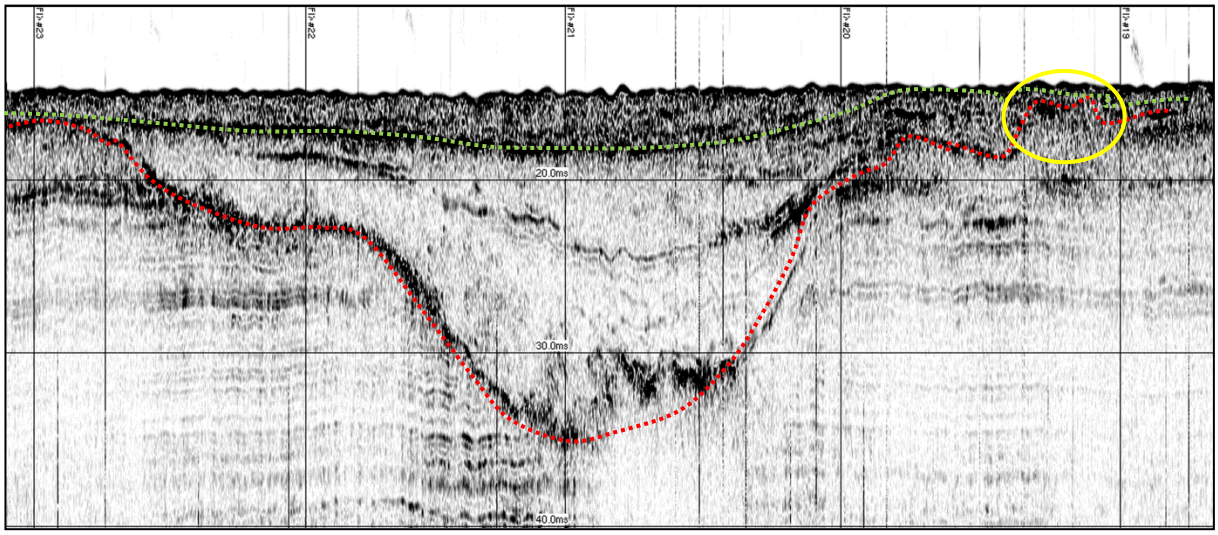

Figure 1: Example of Interpreted sub-Bottom Data Sample (from Evans 2015:70). A levee feature is circled in yellow, the channel horizon is indicated in red, and the ravinement surface is illustrated in green. Vertical scale lines are in 150 m intervals; horizontal scale lines are in 7.5 m intervals.

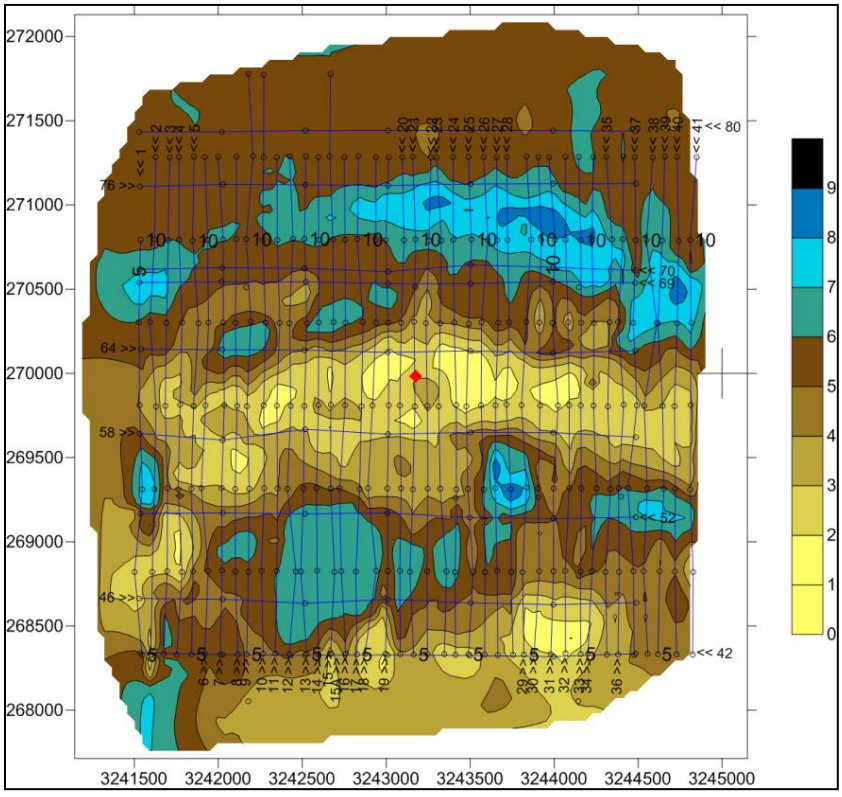

Figure 2: Example of an Archaeological Landscape Model (from Evans 2015:84). The feature of interest is indicated by the red diamond. Survey track lines are superimposed over the area. Depths are in meters below the seafloor; image is oriented north up.

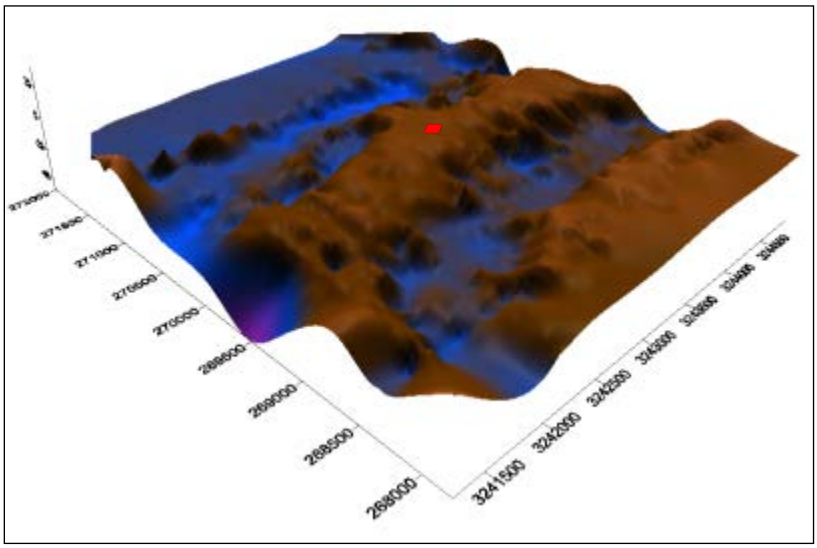

Figure 3: Example of a Three-Dimensional Wireframe Representation of an Interpreted Channel System. The feature of interest is indicated by the red diamond. This system is also depicted in Figure 2, above (from Evans 2015:83).

Summary and Conclusions

This section of the Report includes conclusions and recommendations supported by the archaeological resource survey data and archaeological analyses. This includes a discussion of known or potential archaeological resources and recommendations for avoidance or for further archaeological investigations, citing the relevant language as found in the NHPA.

Back Matter

This section of the Report includes bibliographic references, appendices, and other information, as appropriate. Appendices should include a complete copy of the daily survey operations logs for the duration of the mobilization(s). Logs of virbracores or other direct samples, if collected, should also be included in the appendices.

Archaeological Resource Charts

One or more charts of archaeological resources, as appropriate, should be included with the Report. Charts should be annotated with linear bar-scales (feet and meters), geographic and planar coordinates, lease boundaries, and lease blocks. Charts should be prepared at a standard scale (generally 1:12,000) and oriented to true north. Charts should illustrate all potential archaeological resources identified in relation to the proposed project activities. Please refer to the *Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585* for further information.

At a minimum, the Archaeological Resource Charts should illustrate the following information:

- Navigation post-plot of the surveyed area showing survey lines, line direction, and navigational shot points or event markers.
- The location of the proposed project activities in addition to illustration of areas of the seafloor that could be physically disturbed by any of the activities proposed (e.g., anchor placement, jack up barges, etc.).
- The location of geotechnical testing activities (e.g., soil borings, cone penetrometer tests, vibracores, etc.), if conducted.
- Existing infrastructure, if known.
- All magnetic anomalies and side scan sonar contacts illustrated on the same chart or series of charts. For magnetic anomalies use map symbol: ▲; for side scan sonar contacts use map symbol: ⊠. Identify these magnetic anomalies and side scan sonar contacts using only the aforementioned symbols and a unique number keyed to the listings in the magnetic anomaly and side scan sonar tables in the Report. In congested areas with numerous unidentified magnetic anomalies or side scan sonar targets, you may use a map(s) at a scale of 1:6,000 to depict the anomalies. If this is done, tie this congested area map(s) into the 1:12,000 survey area map. Plot all recommended potential archaeological avoidance areas on the survey area map.
- Bathymetry contours at an appropriate interval depending on water depth and/or seafloor morphology.
- Sub-bottom features including the horizontal and vertical extent of the geomorphic features (e.g., depth below seafloor of channel margins and thalwegs).
- Magnetic contour maps depicting anomalies of 5 γ or greater, including a key to the contour interval.
- Side scan sonar mosaics.

Digital Data

In addition to the geospatial information and digital data deliverables requested under the *Guidelines for Submission of Spatial Data for Atlantic Offshore Renewable Energy Development Site Characterization Surveys* and the *Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585,* the following digital information should be submitted with the Report:

Navigation Data

The navigation post-plot of the surveyed area(s) including survey lines, line numbers or other designations, navigational shot points or event markers, and other relevant attributes should be submitted in an ArcGIS readable format (e.g., Microsoft Excel (.xls), Comma separated value (.csv), Text file (.txt), Database (.dbf) or Shapefile (.shp)).

Proposed Project

The location of the proposed project elements including relevant attributes should be submitted in an ArcGIS readable format (e.g., Microsoft Excel (.xls), Comma separated value (.csv), Text file (.txt), Database (.dbf) or Shapefile (.shp)).

Gradiometer Data

The information used to create the table of magnetic anomalies and charting of magnetic anomalies should be submitted in an ArcGIS readable format (e.g., Microsoft Excel (.xls), Comma separated value (.csv), Text file (.txt), Database (.dbf) or Shapefile (.shp)). The following attributes should be included in the table:

- Anomaly ID
- Lease block
- Survey line number
- Gamma intensity of each identified anomaly (peak gradient amplitude)
- Duration (m)
- Characterization of the anomaly as a dipole, positive (+) or negative (-) monopole, or complex signature, based on the magnetic traces
- Gradiometer height above the seafloor
- Horizontal position, indicated as NAD 83 coordinates of the interpreted location of each unidentified anomaly in decimal degrees to 5 decimal places, based on magnetic traces and contoured data
- Vertical position, indicated as estimated depth using half-width rule, Euler equation, or other means as described in the methodology section
- Association with side scan sonar contacts or sub-bottom profiler features
- Recommended avoidance distance, if applicable

Applicants should also submit the complete, unprocessed magnetometer complete gradiometer dataset. This should include the processed gradiometer data, as well as the unprocessed data for each individual total field magnetometer instrument in the gradiometer configuration. These data should be submitted in a tabular data format recognized by ArcGIS (i.e., Comma separated value (.csv), Text file (.txt), Database (.dbf) or Shapefile (.shp)). At a minimum, the following items should be included within the data table(s):

- Easting/Longitude
- Northing/Latitude
- Time, in UTC
- Raw Magnetic Readings for each instrument
- Gradiometer Altitude
- Survey Line Number/Name

Each of these components must occupy a single field within the table. For example, easting or longitude data must be within a single column in the data table. This would include a column for an easting amount, or longitude in decimal degrees, not a table with separate columns for degrees and another for decimal minutes.

Side Scan Sonar Data

The information used to create the table of side scan sonar contacts and charting of sonar contacts should be submitted in an ArcGIS readable format (e.g., Microsoft Excel (.xls), Comma

separated value (.csv), Text file (.txt), Database (.dbf) or Shapefile (.shp)). The following attributes should be included:

- Side scan sonar contact ID
- Lease block
- Survey line number
- Target length (m)
- Target width (m)
- Target height (m)
- Target shadow (m)
- Target description
- Associated magnetic anomalies
- NAD 83 coordinates of the target in decimal degrees to 5 decimal places
- Original source file name
- Recommended avoidance distance, if applicable

Applicants should provide both raw and processed eXtended Triton Format (.xtf) line files for the survey. Side scan sonar mosaics of the survey area should be prepared as a geo-referenced Tagged Image Format (.tif) and output as 0.5 m resolution or better.

Sub-bottom Profiler Data

The data used to create the charts illustrating the horizontal and vertical extent of sub-bottom geomorphic features should be submitted in an ArcGIS readable format.

Applicants should provide sub-bottom profiler data recorded in SEG-Y standard exchange format. Digital information for the reflectors/horizons identified in the data should also be provided. Formatting may include image plots showing the identified horizons, XYZ data files, or CSF files compatible with SonarWiz software, or other formats approved by BOEM.

Bathymetry Data

The applicant should provide bathymetric data in the following formats with appropriate metadata detailing processing parameters, illumination angles and coordinate systems:

- XYZ data
- ARC ASCII Grid and layer files
- Contours (ESRI compatible)
- Geo-referenced image files

Geotechnical Data

The location of geotechnical testing activities (e.g., soil borings, cone penetrometer tests, vibracores, etc.) should be submitted in an ArcGIS readable format (e.g., Microsoft Excel (.xls), Comma separated value (.csv), Text file (.txt), Database (.dbf) or Shapefile (.shp)) including relevant attributes.

V. Guidance Document Statement

BOEM issues guidance documents to clarify, supplement, and provide more detail about certain BOEM regulatory requirements of and to outline information required of the applicant to support their various submittals. This guidance document sets forth a policy and an interpretation of a regulatory requirement to provide a clear and consistent approach to complying with that requirement. An applicant may use an alternate approach for compliance; however, early and frequent coordination with BOEM will be especially critical to ensure the work conducted meets BOEM's regulatory requirements.

VI. Paperwork Reduction Act Statement

The information collection provisions of this document are intended to provide clarification, description, or interpretation of requirements contained in 30 CFR 585 Subpart F. The Office of Management and Budget (OMB) has approved the information collection requirements for these regulations and assigned OMB Control Number 1010-0176.

VII. Contact Information

For further information or inquiries regarding these guidelines, please contact the Office of Renewable Energy Programs at (703) 787-1340 or renewable_reporting@boem.gov. Additional resources, including links to BOEM-funded archaeological and historic preservation studies, are available online at www.boem.gov/Renewable-Energy/Historic-Preservation-Activities/.

VIII. References

Carrier, B. M., A. Pulkkinen, and M. Heinz. 2016. Recognizing Geomagnetic Storms in Marine Magnetometer Data: Toward Improved Archaeological Resource Identification Practices, STAR: Science & Technology of Archaeological Research, 2:1, 1-14.

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Evans, A.M. 2015. Examining and Testing Potential Prehistoric Archaeological Features on the Gulf of Mexico Outer Continental Shelf. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. CMI Study 2015. 366p.

Faught, M. K. 2014. Remote Sensing, Target Identification and Testing for Submerged Prehistoric Sites in Florida: Process and Protocol in Underwater CRM Projects. In Prehistoric Archaeology on the Continental Shelf, Amanda M. Evans, Joseph C. Flatman and Nicholas C. Flemming, editors, Springer, New York.

National Register of Historic Places. 2002. How to Apply the National Register Criteria for Evaluation, National Register Bulletin No. 15. U.S. Department of the Interior, National Park Service. http://www.nps.gov/nr/publications/bulletins/nrb15/ (Accessed September 10, 2014).

Sullivan, S.M., K.R. Smith, and D.M. Sackett. 2016. Virginia Ocean Geophysical Survey Phase II Analyses: Offshore Virginia Wind Energy Area. U.S. Department of the Interior, Bureau of Ocean Energy management, Office of Renewable Energy Programs, Herndon. OCS Study BOEM 2016-056. 39 pp.

TRC Environmental Corporation. 2012. Inventory and analysis of archaeological site occurrence on the Atlantic outer continental shelf. U.S. Department of the Interior, Bureau of Ocean Energy, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2012-008. 324 pp.

Westley, K., T. Bell, R. Plets, and R. Quinn. 2011. Investigating Submerged Archaeological Landscapes: a Research Strategy Illustrated with Case Studies from Ireland and Newfoundland, Canada. In Submerged Prehistory, Jonathan Benjamin, Clive Bonsall, Catriona Pickard, and Anders Fischer, editors, pp. 129–144. Oxbow Books, Oxford.