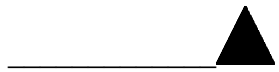
OCS EIS/EA
BOEM 2014-017

Lease Issuance for Wind Resources Data Collection on the Outer Continental Shelf Offshore Georgia

Environmental Assessment

U.S. Department of the Interior
Bureau of Ocean Energy Management
www.boem.gov

BOEM
Bureau of Ocean Energy Management



OCS EIS/EA
BOEM 2014-017

Lease Issuance for Wind Resources Data Collection on the Outer Continental Shelf Offshore Georgia

Environmental Assessment

U.S. Department of the Interior
Bureau of Ocean Energy Management
Office of Renewable Energy Programs

March 2014

TABLE OF CONTENTS

List of Figures

List of Tables

Acronyms and Abbreviations

µPa	micropascal(s)
µs	microsecond(s)
2D	two-dimensional
3D	three-dimensional
4D	four-dimensional
ABR	auditory brainstem response
ac	acre(s)
ADCP	Acoustic Doppler Current Profilers
AEP	auditory evoked potential
AIM	Acoustic Integration Model
ALWTRP	Atlantic Large Whale Take Reduction Plan
AOI	Area of Interest
ASMFC	Atlantic States Marine Fisheries Commission
AUV	Autonomous underwater vehicle
BA	Biological Assessment
bbl	Barrel(s)
BDCC	Buoy Data Collection Configuration
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CHIRP	compressed high intensity radar pulse
Cm	centimeter(s)
CODAR	coastal ocean dynamic applications radar
COE	U.S. Army Corps of Engineers
COP	Construction and Operations Plan
COST	Continental Offshore Stratigraphic Test
CPT	cone penetrometer test
CSEM	controlled source electromagnetic
dB	decibel(s)
DCC	Data Collection Configuration
DIN	dissolved inorganic nitrogen
DIP	dissolved inorganic phosphorus
DO	dissolved oxygen
DOD	Department of Defense
DPS	distinct population segment
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
EPD	Environmental Protection Division
ESA	Endangered Species Act
FAA	Federal Aviation Administration

FAZ	full azimuth
FERC	Federal Energy Regulatory Commission
ft	feet
FWS	U.S. Fish and Wildlife Service
G&G	geological and geophysical
gal	gallon(s)
GAP	General Activities Plan
GDNR	Georgia Department of Natural Resources
GPS	global positioning system
ha	hectare(s)
HESS	High Energy Seismic Survey
hr	hour(s)
HRG	high-resolution geophysical
Hz	hertz
IAGC	International Association of Geophysical Contractors
in.	inch(es)
IPF	impact-producing factor
ISSMGE	International Society for Soil Mechanics and Geotechnical Engineering
JNCC	Joint Nature Conservation Committee
EIS	Environmental Impact Statement
kg	kilogram(s)
km	kilometer(s)
kn	knot(s)
L	liter(s)
LIDAR	light detection and ranging
lb	pound(s)
LFA	low frequency active
LNG	liquefied natural gas
m	meter(s)
MARAD	Maritime Administration
MHK	marine hydrokinetic
MHW	Mean High Water
mi	mile(s)
min	minute(s)
ml	milliliters
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
ms	millisecond(s)
MSD	marine sanitation device
MT	magnetotelluric
MW	megawatt(s)
NASA	National Aeronautics and Space Administration
NDBC	National Data Buoy Center
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NM	nautical mile(s)

NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	National Research Council
NRDC	National Resources Defense Council
NRU	Northern Recovery Unit
NSF	National Science Foundation
NTL	Notice to Lessees and Operators
NWP	Nationwide Permit
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
ODMDS	ocean dredged material disposal site
OPAREA	Operating Area
PAM	passive acoustic monitoring
PBR	Potential Biological Removal
PCPT	piezocone penetration test
PFRU	Peninsular Florida Recovery Unit
P.L.	Public Law
ppm	parts per million
PTS	permanent threshold shift
ROD	Record of Decision
ROV	remotely operated vehicle
s	second(s)
SAB	South Atlantic Bight
SAFMC	South Atlantic Fishery Management Council
SAP	Site Assessment Plan
SOC	Standard Operating Condition
SODAR	sonic detection and ranging
SBF	synthetic-based fluid
SCDNR	South Carolina Department of Natural Resources
SEL	sound exposure level
SMA	Seasonal Management Area
SPL	sound pressure level
SURTASS	Surveillance Towed Array Sensor System
TDP	total dissolved phosphorus
TED	turtle excluder device
TOC	total organic carbon
TTS	temporary threshold shift
U.S.C.	United States Code
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USDOC	U.S. Department of Commerce
USDOI	U.S. Department of Interior
VGP	Vessel NPDES general permit
WRD	Wildlife Resources Division

1. INTRODUCTION

1.1 BOEM Authority and Regulatory Process

Subsection 8(p)(1)(C) of the Outer Continental Shelf (OCS) Lands Act (43 U.S.C. §1337(p)(1)(3)), which was added by section 388 of the Energy Policy Act of 2005 (EPAct), gave the Secretary of the Interior the authority to issue leases, easements and rights-of-way on the OCS for activities which produce or support the production, transportation, or transmission of energy from sources other than oil and gas. This authority has been delegated to the Bureau of Ocean Energy Management (BOEM).

On November 6, 2007, BOEM announced an interim policy for authorizing the issuance of leases for the installation of offshore data collection and technology testing facilities on the OCS (72 FR 62673, November 6, 2007). An applicant has submitted a lease proposal to BOEM pursuant to the interim policy. BOEM has prepared this Environmental Assessment (EA) to consider the reasonably foreseeable environmental consequences of lease issuance and, in particular, whether issuing a lease will result in significant environmental impacts (77 FR 74512, December 14, 2012). If an interim policy lease is issued offshore Georgia, it would grant the lessee the exclusive right, subject to the terms and conditions of the lease, to conduct site characterization and site assessment activities. The lessee would have a limited term (five years) for activities on the OCS. Any application for commercial-scale renewable energy facilities would be processed independently of this lease in accordance with subsection 8(p) of the OCS Lands Act and the associated implementing regulations.

1.2 Description of the Proposed Action

EPAct requires BOEM to issue renewable energy leases competitively, unless the agency determines after public notice of a proposed lease area that no competitive interest exists. In 2007, BOEM published a Request for Information and Nominations (72 FR 62673, November 6, 2007) to solicit nominations of interest for potential projects under the interim policy, to which Southern Company responded by nominating three OCS blocks for offshore wind data collection. After assessing responses to an additional Federal Register notice to solicit both comments and competing nominations (73 FR 21152, April 18, 2008), BOEM announced that there was no competitive interest in Southern Company's originally proposed lease area. On April 7, 2011, Southern Company submitted an application to BOEM for an interim policy lease within three OCS lease blocks off the coast of Georgia in order to collect site-specific wind and environmental data. The application outlined the installation of one meteorological tower within one of three OCS blocks and/or the deployment, operation and removal of a meteorological buoy and associated appurtenances (e.g., Acoustic Doppler Current Profilers [ADCPs] or fixed passive acoustic monitors) within three OCS blocks.

The proposed action is the issuance of a lease to Southern Company under BOEM's Interim Policy, authorizing placement of a single meteorological tower, identified in the Southern Company application as a Data Collection Configuration (DCC), and/or meteorological buoys, identified as Buoy Data Collection Configurations (BDCC), within OCS Blocks 6074, 6174 or 6126. Activities under the lease include geotechnical and shallow hazards surveys and

construction and installation of a meteorological tower and/or up to two buoys for data collection. The Standard Operating Conditions (SOCs) listed in Appendix A are considered to be part of the Proposed Action and Alternatives B and C.

1.3 Purpose and Need

The purpose of issuing a lease for three OCS Lease Blocks (6074, 6174, and 6126) located approximately 3.0 to 11.6 nautical miles (NM; 5.5 to 21.5 km) offshore of Tybee Island, Georgia (Figure 1-1) is to authorize the collection of meteorological and environmental data. The need for the proposed action is to assess the feasibility of developing renewable energy resources on the OCS offshore Georgia.

1.4 Objective of the Environmental Assessment

Pursuant to the National Environmental Policy Act (NEPA; 42 U.S.C. §§4321-4370f), and the Council on Environmental Quality (CEQ) Regulations at 40 CFR 1501.3, this EA was prepared to determine whether or not the proposed action — issuance of the interim policy lease and associated activities — would have a significant effect on the human environment. The activities associated with the action and reasonable alternatives are described in Section 2 of this EA and include: (1) site characterization surveys (i.e., biological, geotechnical, and archaeological surveys), which includes the use of vessels and equipment necessary to conduct them; and (2) site assessment activities which include the lessee's installation, maintenance, and decommissioning of one meteorological tower and/or the installation, maintenance, relocation, and removal of mooring systems for up to two buoys. Section 3 of this EA considers the reasonably foreseeable environmental consequences of these activities, considers reasonable alternatives to Southern Company's proposal, and analyzes the reasonably foreseeable environmental consequences associated with those alternatives.

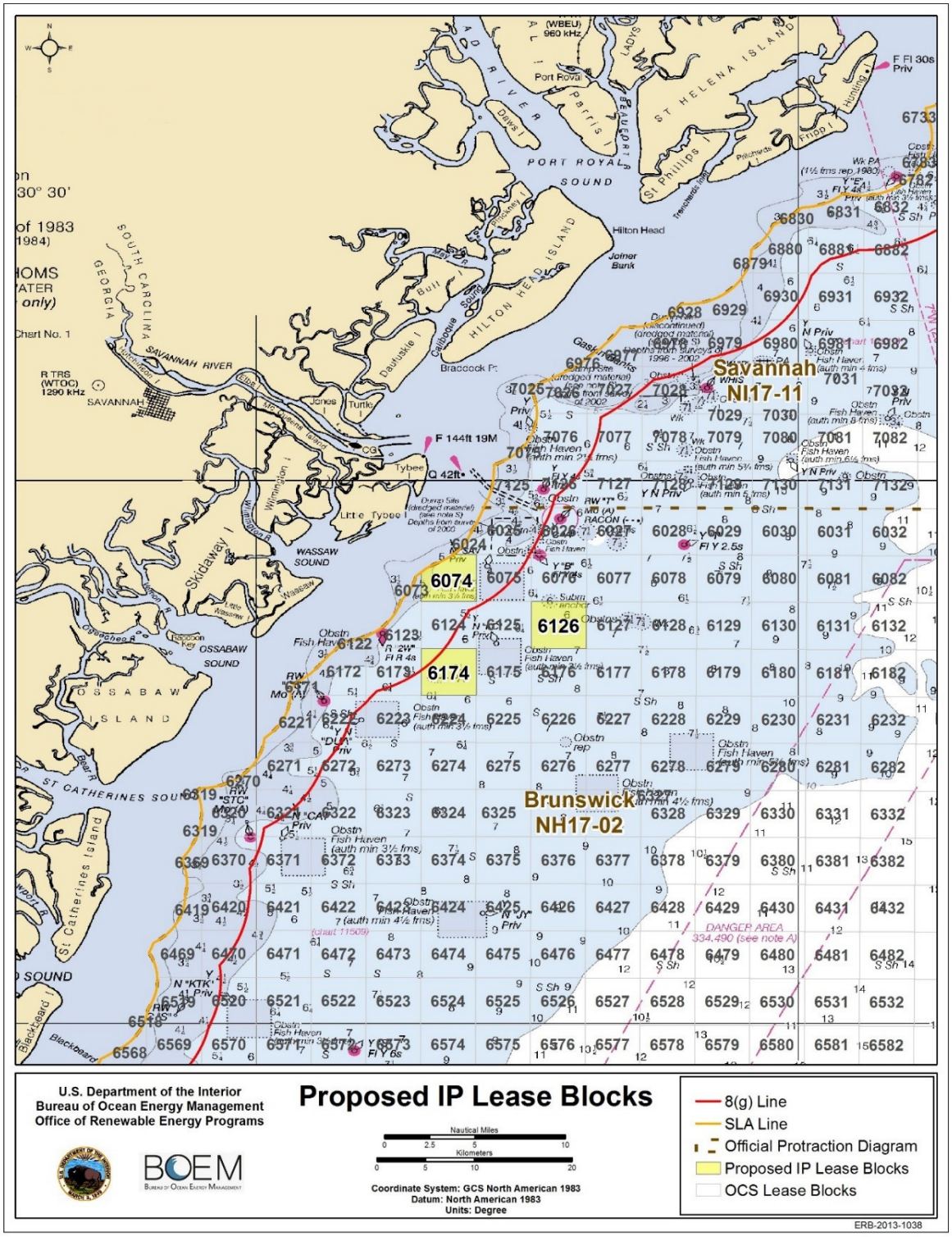
Information considered in this EA includes:

1. Public response to the December 14, 2012 Notice of Intent (NOI) to prepare this EA (77 FR 74512, Dec. 14, 2012);

2. BOEM research and review of current relevant scientific and socioeconomic literature;

3. Ongoing consultations with other Federal agencies including the U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), the U.S. Coast Guard (USCG), and others; and

4. Relevant material from the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia Final Environmental Assessment* (USDOI, BOEM, 2012a); *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts; Environmental Assessment* (USDOI, BOEM, 2012b); and *Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Final Programmatic Environmental Impact Statement* (USDOI, BOEM, 2014).



Source: USDOI, BOEM (2012b)

Figure 1-1. Proposed Lease Blocks.

This page left blank intentionally.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Alternative A – The Proposed Action

Under Alternative A, which is the proposed action, BOEM would issue a lease to Southern Company authorizing placement of a single meteorological tower and/or up to two meteorological buoys within OCS Blocks 6074, 6174, or 6126 located offshore Georgia. Activities proposed on the leasehold include geotechnical and shallow hazards surveys, oceanographic data collection (e.g., ADCPs), and construction, installation, maintenance and decommissioning of a meteorological tower and/or up to two buoys for data collection. BOEM assumes that the lessee would move the buoys at least twice during the total lease term of five years.

Under Alternative A pile driving activities used to install a meteorological tower would be prohibited from November 1 to April 30 due to the sensitivity of North Atlantic right whales to anthropogenic sounds. The proposed lease area is in close proximity to North Atlantic right whale calving areas where they calve mainly between November and March.

2.1.1 Routine Activities

This section discusses the infrastructure involved and activities (impact-producing factors) resulting from the proposed lease and over the life of the project. Activities include site characterization surveys and site assessment activities.

2.1.1.1 Timing

The anticipated timing for the project would be five years after lease issuance. Site characterization surveys would likely occur within the first year. Information gathered from site characterization activities is used to prepare the Project Plan, which provides survey results and installation engineering and construction details. Once BOEM reviews and approves the Project Plan, BOEM expects the lessee to continue with construction of the meteorological tower and/or buoys in the project's second year. When the meteorological tower and/or buoy installation is completed, operation and maintenance (O&M) activities begin. O&M activities continue throughout the period of time that site assessment equipment is operational (that is, for the remainder of the second year and the third, fourth, and part of the fifth year). BOEM expects that Southern Company will decommission the project within one year after the end of the five-year lease term, unless Southern Company requests and BOEM approves an extension of the lease term.

2.1.1.2 Site Characterization Surveys

Site characterization surveys are required to obtain detailed knowledge of project site conditions prior to construction and operation of a meteorological tower or buoy. Although BOEM does not issue permits or approvals for these site characterization activities, it will not consider approving a lessee's Project Plan if the required survey results are not included. Site characterization activities may include, but are not limited to, geotechnical, shallow hazards, biological, and archaeological surveys. Meteorological tower construction and buoy installation require detailed knowledge of surface and shallow subsurface geological and geophysical (G&G)

conditions at the project site to support activities associated with the design, fabrication, installation, operation, and removal of the structure. Integrated marine geophysical/hydrographic surveys, geotechnical exploration, and sediment sampling programs would be conducted to determine the following characterizations: (1) water depths; (2) seafloor morphology; (3) structural features; (4) sub-seafloor stratigraphy and structure; and (5) natural or man-made obstructions on or below the seafloor of the proposed lease area. Geophysical exploration specifically refers to site-specific sediment and underlying geologic data acquired from the seafloor and the sub-bottom and includes geotechnical surveys utilizing borings, vibracores, and cone penetration tests.

Conducting site characterization surveys requires approximately one month, depending on weather and sea state conditions. These surveys may be conducted throughout the proposed lease area. The survey area for a meteorological tower would include a minimum of a 5900-ft by 5900-ft (1,800-m by 1,800-m) rectilinear grid centered on the proposed structure, and include the footprint of all potential bottom disturbing activities from construction, installation, inspection, maintenance, decommissioning, and removal activities (including anchorages).

Chapter 3.5.2 (Site Characterization) of the *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternative Use of Facilities on the Outer Continental Shelf – final programmatic environmental impact statement* (Programmatic EIS; USDOI, MMS, 2007a) and the *Atlantic OCS Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas Draft Programmatic Environmental Impact Statement* (Mid/South Atlantic G&G EIS; USDOI, BOEM, 2014) discuss in detail the various survey technologies that could be used. These documents are briefly summarized below and incorporated by reference.

High resolution geophysical surveys would be used under the proposed action to characterize the potential site of the meteorological tower. High resolution geophysical survey equipment uses less intense sound sources than large air guns that are sometimes used for deeply penetrating exploratory seismic surveys, and result in less sound introduced into the environment. The following technologies may be used to further characterize the site of the meteorological tower:

- To characterize an area for archaeological and cultural resources, shallow hazards, and hard bottom areas, high resolution geophysical surveys may include deep-tow, side-scan sonar surveys; digital depth sounders; multibeam echosounders and backscatter devices; single beam bathymetry surveys; various sub-bottom profiler systems; and remotely operated vehicles.
- To obtain physical and chemical data on surface sediments, geological and geochemical sampling may be used, including bottom-sampling devices, piezocone penetrometers, vibracores, and cores retrieved to the depth of bottom-founded structures.
- To assess benthic community composition and to identify submerged aquatic vegetation within the proposed lease area, benthic and vegetation resource sampling and surveys may be conducted.
- To locate buried pipelines, archaeological and cultural resources, disposal areas, and other metallic debris, a magnetometer survey would be conducted most likely using one of three types of sensors: an Overhauser effect sensor, a proton precession sensor, or a cesium vapor sensor.

The exact location of a meteorological tower and/or buoys will be sited to avoid adverse effects to offshore cultural resources or biologically sensitive habitats, if present. BOEM's primary mitigation strategy for sensitive resources is avoidance. In addition, BOEM has developed several SOCs to minimize or eliminate impacts on protected species, including Endangered Species Act (ESA)-listed species of whales, sea turtles, fish, and birds (Appendix A). These SOCs were developed through previous consultation with other federal and state agencies and may be refined as a result of ongoing consultations. BOEM would require that the lessee comply with these SOCs through lease stipulations. The exact terms of these requirements are subject to change, and would be finalized in the lease. If BOEM would offer a lease to Southern Company, specific lease stipulations would be drafted and negotiated with the lessee at a later stage, after the federal consultations have concluded and prior to lease signing.

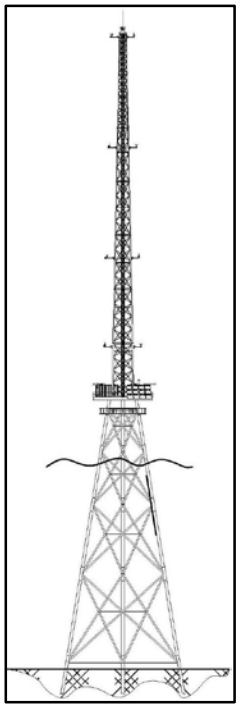
2.1.1.3 Structure and Equipment

2.1.1.3.1 Meteorological Tower and Foundation

Chapter 3.1.3.1 of the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shield Offshore Rhode Island and Massachusetts Revised Environmental Assessment* (RI/MA EA; USDOI, BOEM, 2013) and the Mid/South Atlantic G&G EIS (USDOI, BOEM, 2014) discuss in detail the various tower configurations that could be used. These documents are briefly summarized below and incorporated by reference.

The key component used for assessing wind conditions is the meteorological tower. Southern Company proposes placing a single meteorological tower in one of the three OCS blocks of the proposed lease area. The meteorological tower proposed by Southern Company (see Figure 2-1) would have four main components: pilings, a jacket type foundation, a platform deck, and a lattice type mast (Southern Company and Geo-Marine, Inc., 2012a). The piles are driven approximately 53 ft (16 m) into the seafloor. The platform deck is a three-legged tripod structure and sits approximately 40 ft (12.2 m) above sea level. The lattice mast rises 220 ft (67 m) above the platform deck.

The area of ocean bottom affected by a meteorological tower jacket foundation is up to 2,000 sq ft (186 sq m). The final foundation selection, if different from the meteorological tower specifications presented in this EA or in Southern Company's lease application, will be included in a detailed Project Plan submitted to BOEM after site characterization surveys are conducted and prior to construction. These other types of foundations include monopiles, tripods, or floating foundations. The ocean bottom affected by a monopole-supported meteorological tower is approximately 200 sq ft (19 sq m) (USDOI, BOEM, 2013).



Source: Australian Maritime Systems (2013.

Figure 2-1. Lattice-Type Mast Mounted on a Steel Jacket Foundation.

2.1.1.3.2 Buoys

Chapter 3.1.3.2 of the RI/MA EA (USDOI, BOEM, 2013) and the Mid/South Atlantic G&G EIS (USDOI, BOEM, 2014) discuss in detail the various buoy configurations that Southern Company may use. These documents are briefly summarized below and incorporated by reference. The exact configuration of the buoys will be determined by Southern Company at the time they are deployed. The discussion below includes a brief description of possible configurations and devices that could be used during the term of the lease.

Meteorological buoys may be used as an alternative or in addition to a meteorological tower for meteorological resource data collection (i.e., wind, waves, and ocean currents). Based on the description in the Southern Company application, this EA assumes a maximum of two buoys should the lessee choose to employ buoys in addition to a meteorological tower (Southern Company and Geo-Marine, Inc., 2011). These meteorological buoys will be anchored at fixed locations and regularly collect observations from many different atmospheric and oceanographic sensors. The meteorological buoys may not remain in one location during the duration of the lease; instead, the lessee may move the buoys within the proposed lease area. Because the anchoring system would disturb the seafloor, BOEM is requiring the lessee to conduct site characterization surveys where ever the lease proposes to anchor the buoys.

Southern Company is proposing a boat-shaped hull buoy for meteorological data collection (Southern Company and Geo-Marine Inc., 2012b) (see Figure 2-2) that uses Light Detection and Ranging (LIDAR) as its key component to obtain wind resource measurements. Boat-shaped hull

buoys are aluminum-hulled and provide long-term survivability in severe seas (National Data Buoy Center, 2006). On the OCS, a larger boat-shaped hull buoy requires a combination of a chain, nylon, and buoyant polypropylene materials designed for many years of ocean service. Dimensions of the buoy proposed by Southern Company are 19.7 ft (6 m) long by 10.2 ft (3.1 m) wide by 29.5 ft (9 m) high, including masts, installed with a 10,000 pound anchor. Other buoy types that may be used are discussed in detail in the RI/MA EA (USDOI, BOEM, 2013).

Source: USDOI, BOEM (2013)

Figure 2-2. 6-Meter Boat-Shaped Hull Buoy.

2.1.1.3.3 Equipment

Meteorological Data Collection

To obtain meteorological data, scientific measurement devices are mounted either directly on the tower or buoy or on instrument support arms. Meteorological data will be obtained from a combination of conventional anemometers, LIDAR, Sonic Detection and Ranging (SODAR), and Coastal Ocean Dynamic Applications Radar (CODAR) devices.

Oceanographic Data Collection

A buoy tethered to the meteorological tower and/or other instrumentation on the meteorological tower can monitor oceanographic parameters and collect baseline information on the presence of certain marine life. A tethered buoy can contain instrumentation to monitor ocean environmental parameters at the sea surface and within the water column along with environmental monitoring equipment, such as hydrophones for recording marine mammal vocalizations. A tethered buoy is located within approximately 500 ft. (152 m) of a tower platform, but is far enough from the meteorological tower to negate any turbulence or wake effects created by the underwater platform structure. The size of a tethered buoy is estimated to be up to 9 ft. by 9 ft. (3 m by 3 m).

To measure the speed and direction of ocean currents, an ADCP can be installed on the meteorological tower or buoys. The ADCP can be mounted independently on the seafloor or to the legs of the platform, or attached to a buoy. A seafloor-mounted ADCP is likely to be located

near the meteorological tower (within approximately 500 ft [152 m]), connected by a wire that is hand-buried into the ocean bottom. A typical ADCP has three to four acoustic transducers that emit and receive acoustical pulses from different directions, with frequencies ranging from 300 to 600 kHz and a sampling rate of 1 to 60 minutes. A typical ADCP is about 1 to 2 ft (0.3 to 0.6 m) tall and 1 to 2 ft (0.3 to 0.6 m) wide. Its mooring, base, or cage (surrounding frame) is several feet wider (USDOI, BOEM, 2012a).

Other Equipment

A meteorological tower or buoy also could accommodate other monitoring equipment, for example, bird and bat monitoring equipment (e.g., radar units and thermal imaging cameras), data logging computers, power supplies, visibility sensors, communications equipment, material hoists, and storage containers. Equipment will be powered by batteries charged by small wind turbines, solar panels, and/or diesel generators.

2.1.1.4 Installation

2.1.1.4.1 Project Plan

A Project Plan includes construction and engineering specifications of the facility and includes detailed information regarding proposed activities, structures and facilities, environmental, health, and safety assurance plans, and site characterization survey results. Southern Company is not authorized to commence installation activities until an adequate Project Plan, which includes results of required surveys, is submitted to and reviewed by BOEM. After BOEM acknowledges receipt of a complete Project Plan, BOEM has 60 calendar days to raise any objections to the Plan. For example, the Project Plan must provide sufficient engineering details for BOEM to be able to determine that the proposed facility would be installed and operated in a safe manner, and information provided in the Project Plan shows no impacts beyond those assessed in this EA and the pursuant regulations (e.g., ESA, NHPA, Magnuson-Stevens Conservation and Management Act, etc). If BOEM raises objections to the Project Plan during the review period, Southern Company may not proceed with installation activities under their lease until subsequent modifications to the Project Plan satisfy BOEM's initial objections. If BOEM does not raise objections during the 60-day review period, the Project Plan is considered adequate and Southern Company is authorized to conduct installation activities under the lease.

Installation of a meteorological tower is likely to occur in the spring and summer months, but could extend into the fall. Pile driving activity is prohibited from November 1 – April 30 to reduce acoustic impacts to migrating cetaceans. Total installation time for one meteorological tower ranges from 8 days to 10 weeks, depending on the type of structure installed and weather and sea state conditions. Depending on delays caused by weather and sea state conditions, acquiring required federal permits, and availability of vessels, workers, and tower components, the proposed meteorological tower may be installed over more than one construction season. If installation occurs over two construction seasons, the foundation is likely to be installed first with limited meteorological equipment mounted on the platform deck; the mast and remaining equipment to be installed the following year.

2.1.1.4.2 Onshore Activity

The lessee has identified Georgia Power's existing Plant Kraft facilities in Port Wentworth, Georgia (located approximately 2 miles upriver from the Port of Savannah) as the most likely port to be used by vessels supporting the installation, operation, and decommissioning activities for the proposed action (Southern Company and Geo-Marine, Inc., 2011). Onshore activities at Plant Kraft include: fabrication, which involves cutting, welding, and assembling steel components; staging; and loading and launching of support vessels. Other marinas and facilities, most likely in the Savannah area, may be used for site characterization and assessment staging areas and crew/cargo launch sites for the survey vessels. Some of the meteorological tower components may be fabricated at an onshore facility in New Orleans, Louisiana, and transported to Plant Kraft or sent directly to the installation site via barge. Onshore activity related to the installation of buoys is expected to use the same ports and facilities as the meteorological tower. No expansion of existing facilities is necessary to support the proposed action.

2.1.1.4.3 Offshore Activity

During installation, a radius of approximately 1,500 ft (162 acres; 65 hectares) around the site is needed for anchoring support vessels. Depending on the type of structure installed and the weather and sea state conditions, installation of a meteorological tower may occur over multiple construction seasons. Several vessels are involved with construction of a meteorological tower (see Section 2.1.1.7, Vessel Traffic).

Installation of the Foundation Structure and Mast

A jacket or monopile foundation and deck will be fabricated onshore, transferred to barge(s) and carried or towed to the offshore site. This equipment is typically deployed from two barges, one containing the pile-driving equipment and a second containing a small crane, support equipment, and the balance of materials needed to erect the platform deck. These barges are tended by tugs and workboats as needed.

The foundation pile(s) for a fixed platform range from a single 10 ft (3 m) diameter monopile to four 3 ft (1 m) diameter piles. These piles are driven from 25 to 100 ft (8 to 30 m) below the seafloor with a pile-driving hammer typically used in marine construction operations. When the pile driving is complete, typically after several days, the pile-driver barge would be removed. Next, a jack-up barge equipped with a crane is used to assist in the mounting of the platform decking, tower, and instrumentation onto the foundation. Depending on the type of structure installed and weather and sea conditions, the marine construction of the foundation pilings and platform ranges from a few days (monopole in good weather) to six weeks (jacket foundation in bad weather) (USDOI, MMS, 2009). The mast sections are raised using a separate barge-mounted crane, with installation likely completed within a few weeks.

Scour Control System

Episodic sediment movement caused by ocean currents and waves can cause erosion or scour around the base of the towers. Erosion caused by scour may undermine meteorological tower structural foundations, leading to potential failure. Erosion can also increase turbidity, potentially affecting marine biota. BOEM assumes that scour control systems will be installed as required,

based on potential seabed scour anticipated at the site from site characterization activities. There are several methods for minimizing scour around piles, such as placing rock armoring and mattresses of artificial (polypropylene) seagrass.

Installation of Buoys

Although several types of buoys could be installed, based on Southern Company's lease application, BOEM anticipates that a boat-shaped buoy will be installed and has only included details on installation of boat-shaped buoys in this section of the EA. Installation of other buoy and anchor types are discussed in detail in the RI/MA EA (USDOI, BOEM, 2013).

Based on the Southern Company application, BOEM expects meteorological buoys will be transported by derrick barge or towed to the installation location by a transport vessel after assembly at a land-based facility (Southern Company and Geo-Marine, Inc. 2012a; Addendum A). Once onsite, the buoys will be anchored to the seafloor using a weight anchor and mooring chain. Installation of the buoys will take approximately one to two days. Boat-shaped buoy anchors typically weigh 6,000 to 10,000 pounds with a footprint of about 6 sq ft (0.5 sq m) and an anchor sweep of up to about 370,000 sq ft (8.5 acres; 3.4 hectares). For this type of buoy, the maximum area of disturbance to benthic sediments typically occurs during anchor deployment and removal (e.g., sediment resettlement, sediment extrusion). Bottom disturbances from vessel anchors occur while deploying and decommissioning the buoys.

2.1.1.5 Operation and Maintenance

The proposed structure will likely remain in place collecting data for two to five years. However, BOEM intends to include a lease stipulation giving BOEM the discretion to extend the lease's five-year term if an extension is requested by Southern Company.

Monitoring information that will be transmitted includes the operational status of navigation lighting, buoy positions, and system performance, such as battery levels and charging systems output. All data gathered via sensors will be fed to an onboard radio system that transmits the data string to an onshore receiver (Tetra Tech EC, Inc., 2010). Based on Southern Company's application, BOEM anticipates that buoy and tower equipment will be powered by small solar panels, wind turbines, and/or diesel generators (Southern Company and Geo-Marine, Inc., 2011).

Onsite inspections and preventive maintenance (i.e., marine fouling, wear, and lens cleaning) are expected to occur on a monthly or quarterly basis. Periodic inspections for specialized components (i.e., buoy, hull, anchor chain, and anchor scour) will occur at different intervals, but are likely to coincide with the monthly or quarterly inspections to minimize the need for additional boat trips to the site.

2.1.1.5.1 Lighting and Marking

All meteorological towers and buoys, regardless of height, will have lighting and marking for navigational purposes. Meteorological towers and buoys are considered Private Aids to Navigation, which are regulated by the USCG under 33 CFR 66.

If the proposed meteorological tower is taller than 199 ft (61 m), the lessee is required to file a "Notice of Proposed Construction or Alteration" with the Federal Aviation Administration (FAA) per federal aviation regulations (14 CFR 77.13, Mar. 4, 1972) because the tower is within 12 NM from shore. The FAA conducts an obstruction evaluation to determine whether a meteorological tower poses a hazard to air traffic, and issues a Determination of Hazard/No Hazard. Currently, there are no specific FAA regulations or guidance on lighting and marking of ocean-based towers less than 200 ft (61 m) tall (Edgett-Baron, personal communication, 2012 as cited in USDOI, BOEM, 2013).

2.1.1.5.2 Visual Aesthetics

The closest that a meteorological tower will be located to the shore is 3 NM if placed at the westernmost edge of the proposed lease area (in OCS block 6074). BOEM has completed visual simulations of a meteorological tower in the proposed lease area to evaluate impacts on the views from the shoreline; visual resources information and an evaluation of impacts on visual aesthetics are presented in Chapter 3 and Appendix B of this EA.

2.1.1.5.3 Other

The meteorological tower and platform could also be used to gather other information in addition to meteorological information, such as data on birds, bats, and marine mammals in the lease area.

2.1.1.6 Decommisioning

Unless otherwise authorized by the Director, any facilities constructed on the lease must be removed when the lease expires. Removal of facilities must be accomplished in a manner approved by BOEM. BOEM estimates the entire process of removing a meteorological tower to take one week or less. Decommissioning activities begin with the removal of all meteorological instrumentation from the tower, typically using a single vessel. A derrick barge is transported to the offshore site and anchored adjacent to the structure. The mast is removed from the deck and loaded onto the transport barge. The deck is cut from the foundation structure and loaded on the transport barge. The sea bottom area beneath installed structures is cleared of all materials introduced to the area in support of the lessee's project.

Decommissioning for a buoy is the reverse of the installation process. Equipment recovery is performed with the support of vessels equivalent in size and capability to those used for installation (see section on installation above). For small buoys, a crane lifting hook is secured to the buoy. The mooring chain and anchor are recovered to the deck using a winching system. The buoy is transported to shore by barge. Buoy decommissioning is usually completed within one day. Buoys are returned to shore and disassembled or reused in other applications. BOEM expects mooring devices and hardware will be re-used or disposed of as scrap iron for recycling (Fishermen's Energy of New Jersey, LLC, 2011).

2.1.1.6.1 Cutting and Removing Piles

As required by BOEM, the lessee must sever bottom-founded structures and their related components at least 16 ft (5 m) below the mudline to ensure that nothing is left exposed that could

interfere with future activities in the area. Which severing tool the operator uses depends on the target size and type, water depth, economics, environmental concerns, tool availability, and weather conditions (USDOI, MMS, 2005). Because of the type and size required for this project, piles of the meteorological tower are removed using non-explosive severing methods.

Severing tools that may be used consist of abrasive cutters, mechanical (carbide) cutters, diver cutting, and diamond wire cutters. No excavation around the outside of the monopole or piles prior to cutting is anticipated. Typically, once cut, steel piles are lifted onto a barge and transported to shore. Following the removal of the cut pile and adjacent scour control system, if necessary, sediments can be returned to the excavated pile site using a vacuum pump and diver-assisted hoses. Cutting and removing piles takes anywhere from several hours to one day per pile. After the foundation is severed, it is lifted onto a transport barge and towed to an onshore decommissioning site (USDOI, MMS, 2009).

2.1.1.6.2 Removal of Scour Control System

Any scour control system also will be removed during the decommissioning process. Scour mats are removed by divers or remotely operated vehicle and a support vessel in a manner similar to installation. Removal is expected to result in the suspension of sediments that were trapped in the mats and from contact with sediment during removal activity. If rock armoring is used, armor stones will be removed using a clamshell dredge, or similar equipment, and placed on a barge. BOEM estimates that the removal of the scour control system will take one half day per pile. Therefore, depending on the foundation structure, removal of the scour system will take a total of one-half to two days to complete (USDOI, MMS, 2009).

2.1.1.6.3 Disposal

Unless portions of the meteorological tower are approved for use as artificial reefs, all materials will be removed by barge and transported to shore. The steel will be recycled, and remaining materials will be disposed in existing landfills in accordance with applicable law. If the lessee ultimately proposes to use the structure as an artificial reef, its plan must comply with the artificial reef permitting requirements of the US Army Corps of Engineers (USACE) and the criteria in the National Artificial Reef Plan of 1985 (33 U.S.C. §2101 et seq.). The Georgia Department of Natural Resources (GDNR) Coastal Resources Division manages Georgia's artificial reef program and must accept liability for the structure before BOEM will release the federal lessee from the obligation to decommission and remove all structures from the lease area.

2.1.1.7 Vessel Traffic

2.1.1.7.1 Site Characterization Surveys

To determine a scenario for the maximum vessel traffic in the project area, BOEM assumes the lessee will conduct site characterization surveys over the entire proposed lease area (all three OCS lease blocks). However, the lessee is likely to conduct surveys only in smaller, more focused areas within each OCS block, resulting in fewer vessel trips than presented in the scenario below.

High-Resolution Geophysical Surveys

BOEM assumes that geophysical surveys for shallow hazards (142 ft [150 m] spacing between survey lines) and archaeological resources (98 ft [30 m] line spacing) will be conducted at the same time on the same vessels conducting sweeps at the narrower line spacing. This results in about 500 NM of high-resolution geophysical (HRG) surveys per OCS block, not including turns. Therefore, approximately 1,500 NM of HRG surveys will be conducted. Assuming a vessel speed of 4.5 knots (Continental Shelf Associates, Inc., 2004), surveys will take approximately 333 hours of vessel time. Assuming a 10-hour work day and one vessel round trip per day, HRG surveys over three OCS blocks result in 33 round trips.

Geotechnical Exploration/Sub-bottom Sampling

Geotechnical exploration could result in additional trips based on the number of potential tower locations and the amount of proposed survey area. BOEM assumes the lessee would collect a sub-bottom sample at each potential meteorological tower location. Although the proposed action includes three OCS lease blocks, each with several potential locations for a meteorological tower, the lessee would likely minimize the amount of sub-bottom sampling needed. Therefore, BOEM assumes that the lessee will collect no more than three sub-bottom samples, all focused in one lease block, or one sub-bottom sample collected in each lease block. Geotechnical exploration will occur at a pre-determined site based on the results of other site characterization surveys.

The amount of effort and vessel trips required to collect the geotechnical samples vary greatly by the type of technology used to retrieve the sample. Vibracore samples are likely advanced from a single small vessel (approximately 45 ft [14 m]). Cone penetration test sampling can be advanced from a medium vessel (approximately 65 ft [20 m]), jack-up barge, a barge with a four-point anchoring system, or a vessel with a dynamic positioning system. Geologic boring can be advanced from a jack-up barge, a barge with a four-point anchoring system, or a vessel with a dynamic positioning system. Each barge scenario includes a support vessel. For all types of geotechnical exploration, BOEM assumes one sample taken per day and each work day associated within one round trip. Therefore, three round trips are made by the lessee to collect sub-bottom samples under the proposed action scenario.

2.1.1.7.2 Construction, Operation/Maintenance, and Decommissioning

Vessel trips would be for associated construction and installation, operation/maintenance, and decommissioning of a meteorological tower and buoys (Table 2-1). No expansion of onshore facilities is required to conduct these tasks.

Construction

Based on previous site assessment proposals submitted to BOEM for other leases, up to about 40 round trips are expected during construction of a meteorological tower (as noted in USDOI, BOEM, 2013). Southern Company estimated the number of vessel trips associated with construction to be 10 round trips (Southern Company and Geo-Marine, Inc., 2011); therefore, a range of 10 to 40 trips is used in this EA. These vessel trips may be spread over more than one construction season due to weather and sea state conditions, the time to acquire the necessary

permits, and the availability of vessels, workers, and tower components. Meteorological buoys typically take one to two days to install by one vessel.

Operation and Maintenance

BOEM assumes the lessee will conduct monthly or quarterly vessel trips for operation and maintenance of solar panels or small wind turbines over the five-year life of a meteorological tower (USDOI, MMS, 2009). However, if a diesel generator is used to power the meteorological tower's lighting and equipment, BOEM assumes a maintenance vessel will make a trip at least once every other week, if not weekly, to provide fuel, change oil, and perform maintenance on the generator. Therefore, to provide for a conservative scenario, total maintenance vessel trip calculations are based on weekly trips for towers and monthly trips for buoys over the entire five-year period (see Table 2-1). BOEM also assumes up to two additional vessel trips per year over the five-year lease period to transport the buoys to different locations in the proposed lease area.

Table 2-1
Projected Maximum Vessel Trips for Construction, Operation and Maintenance, and Decommissioning Activities

Activity	Round Trips	Assumptions
Site Characterization Surveys		
HRG Surveys	33	500 NM survey/block x 3 blocks; at 4.5 knots = 333 hr vessel time 10 hr/day = 33 round trips
Meteorological Buoys		
Meteorological Buoy Installation	4	Up to 2 round trips x 2 buoys
Meteorological Buoy Quarterly and Monthly Maintenance Trips	40–120	4 quarters x 2 buoys x 5 years – 12 months x 2 buoys x 5 years
Transport of Buoys to New Site	10	Up to 2 round trips per year x 5 years
Meteorological Buoy Decommission	4	Up to 2 round trips x 2 buoys
Total Buoy Trips over Five-Year Lease Period	58-138	
Meteorological Towers		
Meteorological Tower Construction	10-40	10-40 round trips x 1 tower
Meteorological Tower Quarterly and Weekly Maintenance Trips[1]	20–260	4 quarters x 1 tower x 5 years – 52 weeks x 1 tower x 5 years
Meteorological Tower Decommission	40	40 round trips x 1 tower
Total Tower Trips over Five-Year Lease Period	70–340	
Total Buoy plus Tower Trips over Five-Year Lease Period	128-478	
Maximum Total Vessel Traffic, Alternative A, including Site Characterization Surveys	511	

[1]Although construction and decommissioning would occur during some of the weeks and, therefore, not all weeks would require maintenance trips for the towers, all weeks were included for maintenance to be conservative in the trip calculations. Source: Southern Company and Geo-Marine, Inc. (2011)

Decommissioning

Because the decommissioning process for a meteorological tower is the reverse of construction, vessel use during tower decommissioning is similar to vessel use during construction, therefore, another 40 round trips are estimated for decommissioning. A buoy is assumed to take one to two days to decommission using one vessel.

Total Vessel Traffic

The total vessel traffic estimated as a result of the installation, routine maintenance, and decommissioning of the meteorological towers and buoys that are anticipated in connection with the proposed action ranges from 128 to 478 round trips over a five-year period (Table 2-1). For purposes of estimating total vessel traffic impact under Alternative A, 33 round trips for surveys and a maximum of 478 round trips for construction, operation and maintenance, and decommissioning were summed for a total of 511 vessel roundtrips.

2.1.1.7.3 Types of Vessels

Based on the lessee's lease application (Southern Company and Geo-Marine, Inc., 2011) the vessels used for construction and installation of the meteorological tower include:

- Derrick Barge: used to transport and erect the meteorological tower structure.
- Anchor Handling Vessel: used to deploy the derrick barge's eight-part anchoring system.
- Support Tug: used to guide and position the derrick barge from the shipyard in Louisiana to the proposed tower site off Georgia.
- Crew Boat: used to house the construction crew; it has facilities (e.g., sanitation/hoteling) capable of supporting the crew.
- High-Speed Vessel: used to shuttle personnel from the crew and cargo support docks at Plant Kraft in Port Wentworth, Georgia.

Proposed vessel use and specifications for constructing a meteorological tower are provided in Table 2-2. Vessel use for decommissioning would be similar.

Table 2-2
Proposed Vessel Use and Specifications for Construction of a Meteorological Tower

Vessel Type	Estimated Hours on Site	Length (feet)	Engines (horsepower)	Fuel Capacity (gallons)
Class A-1, derrick barge with diesel crane	288	215	Crane: 950	100,000
Anchor handling vessel	144	95	4,300	20,000
Support tug	72	65	1,500	14,000
Crew boat	96	51	550	1,800
High-speed vessel (personnel transportation)	102	50	600	1,800

Source: Southern Company and Geo-Marine, Inc. (2011)

Georgia Power's Plant Kraft will support vessels during the tower installation, operation, maintenance, and decommissioning (Southern Company and Geo-Marine, Inc., 2011). Based on the Southern Company application, tower components may be fabricated in New Orleans, Louisiana and transported to Plant Kraft or the installation site. The trip from New Orleans to the proposed lease area is anticipated to take 12 days (Southern Company and Geo-Marine, Inc., 2011). If diesel generators are used, BOEM projects that crew boats 51 to 57 ft (16 to 17 m) in length with 400- to 1,000-horsepower engines and 1,800-gallon fuel capacity, will be used for routine maintenance and generator refueling.

2.1.1.7.4 Vessel Operational Waste

The US Environmental Protection Agency (EPA) regulates discharges incidental to the normal operation of all non-recreational, non-military vessels longer than 79 ft (24 m) into US waters under Section 402 of the Clean Water Act. EPA requires that eligible vessels obtain coverage under the National Pollutant Discharge Elimination System (NPDES) Vessel General Permit. With the exception of ballast water discharges, non-recreational vessels less than 79 ft (24 m) in length and all commercial fishing vessels, regardless of length, are not subject to this permit.

Operational waste generated from all vessels associated with the proposed action includes bilge and ballast waters, trash and debris, and sanitary and domestic wastes. When within 12 NM of the nearest land, the discharge of any oil or oily mixtures greater than 15 parts per million (ppm) is prohibited under 33 CFR 151.10. Ballast water may be subject to the USCG Ballast Water Management Program to prevent the spread of aquatic nuisance species (33 CFR 151.01 Subpart D, Apr. 14, 1997).

The discharge of trash and debris is prohibited in the sea or into the navigable waters of the US (33 CFR 151.51–77, Apr. 29, 1991) unless it is passed through a comminutor (a machine that breaks up solids) and can pass through a 25-millimeter mesh screen. All other trash and debris must be returned to shore for proper disposal with municipal and solid waste. All vessels with toilet facilities must have a Type II or Type III marine sanitation device (MSD) that complies with 40 CFR 140 and 33 CFR 159. These systems are designed to retain or treat the waste until it can be disposed of at the proper shoreside facilities. Georgia does not allow the discharge of wastes into its waters (GDNR, WRD, 2013a). Graywater from vessels is not regulated outside of the state's territory and may be disposed of outside state waters.

2.1.2 Non-Routine Events

Chapter 5.2.24 of the Programmatic EIS discusses in detail potential non-routine events and hazards that could occur during data collection activities (USDOI, MMS, 2007a). The primary events and hazards are: (1) occupational hazards similar to those of most large industrial facilities and infrastructure projects, (2) collisions between the proposed structure or associated vessels with other marine vessels or marine life, and (3) spills from collisions or during generator refueling. These events and hazards are summarized below.

2.1.2.1 Occupational Hazards

Two of the primary occupational hazards include working at heights and working on or over water, either of which may result in injury or fatality. Working at heights and over water may be

required during construction or maintenance. Working at heights can pose a significant risk from falls. In addition, risks also are associated with the use of cranes that are often necessary to support working at heights. Working on or over water can pose a risk of drowning and requires consideration of wind and weather conditions, availability of buoyancy devices, and qualified boat and rescue personnel.

2.1.2.2 Vessel Collisions and Allisions

A meteorological tower or buoy located in the proposed lease area poses a risk to both vessel and aviation navigation. An allision between a ship or an airplane and a meteorological structure could result in the loss of the entire facility and/or the vessel or airplane, as well as loss of life and spillage of diesel fuel. However, because a buoy protrudes from the ocean surface only 30 to 40 ft (9 to 12 m), an airplane striking a buoy is unlikely. Vessels associated with site characterization activities could collide with other vessels and experience accidental capsizing or result in a diesel spill. However, risk of allisions with meteorological towers and buoys for both vessels and aviation are reduced by using USCG-required marking and lighting. The most commonly reported causes of allisions with fixed structures include human error, weather-related causes, equipment failure on the vessels, and navigational aids not working on the structures (BOEMRE, 2011c).

2.1.2.3 Spills

A diesel spill could occur as a result of collisions, accidents, or natural events. The amount of diesel fuel released by a marine vessel involved in a collision depends on the type of vessel and severity of the collision. From 2001 to 2011, the average spill size for vessels other than tank ships and tank barges was 114 gallons (USCG, 2012). Should the proposed action result in a spill, BOEM anticipates that the average volume will be similar.

Most equipment on meteorological towers and buoys is powered by batteries charged by small wind turbines and solar panels. However, diesel generators may be used on the meteorological tower. Minor diesel fuel spills may occur during generator refueling. Impacts depend greatly on the material spilled (likely to be diesel fuel in the vessel and infrastructure types used for the proposed action), the size and location of a spill, the meteorological conditions at the time of the spill, and the speed with which cleanup plans and equipment are employed. Small diesel spills (500-5,000 gallons) usually will evaporate and disperse within a few days or less, even in cold water (NOAA, 2006). Thus, seldom is there any oil on the surface for responders to recover. The lessee is required to submit a contingency plan with its Project Plan that describes its emergency response action plan, worst-case discharge scenario, and training and drills for responders.

2.1.2.4 Severe Weather

Severe weather events have the potential to cause structural damage and injury to personnel. Major storms and hurricanes pass through the area regularly resulting in elevated water levels (storm surge) and high waves and winds. Storm surge and wave heights from passing storms are worse in shallow water and along the coast, but can pose hazards in offshore areas.

Data collected between 1988 and 2008 from a National Data Buoy Center buoy located 40 NM southeast of Savannah, Georgia (Buoy 41008) show average wind speeds are typically between 10 to 13 knots all year round, with the higher average wind speeds occurring in the months of

September and October (National Data Buoy Center, 2010a). Peak wind gusts over the same period primarily occurred in September, with speeds of 60 knots recorded at Buoy 41008 (National Data Buoy Center, 2010b).

The Atlantic Ocean hurricane season is June 1 to November 30 with a peak in September, when hurricanes are most likely to impact the lease area. The Atlantic basin averages about 11 storms of tropical storm strength or greater per year; about half reach hurricane level and two and a half become major hurricanes (Category 3 or higher) (NOAA, 2013a).

2.2 Alternative B – Additional Seasonal Restrictions

Due to the sensitivity of the North Atlantic right whale to anthropogenic noise and the proximity of the lease blocks to critical calving ground habitats (see Figure 3-2), Alternative B prohibits all construction activities, along with HRG and geotechnical surveys and decommissioning activities, from November 1 to April 30. This time period overlaps the North Atlantic right whale calving period, when these whales are likely to be found in or close to the proposed lease blocks. As with Alternative A, Alternative B includes SOCs as lease stipulations (see Appendix A).

2.3 Alternative C (Preferred Alternative) – Removal of OCS Block 6074 from Leasing Consideration

The Department of Defense has determined that military use conflicts exist in the majority of OCS Block 6074. Due to this concern, Alternative C restricts site assessment and site characterization activities to OCS Blocks 6126 and 6174, located furthest from shore. However, as with Alternatives A and B, Alternative C also includes SOCs including the prohibition of pile driving activities from November 1 to April 30 to ensure the protection of sensitive species found in the proposed lease area (see Appendix A).

2.4 Alternative D – No Action

Under the No Action Alternative, the proposed lease would not be issued and site assessment activities would not be approved for the proposed lease area at this time.

3. ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES

3.1 Definitions of Impact Levels

The CEQ interprets the human environment "to include the natural and physical environment and the relationship of people with that environment" (40 CFR 1508.14). This EA uses a four-level classification scheme (negligible, minor, moderate, and major) to characterize the environmental impacts that are predicted if the proposed action or an alternative is implemented. Definitions of impacts are presented in two separate groups: one for biological and physical resources and one for socioeconomic resources (USDOI, BOEM, 2012b).

3.1.1 Impact Levels for Biological and Physical Resources

The following impact level definitions are used for biological and physical resources. For biota, these levels are based on population-level impacts rather than impacts on individuals (USDOI, BOEM, 2012b).

Negligible:

- No measurable impacts.

Minor:

- Most impacts on the affected resource could be avoided with proper mitigation.
- If impacts occur, the affected resource would recover completely without any mitigation once the impacting agent is eliminated.

Moderate:

- Impacts on the affected resource are unavoidable.
- The viability of the affected resource is not threatened although some impacts may be irreversible, or the affected resource would recover completely if proper mitigation is applied during the life of the project or proper remedial action is taken once the impacting agent is eliminated.

Major:

- Impacts on the affected resource are unavoidable.
- The viability of the affected resource may be threatened, and the affected resource would not fully recover even if proper mitigation is applied during the life of the project or remedial action is taken once the impacting agent is eliminated.

3.1.2 Impact Levels for Socioeconomic Issues

The following impact levels are used for the analysis of socioeconomic resources.

Negligible:

- No measurable impacts.

Minor:

- Adverse impacts on the affected activity or community could be avoided with proper mitigation.
- Impacts would not disrupt the normal or routine functions of the affected activity or community.

- Once the impacting agent is eliminated, the affected activity or community would return to a condition with no measurable effects without any mitigation.

Moderate:

- Impacts on the affected activity or community are unavoidable.
- Proper mitigation would reduce impacts substantially during the life of the project.
- The affected activity or community would have to adjust somewhat to account for disruptions due to impacts of the project, or once the impacting agent is eliminated, the affected activity or community would return to a condition with no measurable effects if proper remedial action is taken.

Major:

- Impacts on the affected activity or community are unavoidable.
- Proper mitigation would reduce impacts somewhat during the life of the project.
- The affected activity or community would experience unavoidable disruptions to a degree beyond what is normally acceptable, and once the impacting agent is eliminated, the affected activity or community may retain measurable effects indefinitely, even if remedial action is taken.

3.2 The Proposed Action (Alternative A)

3.2.1. Physical Resources

3.2.1.1 Air Quality

3.2.1.1.1 Description of the Affected Environment

The Clean Air Act Amendments (CAAA) of 1970, 42 U.S.C. §§ 7401-7671q, directed the EPA to establish National Ambient Air Quality Standards (NAAQS) for air pollutants listed as "criteria" pollutants. The EPA determined there were adequate reasons to believe their presence in ambient air "may reasonably be anticipated to endanger public health and welfare." The NAAQS apply to sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb) (40 CFR Part 50). The primary standards are set at levels to protect public health with an adequate margin of safety. The EPA has designated secondary standards to protect public welfare. All of the standards are expressed as concentration in air and duration of exposure. Many standards address both short- and long-term exposures. Any individual state may adopt a more stringent set of standards.

The proposed lease area is located offshore Chatham County, Georgia. A non-attainment area is an area where the concentration of a specific criteria pollutant is exceeded, based upon the NAAQS for that pollutant. If an area is in non-attainment, then the state or tribe that the area is in must develop an implementation plan in order to reach attainment. Upon attaining the NAAQS, the area is then classified as maintenance. None of the Georgia coastal counties, including Chatham County, are classified as non-attainment areas for any of the criteria pollutants listed above, nor are any of the coastal counties classified as air quality maintenance areas. Because the Georgia coastal counties have not exceeded criteria air pollutant thresholds, they are not required to institute measures in a non-attainment area plan.

Class I areas are federally-owned lands where very little air quality degradation is allowed. There are two Class I areas in Georgia and one area along coastal South Carolina near the proposed lease area and principle ports. In these areas, air quality related values, including visibility, are protected. Class I areas have stringent incremental limits for NO_2, SO_2 and PM_{10}. Class I areas are defined in Sections 101(b)(1), 169A(a)(2), and 301(a) of the CAAA, as amended (42 U.S.C. 7401(b), 7410, 7491(a)(2), and 7601(a)). These Class I areas include Wolf Island and Okefenokee Swamp in Georgia, and Cape Romain in South Carolina. Wolf Island is closest to the proposed lease area – approximately 75 miles (120 km) southwest of Savannah, Georgia; Cape Romain and Okefenokee Swamp are each 130 miles (209 km) northeast and southwest, respectively, of the Savannah port location. The potential emissions associated with the proposed action fall below incremental limits for the mentioned pollutants (see Table 3-1 in Section 3.2.1.1.2). Therefore, the proposed action will not cause degradation to air quality, including visibility.

The proposed action could affect air quality in three areas: onshore at the two principle ports (Port Wentworth and Port of Savannah); in state waters that would be transited by vessels associated with the proposed action; and in the proposed OCS lease blocks. Vessel engine emissions would be the source of air quality impacts during surveying, installation, operations, buoy relocation activities, and decommissioning. Additional emissions at the proposed lease blocks would occur from equipment used for meteorological tower installation and removal. There also is the potential for impacts to air quality due to vessel fuel spills.

The Clean Air Act Amendments of 1977 included the Prevention of Significant Deterioration (PSD) program, which imposes permitting requirements for the construction of new facilities and "major modifications" at existing facilities in attainment areas. The purpose of the program is to prevent the degradation of ambient air quality in attainment areas and to address ambient air quality concerns associated with other non-criteria pollutants while still allowing for industrial and commercial growth. Georgia has permitting authority under the PSD program and permit decisions are made in accordance with state law and regulations.

"Major sources," as defined under Georgia state law, must determine whether construction of a new unit or projects at an existing unit will trigger a PSD review by causing both an emissions increase and a net emissions increase. According to the State of Georgia, another type of "significant" emissions threshold is defined as any emissions rate at a new major stationary source (or any net emissions increase associated with a modification to an existing major stationary source) that is constructed within 6 miles (10 km) of a Class I area, and which would increase the 24-hour average concentration of any regulated pollutant in the Class I area by 1 microgram per cubic meter or greater. Exceedance of this threshold triggers a PSD review (GDNR, EPD, 2012). None of the three Class I areas listed above are within the 6 miles (10 km) range of Port Wentworth, where initial proposed construction activity will occur.

3.2.1.1.2 Impact Analysis of the Proposed Action

Routine Activities

Routine activities (see Section 2.1.1 of this EA), which include site characterization and site assessment activities, have the potential to impact air quality locally. Potential emission sources include support vessels, survey vessels and equipment, and the possible use of diesel generators to

power equipment on meteorological towers. Vessels associated with Alternative A, the proposed action, would emit sulfur oxides (SO_X), nitrogen oxides (NOx), carbon monoxide, particulate matter, volatile organic compounds (VOCs), and other chemicals categorized as air pollutants (USDOI, BOEM, 2012a). In sunlight, NOx and VOCs react to create ozone. In addition, greenhouse gases (GHG) including carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4) also would be emitted.

Site Characterization Surveys

Survey vessels emit pollutants both in state waters and OCS waters while traveling to and from the lease areas and while conducting site characterization surveys within the proposed lease areas. Impacts from pollutant emissions associated with these vessels would occur at the onset of the project in the first year of the five-year lease (see Table 3-1). These impacts will be localized and would not travel between lease blocks or across the border between Georgia and South Carolina waters.

Prevailing westerly winds (west to east flow) will prevent any substantial amount of pollutant emissions from traveling from offshore areas to onshore non-attainment areas. In state waters, vessel traffic associated with survey vessels transiting the Port of Savannah would, reasonably, be predicted to average 33 trips in the first year for HRG surveys and 3 round trips for sub-bottom sampling (see Section 2.1.1.7.1 of this EA). This number of annual trips is a very small contribution to the annual average traffic in each port. For example, at the Port of Savannah the USACE registered 8,648 domestic and foreign vessel calls (stops) in 2011 (see Section 3.5.1 of this EA).

Construction and Decommissioning

Alternative A is projected to result in one meteorological tower or up to two meteorological buoys within the proposed lease area. Potential impacts on ambient air quality within the lease areas during construction and decommissioning would be negligible due to the short duration of these activities, the offshore location of these activities, and the prevailing winds that prevent emissions from reaching shore.

Construction of the projected meteorological tower offshore Georgia is expected to occur in the second year of the project. Emissions from construction activities result from up to 40 vessel round trips to transport equipment and personnel and crane and pile driving activity on-site (see Table 2-1). In addition, the meteorological tower will be constructed in New Orleans and shipped to Port Wentworth; the trip is estimated to take 12 days. The portion of the trip in proximity of the proposed lease area is 10 hours and the resultant emissions are listed in Table 3-2.

Table 3-1
Potential Project Emissions by Major Activity

		Emission (tons; metric tons for GHG pollutants)							
		Tons					Metric tons		
Project Activity	**Project Year**	**CO**	**NOx**	**VOC**	**PM**	**SOx**	**CO_2**	**N_2O**	**CH_4**
Site Characterization Surveys	1	0.172	2.063	0.078	0.113	0.203	97.924	0.003	0.013
Transport of Tower to Port Wentworth	1	0.004	0.054	0.0020	0.003	0.005	2.807	8.14E-05	0.000
Total Year 1 Emissions (tons/yr)	1	0.176	2.117	0.080	0.116	0.208	100.731	0.003	0.013
Tower Construction[1]	2	0.898	8.603	0.369	0.511	0.847	412.260	0.012	0.095
Operation and Maintenance	2	0.306	3.667	0.139	0.200	0.361	173.874	0.005	0.023
Total Year 2 Emissions (tons/yr)	2	1.204	12.270	0.508	0.711	1.208	586.134	0.017	0.118
Operation and Maintenance	3	0.611	7.333	0.278	0.400	0.722	347.748	0.010	0.045
Total Year 3 Emissions (tons/yr)	3	0.611	7.333	0.278	0.400	0.722	347.748	0.010	0.045
Operation and Maintenance	4	0.611	7.333	0.278	0.400	0.722	347.748	0.010	0.045
Total Year 4 Emissions (tons/yr)	4	0.611	7.333	0.278	0.400	0.722	347.748	0.010	0.045
Operation and Maintenance	5	0.611	7.333	0.278	0.400	0.722	347.748	0.010	0.045
Tower Decommissioning[2]	5	0.516	4.566	0.199	0.273	0.447	244.734	0.007	0.068
Total Year 5 Emissions (tons/yr)	5	1.127	11.899	0.477	0.673	1.169	592.482	0.017	0.113

[1] Tower construction activities include: vessel trips to OCS lease block for crew, a barge trip to bring the tower to the OCS lease block, pile driving activity, and on-site construction to install tower.

[2] Tower decommissioning activities include: vessel trips to OCS lease block for crew, removal of the meteorological tower, removal of pilings, and a barge trip to bring the tower back to port.

Table 3-2
Vessel Emissions Transporting Meteorological Tower in Proximity of Proposed Lease Area

Emission (tons/year; metric tons/year for GHG pollutants)								
Ton/yr						Metric tons/yr		
CO	NOx	VOC	$PM_{2.5}$	PM_{10}	SOx	CO_2	N_2O	CH_4
0.0045	0.0537	0.0020	0.0029	0.0029	0.0053	2.8076	8.14E-05	0.000

Emissions associated with a buoy are much less than those associated with a tower because buoys are towed or carried aboard a vessel and then anchored to the seafloor. Only 10 vessel trips are associated with hauling buoys to the lease site. No drilling equipment would be required to install meteorological buoys.

Decommissioning or removal of the site assessment equipment is anticipated to occur in the last year of the project. As for construction, 40 vessel round trips are expected for decommissioning activities and to bring the equipment back to shore (see Table 2-1). Whether towers or buoys are employed, emissions associated with the construction and decommissioning of the anticipated meteorological data collection facilities are negligible. The majority of these emissions occur within the proposed lease area and will not affect onshore air quality (USDOI, BOEM, 2012a).

Operation and Maintenance

Operations and maintenance activities are anticipated to commence once construction has been completed and either the meteorological tower and/or buoys are operational, requiring either weekly trips to the meteorological tower or monthly trips to the buoys offshore. It is anticipated that operations and maintenance activities will occur through part of the second year of the project, all of the third and fourth, and until decommissioning in the fifth year. Equipment on the meteorological data collection facilities will be powered by batteries charged by small wind turbines (typically less that 8 ft [3 m] in diameter), solar panels, and/or diesel generators. While wind turbines and solar panels would produce no emissions, diesel generators emit NOx, CO, PM_{10} and SO_2. All criteria pollutant emissions are estimated to total less than one ton per year for each facility (USDOI, BOEM, 2012a).

Impacts of Non-Routine Events

The most likely impact to air emissions from non-routine events are caused by vapors from fuel spills resulting from vessel collisions, allisions, or from servicing or refueling generators that may be located on the meteorological towers or buoys. A spill could occur from vessel collisions within or outside the proposed lease area, or at meteorological tower or buoy sites. If a vessel spill were to occur, the estimated spill size is approximately 114 gallons, based on the average spill size for vessels other than tank ships and tank barges (USCG, 2012). BOEM has estimated that a buoy generator could contain 240 gallons of diesel fuel (USDOI, BOEM, 2012a). If such a spill were to occur, it is expected to dissipate very rapidly and then evaporate and biodegrade within a few days (USDOI, BOEM, 2012a). Air emissions from such a diesel spill are minor and temporary.

Table 3-3 lists the estimated VOC emissions from such a diesel spill. Such a spill occurring in the lease blocks is not projected to have any impacts on onshore air quality because of the estimated size of a spill, prevailing atmospheric conditions over the lease block, and distance from shore.

Table 3-3
Fuel Spill Diesel Emissions

Spill Volume (gal)[1]	Fuel Type	Density (lb/gal)[2]	Percent Recovered[3] (%)	Amount Not Recovered [3] (gal)	VOC Emissions	
					(lb/yr)	(tons/yr)
114	Diesel	7.1	0%	114	809.4	0.40
240	Diesel	7.1	0%	240	1,704	0.85

[1] Assume a spill of 114 gallons of diesel occurs each year.
[2] Liquid fuel density values obtained from Air Emissions Factor Guide to Air Force Stationary Sources, December 2009, Table 14-2.
[3] Assume none of the spill could be recovered and that 100% of the fuel evaporates.
Source: USDOI, BOEM (2012b)

In the unlikely event of vessel collision or allision, a spill could occur while enroute to and from the proposed lease blocks. Spills occurring in these areas, which include harbor and coastal areas, are not anticipated to have significant impacts on onshore air quality due to the estimated size and duration of the spill. If such a spill were to occur, the impacts to local air quality are expected to be minor and temporary.

Conclusion

Based on the level of emissions associated with routine activities, potential impacts to onshore ambient air quality from the proposed action are expected to be negligible. Prevailing westerly (west to east flow) winds would prevent pollutant emissions from drifting onshore from offshore areas and the proposed lease blocks. Emissions from vessel traffic associated with the proposed action in ports and harbors are negligible, if detectable, due to the low volume of vessel activity in comparison to the volume of pollution emitted by existing vessel activity in and around these areas. If a non-routine event occurred, such as a fuel spill, minor and temporary impacts on air quality in a localized area may occur. Neither routine activities nor non-routine events in coastal waters, or in the proposed OCS lease blocks, are expected to significantly impact onshore air quality, including the Class I areas listed in Section 3.2.1.1.1 for which pollutant emissions for the proposed action fall well below limits of concern for visibility.

3.2.1.2 Water Quality

3.2.1.2.1 Description of the Affected Environment

As stated in USDOI, BOEM (2012a) water quality is a measure of the ability of a waterbody to maintain the ecosystems it supports or influences. In the case of coastal and marine environments, the quality of the water is influenced by rivers that drain into the area, the quantity and composition of wet and dry atmospheric deposition, and the influx of constituents from sediments. Besides natural inputs, human activity can contribute to water quality through discharges, run-off, dumping, air emissions, burning, and spills. Also, mixing or circulation of

water can either improve water quality through flushing or introduce factors that may be detrimental to water quality.

The primary measurements used to determine coastal and marine water quality are water temperature, salinity, dissolved oxygen, nutrients, pH, oxidation-reduction potential (Eh), pathogens, chlorophyll concentration, and turbidity or suspended sediment load. Trace constituents, such as metals and organic compounds, can affect water quality. Water quality and suspended sediments may be closely linked. Contaminants may often reside in the sediments rather than the water column, and sediment resuspension may ultimately contaminate water quality.

Coastal Waters

The EPA rated the coastal condition of US waters based on five indices of ecological condition (USEPA, 2012): water quality, sediment quality, benthic condition, coastal habitat, and fish tissue contaminants. Component indicators for the water quality index are dissolved inorganic nitrogen (DIN), dissolved inorganic phosphorus (DIP), chlorophyll a, water clarity, and dissolved oxygen (DO). Component indicators for the sediment quality index are sediment toxicity, sediment contaminants, and sediment total organic carbon (TOC). The overall coastal condition of the Southeast Coast region is rated fair, with an overall condition score of 3.6 out of a 5-point system. The benthic and fish tissue indices for the Southeast Coast region are rated good; the water quality and coastal habitat indices are rated fair; and the sediment quality index is rated fair to poor (USEPA, 2012).

Using similar indicator criteria, Sheldon & Alber (2011) described the water quality of Tybee Island beaches and Wassaw Sound for DO, DIN, total dissolved phosphorus (TDP), and pH. A rating of good, fair and poor was assigned to median water quality conditions based on current water quality standards (Table 3-4). In most cases the median water quality conditions from Tybee Island beaches and Wassaw Sound indicated good to fair conditions. The extreme episodes were evaluated for DO and pH by comparing the yearly minimum DO value to water quality standards and the largest pH deviation from the norm over the year. Both extreme episodal DO and pH were given a good, fair and poor rating. In most cases the extreme episodes water quality conditions were good to fair, with poor conditions for DO in the sound and pH on the beach.

Table 3-4
Indicator Criteria used for Water Quality Status of Georgia Coastal Waters

Status	DO mg/l	DIN mg/l	TDP mg/l	Δ pH unit deviation
Good	>5.5	<0.025	<0.01	<0.5
Fair	3.0-5.5	0.025-0.250	0.01-0.10	0.5-1.0
Poor	<3.0	>0.250	>0.10	>1.0

Source: Sheldon & Alber (2011)

Marine Waters

As the distance from shore increases, oceanic circulation increasingly serves to disperse and dilute anthropogenic contaminants and determine water quality (USDOI, BOEM, 2012a). Offshore water quality in the marine areas of the proposed action are generally good as the region exhibits low water column stratification, low nutrient concentration, low chlorophyll populations, and good water quality measurements (USDOI, MMS, 2007a). The vast majority of pollutants and threats to marine waters originate on land; far fewer major threats to marine water are identified as actually originating from activities in the waters (USDOI, BOEM, 2012a).

In 2004 EPA and NOAA conducted a study to assess the ecological conditions throughout the coastal waters of the South Atlantic Bight (SAB), which includes the proposed action area. Using similar techniques as those used for the coastal and estuarine program, EPA found that the coastal ocean sediments and overlying waters of the SAB are in generally good condition, with lower-end values of biological attributes representing parts of a normal reference range controlled by natural factors (USEPA, 2012).

The majority of the continental shelf in the SAB is a sandy environment with infrequent rock outcrops and other hard bottom habitats. It contains valuable reservoirs of both living and mineral resources and includes Gray‘s Reef National Marine Sanctuary off the coast of Georgia (Cooksey, et al., 2010).

Discharges from ships, sediment resuspension from ocean dredging activities, and wastewater treatment facilities are the most likely sources of water-borne contaminants in the proposed lease areas. Bar Channel, an ocean disposal site of Savannah Harbor dredge material, is located northeast of the proposed lease area. The USACE reports roughly 93 percent of disposed sediment at the site has stayed within the disposal area (USACE, 2012b).

Mid-Atlantic ocean waters beyond three miles offshore typically have very low concentrations of suspended inorganic particles, generally less than 1 milligram per liter. Levels may be higher in bottom waters because bottom currents may re-suspend sand. Storms can cause suspended sediment loads to increase by one to two orders of magnitude, but this effect dissipates soon (within days) after the storm passes (USDOI, BOEM, 2012a).

3.2.1.2.2 Impact Analysis of the Proposed Action

Routine Activities

The routine activities associated with Alternative A that would impact coastal and marine water quality include vessel discharges (including bilge and ballast water and sanitary waste), and structure installation and removal. A general description of these impacts to coastal and marine water quality is presented in USDOI, MMS (2007a); USDOI (2013); USDOI, BOEM, (2012a, e). The following summarizes that information and incorporates new and site-specific information.

Onshore Discharges

Point-source discharges onshore and in state waters are regulated by the EPA, the agency responsible for coastal water quality, or the EPA-authorized state agency. The EPA NPDES

stormwater effluent limitation guidelines control storm-water discharges from support facilities, such as ports and harbors. Activities associated with staging and fabrication of the meteorological tower and buoys account for a very small amount of activity at existing port facilities during the short duration of staging. Alternative A is not anticipated to increase runoff or onshore discharge into harbors, waterways, coastal areas or the ocean environment (USDOI, BOEM, 2012a).

Vessel Discharges

Vessel discharges associated with the proposed action, including sanitary waste and bilge and ballast water, can affect water quality when vessels are traveling to and from the proposed site and during site characterization activities in the proposed lease areas. Bilge water, which is often contaminated by oil that leaks from the machinery within the vessel, is water that collects in the lower part of a ship. The discharge of any oil or oily mixtures is prohibited within 12 NM (22.2 km) of shore under 33 CFR 151.10. The blocks covered by this lease are all within 12 NM of shore, and therefore, these discharges are prohibited.

Ballast water is used to maintain stability of the vessel and may be pumped from coastal or marine waters. Generally, ballast water is pumped into and out of separate compartments and is not usually contaminated with oil. However, the same discharge criteria apply as for bilge water (33 CFR 151.10, Jul. 12, 2006). Ballast water also may be subject to the USCG Ballast Water Management Program to prevent the spread of aquatic nuisance species.

A marine sanitation device (MSD) is required under 33 CFR 159 to treat sanitary waste generated on service vessels to prevent possible contamination of surrounding waters. All vessels with toilet facilities must have a MSD that complies with 40 CFR 140. These systems are designed to retain or treat the waste until it can be disposed of at the proper facilities on shore (USDOI, BOEM, 2012b).

State and local governments regulate domestic or gray water discharges. Domestic waste consists of all types of wastes generated in the living spaces on board a ship including gray water that is generated from dishwasher, shower, laundry, bath, and washbasin drains. Vessel discharge of gray water is not defined as a pollutant or a sewage discharge under the Clean Water Act Section 312, except in cases of commercial vessels operating on the Great Lakes and vessels that discharge gray water and sewage in one effluent stream. Such vessels are required to obtain coverage under the EPA NPDES Vessel General Permit (VGP) for discharges incidental to the normal operation of those vessels.

The discharge of trash and debris is prohibited in the sea, or into the navigable waters of the US (33 CFR 151.51-77, Apr. 29, 1991), unless it is passed through a comminutor and can pass through a 1-in (25-mm) mesh screen. All other trash and debris must be returned to shore for proper disposal with municipal and solid waste. Therefore, any discharge of trash and debris from the proposed activity would result in a negligible environmental impact to the proposed leasing area (USDOI, BOEM, 2012b).

The EPA VGP applies to vessel discharges incidental to the normal operation of all non-recreational, non-military vessels of 79 ft or greater in length that discharge in waters of the US. Federal permit guidelines state that vessels greater than or equal to 300 gross tons (304.8 metric

tons) or vessels with the capacity to hold or discharge more than 2,113 gal (8.0 cubic m) of ballast water must submit a Notice of Intent to hold or discharge such ballast water (Federal Register Vol 78. No 71, 2013). EPA modeled how these vessel types may impact water quality and determined that vessels discharging to a relatively large water body were not likely to exceed National Recommended Water Quality Criteria. However, there is the potential for these discharges to cause impacts to water quality on small spatial and temporal scales. Metals are frequently found in bilge water samples. The volume and make-up of graywater discharge varies by vessel type, but potable freshwater is usually bunkered in port (service water) (USDOI, BOEM, 2012b).

In order to comply with the various vessel discharges regulations listed above, all trash and debris generated during the project will be held onboard the vessels and discharged at an approved onshore disposal facility. Wastes not covered by EPA VGPs will not be discharged or disposed of overboard in state or federal waters off the Georgia coast during any phase of the proposed project.

Sediment Disturbance

Sediment disturbances result from vessel and buoy anchoring, geological and geophysical surveys, and structure installation and removal (USDOI, BOEM, 2012a).

Anchoring: The process of anchoring and removing vessels and buoys, causes intermittent disturbance of the seafloor, with movement of sediment into the water column followed by sedimentation. The amount and duration of increased turbidity is dependent upon the activity, the sediment grain size, current velocity, and water depth. Vessel traffic specifically associated with bottom sampling, construction, and decommissioning, results in anchorages. Anchoring and removal are short processes; therefore, sediment is expected to settle within a few minutes of disturbance. Short-term impacts to turbidity and water clarity are expected to be local within discrete areas of the proposed site. These impacts are anticipated to be minor (USDOI, BOEM, 2012a).

Site Characterization Surveys: Sediment coring causes temporary disturbance of the seafloor, introduction of sediment into the water column, temporary increased turbidity, and sedimentation. To the extent that sediment samples are collected by drilling equipment, the disposition of the sediment core material itself could cause short-term water-quality impacts, such as turbidity and a degradation of water clarity in the immediate area of disturbance. These impacts are anticipated to be temporary and minor.

Installation and Decommissioning: One tower is anticipated to be installed and ultimately decommissioned within the proposed site. Impacts to water quality resulting from the construction and installation of the meteorological tower consist of sediment dispersal, resuspension and subsequent sedimentation from pile-driving, and anchoring. Water quality impacts occur during decommissioning activities from material dislodged from the piles during removal and from sediment resuspension and resedimentation during the removal of the tower, foundation, and scour protection system. When the tower structure is decommissioned, sediments that had collected in any scour control system, mats or rock armor, is temporarily disturbed. The mats and rock armor are returned to shore for disposal. Due to the short duration of installation — anticipated to be eight days to 10 weeks (see Section 2.1.1.4.1 of this EA), and decommissioning, anticipated to be

one week (see "Decommissioning" in Section 2.1.1.6 of this EA) — impacts from these activities may create temporary and localized water and sediment impacts. As a result, impacts caused by installation, construction and decommissioning of the tower are anticipated to be minor.

A maximum of two meteorological buoys may be installed on the proposed site, and there may be up to two buoy relocations per year. Buoy installation, relocation, and decommissioning are expected to take one to two days. Impacts to water quality resulting from the installation and relocation of meteorological buoys consist of sediment dispersal, resuspension, and subsequent sedimentation from anchoring. Water quality impacts occur during decommissioning activities from material dislodged during the removal of the buoy anchor. Because the installation and removal of a buoy does not involve any pile driving or installation (or removal) of a foundation, a buoy is likely to have even less of an impact on local water quality than the installation and decommissioning of a meteorological tower.

Non-Routine Events

During travel to and from ports and harbors, and during site characterization activities within the proposed site, multiple sources of diesel fuel are present on vessels, generators, and pile driving hammers. Spills could occur during refueling or as the result of an allision or collision (USDOI, BOEM, 2012a).

A vessel allision with the meteorological structures or collision with other vessels can result in the spillage of diesel fuel. Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills. Spills are not projected to have significant impacts due to the small size of a projected spill. If a spill were to occur, either inside or outside of the proposed site, the estimated spill size would be small. The average spill size for vessels similar to those anticipated to be used for Alternative A is 114 gallons. Vessel allision with a meteorological buoy containing diesel powered generator also can occur. Such a buoy generator can contain 240 gallons of diesel fuel (USDOI, BOEM, 2012a). Diesel spills of 114 to 240 gallons are expected to dissipate very rapidly in the water column of the open ocean, then evaporate and biodegrade within a few days (see Section 2.1.2.3 of this EA).

The meteorological towers and buoys also could serve as attractants for marine life, which in turn can attract recreational fishermen to the area. Therefore, there is some potential for collisions and allisions of recreational fishing boats and accidental release of diesel fuel. Should this occur, the spill would be similarly small, and would dissipate and biodegrade in the same manner discussed above in Section 2.1.2.3 (USDOI, BOEM, 2012a).

Storms also can cause or contribute to allisions and collisions that could result in a spill. Storm conditions, however, also will cause the spill to dissipate faster (USDOI, BOEM, 2012a). The impacts to the environment that could result from an oil spill associated with Alternative A, should one occur, are expected to be both minor and temporary (USDOI, BOEM, 2012a).

It also is possible that larger vessels, such as tankers or container ships, could collide with meteorological structures within the proposed site (see Section 2.1.2.1). Such an allusion or collision is considered unlikely, as there is only one meteorological tower and two buoys proposed and these will be lit and marked for navigational purposes. If a larger vessel should collide with a

meteorological facility, a large spill would be extremely unlikely. Because such ships are so much larger than the meteorological tower or buoys, damage to the tower will be far greater than to ships. Any resulting spill is far more likely to result from damage to the tower than to the ship. Thus, the largest spill resulting from the unlikely event that a larger ship were to collide with a meteorological facility is on the order of 240 gallons – the estimated amount of generator fuel present on the meteorological facility itself, assuming that a generator is present on the facility (USDOI, BOEM, 2012a).

Conclusion

A general description of these impacts to coastal and marine water quality is presented in USDOI, MMS (2007a), and USDOI, BOEM (2012b; c). The consensus among these documents is that impacts to coastal and marine waters from vessel discharges associated with Alternative A should be of short duration and, if detectable, remain negligible. Sediment disturbances resulting from anchoring and coring will be short-term, temporarily impacting local turbidity and water clarity. As a result, sediment disturbances resulting from Alternative A are not anticipated to result in any significant impact to any area within the proposed site. Because collisions and allisions occur infrequently and rarely result in a spill, the risk of spills is small. In the unlikely event of a fuel spill, negligible impacts will result as the spill would very likely be small and would dissipate and biodegrade within a short time. Impacts from vessel discharges, sediment disturbance, and potential spills associated with Alternative A on coastal and marine areas, if detectable, would be minor.

3.2.2 Biological Resources

3.2.2.1 Coastal Habitats

3.2.2.1.1 Description of the Affected Environment

Georgia ecosystems are characterized by coastal marsh and barrier islands and locally referred to as "Lowcountry," bordered on the west by sandhill ridges and on the east by the Atlantic Ocean, and extending from Georgetown, South Carolina, to St. Mary's, Georgia (USDOI, FWS, 2011a)

The barrier islands provide ideal habitat for a wide variety of plants and animals. The saltwater marshes that lie behind the barrier islands are nurseries for countless marine organisms both commercial and sport species, that are particularly important to the coastal economy. Such an abundance of life in the salt marsh invites other animals to rest, feed, or nest — promoting the diversity of flora and fauna found in the Lowcountry coastal plain and the barrier islands habitats (USDOI, FWS, 2011a).

A chain of seven national wildlife refuges (NWR) form the Savannah Coastal Refuges Complex that extends from Pinckney Island NWR near Hilton Head Island, South Carolina, to Wolf Island NWR near Darien, Georgia. Between these two refuges lie five additional NWRs: Savannah (the largest unit in the Complex), Wassaw, Tybee, Harris Neck, and Blackbeard Island NWRs. These seven refuges total 56,949 acres (23,046 hectares) and span about 100 miles (160 km) of the Atlantic Ocean coastline (USDOI, FWS, 2011a).

Sediment from the Savannah River is the predominant source of sand deposits for coastal beaches. Littoral currents flowing southward at one time carried sand from the river to beaches. Dredging activities of the Savannah River delta have interrupted the natural transport (USDOI, FWS, 2011a).

3.2.2.1.2 Impact Analysis of the Proposed Action

Routine Activities

The proposed lease area is located at least 3 NM (5.6 km) from the nearest shoreline. Therefore, site characterization surveys, and the construction, operation and decommissioning activities of the meteorological tower and/or buoys occurring within the proposed lease areas will have no direct impact on coastal habitats. However, coastal vessel traffic associated with Alternative A and the use of existing coastal and port facilities have the potential to contribute to the impacts on coastal habitats as discussed below.

As per the Southern Company application, several sites along the Savannah River, Georgia and the Port of Savannah support site characterization surveys and the construction, operation, and decommissioning of meteorological towers/buoys. No expansion of these existing onshore areas is anticipated in support of Alternative A. Existing channels accommodate the vessels anticipated to be used and no additional dredging is required to accommodate different vessel sizes resulting from Alternative A.

Indirect impacts from routine activities can occur from wake erosion caused by vessel traffic in support of the proposed action. The approximate maximum number of vessel trips projected to occur over the five-year lease period would be 511 trips for survey, site characterization, and assessment activities, operation and maintenance, and decommissioning associated with Alternative A (see Section 2.1.1.7.2, Table 2-1 of this EA). Wake erosion and sedimentation effects would be limited to approach channels and the coastal areas near ports and bays used to conduct activities. The USACE recorded some 8,648 vessel stops at the Port of Savannah in 2011(see Section 3.5.1). Given the existing amount and nature of vessel traffic (including tanker ships, container ships, and other very large ships) into and out of nearby ports (see Section 3.2.3.6.1), there would be a negligible, if any, increase to wake-induced erosion of associated channels based on the relatively small size and number of vessels associated with Alternative A.

Non-Routine Events

Non-routine events associated with coastal habitats are discussed in Section 2.1.2.

Conclusion

No direct impacts on coastal habitats are expected to occur from routine activities in the proposed sites due to the distance of the sites from shore. The existing port or industrial areas in the Savannah/Port Wentworth area are expected to be used in support of Alternative A. No anticipated expansion of existing facilities is expected to occur as a result of Alternative A. Indirect impacts from routine activities may occur from wake erosion and associated added sediment caused by increased vessel traffic in support of the Alternative A. However, given the volume and nature of existing vessel traffic in this area, a negligible increase, if any, to wake-

induced erosion will occur around smaller, non-armored waterways as a result of Alternative A. Should an accidental diesel fuel spill occur as a result of Alternative A, the potential impacts to coastal habitats would be negligible, localized, and temporary.

3.2.2.2 Benthic Habitat

3.2.2.2.1 Description of the Affected Environment

The benthos is a community of organisms that live on or in the bottom sediment. The benthos provides a critical link in the productivity of the marine ecosystem off of Georgia. The benthos includes organisms that live on the sediment surface (epifauna), such as starfish and sand dollars, as well as organisms that live within the sediment (infauna), such as bivalves and worms. The majority of the benthos lives in the upper 6 in (15 cm) of sediment (Gray, 1981). Benthic organisms are an important food resource for fish, including those caught by recreational and commercial fishermen.

There are two primary offshore benthic habitats on the nearshore Georgia continental shelf, within the region occupied by the project area; (1) soft bottom habitat consisting of unvegetated and unconsolidated sand of varying grain size, and (2) live/hard bottoms consisting primarily of limestone and sandstone outcrops.

In addition to these natural habitats, there are artificial reefs present within the project vicinity; however, there are no artificial reefs in any of the three proposed lease blocks (Figure 3-1). Georgia's artificial reef program is maintained by the Department of Natural Resources. Artificial reefs are considered live/hard bottom habitat and are classified as Special Management Zones under the South Atlantic Fishery Management Council (SAFMC) Snapper-Grouper Fishery Management Plan (FMP), see also Section 3.2.2.7 (Fish and Essential Fish Habitat).

Soft Bottom

Physical factors such as sediment type, hydrodynamics, and bottom topography play a role in determining the structure of soft bottom benthic communities of the shallow continental shelf. Sedimentary characteristics, such as grain size and organic content, are particularly important factors in determining the distribution and structure of benthic communities on open continental shelf areas. Sediment grain size distribution plays an important role in determining substrate stability and food availability, which in turn affects benthic community structure and the benthic trophic groups that are present as suspension or deposit-feeding taxa (Rhoads, 1974; Fauchald and Jumars, 1979). Although infaunal species occur across a range of sediment types, the distribution of many infaunal taxa tend to be correlated to specific sedimentary habitats.

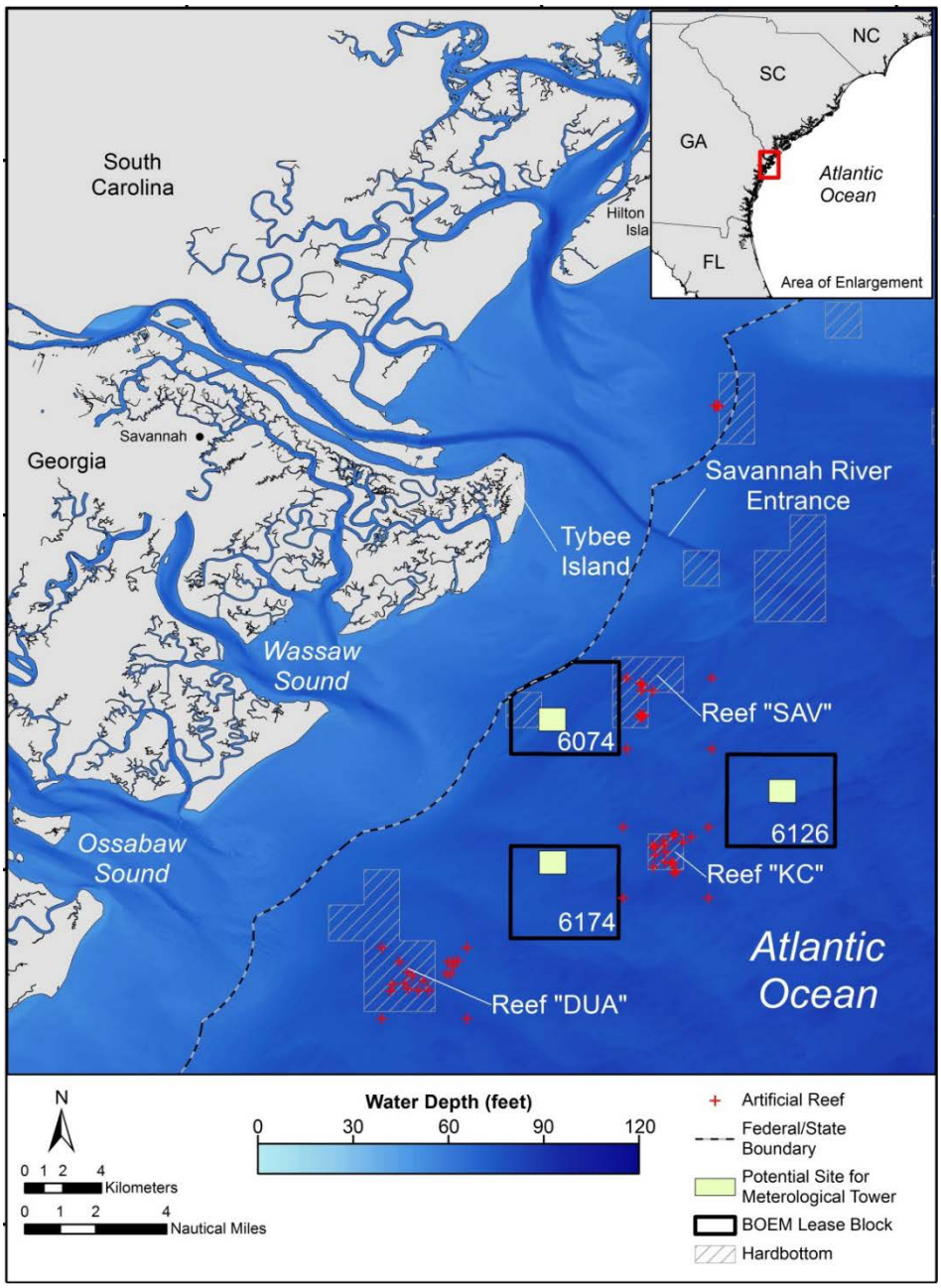


Figure 3-1. Artificial Reefs and Hard Bottom.

Hydrodynamic processes (e.g., currents and waves) also affect benthic community structure (e.g., Eckman, 1983; Hall, 1994). Hydrodynamic processes affect benthic larval transport, sediment characteristics, and food resources at a variety of spatial scales (Butman, 1987; Zajac, et al., 1998; Palmer, 1988). Storms may affect benthic community composition, especially in shallow water (Hall, 1994; Posey, et al., 1996; Posey and Alphin, 2002). Even though individual storm events are unpredictable, their seasonality and frequency have a relatively narrow range over the course of a year. Storms can affect surface sedimentology over relatively short time periods.

Local bottom topographic features, such as ridges and troughs, also play a role in determining shallow continental shelf macrobenthic communities. Diaz, et al. (2004) reported that shoal-ridge communities are different from the mid-shoal and trough communities. Viscido, et al. (1997) reported that the presence of a ridge has a clear influence on the local abundance and distribution of shrimp and crab populations. They reported that the ridge has an assemblage of crab and shrimp different from that on either side of the ridge. The differences may be attributable to the ridge being a high-energy environment or its sediment composition.

Variations in density over space and time are typical of the numerically dominant species in soft bottom communities on the Georgia OCS (Frankenberg, 1971; Frankenberg and Leiper, 1977; Center for Natural Areas, 1979). In general, the overall abundance of benthic communities is highest in the late spring and early summer. However, a range of reproductive cycles exist for the benthos at the individual species level. Some species reproduce year-round, while others spawn during one or multiple seasons. Georgia's inner shelf, which is within 5 to 9.5 NM (9 km to 17 km) of the shoreline and has a water depth ranging from 20 – 45 ft (7 m to 13 m), is dominated by polychaete worms and crustaceans that numerically comprised approximately 75 percent of the benthic community (Cooksey, et al., 2004; Hyland, et al., 2006).

Live/Hard Bottom

Live/hard bottom ledges and reefs are widely distributed in the sub-tropical region off the southeastern U.S. OCS (Wenner, et al., 1983; Barans and Henry, 1984; Sedberry and Van Dolah, 1984). These ledges and reefs are comprised of limestone and sandstone outcrops that rise 3 to 10 ft (1 to 3 m) above the surrounding sandy substratum. Live/hard bottom communities in this region are areas of low, rough, or broken relief consisting of naturally-occurring hard or rocky outcroppings, usually covered by a thin layer of sand. The geological and biological architecture of these three-dimensional substrates provide shelter and substrate for benthos and demersal fish. These outcrops are colonized by corals, sponges, and other diverse epifaunal components and support unique fish assemblages compared to surrounding sandy habitats. Live/hard bottom communities are focal sites for activities of many species of small schooling fishes, as well as mid-water and demersal piscivorous fishes (Kracker, Kendall, & McFall, 2008). Live/hard bottom communities support rich, sessile biological assemblages (e.g., sea fans and sea whips, ascidians, bryozoans, hard corals, hydroids, anemones, encrusting algae, and sponges), commercially and recreationally important fish, and other fauna such as sea turtles (Thompson, Schroeder, & Phillips, 1999).

The live/hard bottom habitat present within the project area generally consists of relatively smooth, flat-lying rock outcrops (<1.6-ft relief) covered by a thin, sandy layer. It is present within or adjacent to OCS block 6074 and situated between OCS blocks 6174 and block 6126 (see Figure 3-1). Sponges, bryozoans, corals, and anemones numerically dominate the macrobenthic community during all seasons. Sponges are the most important invertebrate group overall on the inner OCS, comprising 60 to 78 percent of the total biomass (Wenner, Hinde, Knott, & Van Dolah, 1984). They also support epifaunal amphipods in winter and spring and polychaetes in summer and fall, which are important prey for fish and other higher trophic species (Wenner, Hinde, Knott, & Van Dolah, 1984).

Artificial Reefs

The majority of the offshore artificial reefs on the Georgia inner continental shelf are located east of the coastal trawling grounds at a distance of 6 to 23 NM (11 to 43 km) offshore and at depths ranging from 30 - 70 ft (9 to 21 m). Several artificial reef locations are documented in the vicinity of the three OCS blocks, although none of the OCS lease blocks contain artificial reef sites under Georgia's artificial reef program. In addition, three deepwater reefs have been constructed in 140 - 160 ft (42 to 49 m) of water 50 to 70 NM (93 to 130 km) offshore to address a growing recreational component targeting bluewater fishes. Permitted offshore reef sites typically average 4 sq NM (14 sq km) in size. Artificial reefs add three-dimensional structure to the benthic habitat that attracts fish and provide a substrate for a variety of sessile organisms.

3.2.2.2.2 Impact Analysis of the Proposed Action

Routine Activities

The primary direct adverse impacts on benthic resources are from construction activities and include crushing of benthos by anchors and anchor chains, the scour control system, and driven piles. Direct impacts also include smothering by redeposited suspended sediment resulting from construction activities. The operational phase of the proposed action includes the displacement of benthic resources through sediment scour around tower piles and buoy anchor systems. Tower piles and the scour system (e.g., rocks, etc.) provide hard substrate and habitat surface area for sessile organisms (e.g., barnacles, sponges, and ascidians) to attach.

Site Characterization Surveys

Because most site characterization activities involve remote sensing of the seafloor, they do not directly impact benthic resources other than fish. Impacts on fish are addressed in Section 3.2.2.7.2. Site characterization activities that may disturb benthic resources include grab samples, borings, and vibracores. The impacts from these activities are expected to be limited to the immediate sampling area (e.g., several sq m) as well as any anchoring from the survey vessels.

Meteorological Tower and Foundation

As described in Chapter 2, the area of ocean bottom affected by a meteorological tower ranges from approximately 200 sq ft (19 sq m) if supported by a monopole, to 2,000 sq ft (186 sq m) if supported by a jacket foundation. Bottom disturbance associated with vessel anchors during construction are approximately 800 sq ft (75 sq m) and may occur within a radius of 1,500 ft (162 acres; 65 hectares) around the tower.

In addition to tower piling(s), a scour control system may be installed that would disturb benthic resources. A scour control system may be constructed of rock armor or an artificial seaweed mat attached to the seafloor by anchoring pins. The placement of these objects on the bottom results in direct adverse impacts on the benthos by crushing individual benthic organisms. An artificial seaweed mat disturbs a maximum of 7,800 sq ft (725 sq m) of seabed. In some areas not expected to be subjected to scour, or where expected scouring does not compromise the integrity of the structure, scour protection may not be required. However, if scouring does occur,

the area impacted will be similar to or slightly larger than the projected area covered by a scour control system.

A rock scour system provides habitat for sessile benthic organisms where little or none exists because the hard surface functions like an artificial reef. Scour mats can potentially provide habitat to marine organisms that undergo settlement into the stabilized sediment trapped within the mat material.

Upon decommissioning and removal of the tower and associated scour system, the seafloor is disturbed by severing the pile foundation to the required minimum 15 ft (4.5 m) below the sediment surface (i.e., mudline). The area affected is similar to that disturbed during the construction phase. Similarly, removing the scour control system displaces the equivalent area disturbed when it was installed. The decommissioning activity produces suspended sediment that can temporarily impact filter-feeding organisms until the sediment has resettled. The time of sediment suspension depends upon ocean currents and sediment grain size.

According to BOEM (2012a) and others, depending on the species density and diversity in the immediate area at the time of disturbance, soft bottom communities may take between approximately one and three years to recover to pre-disturbance levels in terms of abundance. Recovery of community composition or trophic structure that exploits all ecologic niches available in a particular area may take longer (Continental Shelf Associates, Inc., 2004). These estimates are supported by Michel, et al. (2007), who summarized the results of seven years of monitoring at the Horns Rev Wind Park in Denmark. Michel, et al. (2007) also noted an increase in sessile organisms as a result of the increased hard substrate provided by the tower pilings.

The duration of activity directly impacting benthic communities from site characterization surveys, meteorological platform installation, and removal is likely to be short term (from a few days to 10 weeks, depending on weather, sea state, and equipment for both construction and removal). Given the relatively small amount of disturbed area, the impact on benthic habitats would be minor.

Buoy Anchoring Systems

Anchors for a single boat-shaped and discus-shaped buoy would disturb a footprint of approximately 6 sq ft (0.5 sq m) with an anchor sweep of approximately 8.5 acres (3.4 hectares) (as cited in USDOI, BOEM, 2012a). The anchor sweeps result in redistribution of sediment and accompanying benthos and possibly crush individual benthic organisms. The placement of the buoy anchor results in direct adverse impacts on the benthos at that location.

Because Alternative A assumes two buoys are installed, the total anchor footprint would be 12 sq ft (1 sq m) with a total anchor sweep of approximately 17 acres (6.8 hectares) at any particular time. The buoys are assumed to be moved once each per year within a lease block and impact multiple locations within the proposed lease area.

Non-Routine Events

In the unlikely event that a vessel allision or collision would cause a spill, the most likely pollutant to be discharged is diesel fuel. If a fuel spill were to occur, it would be expected to

dissipate very rapidly in the water column, then evaporate and biodegrade within a few days, resulting in negligible impacts on the benthos in the area of the spill.

Conclusion

The primary reasonably foreseeable impacts resulting from routine activities on benthic communities are direct contact by anchors, driven piles, and scour protection that cause crushing and smothering of the benthos. Impacts of the proposed action on benthic communities will be short term (likely less than a year) and localized, totaling less than one percent of a lease block.

Furthermore, sensitive benthic habitats such as artificial reef sites and hard bottom habitats are not present in two of the Blocks (6174, and 6126). Block 6074 contains hard bottom habitat but no artificial reef sites. If a specific area is adversely impacted, the ability of soft bottom communities to recover, in terms of abundance and diversity, to pre-disturbance levels may take one to three years. Recovery of community composition or trophic structure that exploits all ecologic niches available in that particular area may take longer. The data collected during site characterization surveys will indicate the presence of any potential undocumented benthic resources. Thus, sensitive habitat types, such as hard bottom and live bottom habitats, will be avoided by the lessee during geotechnical exploration and during tower and/or buoy installation. Thus, Alternative A results in negligible to moderate impacts on benthic communities that are not considered significant for the purposes of this assessment.

3.2.2.3 Marine Mammals

3.2.2.3.1 Description of the Affected Environment

The area for potential effect of the proposed action is the coastal (principal ports) and offshore continental shelf habitats (mooring locations) and the transit area between the two, offshore northeastern Georgia in the South Atlantic Bight.

The South Atlantic Bight's marine mammals are represented by members of the taxonomic orders Cetacea, Sirenia, and occasionally Pinnipedia. The order Cetacea includes the mysticetes (the baleen whales) and the odontocetes (the toothed whales, including the sperm whale *[Physeter macrocephalus]*, dolphins, and porpoises). Occurrence of cetacean species is generally widespread along the US Atlantic coast. Portions of the whale populations undergo seasonal migrations along the length of the US Atlantic coast.

The order Sirenia is represented by the West Indian manatee (*Trichechus manatus latirostris*), which occurs on the east coast of Florida (USDOI, BOEM, 2012e) and is also known to occur in all Georgia coastal counties and the Savannah Coastal NWR Complex (USDOI, FWS, 2011a). Members of the order Pinnipedia that could occur in the area of potential effect includes four species of seal, which are mainly found in the northeast US and are considered rare or uncommon in the proposed action area off of Georgia. However two seals, the harbor seal (*Phoca vitulina*) and the hooded seal (*Cystophora cristata*) have been known to stray into the South Atlantic (USDOI, BOEM, 2012e).

All marine mammals are protected under the Marine Mammal Protection Act of 1972 (MMPA) (16 U.S.C.§1361). Seven species known to occur within the Mid-Atlantic and Southern Atlantic

OCS are further protected under the ESA. These include five baleen whales (North Atlantic right whale [*Eubalaena glacialis*], blue whale [*Balaenoptera musculus*], fin whale [*B. physalus*], sei whale [*B. borealis*], and humpback whale [*Megaptera novaeangliae*]), one toothed whale (sperm whale) and the Florida subspecies of the West Indian manatee. The *Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas, Biological Assessment* (USDOI, BOEM, 2012c) provides a detailed summary of the life history of these species and is incorporated by reference and herein presented in summary.

Of the seven species of marine mammals listed as endangered, only the North Atlantic right whale and the Florida manatee, are commonly found in the EA Area. The Western North Atlantic South Carolina-Georgia Coastal stock of bottlenose dolphin (*Tursiops truncates*), which is currently listed under the MMPA as depleted, is a year round resident of the EA Area (Waring, et al., 2011). Although the blue whale, fin whale, sei whale, humpback whale and sperm whale may occur in the South Atlantic Bight and near the EA area, data and descriptions from Waring, et al. (2011 and 2012) indicate these species are infrequent visitors to the EA Area.

This section of the EA provides a brief description of the North Atlantic right whale, Florida manatee, and bottlenose dolphin. Table 3-5 provides habitat location and occurrences of the seven ESA listed marine mammals plus the bottlenose dolphin within the EA Area.

Table 3-5
Listed Marine Mammals Found in South Atlantic Planning Area

Common Name	Species	Status	Occurence[1]	Critical Habitat in EA Area
Manatees	***Sirenia***			
West Indian Manatee (Florida subspecies)	*Trichechus manatus latirostris*	E/S	Rare	--
Baleen Whales	***Mysticetes***			
North Atlantic Right Whale	*Eubalaena glacialis*	E/S	Regular	Yes
Sei Whale	*Balaenoptera borealis*	E/S	Rare	--
Fin Whale	*Balaenoptera physalus*	E/S	Regular	--
Humpback Whale	*Megaptera novaeangliae*	E/S	Regular	--
Blue Whale	*Balaenoptera musculus*	E/S	Rare	--
Toothed Whales	***Odontocetes***			
Sperm Whale	*Physeter macrocephalus*	E/S	Regular	--
Bottlenose Dolphin	*Tursiops truncatus*	Depleted[2]/S	Regular	--

[1] E = Endangered, S = Strategic Stock.
[2] Listed as 'Depleted' under the MMPA.
Source: Adapted from USDOI, BOEM (2014)

North Atlantic Right Whale (*Eubalaena glacialis*)

The North Atlantic right whale is a member of the family Balaenidae. Right whales may be distinguished from other baleen whale species by their black color and stocky body; large head size with a strongly bowed lower jaw; thickened, light-colored patches of epidermis called callosities; the absence of a dorsal fin; and short, broad, paddle-shaped flippers. It is medium in size when compared to other baleen whale species, with adults ranging in size from 45-55 ft (14-17 m). Females are generally larger than males (USDOI, BOEM, 2012c).

The North Atlantic right whale is considered one of the most critically endangered whales and is listed as endangered under the ESA. According to the MMPA, the maximum number of animals which may be removed from a marine mammal stock (not including natural mortalities), while allowing that stock to reach or maintain its optimum sustainable population, is known as the minimum Potential Biological Removal (PBR) level. Because the average annual human-related mortality and serious injury of the North Atlantic right whale exceeds the PBR level, the western Atlantic stock is classified as a strategic stock. The minimum population size is estimated at approximately 444 individuals (Waring, et al., 2013).

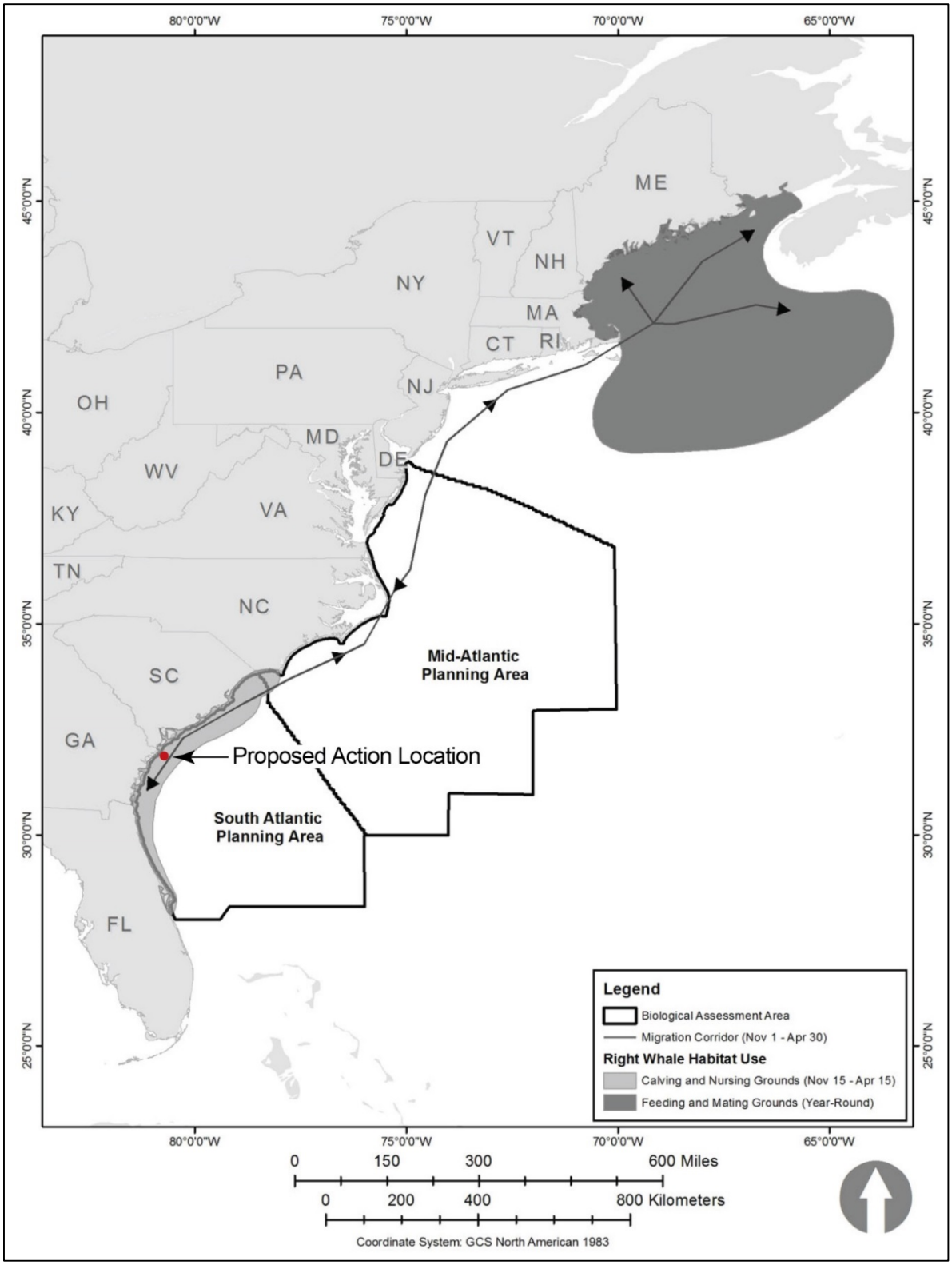
Generally, North Atlantic right whales undergo seasonal coastal migrations from summer feeding grounds off eastern Canada and the US northeast coast to winter calving grounds off the US southeast coast (Figure 3-2). Most calving takes place in shallow coastal waters offshore Georgia and Florida between December and March. The winter calving grounds and a segment of the migratory corridor are located within the proposed lease area. According to 1986-2011 sighting data from the Right Whale Consortium, twenty-four right whale sightings (including three mother-calf pairs) were recorded within the proposed lease areas. Recent surveys also indicate that waters off of South Carolina and North Carolina are frequently used by calving right whales, areas that are significantly north of the calving habitat offshore of Florida and Georgia (Garrison, 2007).

Although the main feeding grounds are located offshore Canada and the northeastern US, right whales also may feed, at least opportunistically, while migrating. Data suggest that not all reproductively active females return to calving and nursery grounds each year, and additional wintering and summering grounds may exist in unsurveyed locations of the western North Atlantic (USDOI, BOEM, 2012c).

Florida Manatee (*Trichechus manatus latirostris*)

The Florida subspecies of the West Indian manatee is the only sirenian that occurs along the eastern coast of the US. The average adult West Indian manatee ranges from 10ft - 13 ft (3 m - 4 m) in length and from 800 lb to 1,200 lb (362 kg to 544 kg) in weight (USDOI, BOEM, 2012c).

The Florida manatee is currently listed as endangered under the ESA and a “strategic stock” under the MMPA. The species is also protected under the Florida Manatee Sanctuary Act. The majority of the Atlantic population of the Florida manatee is located in eastern Florida and southern Georgia and managed within four distinct regional management units (USDOI, BOEM, 2012c).



Source: USDOI, BOEM (2012c)

Figure 3-2. North Atlantic Right Whale Seasonal Distribution and Habitat Use.

In warmer months, Florida manatees range up and down the Georgia coast, appearing as early as March and staying as late as December, depending on the weather, water temperature, and sources of warm water (Deutsch, et al., 2008) (see Figure 3-3).

The general migration pattern for manatees is characterized by movements to specific core areas that are used for prolonged periods. Manatees have used waters within or adjacent to Savannah, Pinckney Island, Tybee, Wassaw, Harris Neck, and Blackbeard Island NWRs during the summer, feeding in the tidal creeks on various marsh plants (USDOI, FWS, 2011a).

The Atlantic population located in eastern Florida and southern Georgia is managed within four distinct regional management units: Atlantic Coast (northeast Florida to the Florida Keys), Upper St. Johns River (St. Johns River, south of Palatka), Northwest (Florida Panhandle to Hernando County), and Southwest (Pasco County to Monroe County). The Atlantic Coast regional management unit is the most relevant to, and encompasses, the proposed lease area (USDOI, BOEM, 2012c). A minimum population estimate of Florida manatees is 4,834 individuals (USDOI, FWS, 2012).

Source: USDOI, FWS (2012)

Figure 3-3. Florida Subspecies of West Indian Manatee Distribution Along the Eastern Coast of the US.

Common Bottlenose Dolphin (*Tursiops truncatus*): Western North Atlantic South Carolina/Georgia Coastal Stock

Common bottlenose dolphins are reported to be distributed worldwide and can be found in both coastal and pelagic waters; near oceanic islands over the continental shelf and break; and in estuarine habitats. Dolphins have been sighted in depths from 0 ft to <15,000 ft (0 m - 4,932 m) with a mean of 1,900 ft (588 m) and sea surface temperatures from 34°F to 88°F (1.1°C - 31.1°C) with a mean of 67.5°F (19.7°C). Offshore stocks have been associated with a wider range of temperature and geography (Kenney, 1990).

Two different morphotypes of the common bottlenose dolphin inhabit waters along the U.S. east coast. The coastal morphotype is morphologically and genetically distinct from the larger, more robust morphotype that primarily occupies habitats further offshore. Spatial and genetic studies indicate both regional and seasonal differences between the coastal and offshore stocks (Waring, et al., 2011).

The South Carolina/Georgia Coastal stock is present in coastal Atlantic waters from the North Carolina/South Carolina border south to the Georgia/Florida border. There is no obvious boundary defining the offshore extent of this stock. The combined genetic and logistic regression analysis indicated that in waters less than 33 ft (10 m) depth, 70 percent of the bottlenose dolphins were of the coastal morphotype. Between 33 and 66 ft (10 and 20 m) depth, the percentage of animals of the coastal morphotype dropped precipitously and at depths 131 ft (40 m) nearly all (> 90 percent) animals were of the offshore morphotype (Waring, et al., 2011).

3.2.2.3.2 Impact Analysis of the Proposed Action

The activities associated with the proposed action that may affect the marine environment include: (1) site characterization surveys; (2) construction and/or installation of meteorological observation platforms (i.e., towers and buoys); (3) vessel traffic; (4) discharges of waste materials and accidental fuel releases; and (5) meteorological observation platform decommissioning. The potential effects from these activities can be grouped into the following categories: (1) acoustic effects; (2) benthic habitat effects; (3) vessel collision effects; and (4) other effects (e.g., contact with waterborne pollution) (USDOI, BOEM, 2012c).

Relevant research and data were drawn from similar activities described in BOEM's EAs for *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia Final Environmental Assessment* (USDOI, BOEM, 2012a) and *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Environmental Assessment* (USDOI, BOEM, 2012b).

Routine Activities

Acoustic Effects

Current thresholds established by NMFS for determining impacts to marine mammals typically center around root-mean-square (RMS) received levels of 180 dB re 1µPa for potential injury, 160 dB re 1µPa for behavioral disturbance/harassment from a non-continuous noise source (impact

pile driving), and 120 dB re 1μPa for behavioral disturbance/harassment from a continuous noise source (vibratory pile driving). Marine mammal responses to sound can be highly variable, depending on the individual hearing sensitivity of the animal, the behavioral or motivational state at the time of exposure, past exposure to the noise which may have caused habituation or sensitization, demographic factors, habitat characteristics, environmental factors that affect sound transmission, and non-acoustic characteristics of the sound source, such as whether it is stationary or moving. Nonetheless, the threshold levels referred to above are utilized by NMFS in evaluating impacts and prescribing mitigation under the ESA and MMPA (USDOI, BOEM, 2012a).

Underwater sound from Alternative A can be divided into two categories relevant to marine organisms (e.g., marine mammals, sea turtles, fish): (1) impulsive and (2) non-impulsive (Table 3-6). Impulsive noise can be a single pulse (single pile strike, single ping of certain sonars) or multiple pulses (sequential pile strikes). Impulsive noises are brief, broadband, atonal, and transient with a rapid rise from ambient pressure to a maximal pressure followed by oscillating maximal and minimal pressures. Impact pile-driving noise is predominantly low frequency with a high source level, whereas vibratory pile-driving is predominantly low frequency with a lower source level. Low frequency sources in general have a significant potential for long-range propagation. However, propagation is variable depending on multiple factors, including water temperature, water depth, and bottom type (USDOI, BOEM, 2012b). The Alternative A time-area closure from November 1 - April 30 restricts pile driving noise to a time period when most migratory marine mammals are not expected to be present in the proposed action area.

Noise modeling for the two different types of pile driving, impact and vibratory, provide differing results. Results from areas off Delaware and New Jersey and in Nantucket Sound for impact pile driving associated with offshore wind construction has been submitted to BOEM for previous lease applications and plans (USDOI, BOEM, 2012a). These results indicate that underwater noise levels produced from impact pile driving reach 180 dB re 1 μPa RMS at 1,640 to 3,280 ft (500 to 1000 m) from the source, and reach 160 dB re 1 μPa RMS at 2.1 to 4.5 miles (3.4 to 7.2 km) from the source. However, the local environmental characteristics, sources of sound, and monopile diameters are variable, thus causing the isopleths to vary significantly. Model results from Florida and sites in California indicate that underwater noise levels from vibratory pile driving reach 180 dB re 1 μPa RMS at less than 33 ft (<10 m) and reach 120 dB re 1 μPa RMS over 22,966 ft (>7,000 m) away from the sound source (U.S. Department of the Navy, Naval Facilities Engineering Command Southeast and Atlantic, 2013; Caltrans, 2009). Nonimpulsive (continuous or intermittent) sound can be tonal, broadband, or both. Some nonimpulsive sounds can be transient signals of short duration but without the rapid rise time (i.e., vibratory hammers, vessels and many active sonar systems). Although sonar sound is a “tone pulse,” it is considered non-impulsive because it is often narrowband (any sound that is a tone, rather than broadband). Non-impulsive sounds can have very long durations and can be received (audible) at a distance of tens of kilometers (USDOI, BOEM, 2012b). The effects of the two methods of pile driving on marine mammals are discussed below in the subsection entitled Vessel and Equipment Noise.

Table 3-6
Summary of Noise Sources from Site Characterization and Assessment Work

Sound Source	Sound type	Frequency	Source Level
Electromechanical survey equipment (see Table 3-7)	Non-impulsive	Narrowband	Generally 202-220 with a maximum of 242 dB re 1µPa/m
Pile driving (Impact)	Impulsive (multiple pulse)	Broadband 20 Hz to > 20 kHz	>200 dB re 1µPa/m
Pile driving (Vibratory)	Continuous	Low Frequency 5-40 Hz[1]	150-174 dB re 1µPa/m [2]
Vessel noise	Continuous	Low Frequency 10-1,000 Hz	150-180 dB re 1µPa/m
Tug Boat	Continuous	100-500 Hz	140-170 dB re 1µPa/m
Dynamic Positioning Vessel	Continuous	500-1,000 Hz	170-180 dB re 1µPa/m

Source: USDOI, BOEM (2012b)
[1] Sources: Geoforum (1998) and Abdel-Rahman (2002)
[2] There are currently no measurement data available for wind turbine monopile installations using vibratory hammers but other measurements suggest this technique is quieter than impact piling (Nedwell, et al., 2004).

Hearing in Marine Mammals

Marine mammals use sound for many important biological functions, including foraging, orientation, response to predators, and social interactions. The impacts from noise and interference with these functions can cause a variety of responses ranging from mild behavioral changes to physical injury. Impacts on marine mammals from anthropogenic noise are dependent on multiple factors, including characteristics of the local acoustic environment (i.e., water depth and bottom type), novelty of sound to the animal, the individual animal's hearing sensitivity, and the animal's activity during the noise emission. Impacts on marine mammals may occur if the frequencies of sound from project activities are generally similar to, or overlap, the frequency range of hearing for the animal exposed to the sound, and/or the sound pressure level (SPLs) are high enough for a sufficient duration (USDOI, BOEM, 2012b).

Marine mammals have been divided into hearing groups according to their hearing ranges (Table 3-7). From what is known of marine mammal hearing and the source levels and the volume and frequencies of the meteorological tower construction noise sources, it is evident that, if present in the area where the underwater noise occurs, marine mammals are capable of perceiving survey and construction related noises; and have hearing ranges that are likely to have peak sensitivities that overlap the frequencies of sub-bottom profiling survey equipment, pile driving, and vessel sound (USDOI, BOEM, 2012c).

Table 3-7
Functional Marine Mammal Hearing Groups, Auditory Bandwidth, and Genera Represented from Each Group

Functional Hearing Group	Estimated Auditory Bandwidth	Genera Represented (number species/subspecies)
Low-frequency cetaceans	7 Hz to 22 kHz	*Eubalaena*[1], *Balaena, Caperea, Eschrichtius, Megaptera, Balaenoptera* (13 species/subspecies)
Mid-frequency cetaceans	150 Hz to 160 kHz	*Steno, Sousa, Sotalia, Tursiops*[1], *Stenella, Delphinus, Lagenodelphis, Lagenorhynchus, Lissodelphis, Grampus, Peponocephala, Feresa, Pseudorca, Orcinus, Globicephala, Orcaella, Physeter, Delphinapterus, Monodon, Ziphius, Berardius,Tasmacetus, Hyperoodon, Mesoplodon* (57 species/subspecies)
High-frequency cetaceans	200 Hz to 180 kHz	*Phocoena, Neophocaena, Phocoenoides, Platanista, Inia, Kogia, Lipotes, Pontoporia, Cephalorhynchus* (20 species/subspecies)
Pinnipeds in water[2]	75 Hz to 75 kHz	*Arctocephalus, Callorhinus, Zalophus, Eumetopias, Neophoca, Phocarctos, Otaria, Erignathus, Phoca, Pusa, Halichoerus, Histriophoca, Pagophilus, Cystophora, Monachus, Mirounga, Leptonychotes, Ommatophoca, Lobodon, Hydrurga, and Odobenus* (41 species/subspecies)
Pinnipeds in air	75 Hz to 30 kHz	Same as pinnipeds in the water

[1] Species of concern for the proposed action.
[2] Data suggests the Florida Manatee, *Trichechus manatus latirostris*, hearing is similar to phocid pinnipeds (USDOI, BOEM, 2012c).
Source: Southall et. al. (2007) as found in USDOI, BOEM (2012b).

HRG Survey Acoustic Effects

HRG surveys associated with the proposed action involve shallow penetration of the seafloor and involve far less energy (and therefore, far less sound introduced into the environment) than deep-penetrating oil and gas-related surveys (USDOI, BOEM, 2012c).

As presented in Table 3-8, HRG surveys consist of boomer and compressed high intensity radar pulse (CHIRP) sub-bottom profilers, side-scan sonars, and multibeam depth sounders. Boomers are electromechanical sound sources that generate short, broadband acoustic pulses that are useful for high-resolution, shallow penetration sediment profiling. This system is commonly mounted on a sled and towed off the stern or alongside the ship. The reflected signal is received by a towed hydrophone streamer. CHIRP systems are used for high-resolution mapping of relatively shallow deposits and have less penetration than boomers. However, newer CHIRP systems are able to penetrate to levels comparable to the boomer yet yield extraordinary detail or resolution of the substrate. Multibeam depth sounders emit brief pings of medium- or high-frequency sound in a fan-shaped beam extending downward and to the sides of the ship, allowing bathymetric mapping of swaths of the seafloor. Single beam depth sounders also may be used for seafloor mapping, but the multibeam depth sounder is considered by BOEM as conservative from the standpoint of acoustic impacts (USDOI, BOEM, 2012c).

Table 3-8
Typical Equipment to be Utilized During an HRG Survey

Source	Broadband Source Level (dB re 1µPa at 1m)	Frequency	Within Hearing Range		
			Marine Mammals	Sea Turtles	Fishes
Medium-Penetration Sub-bottom Profiler (Boomer)	212	200 Hz-16k Hz	Yes	Yes	Yes
Side-Scan Sonar	226	100 kHz	Yes	No	No
		400 kHz	No	No	No
Shallow-Penetration Sub-bottom Profiler (CHIRP System)	222	3.5 kHz	Yes	No	No
		12 kHz	Yes	No	No
		200 kHz	No	No	No
Multibeam Depth Sounder	213	240 kHz	No	No	No

Source: USDOI, BOEM (2012c)

The spatial extent of the noise contribution for HRG surveys is proportional to the area covered by such surveys, and attenuation of noise away from the source vessel will be influenced by local weather (sea state) and geological attributes of the seafloor. The assumption that the digital dual-frequency side-scan sonar systems used for HRG surveys of seafloor surface conditions will be in the 100 to 900 kHz range indicates an increase in high frequency noise when compared to the assumed pre-existing soundscape. However, these frequencies are outside the hearing range of baleen whales (mysticetes) and at the upper limits of toothed whale (odontocete) hearing (see Table 3-6) (USDOI, BOEM, 2012b).

Sub-bottom profiling of the proposed site using CHIRP systems will introduce sound frequencies of 2 to 200 kHz at an estimated broadband source level of 222 dB re 1 µPa at 3 ft (1 m) from the source. Although the sound frequencies produced by CHIRP sampling systems are within the expected pre-existing soundscape, the sound pressure produced by these systems may exceed ambient levels. The attenuation of sound pressure from the source will vary depending on the CHIRP system used and sampling site conditions. When calculated using the short pulse duration (received level) of the source, the 180 dB radius for the CHIRP sub-bottom profiler is 85 to 115 ft (26 to 35 m) and the 160 dB radius is 787 to 2,260 ft (240 to 689 m) from the source (USDOI, BOEM, 2014). Medium penetration sub-bottom profiling using boomers (impulse type) is expected to produce sound frequencies in the range of 200 Hz to 16 kHz at an estimated broadband source level of 212 dB re 1 µPa RMS at 3 ft (1 m) (USDOI, BOEM, 2012b).

As indicated in Table 3-8, boomer and CHIRP sub-bottom profiler operating frequencies overlap with the hearing frequency ranges for all marine mammal hearing groups (Table 3-7), and are thus audible to all marine mammals (USDOI, BOEM, 2014). Side-scan sonar overlaps only with hearing frequencies for odontocetes, while frequency level for multibeam depth sounders is above the frequency hearing range for all marine mammals, and thus would not be audible (USDOI, BOEM, 2014). Peak source levels for each electromechanical source, the 180 dB radii

are estimated to be within the 656 ft (200 m) exclusion zone, and therefore no physical injuries are expected for marine mammals in the area (Table 3-9). The extended exclusion zone of 1,640 ft (500 m) for right whales includes the 160 dB isopleth for all electromechanical sources except potentially CHIRP and boomer sub-bottom profilers, which may exceed the 160 dB isopleth within the 1,640 ft (500 m) exclusion zone (Table 3-9). In the unlikely event that right whales are exposed to levels of 160 dB, the noise may cause behavioral changes or harassment, but are not expected to incur injury to the whales (USDOI, BOEM, 2012b).

Table 3-9
Summary of Radial Distances to the 160- and 180-dB (rms) Isopleths from a Single Pulse for Various Equipment

Equipment	Number of Scenarios Modeled	Pulse Duration	Adjustment (dB) for Short Pulse Duration[a]	180-dB Radius (m)		160-dB Radius (m)	
				Calculated using Nominal Source Levels[b]	Recalculated for Short Pulse Duration[a]	Calculated using Nominal Source Levels[b]	Recalculated for Short Pulse Duration[a]
Boomer	14	180 µs	-27.3	38-45	<5	1,054-2138	16
Side-Scan Sonar	14	20 ms	-7.0	128-192	65-96	500-655	337-450
CHIRP Sub-bottom Profiler	14	64 ms	-1.9	32-42	26-35	359-971	240-689
Multibeam Depth Sounder	7	225 µs	-26.5	27	<5	147-156	12

[a] For sources with a pulse duration <100 ms, the nominal source level was adjusted by the amount indicated to produce a second, "recalculated" radius for both the 180-dB and 160-dB criteria. See Appendix D of the Programmatic EIS (USDOI, MMS, 2007a).

[b] The value is the radius (Rmax) for the maximum received sound pressure level.

Source: USDOI, BOEM (2012c).

Geotechnical Exploration Acoustic Effects

The majority of geotechnical exploration work will be accomplished via cone penetration test (CPT), and to a more limited extent, vibracores, which do not require deep borehole drilling. However, some geologic conditions may prevent sufficient data from being acquired from vibracores and CPTs and instead necessitate obtaining a geologic profile via a borehole. Acoustic impacts from borehole drilling are expected to be below the 120 dB threshold established by NMFS for marine mammal harassment from a continuous noise source. Previous estimates submitted to BOEM for geotechnical drilling have source sound levels not exceeding 145 dB at a frequency of 120Hz. Previous submissions to BOEM also indicated that boring sound should attenuate to below 120 dB by the 150 m isopleth (USDOI, BOEM, 2012a). According to BOEM's standard operating conditions as outlined in Appendix A, there will be a 656 ft (200 m) exclusion zone for marine mammals during geotechnical survey activity that will further reduce the

probability of marine mammals encountering equipment or noise from the geotechnical drilling activity.

Vessel and Equipment Noise

Vessel noise is one of the main contributors to overall noise in the sea. The survey and site assessment vessels would contribute to the overall noise environment by transmitting noise through both air and water. Vessel noise is a combination of narrow-band (tonal) and broadband sound. Tones typically dominate up to about 50 Hz, whereas broadband sounds may extend to 100 kHz. The primary sources of vessel noise are propeller cavitation, propeller singing, and propulsion. Other sources include auxiliaries, flow noise from water dragging along the hull, and bubbles breaking in the wake. Propeller cavitation is usually the dominant noise source. The intensity of noise from service vessels is roughly related to ship size and speed. Large ships tend to be noisier than small ones, and ships underway with a full load (or towing or pushing a load) produce more noise than unladen vessels. For a given vessel, relative noise also tends to increase with increased speed. Broadband source levels for smaller boats (a category that would include survey vessels for renewable energy) are in the range of 150-170 dB re 1 μPa at 3 ft (1 m). Noise levels would attenuate quickly with distance from the source (USDOI, BOEM, 2012c).

The effects of noise produced by moving survey and site assessment vessels on marine mammals are difficult to assess because of the wide array of reports of their observed behavioral responses, both between and among species. Several species of small toothed cetaceans have been observed to avoid boats when they are approached to within 0.3-0.9 miles (0.5-1.5 km), with occasional reports of avoidance at greater distances. Reports of responses of cetacean species to moving power vessels are variable, both between species and temporally. A conservative assumption is that vessel noise may, in some cases, elicit behavioral changes in individual marine mammals that are in close proximity to these vessels. These behavioral changes may include evasive maneuvers such as diving or changes in swimming direction and/or speed, including attraction response in some species. Vessel and equipment noise is transitory and generally does not propagate at great distances from the vessel (USDOI, BOEM, 2012c).

Under the proposed action, all authorizations for shipboard surveys include guidance for maintaining safe distances between survey and site assessment vessels and protected species to minimize potential impacts from vessel and equipment noise and the avoidance of vessel collisions with these protected species. The guidance will follow the provisions in Joint BOEM-BSEE NTL 2012-G01 (Vessel Strike Avoidance and Injured/Dead Protected Species Reporting), which incorporates NMFS "Vessel Strike Avoidance Measures and Reporting for Mariners" addressing protected species identification, vessel strike avoidance, and injured/dead protected species reporting (USDOI, BOEM, BSEE, 2012). For the proposed activities, BOEM assumes this guidance will help avoid or minimize potential negative impacts to marine mammals from both the presence of vessels and the noise they produce (USDOI, BOEM, 2012c).

The type and intensity of the sounds produced by pile driving depend on a variety of factors, including the type and size of the pile, the firmness of the substrate into which the pile is driven, the depth of the water, and the type and size of the impact/vibratory hammer being used. Thus, the actual sounds produced vary from area to area (USDOI, BOEM, 2012a). Regardless, this section attempts to capture the range of acoustic impacts from pile driving.

Pile driving is expected to generate sound levels in excess of 200 dB and have a relatively broad band of 20 Hz to >20 kHz. BOEM (2014) reported sound attenuation modeling indicates that underwater noise levels may be greater than 160 dB re 1 µPa (i.e., NMFS threshold for behavioral disturbance/harassment from a non-continuous noise source) within approximately 2.1 miles (3.4 km) of the pile being driven. At distances greater than 2.1 miles (3.4 km) from the pile being driven, noise levels will have dissipated to below 160 dB re 1 µPa. Measurements for the modeling were for a 1.7 MW turbine mounted on a monopile of approximately 16.4 ft (5m) in diameter and not for a meteorological tower. Generally, the larger the diameter of the monopole, the greater the noise produced from pile driving. Actual measured underwater sound levels during the construction of the Cape Wind meteorological tower in 2003 were 145-167 dB at 1640 ft (500 m) with peak energy at around 500Hz (USDOI, BOEM, 2012a).

Pile driving also can be completed with a vibratory, rather than an impact hammer. Vibratory hammers use oscillatory hammers that vibrate the pile, causing the sediment surrounding the pile to liquefy and allow pile penetration. Peak sound pressure levels for vibratory hammers can exceed 180 dB; however, the sound from these hammers rises relatively slowly and the sound energy is spread out over time. As a result, sound levels are generally 10 to 20 dB lower than impact pile driving (Caltrans, 2009).

Almost all available literature on sound levels produced by vibratory hammers are modeled or measured in shallow water (6.6-49 ft or 2-15 m depth) usually in harbors and bays, using smaller diameter monopiles (U.S. Department of the Navy, Naval Facilities Engineering Command Southeast and Atlantic, 2013; Caltrans, 2009), compared to offshore installation sites in other South Atlantic Action Areas (approximately 46-328 ft or 14-100 m depth).

The noise levels produced by vibratory pile driving were modeled by the Navy in its request for incidental harassment authorization for the Wharf C-2 recapitalization project at Naval Station Mayport in Florida (U.S. Department of the Navy, Naval Facilities Engineering Command Southeast and Atlantic, 2013). The 180 dB re 1µPa isopleth was modeled at less than 3.3 ft (1m) and the 120 dB re 1µPa isopleth was modeled at 22, 966 ft (7,356 m).

As with impact pile driving, BOEM notes that differences in monopile diameters, pile types, and environmental characteristics can lead to different isopleths under different project conditions. While modeling done by the Navy indicates that the potential range of the ensonified area within the 120 dB re 1µPa SPL would be expected to be larger for vibratory pile driving than for impact pile driving (U.S. Department of the Navy, Naval Facilities Engineering Command Southeast and Atlantic, 2013), due to the lower source level of vibratory pile driving noise compared to impact pile driving noise, the potential range of the ensonified area within the 180 dB re 1 µPa SPL is expected to be much smaller for vibratory pile driving than for impact pile driving. Results from vibratory pile driving projects in the South China Sea, indicate that "in appropriate soils, using vibratory hammers can not only reduce the installation time and the costs, but moreover minimize the environmental impact during installation" (Middendrop, et al., 2012).

During meteorological tower construction, marine mammals in the vicinity of the construction site may temporarily be disturbed by noise generated during pile driving (4-8 hours over a few days to six weeks, depending on the type of foundation [monopole; jacket] and weather). Such noise could disturb normal behaviors (e.g., feeding, social interactions), mask calls from

conspecifics, disrupt echolocation capabilities, and mask sounds generated by predators. Behavioral effects may be incurred at ranges of many miles, and hearing impairment may occur at close range. Behavioral reactions may include avoidance of, or flight from, the sound source and its immediate surroundings, disruption of feeding behavior, interruption of vocal activity, and modification of vocal patterns. Depending on the frequency of the noise generated during construction of the meteorological towers, impacts to marine mammals may also include temporary hearing loss or auditory masking. The biological importance of hearing loss or behavioral responses to construction noise (e.g., effects on energetics, survival, reproduction, population status) is unknown, and there is little information regarding short-term or long-term effects of behavioral reactions on marine mammal populations (USDOI, BOEM, 2014).

The potential risk of injury from pile driving or temporary avoidance of foraging habitat depends on multiple factors, including the species and time of year. The time of year at which right whales will be at the highest risk of acoustic impacts from pile driving is primarily during the fall through spring. BOEM has implemented the most conservative protective measures for this highly endangered, ESA-listed species by prohibiting pile driving work from November 1 through April 30. Any protected species in the area during this period will also benefit from these protective measures.

The frequency range for pile driving overlaps the frequency hearing range for all odontocetes, and pile-driving noise will therefore be audible. However, the limited data on effects of multiple pulse noise such as pile driving on mid-frequency cetaceans indicate variable reactions between and within species (USDOI, BOEM, 2012b). Bailey, et al. (2010) as quoted in USDOI, BOEM (2012b) stated that bottlenose dolphins may exhibit behavioral reactions from impact pile driving at a SPL of 140 dB re 1 μPa equal to 31 mile (50 km) from the source.

Impact pile driving is capable of masking strong vocalizations by bottlenose dolphins within 6.2 to 9.3 miles (10 to 15 km), and weak vocalizations up to 25 miles (40 km) (Bailey, et al., 2010). In a study to determine physiological responses to similar exposures, Romano, et al. (2004) observed significant differences in aldosterone and monocyte counts in dolphins with exposures ranging from 213 to 226 dB re 1 μPa (peak-to-peak). Aldosterone is one of the primary stress hormones in cetaceans and may be a more sensitive indicator to stress than cortisol (USDOI, BOEM, 2012b). However, as previously stated, these acoustic impacts are considered to be temporary and minor since the exposed animals will not be exposed to any physically injurious sound.

Benthic Habitat Effects

Impacts on benthic habitats for marine mammals are considered to be negligible. Temporary disturbance to the benthic community occur during sub-bottom sampling and meteorological tower/buoy installation. These activities may cause an indirect loss of a minimal number of benthic prey organisms for the fish species that seals and some whale species prey on (e.g., herring, sand lance, and mackerel). Meteorological tower/buoy installation also causes re-suspension and subsequent increased turbidity, which is also expected to be temporary, and have negligible impact on marine mammals in the proposed area (USDOI, BOEM, 2012b).

Non-Routine Events

Vessel Collision Effects

Collisions with ships resulting in serious injury or death are not uncommon with cetaceans and are a significant threat to the recovery of the North Atlantic right whale. The highest risk for vessel strike for right whales is most likely during the transit to and from the proposed sites as a result of vessel speeds greater than 10 knots. The potential risk for ship strike during survey work is lower because vessel speeds range from 4 to 5 knots. Vessels transiting between the leasehold and shore at night may pose a potential strike risk to North Atlantic right whales. Right whales can be difficult to detect with their black coloration and absence of a dorsal fin, and are especially less observable at night.

The total number of vessel round trips estimated over five years for site characterization and site assessment is anticipated to be a maximum of 511, plus three round trips for sub-bottom sampling (See Section 2.1.1.7). This is a very small amount of traffic given the Port of Savannah saw over 8,000 port calls in 2011 alone (see Section 3.2.3). The Vessel Strike Avoidance Measures and Reporting for Mariners outlined in Appendix A of this report is expected to minimize the potential for ship strikes to all marine mammals. Alternative A includes the mitigation measures described in the SOCs (Appendix A) for transits and operations. Considering the slow vessel-operating speeds, vessels used for site surveys and site characterizations are unlikely to strike any marine mammals.

Spill Effects

As discussed in Section 2.1.2.3, the severity of an oil or fuel spill depends on the material, size, and location, as well as the current meteorological conditions. The average fuel spill size for project vessels is estimated at 114-240 gallons, which is relatively small, and would contribute a negligible potential for negative impacts on marine mammals. In the unlikely event of a vessel spill, the most likely material to be spilled would be diesel fuel, which is expected to dissipate fairly quickly.

Discharge of Waste Effects

All wastes generated during the project will be held onboard the vessels and discharged at an approved onshore disposal facility. No wastes will be discharged or disposed of overboard in state or federal waters off the Georgia coast during any phase of the proposed project.

Meteorological Tower Decommissioning Effects

Details regarding decommissioning of the meteorological towers are described in Section 2.1.1.6. The potential effects from decommissioning work include sound and operational discharges similar to those described during meteorological construction. Noise levels and vessel traffic rates are expected to be similar to meteorological tower construction, with the exception of pile driving. Piles and foundations would be removed using non-explosive methods such as mechanical cutting or high-pressure water jets at a depth of 15 ft (4.6 m) below the mudline. Noise levels associated with these methods have not been established in this region. A decommissioning

plan will be submitted to BOEM for approval prior to commencement of any decommissioning activities.

Conclusions

Based on the analysis above, marine mammals could experience potential effects from pile-driving, loss of water column habitat, prey abundance and distribution effects, and tower decommissioning. BOEM anticipates that effects from loss of water column habitat, prey abundance and distribution effects, and tower decommissioning will result in short-term behavioral changes, but these effects are anticipated to be negligible. However, it is anticipated that in-water noise generated from pile-driving of meteorolgical tower foundations (both impact and vibratory) will expose whales to noise up to levels equivalent to Level B harassment. For impact pile-driving, the exclusion zone at 180 dB re 1 µPa would be 3,281 ft (1,000 m); for vibratory pile driving, the exclusion zone will likely be smaller. Pile driving would be short-term (4-8 hours over a few days to six weeks, depending on the type of foundation [monopole; jacket] and weather), and measures to reduce noise exposure would include seasonal prohibition on pile driving, exclusion zones, and soft start pile driving. However, despite these measures, BOEM anticipates that marine mammals could still be exposed to noise levels where they may experience temporary adverse impacts. As these impacts would be temporary and non-injurious the conclusion is that the moderate impacts are not significant.

3.2.2.4 Sea Turtles

3.2.2.4.1 Description of the Affected Environment

There are five species of sea turtles that potentially occur in the proposed action area, all of which are listed as endangered or threatened under the ESA (Table 3-10). The five sea turtle species that may occur in the proposed lease area are: loggerhead turtle (*Caretta caretta*), green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), Kemp's ridley turtle (*Lepidochelys kempii*), and leatherback turtle (*Dermochelys coriacea*). The leatherback is the only member of the family Dermochelyidae; the other four turtles are members of the family Cheloniidae (USDOI, BOEM, 2012c).

Because sea turtles use terrestrial and marine environments at different life stages, USFWS and NMFS share jurisdiction over sea turtles under the ESA. The USFWS has jurisdiction over nesting beaches, and NMFS has jurisdiction in the marine environment (USDOI, BOEM, 2012c). The hawksbill, Kemp's ridley, and leatherback turtles are listed as endangered. The green turtle is listed as threatened, except for Florida's and Mexico's Pacific breeding colonies, which are endangered (USDOC, NMFS, 2013b). The Northwest Atlantic population of the loggerhead turtle is currently listed as threatened (USDOI, FWS, 2013a).

The five sea turtle species are highly migratory and occupy different habitat niches at various life stages. These five species are found from the offshore proposed lease area to the near-shore coral reef/seagrass habitat adjacent to the principal ports. Since 2009, the loggerhead, green, leatherback, and Kemp's ridley sea turtles have laid nests on beaches adjacent to the EA Area (Table 3-10) (Seaturtle.org, 2013).

Table 3-10
Sea Turtles with the Potential to Occur in Proposed Lease Area

Common Name	Scientific Name	Status	Occurrence in Area of Interest	Life Stage	U.S. Atlantic States with Nesting Reported
Loggerhead turtle	*Caretta caretta*	Threatened; NW Atlantic DPS	DE-FL	All	VA, NC, SC, GA, FL
Green turtle	*Chelonia mydas*	Endangered, Threatened	DE-FL	All	VA, NC, SC, GA, FL
Hawksbill turtle	*Eretmochelys imbricata*	Endangered	DE-FL	All	--
Kemp's ridley turtle	*Lepidochelys kempii*	Endangered	DE-FL	Juveniles and Adults	NC, SC, FL
Leatherback turtle	*Dermochelys coriacea*	Endangered	DE-FL	All	NC, SC, GA, FL

Source: USDOI, BOEM, 2012c.

USDOI, BOEM (2014) provides a detailed description of the distribution, population, conservation and management, and ecology and life history for all five species and are included by reference herein. This section of the EA provides a brief description of the sea turtles that have nested on beaches adjacent to the proposed site; the loggerhead, green, leatherback, and Kemp's ridley sea turtles.

Loggerhead Turtle (*Caretta caretta)*

The loggerhead is a circumglobal species that is found from tropical to temperate regions. They range through the Pacific, Indian, and Atlantic Oceans from Alaska, eastern Russia, Newfoundland, and Norway, south to Chile, Australia, and South Africa. In the Atlantic Ocean the loggerhead turtle is reported in Newfoundland, the Caribbean Sea, the Gulf of Mexico, and along the US east coast. Loggerhead turtles, like other sea turtles, are highly migratory, making various seasonal and annual migrations. Loggerhead turtles commonly make extended transoceanic journeys and then later return to specific nesting beaches (USDOI, BOEM, 2012c).

The southeast U.S. coast is among the most important areas in the world for loggerhead nesting. Loggerhead turtle nesting in the western North Atlantic is from April to September, with peak nesting occurring in June and July. The loggerhead is the sea turtle species most likely to occur in the proposed lease area and is expected to occur commonly. Based on nesting information, loggerhead turtle nests are primarily located in Florida (91 percent), South Carolina (6.5 percent), Georgia (1.5 percent), North Carolina (1 percent), and Virginia (<1 percent). Recovery units are based on genetic differences and a combination of the geographic distribution of nesting densities, geographic separation, and geopolitical boundaries. Recovery units are necessary to conserve genetic and demographic robustness, important life history stages, or some other feature essential to the recovery and long-term sustainability of the species. The Northern Recovery Unit (NRU) of the Northwest Atlantic Distinct Population Segment (DPS) stretches from Virginia to Northern

Florida and is the second largest subpopulation in the US; South Carolina represents about 65 percent of NRU nests (USDOI, BOEM, 2012c). After a crash from 1,649 nests in 2008 to 997 nests in 2009, loggerhead nesting in Georgia has increased to 2,218 in 2012 (GDNR, 2013d). During the nesting season from May - September 2013, there were 655 loggerhead turtle nests reported on beaches adjacent to the proposed lease area (Table 3-11) (Seaturtle.org, 2013).

Green Turtle (*Chelonia mydas*)

The green turtle is a circumglobal species that is found in the Mediterranean Sea and Pacific, Indian, and Atlantic Oceans. The green turtle can be found in tropical and subtropical waters between 30°N and 30°S latitude, and, to a lesser extent, in temperate waters. Similar to other sea turtles, satellite tagging data indicate that green turtles display highly migratory behavior, making vast seasonal and annual transoceanic migrations (USDOI, BOEM, 2012c).

Breeding populations in Florida and on the Pacific coast of Mexico are listed as endangered under the ESA, whereas the remaining populations are listed as threatened. Currently, there is no reliable green turtle population estimate, but inferences have been attempted using age-based survivability models and nesting data. Nesting data indicate that between 200 and 1,100 females nest annually on continental US beaches (USDOI, BOEM, 2012c).

In the Atlantic, there is a regionally significant nesting aggregation in Florida (the second largest colony in the western hemisphere). Green turtles also nest in small numbers in the US Virgin Islands, Puerto Rico, Georgia, South Carolina, and North Carolina. Table 3-10 provides the number of green sea turtle nests documented on beaches adjacent to the EA Area (Seaturtle.org, 2013). The BOEM South Atlantic and Straits of Florida Planning Areas are the primary BOEM areas with nesting green turtles.

Leatherback Turtle (*Dermochelys coriacea*)

The leatherback turtle is found worldwide in tropical to sub-polar oceans. Leatherbacks with a curved carapace length smaller than 3 ft (100 cm, i.e., juveniles) appear to be limited to regions warmer than 79°F, but adults have a broader thermal tolerance and forage from 71°N to 47°S. Though juveniles have been reported near the coastlines in some regions, the species is considered primarily pelagic (Waring, et al., 2012).

Leatherback turtles use the terrestrial zone for oviposition and embryonic development and may use shallower waters to feed and reproduce, especially during the nesting season. They are otherwise a pelagic species, inhabiting the open ocean from hatchling through adulthood. Leatherback nesting habitat consists primarily of high energy beaches with either a deep water oceanic or shallow water mud bank approach. The spatial patterns of leatherback nest distributions along the Florida coastline do not follow any particular pattern and are more random in occurrence (Waring, et al., 2012). Leatherback turtles in the western North Atlantic nest primarily in the Caribbean Sea.

Table 3-11
Sea Turtle Nest Counts for Beaches Adjacent to the Proposed Lease Area

	Loggerhead	Green	Leatherback	Kemp's ridley
2009				
Tybee Island	3	NR[1]	0	NR
Little Tybee Island	8	NR	0	NR
Williamson Island	0	NR	0	NR
Wassaw Island	91	NR	0	NR
Ossabaw Island	104	NR	0	NR
2010				
Tybee Island	10	0	0	NR
Little Tybee Island	16	0	0	NR
Williamson Island	0	0	0	NR
Wassaw Island	160	1	0	NR
Ossabaw Island	216	0	1	NR
2011				
Tybee Island	9	0	0	NR
Little Tybee Island	16	0	0	NR
Williamson Island	0	0	0	NR
Wassaw Island	165	0	0	NR
Ossabaw Island	450	0	3	NR
2012				
Tybee Island	23	0	0	0
Little Tybee Island	15	0	0	0
Williamson Island	0	0	0	0
Wassaw Island	138	0	0	0
Ossabaw Island	225	0	0	1
2013				
Tybee Island	21	0	NR	NR
Little Tybee Island	20	0	NR	NR
Williamson Island	1	0	NR	NR
Wassaw Island	250	0	NR	NR
Ossabaw Island	363	0	NR	NR

NR[1] =. Not reported on Species Beach Report.

Source: Seaturtle.org (2013)

Kemp's Ridley Turtle (*Lepidochelys kempii*)

Kemp's ridley seat turtles are distributed along the coastlines of the Gulf of Mexico and the northwestern Atlantic Ocean, as far north as the Grand Banks and Nova Scotia. Adults are only occasionally found in the Atlantic. Their preferred habitat in the Gulf of Mexico is thought to be nearshore waters of 120 ft (37 m) or less (Waring, et al., 2012). The Kemp's ridley is occasionally sighted along the east coast from Florida to New England. Similar to other sea turtles, Kemp's ridley sea turtles display some seasonal and coastal migratory behavior (USDOI, BOEM, 2012c).

Kemp's ridley sea turtles use different habitats during different life stages. Terrestrial zones are used during oviposition and embryonic development. Hatchlings swim from the beach to the boundary current and remain in the oceanic currents for the first two years of their lives. Some of the juveniles remain in the Gulf of Mexico and others are brought into the Atlantic on the Gulf Stream. The young turtles move into the nearshore waters of the Gulf of Mexico or the Atlantic coast from Florida to New England and spend the warmer months in shallow foraging areas along the Atlantic coast (Waring, et al., 2012). Along the US Atlantic coast, isolated nesting events have been reported in Florida, Georgia, and North and South Carolina. These areas fall mostly within the BOEM South Atlantic and Straits of Florida Planning Areas (Waring, et al., 2012).

3.2.2.4.2 Impact Analysis of the Proposed Action

The activities associated with the proposed action that may affect the marine environment include: (1) site characterization surveys; (2) site assessment activities; (3) vessel traffic; (4) discharges of waste materials and accidental fuel releases; and (5) meteorological observation platform decommissioning. The potential effects from these activities can be grouped into the following categories: (1) acoustic effects; (2) benthic habitat effects; (3) vessel collision effects; and (4) other effects (e.g., contact with waterborne pollution) (USDOI, BOEM, 2012c). This section was drawn from similar activities described in BOEM's documents *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia Final Environmental Assessment* (USDOI, BOEM, 2012a) and *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Environmental Assessment* (USDOI, BOEM, 2012b).

Routine Activities

Acoustic Effects

USDOI, BOEM (2012b) cited studies that indicate that sea turtle hearing is confined to low frequencies, below 1,000 Hz, with the range of highest sensitivity between 200 and 700 Hz, and a possible upper hearing limit of 1,600 Hz. Sea turtle hearing sensitivity is relatively low, with a hearing threshold of approximately 160 to 200 dB. Current data for hearing range frequencies by species is summarized in Table 3-12. Studies of behavioral reactions have elicited startle response from sea turtles at frequencies between 200 and 700 Hz. The proposed activities that have potential acoustic impacts for sea turtles are medium-depth sub-bottom profilers, pile driving, and vessel noise, which overlap with sea turtles' hearing frequency range (USDOI, BOEM, 2012b).

Table 3-12
Hearing Ranges for Sea Turtles

Sea Turtle Species		Sound Production Frequency Range (Hertz)	Hearing Range (Hertz)	Most Sensitive Hearing Range (Hertz)
Common Name	**Scientific Name**			
Loggerhead	*Caretta caretta*	NA	100-1,000	250
Green	*Chelonia mydas*	NA	100-800; 50-1,600	200-400 subadult; 600-700 juvenile
Hawksbill	*Eretmochelys imbricata*	NA	NA	NA
Kemp's ridley	*Lepidochelys kempii*	NA	100-500	100-200
Leatherback	*Dermochelys coriacea*	300-4,000	500-1200 hatchlings[1]	100-400 hatchlings[1]

Source: USDOI, BOEM (2012b)

[1] Source: Dow Piniak W.E., et. al. (2012)

Current Noise Criteria for Behavioral Disturbance and Potential Injury

Currently, there are no hearing criteria for sea turtles. NMFS, during its Section 7 ESA consultations, typically applies the criteria for marine mammals to evaluate the potential for similar impacts. The current NMFS criteria for potential injury to cetaceans is a received SPL of 180 dB re 1 μPa and 160 dB re 1 μPa for potential behavioral disturbances. USDOI, BOEM (2012b) stated the USGS used a 166 dB threshold in its assessment of survey activities, since McCauley, et al. (2000) reported that source levels of 166 dB re 1 μPa were required to evoke behavioral responses to airgun pulses in captive sea turtles.

As the hearing frequencies of sea turtles fall within the frequencies produced by construction and survey activities, these animals may be affected by exposure.

HRG Survey Acoustic Effects

The HRG surveys of renewable energy sites use only electromechanical sources such as side-scan sonar, boomer and CHIRP sub-bottom profilers, and multibeam depth sounders. The effects from these sources on sea turtles are expected to range from no effect to negligible, based on the audibility of the source to sea turtles (which may be a function of distance). Sea turtles are unlikely to hear the electromechanical sources except perhaps the boomer, which has an operating frequency range of 200 Hz to 16 kHz, at very close range. However, the boomer has a very short pulse length (180 μs) with a radius of less than 16 ft (5 m) for the 180 dB isopleth, and 52 ft (16 m) for the 160 dB isopleth. The SOC included in Appendix A recommends a separation distance of 656 ft (200 m) for sea turtles, and the confirmation of no sea turtles within the 656 ft (200 m) exclusion zone 60 minutes prior to startup. Therefore, impacts from HRG surveys using boomer sub-bottom profilers on sea turtles are expected to range from negligible to minor, based on the distance of the individual sea turtle from the sound pulse (USDOI, BOEM, 2012b).

Geotechnical Exploration Acoustic Effects

Acoustic impacts from borehole drilling are expected to be below 120 dB. Previous estimates submitted to BOEM for geotechnical drilling have source sound levels not exceeding 145 dB at a frequency of 120 Hz. Previous submissions to BOEM also indicated that boring sound should attenuate to below 120 dB by the 492 ft (150 m) isopleth. Therefore, sea turtles are expected to be able to sense the sound, but the impacts are anticipated to be negligible due to short duration, low sound levels, and the ability of the turtles to leave the immediate area of the activity (USDOI, BOEM, 2012a).

Vessel and Equipment Noise

Potential acoustic impacts from vessel noise during site assessment and characterization activities would consist of vessel noise produced during vessel transit to and from the port, as well as the vessel noise produced during the HRG surveys, sub-bottom sampling, and construction, maintenance, and decommissioning of the meteorological tower. Vessels for this project will travel through a port in which heavy vessel traffic already exists. Given the negligible increase to the existing vessel traffic, the estimated 511 vessel round trips (See Section 2.1.1.7) would cause a negligible increase to the acoustic environment.

The frequency range for vessel noise overlaps with the known hearing range of sea turtles and would therefore be audible. USDOI, BOEM (2012b) reported that the ability of sea turtles to detect approaching vessels is vision-dependent, not acoustic. Sea turtles may respond to vessel approach and/or noise with a startle response and a temporary stress response. The potential effects of vessel traffic noise from site characterization and assessment work on sea turtles are expected to be short-term and negligible. In addition, the SOCs require a 656 ft (200 m) separation distance for sea turtles for project-related vessels (see Appendix A) (USDOI, BOEM, 2012b).

The type and intensity of the sounds produced by pile driving depend on the type and size of the pile, the firmness of the substrate into which the pile is driven, the depth of the water, and the type and size of the impact/vibratory hammer being used. Thus, the actual sounds produced would vary project by project. Section 3.2.2.3.2 fully describes the range of pile driving sound and is thus not repeated here.

Avoidance behavior may shorten the exposure period; however, the avoidance behavior could potentially disrupt normal behaviors. A reaction of individual sea turtles to the pile driving is expected to be limited to an avoidance response. Only pile driving occurring during the Alternative A allowable time period, May to October, has the potential to affect sea turtles (USDOI, BOEM, 2012b).

As stated above, sea turtles that experience behavioral impacts will be expected to resume their behavior after the pile driving has stopped. Since pile driving occurs for approximately four to eight hours a day, sea turtles will likely avoid the area with disturbing levels of sound for at least this period each day that pile driving occurs. Available information indicates that sea turtle forage items are available throughout the action area; therefore, while sea turtles may move to other areas within the action area to forage during the times when pile driving is occurring, the ability of individual sea turtles to find suitable forage is not expected to be impacted. Likewise, if sea turtles were resting in a particular area, they are expected to be able to find an alternate resting area nearby (USDOI, BOEM, 2012a).

Additionally, if sea turtles are migrating through an area where activities associated with Alternative A are taking place, they may avoid the area with disturbing levels of sound and choose an alternate route. As such, while the movements of individual sea turtles will be affected by the sound associated with the pile driving, these effects would be temporary and localized. It is expected that there would be only a negligible impact on foraging, migrating or resting sea turtles that would not result in injury or impairment in an individual's ability to complete essential behavioral functions. Major shifts in habitat use, distribution, or foraging success are not expected (USDOI, BOEM, 2012a) and any effects are anticipated to be negligible.

During impact pile driving, sound levels are anticipated to dissipate to below harassing levels of sound (approximately 160 dB) at a distance of approximately 4 miles (7 km). Sea turtles within 3,281 ft (1000 m) could be exposed to potentially injurious levels of sound. Pile driving activity will be temporary (4-8 hours over a few days to 6 weeks, depending on the type of foundation [monopole; jacket] and weather). It is anticipated that if sea turtles exhibit avoidance behaviors, these changes to the movements of individuals are expected to be minor and short-term, not likely to have population-level effects, and are, therefore, negligible. Management measures such as the soft start, 60 minute clearance period, and the exclusion zone during pile driving will all further reduce the likelihood of impacts to sea turtles.

BOEM does not discourage the use of vibratory hammers as their use would reduce exposure to the higher sound pressure levels associated with impact hammers. Although no measurements of wind turbine pile installation using a vibratory hammer are currently available, other measurements suggest this technique reduces installation time and is quieter than impact piling (Middendorp, et al., 2012; Nedwell, et al., 2004). Other noise mitigation measures for pile driving, primarily cofferdams, bubble curtains and foam sleeves have also been shown to be effective. However, the feasibility of requiring these technologies in the offshore environment needs further exploration and may be appropriate on a case-by-case basis for full commercial-scale construction projects where the total duration of pile driving activities would be greater than that for a single meteorological tower (USDOI, BOEM, 2012a).

Benthic Habitat Effects

The proposed activities known to disturb the sea floor bottom and near-bottom, such as sediment sampling, pile driving, and buoy anchoring, may indirectly affect sea turtle habitat and associated prey. Sub-bottom sampling would result in a temporary loss of benthic or near-benthic organisms, including potential prey species for sea turtles as a result of anchor placement and removal of the core sample. However the area is extremely small (less than 1 ft [0.3 m] diameter), and potential loss of habitat area would be negligible (USDOI, BOEM, 2012b).

Potential effects during meteorological tower/buoy installation and operation include the loss of bottom area from each meteorological foundation (less than 2,000 sq ft [189 sq m]) and/or the buoy anchor (6 sq ft [0.5 sq m]) and chain drag 370,000 sq ft (8.5 acres; 3.4 hectares). During foundation and anchor installation, re-suspension of sediment resulting in temporary and localized increased turbidity is expected. The meteorological tower foundation would add an area of vertical, hard substrate to a soft bottom habitat. The surface area of the artificial substrate would be too small to change the diversity or structure of the existing benthic community dramatically (USDOI, BOEM, 2012b).

Non-Routine Events

Vessel Collision Effects

Propeller and collision injuries from boats and ships are common in sea turtles. Vessel strike data from 1997 to 2005 for loggerhead sea turtles indicates that 14.9 percent of all stranded loggerheads in the US Atlantic and Gulf of Mexico had evidence of some type of propeller or collision injuries, although the proportion of these injuries that were post- or ante-mortem is unknown. The incidence of propeller wounds in the US Atlantic and Gulf of Mexico rose from approximately 10 percent in the late 1980s to a record high of 20.5 percent in 2004 (USDOI, BOEM, 2012b).

Sea turtles are likely to be most susceptible to vessel collision in coastal waters, where they are known to forage. The increase of up to 511 vessel round trips in the region is not likely to increase the relative risk of vessel strike for sea turtles, as the Port of Savannah sees over 4,000 port calls per year (see Section 3.2.3). The Vessel Strike Avoidance Measures outlined in Appendix A are designed to further minimize the potential for vessel strikes for sea turtles by proposed action vessel traffic. However, protected species observers can only see turtles when they surface. Thus, any effects are anticipated to be negligible to minor.

Spills

As discussed in Section 2.1.2.3, the severity of an oil or fuel spill depends on the material, size, and location, as well as the current meteorological conditions. The average fuel spill size for vessels during site characterization and assessment is estimated as 114 gallons, which is relatively small, and would contribute a negligible potential for negative impacts on sea turtles. In the unlikely event of a vessel spill, the most likely material to be spilled would be diesel fuel. If a sea turtle surfaced within the spill, there is a potential for ingestion. However, the overall potential risk for spills to occur, and subsequently impact sea turtles, is extremely small.

Discharge of Waste Effects

All wastes generated during the project will be held on board the vessels and discharged at an approved onshore disposal facility. No wastes will be discharged or disposed of overboard in state or federal waters off the Georgia coast during any phase of the proposed project.

Conclusion

Based on the analysis above, sea turtles could experience potential effects from pile driving, loss of water column habitat, changes in prey abundance and distribution, and tower decommissioning. BOEM anticipates that effects from loss of water column habitat, prey abundance and distribution effects, and tower decommissioning will result in temporary behavioral changes, but these effects are anticipated to be negligible. However, pile driving noise could be detectable by sea turtles at low frequencies; if sea turtles were to be in close enough proximity to the sound source, the potential for injury could exist. It is highly unlikely that this will happen due to the required standard operating conditions which include a 3,281 ft (1,000 m) exclusion zone and 60-minute all clear period for pile driving, and the short-term nature of the pile driving activities (4-8 hours over a few days to 6 weeks, depending on the type of foundation [monopole;

jacket] and weather). However, given the larger area of ensonification that results from pile driving and the known occurrences of sea turtles throughout the project area, it can be reasonably assumed that some sea turtles may be exposed to disturbing/harassing levels of noise beyond the 3,281 ft (1,000 m) exclusion zone. As a result, BOEM concludes that the proposed activity could result in temporary adverse effects to sea turtles during pile driving. This is considered a moderate, non-significant, impact because it is temporary in nature and does not result in any permanent impact to sea turtles.

3.2.2.5 Avian Resources

3.2.2.5.1 Description of the Affected Environment

Endangered Species Act Threatened and Endangered Birds

There are six bird species potentially occurring within the proposed lease area that are of federal concern (Table 3-13). Three bird species are federally-listed as endangered: Bermuda petrel (*Pterodroma cahow)*, roseate tern (*Sterna Dougalli)*, and Kirtland's warbler (*Setophaga kirtlandii*). Three species that are listed as threatened or under review for listing are the piping plover (*Charadrius melodus)*, the red knot (*Calidris canutus rufa)*, and the Black-capped petrel (*Pterodroma hasitata)*. Of these, the piping plover and red knot have confirmed sightings in Tybee Island NWR and other Georgia Important Bird Areas, such as defined by the National Audubon Society.

Table 3-13
Federally Protected Bird Species Found Along the Georgia Coastline

Common Name	Scientific Name	Status
Bermuda petrel	*Pterodroma cahow*	Endangered (Federal)
Black-capped petrel	*Pterodroma hasitata*	Under status review (Federal)
Kirtland's warbler	*Setophaga kirtlandii*	Endangered (Federal)
Piping plover	*Charadrius melodus*	Threatened (Federal)
Red knot	*Calidris canutus rufa*	Candidate (Federal)
Roseate tern	*Sterna Dougalli*	Endangered (Federal)

Source: USDOI, FWS (2013); GDNR, WRD (2010)

The Bermuda petrel breeds on the rocky islets of Castle Harbor, Bermuda. It is a highly pelagic species and feeds by capturing prey near-surface. The Bermuda petrel migrates to the North Atlantic along the western Gulf Stream. The proposed lease area is along this migratory path so, though rare, the Bermuda petrel could occur offshore Georgia (USDOI, BOEM, 2012b).

The black-capped petrel is currently under status review by the USFWS to determine whether the species warrants protection under the ESA. The species lives at sea when it is not breeding and typically nests in colonies on islands. Their range extends from North Carolina Gulf Stream waters to waters off of northeastern Brazil (USDOI, BOEM, 2012c).

The Kirtland's warbler is a federally-listed endangered species that migrates through the southeastern U.S. with a path that carries them over coastal areas of Georgia. Recorded observations from coastal areas of the South Atlantic states provide evidence that the proposed lease area would be in the path of the Kirtland's warbler's migration route (USDOI, FWS, 2013d).

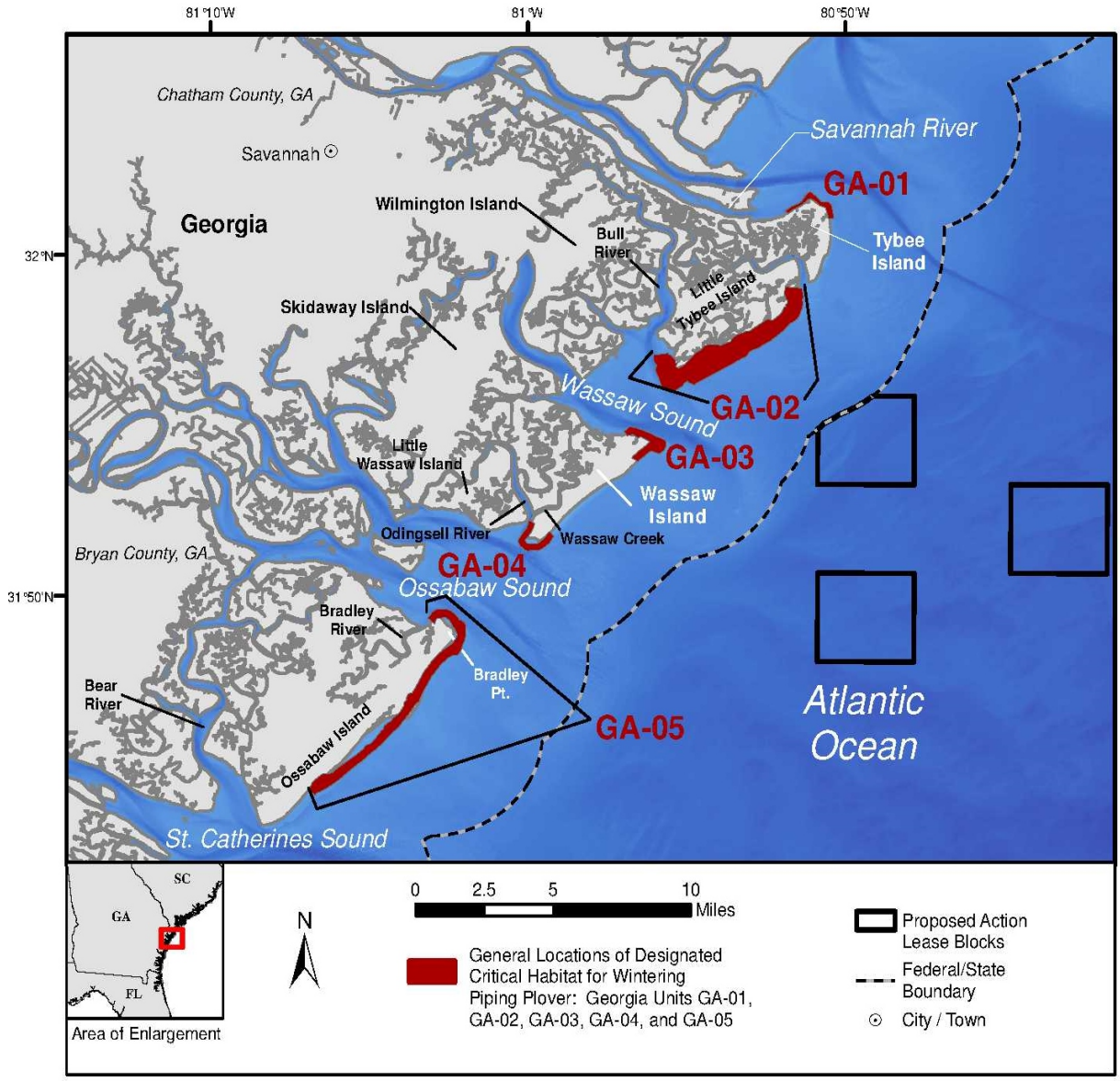
The piping plover is federally-listed as threatened and may potentially occur in the proposed lease area. Piping plovers from breeding populations of the Great Lakes area, Atlantic coast, and Northern Great Plains all winter along the South Atlantic, Gulf coast, and Caribbean beaches and barrier islands, primarily on intertidal beaches with sand and/or mud flats with no, or very sparse, vegetation. Availability of quality foraging and roosting habitat in the wintering grounds is necessary in order to ensure that an adequate number of adults survive to migrate back to breeding sites (USDOI, FWS, 2007). The piping plover has several critical wintering habitats along the coast of Georgia (Figure 3-4). The critical wintering habitats closest to the proposed lease area are located on Little Tybee Island and Tybee Island (USDOI, FWS, 2013e).

The USFWS proposed listing the *rufa* subspecies of the red knot (*Calidris canutus rufa*) as a threatened species in 2006 (78 FR 60024, September 30, 2013). During the red knot's long migration they stop along the southeastern U.S. coast to forage along sandy beaches, tidal mudflats, salt marshes, and peat banks. Red knots have been sighted along Georgia beaches, close to the proposed lease area (USDOI, BOEM, 2012c).

The roseate tern was listed as endangered in 1987 and populations are found in the northeastern US, Florida, Georgia, North Carolina, Puerto Rico, South Carolina and the Virgin Islands (USDOI, FWS, 2013c).

Bald and Golden Eagles

The Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. 668-668d) prohibits the take and trade of bald and golden eagles. Take is defined by the Act as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." After a period of no known nesting activity in Georgia, nests were discovered in 1978 and 1981 on Georgia's coast. Bald eagle populations have been gradually increasing since the discovery of the nests. Bald eagles were removed from the Federal threatened and endangered list but are still listed as threatened under Georgia's Endangered Wildlife Act (GDNR, 2013e). The coastal region of Georgia has the greatest density of nesting eagles and bald eagles have been sighted nesting on Little Tybee Island. Golden eagles are found further inland and are not expected to be affected by Alternative A.



Source: USDOI, FWS, 2013e.

Figure 3-4. Critical Habitat for the Piping Plover.

Migratory Birds

The Atlantic Flyway, which includes the Georgia coast, is a migratory route for many bird species. Depending on the species and migration period, some species may fly at higher altitudes and others may fly at lower altitudes and rest on the surface of the water. Neo-tropical migrants that fly at high altitudes usually fly at night during spring and fall migration times. Some species may migrate or wander through the area or follow boats. The Migratory Bird Treaty Act (MBTA) of 1918 protects over 800 birds. It is illegal for any "person" to "take" migratory birds, their eggs,

feathers, or nests under the MBTA. Take is "construed to mean pursue, hunt, shoot, capture, collect, kill" or any attempt to do so by any "person" to mean "any individual, firm, corporation, association, partnership, club, or private body, anyone at all, as the context requires." Departments and agencies are directed to take certain actions to implement the MBTA under Executive Order (EO) 13186. BOEM and USFWS entered into a Memorandum of Understanding which outlined the specific areas in which cooperation between the two agencies would contribute to the conservation of migratory birds and their habitats (USDOI, FWS, MMS, 2009). One important part of the document is to "evaluate potential impacts to migratory birds and design or implement measures to avoid, minimize, and mitigate such impacts as appropriate (MOU Sections C, D, E(1), F(1-3, 5), G(6))" (USDOI, BOEM, 2012e).

3.2.2.5.2 Impact Analysis of the Proposed Action

Routine Effects

Vessel Traffic

Since the lease will require the lessee to conduct all activities in the lease area in accordance with all applicable laws, rules and regulations, BOEM assumes the applicant will comply with all USCG lighting requirements. At night or during periods of inclement weather that reduce visibility, it is possible that birds in transit may be attracted to the vessel lights, and in some cases, collide with vessels (USDOI, BOEM, 2012e). The potential impacts from lighting on site characterization and assessment vessels in the affected environment on birds are expected to be negligible.

Meteorological Tower

Some birds (i.e., gulls, terns, shorebirds, petrels, shearwaters, sea ducks, and alcids) may collide with the meteorological towers out in the open ocean and be injured or killed (USDOI, BOEM, 2012b). BOEM anticipates that the meteorological tower contemplated in this EA will be self-supported structures and not require guy wires for support and stability (See Section 2.1.1.3.1). Because only one meteorological tower is proposed, its relatively short height and distance from shore, impacts on bird populations from collisions, should any occur, will be negligible. Under good weather conditions, most migratory bird species in the vicinity of the proposed lease areas (at least 3 NM [5.6 km] from shore) will be flying at an altitude higher than the anticipated meteorological towers. However, individuals of some species (e.g., sea ducks, cormorants, loons, shearwaters, petrels, alcids, gannets) may fly lower (USDOI, BOEM, 2012b).

Given the small number of anticipated structures scattered over the proposed lease area (one tower and multiple buoys) at distances greater than 3 NM (5.6 km) from the coast, the proposed action is not expected to significantly affect birds. Terns may perch on tower equipment, including handrails and equipment sheds. Lattice-type masts with numerous diagonal and horizontal bars are more likely to provide perching opportunities than monopole masts (Section 2.1.1.3.1). Perching does not pose a threat to the birds and may even be beneficial by providing roosting, loafing, and feeding locations for certain species (USDOI, BOEM, 2012b).

Under poor visibility conditions (fog and rain), migrating birds become disoriented and circle lighted communication towers instead of continuing on their migratory path, greatly increasing

their risk of collision (Huppop et al. 2006). Meteorological tower lighting will have the greatest impact on bird species during evening hours when nocturnal migration occurs. However, red flashing lights are commonly used at land-based wind facilities without any observed increase in avian mortality compared with unlit turbine towers (Kerlinger et al. 2010). Thus, red flashing lights will be used at the meteorological towers to reduce the risk of bird collisions. Though there is the potential for the lighting of the meteorological towers to affect the collision probability of the piping plover, roseate tern, and red knot during migration, the anticipated small number of towers that will be present will greatly decrease the likelihood of these species being in proximity of a tower. BOEM also anticipates that any additional lights (e.g., work lights) on towers and support vessels will be used only when necessary and be hooded downward and directed when possible to reduce upward illumination and illumination of adjacent waters. Lastly, given the small number of structures contemplated and their distance from shore, migratory birds (including pelagic birds) colliding with meteorological towers is possible, but collisions will be rare, thus the impacts will be minor (USDOI, BOEM, 2012a). The potential impacts from the meteorological tower in the affected environment on birds are expected to be negligible to minor.

Buoys

Migratory birds may investigate buoys, but because buoys are typically located on the water's surface and migratory passerines are high above the water during the spring and fall migration, migratory birds may hardly encounter the buoys. Other migratory bird types, including coastal shore birds and non-ESA listed birds will not likely encounter buoys due to the proximity of these birds to shore. Additionally, the number of bird species decreases with distance from shore. Approximately 160 bird species fly through the Atlantic flyway and a total of 55 species use offshore (3-12 miles [5-20 km]) and pelagic environments, while the remaining 105 species use bays, coastlines, and near shore environments (USDOI, BOEM, 2012e).

Birds will not likely be affected by buoys during the day because birds are likely to see the buoy and avoid collision. In addition, the potential impacts from lighting on buoys and in the affected environment on birds are expected to be negligible (USDOI, BOEM, 2012e).

Buoys and vessels may provide perching opportunities for diving birds including cormorants and non-diving species like gulls. However, these perching opportunities pose no threat to the birds, and thus the potential impacts of buoys on birds are expected to be negligible (USDOI, BOEM, 2012e).

Vessel and Equipment Noise

Potential acoustic impacts from vessel noise during site assessment and characterization activities would consist of vessel noise produced during vessel transit to and from the port, as well as the vessel noise produced during the HRG surveys, sub-bottom sampling, and construction, maintenance, and decommissioning of the meteorological tower. Among these potential impacts, pile driving impacts are likely to be the most serious. Sound levels of impact pile driving are expected to fall below 160 dB approximately 4 miles (7 km) from the installation site. BOEM anticipates avoidance behavior of avian species and their high degree of mobility to reduce potential acoustic impacts to a negligible level.

Non-Routine Effects

Trash and Debris

Marine and coastal birds could be exposed to operational discharges or accidental releases of solid debris. Many species of birds (such as gulls) often follow ships and forage in their wake on fish and other prey injured or disoriented by the passing vessel. In doing so, these birds may be affected by discharges of waste fluids (such as bilge water) generated by the vessels. Sanitary and domestic wastes will be processed through on-site waste treatment facilities before being discharged overboard. Deck drainage also will be processed prior to discharge. Thus, potential impacts to marine and coastal birds from waste discharges from vessels are expected to be negligible (USDOI, BOEM, 2012e).

Entanglement in trash and debris may result in strangulation, the injury or loss of limbs, entrapment, or the prevention or hindrance of the ability to fly or swim, and all of these effects may be considered lethal. Ingestion of debris may irritate, block, or perforate the digestive tract, suppress appetite, impair digestion of food, reduce growth, or release toxic chemicals (USDOI, BOEM, 2012e).

The discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by the USCG (MARPOL, Annex V, and Public Law 100–220 (101 Stat. 1458)). Thus, entanglement in or ingestion of OCS-related trash and debris by marine and coastal birds is not expected, and potential impacts to marine and coastal birds associated with accidental project debris, if any, will be negligible. Because of the limited amount of vessel traffic associated with the placement of two buoys and/or one meteorological tower, the release of wastes, debris, hazardous materials, or fuels would occur infrequently and cease entirely following completion of the activity (USDOI, BOEM, 2012e).

All wastes generated during the project will be held onboard the vessels and discharged at an approved onshore disposal facility. No wastes will be discharged or disposed of overboard in state or federal waters off the Georgia coast during any phase of the proposed project.

Accidental Fuel Spills

Accidental fuel spills could occur very rarely. The fuel would disperse rapidly in the open ocean resulting in a negligible effect on avian species.

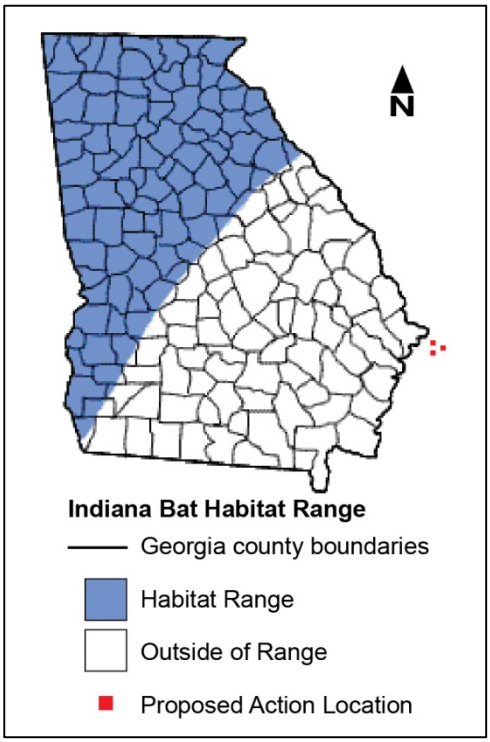
Conclusion

Although ESA-listed and migratory birds could be affected by vessel discharges, the presence of a meteorological tower and buoys, and accidental fuel releases, these potential impact-causing factors pose no threat of significant impacts on these animals. The risk of collision with a tower would be minor given the single meteorological tower proposed, its size, and its distance from shore. The impact of meteorological buoys on ESA-listed and non-ESA-listed migratory birds (including pelagic species) is expected to be negligible because buoys are much smaller and closer to the water surface than a tower, and would be dispersed over a wide area.

3.2.2.6 Bats

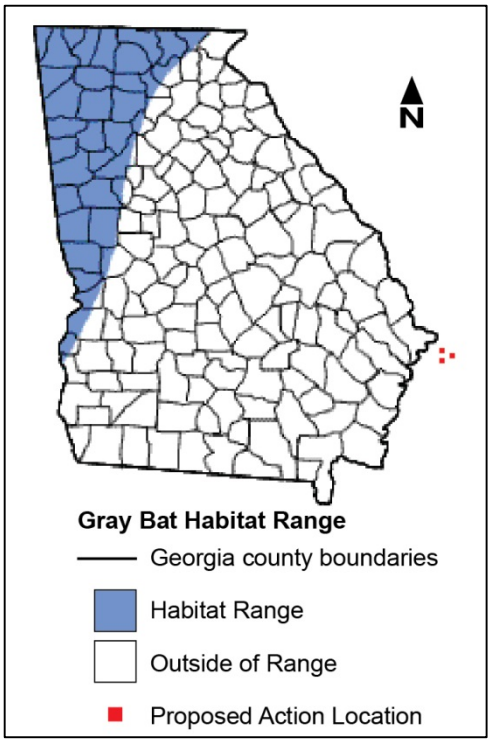
3.2.2.6.1 Description of the Affected Environment

Of the seven endangered species of bats in the US, three species may occur in the state of Georgia; the Indiana bat (*Myotis sodalist)*, the gray bat (*Myotis grisescens)*, and the Virginia big-eared bat (*Corynorhinus townsendii virginianus*). The habitat ranges for two of these species are located significantly inland from the Georgia coast (Figures 3-5 and 3-6). Indiana bats have long lived in the forests and caves of the Northeast and Southeast but primarily in the Midwest. The gray bat occupies a limited geographic range in limestone karst areas (landscape characterized by limestone caves and sinkholes) of the southeastern US and within Georgia along the northwest boundary. The endangered Virginia big-eared bat has not been sighted in Georgia, is non-migratory, and inhabits caves year-round. None of these bats are located in offshore areas and are not expected to be in the proposed lease area (USDOI, FWS, 2004; USDOI, FWS, 1997; USDOI, FWS, 2011b).



Source: The University of Georgia, 2010

Figure 3-5. Indiana Bat Habitat Range.



Source: The University of Georgia, 2010

Figure 3-6. Gray Bat Habitat Range.

There are limited data on bat migration patterns offshore Georgia, but several species migrate over long-distances along the Atlantic coast. Species with migratory paths along the Mid-Atlantic coast include the Eastern red bat (*Lasiurus borealis*), the hoary bat (*L. cinereus*), and the silver-haired bat (*Laserionycteris noctivagans*) (Kunz, et al., 2007). These species are not ESA-listed.

3.2.2.6.2 Impact Analysis of the Proposed Action

Routine Activities

Bats are expected to be present in the proposed lease area only rarely. Thus, impacts on bats are not expected during construction/installation, operation and maintenance, or decommissioning.

Impacts on these species associated with tower construction noise, if any, will be short-term and temporary. It would take one to two days to install each of the eight meteorological buoys within the proposed lease area. Noise has been shown to reduce bat foraging efficiency (Siemers and Schaub 2011). However, bats occurring in the proposed lease areas are expected to be migratory and not foraging. Noise effects could include avoidance or attraction responses to structures, but such effects would be difficult to distinguish from similar effects resulting from lighting or the visual presence of the structures. Unlike the large-scale wind turbines used at commercial wind facilities, the wind turbines that may be used for charging batteries on the meteorological towers and buoys are small (blade diameter $\leq$ 2 meters) and are not expected to impact bats, if present, more than 10 NM from shore.

Migrating bats could collide with the meteorological towers and buoys, possibly resulting in injury or mortality. Bats migrating through the proposed lease area are expected to be at low risk for encountering meteorological towers or buoys because of the low number, density, and small footprints of the anticipated structures. There are no expected additive effects on bats from construction/installation of all meteorological towers and buoys. In addition to collecting meteorological and oceanographic data, the meteorological towers and buoys will provide platforms that will assist in conducting biological studies, including monitoring for the presence of bats.

Non-Routine Effects

No federally-listed threatened or endangered bat species are expected to occur within the proposed lease area. It is rare but possible that migrating bats may be driven to OCS waters by a storm and subsequently into a tower. However, the land-based roosting, breeding, and foraging behavior of bats, as well as their echolocation sensory systems, suggest that the risk of being blown so far out of their habitat range, and the unlikelihood that a bat so blown off course could return from the open oceans if it did not strike a tower, makes the expected likelihood of any impact due to the presence of the tower or buoys negligible.

Conclusion

While it is rare that bats would be foraging or migrating through the proposed area, individual bats may, on occasion, be driven to the project area by prevailing winds and weather. In the event bats are present, impacts will be limited to avoidance or attraction responses. Because of the anticipated distance of the meteorological tower and/or buoys from shore, there will not likely be any effect on bats. In fact, the anticipated data collection activities (e.g., biological surveys) may assist in future environmental analyses of impacts of OCS activities on bats. To the extent that there would be any impacts to individuals, the overall impact of Alternative A on bats will be negligible.

3.2.2.7 Fish and Essential Fish Habitat

3.2.2.7.1 Description of the Affected Environment

Fish

The marine waters off Georgia support a variety of species. Georgia Department of Natural Resources (DNR) reports over 70 different marine fishes. Of these 70 species, the State of Georgia regulates the commercial and recreational fishing of approximately 50 species. This species list includes: common found fish (Atlantic menhaden, bluefish, northern puffer), popular sports fish (black sea bass, red drum, southern flounder), rays (Atlantic stingray, cownose ray, southern stingray), pelagic fish (marlins, sailfish, tunas), reef fish (gag grouper, gray triggerfish, red snapper), and sharks (dusky, bull, sandbar) (GDNR, 2013c; GDNR, CRD, 2013). The SAFMC manages the commercial and recreational fisheries for species within federal waters. Fishery management plans developed by the Council include: Coral, Dolphin Wahoo, Golden Crab, Habitat, Sargassum, Shrimp (including rock shrimp), Snapper Grouper, and Spiny Lobster, Coastal Migratory Pelagics (includes king & Spanish mackerel), and Ecosystem-Based Amendments (includes Coral Habitat Areas of Particular Concern; Special Management Zones; octocorals; and sea turtle release gear for snapper grouper fishermen). These management plans include many of the species found in marine waters off Georgia including, red snapper, gray triggerfish, gag grouper, and mackerels (SAFMC, 2013a). Highly migratory species such as marlins, sailfish, and tunas are managed directly by the NMFS under the Consolidated Atlantic Highly Migratory Species Fishery Management Plan.

Two fish species presently listed as endangered under the ESA are known to occur within the proposed lease area: smalltooth sawfish (*Pristis pectinata*) and Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). According to NMFS, another federally-listed endangered species found in Georgia, the shortnose sturgeon, would not be present in the action area (Baker, written communication, 2013). The shortnose sturgeon typically remain within their natal rivers and estuaries of those rivers (only occasionally migrating between adjacent rivers).

Smalltooth Sawfish (*Pristis pectinata*)

The smalltooth sawfish historically occurred throughout the Gulf of Mexico and north to Long Island Sound on the east coast. The smalltooth sawfish range has receded greatly over the past 200 years, resulting in a single distinct population segment (DPS) in southwest Florida. This area in Florida is where the critical habitat has been designated for this species. Population status in areas north of southern Florida is virtually unknown. A search of the National Sawfish Encounter Database managed by the Florida Museum of Natural History Sawfish Implementation Team revealed only two recent sightings of smalltooth sawfish near the proposed lease area: one off Florida, and another off Georgia reported by a bottom longline fishery observer who documented the capture of an estimated 13-ft (4.0-m) adult from depths of 152-242 ft (45.6-72.6 m) (USDOI, BOEM, 2012c).

Atlantic Sturgeon (*Acipenser oxyrinchus*)

Adult and subadult Atlantic sturgeon occur in shelf waters during fall and winter months. Evidence from extensive tagging programs using trawl-caught fish indicate that shelf areas less

than 70 ft (21.3 m) deep offshore of Virginia and North Carolina support concentrations of Atlantic sturgeon during fall and winter months. Data are lacking for areas south of Cape Hatteras. Satellite tracking confirmed the depth preferences and geographic areas generated from conventional trawl gear (USDOI, BOEM, 2012c).

Atlantic sturgeon are documented to occur in the watersheds (including all rivers and tributaries) of the Ashepoo, Combahee, and Edisto Rivers (ACE) Basin southward along the South Carolina, Georgia, and Florida coastal areas to the St. Johns River, Florida. The marine range of Atlantic sturgeon extends from Hamilton Inlet, Labrador, Canada, to Cape Canaveral, Florida (USDOC, NMFS, 2013b).

Rivers known to have current spawning populations within the range of the ESA-designated South Atlantic district population segment of the endangered Atlantic sturgeon include the Combahee, Edisto, Savannah, Ogeechee, Altamaha, and Satilla Rivers (USDOC, NMFS, 2013b).

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (FCMA) requires fishery management councils to: (1) describe and identify Essential Fish Habitat (EFH) in their respective regions, (2) specify actions to conserve and enhance that EFH, and (3) minimize the adverse effects of fishing on EFH. The FCMA requires federal agencies to consult on activities that may adversely affect EFH designated in fishery management plans.

Throughout their lives, marine fish and invertebrates depend on many types of habitats including seagrass, salt marsh, coral reefs, rocky intertidal areas, and hard/live bottom areas. Various activities on land and in water may threaten to alter, damage, or destroy these habitats, adversely affecting the fishery resources that utilize them.

The 2009 Fishery Ecosystem Plan of the South Atlantic Region (SAFMC, 2009) describes the freshwater, estuarine/inshore, and marine/offshore systems that provide EFH for six management plans within the South Atlantic. As identified above these include: coastal migratory pelagics, shrimp, snapper-grouper complex, spiny lobster, coral and coral reefs, and the golden crab. Additionally, the SAFMC has identified EFH that is a “habitat area of particular concern” (HAPC) within fishery management plans. HAPCs are discrete subsets of EFH that provide extremely important ecological functions, or are especially vulnerable to degradation (USDOI, BOEM, 2012b). Based on the SAFMC EFH mapping site and Amendment 1 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan there are EFH-HAPCs as Special Management Zones for the snapper/grouper complex directly adjacent to all three proposed lease blocks and EFH for juvenile and adult life-cycle for sailfish and 13 species of sharks throughout the entire proposed area (USDOI, NOAA, 2009; SAFMC, 2013b). HAPC locations are shown on Figure 3-7.

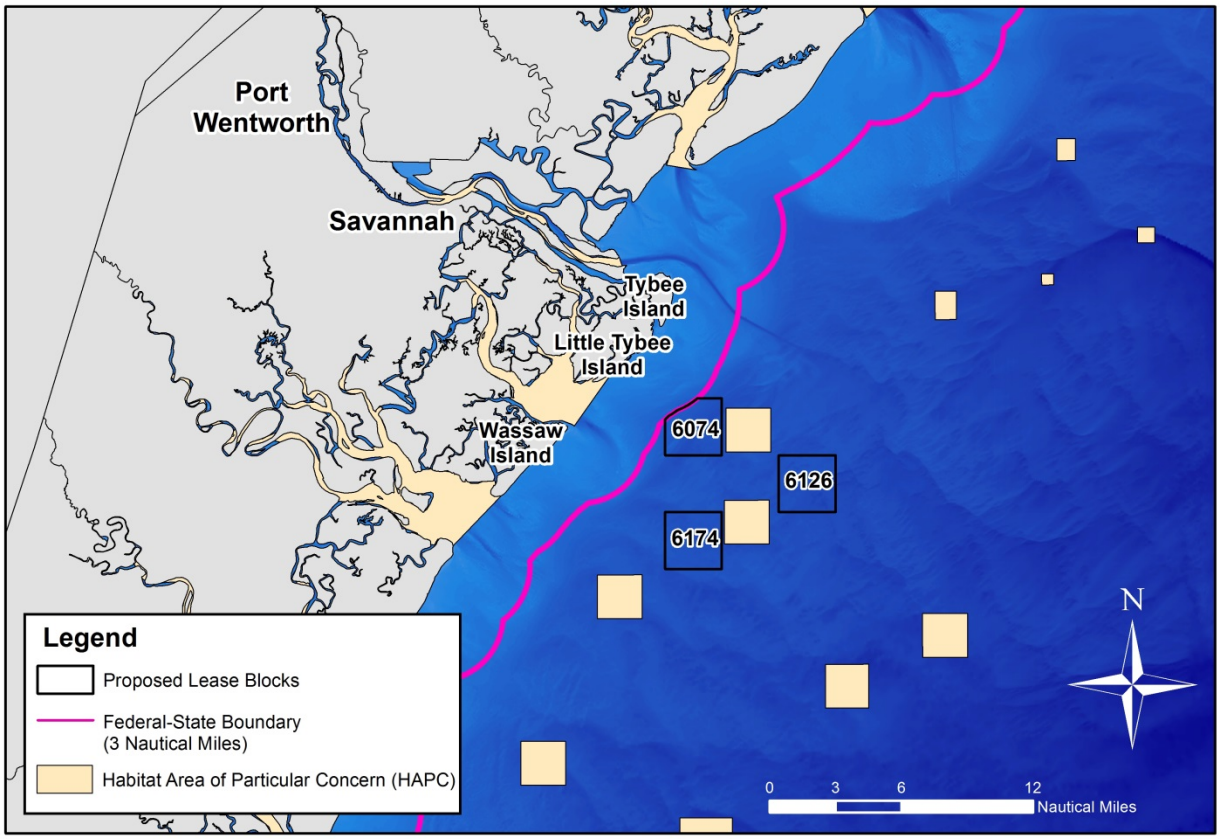


Figure 3-7. Habitat Areas of Particular Concern near the Proposed Lease Area.

3.2.2.7.2 Impact Analysis of Proposed Action

Routine Activities

Acoustic Effects

The auditory thresholds of marine fish that could occur in the proposed area are not well studied. A fish's inner ear and the lateral line overlap in the frequency range to which they respond. The lateral line appears to be most responsive to signals ranging from below one Hz to between 150 and 200 Hz, while the ear responds to frequencies from about 20 Hz to several thousand Hz in some species. The specific frequency response characteristics of the ear and lateral line vary among different species and are probably related, at least in part, to the life styles of the particular species (USDOI, BOEM, 2012a).

As for sound production in fish, (USDOI, BOEM, 2012a) cites that members of more than 50 fish families produce some kind of sound using special muscles or other structures that have evolved for this role, or by grinding teeth, rasping spines and fin rays, burping, expelling gas, or gulping air. Sounds are often produced by fish when they are alarmed or presented with noxious stimuli. Some of these sounds may involve the use of the swim bladder as an underwater resonator. Sounds produced by vibrating the swim bladder may be at a higher frequency (400 Hz) than the

sounds produced by moving body parts against one another. The swim bladder drumming muscles are correspondingly specialized for rapid contractions (USDOI, BOEM, 2012a).

USDOI, BOEM (2012a) cites various categories of acoustic communication that are used by fishes. These are startle or warning sounds that may help protect individuals and groups from predation; courting sounds used as part of the usual mating behaviors including advertisement; swimming sounds used in schooling and aggregation; aggressive sounds used when competing for mates; sounds used in other aggressive interactions (e.g., in territorial defense); sounds used by interceptor species to avoid predation or to locate prey; and sounds overheard and used to competitive advantage by competitors. Sounds are known to be used in reproductive behavior by a number of fish species, and the current data lead to the suggestion that males are the most active producers. Sound activity often accompanies aggressive behavior in fish, usually peaking during the reproductive season. Those benthic fish species that are territorial in nature throughout the year often produce sounds regardless of season, particularly during periods of high-level aggression. USDOI, BOEM (2012a) states in addition to the behaviors as communication, hearing is also likely used to help form a general image of the auditory scene that may include both other fishes and abiotic sound sources and scatterers.

High Resolution Geological Survey Acoustic Effects

The impact of HRG survey noise on marine fish that could occur in the proposed area is not well understood. Generally, noise generated by HRG surveys may have physical and/or behavioral effects on fish (USDOI, BOEM, 2012a). USDOI, BOEM (2012a) states that sounds 90 to 140 dB above a fish's hearing threshold may potentially injure the inner ear of a fish. This finding was supported by data in which injury occurred only when the stimulus was 100 to 110 dB above threshold at 200 to 250 Hz for cod. Additional cited studies in USDOI, BOEM (2012a) derived the values of 90 to 140 dB above threshold by examining the degree of masking and how similar the masking signal and test signal are. The data on other species are much less extensive; ambient noise at higher sea states in the ocean have masking effects in cod, haddock, and pollock. Additionally, sound could also produce generalized stress. Thus, based on limited data, it appears that for fish communication, masking and stress may occur in fish exposed to this level of sound (USDOI, BOEM, 2012a).

Effects on fish are generally expected to be limited to avoidance of the area around the HRG survey activities and short-term changes in behavior. The region of best hearing in the majority of fish for which there are data available is from 100 to 200 Hz up to 800 Hz. Adult fish are highly mobile and may be expected to quickly leave an area when disturbed. While an HRG survey may disturb more than one individual, surveys associated with Alternative A are not expected to result in population-level effects. Individuals disturbed by a survey would likely return to normal behavioral patterns after the survey has ceased or after the animal has left the survey area (USDOI, BOEM, 2012a).

Fish are not expected to be exposed to sound pressure levels that could cause hearing damage. Side-scan sonar, which uses a low-energy, high-frequency signal, is not expected to affect fish, based on fish hearing data. Because of the limited immediate area of ensonification and duration of individual HRG surveys that may be conducted during site characterization, few fish may be

expected in most cases to be present within the survey areas. Thus, BOEM expects potential population level impacts on fish from HRG surveys to be negligible (USDOI, BOEM, 2012a).

Geotechnical Exploration Acoustic Effects

Acoustic impacts from borehole drilling are expected to be below 120 dB. Previous estimates submitted to BOEM for geotechnical drilling have source sound levels not exceeding 145 dB at a frequency of 120 Hz. Previous submissions to BOEM also indicated that boring sound should attenuate to below 120 dB by the 492 ft (150 m) isopleth. Therefore, fish are expected to able to sense the sound, but the impacts are anticipated to be negligible due to short duration, low sound levels, and the ability of the fish to leave the immediate area of the activity (USDOI, BOEM, 2012a).

Vessel and Equipment Noise

Meteorological tower construction noise could disturb normal behaviors (e.g., feeding) of marine fish. Depending upon several factors, including the sound source and physical oceanographic features, behavioral effects may be incurred at ranges of many miles, and hearing impairment may occur at close range. As discussed in the impacts from HRG survey, behavioral reactions may include avoidance of, or flight from, the sound source and its immediate surroundings, disruption of feeding behavior, and generalized stress (USDOI, BOEM, 2012a). In addition, fish that do not flee the immediate action area during the pile driving procedure could be exposed to lethal sound pressure levels.

The Alternative A activity restrictions, including the SOC requirements intended to reduce or eliminate the potential for adverse impacts to marine mammals and sea turtles will also benefit fish including the implementation of a "soft start" procedure (see Appendix A). This measure will be included as a condition on any leases and/or SAPs issued or approved under this proposed action. Due to the "soft start" procedure, it is anticipated that the majority of fish would flee the area during the period of disturbance and return to normal activity in the area post-construction. Those fish that do not flee the immediate action area during the pile driving procedure could be exposed to lethal sound pressure levels. However, given the short duration of pile driving and the limited number of fish that could be exposed to the noise, and because fish will flee from pile driving activities when they begin, BOEM does not anticipate significant effects to fish populations.

Benthic Effects

This section only discusses those impacts related to fish and their habitat. Benthic effects from Alternative A that would impact fish and fish habitat are anticipated to be temporary and limited to the immediate area surrounding the activity. Therefore, BOEM does not anticipate that benthic fish habitat will experience significant negative impacts that could then impact fish populations.

Sub-bottom Sampling

As stated in Section 2.1.1 of this EA, the sub-bottom sampling will result in a negligible temporary loss of some benthic organisms, and a localized increase in disturbance due to vessel activity, including noise and anchor cable placement and retrieval. This activity could impact

marine fish by removing a small amount of forage items for these species. However, due to the small footprint, the temporary nature of the action, and likely availability of similar benthic habitat around the sampling location, it is expected that this activity would have negligible benthic effects that could impact federally-managed fish species that occur in the proposed area.

Meteorological Tower/Buoy Installation/Decommissioning

The installation of a meteorological buoy and/or the construction of a meteorological tower would have benthic effects that are temporary in nature. BOEM anticipates there will be some sediment that becomes suspended around deployed anchoring systems and around monopoles resulting from the installation activity. This sediment will be dispersed and settle on the surrounding seafloor. Depending upon the currents this could potentially smother some benthic organisms. BOEM expects any sedimentation that will occur around an installed tower or buoy will have only minor temporary effects that could impact the habitat and food availability for federally-managed fish species. The loss of benthic habitat as a result of scour and/or scour control systems around foundations and moorings is discussed in Section 2.1.1.4.3 of this EA. Sessile marine invertebrates, including molluscan shellfish, will be lost in the footprint of the foundation/mooring and any scour control system. However, BOEM does not expect a single meteorological tower or buoy within a lease area to result in significant changes to the availability of habitat and forage items in the action area.

Certain scour control measures may alter available habitat while they are emplaced. Thus, rock armouring will create a hard substrate habitat, while scour mats can provide a soft bottom substrate. Upon decommissioning, these created habitats will be lost as the local benthic environment reverts to its pre-operational condition.

Meteorological Tower/Buoy Operation

The installation of meteorological towers and large anchoring systems introduced to soft sediments will introduce an artificial hard substrate that opportunistic benthic species that prefer such substrate could colonize. In addition, minor changes in species associated with softer sediments could occur due to scouring around the pilings. Certain fish species (e.g., snapper and groupers) are likely to be attracted to the newly formed habitat complex, and fish population numbers in the immediate vicinity of the anchors and monopoles are likely to be higher than in surrounding waters away from the structures. However, BOEM does not expect a single meteorological tower or buoy within a lease area to result in significant changes in local community assemblage and diversity, nor the availability of habitat and forage items in the action area.

Non-Routine Events

Discharge of Waste Materials Effects

Collisions between vessels and allisions between vessels and meteorological towers and buoys is considered unlikely (see Section 2.1.2.2 of this EA). However in the unlikely event that a vessel allision or collision were to occur, and in the unlikely event that such an allision or collision results in a discharge, the most likely pollutant to be discharged would be diesel fuel. If a diesel spill were to occur, it is expected to dissipate very rapidly in the water column, then evaporate and

biodegrade within a few days (see Section 2.1.2.3 of this EA). BOEM expects that pelagic fish and larval fish found high in the water column will be negatively impacted by such a spill. BOEM does not expect these impacts to be significant to the populations they represent due to the temporary nature of a spill and the limited area that a spill may affect. Overall impacts to fish resources from diesel spills resulting from collisions, should they occur, are expected to be negligible.

All wastes generated during the project will be held onboard the vessels and discharged at an approved onshore disposal facility. No wastes will be discharged or disposed of overboard in state or federal waters off the Georgia coast during any phase of the proposed project.

Conclusion

BOEM expects Alternative A and the potential effects of HRG survey noise on marine fish generally to be limited to avoidance around the HRG survey activities and short-term changes in behavior. Thus, potential population-level impacts, if any, on fish resulting from HRG surveys are expected to be negligible.

Meteorological tower construction noise could disturb normal behaviors. As discussed in the analysis of HRG surveys, behavioral reaction may include avoidance of, or flight from, the sound source. Fish that do not flee the immediate action area during pile driving procedures could be exposed to lethal sound pressure levels. However, the project design criteria, including the implementation of a "soft start" procedure will minimize the possibility of exposure to lethal sound levels (see Appendix A).

As a result of the small sub-bottom sampling footprint, BOEM expects this activity will have negligible benthic effects that could impact fish species that may occur in the proposed area. BOEM expects impacts related to meteorological towers/buoys installation, operation and decommissioning to be minor and not expected to result in changes in local community assemblage and diversity.

Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. All wastes generated during the project will be held onboard the vessels and discharged at an approved onshore disposal facility. No wastes will be discharged or disposed of overboard in state or federal waters off the Georgia coast during any phase of the proposed project.

3.2.3 Socioeconomic Conditions

3.2.3.1 Cultural Resources

3.2.3.1.1 Description of the Affected Environment

Offshore cultural resources that may be potentially affected by a meteorological tower and buoys in the proposed lease area include pre-contact and post-contact archaeological resources. Pre-contact archaeological resources in the vicinity of the proposed lease area may have been inundated by late- and post-Pleistocene sea level fluctuation (USDOI, MMS, 2007a). Post-contact archaeological resources, such as shipwrecks, can potentially date from the 15th century to the

Modern period, as detailed in BOEM's OCS Study, *Inventory and Analysis of Archaeological Site Occurrence on the Atlantic Outer Continental Shelf* (TRC Environmental Corp., 2012). A concise overview of the types of potential offshore cultural resources located on the OCS can be found in section 4.2.19 of the Programmatic EIS (USDOI, MMS, 2007a).

The proposed lease area is located within a coastal region that has been identified as highly sensitive because of the potential to contain inundated pre-contact archaeological resources (TRC Environmental Corp., 2012). The proposed lease area also is likely to contain uncharted post-contact shipwrecks based on 1) the number and locations of known wrecks in the vicinity of the proposed lease area and 2) the location of the proposed lease area relative to the Port of Savannah and to known historic coastal sailing routes.

Per the Programmatic Agreement guiding Section 106 review for renewable energy activities on the OCS (executed between BOEM and several State Historic Preservation Offices, including Georgia; see Appendix C) (USDOI, 2013), the installation of meteorological towers and buoys "would have no effect on onshore historic properties since they are temporary in nature and indistinguishable from lighted vessel traffic." The potential effects of meteorological towers and buoys on onshore historic properties are, therefore, exempted from Section 106 review.

3.2.3.1.2 Impact Analysis of the Proposed Action

Installation of a meteorological tower in the proposed lease area will have a direct impact on the seafloor. The proposed construction method requires that piles be driven into the seafloor for the base of the tower using vibratory or impact hammers (Southern Company and Geo-Marine, Inc., 2011). The seafloor in a radius of approximately 1,500 ft (162 acres; 65 hectares) around the tower could be disturbed for the anchoring of support vessels such as crane barges. Additionally, installation and operation of buoys results in seafloor disturbances from anchors and mooring chains. If archaeological resources are present in these locations, they could be destroyed or displaced by anchoring activities, anchor sweeps, and pile driving.

BOEM will require lessees to conduct a high resolution geophysical survey to identify archaeological resources. Under the Programmatic Agreement between BOEM and several State Historic Preservation Offices, including Georgia (USDOI, 2013), if archaeological resources are found in the proposed lease area, BOEM will require the lessee to avoid adverse impacts to historic properties where practicable through lease stipulations. Prior to issuing a lease, BOEM will record a finding of *No historic properties affected*, consistent with 36 CFR §800.4(d). If adverse effects to historic properties cannot be avoided, BOEM will make a determination of *Historic properties affected*, following 36 CFR §800.4(d)(2) and resolve any adverse effect by following 36 CFR §800.6 (USDOI, 2013). If unanticipated discoveries of archaeological resources are made during the course of activities, the lessee will follow the appropriate SOC for reporting these events to BOEM (Appendix A).

3.2.3.1.3 Conclusion

Bottom-disturbing activities have the potential to affect pre-contact and post-contact historic and cultural resources. However, existing regulatory measures, information generated from the lessee's initial site characterization activities, and the unanticipated discoveries requirement make

the potential for adverse effects (i.e., cause significant impact or damage) from bottom-disturbing activities (e.g., coring, anchoring, installation of meteorological towers and buoys) to have an adverse effect on historic properties a very low possibility.

3.2.3.2 Commercial and Recreational Fishing Activities

The waters of offshore Georgia are actively used for commercial and recreational fishing. The following sections describe these activities. An overview of commercial and recreational fishing for the Atlantic coast can be found in sections 4.2.7 and 4.2.8 of the Programmatic EIS (USDOI, BOEM, 2014). Species of fish and fish habitat found off the coast of Georgia are addressed under Biological Resources.

3.2.3.2.1 Description of the Affected Environment

Commercial Fishing

Commercial fisheries are an important part of the coastal Georgia economy. In 2011, commercial fishery landings in Georgia totaled almost 12.8 million pounds, with a value of about $16.1 million, which was an increase over the 2010 landings of 7.2 million pounds that were worth around $13.7 million (NMFS, OST, 2013). Among the 28 coastal US states[1], Georgia ranked 24th in total monetary value of landings for 2011; the State also ranked 24th in landings by pounds in 2010, but ranked 21st by the same measure in 2011 (NMFS, OST, 2013). Georgia's landings accounted for about 6.2 percent (2010) and 10.2 percent (2011) of the South Atlantic[2] landing in pounds (NMFS, OST, 2012). In 2010, approximately 51 percent of the total commercial catch landings by pound came from federal waters, while the remainder came from state waters (NMFS, OST, 2013).

The types of fishing gear used off the coast of Georgia include otter trawls, pots and traps, gill nets, long lines, hand lines, and cast nets (NMFS, OST, 2013). The open season for commercial fishing is limited for some species (amberjack can be harvested March 16 through December 31, while bluefish, cobia, and Spanish mackerel can be harvested March 16 through November 30), but many species can be commercially harvested year-round (GDNR, 2013b). The proposed lease area addressed in this EA lies within two Marine Protected Areas (MPAs) (NOAA, 2013c). The first MPA is the Southeast US Restricted Area, which prohibits gillnet fishing between November 15 and April 15 each year for the protection of North Atlantic right whale calving areas (72 FR 34632). The second is the Charleston Bump Closed Area, which is closed to pelagic long-line fishing from February through April to reduce bycatch and catch of undersized swordfish (Sedberry, 2001; Sedberry, et al., 2001). A third MPA is located near the proposed lease area and restricts fishing to protect several snapper grouper species; however, the proposed lease area does not lie directly within this MPA (SAFMC, 2013c).

[1] Florida's east and west shores are counted separately, and the ranking includes a category for at-sea processing, for a total of 30 categories among the 28 states included.

[2] In this source, the South Atlantic included North Carolina, South Carolina, Georgia, and Florida's east coast.

There are two seaports in Georgia operated by the Georgia Port Authority: Savannah and Brunswick (GPA, 2012; GDED, 2013). The Darien-Bellville port also is in the state, and is the only one in Georgia to be ranked as a major port based on commercial landings between 2008 and 2011 (72nd in 2011 and 78th in 2008, by pounds, out of approximately 100 ports; NMFS OST, 2013). There are other smaller facilities along the coastline where commercial vessels may bring in their harvest. Commercial fishing vessels that fish in the proposed lease area can use any of these ports or facilities, or facilities in nearby South Carolina, but Savannah is the closest port to the proposed lease area.

Commercially harvested estuarine and marine species include a wide variety of finfish (e.g., catfish and bullheads, dolphinfish, flatfish, king whiting, and sharks) and shellfish (e.g., quahog clams, blue crabs, jellyfish, eastern oysters, conch snails, and shrimp). Estuarine species such as catfish and oysters are not present in the proposed lease area. In 2011, shellfish contributed the vast majority of landings at about 12.7 million pounds (5.8 million kg), while commercially caught finfish contributed only about 82,000 pounds (37,270 kg) to the state's total landing for the year (NMFS, OST, 2013). Blue crab, white shrimp, and jellyfish were the only three groups with over a million pounds caught each in Georgia for 2011. Blue crab, white shrimp, and brown shrimp were the only three groups with a total value of over a $1 million each for 2011 in Georgia (NMFS, OST, 2013).

There is no information available to determine specifically how commercial fishermen use the proposed lease area.

Recreational Fishing

Recreational fishing is known to occur within the proposed lease area, however, site-specific data are not available with respect to the amount or seasonality/timing. Saltwater species recreationally fished in Georgia include amberjack, Atlantic croaker, Atlantic sturgeon, billfish, black drum, black sea bass, bluefish, cobia, dolphin, flounder, gap grouper, king mackerel, red drum, red porgy, red snapper, sharks, sheepshead, Spanish mackerel, spot, spotted sea trout, striped bass, tarpon, tripletail, and weakfish (GDNR, 2013c). The season for recreational fishing is restricted for some species (amberjack, bluefish, cobia, and Spanish mackerel as above; tarpon season runs March 16 to November 30), but lasts all year for most species (GDNR, 2013c).

The Marine Recreational Information Program (MRIP) develops statistical information on recreational fishing trips using telephone surveys and dock interviews. In this system, an angler trip is any excursion made by an individual who goes fishing. The number of angler trips taken in the ocean waters offshore Georgia for 2011 was approximately 70,000 (NMFS, OST, MRIP, 2013). Of the total marine angler trips in Georgia each year, approximately 83 percent occur between May and October (NMFS, OST, MRIP, 2013).[3]

[3] MRIP defines specific two-month time periods as sampling "waves" for data collection purposes. This percentage is the average number of trips taken during these "waves" (May/June, July/Aug, Sept/Oct) from 2007 to 2012.

Recreational fishing at reefs (both artificial and natural) is a popular activity in Georgia coastal waters. There are artificial reefs in two OCS blocks adjacent to the proposed lease area (MMC, 2013; GDNR, 2001).

3.2.3.2.2 Impact Analysis of the Proposed Action

This section describes the potential impacts from the proposed action on commercial and recreational fishing resources off the coast of Savannah, Georgia. The potential impacts of the proposed action on fish and essential fish habitat are discussed in Section 3.2.2.7 of this EA.

Routine Activities

The proposed activities involve installing a meteorological tower and buoys in the proposed lease area and conducting surveys for site characterization. These activities result in increased vessel traffic and restricted areas during construction/installation that may temporarily exclude fishing vessels from using specific areas. Surveys, construction, and decommissioning are likely to occur during the spring and summer, which overlap with commercial and recreational fishing seasons.

The vessel traffic associated with the proposed action uses some of the same navigation channels as commercial and recreational fishing vessels, especially the Savannah River. Most of the traffic associated with the proposed action occurs during construction, which is expected to last approximately eight days to 10 weeks and could involve up to five vessels at a time, and during decommissioning, which is expected to take several days for buoys and scour control removal, and two days per piling. Site characterization lasts approximately one month, but would likely result in only one to two survey vessels in the proposed lease area per day. During the maintenance and operation of the tower and buoys, vessel traffic will be minimal. Therefore, BOEM anticipates that impacts from vessel traffic associated with the proposed action on commercial and recreational fishing will be negligible.

Because fish have a tendency to be attracted to structures or objects in the water, the potential also exists for the tower and buoys to function as an artificial reef, giving fishermen an additional area to target. This could result in minor benefits for commercial and recreational fishing during the lifespan of the tower.

Non-Routine Events

The potential effects of non-routine events are identified and characterized in Section 2.1.2. Diesel fuel will be used in vessels, generators, and pile-driving hammers, all of which have the potential to be damaged in non-routine events such as collisions, allisions, and storms. Based on data from 2001 to 2011, the average spill size for vessels other than tank ships and tank barges was 114 gallons (USCG, 2012), so BOEM anticipates that the average volume of any potential spill caused by Alternative A would be similar. Allisions with buoys with a diesel-powered generator could result in a spill of about 240 gallons (USDOI, BOEM, 2012a). If such diesel spills occurred, the fuel would be expected to dissipate rapidly, evaporate, and biodegrade within a few days (USDOC, NOAA, 2006) because of physical oceanographic features, resulting in negligible impact to the ecosystem and, therefore, the fishing resource and fisheries.

3.2.3.2.3 Conclusion

The proposed action consists of vessel traffic and activities related to the installation/operation of the meteorological towers and buoys that will not measurably impact commercial or recreational fishing activities. Areas in which commercial and recreational fishermen will be excluded are small in relation to the fishing grounds, and changes to navigation necessary to reach fishing areas beyond the proposed lease area will be minimal. Localized fishing displacement and/or target species availability/catchability within the immediate area of proposed activities may occur during the initial stages of Alternative A, but these will be temporary and confined to a limited area, resulting in a negligible, if detectible, impact to fishing. Meteorological tower foundations can provide habitat for some target fish species in the area, which may have a minor beneficial impact on fisheries.

3.2.3.3 Recreational Resources

The Georgia coast provides a multitude of outdoor recreational opportunities such as biking, bird watching, boating, camping, golfing, hiking, and hunting (GDNR, 2013a), in addition to recreational activities in offshore waters such as fishing, boating, and diving.

3.2.3.3.1 Description of the Affected Environment

The beaches of Georgia are an important recreational resource that attracts both residents and tourists. There are 41 beaches subject to state monitoring distributed among five counties along the Georgia coastline, 13 of which are in Chatham County (USEPA, 2013), the county that is directly west of the proposed lease area. Chatham County includes the city of Savannah, a popular tourist destination, along with several islands that host thousands of tourists annually, the most popular of which is Tybee Island. Chatham County public beaches encompass 29.9 miles (55 km) of shoreline, with 5 of those miles (9 km) on Tybee Island (USEPA, 2013). Tybee Island is the easternmost point in the state, and tourist attractions like the Tybee Island Light (City of Tybee, 2012) and the Fishing Pier and Pavilion (Chatham County GA, 2013) offer open views of the ocean to the east and make the island one of the most popular coastal destinations in the state. Another popular destination along the coast is Fort Pulaski National Monument on Cockspur and McQueens Islands, between Tybee Island and Savannah. Fort Pulaski National Monument includes the Cockspur Island Light, a small lighthouse that is maintained by the National Park Service (NPS) and open to the public, but has not been in service since 1909 (NPS, 2013b).

The National Ocean Economics Program defines the tourism and recreation sector of the ocean economy to include the following industries: amusement and recreation services, boat dealers, eating and drinking places, hotels and lodging places, marinas, recreational vehicle parks and campgrounds, scenic water tours, sporting goods retailers, and zoos and aquaria (NOEP, 2007). Based on this categorization, the tourism and recreation portion of the marine economy contributed over 14,000 jobs and over $237 million in wages to the six Georgia coastal counties in 2010, $103 million of which was attributed to Chatham County (NOEP, 2013).

The Georgia and South Carolina coastlines encompass several FWS NWRs; the closest to the proposed lease area are the Wassaw and Tybee NWRs. The Tybee NWR is closed to the public to allow exclusive wildlife use (USFWS, 2013a). Recreational activities at the Wassaw NWR

include bird watching, beachcombing, hiking, and general nature observation (USFWS, 2013b). The Cumberland Island National Seashore (NPS, 2013a), Sapelo Island National Estuarine Research Reserve (NERRS, 2013), and Gray's Reef National Marine Sanctuary (GDNR, 2001) are all located on or near the coast of Georgia; however, none of them are close enough to the proposed lease area to be affected by the proposed action.

3.2.3.3.2 Impact Analysis of the Proposed Action

Routine Activities

As described in Section 5.2.21.2 of the Programmatic EIS (USDOI, MMS, 2007a), a meteorological tower in a typical seascape introduces a geometrical, manmade visual element (the vertical tower) into a natural landscape (the horizon). However, the main visual impact of meteorological towers is the deck because it is the widest and most substantial portion of the tower, with an approximate diameter between 16 and 40 ft (5 and 12 m). In contrast, the mast is relatively slender (approximate diameter between 3 to 10 ft [1 to 3 m], depending on height above the water) (GL Garrad Hassan, 2012). Visual impacts are contingent on the tower's distance from shore, earth curvature, wave height, and atmospheric conditions that could screen some or all of the deck from view (USDOI, MMS, 2007a). According to the Programmatic EIS, a tower 220 ft (67 m) tall would be visible from approximately 17.4 NM (32 km) away under clear weather conditions (USDOI, MMS, 2007a). Because the shoreline ranges from approximately 5 to 11 NM (9 to 20 km) away from the proposed lease area (depending on which OCS block is approved for tower construction), it is likely that a meteorological tower would be visible from the shore.

To assess visual resources, BOEM created daytime and nighttime simulations of the meteorological tower from two viewsheds (i.e., the area that is visible from a fixed vantage point): the Tybee Fishing Pier and Pavilion and the Fort Pulaski National Monument. These locations were chosen to illustrate views of the proposed lease area from representative popular viewpoints if the tower was installed in the closest possible location to the shoreline (Figure 3-8). The photographs and simulations are included in Appendix B along with a description of the visual simulation methodology. Animations showing the FAA standard obstruction lighting (AC 70/7460-1K) on the meteorological towers were created to illustrate what the tower will look like at nighttime. The final color, intensity, and timing of tower lights would be determined in consultation with the USCG (in accordance with 33 CFR 66.01–11, Dec. 8, 2003) and FAA.

Figure 3-8. Popular Recreation Areas and Visual Simulation Viewpoints.

There will be negligible visual impacts during the day time on Tybee Island beaches, the Tybee Pier, and Fort Pulaski National Monument including the Cockspur Island Light, from installation of a meteorological tower in the proposed lease area (see Appendix B). Any visual impact will be further reduced by the many other existing elements along the seashore and on the horizon, including buoys, tidal gauges, occasional military aircraft, beach activities, and container/cargo ships accessing the nearby Savannah River channel.

Similarly, the nighttime tower lighting will have a minor impact on the surrounding area, but this impact is somewhat reduced by the many other existing lights visible along the seashore and horizon, including buoys and tidal gauge lights, beach activities and strip development, container/cargo ships, surrounding communication towers, the Tybee lighthouse and communication tower lights. As shown in the nighttime visual simulation, the lights on the tower can be seen by the naked eye from the shoreline (see Appendix B). However, boats and ships frequently appear on the horizon, and it will be difficult to distinguish the tower from these other lights. Weather conditions such as fog, haze, clouds, or rough seas will also greatly limit the visibility of the towers and lighting from the shore. Therefore, the presence of a flashing light or lights on a meteorological tower at night will result in minor impacts when no other lights could be seen on the horizon, and negligible impacts if other lights are present. Buoys placed within any of the three OCS lease areas are not considered to have a negative effect on aesthetics due to their low profile and distance from shore.

A meteorological tower or buoy can be seen from vessels traveling in and around the proposed lease area, but because boats and ships are generally moving, close-up views and any associated visual impacts, will be brief and temporary.

There are no known underwater features that have significant recreational value (e.g., natural reefs, artificial reefs, or shipwrecks) in the proposed lease area; therefore, there would be no impacts on existing underwater recreational resources.

Non-Routine Events

Non-routine events that may affect recreational resources include vessel allisions/collisions, which could result in spills, and litter from vessels associated with the proposed action. Implementation of USCG-required marking and lighting will reduce the possibility of vessel or aircraft allisions with a tower or buoy. Spills from vessels (typically diesel spills from collisions/allisions or during refueling), the tower, or a buoy during construction, operation, or maintenance activities have the potential for adverse impacts on recreation if the spill reached shore. If a spill were to occur, it is expected to dissipate very rapidly and biodegrade within a few days. Because the closest edge of the proposed lease area is over 5 NM (9 km) from the nearest shoreline, a spill is not likely to reach the shore in quantities that will result in impacts on coastal recreation resources. To reduce or eliminate the potential for litter that washes up onto beaches, all vessel operators, employees, and contractors actively engaged in offshore operations will be required to be briefed on marine trash and debris awareness and elimination.

3.2.3.3.3 Conclusion

The proposed action will result in negligible impacts to recreational resources including the Fort Pulaski Monument, Cockspur Island Light, Tybee Island beaches and Tybee Pier during the day time and minor impacts to these areas from the flashing lights on the meteorological tower during the night time. Impacts to offshore recreational vessels will be minor and temporary. There will be no impacts on existing underwater recreational resources.

3.2.3.4 Demographics and Employment

3.2.3.4.1 Description of the Affected Environment

The State of Georgia had an estimated population of 9,919,945 in 2012 (USDOC, Census Bureau, 2013b). The median household income for the state in 2012 was $49,736, in comparison to the overall US median household income of $52,762 (USDOC, Census Bureau, 2013b). Between 2007 and 2011, approximately 65 percent of the state population was in the labor force (USDOC, Census Bureau, 2013a).

This section focuses on Chatham County because it contains the necessary resources such as deepwater port facilities along the Savannah River and a variety of docks and boating facilities to provide services for activities related to the proposed action. These services include the fabrication and staging yards for meteorological tower components, and crew/cargo launch sites for survey vessels.

Chatham County experienced positive population growth of 4.3 percent from 2010 to 2012 (USDOC, Census Bureau, 2013b). Savannah is the primary metropolitan area, and is located within Chatham and Bryan Counties. The median household income for Chatham County between 2007 and 2011 was $45,985 (USDOC, Census Bureau, 2013b). Within the county, 55.8 percent of the population was employed within the civilian labor force, 4.7 percent was unemployed, and 1.6 percent served in the armed forces, totaling 62.1 percent of the county population in the labor force (with the corresponding 37.9 percent not in the labor force) (USDOC, Census Bureau, 2013a). The primary industries of the civilian population were: educational services, health care, and social assistance (23.1 percent); retail trade (12.8 percent); and arts, entertainment, recreation, accommodation, and food services (12.3 percent) (USDOC, Census Bureau, 2013a).

Chatham County has an economy in which 457 ocean-related establishments directly employed 9,661 people in 2009. Tourism represents approximately 65.8 percent of the ocean-related jobs in the county, and approximately 45 percent of the ocean recreation and tourism-related businesses are small. In 2010, domestic travel resulted in about $1.07 billion in direct spending within the county. According to 2011 data, 923 establishments in the county were dedicated to leisure and hospitality and several large festivals contribute to the local economy (USDOI, BOEM, 2012f).

3.2.3.4.2 Impact Analysis of the Proposed Action

The proposed action will require support services from the Savannah metropolitan area in Chatham County, but the potential also exists for support services to be needed in nearby ports and businesses in other areas such as the Port of New Orleans. The effects of such services may include a temporary increase in employment at Plant Kraft during staging and construction of the tower, a boost in hospitality businesses patronized by out-of-town personnel, and increased port/business activity associated with crew and vessel support.

3.2.3.4.3 Conclusion

Due to the early stages of offshore wind development in the US, there is a lack of data regarding actual economic impacts of activities related to offshore wind projects. After a literature review on impacts of offshore wind on tourism and recreation economics, BOEM concluded that anticipated impacts do not necessarily correspond with actual impacts (USDOI, BOEM, 2012f). However, BOEM anticipates that the proposed action will have beneficial impacts on the local economy. The majority of impacts will be temporary in nature and the degree of impact is expected to be negligible relative to the current population and employment numbers in Chatham County.

3.2.3.5 Environmental Justice

Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…" (Subsection 1-101). If such effects are identified, appropriate mitigation measures must be implemented. The

2007 Programmatic EIS contains a complete description of the method of analysis (USDOI, MMS, 2007a).

3.2.3.5.1 Description of the Affected Environment

In Chatham County, 18.1 percent of the population exists below the poverty line (USDOC, Census Bureau, 2013a). The county contains a significant minority presence at 49.4 percent of the population. For reference, 16.5 percent of the population of Georgia is below the poverty line, and 43.7 percent of the state's population are minorities.

A low-income (or minority) population is distinct from the portion of the population that is low-income (or minority); it is defined primarily by the relative proportion of individuals in a given geographic unit to the proportion of individuals in a (larger) reference unit (USDOI, MMS, 2007a). According to the definitions of minority and low-income populations used in the Programmatic EIS (USDOI, MMS, 2007a), Chatham County would not be considered to have either a low-income population or a minority population in comparison to the State of Georgia.

A low-income population is not present because the number of individuals below the poverty line (18.1 percent) is less than 20 percent higher than the number of low-income individuals in the state (16.5 percent). A minority population is not present because fewer than 50 percent of the population are minority persons (at 49.4 percent), and the percentage of minority persons is not more than 20 percent higher in Chatham County than in the State of Georgia as a whole (at 43.7 percent).

3.2.3.5.2 Impact Analysis of the Proposed Action

Existing coastal facilities will be used to support the proposed action, and no expansion of these facilities is anticipated. In addition, according to the definitions of minority and low-income populations used in the Programmatic EIS, neither a low-income or minority population is present in Chatham County (USDOI, MMS, 2007a).

3.2.3.5.3 Conclusion

BOEM does not anticipate that the proposed action would result in disproportionate environmental or health effects on minority or low-income populations.

3.2.3.6 Other Uses of the OCS

3.2.3.6.1 Description of the Affected Environment

The vessel traffic associated with the proposed action could pose a conflict with other existing and future uses of the OCS, including marine transportation, military activities, and commercial and recreational fishing. In addition, the meteorological tower may impede radar transmissions. Marine transportation, military activities, and radar are discussed below; commercial and recreational fishing are discussed in Section 3.2.3.2 of this EA.

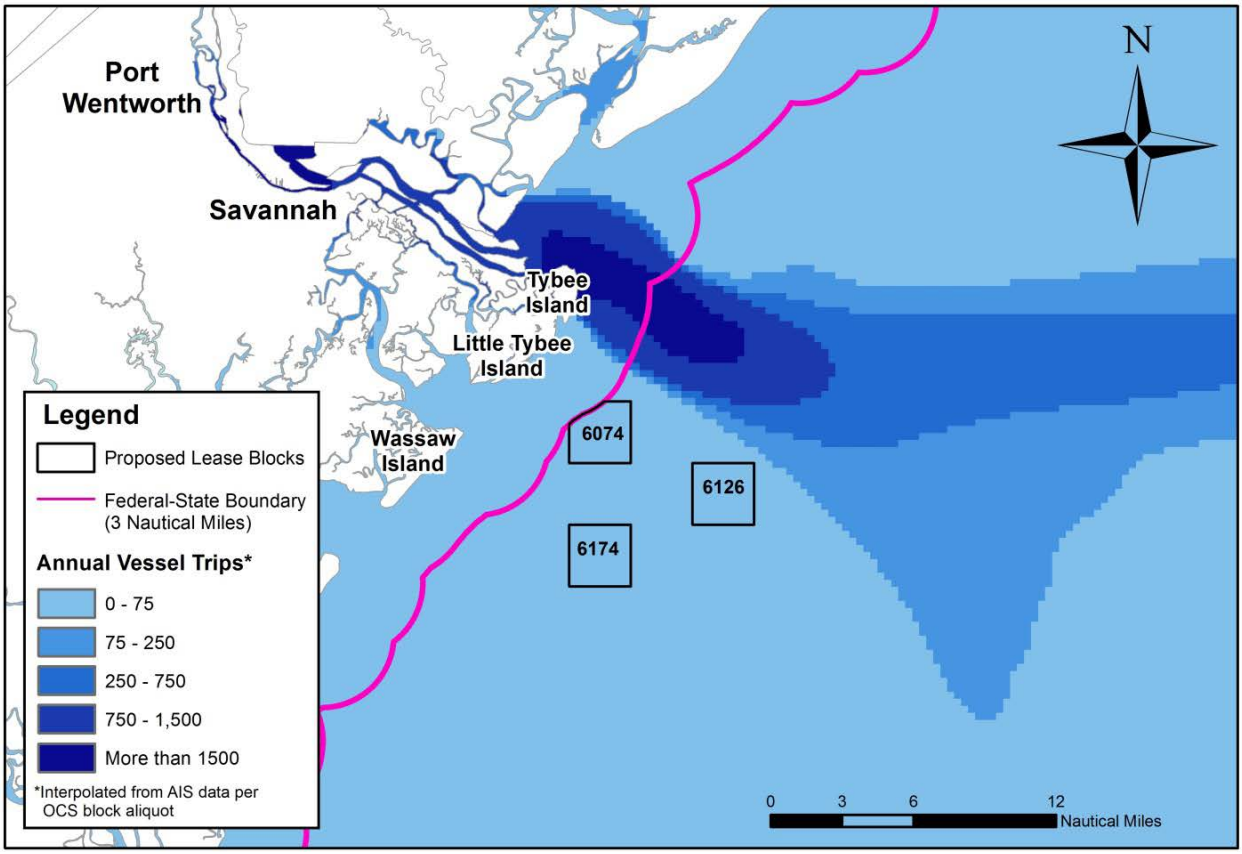
Marine Transportation

Vessels traveling in the vicinity of the proposed lease area include cargo ships such as tankers, bulk carriers, and tug and barge units; naval vessels; government research, enforcement, and search and rescue vessels; pilot boats; and fishing and recreational craft. Most of the commercial vessel traffic is destined for the port of Savannah, located on the Savannah River. There are no official shipping lanes, fairways, zones, or restricted or precautionary areas as designated by NOAA (NOAA, 2013a, d) in or out of the port of Savannah or in the areas between the proposed lease blocks and the shoreline. Vessel traffic in the vicinity of the proposed lease area is supported by a network of navigational aids, including lights, signals, buoys, day beacons, and other aids intended to help navigators determine position or safe course, or to warn of dangers or obstructions (NOAA, 2013e). Navigational aids are primarily concentrated along the entrance to the Savannah River, starting in the lease blocks north of the proposed lease area and continuing inland, with a few dispersed in lease blocks surrounding the proposed lease area (but none directly within the proposed lease area blocks).

Large vessels associated with the proposed action will be traveling from Port Wentworth, which is approximately 2 miles (3.7 km) upriver from Savannah, to the proposed lease area. Smaller vessels associated with site assessment for the proposed action will primarily travel from the Savannah or Tybee Island areas to the proposed lease area.

Figure 3-9 shows the vessel traffic density in the vicinity of the proposed lease area analyzed from the most recent (2011) Automatic Identification Systems (AIS)[4] data. AIS data are collected within an OCS block aliquot (an aliquot is 1/16th of an OCS block) on a monthly basis (USDOI, BOEM; NOAA, 2012). Although AIS data only account for approximately 50 percent of all vessel traffic, it shows where the busiest areas of the ocean that are trafficked by large commercial vessels and passenger ships are located. Vessels can either avoid those areas, or have heightened awareness of navigation and safety when approaching these areas. AIS data exclude research, recreational, fishing, and military vessel activity (USDOI, BOEM; NOAA, 2011). The data show that the majority of commercial vessel traffic is concentrated in a corridor north of the proposed lease area, and does not cross the proposed lease area or use the area between the proposed lease blocks and the shoreline. The port of Savannah is ranked eighth among US ports in the number of oceangoing vessel calls (vessel stops) in 2011 for commercial vessels including tankers, container ships and carriers (USDOT, MARAD, 2013). The surrounding area has numerous marinas, harbors, and docks for both commercial and recreational fishing vessels.

[4] AIS is a maritime safety communications system, standardized by the International Telecommunications Union and adopted by the International Maritime Organization (IMO), that automatically transmits vessel information, including type, position, course, speed, and other safety-related information, to appropriately equipped shore stations, other ships, and aircraft (USCG Navigation Center, 2013). It is required equipment on all vessels larger than 300 gross tons.



Source: USDOI, BOEM; NOAA (2012)

Figure 3-9. Vessel Traffic Density Derived from AIS Data Showing Number of Annual Trips for 2011.

Data from the USACE Navigation Data Center (NDC) indicate that 4,314 shipments were received at the port Savannah and 4,334 shipments were sent out of the port for domestic and foreign commercial vessels in 2011 (USACE, NDC, 2013). The number of annual shipments shows that commercial vessel density in the busiest OCS block aliquots presented on Figure 3-9 exceeded 1,500 trips in 2011.

Depending on season and weather conditions, recreational vessels of all sizes may be found in the proposed lease area. Approximately 83 percent of marine angler trips occur between May and October in the waters offshore Georgia (NMFS, OST, MRIP, 2013). Artificial reefs adjacent to the proposed lease area are popular spots for commercial and recreational fishing. Although there are no data specifically for commercial fishing vessel trips in the Georgia offshore waters or the proposed lease area, commercial fishing vessels frequently use waters off the coast of Georgia.

Military Use Areas

The U.S. Air Force, Navy, Marine Corps, and Special Operations Forces conduct various testing and training missions within a variety of Military Use Areas that are established by the military off all US coastlines. The proposed lease area is within the Jacksonville Range Military

Complex, which includes both the Charleston and Jacksonville military operating areas (OPAREAs). The largest naval facility in the OPAREAs is the Naval Submarine Base at Kings Bay, Georgia, approximately 74 NM (137 km) south of the proposed lease area. Submarines are operated throughout all deepwater portions of the OPAREAs, extending south and north and offshore to the Jacksonville Range Complex limits (Dept. of the Navy, 2009).

The USACE has established surface danger zones and restricted areas in many areas adjacent to US coastlines. The regulations pertaining to the identification and use of these areas are found at 33 CFR Part 334. There are no danger zones or restricted areas in the proposed lease area. There is a military aviation warning area approximately 7 NM (13 km) east of OCS lease block 6126 and a Department of Defense (DoD) danger zone approximately 12 NM (22 km) east of lease block 6126. The airspace within the military aviation warning area is designated for aircraft that may be hazardous to nonparticipating aircraft or mariners; therefore, aircraft are restricted between 1,200 and 17,000 feet above sea level (National Geospatial-Intelligence Agency, 2013). The danger zone may be used by the US Armed Forces for hazardous operations and may be intermittently closed to the public (USACE, 2012).

Radar

Military and civilian radar systems provide coverage along the coast. The FAA evaluates structures for their potential to interfere with radar when a "Notice of Proposed Construction or Alteration" is filed for a specific action. In this case, a lessee's plans to construct a meteorological tower more than 199 ft (61 m) tall within FAA jurisdiction (up to 12 NM [22 km] offshore) would trigger such a filing. The FAA would then conduct an obstruction evaluation analysis to determine whether a meteorological tower would pose a hazard to air traffic radar, and then issue a Determination of Hazard/No Hazard.

3.2.3.6.2 Impact Analysis of the Proposed Action

Routine Activities

Marine Transportation

Activities under Alternative A will result in an increase in vessel traffic in the proposed lease area. The AIS data in Figure 3-9 indicate that the majority of large commercial vessels transit the area to the north of the proposed lease area to reach ports on the Savannah River. Vessels associated with the proposed action will travel via the Savannah River to Port Wentworth and the Port of Savannah area along the same route as commercial vessels.

The frequency of expected vessel trips under Alternative A (see Section 2.1.1.4 through 2.1.1.7; Table 2-1) ranges from 128 to 511 trips over the five-year term of the lease, or about 25 to 100 trips annually. At any single point in time during the five-year lease period, BOEM anticipates that there could be one vessel traveling in the waters offshore Georgia to conduct surveying or routine maintenance associated with the proposed action. As many as five vessels at a time may be used for 2- or 3-day periods during construction or decommissioning.

The meteorological tower and buoys are considered Private Aids to Navigation, which are regulated by the USCG under 33 CFR 66. Marking and lighting of the meteorological tower and

buoys in accordance with USCG and FAA regulations will mitigate risks to commercial, private, and government aircraft using the airspace above the proposed lease area. If the meteorological tower is taller than 199 ft (61 m), as BOEM anticipates, the lessee is required to file a "Notice of Proposed Construction or Alteration" with the FAA (14 CFR 77.13, Mar. 4, 1972). The FAA then conducts an obstruction evaluation analysis to determine whether the meteorological tower will pose a hazard to air traffic, and then issues a Determination of Hazard/No Hazard. With implementation of mitigation measures and appropriate FAA review and approvals, BOEM anticipates that impacts on navigation from the placement of a meteorological tower and buoys will be minor.

Military Use Areas

BOEM consulted with DoD on the proposed action of this EA; on November 29, 2013, DoD responded that a military use conflict exists in OCS block 6074, specifically noting that, "We request that lease blocks underlying the MTRs VR-1040 and 1041 (parallel the coast) be kept clear (red) of wind turbines for flight safety." Figure 3-10 shows the military use conflict areas provided by DoD, and shows that approximately the western two thirds of OCS block 6074 are restricted by the DoD (see "Wind Exclusion" areas noted in red). The DoD would require sit-specific stipulations for construction of a meteorological tower in OCS lease blocks 6126 and 6174.

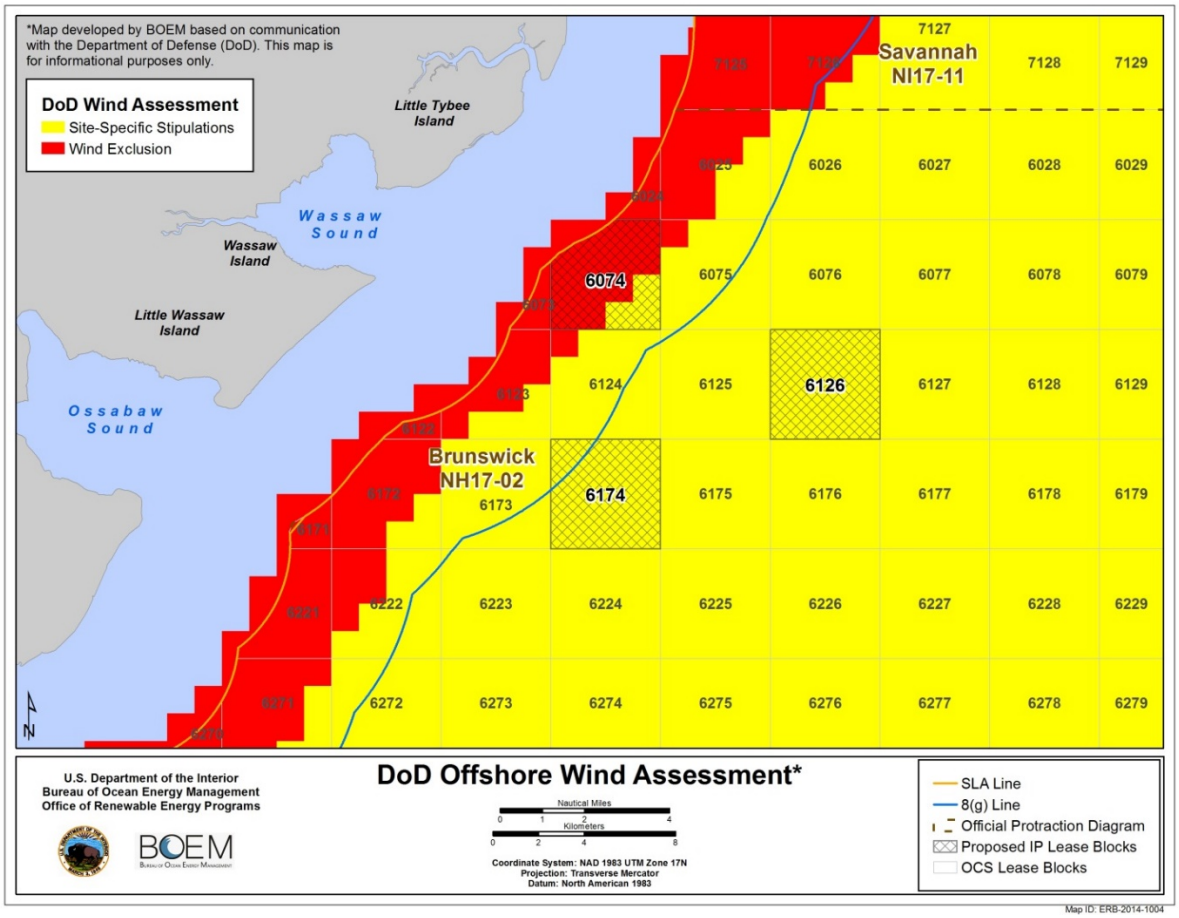


Figure 3-10. Military Use Conflict Areas.

Because the number of vessels associated with the proposed action at any given time will be negligible, BOEM does not anticipate that the additional vessel traffic will conflict with military uses of the OCS. Additionally, because vessel traffic associated with the proposed action will travel primarily between the Georgia shoreline and the proposed lease area, vessels are not anticipated to approach the danger zone/restricted area located 12 NM (22 km) east of the closest portion of the proposed lease area. Therefore, impacts on Military Use Areas from the proposed action will be negligible.

Radar

A meteorological tower could affect radar performance and accuracy in the area because the meteorological tower itself will likely include equipment that sends out radar signals (such as avian detection/tracking radar, shipping vessel traffic-monitoring radar, and lightning detection sensors). Additionally, the tower structure may obstruct radar. Radar interference effects will depend on the type of radar being affected, as well as the location, height, and design of the meteorological tower. The FAA will conduct an evaluation of impacts on radar systems once details of the tower design and location are known. Evaluation of impacts of meteorological towers on military and civilian radar systems will be included in any Determination of Hazard/No Hazard by the FAA. Therefore, BOEM anticipates that impacts on radar will be minor.

Non-Routine Events

Because the proposed lease area is to the south of the heavily trafficked vessel corridor in/out of the Savannah River, the likelihood of a vessel allision/collision with vessels associated with the proposed action is low. An allision between a large commercial vessel and a meteorological tower or buoy will most likely result in the collapse or destruction of the structure and little to no damage of the vessel. Therefore, large oil/fuel spills from commercial vessel collisions are unlikely. Smaller vessels servicing or decommissioning towers/buoys could collide with a tower, buoy, or other vessel. An aircraft (military, commercial, or private) colliding with the meteorological structure could result in adverse impacts from spillage of diesel fuel contained in generators on the tower, aircraft fuel, oil-based lubricants, or hydraulic oil, and present a risk to the health and safety of pilots and passengers.

3.2.3.6.3 Conclusion

BOEM does not anticipate that the number of vessels associated with the proposed action will measurably increase vessel traffic density levels over existing traffic. Therefore, impacts on vessel traffic from activities associated with Alternative A will be negligible. With implementation of mitigation measures and appropriate FAA review and approvals regarding obstruction to navigation and radar, BOEM anticipates that impacts on navigation and/or radar from the placement of a meteorological tower and buoys will be minor. Mitigation measures such as FAA and USCG-approved lighting and marking of the tower and buoys will reduce the potential for a collision. Therefore, BOEM anticipates the likelihood of impacts on navigation and vessel traffic (private, commercial, military) from non-routine events will be minor.

BOEM's consultation with DoD on Alternative A resulted in DoD requesting that OCS lease block 6074 be removed from consideration due to a military use conflict with DoD activities

regarding flight safety. Therefore, installing a meteorological tower in OCS lease block 6074 will result in moderate impacts on military use areas.

3.3 Alternative B – Additional Seasonal Restrictions

3.3.1 Summary of Alternative B

Several species of large whales migrate from their feeding grounds of the northern latitudes of northeastern U.S. and Canada to calving and nursing latitudes in the southeastern US. In particular, the North Atlantic right whale migrates through and resides in the proposed action area during late fall through mid-spring (Waring, et al., 2012). Compared to Alternative A, Alternative B tightens restrictions of the allowed proposed activity starting November 1 and lasting through April 30 of the following year. Alternative B states: Due to the sensitivity of the North Atlantic right whale to anthropogenic noise and the proximity of the lease blocks to critical calving ground habitats (see Figure 3-1), Alternative B prohibits all construction activities, along with HRG and geotechnical surveys and decommissioning activities from November 1 to April 30. In addition, Alternative B includes SOCs required under Altenative A (excluding SOCs that are less restrictive than the requirements of Alternative B) as lease stipulations (see Appendix A).

3.3.2 Effects of the Alternative

Alternative B will not increase total potential impacts to air quality, water quality, coastal habitats, and benthic habitats from that described in Alternative A. Socioeconomic impacts will also be similar to those found in Alternative A. Impacts will be similar but less than those under the Proposed Action. Impacts to resources are discussed below.

3.3.2.1 Physical and Biological Resources

Air Quality: Section 3.2.1.1, which describes the reasonably foreseeable impacts of Alternative A on air quality, states that due to the distance from shore, neither routine activities nor non-routine events within the proposed lease area will impact onshore air quality. Similarly, Section 3.2.1.1 states that the amount of additional vessel traffic associated with Alternative A will not significantly affect onshore air quality in any of the potentially affected states.

Under Alternative B, the total annual impacts to air quality will be unchanged from that described under Alternative A. However, Alternative B will narrow the window of time to complete construction and site characterization activities. Under Alternative A the lessee will have six months to conduct site surveys and preparation for six months of construction phase. Under Alternative B the lessee will have to conduct site surveys and the finish the construction phase all within a six month window. Impacts to air quality are expected to minor under Alternative B.

Water Quality: Section 3.2.1.2, which describes the reasonably foreseeable impacts of Alternative A on water quality, states that impacts to coastal and marine waters from routine activities associated with Alternative A, if detectible, will be of short duration and remain minimal. Should an oil spill occur, the localized impact on water quality will be negligible; diesel is light and will become dispersed, evaporate, and biodegrade within a few days. Since collisions occur infrequently, the potential impacts to water quality associated with Alternative A are not expected

to be significant. Similar to impacts to air quality, under Alternative B the total annual impacts to water quality will be unchanged from that described under Alternative A. However, Alternative B narrows the window of time to complete construction and site characterization activities. Under Alternative A the lessee will have 12 months to conduct site characterization surveys and six months during each year for construction or decommissioning phase. Under Alternative B the lessee will have to conduct site characterization surveys and the construction and decommissioning phases all within a 6-month window in each year. Similarly, impacts to coastal and marine waters from routine and non-routine events associated with Alternative B, if detectible, will be of short duration and remain negligible.

Coastal Habitats: Section 3.2.2.1, which describes the reasonably foreseeable impacts of Alternative A on coastal habitats, states that no direct impacts on coastal habitats will occur from routine activities as a result of Alternative A due to the distance of the proposed area from shore and the use of heavily-trafficked vessel routes and existing port facilities. Indirect impacts from routine activities may occur from wake erosion and associated added sediment caused by increased vessel traffic in support of Alternative A, but in light of the amount of existing vessel traffic in the waterway and the negligible increase in traffic in the waterway associated with Alternative A, these impacts will be negligible, if detectible. Under Alternative B, the total traffic to and from coastal areas (i.e. port) remains unchanged from that described in Alternative A. However, BOEM is restricting the period during which certain activities can take place.

Marine Mammals: Alternative B reduces the likelihood of strikes associated with vessels that are engaged in site characterization and site assessment activities during the winter. Alternative B also reduces the likelihood that marine mammals would suffer potential acoustic disturbances from vessel operation, HRG survey activity, and meteorological tower construction during winter. Other cetacean species that may venture into the proposed area, such as bottlenose dolphin and humpback whales, also will benefit from a winter seasonal prohibition in the proposed area.

However, Alternative B presents marginal additional protection for whales for two reasons. One reason is BOEM's mandatory SOCs detailed in Appendix A (particularly the exclusion zone). The second is that while Alternative B will reduce impacts over winter months, seasonal restrictions will do little to reduce overall annual vessel activity, but merely compress it into more favorable seasonal operating conditions. Thus, BOEM does not anticipate this alternative would greatly impair lessee activities, as most survey and construction activities are expected to occur in the summer when the weather is most favorable. It is therefore unlikely that Alternative B would have substantially different consequences to right whales and marine mammals than would Alternative A.

Sea Turtles: The winter prohibition narrows the window of activity in and around the proposed area, concentrating activities that would have been performed in the winter into spring, summer, and fall. Sea turtle occurrence in the proposed area is greatest in the summer season. Thus, sea turtles will not benefit from the winter prohibition. BOEM does not anticipate that much survey work would be conducted during the winter as allowed for under Alternative A. Given BOEM's mandatory SOCs detailed in Appendix A (particularly the exclusion zone), it is doubtful that Alternative B concentration of work into the early spring, summer and early fall will greatly increase the effects of Alternative A to sea turtles. The majority of vessel traffic is associated with surveys, which will be conducted in the spring and early summer months. When compared to

increase in recreational vessels during this time period, survey vessel traffic will have minor impact on sea turtles.

Birds: It is not expected that Alternative B will significantly increase the potential impacts the piping plovers or roseate terns. They are present in the proposed area September to April. By early April, both species have migrated north back to their breeding grounds in the Mid- Atlantic and New England where they remain close to shore to feed and provision for their offspring. At the end of the breeding season (August-September), individuals aggregate near shore before migrating southward to the South Atlantic and Caribbean by mid-September. Since these birds migrate south to and near the proposed area for the winter, a winter prohibition decreases the exposure of birds to vessels and activity associated with the proposed action. Since most bird activity is restricted to nearshore waters, the activity associated with the proposed activities is not likely to impact these species.

Bats: Section 3.2.2.6, which describes the reasonably foreseeable impacts of Alternative A on bats, states that, while it is unlikely that bat species will be foraging or migrating through the proposed area, these mammals may on occasion be driven to the project area by prevailing winds and weather. The only potential impact to bats presented by Alternative A will be the possibility that bats blown into the project area could possibly collide with vessels, a meteorological tower or buoy. It is not expected that Alternative A will have any measurable impact on bats. Since bat impacts do not have a seasonal component related to construction and survey activity, it is not expected to impact bats in any case; BOEM does not anticipate that there will be any difference in the impacts to bats between Alternative B and Alternative A.

Benthic Resources: Section 3.2.2.2, which describes the reasonably foreseeable impacts of Alternative A on benthic habitat, states that it is unlikely Alternative A will result in significant impacts. Alternative A has a time-area restriction of pile-driving from November 1 – April 30. Construction activity will be limited to a seasonal phase when motile invertebrates are the most active and have the capability to leave a disturbed area. Surveys conducted prior to the proposed activity will indicate any potential benthic resources that will need to be avoided. Alternative B restricts the same construction activity to spring, summer, and early fall. As a result it is unlikely there will be an increase in impacts to benthic habitat as a result of Alternative B.

Fish and Essential Fish Habitat (EFH): Section 3.2.2.7, which describes the reasonably foreseeable impacts of Alternative A on fish and EFH, states that the activities associated with Alternative A and the potential effects of HRG survey noise on marine fish are generally expected to be limited to avoidance around the HRG survey activities, short-term changes in behavior, and limited and temporary loss of habitat from the installation of meteorological towers and buoys. Thus, potential population-level impact on fish for HRG surveys is not anticipated. Sub-bottom sampling, construction of meteorological towers, and the installation of meteorological buoys could affect local benthic habitats. The seabed disturbance footprint of sub-bottom sampling will be small; it is expected that this activity will have negligible effects on benthic habitat, and that this disturbance will have a negligible, if detectible, impact on federally-managed fish species that may occur in the proposed area. Impacts related to meteorological towers/buoys installation and decommissioning is expected to be minor and not expected to result in changes in local community assemblage and diversity.

Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. The entanglement in, or ingestion of, OCS-related trash and debris by fish are not be expected during normal operations. Impacts to fish and their habitat from the discharge of waste materials or the accidental release of fuels are expected to be minor. However, all wastes generated during the project will be held on board the vessels and discharged at an approved onshore disposal facility. No wastes will be discharged or disposed of overboard in state or federal waters off the Georgia coast during any phase of the proposed project.

The impacts to fish and EFH are not expected to differ much from Alternative A in the case of migratory fish. Impacts to the biological benthic resources are discussed in the preceding section. Migratory fish tend to be warm water migrants along the Atlantic coast. This means they will be moving into the proposed area in the late spring through early summer. Thus they will not benefit from a winter prohibition on activity as they will likely be located in warmer southern waters including the Gulf of Mexico and the Caribbean during the winter prohibition period. These species are fast swimmers; they are expected to quickly flee an area that is being disturbed through site characterization surveys and construction/installation of meteorological platforms. So, although the chance of exposure to disturbing impacts to migratory fish are more concentrated under Alternative B than Alternative A, the actual impacts to these species is not expected to differ substantially from those associated with Alternative A.

3.3.2.2 Socioeconomic Conditions

Cultural Resources: Section 3.2.3.1, which describes the reasonably foreseeable impacts of Alternative A on cultural resources, states that the location of the tower and the buoys could impact the cultural resources. However, the Programmatic Agreement states that if cultural resources were found in the proposed area, BOEM will require the lessee to avoid adverse impacts to historical properties. Alternative B does not increase the proposed activity but it does concentrate the activity to May through October. This concentration of activity is unlikely to change the impacts to cultural resources.

Commercial and Recreational Fishing Activities: Section 3.2.3.2, which describes the reasonably foreseeable impacts of Alternative A on commercial and recreational fishing activities, states that the increase in vessel traffic, and activities from the installation/operation of the meteorological towers and buoys will not measurably impact commercial or recreational fishing activities, total catch of fish and shellfish, or navigation. Any impacts, such as fishing displacement and target species availability, will be of short duration, limited in area, and temporary.

Although commercial and recreational fishing occur year-round, the bulk of activity occurs in the summer months. Thus, although a winter prohibition may slightly benefit some winter fisheries; most fishing activity will not accrue any benefit from Alternative B. The concentration of activity to the spring, summer, and fall may slightly increase the vessel traffic in areas fished and transited by commercial and recreational fishing vessels. However, as explained under Alternative A, these impacts are expected to be of short duration within a limited area. Thus the overall impacts from Alternative B in comparison to Alternative A are not expected to be

significantly different. Because proposed area is located near bottom structure, hard bottom and artificial reefs, the presence of the tower could add to the total area of fishing locations.

Recreational Resources: Section 3.2.3.3, which describes the reasonably foreseeable impacts of Alternative A on recreational resources, states that, due to the distance of the proposed lease areas from shore and the fact that that no new coastal infrastructure is proposed, no impacts to coastal recreational resources from meteorological towers or buoys and spills within the proposed area are expected. Section 3.2.3.3 also stated that the increase in vessel traffic associated with Alternative A will not significantly affect recreation in the coastal areas or oceans outside any of the potentially affected states.

Although Alternative B would restrict activity to a period of higher tourism along the Georgia coast, the impacts are not expected to differ from those under Alternative A. The vessel traffic from the proposed action will be negligible when compared to recreational traffic; thus, the impacts to recreational resources under Alternative B are not expected to be greater or less than the impacts expected under Alternative A.

Visual Impacts: Under Alternative B, the location of the meteorological tower and/or buoys is not anticipated to be different than Alternative A. Thus, the Tybee Island beaches and Tybee Pier could be minimally impacted under Alternative B if the tower is placed in Block 6074.

Demographics: Section 3.2.3.4, which describes the reasonably foreseeable impacts of Alternative A on demographics, states that, due to the magnitude, dispersed nature, and short duration of survey, construction, and decommissioning activities, any benefit to local economies or employment will be minor and temporary. Also, these activities are not expected to employ many workers relative to the existing employment numbers. There is no perceptible seasonal component to affected demographic groups from site characterization surveys and construction/installation of meteorological towers/buoys. Thus, the impacts to demographics from Alternative B do not differ from those discussed in Alternative A.

Environmental Justice: Section 3.2.3.5, which describes the reasonably foreseeable impacts of Alternative A related to environmental justice issues, stated that Alternative A will have no impacts on the environmental or health-related conditions of minority or low-income populations. Only the use of existing coastal facilities has the potential to impact minority or low-income populations. No expansion of these existing onshore areas is anticipated to support Alternative A or Alternative B, and significant increases in activity at these existing facilities is not anticipated as a result of either Alternative A or Alternative B. Like Alternative A, Alternative B is not expected to have disproportionately high or adverse environmental or health effects on minority or low-income populations.

Other Uses of the OCS: Section 3.2.3.6, which describes the reasonably foreseeable impacts of Alternative A on other uses of the OCS, stated that minor direct impacts on vessel traffic density and patterns will occur from routine activities associated with Alternative A.

Under Alternative B impacts to other uses of the OCS are not expected to differ from that described in Alternative A. Military and marine transportation uses of the OCS occur year round. Restricting site characterization surveys and construction/installation of meteorological

towers/buoys to the spring, summer, and fall will not alter the impacts that are given in Alternative A as the activities are not heavily influence by seasonality and slight increases or decreases of activities therein.

3.3.3 Summary/Conclusion

Alternative B is likely to reduce the risk of vessel strikes to North Atlantic right whales and other marine mammals in and around the proposed area only marginally compared to Alternative A. Other resources that have a seasonal component that might be affected by site characterization surveys and/or meteorological tower/buoy construction/installation may have slightly positive to slightly negative impacts depending on the specific resource. As a whole, it is not anticipated that the impacts are substantially different between Alternatives A and B for resources other than the North Atlantic right whale, and other cetaceans. Since Alternative B narrows the window of time to complete construction and site characterization activities and additional biological surveys, there would be slightly greater impacts on air and water quality and slightly less to coastal habitats than under Alternative A.

3.4 Alternative C (Preferred Alternative) – Removal of OCS Block 6074 from Leasing Consideration

3.4.1 Summary of the Alternative

Under Alternative C, the preferred alternative, the site assessment and site characterization activities are restricted to OCS Blocks 6126 and 6174, located furthest from shore. No lease would be granted for OCS Block 6074 at this time. The Department of Defense has determined that military use conflicts exist in OCS Block 6074. Due to this concern, Alternative C restricts the site assessment and site characterization activities to OCS Blocks 6126 and 6174, located furthest from shore. Block 6074 the closest to shore is removed from contention as a leased block.

As with Alternative A, BOEM anticipates Alternative C will still result in the installation of a single meteorological tower and/or two meteorological buoys within the Alternative C proposed area. BOEM anticipates a limited reduction in vessel traffic. Vessel traffic for Alternative C will be a reduction of those trips needed to conduct site surveys for one lease block. This reduction amounts to approximately 11 trips, plus any additional trips needed for sub-bottom sampling (See Section 2.1.1.7). The reduction in vessel trips for Alternative C also results in a slight reduction (0.1 tons) in air emissions compared to Alternative A.

Although tower construction under Alternative C is the same as for Alternative A, the exclusion of OCS Block 6074, which is within 5-6 NM (9-11 km) of the shoreline, results in a tower being constructed farther from the Georgia shoreline. Even though a viewer could theoretically see a tower 17.4 NM (32 km) from the shoreline during the daytime under clear, sunny conditions (see Section 3.2.3.3), BOEM anticipates the average viewer under normal conditions (i.e., with some haze) would not be able to discern the structure at lease Blocks 6126 and 6174. Nighttime views of a tower from the shoreline also will be more difficult under Alternative C compared to Alternative A because the tower will be located farther from the shoreline as a result of the extent and location of the excluded OCS Block 6074. By removing the

closest lease block to the shoreline, any visual impacts from Alternative C are expected to be reduced from the minor anticipated impacts under Alternative A.

3.4.2 Conclusion

The impacts associated with Alternative C are to reduce the number of vessel trips and increase the distance from shore associated with the tower in the proposed action. By reducing the number of vessel trips BOEM anticipates a decrease in species and vessel interaction, reduction in air emissions, and decreased impact on recreational resources when compared to Alternative A. By increasing the distance from shore, BOEM anticipates a reduction in the negligible visual impact of the tower during the day time and from flashing lights during the night time. Impacts from Alternative C will be minimally less than impacts from Alternative A.

3.5 Alternative D – No Action

3.5.1 Summary of the Alternative

Under the No Action Alternative, no lease is issued and there is no approval of site assessment activities within the proposed area offshore of the Georgia coast granted at this time. Opportunities for the collection of meteorological and oceanographic data offshore Georgia will not occur or will be postponed. Site characterization surveys, including the collection of biological data, also will not likely occur. Therefore, the potential environmental and socioeconomic impacts described in Section 3.2 of this EA will not occur or will be postponed.

3.5.2 Conclusion

Under Alternative D, there will be no action taken and as a result, there will be no impacts when compared to Alternative A.

3.6 Cumulative Impacts

Cumulative impacts are the impacts on the environment that result from the incremental impacts of the proposed action (Alternative A) when added to other past, present, and reasonably foreseeable future actions, regardless of what agency, industry, or person undertakes the other actions (40 CFR 1508.7, Jul. 01, 2010). Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a given period. Cumulative effects are those that are reasonably certain to occur within the area of coverage of the federal action. This discussion of cumulative effects considers past and current activities (the baseline), as well as future government and private commercial activities.

The following section summarizes the cumulative impacts on both on- and offshore areas over the five-year life of the proposed action, focusing on the incremental impact of Alternative A when added to other current and reasonably foreseeable future actions. The proposed action includes the following potential impact-producing factors: discharges; bottom disturbance during surveying, anchoring, and structure placement; disturbance and collision risk from an increase in vessel traffic; and disturbance, space-use conflicts, and collision risk due to the presence of a meteorological tower.

3.6.1 Onshore Cumulative Impacts

Onshore impacts resulting from Alternative A that were considered include those related to tower and buoy fabrication, staging, and loading and launching support vessels involved in the installation, operation, and decommissioning activities. Impact-producing factors include acoustic disturbances from vessels, vessel traffic, trash and debris, operational discharges from vessels, and fuel spills. The primary impact producing factor is vessel traffic.

As discussed in Section 2.1, it is anticipated that Port Wentworth and the Port of Savannah will be used by vessels supporting the proposed action. The Port of Savannah is ranked eighth among US ports in the number of oceangoing vessel calls (vessel stops) in 2011 for commercial vessels including tankers, container ships and carriers (USDOT, MARAD, 2013), and the surrounding area has numerous marinas, harbors and docks for both commercial and recreational fishing vessels.

According to the USACE's Navigation Data Center, the Port of Savannah vessel traffic consisted of 8,648 domestic and foreign vessel stops in 2011. These vessel stops included 4,214 shipments received and 4,334 shipments sent out of the Port of Savannah. Compared to other Eastern US ports in terms of activity, it is similar to Charleston, South Carolina (approximately 8,500 vessels) (USACE, NDC, 2013).

The number of vessel trips estimated for a five year period under the proposed action is at a maximum of 511 roundtrips: 340 trips for a meteorological tower and 138 trips for up to two buoys for construction, O&M, and decommissioning activities, and 33 trips for geotechnical surveys. Over that same period, a total of 43,240 vessel calls (vessel stops) are expected at the Port of Savannah. Thus, the incremental impact of the proposed action would contribute an additional 1 percent of vessel traffic. Additionally, the Savannah Harbor Expansion Project (STEM) may potentially result in a two-fold increase in vessel traffic, further reducing the incremental impact of the proposed action.

Thus, BOEM has determined that cumulative, incremental impacts to coastal habitats and the economy from vessel traffic and related onshore activities associated with meteorological tower and buoy transport, installation, operation and maintenance, and decommissioning as proposed under Alternative A are expected to be negligible, if detectable.

3.6.2 Offshore Cumulative Impacts

The following impact-producing factors were examined in Section 3 — active acoustic sources, vessel and equipment noise, shipping and marine traffic, trash and debris, seafloor disturbances, and accidental fuel spills. Of the activities that will occur offshore Georgia during the five-year lease term of the proposed action, the chief impact-producing activity is vessel traffic. For example, one of the primary threats to the North Atlantic right whale and sea turtles is collisions with vessels (ship strikes). Mitigation measures described in SOCs (Appendix A) will limit impacts of the other impact producing factors to a negligible level.

With the exception of other renewable energy activities, the past, present, and reasonably foreseeable future actions discussed in this section are not unique to the proposed area of coverage of the proposed action. Migratory species that may be impacted by Alternative A will also

experience impacts from other actions outside the proposed area. Sections 3.2.2.3 (Marine Mammals), 3.2.2.4 (Sea Turtles) and 3.2.2.5 (Birds) discuss cumulative impacts of the proposed action specific to those species.

Considering both the mitigation measures described in the SOCs (Appendix A) for transits and operations and the slow vessel-operating speeds required, BOEM has determined vessels used for site surveys and site characterizations are unlikely to strike any migratory marine mammals or sea turtles. In addition, protected species observers will monitor waters surrounding survey vessels for the presence of marine mammals and sea turtles. The risk of vessel strikes for marine mammals and sea turtles is also expected to be low because survey vessels towing active acoustic sound sources travel at slow speeds (USDOI, BOEM, 2012c).

During transit to and from shore bases, survey vessels are expected to travel at greater speeds. However, these vessel movements will be subject to BOEM guidance for vessel strike avoidance and will be required to comply with the Right Whale Ship Strike Reduction Rule. BOEM has determined that the cumulative impact of Alternative A to marine mammals and sea turtles, if detectible, will be negligible.

Florida manatees are vulnerable to vessel collisions. However, because of their preference for shallow coastal and inland waters, it is unlikely that manatees will be present in the vicinity of survey and site assessment vessels operating in the proposed lease area. Taking into account the mitigation described in the SOCs, the slow transit and operation speeds, and the low level of manatee occurrence in the proposed lease area, the cumulative impacts of vessel strikes on manatees resulting from Alternative A are expected to be negligible, if detectible (USDOI, BOEM, 2012c).

3.6.3 Climate Change

The temperature of the earth's atmosphere is regulated by a balance between the radiation received from the sun, reradiation from the earth's surface and clouds, and the amount of radiation absorbed by the earth and atmosphere. Greenhouse gases (GHG) result in the earth's surface being warmer than it would be otherwise because they absorb infrared radiation from the earth and radiate this energy back down to the surface.

Regionally, the US Global Change Research Program predicts the following long-term changes for the southeastern US: increased shoreline erosion from a combination of sea-level rise and increased hurricane intensity; a decline in wetland-dependent fish and shellfish populations; heat-related stresses for all biota; decreased fresh water availability; major changes in ecosystem structure and function and in ecosystem interactions; and shifts in the geographical ranges of many species (USDOI, BOEM, 2014).

Increasing concentrations of GHG will occur during surveying and site assessment activities, including the installation, operation, and removal of meteorological buoys and/or tower. In general, while it can be assumed that the GHG emissions associated with Alternative A contribute to the phenomenon of climate change, these contributions are so small compared to the aggregate global emissions of GHGs that they cannot be deemed significant, if their impact could even be detected. The additional maximum 511 vessel trips over the proposed five-year lease period of

Alternative A will have a negligible incremental contribution to existing GHG emissions. Therefore, the proposed action will have an exceedingly minor cumulative impact on the environment via contributions to climate change (USDOI, BOEM, 2012e).

For marine mammals, the main cumulative impacts from increased GHG will likely be changes in prey distribution, which could possibly influence migratory routes and timing, and changes in their geographical range. Overlaying the sighting distribution of right whale calving habitat with OCS sea surface temperatures suggests the warm Gulf Stream waters may represent a thermal indicator for right whales because within the area westward of the Gulf Stream, sea surface temperature and bathymetry appear to greatly influence whale distribution. Additionally, climate-driven changes in North Atlantic major currents (the North Atlantic Oscillation, the Gulf Stream, and the Southern Oscillation) indicate all three atmospheric cycles can be correlated with right whale reproduction rates (USDOI, BOEM, 2014).

These preceding observations suggest the North Atlantic right whale habitat is likely vulnerable to climate change. Although there is little direct information on other species, impacts to other marine mammals will also likely be related to changes in prey, and suitable habitat availability. By their nature, climate changes are very small on an annual basis. Thus, although climate change may adversely affect listed marine mammals in the proposed lease area over the long term, during the five-year period of the proposed action these changes are likely to be small, incremental, and difficult to discern from effects of other natural and anthropogenic factors (USDOI, BOEM, 2014).

In general, while it can be assumed that the GHG emissions associated with Alternative A contribute to the phenomenon of climate change, these contributions are so small compared to the aggregate global emissions of GHGs that they cannot be deemed significant, if their impact could even be detected. The additional 511 vessel trips over the proposed 5 year lease period anticipated with Alternative A will have a negligible incremental contribution to existing GHG emissions, and therefore, will have a negligible cumulative impact on the environment via contributions to climate change.

3.6.4 Conclusion

The cumulative impacts on the affected environment in this EA includes consideration of past, present, and reasonably foreseeable human-induced impacts. The incremental contribution of the proposed action and alternatives to other past, present, and reasonably foreseeable actions that may affect the environment will be negligible.

The major cumulative impact-producing factor affecting both onshore and offshore environments is the incremental increase in vessel traffic related to Alternative A. Onshore cumulative impacts to coastal habitat and the economy from increased vessel traffic will be negligible, if detectible. Offshore cumulative impacts from vessel strikes on marine mammals, sea turtles, and manatees will also be negligible, if detectible. The cumulative impacts of Alternative A on climate change also result from GHG emissions from increased vessel traffic. This incremental increase in GHG emissions is exceedingly minor compared to existing levels of GHG emissions. Thus, the cumulative impact of Alternative A to climate change will be negligible, if detectible.

This page left blank intentionally.

4. CONSULTATION AND COORDINATION

4.1 Public Involvement

4.1.1 Notice of Intent

On December 14, 2012, BOEM published in the *Federal Register*, the Notice of Intent (NOI) to prepare an EA for the Interim Policy Leasing for Renewable Energy Data Collection Facility on the Outer Continental Shelf off the Coast of Georgia (77 FR 74513, Dec. 14, 2012). Input on issues and alternatives to be analyzed in the EA were solicited. BOEM accepted comments until January 14, 2013. A total of twenty-one comments were received during the 30-day comment period. Many of the comments, including one submitted by the Marine Mammals Commission, raised concerns of the proposed activity's proximity to North Atlantic right whale calving grounds, effects of noise, possible vessel strikes, seasonal residency, migratory corridor, and current designated critical habitat and proposed expansion of the critical habitat of the North Atlantic right whale. The National Park Service submitted comments that raised concerns about the impact of nighttime lighting on night sky quality as a result of constructing a meteorological tower. Included in those concerns were light color which may disorient sea turtles and birds, strobe and flash lighting, and light intensity. Other issues identified to be analyzed included:

- analysis of the potential harmful effects of wind power generation on birds and other fauna that depend upon the offshore ecosystem;
- engaging the communities of Tybee Island, Savannah and Brunswick in a dialog about the BOEM process and offshore wind energy;
- requiring Southern Company to clarify its intent on the DCC;
- setting ship speed limits;
- defining BMPs for DCC construction;
- incorporating mitigation efforts in a lease agreement;
- requiring Southern Company to either clarify its intent for the DCC and choose a single contractor, or name multiple contractors;
- conducting full assessments for each of the OCS blocks for full deployment of both a meteorological tower (DCC) and a buoy (BDCC) in each block;
- improving stakeholder outreach;
- analyzing impacts of proposed actions on other endangered marine mammals; and
- analyzing the effect of the size of the boats necessary for construction on marine mammals.

The comments can be viewed at http://www.regulations.gov by searching for docket ID BOEM-2012-0074.

4.1.2 Notice of Availability

BOEM is making this EA available for public review. Comments on the EA will be solicited for 30 days following the publication of the Notice of Availability in the *Federal Register*.

4.2 Cooperating Agencies

Section 1500.5(b) of the CEQ implementing regulations (40 CFR 1500.5(b), Nov. 29, 1978) encourages agency cooperation early in the NEPA process. A federal agency can be a lead, joint lead, or cooperating agency. A lead agency manages the NEPA process and is responsible for the preparation of an EA or EIS; a joint lead Agency shares these responsibilities; and a cooperating agency that has jurisdiction by law or special expertise with respect to any environmental issue shall participate in the NEPA process upon the request of the lead agency. The NOI included an invitation to other federal agencies and state, tribal, and local governments to consider becoming cooperating agencies in the preparation of this EA. Currently, USACE, USCG, the State of Georgia, the Georgia State Historic Preservation Office, and the Catawba Indian Nation are participating in the development and review of this EA.

4.3 Consultations

4.3.1 Endangered Species Act

On May 24, 2012, BOEM initiated consultation for site characterization (e.g. survey) activities for all of BOEM's program areas (oil and gas, marine minerals, and renewable energy) in the Mid- and South Atlantic Planning Areas. That consultation ended informally with USFWS concurrence on August 7, 2012, and formally on July 19, 2013, with a biological opinion from NMFS. While the NMFS consultation concluded the activity would not jeopardize the continued existence of any ESA-listed species, it did require several reasonable and prudent measures (RPMs) and included an incidental take statement (ITS) for ESA-listed marine mammals and sea turtles. Those measures are included in the SOCs in Appendix A.

For activities not previously consulted upon, primarily meteorological tower construction, BOEM requested technical assistance from the NMFS and FWS on June 12, 2013. The resulting regional biological assessment (BA) was sent to the consulting agencies on February 12, 2014. The BA prepared by BOEM for the consultations, concludes that the proposed lease issuance, associated site characterization, and subsequent site assessment activities are expected to be discountable and insignificant and, thus, not likely to adversely affect ESA-listed bats, birds, and fish. On March 17, 2014, the FWS concurred with BOEM's determination that the activities described in the BA will not likely adversely affect the Bermuda petrel, black capped petrel, Kirkland's warbler, roseate tern, piping plover, and red knot. For the West Indian manatee and piping plover critical habitat, the FWS concurred with BOEM's determination of no effect. BOEM anticipates that temporary adverse impacts equivalent to Level B harassment from noise will affect ESA-listed marine mammals and sea turtles during HRG survey and pile driving activity. Potential adverse impacts are greatly reduced when activities are implemented according to the SOCs outlined in this assessment (see Appendix A). These requirements will be included as a condition on any leases and/or SAPs issued or approved under this decision.

4.3.2 Magnuson-Stevens Fishery Conservation and Management Act

Pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act, Federal agencies are required to consult with the NMFS on any action that may result in adverse effects on EFH. NMFS regulations implementing the EFH provisions of the Magnuson-

Stevens Fishery Conservation and Management Act can be found at 50 CFR 600. Certain OCS activities authorized by BOEM may result in adverse effects on EFH and, therefore, require consultation with the NMFS. Concurrent with this EA BOEM will consult with NMFS regarding the impacts of the proposed action on EFH. BOEM has determined that the proposed action will not significantly affect the quality and quantity of EFH in the action area. There are no EFH HAPCs in the proposed lease area.

4.3.3 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) requires that federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be "consistent to the maximum extent practicable" with relevant enforceable policies of a state's federally approved coastal management program (15 CFR 930 Subpart C). If an activity will have direct, indirect, or cumulative effects, the activity is subject to a federal consistency determination. BOEM will perform a consistency review and prepare a Consistency Determination (CD) for the State of Georgia.

The CD will be prepared under 15 CFR 930.36(a) to determine whether issuing a lease, conducting geotechnical and shallow hazards surveys, and constructing and installing a meteorological tower and/or up to two buoys offshore of Georgia is consistent, to the maximum extent practicable, with enforceable provisions identified by the Coastal Management Program of the State of Georgia. The EA provides the comprehensive data and information required under 30 CFR 939.39 to support BOEM's CD. When Georgia receives the CD, they will have 60 days to review it. Additionally, Georgia has 14 days after receiving the CD to identify any missing information required by 930.39(a) and notify BOEM.

4.3.4 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. 470f), and its implementing regulations (36 CFR Part 800, Jul. 1, 2004) require federal agencies to consider the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. BOEM has determined that the issuance of an interim policy lease and approval of a SAP has the potential to cause effects on historic properties insofar as it may lead to the lessee conducting geotechnical testing and constructing and operating site assessment facilities.

In December 2012, BOEM identified and initiated a request for NHPA Section 106 consultation through correspondence with the appropriate State Historic Preservation Office (SHPO) and potentially affected federally-recognized tribes, local governments, and other individuals and organizations with a potential interest in the undertaking to obtain further information and to learn their concerns regarding the proposed undertakings' potential effects on historic properties. The entities contacted by BOEM are listed in Table 4-1.

Table 4-1
Entities Solicited for Information and Concerns Regarding Historic Properties

Consulting Party Type	Organization	
Advisory Council on Historic Preservation	Advisory Council on Historic Preservation	
Federally Recognized Tribal Governments	Catawba Indian Nation	
	Miccosukee Tribe of Indians of Florida	
	Seminole Tribe of Florida	
Other Governments and Entities	Beaufort County	City of Tybee Island
	Blackbeard Island National Wildlife Refuge	Cumberland Island National Seashore
	Bryan County	Fort Sumter National Monument
	Camden County	Garden City
	Charleston County	Georgia State Parks & Historic Sites
	Charlton County	Glynn County
	Chatham County	Jasper County
	City of Brunswick	Jekyll Island Authority
	City of Charleston	Liberty County
	City of Darien	McIntosh County
	City of Kingsland	Savannah
	City of Port Wentworth	Town of Hilton Head Island
	City of Richmond Hill	Town of Mount Pleasant
	City of St. Marys	Wassaw National Wildlife Refuge
	City of Thunderbolt	
Other Tribal Governments	Beaver Creek Indians	Santee Indian Tribe
	Chaloklowa Chickasaw Indian People	Sumter Band of Cheraw Indians
	Chicora Indian Tribe of South Carolina	The Cherokee of Georgia Tribal Council
	Edisto Indian Organization	The Georgia Tribe of Eastern Cherokee
	Pee Dee Indian Nation of Upper South Carolina	The Lower Muscogee Creek Tribe
	Pee Dee Indian Tribe of South Carolina	The United Creeks of Georgia
	Piedmont American Indian Association	Waccamaw Indian People
State Historic Preservation Office (SHPO)	Georgia Department of Natural Resources; Historic Preservation Division	
	Deputy State Archaeologist - Underwater	

Under the PA, the proposed construction and operation of meteorological towers and the installation of meteorological buoys are exempted from Section 106 review when the results of geophysical data collected meet the standards established in BOEM's *Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 585* and either 1) resulted in the identification of no archaeological sites within the seabed portion of the Area of Potential Effects for the tower and/or buoy, or 2) if the project Area of Potential Effects can be relocated to an area that does not contain an archaeological site, if any such sites are identified during geophysical survey. The signatories to the PA agreed that offshore meteorological towers and buoys have no effect on onshore historic properties since they are temporary in nature and indistinguishable from lighted vessel traffic.

On January 8, 2013, March 4, 2013, and May 8, 2013, BOEM held Section 106 consultation meetings and webinars to discuss the proposed undertaking and BOEM's intention to prepare a PA. BOEM and the signatories developed multiple drafts of the PA and discussed changes, prepared revised drafts, and on May 28, 2013 BOEM circulated a final version for signing. The PA was executed on June 26, 2013. BOEM intends to use NEPA public involvement and outreach opportunities to fulfill its public involvement requirements under the NHPA. BOEM's fulfillment of the stipulations under the PA constitutes completion of the Section 106 review process under the NHPA.

This page left blank intentionally.

5. REFERENCES

Abdel-Rahman, S. (2002). Vibration associated with pile driving and its effects on nearby historical structures. *IMAC-XX: Conference & Exposition on Structural Dynamics. Society for Experimental Mechanics, Inc.* Retrieved December 3, 2013, from http://sem-proceedings.com/20i/sem.org-IMAC-XX-Conf-S37P04-Vibration-Associated-with-Pile-Driving-its-Effects-Nearby-Historical.pdf

Allison, T., Jedrey, E., Perkins, S., & Massachusetts Audobon Society. (2008). Avian Issues for Offshore Wind Development. *Marine Technology Society Journal, 42*(2), 28-38.

Australian Maritime Systems. (2013). Retrieved from Aids to Navigation: Buoys & Mooring Systems: http://www.marsys.com.au/index.php?option=com_content&view=category&layout=blog&id=14&Itemid=14

Bailey, H., Senior, B., Simmons, D., Rusin, J., Picken, G., & Thompson, P. (2010). Assessing underwater noise levels during pile-driving at an offshore windfarm. *Marine Pollution Bulletin, 60*, 888-897.

Barans, C. A., & Henry, Jr., V. J. (1984). A Description of the Shelf Edge Groundfish Habitat along the Southeastern United States. *Northeast Gulf Science, 7*, 77-96.

BOEMRE. (2011c). *Incident Statistics and Summaries 1996-2011. OCS Incidents/Spills by Category*. TIMS Database as of 16-February-2011. Retrieved May 3, 2012, from http://www.boemre.gov/incidents/IncidentStatisticsSummaries.htm

Butman, C. A. (1987). Larval Settlement of Soft-Sediment Invertebrates: The Spatial Scales Explained by Active Habitat Selection and the Emerging Role of Hydrodynamical Processes. *Oceanography and Marine Biology Annual Review, 25*, 113-165.

Caltrans. (2009). *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish, Appendix 1: Compendium of Pile Driving Sound Data. Prepared by: ICF Jones & Stokes and Illingworth & Rodkin, Inc.* Retrieved December 3, 2013, from http://www.dot.ca.gov/hq/env/bio/files/Guidance_Manual_2_09.pdf

Cape Wind Associates, LLC. (2012). *Project Construction*. Retrieved April 20, 2012, from http://www.capewind.org/article20.htm.

Center for Natural Areas. (1979). *A Summary and Analysis of Environmental Information on the Continental Shelf and Blake Plateau from Cape Hatteras to Cape Canaveral (1977)* (Vol. 1). South Gardiner, Maine: Prepared for the Bureau of Land Management under Contract Number AA 550-C17-39.

Chatham County GA, P. a. (2013). *Tybee Pier and Pavilion*. Retrieved August 12, 2013, from http://parks.chathamcounty.org/Parks/BoatRampsandFishingPiers/TybeeIslandFishingPierandPavilion.aspx

City of Tybee. (2012, June). *2012 New Resident Guide.* Retrieved August 7, 2013, from http://www.cityoftybee.org/Assets/Files/Better%20Hometown/NewResidentWelcomePacket.pdf

Continental Shelf Associates, Inc. (2004). *Geological and Geophysical Exploration for Mineral Resources on the Gulf of Mexico Outer Continental Shelf, Final Programmatic Environmental Assessment.* USDOI, MMS, Gulf of Mexico OCS Region. OCS EIS/EA MMS 2004-054. July 2004.

Cooksey, C. J., Hyland, J., Balthis, W. I., Scott, G., & Bearden, D. (2004). . Soft-bottom benthic assemblages and levels of contaminants in sediments and biota at Gray's Reef National Marine Sanctuary and Nearby Shelf Waters off the Coast of Georgia (2000 and 2001).

Cooksey, C., Harvey, J., Harwell, L., Hyland, J., & Summers, J. K. (2010). *Ecological Condition of Coastal Ocean and Estuarine Waters of the U.S. South Atlantic Bight: 2000 – 2004. NOAA Technical Memorandum NOS NCCOS 114, NOAA National Ocean Service, Charleston, SC 29412-9110; and EPA/600/R-10/046.* U.S. EPA, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division, Gulf Breeze FL.

Dept. of the Navy. (2009). *Jacksonville Range Complex Final Environmental Impact Statement/Overseas Environmental Impact Statement.* NAVFAC Atlantic, Dept. of the Navy, Norfolk, Virginia.

Deutsch, C. C.-S.-G. (2008). *Trichechus manatus. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. www.iucnredlist.org. Downloaded on 08 November 2013.*

Diaz, R. J., Cutter, J. G., & Hobbs, I. C. (2004). Potential Impacts of Sand Mining Offshore Maryland and Delaware: Part 2 – Biological Considerations. *Journal of Coastal Research, 20*(1), 61-69.

Dow Piniak W. E., S. A. Eckert, C. A. Harms, and E. M. Stringer. (2012). *Underwater hearing sensitivity of the leatherback sea turtle (Dermochelys coriacea): Assessing the potential effect of anthropogenic noise.* U.S. Dept. of the Interior, BOEM, Herndon, VA. OCS Study BOEM 2012-01156. September 2012.

Eckman, J. E. (1983). Hydrodynamic Processes Affecting Benthic Recruitment. *Limnology and Oceanography, 28,* 241-257.

Edgett-Baron, personal communication. (2012). *Federal Aviation Administration, Obstruction Evaluation Group, AWA/FAA.* E-mail correspondence with S. Richert (URS Group, Inc.). April 13, 2012.

ESS Group, Inc. (2006). *Conceptual Rock Armor Scour Protection Design, Cape Wind Project Nantucket Sound. Scour Analysis Proposed Offshore Wind Park.* Boston, Massachusetts: Prepared for Cape Wind Associates, L.L.C.

Fauchald, K., & Jumars, P. A. (1979). The Diet of Worms: a Study of Polychaete Feeding Guilds. *Marine Biology Annual Review*, 193-284.

Federal Register Vol 78. No 71. (2013). *Final National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges Incidental to the Normal Operation of a Vessel.*

Fishermen's Energy of New Jersey, LLC. (2011). *Project Plan for the Installation, Operation, and Maintenance of Buoy Based Environmental Monitoring Systems OCS Block 6931, New Jersey.* Herndon, VA: U.S. Department of Interior, BOEM, Regulation and Enforcement, Office of Offshore Alternative Energy Programs.

Frankenberg, D. (1971). The Dynamics of Benthic Communities off Georgia, USA. *Thalassia Jugoslavia, 7*, 49-55.

Frankenberg, D., & Leiper, A. S. (1977). Seasonal Cycles in Benthic Communities of the Georgia Continental Shelf. *Ecology of Marine Benthos*, 383-397.

Garrison, L. P. (2007). *NOAA Technical Memorandum NMFS-SEFSC-553, Defining the North Atlantic Right Whale Calving Habitat in the Southeastern, United States: An Application of a Habitat Model.* Miami, FL: U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, NOAA Fisheries.

GDED. (2013). *Sea Ports.* Retrieved August 7, 2013, from http://www.georgia.org/industries/logistics-services/Pages/sea-port.aspx

GDNR. (2001). *A Guide to Georgia's Offshore Artificial Reefs, including the Gray's Reef National Marine Sanctuary and U.S. Navy TACS Towers.* Brunswick, Georgia.

GDNR. (2013a). *About Outdoor Recreation in Georgia*. Retrieved August 6, 2013, from http://www.gadnr.org/recreation

GDNR. (2013b). Georgia's Commercial Saltwater Fishing Regulations. Retrieved August 7, 2013, from http://www.coastalgadnr.org/sites/uploads/crd/2013CommRegWeb.pdf

GDNR. (2013c). Georgia Sport Fishing 2013 Regulations. Retrieved August 9, 2013, from http://coastalgadnr.org/fb/rf/regs

GDNR. (2013d). *Sea Turtle Nest Monitoring System*. Retrieved September 16, 2013, from Sea Turtle Conservation Program: http://www.seaturtle.org/nestdb/index.shtml?view=3&year=2013

GDNR. (2013e). *Bald Eagle Recovery*. Retrieved August 13, 2013, from Georgia Dept. of Natural Resources Wildlife Resources Division; Bird Conservation: http://www.georgiawildlife.org/node/1318

GDNR. (2013f). *Anabat Project*. (W. R. Georgia Dept. of Natural Resources, Producer) Retrieved July 23, 2013, from Bat Conservation in Georgia: http://www.georgiawildlife.com/AnabatProject

GDNR, CRD. (2013). *A Guide to the Marine Fishes of Georgia*. Retrieved October 23, 2013, from http://www.marinefishesofgeorgia.org/

GDNR, EPD. (2000). Savannah River Basin Management Plan 2000. Retrieved September 22, 2013, from http://www.gaepd.org/Documents/savannah.htm

GDNR, EPD. (2012). *Georgia EPD PSD Permit Application Guidance Document.* Georgia Dept. of Natural Resources, Environmental Protection Division, Air Protection Branch. Retrieved October 8, 2013, from http://www.georgiaair.org/airpermit/downloads/sspp/psdresources/psd_guidance_document/epdnarrative09142912.pdf

GDNR, WRD. (2010, July 13). *Protected Birds of Georgia*. Retrieved October 20, 2013, from Georgia Department of Natural Resources, Wildlife Resources Division; Conservation: http://georgiawildlife.com/sites/default/files/uploads/wildlife/nongame/text/html/protected_species/Birds.html.

GDNR, WRD. (2013a). *Unlawful and Dangerous Operation: Marine Toilet Laws and Discharge of Oil and Other Hazardous Substances*. Retrieved August 16, 2013, from http://www.georgiawildlife.com/node/775

GDNR, WRD. (2013b). *Rare Mammal Species Profiles*. Retrieved from Georgia Department of Natural Resources, Wildlife Resources Division; Mammals: http://georgiawildlife.com/node/2625

GL Garrad Hassan. (2012). *Fino2*. Retrieved May 16, 2012, from http://www.fino2.de/fino2.php

GPA. (2012). Fiscal Year 2012 Annual Report (July 1 through June 30, 2012). Retrieved August 7, 2013, from http://www.gaports.com/corporate/AboutUs/AnnualReport.aspx

Gray, J. S. (1981). The Ecology of Marine Sediments. *Cambridge Studies in Modern Biology 2*, 185.

Hall, S. J. (1994). Physical Disturbance and Marine Benthic Communities: Life in Unconsolidated Sediments. *Oceanography Marine Biology Annual Review, 32*, 179-239.

Hyland, J., Cooksey, C., Balthis, W. I., Fulton, M., Bearden, D., Mcfall, G., & Kendall, M. (2006). The Soft-Bottom Macrobenthos of Gray's National Marine Sanctuary and Nearby Shelf Waters off the Coast of Georgia, USA. *Journal of Experimental Marine Biology and Ecology, 330*, 307-326.

Kenney, R. D. (1990). *Bottlenose Dolphins off the Northeastern United States., In: The Bottlenose.* San Diego: Academic Press Inc.

Kracker, L., Kendall, M., & McFall, G. (2008). Benthic features as a determinant for fish biomass in Gray's Reef National Marine Sanctuary. *Marine Geodesy, 31*, 267-280.

Kunz, T. H., E. B. Arnett, W. P. Erickson, A. R., Hoar, G. D. Johnson, R. P. Larkin, M. D. Strickland, R. W. Thresher, and M. D. Tuttle. (2007). Ecological Impacts of Wind Energy

Development on Bats: Questions, Research Needs, and Hypotheses. *Front Ecol Environ* 2007; 5(6): 315-324.

Laporte, C., & Alber, M. (2011). *Offshore Wind Energy: Considerations for Georgia.* Georgia Coastal Research Council, for the Georgia Department of Natural Resources, Coastal Resources Division.

McCauley, R. D, J. Fewtrell, A.J Duncan, C. Jenner, M-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch and K. McCabe. (2000). Marine seismic surveys – a study of environmental implications. *APPEA Journal 2000,* 692-708.

Michel, J., Dunagan, H., Boring, C., Healy, E., Evans, W., Dean, J., . . . Hain, J. (2007). *Worldwide Synthesis and Analysis of Existing Information Regarding Environmental Effects of Alternative Energy Uses on the Outer Continental Shelf.* Herndon, VA: U.S. Department of the Interior, Minerals Management Service.

Middendorp, P., & Verbeek, G. E. (2012). At the cutting edge of pile driving and pile testing. *The 9th International Conference on Testing and Design Methods for Deep Foundation.* Kanasawa. IS-Kanasawa 2012.

National Data Buoy Center. (2006). *Can You Describe Moored Buoys?* Retrieved May 3, 2012, from Center of Excellence in Marine Technology : http://www.ndbc.noaa.gov/hull.shtml

National Data Buoy Center. (2010a). *Buoy 41008 Average Wind Speed Climatic Summary Plots 1988-2008.* Retrieved December 9, 2013, from http://www.ndbc.noaa.gov/view_climplot.php?station=41008&meas=ws

National Data Buoy Center. (2010b). *Buoy 41008 Hourly Peak Wind Gust Climatic Summary Plots 1988-2008.* Retrieved December 9, 2013, from http://www.ndbc.noaa.gov/view_climplot.php?station=41008&meas=wg

National Geospatial-Intelligence Agency. (2013). GIS layer titled "Military Aviation Warning Areas". (B. a. USDOI, Compiler) Retrieved from http://csc.noaa.gov/mmcviewer

Nedwell, J., & Howell, D. (2004). *A Review of Offshore Windfarm Related Underwater Noise Sources. Report No. 544 R 0308.* Commissioned by COWRIE.

NERRS. (2013). *Sapelo Island, GA.* Retrieved August 6, 2013, from http://nerrs.noaa.gov/Reserve.aspx?ResID=SAP

NMFS, OST. (2012, August). Fisheries of the United States 2011: Current Fishery Statistics No. 2011. (A. Lowther, Ed., & C. David Van Voorheeds, Compiler) Silver Spring, Maryland: Fisheries Statistics Division. Retrieved August 7, 2013, from http://www.st.nmfs.noaa.gov/commercial-fisheries/fus/fus11/index

NMFS, OST. (2013). *Commerical Fishery Landings Data*. Retrieved August 7, 2013, from http://www.st.nmfs.noaa.gov/st1/commercial/index.html

NMFS, OST, MRIP. (2013). *MRIP Effort Time Series Query*. Retrieved August 7, 2013, from http://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/index

NOAA. (2006). *Fact Sheet: Small diesel spills (500-5,000 gallons). NOAA Scientific Support Team, Hazardous Materials Response and Assessment Division, National Oceanic and Atmospheric Administration, Seattle.* Retrieved December 9, 2013, from http://incidentnews.noaa.gov/attachments/6032/2260/diesel.pdf

NOAA. (2013a, April). Office of Coast Survey Nautical Chart "Savannah River and Wassaw Sound". *Chart Number 11512, Edition 63*. Retrieved August 5, 2013, from http://www.charts.noaa.gov/OnLineViewer/11512.shtml

NOAA. (2013b). *Southeast United States map "Total number of hurricane strikes by counties/parishes/boroughs, 1900-2010."* National Weather Service National Hurricane Center, Tropical Cyclone Climatology Website. Retrieved December 9, 2013, from http://www.nhc.noaa.gov/climo/images/strikes_se.jpg

NOAA. (2013c, July). GIS layer titled "Aids to Navigation".

NOAA. (2013c). *U.S. Marine Protected Areas Mapping Tool*. Retrieved August 9, 2013, from http://marineprotectedareas.noaa.gov/dataanalysis/mpainventory/mpaviewer/

NOAA. (2013d, June 17). National Ocean Service, Coastal Services Center GIS file "Shipping Fairways, Lanes, and Zones for U.S. waters as of June 2013. Retrieved August 5, 2013, from http://csc.noaa.gov/mmcviewer

NOAA. (2013e). GIS layer titled "Aids to Navigation" Dated July 2012. (S. The Multipurpose Marine Cadastre notes the originator of the data is the U.S. Coast Guard with publication by NOAA Coastal Services Center in Charleston, Ed.) Retrieved August 5, 2013, from http://csc.noaa.gov/mmcviewer

NOEP. (2007). *A Guide to the Measurement of the Market Data for the Ocean and Coastal Economy in the National Ocean Economics Program.*

NOEP. (2013). *Search Results - Market Data, Georgia Coastal Counties, 2010*. Retrieved August 6, 2013, from http://www.oceaneconomics.org/Market/ocean/oceanEcon.asp

NPS. (2013a). *Cumberland Island National Seashore, Georgia: Outdoor Activities*. Retrieved August 6, 2013, from http://www.nps.gov/cuis/planyourvisit/outdooractivities.htm

NPS. (2013b). *Fort Pulaski National Monument, Georgia*. Retrieved August 9, 2013, from http://www.nps.gov/fopu/historyculture/index.htm

Page, Personal Communication. (2012). Email on April 26, 2012, between BOEM and the Federal Aviation Administration.

Palmer, M. A. (1988). Dispersal of Marine Meiofauna: a Review and Conceptual Model Explaining Passive Transport and Active Emergence with Implications for Recruitment. *Marine Ecology Progress Series, 48*, 81-91.

Posey, M. H., & Alphin, T. D. (2002). Resilience and Stability in an Offshore Benthic Community: Responses to Sediment Borrow Activities and Hurricane Disturbance. *Journal of Coastal Resources, 18*(4), 685-697.

Posey, M., LindbergW., Alphin, T., & Vose, F. (1996). Influence of Storm Disturbance on an Offshore Benthic Community. *Bulletin of Marine Science, 59*, 523-529.

Rhoads, D. C. (1974). Organism-Sediment Relations on the Muddy Sea Floor. *Oceanography and Marine Biology Annual Review, 12*, 263-300.

SAFMC. (2009). *Fishery Ecosystem Plan of the South Atlantic Region Volume II: South Atlantic Habitats and Species.* South Atlantic Fishery Management Council. Retrieved from http://www.safmc.net/EcosystemLibrary/FEPVolumeII/

SAFMC. (2013a). *South Atlantic Fishery Management Council Managed Areas*. Retrieved from http://www.safmc.net/managed-areas/marine-protected-areas

SAFMC. (2013b). *SAFMC EFH Viewer*. Retrieved from http://ocean.floridamarine.org/sa_efh/

SAFMC. (2013c). *Marine Protected Area Information Page*. Retrieved August 5, 2013, from http://www.safmc.net/MPAInformationPage/tabid/469/Default.aspx

Schaub, A., Ostwald, J., & Siemers, B. M. (2008). Foraging Bats Avoid Noise. *The Journal of Experimental Biology, 211*, 3174-3180.

Seaturtle.org. (2013). *Sea Turtle Nest Monitoring System*. Retrieved September 18, 2013, from www.seaturtle.org: http://www.seaturtle.org/nestdb/

Sedberry, G. (2001). *A Profile of the Charleston Bump*. (N. O. Administration, Producer, & Ocean Explorer). NOAA Ocean Explorer: Islands in the Stream. Retrieved from http://oceanexplorer.noaa.gov/explorations/islands01/background/islands/sup11_bump.html

Sedberry, G. R., & Van Dolah, R. F. (1984). Demersal Fish Associated with Hard Bottom Habitat in the South Atlantic Bight of the U.S.A. *Environmental Biology of Fishes, 11*, 241-258.

Sedberry, G. R., McGovern, J. C., & Pashuk, O. (2001b). The Charleston Bump: An Island of Essential Fish Habitat in the Gulf Stream. American Fisheries Society Symposium 25:3 24.

Sheldon, J. E., & Alber, M. (2011). *Georgia Coastal Water Quality 2000-2006*. Report prepared by the Georgia Coastal Research Council, University of Georgia for GDNR. Retrieved September 21, 2013, from http://www.gcrc.uga.edu/Indicators/GACoastalWQ2000_6.pdf

Southern Company and Geo-Marine Inc. (2012b). *Southern Company Interim Policy Lease Application Addendum B-Data Collection Project Offshore of Tybee Island, Georgia.* .

Southern Company and Geo-Marine, Inc. (2011). *Southern Company Interim Policy Lease Application-Data Collection Project Offshore of Tybee Island, Georgia.*

Southern Company and Geo-Marine, Inc. (2012a). *Southern Company Interim Policy Lease Application Addendum A-Data Collection Project Offshore of Tybee Island, Georgia.*

Tetra Tech EC, Inc. (2010). *GSOE Project Plan for the Deployment and Operation of a Meteorological Data Collection Buoy within Interim Lease Site, Block 7033.* Prepared for Deepwater Wind, LLC.

The University of Georgia. (2010). *Bats, Species List and Descriptions.* Museum of Natural History. Retrieved July 22, 2013, from http://naturalhistory.uga.edu/~GMNH/gawildlife/index.php?page=speciespages/list_species&class=Mammalia

Thompson, M. J., Schroeder, W. W., & Phillips, N. W. (1999). *Ecology of Live Bottom Habitats of the Northeastern Gulf of Mexico: A Community Profile.* New Orleans, LA: U.S. Geological Survey and Minerals Management Service.

TRC Environmental Corp. (2012). *Inventory and Analysis of Archaeological Site Occurrence on the Atlantic Outer Continental Shelf.* OCS Study BOEM 2012-008, U.S. Dept. of the Interior, Bureau of Ocean Energy Management Gulf of Mexico OCS Region.

U.S. Department of the Navy, Naval Facilities Engineering Command Southeast and Atlantic. (2013). *Request for an Incidental Harassment Authorization under the Marine Mammal Protection Act for the Wharf C-2 Recapitalization Project at Naval Station Mayport, Florida. Navy Region Southeast.* Retrieved December 3, 2013 from www.nmfs.noaa.gov/pr/pdfs/permits/navy_wharf_mayport_iha_application2013.pdf

USACE. (2012). GIS layer titled "Danger Zones and Restricted Areas". Retrieved August 5, 2013.

USACE. (2012b). *Savannah Harbor Expansion Project Dredged Material Management Plan.* January 2012; Updated March 2012.

USACE, NDC. (2013). Waterborne Commerce of the United States, Part 1 Atlantic Coast. Trips by Ports, Sheet 355. Retrieved August 9, 2013, from http://www.navigationdatacenter.us/wcsc/webpub11/Part1_Ports_Trips_VessType_YR_Dir_Draft_CY2011_CY2007.HTM

USCG. (2012). *Polluting Incidents in and around U.S. Waters: A Spill/Release Compendium: 1969.* 2100 Second Street, SW, Washington DC 20593-0001: Office of Investigations & Compliance Analysis (CG-INV). Retrieved from https://homeport.uscg.mil

USCG, Navigation Center. (2013). *AIS Frequently Asked Questions*. Retrieved August 7, 2007, from http://www.navcen.uscg.gov/?pageName=AISFAQ#1

USDOC, Census Bureau. (2013a). American Fact Finder. Retrieved August 5, 2013, from http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

USDOC, Census Bureau. (2013b). QuickFacts. Retrieved August 2, 2013, from http://quickfacts.census.gov/qfd/states/13000.html

USDOC, NMFS. (2013b). *Biological Opinion Bureau of Ocean Energy Management Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf in Massachusetts, Rhode Island, New York and New Jersey Wind Energy Areas.* Endangered Species Act Section 7 Consultation , BOEM, USACE, New England District. Retrieved from http://www.nero.noaa.gov/protected/section7/bo/actbiops/boem_ocs_wind_energy_april_2013.pdf

USDOI. (2013). *Programmatic Agreement among The U.S. Department of the Interior, Bureau of Ocean Energy Management; the State Historic Preservation Officers of North Carolina, South Carolina, Georgia, and Florida; The Catawba Indian Nation and The Advisory Council on Hi.*

USDOI, BOEM. (2012a). *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia Final Environmental Assessment, BOEM 2012-003.*

USDOI, BOEM. (2012b). *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts; Environmental Asessment 2012-087.* BOEM Technical Document 2012-087.

USDOI, BOEM. (2012c). *Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas, Biological Assessment.* Gulf of Mexico OCS Region. May 2012.

USDOI, BOEM. (2012e). *Lease Issuance for Marine Hydrokinetic Technology Testing on the Outer Continental Shelf Offshore Florida, Environmental Assessment.*

USDOI, BOEM. (2012f). *Atlantic Region Wind Energy Development: Recreation and Tourism Economic Baseline Development, Impacts of Offshore Wind on Tourism and Recreation Economics.* September 2012. OCS Study BOEM 2012-085.

USDOI, BOEM. (2013). *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts Revised Environmental Asessment.* OCS EIS/EA BOEM 2013-1131.

USDOI, BOEM. (2014). *Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Final Programmatic Environmental Impact Statement.* February 2014. OCS EIS/EA BOEM 2014-001.

USDOI, BOEM, BSEE. (2012). *Notice to Lessees and Operators (NTL) of Federal oil, gas, and sulphur leases and pipeline right of-way holders in the OCS, Gulf of Mexico OCS Region.*

Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program. Joint NTL 2012-G02.

USDOI, BOEM; NOAA. (2011). *Automated Identification System Vessel Traffic Data for 2011.*

USDOI, BOEM; NOAA. (2012). *Automated Identification System Vessel Traffic Data for 2011*. Retrieved July 20, 2013, from BOEM and NOAA Multipurpose MarineCadastre.gov: http://www.marinecadastre.gov/Data/default.aspx

USDOI, FWS. (1997). *Gray Bat, Myotis sodalis. Factsheet.* Retrieved August 2013, from http://www.fws.gov/ midwest/endangered/mammals/grbat_fc.html

USDOI, FWS. (2004). *Indiana bat, Myotis sodalis. USFWS Northeast Region.* Retrieved September 4, 2013, from http://www.fws.gov/northeast/ pdf/indianabat.fs.pdf

USDOI, FWS. (2007). *The Atlantic Coast Piping Plover*. Retrieved August 28, 2013, from http://www.fws.gov/northeast/pipingplover/pdf/plover.pdf

USDOI, FWS. (2011a). *Savannah Coastal Refuges Complex: Blackbeard Island, Harris Neck, Pinckney Island, Savannah, Tybee, Wassaw National Wildlife Refuges Comprehensive Conservation Plan.*

USDOI, FWS. (2011b). *Virginia big-eared bat, Plecotus townsendii virginianus. Factsheet.* Prepared by FWS, Asheville Office, Nov. 2011. Retrieved August 2013, from http://www.fws.gov/asheville/pdfs/VaBigEarBat.pdf

USDOI, FWS. (2011c). *The Effects of Noise on Wildlife.* Retrieved October 10, 2013, from http://www.fws.gov/windenergy/docs/noise.pdf

USDOI, FWS. (2012). *Draft Revised Stock Asssessment Report. West Indian Manatee (Trichechus manatus), Florida Stock (Florida Subspecies, Trichechus manatus latirostris).* Jacksonville, Florida. Retrieved November 14, 2013, from http://www.fws.gov/northflorida/Manatee/SARS/20130328_FR1149-Draft_Revised_Manatee_SAR_FL_Stock.pdf

USDOI, FWS. (2013a). *Environmental Conservation Online System.* Retrieved July 16, 2013, from http://ecos.fws.gov/tess_public/SpeciesReport.do?groups=C&listingType=L&mapstatus=1.

USDOI, FWS. (2013c). *Roseate Tern: North American Subspecies Sterna dougallii dougalli.* Retrieved August 15, 2013, from http://www.fws.gov/northeast/pdf/ Roseatetern0511.pdf.

USDOI, FWS. (2013d). *Consultation and Concurrence Letter dated July 8, 2013 from P. Benjamin, USFWS Raleigh Field Office, to M. Morin, USDOI BOEM, received July 15, 2013.*

USDOI, FWS. (2013e). *All About Piping Plovers*. Retrieved August 2013, from http://www.fws.gov/plover/ facts.html

USDOI, FWS, MMS. (2009). *Memorandum of Understanding Between the Department of the Interior U.S. Minerals Management Service and the Department of the Interior U.S. Fish and Wildlife Service Regarding Implementation of Executive Order 13186.* June 4, 2009.

USDOI, MMS. (2005). *Structure-Removal Operations on the Gulf of Mexico Outer Continental Shelf - Programmatic Environmental Assessment.* February 2005. OCS EIS/EA MMS 2005-013.

USDOI, MMS. (2007a). *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternative Use of Facilities on the Outer Continental Shelf – Final Programmatic Environmental Impact Statement.* October 2007. OCS EIS/EA MMS 2007-046.

USDOI, MMS. (2009). *Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey, Environmental Assessment.* June 2009. OCS EIS/EA MMS 2009-025.

USDOI, NOAA. (2009). *Final Amendment 1 to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan, Essential Fish Habitat.* NOAA, NMFS, Office of Sustainable Fisheries, Highly Migratory Species Management Division, Silver Spring, MD.

USDOT, MARAD. (2013, March). Vessel Calls Snapshot, 2011. Retrieved August 7, 2013, from http://www.marad.dot.gov/documents/Vessel_Calls_at_US_Ports_Snapshot.pdf

USEPA. (2012). *National Coastal Condition Report IV*. Retrieved September 24, 2013, from http://water.epa.gov/type/oceb/assessmonitor/upload/nccr3_entire.pdf

USEPA. (2013). National List of Beaches. Retrieved August 2, 2013, from http://ofmpub.epa.gov/apex/beacon2/f?p=109:14:11479640393890::NO::P14_STATE:GA

USFWS. (2013a). Tybee National Wildlife Refuge. Retrieved August 6, 2013, from http://www.fws.gov/tybee/

USFWS. (2013b). *Wassaw National Wildlife Refuge*. Retrieved August 6, 2013 , from http://www.fws.gov/wassaw/.

Viscido, S. V., Stearns, D. E., & Able, K. W. (1997). Seasonal and Spatial Pattern of an Epibenthic Decapod Crustacean Assemblage in North-West Atlantic Continental Shelf Waters. *Estuarine, Coastal and Shelf Science, 45*, 377-392.

Waring, G. T., Josephson, E., Maze-Foley, K., & Rosel, P. E. (Eds.). (2011). U.S. Atlantic and Gulf of Mexico Marine mammal Stock Assessments - 2010. *NOAA Tech Memo NMFS NE 219*, 598. Woods Hole, MA: National Marine Fisheries Service.

Waring, G. T., Josephson, E., Maze-Foley, K., & Rosel, P. E. (2013). *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2012.* NOAA Tech Memo NMFS-NE-223. Volume I. 419 pp.

Waring, G. T., Wood, S. A., & Josephson, E. (2012). *Literature search and data synthesis for marine mammals and sea turtles in the U.S. Atlantic from Maine to the Florida Keys.* U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA.

Wenner, E. I., Hinde, P., Knott, D. M., & Van Dolah, R. F. (1984). *A Temporal and Spatial Study of Invertebrate Communities Associated with Hardbottom Habitats in the South Atlantic Bight.* Seattle, Washington: National Marine Fisheries Service.

Wenner, E. I., Knott, D. M., Van Dolah, R. F., & Burrell, Jr. , V. G. (1983). Invertebrate Communities Associated with Hard Bottom Habitats in the South Atlantic Bight. *Estuarine, Coastal and Shelf Science, 17*, 143-158.

Zajac, R. N., Whitlatch, R. B., & Thrush, S. F. (1998). Recolonization and Succession in Soft-Sediment Infaunal Communities: the Spatial Scale of Controlling Factors. *Hydrobiologia, 375/376*, 227-240.

.

APPENDIX A

STANDARD OPERATING PROCEDURES

A.1 INTRODUCTION

These Standard Operating Conditions (SOCs) were developed by the Bureau of Ocean Energy Management (BOEM) and refined during consultations under Section 106 of the National Historic Preservation Act and under Section 7 of the Endangered Species Act. As BOEM develops lease sale procedures and documents, these SOCs may be further refined.

A.2 STANDARD OPERATING CONDITIONS FOR CULTURAL RESOURCES

BOEM has determined that geotechnical exploration and sub-bottom sediment sampling may impact historic properties. If the lessee conducts high-resolution geophysical (HRG) surveys prior to conducting geotechnical exploration, the lessee will be able to avoid impacts on historic properties. Therefore, BOEM will require the lessee to conduct HRG surveys prior to conducting geotechnical exploration and, when a potential historic property is identified, the lessee will be required to avoid it. Inclusion of the following elements in the lease will ensure avoidance of historic properties and is a requirement of this finding.

The lessee may only conduct geotechnical exploration activities in areas of the leasehold in which an analysis of the results of geophysical surveys has been completed for that area. The geophysical surveys must meet BOEM's minimum guidelines (*see Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 285*), and the analysis must be completed by a qualified marine archaeologist who both meets the *Secretary of the Interior's Professional Qualifications Standards* (48 FR 44738-44739) and has experience analyzing marine geophysical data. This analysis must include a determination whether any potential archaeological resources are present in the area and the geotechnical exploration activities must avoid potential archaeological resources by a minimum of 50.0 meters (m; 164.0 feet [ft]). The avoidance distance must be calculated from the maximum discernible extent of the archaeological resource. Finally, in no case may the lessee impact a potential archaeological resource without BOEM's prior approval.

The following post-review discoveries clause will be included in the lease:

> If the Lessee, while conducting activities, discovers a potential archaeological resource, such as the presence of a shipwreck (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of historic objects, piles of ballast rock), prehistoric artifacts, and/or relict landforms, etc. within the project area, the Lessee must:
>
> - Immediately halt seafloor/bottom-disturbing activities within the area of discovery;
> - Notify the Lessor within 24 hours of discovery;
> - Notify the Lessor in writing via report to the Lessor within 72 hours of its discovery;
> - Keep the location of the discovery confidential and take no action that may adversely affect the archaeological resource until the Lessor has made an evaluation and instructs the applicant on how to proceed; and
> - Conduct any additional investigations as directed by the Lessor to determine if the resource is eligible for listing in the National Register of Historic Places (30 CFR

585.802(b)). The Lessor will do this if: (1) the site has been impacted by the Lessee's project activities; or (2) impacts to the site or to the area of potential effect cannot be avoided. If investigations indicate that the resource is potentially eligible for listing in the National Register of Historic Places, the Lessor will tell the Lessee how to protect the resource or how to mitigate adverse effects to the site. If the Lessor incurs costs in protecting the resource, under Section 110(g) of the National Historic Preservation Act, the Lessor may charge the Lessee reasonable costs for carrying out preservation responsibilities under the Outer Continental Shelf Lands Act (30 CFR 585.802(c-d)).

A.3 STANDARD OPERATING CONDITIONS FOR PROTECTED SPECIES VESSEL STRIKE AVOIDANCE

The lessee must ensure that all vessels conducting activity in support of a plan (i.e., Site Assessment Plan [SAP] and/or Construction and Operation Plan [COP]) comply with the vessel strike avoidance measures specified below except under extraordinary circumstances when the safety of the vessel or crew are in doubt or the safety of life at sea is in question.

1. The lessee must ensure that vessel operators and crews maintain a vigilant watch for cetaceans, pinnipeds, and sea turtles and slow down or stop their vessel to avoid striking protected species. While pinnipeds are rarely found in the proposed area, Warning et al. (2012) suggests they range as far south as Florida. Where appropriate pinnipeds are included in these SOCs.

2. The lessee must ensure that all vessel operators comply with the 10 knot (18.5 kilometers per hour [km/h]) or less, speed restrictions in any Dynamic Management Area (DMA) or Seasonal Management Area (SMA). In addition, the lessee must ensure that all vessels operating from November 1 through April 30, operate at speeds of 10 knots (18.5 km/h) or less. Vessel operators may send a blank email to ne.rw.sightings@noaa.gov for an automatic response listing all current Seasonal Management Areas (SMAs) and DMAs.

3. North Atlantic right whales
   (a) The lessee must ensure all vessels maintain a separation distance of 500 m (1,640 ft) or greater from any sighted North Atlantic right whale.
   (b) The lessee must ensure that the following avoidance measures are taken if a vessel comes within 500 m (1,640 ft) of a right whale:
      (i) The lessee must ensure that while underway, any vessel must steer a course away from the right whale at 10 knots (< 18.5 km/h) or less until the 500 m (1,640 ft) minimum separation distance has been established (unless (ii) below applies).
      (ii) The lessee must ensure that when a North Atlantic right whale is sighted in a vessel's path, or within 100 m (328 ft) to an underway vessel, the underway vessel must reduce speed and shift the engine to neutral. The lessee must not engage the engines until the right whale has moved beyond 100 m (328 ft).
      (iii) The lessee must ensure that if a vessel is stationary, the vessel must not engage engines until the North Atlantic right whale has moved beyond 100 m (328 ft), at which time refer to point 3(b)(i).

4. Non-delphinoid cetaceans other than the North Atlantic right whale
   (a) The lessee must ensure all vessels maintain a separation distance of 100 m (328 ft) or greater from any sighted non-delphinoid cetacean.
   (b) The lessee must ensure that the following avoidance measures are taken if a vessel comes within 100 m (328 ft) of a non-delphinoid cetacean:
      (i) The lessee must ensure that when a non-delphinoid cetacean (other than a North Atlantic right whale) is sighted, the vessel underway must reduce speed and shift the engine to neutral, and must not engage the engines until the nondelphinoid cetacean has moved beyond 100 m (328 ft).
      (ii) The lessee must ensure that if a vessel is stationary, the vessel must not engage engines until the non-delphinoid cetacean has moved beyond 100 m (328 ft).

5. Delphinoid cetaceans
   (a) The lessee must ensure all vessels maintain a separation distance of 50 m (164 ft) or greater from any sighted delphinoid cetacean.
   (b) The lessee must ensure that the following avoidance measures are taken if the vessel comes within 50 m (164 ft) of a delphinoid cetacean:
      (i) The lessee must ensure that any vessel underway remain parallel to a sighted delphinoid cetacean's course whenever possible, and avoid excessive speed or abrupt changes in direction. Course and speed may be adjusted once the delphinoid cetacean has moved beyond 50 m (164 ft) or the delphinoid cetacean has moved abeam of the underway vessel.
      (ii) In addition, the lessee must ensure that any vessel underway reduce vessel speed to 10 knots (18.5 km/h) or less when pods (including mother/calf pairs) or large assemblages of delphinoid cetaceans are observed. The lessee must ensure that the vessel does not adjust course and speed until the delphinoid cetaceans have moved beyond 50 m (164 ft) or abeam of the underway vessel.

6. Sea turtles and pinnipeds. The lessee must ensure all vessels maintain a separation distance of 50 m (164 ft) or greater from any sighted sea turtle or pinniped.

7. The lessee must ensure that vessel operators are briefed to ensure they are familiar with the above requirements.

A.4 MARINE DEBRIS AWARENESS

The lessee must ensure that vessel operators, employees and contractors engaged in activity in support of a plan (i.e., SAP and/or COP) are briefed on marine trash and debris awareness elimination as described in the Bureau of Safety and Environmental Enforcement Notice to Lessees (NTL) No. 2012-G01 ("Marine Trash and Debris Awareness and Elimination"). BOEM (the Lessor) will not require the applicant to undergo formal training or post placards, as described under this NTL. Instead, the lessee must ensure that its employees and contractors are made aware of the environmental and socioeconomic impacts associated with marine trash and debris and their

responsibilities for ensuring that trash and debris are not intentionally or accidentally discharged into the marine environment. The above referenced NTL provides information the applicant may use for this awareness training.

A.5 STANDARD OPERATING CONDITIONS FOR PROTECTED SPECIES – GEOLOGICAL AND GEOPHYSICAL (G&G) SURVEY REQUIREMENTS

The lessee must ensure that all vessels conducting activity in support of a plan (i.e., SAP and/or COP) comply with the geological and geophysical survey requirements specified below except under extraordinary circumstances when the safety of the vessel or crew are in doubt or the safety of life at sea is in question:

1. Visibility. The lessee must not conduct G&G surveys in support of plan (i.e., SAP and/or COP) submittal at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevents visual monitoring of the exclusion zones for HRG surveys and geotechnical surveys as specified below. This requirement may be modified as specified below.

2. Modification of Visibility Requirement. If the Lessee intends to conduct G&G survey operations in support of plan submittal at night or when visual observation is otherwise impaired, the Lessee must submit to the Lessor an alternative monitoring plan detailing the alternative monitoring methodology (e.g., active or passive acoustic monitoring technologies). The Lessor may decide to allow the Lessee to conduct G&G surveys in support of plan submittal at night or when visual observation is otherwise impaired using the proposed alternative monitoring methodology.

3. Protected-Species Observer (PSO). The lessee must ensure that the exclusion zone for all G&G surveys performed in support of plan (i.e., SAP and/or COP) submittal is monitored by a NMFS-approved PSO. The lessee must provide to the Lessor a list of observers and their résumés no later than forty-five (45) calendar days prior to the scheduled start of surveys performed in support of plan submittal. The résumés of any additional observers must be provided fifteen (15) calendar days prior to each observer's start date. The Lessor will send the observer information to NMFS for approval.

4. Optical Device Availability. The lessee must ensure that reticle binoculars and other suitable equipment are available to each observer to adequately perceive and monitor distant objects within the exclusion zone during surveys conducted in support of plan (i.e., SAP and/or COP) submittal.

A.5.1 High Resolution Geophysical (HRG) Survey Requirements

The following requirements will apply to all HRG survey work actively using electromechanical survey equipment where one or more acoustic sound source is operating at frequencies below 200 kHz:

1. Establishment of Exclusion Zone. The lessee must ensure that a 200m default exclusion zone for cetaceans, pinnipeds, and sea turtles will be monitored by a protected species observer around any active sound sources on a survey vessel actively using electromechanical survey equipment where one or more acoustic sound sources is operating at frequencies below 200 kiloHertz (kHz). In the case of the North Atlantic right whale, the minimum separation distance of 500 m (1,640 ft) is in effect when the vessel is underway as described in the vessel-strike avoidance measures.
   (a) If the Lessor determines that the exclusion zone does not encompass the 180-decibel (dB) Level A harassment radius calculated for the acoustic source having the highest source level, the Lessor will consult with NMFS about additional requirements.
   (b) The Lessor may authorize surveys having an exclusion zone larger than 200 m (656 ft) to encompass the 160-dB Level B harassment radius if the lessee can demonstrate the zone can be effectively monitored.

2. Field Verification of Exclusion Zone. The lessee may choose to conduct field verification of the exclusion zone for specific HRG survey equipment operating below 200 kHz. The lessee must take acoustic measurements at a minimum of two reference locations and be sufficient to establish the following: source level (peak at 1 m) and distance to the 180, 160, and 150 dB_{rms} re 1µPa sound pressure level (SPL) isopleths as well as the 187 dB re 1µPa cumulative sound exposure level (cSEL). Sound measurements must be taken at the reference locations at two depths (i.e., a depth at mid-water and a depth at approximately 1 m above the seafloor). An infrared range finder may be used to determine distance from the sound source to the reference location.

3. Modification of Exclusion Zone. The lessee must use the field-verification method described above to modify the HRG survey exclusion zone for specific HRG survey equipment operating below 200 kHz. This modified exclusion zone may be greater than or less than the 200m default exclusion zone depending on the results of the field tests. Any new exclusion zone radius must be based on the most conservative measurement (i.e., the largest safety zone configuration) of the target (160 dB or 180 dB) zone. This modified zone must be used for all subsequent use of field-verified equipment and may be periodically reevaluated based on the regular sound monitoring. The lessee must obtain Lessor approval of any new exclusion zone before it may be implemented.

4. Clearance of Exclusion Zone. The lessee must ensure that active acoustic sound sources must not be activated until the protected species observer has reported the exclusion zone clear of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

5. Electromechanical Survey Equipment Ramp-Up. The lessee must ensure that when technically feasible a “ramp-up” of the electromechanical survey equipment occur at the start or re-start of HRG survey activities. A ramp-up would begin with the power of the smallest acoustic equipment for the HRG survey at its lowest power output. The power output would be gradually turned up and other acoustic sources added in a way such that the source level would increase in steps not exceeding 6 dB per 5-min period.

6. Shut Down for Non-Delphinoid Cetaceans and Sea Turtles. If a non-delphinoid cetacean or sea turtle is sighted at or within the exclusion zone, an immediate shutdown of the electromechanical survey equipment is required. The vessel operator must comply immediately with such a call by the observer. Any disagreement or discussion should occur only after shut-down. Subsequent restart of the electromechanical survey equipment must use the ramp-up provisions described above and may only occur following clearance of the exclusion zone of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

7. Power Down for Delphinoid Cetaceans and Pinnipeds. If a delphinoid cetacean or pinniped is sighted at or within the exclusion zone, the electromechanical survey equipment must be powered down to the lowest power output that is technically feasible. The vessel operator must comply immediately with such a call by the observer. Any disagreement or discussion should occur only after power-down. Subsequent power up of the electromechanical survey equipment must use the rampup provisions described above and may occur after (1) the exclusion zone is clear of a delphinoid cetacean and/or pinniped or (2) a determination by the protected species observer after a minimum of 10 minutes of observation that the delphinoid cetacean and/or pinniped is approaching the vessel or towed equipment at a speed and vector that indicates voluntary approach to bow-ride or chase towed equipment. An incursion into the exclusion zone by a non-delphinoid cetacean or sea turtle during a power-down requires implementation of the shut-down procedures described above.

8. Pauses in Electromechanical Survey Sound Source. The lessee must ensure that if the electromechanical sound source shuts down for reasons other than encroachment into the exclusion zone by a non-delphinoid cetacean or sea turtle, including, but not limited to, mechanical or electronic failure, resulting in the cessation of the sound source for a period greater than 20 minutes, the lessee must restart the electromechanical survey equipment using the full ramp-up procedures and clearance of the exclusion zone of all cetaceans, pinnipeds, and sea turtles for 60 minutes. If the pause is less than 20 minutes the equipment may be re-started as soon as practicable at its operational level as long as visual surveys were continued diligently throughout the silent period and the exclusion zone remained clear of cetaceans, pinnipeds, and sea turtles. If visual surveys were not continued diligently during the pause of 20- minutes or less, the lessee must restart the electromechanical survey equipment using the full ramp-up procedures and clearance of the exclusion zone of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

A.5.2 Requirements for Geotechnical Exploration

The following requirements will apply to all geotechnical exploration:

1. Establishment of Exclusion Zone. The lessee must ensure that a 200m radius exclusion zone for all cetaceans, pinnipeds, and sea turtles will be monitored by a protected species observer around any vessel conducting geotechnical surveys (i.e. drilling, cone penetrometer tests, etc.).

2. Modification of Exclusion Zone. The lessee may use the field-verification method as described below to modify the geotechnical survey exclusion zone for specific geotechnical

exploration equipment being utilized. Any new exclusion zone radius must be based on the most conservative measurement (i.e., the largest safety zone configuration) of the 120-dB zone. This modified zone must be used for all subsequent use of field-verified equipment and may be periodically reevaluated based on the regular sound monitoring described below. The lessee must obtain Lessor approval of any new exclusion zone before it may be implemented.

3. Field Verification of Exclusion Zone. If the lessee wishes to modify the exclusion zone as described above, the lessee must conduct field verification of the exclusion zone for specific geotechnical exploration equipment. The results of the measurements from the equipment must be used to establish a new exclusion zone, which may be greater than or less than the 200-m default exclusion zone depending on the results of the field tests. The lessee must take acoustic measurements at a minimum of two reference locations and be sufficient to establish the following: source level (peak at 1 m) and distance to the 180, 160, and 150 dB_{rms} re 1µPa SPL isopleths as well as the 187 dB re 1µPa cSEL. Sound measurements must be taken at the reference locations at two depths (i.e., a depth at mid-water and a depth at approximately 1 m above the seafloor). An infrared range finder may be used to determine distance from the sound source to the reference location.

4. Clearance of Exclusion Zone. The lessee must ensure that geotechnical sound source must not be activated until the protected species observer has reported the exclusion zone clear of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

5. Shut Down for Non-Delphinoid Cetaceans and Sea Turtles. If any non-delphinoid cetaceans or sea turtles are sighted at or within the exclusion zone, an immediate shutdown of the geotechnical survey equipment is required. The vessel operator must comply immediately with such a call by the observer. Any disagreement or discussion should occur only after shut-down. Subsequent restart of the geotechnical survey equipment may only occur following clearance of the exclusion zone for 60 minutes.

6. Pauses in Geotechnical Survey Sound Source. The lessee must ensure that if the geotechnical sound source shuts down for reasons other than encroachment into the exclusion zone by a non-delphinoid cetacean or sea turtle, including, but not limited to, mechanical or electronic failure, resulting in the cessation of the sound source for a period greater than 20 minutes, the lessee must ensure clearance of the exclusion zone of all cetaceans, pinnipeds, and sea turtles for 60 minutes. If the pause is less than 20 minutes the equipment may be re-started as soon as practicable as long as visual surveys were continued diligently throughout the silent period and the exclusion zone remained clear of cetaceans, pinnipeds, and sea turtles. If visual surveys were not continued diligently during the pause of 20-minutes or less, the lessee must restart the geotechnical survey equipment only after the clearance of the exclusion zone of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

A.6 STANDARD OPERATING CONDITIONS FOR PROTECTED SPECIES – CONSTRUCTION OF METEOROLOGICAL TOWERS AND INSTALLATION OF METEOROLOGICAL BUOYS

The lessee must ensure that all vessels conducting activity in support of a plan (i.e., SAP and/or COP) comply with the construction of meteorological tower and installation of meteorological buoy requirements specified below except under extraordinary circumstances when the safety of the vessel or crew are in doubt or the safety of life at sea is in question:

1. Visibility. The lessee must not conduct pile-driving for a meteorological tower foundation at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevents visual monitoring of the exclusion zones for meteorological tower foundation pile-driving as specified below. This requirement may be modified as specified below.

2. Modification of Visibility Requirement. If the lessee intends to conduct pile-driving for a meteorological tower foundation at night or when visual observation is otherwise impaired, an alternative monitoring plan detailing the alternative monitoring technologies (e.g. active or passive acoustic monitoring technologies) must be submitted to the Lessor for consideration. The Lessor may, after consultation with NMFS, decide to allow the lessee to conduct pile-driving for a meteorological tower foundation at night or when visual observation is otherwise impaired.

3. Protected-Species Observer (PSO). The lessee must ensure that the exclusion zone for all pile-driving for a meteorological tower foundation is monitored by a NMFS approved PSO. The lessee must provide to the Lessor a list of observers and their résumés no later than forty-five (45) calendar days prior to the scheduled start of meteorological tower construction activity. The résumés of any additional observers must be provided fifteen (15) calendar days prior to each observer's start date. The Lessor will send the observer information to NMFS for approval.

4. Optical Device Availability. The lessee must ensure that reticle binoculars and other suitable equipment are available to each observer to adequately perceive and monitor protected marine species within the exclusion zone during surveys conducted in support of plan (i.e., SAP and COP) submittal.

5. Pre-Construction Briefing. Prior to the start of construction, the lessee must hold a briefing to establish responsibilities of each involved party, define the chains of command, discuss communication procedures, provide an overview of monitoring purposes, and review operational procedures. This briefing must include construction supervisors and crews, and the protected species observer(s) (see further below). The Resident Engineer (or other authorized individual) will have the authority to stop or delay any construction activity, if deemed necessary by the Resident Engineer. New personnel must be briefed as they join the work in progress.

A.6.1 Requirements for Pile Driving

1. Prohibition on Pile-Driving. The lessee must ensure that no pile-driving activities (e.g. pneumatic, hydraulic, or vibratory installation of foundation piles) occur from November 1 – April 30 nor during an active Dynamic Management Area (DMA) if the pile-driving location is within the boundaries of the DMA as established by the National Marine Fisheries Service or within 1 kilometer of the boundaries of the DMA.

2. Establishment of Exclusion Zone. The lessee must ensure the establishment of a default 1,000 m (3,281 ft) radius exclusion zone for cetaceans, sea turtles, and pinnipeds around each pile-driving site. The 1,000 m (3,281 ft) exclusion zone must be monitored from two locations. One observer must be based at or near the sound source and will be responsible for monitoring out to 500 m (1,640 ft) from the sound source. An additional observer must be located on a separate vessel navigating approximately 1,000 m (3,281 ft) around the pile hammer and will be responsible for monitoring the area between 500 m (1,640 ft) to 1,000 m (3,281 ft) from the sound source.

3. Field Verification of Exclusion Zone. The lessee must conduct acoustic monitoring of pile-driving activities during the installation of each meteorological tower requiring pile-driving. The lessee must take acoustic measurements at a minimum of two reference locations and be sufficient to establish the following: source level (peak at 1 m) and distance to the 180, 160, and 150 dB_{rms} re 1µPa SPL isopleths as well as the 187 dB re 1µPa cSEL. Sound measurements must be taken at the reference locations at two depths (i.e., a depth at mid-water and a depth at approximately 1 m above the seafloor). An infrared range finder may be used to determine distance from the sound source to the reference location.

4. Modification of Exclusion Zone. The lessee may use the field verification method described above to modify the default exclusion zone provided above for pile-driving activities. Results of the field verification must be submitted to the Lessor after the pile-driving of the first pile and before the pile-driving of subsequent piles for a multiple pile foundation. The results of the measurements must be used to establish a new exclusion zone which may be greater than or less than the 1,000 m (3,281 ft) default exclusion zone, depending on the results of the field tests. Any new exclusion zone radius must be based on the most conservative measurement (i.e., the largest safety zone configuration) of the target (180 dB or 160 dB) zone.

5. Clearance of Exclusion Zone. The lessee must ensure that visual monitoring of the exclusion zone must begin no less than 60 minutes prior to the beginning of soft start and continue until pile-driving operations cease or sighting conditions do not allow observation of the sea surface (e.g., fog, rain, darkness). If a cetacean, pinniped, or sea turtle is observed, the observer must note and monitor the position, relative bearing and estimated distance to the animal until the animal dives or moves out of visual range of the observer. The observer must continue to observe for additional animals that may surface in the area, as often there are numerous animals that may surface at varying time intervals.

6. Implementation of Soft Start. The lessee must ensure that a "soft start" be implemented at the beginning of each pile installation in order to provide additional protection to cetaceans, pinnipeds, and sea turtles near the project area by allowing them to vacate the area prior to the commencement of pile-driving activities. The soft start requires an initial set of three (3) strikes from the impact hammer at 40 percent energy with a one minute waiting period between subsequent 3-strike sets.

7. Shut Down for Cetaceans, Pinnipeds, and Sea Turtles. The lessee must ensure that any time a cetacean, pinniped, and/or sea turtle is observed within the exclusion zone, the observer must notify the Resident Engineer (or other authorized individual) and call for a shutdown of pile-driving activity. The pile-driving activity must cease as soon as it is safe to do so. Any disagreement or discussion should occur only after shut-down, unless such discussion relates to the safety of the timing of the cessation of the pile-driving activity. Subsequent restart of the pile-driving equipment may only occur following clearance of the exclusion zone of any cetacean, pinniped, and/or sea turtle for 60 minutes.

8. Pauses in Pile-Driving Activity. The lessee must ensure that if pile-driving ceases for 30 minutes or more and a cetacean, pinniped, and/or sea turtle is sighted within the exclusion zone prior to re-start of pile-driving, the observer(s) must notify the Resident Engineer (or other authorized individual) that an additional 60 minute visual and acoustic observation period must be completed, as described above, before restarting pile-driving activities. A pause in pile-driving for less than 30 minutes must still begin with soft start but will not require the 60 minute clearance period as long as visual surveys were continued diligently throughout the silent period and the exclusion zone remained clear of cetaceans, pinnipeds, and sea turtles. If visual surveys were not continued diligently during the pause of 30-minutes or less, the lessee must clear the exclusion zone of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

A.7 PROTECTED SPECIES REPORTING REQUIREMENTS

The lessee must ensure compliance with the following reporting requirements for site characterization activities performed in support of plan (i.e., SAP and/or COP) and must use contact information provided by the Lessor, to fulfill these requirements:

1. Reporting Observed Impacts to Protected Species. The observer must report any observations concerning impacts on Endangered Species Act listed marine mammals or sea turtles to the Lessor and the NMFS within 48 hours.

2. Reporting Injured or Dead Protected Species.
    1) The Lessee must ensure that sightings of any injured or dead protected species (e.g., marine mammals or sea turtles) are reported to NMFS Southeast Region's Stranding Hotline (877-433-8299 or current) within 24 hours of sighting, regardless of whether the injury or death is caused by a vessel. In addition, if the injury or death was caused by a collision with a project-related vessel, the Lessee must ensure that the incident is immediately reported to the Lessor and NMFS Southeast Region's Stranding Hotline (877-433-8299 or current). The Lessee must report any

injuries or mortalities using the Incident Report in Attachment B-1. If the Lessee's activity is responsible for the injury or death, the Lessee must ensure that the vessel assist in any salvage effort as requested by NMFS.

2) The Lessee must ensure that any collision with or injury to a manatee shall be reported immediately to the Florida Fish and Wildlife Conservation Commission (FWC) Hotline at 1-888-404-3922. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Vero Beach (1-772-562-3909) and to FWC at ImperiledSpecies@myFWC.com. The Lessee must report any injuries or mortalities using the Incident Report in Attachment B-1.

3. Report Information. The protected species observer must record all observations of protected species using standard marine mammal observer data collection protocols. The list of required data elements for these reports is provided in Attachment B-2.

4. HRG Plan for Field Verification of the Exclusion Zone. The lessee must submit a plan for verifying the sound source levels of any electromechanical survey equipment operating at frequencies below 200 kHz to the Lessor no later than 45 days prior to the commencement of the field verification activities. The Lessor may require that the Lessee modify the plan to address any comments the Lessor submits to the Lessee on the contents of the plan in a manner deemed satisfactory to the Lessor prior to the commencement of the field verification activities.

5. Report of Activities and Observations. The lessee must provide the Lessor and the NMFS with a report within ninety (90) calendar days following the commencement of HRG and/or geotechnical exploration activities that includes a summary of the survey activities, all protected species observer reports, a summary of the survey activities and an estimate of the number of listed marine mammals and sea turtles observed or Taken during these survey activities.

6. Final Technical Report for Meteorological Tower Construction and Meteorological Buoy Installation Observations. The lessee must provide the Lessor and NMFS a report within 120 days after completion of the pile-driving and construction activities. The report must include full documentation of methods and monitoring protocols, summaries of the data recorded during monitoring, estimates of the number of listed marine mammals and sea turtles that may have been taken during construction activities, and provide an interpretation of the results and effectiveness of all monitoring tasks. The report must also include acoustic monitoring results from any pile-driving activity conducted during the installation of a meteorological tower. Reports must be sent to:

Bureau of Ocean Energy Management Environment Branch for Renewable Energy Phone: 703-787-1340 Email: renewable_reporting@boem.gov	National Marine Fisheries Service Southeast Regional Office, Protected Resources Division Section 7 Coordinator Phone: 727-824-5312 Email: incidental.take@noaa.gov

APPENDIX B
VISUAL SIMULATION METHOD

B.1 INTRODUCTION

The potential visual impacts of the installation of a single 260-foot-tall lattice meteorological tower and associated platform was considered at each of the three OCS blocks presented in Southern Company IP Lease Application (2011).[1] Additionally, the option to utilize a single AXYS WindSentinelTM buoy at any of the three OCS blocks was also considered. The visual impacts of each of the alternatives were studied using a combination of viewshed analyses and visual simulations for an Area of Potential Effect (APE) of 30 nautical miles.

Two main areas within the APE were identified as being potentially affected by one or all potential project scenarios: Tybee Island and Cockspur Island. Two key observation points (KOPs) were identified for detailed investigation: Fort Pulaski battlements and Fort Pulaski Bridge and Tybee Island Pier and Pavilion.

B.2 SIMULATION METHODOLOGY

B.2.1 Photographic Simulations

Still single-frame photographic simulations were created from each of the KOPs. In addition, panoramic simulations were created from the Fort Pulaski battlements (daytime) and bridge (nighttime), and the Tybee Island Pier and Pavilion (daytime and nighttime). The photographs were taken August 9-11, 2013, looking toward the project at varied times, including early morning, mid-afternoon, late afternoon and starlit night on partly cloudy days with visibility of more than 10 miles. The digital images were 4,928-by-3,264 pixels and covered 37.8º horizontally.

Viewpoint locations and bearing to the project were determined prior to conducting fieldwork. A camera-mounted GPS and compass unit was used to determine photograph location and direction while in the field. A Trimble GPS unit with sub-decimeter accuracy was used to accurately record the location of each viewpoint as well as locate elements present within the view for later registration of the 3D model.

A 3D computer model of the proposed lattice tower was prepared in AutoCAD and 3DS Max Design based upon tower diagrams provided in the Southern Company (2013b). Appropriate FAA obstruction marking and lighting were added to the 3D model (FAA 2007). Also included in the 3D model were terrain, reference elements, and the ocean surface. The views represented by the photographs were replicated in the 3D model utilizing the camera and lens specifications and known viewing angles and bearing. A rendered image was then registered to the matching photograph in Photoshop using the reference elements. The location of the tower relative to the horizon takes into account both the curvature of the earth and atmospheric refraction (h+m 2006). Selected single-frame photographic simulations are included in Appendix B.

[1] This methodology is a summary from the document: TJ Boyle Associates (2013), Environmental Assessment for Wind Resources Offshore Georgia, Visual Analysis and Report. Prepared for USDOI, BOEM. October 2013.

The panoramic simulations have a 124º horizontal by 55º vertical field of view composed of multiple overlapping photographs stitched together in a cylindrical projection using Autopano PRO. The tower is located in the same manner as used for the single frame simulations.

For KOPs where intervening vegetation or buildings may obstruct views of the proposed meteorological equipment, cross-sections were created to further analyze the extent of visibility as well as to confirm the results of the simulations. These sections also take into account the curvature of the earth and atmospheric refraction.

B.2.2 Nighttime Panoramas and Video Animation

Two nighttime panoramas and one video animation were prepared depicting the required FAA warning and USCG navigation lighting for a 260-foot-tall private tower. For each of these, the tower is located in the same manner as used for the single-frame simulations.

Three types of lights were simulated for nighttime panoramas and video animation:

1. One red L-864 FAA warning light of 2000 candela at 80 meters above mean low water that flashes with a 3 second period (1 second on, 2 seconds off).
2. Three red L-810 FAA warning lights of 30 candela at 39.6 meters above mean low water with a fixed intensity (i.e., no flashing).
3. Three white USCG-required Navigation Lights of 185 candela at 13.7 meters above mean low water that flash with a 4 second period (1 second on, 3 seconds off).

Each of these lights was rendered utilizing the light simulation options in 3DS Max Design software. The accuracy of the modeling was verified by comparison to field-checked night photography of L-864 lights gathered by the field team in 2012 and 2013.

Following are images from the photographic panoramas taken from Tybee Island and Fort Pulaski at 3 timepoints: morning, afternoon, and night

Simulation

Tybee Island Pier

Morning

Simulated Meteorological Tower
OCS Block 6074 at 4.19 nm

GENERAL INFORMATION

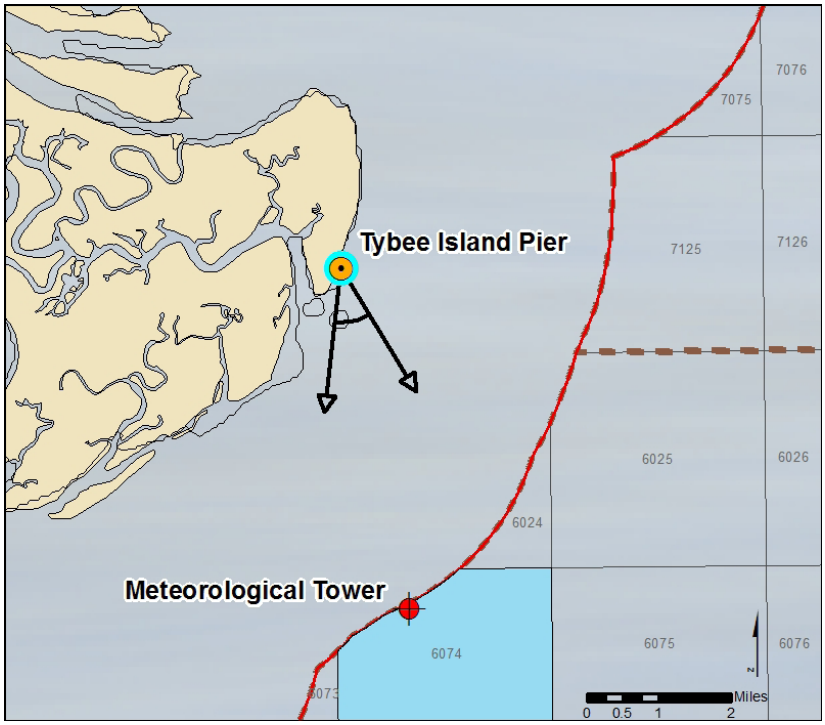
Base Photograph
Photo Name: 2013-08-10 BOEM GA 0321
Date: August 10, 2013
Time: 8:42 AM
GPS Coordinates[1]: lat 31.991768°, long -80.845668°
Viewpoint Elevation: 6.7 m (22')
Eye Level: 1.7 m (5.5')
Original Image Size: 4,928 x 3,264 pixels

Sun and Weather
Sun Angle/Azimuth: 85.6°
Sun Elevation: 22.9°
Lighting Angle: Side lit
Weather Conditions: Sunny/Partly cloudy
Visibility[2]: 10 mi

Camera Properties
Camera Make/Model: Nikon D7000
Sensor Dimensions: 23.6 mm x 15.6 mm
Lens Make/Model: Nikkor DX AF-S 35 mm
Lens Focal Length: 35 mm
35 mm Equivalent Focal Length: 52.5 mm
Horizontal and Vertical Angles of View:
37.3° wide and 25.2° high
Azimuth from Viewpoint to Tower[3] : 168.49°

Tower 6074 Information
Height/Dimensions:
Platform Height: 12.2 m (40') above MLW
Lattice Tower Height: 67 m (220')
Total Height: 79.2 m (260') above MLW
Instrument House: A bldg. 8'H x 7'W x 13.25'L
FAA L-864 light height: 80m (262.5') above MLW
FAA L-810 light height: 39.6m (130') above MLW
Navigation light height: 13.7m (45') above MLW

CONTEXT MAP



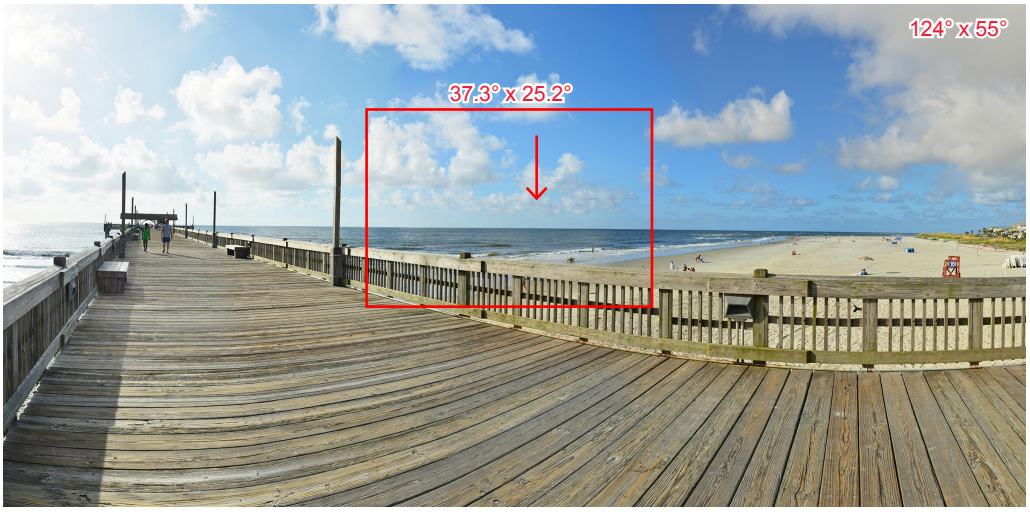
VIEWING INSTRUCTIONS

The simulation is properly printed on an 8.5" x 11" sheet. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the proper perspective when viewed at 15" from the eye, or at a distance of approx. twice the image height.

NOTES

- Lens smudges were adjusted in Photoshop.
- This simulation is taken from a larger panoramic simulation prepared for BOEM
- In reformatting this simulation for inclusion in the EA, its size was reduced to approximately 3051 x 2020 pixels

PANORAMA



Panoramic simulation over view is sized 124° x 55°. The single-frame simulation is shown within the red box, and is 37.3° x 25.2°

T. J. Boyle Associates
landscape architects • planning consultants

ENVIRONMENTAL ASSESSMENT FOR WIND RESOURCES: OFFSHORE GEORGIA

Tybee Island Pier Simulation, Morning, Simulated Meteorological Tower 6074

T. J. Boyle Associates
landscape architects • planning consultants

Simulation

Tybee Island Pier

Afternoon

Simulated Meteorological Tower
OCS Block 6074 at 4.19 nm

GENERAL INFORMATION

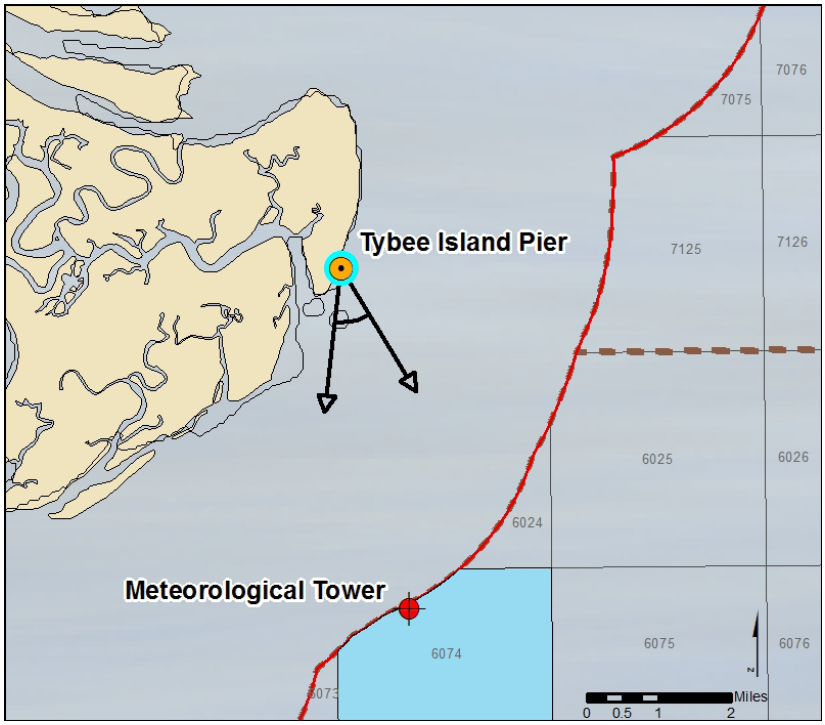
Base Photograph
Photo Name: 2013-08-10 BOEM GA 0173
Date: August 9, 2013
Time: 5:44 PM
GPS Coordinates[1]: lat 31.991768°, long -80.845668°
Viewpoint Elevation: 6.7 m (22')
Eye Level: 1.7 m (5.5')
Original Image Size: 4,928 x 3,264 pixels

Sun and Weather
Sun Angle/Azimuth: 269.5°
Sun Elevation: 31.3°
Lighting Angle: Side lit
Weather Conditions: Sunny
Visibility[2]: 10 mi

Camera Properties
Camera Make/Model: Nikon D7000
Sensor Dimensions: 23.6 mm x 15.6 mm
Lens Make/Model: Nikkor DX AF-S 35 mm
Lens Focal Length: 35 mm
35 mm Equivalent Focal Length: 52.5 mm
Horizontal and Vertical Angles of View:
37.3° wide and 25.2° high
Azimuth from Viewpoint to Tower[3]: 168.49°

Tower 6074 Information
Height/Dimensions:
Platform Height: 12.2 m (40') above MLW
Lattice Tower Height: 67 m (220')
Total Height: 79.2 m (260') above MLW
Instrument House: A bldg. 8'H x 7'W x 13.25'L
FAA L-864 light height: 80m (262.5') above MLW
FAA L-810 light height: 39.6m (130') above MLW
Navigation light height: 13.7m (45') above MLW

CONTEXT MAP



VIEWING INSTRUCTIONS

The simulation is properly printed on an 8.5" x 11" sheet. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the proper perspective when viewed at 15" from the eye, or at a distance of approx. twice the image height.

NOTES

- Lens smudges were adjusted in Photoshop.
- This simulation is taken from a larger panoramic simulation prepared for BOEM
- In reformatting this simulation for inclusion in the EA, its size was reduced to approximately 3051 x 2020 pixels

PANORAMA

Panoramic simulation over view is sized 124° x 55°. The single-frame simulation is shown within the red box, and is 37.3° x 25.2°

ENVIRONMENTAL ASSESSMENT FOR WIND RESOURCES: OFFSHORE GEORGIA

Tybee Island Pier Simulation, Afternoon, Simulated Meteorological Tower 6074

T. J. Boyle Associates
landscape architects • planning consultants

Simulation

Tybee Island Pier

Night-Time

Simulated Meteorological Tower
OCS Block 6074 at 4.19 nm

GENERAL INFORMATION

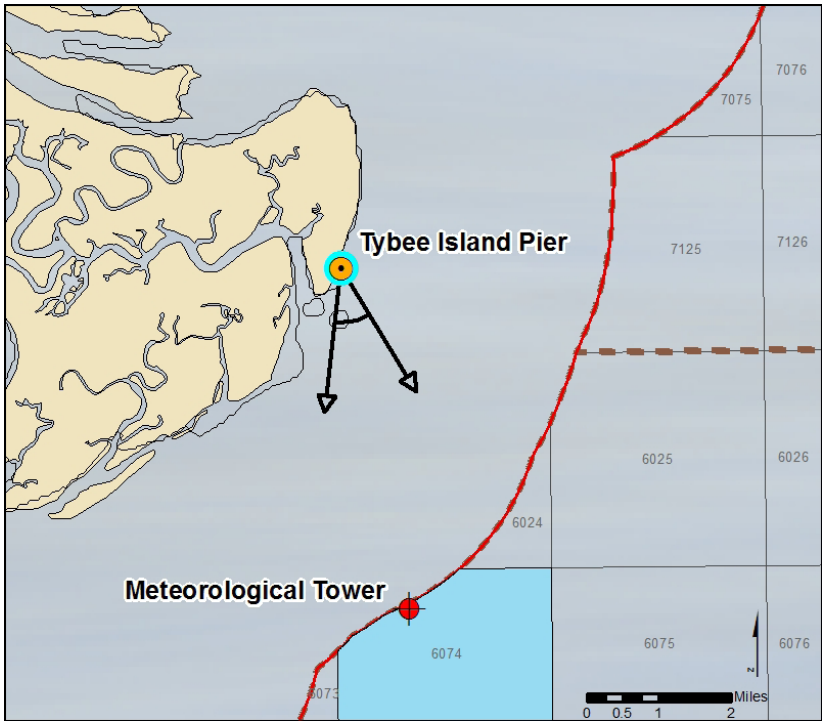
Base Photograph
Photo Name: 2013-08-10 BOEM GA 0237
Date: August 9, 2013
Time:10:06 PM
GPS Coordinates[1]: lat 31.991768°, long -80.845668°
Viewpoint Elevation: 6.7 m (22')
Eye Level: 1.7 m (5.5')
Original Image Size: 4,928 x 3,264 pixels

Sun and Weather
Sun Angle/Azimuth: N/A
Sun Elevation: N/A
Lighting Angle: N/A
Weather Conditions: Starlit
Visibility[2]: N/A

Camera Properties
Camera Make/Model: Nikon D7000
Sensor Dimensions: 23.6 mm x 15.6 mm
Lens Make/Model: Nikkor DX AF-S 35 mm
Lens Focal Length: 35 mm
35 mm Equivalent Focal Length: 52.5 mm
Horizontal and Vertical Angles of View:
37.3° wide and 25.2° high
Azimuth from Viewpoint to Tower[3] : 168.49°

Tower 6074 Information
Height/Dimensions:
Platform Height: 12.2 m (40') above MLW
Lattice Tower Height: 67 m (220')
Total Height: 79.2 m (260') above MLW
Instrument House: A bldg. 8'H x 7'W x 13.25'L
FAA L-864 light height: 80m (262.5') above MLW
FAA L-810 light height: 39.6m (130') above MLW
Navigation light height: 13.7m (45') above MLW

CONTEXT MAP



VIEWING INSTRUCTIONS

The simulation is properly printed on an 8.5" x 11" sheet. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the proper perspective when viewed at 15" from the eye, or at a distance of approx. twice the image height.

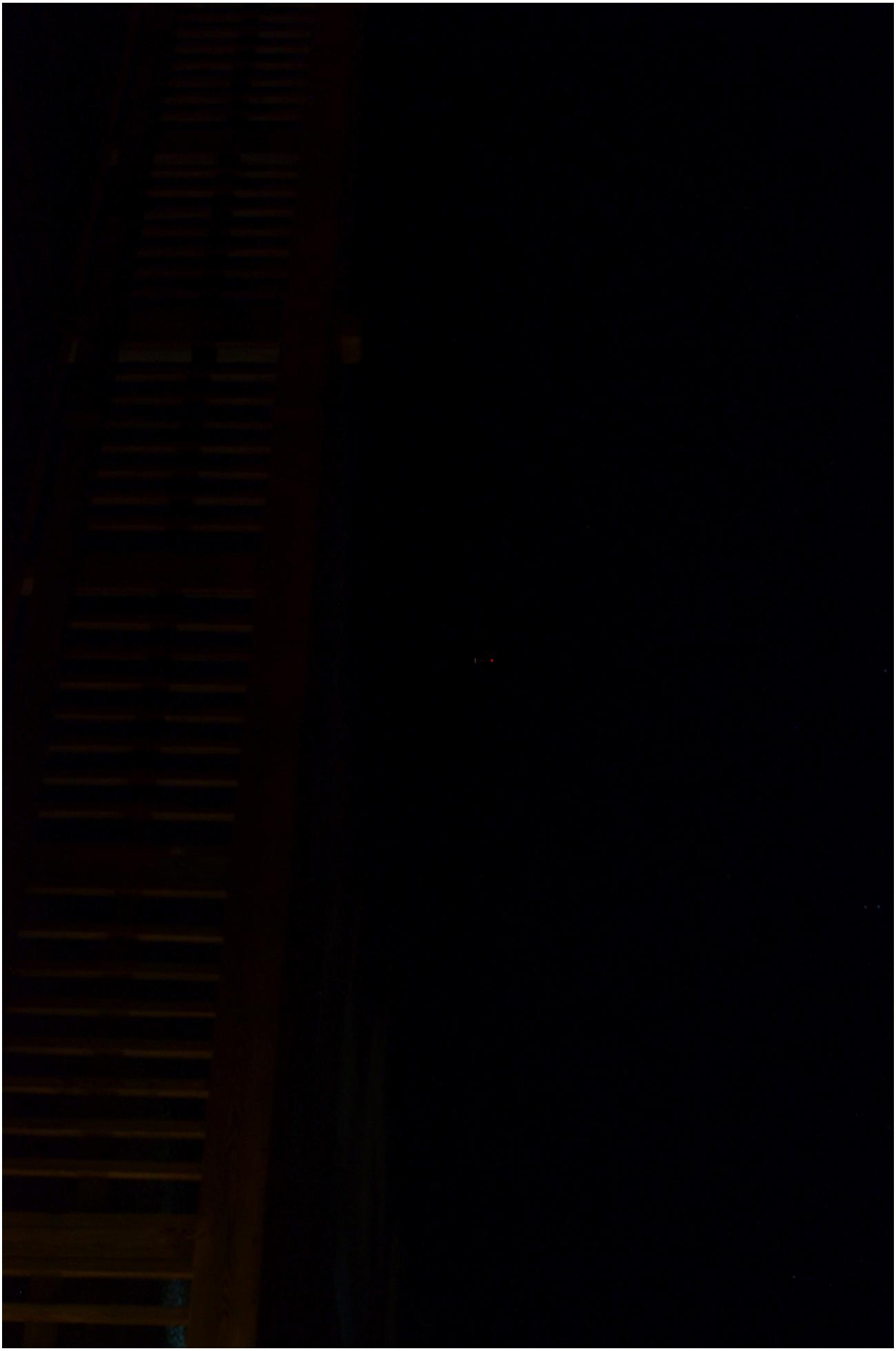
NOTES

- Lens smudges were adjusted in Photoshop.
- This simulation is taken from a larger panoramic simulation prepared for BOEM
- In reformatting this simulation for inclusion in the EA, its size was reduced to approximately 3051 x 2020 pixels

PANORAMA

Panoramic simulation over view is sized 124° x 55°. The single-frame simulation is shown within the red box, and is 37.3° x 25.2°

T. J. Boyle Associates
landscape architects • planning consultants



ENVIRONMENTAL ASSESSMENT FOR WIND RESOURCES: OFFSHORE GEORGIA

Tybee Island Pier Simulation, Night-Time, Simulated Meteorological Tower 6074

Simulation

Fort Pulaski National Monument

Morning

Simulated Meteorological Tower
OCS Block 6074 at 6.91 nm

GENERAL INFORMATION

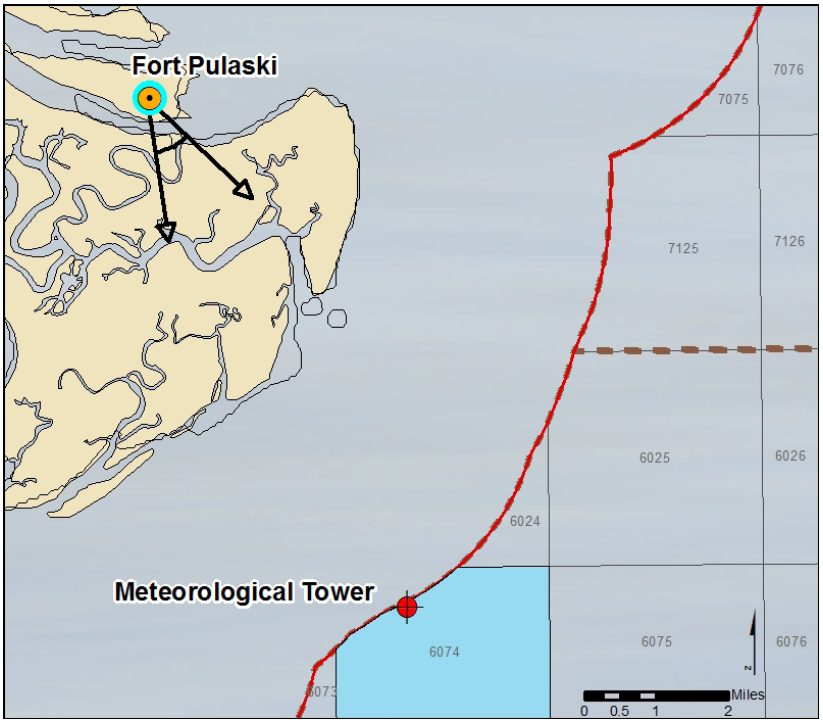
Base Photograph
Photo Name: 2013-08-10 BOEM GA 0360
Date: August 10, 2013
Time: 9:59 AM
GPS Coordinates[1]: lat 32.026997°, long -80.890358°
Viewpoint Elevation: 9.3 m (30.5')
Eye Level: 1.7 m (5.5')
Original Image Size: 4,928 x 3,264 pixels

Sun and Weather
Sun Angle/Azimuth: 96.5°
Sun Elevation: 39.8°
Lighting Angle: Side lit
Weather Conditions: Sunny/Partly cloudy
Visibility[2]: 10 mi

Camera Properties
Camera Make/Model: Nikon D7000
Sensor Dimensions: 23.6 mm x 15.6 mm
Lens Make/Model: Nikkor DX AF-S 35 mm
Lens Focal Length: 35 mm
35 mm Equivalent Focal Length: 52.5 mm
Horizontal and Vertical Angles of View:
37.3° wide and 25.2° high
Azimuth from Viewpoint to Tower[3]: 152.9°

Tower 6074 Information
Height/Dimensions:
Platform Height: 12.2 m (40') above MLW
Lattice Tower Height: 67 m (220')
Total Height: 79.2 m (260') above MLW
Instrument House: A bldg. 8'H x 7'W x 13.25'L
FAA L-864 light height: 80m (262.5') above MLW
FAA L-810 light height: 39.6m (130') above MLW
Navigation light height: 13.7m (45') above MLW

CONTEXT MAP



VIEWING INSTRUCTIONS

The simulation is properly printed on an 8.5" x 11" sheet. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the proper perspective when viewed at 15" from the eye, or at a distance of approx. twice the image height.

NOTES

- Lens smudges were adjusted in Photoshop.
- This simulation is taken from a larger panoramic simulation prepared for BOEM
- In reformatting this simulation for inclusion in the EA, its size was reduced to approximately 3051 x 2020 pixels

PANORAMA

Panoramic simulation over view is sized 124° x 55°. The single-frame simulation is shown within the red box, and is 37.3° x 25.2°

ENVIRONMENTAL ASSESSMENT FOR WIND RESOURCES: OFFSHORE GEORGIA

Fort Pulaski National Monument Simulation, Morning, Simulated Meteorological Tower 6074

T. J. Boyle Associates
landscape architects • planning consultants

Simulation

Fort Pulaski National Monument

Afternoon

Simulated Meteorological Tower
OCS Block 6074 at 6.91 nm

GENERAL INFORMATION

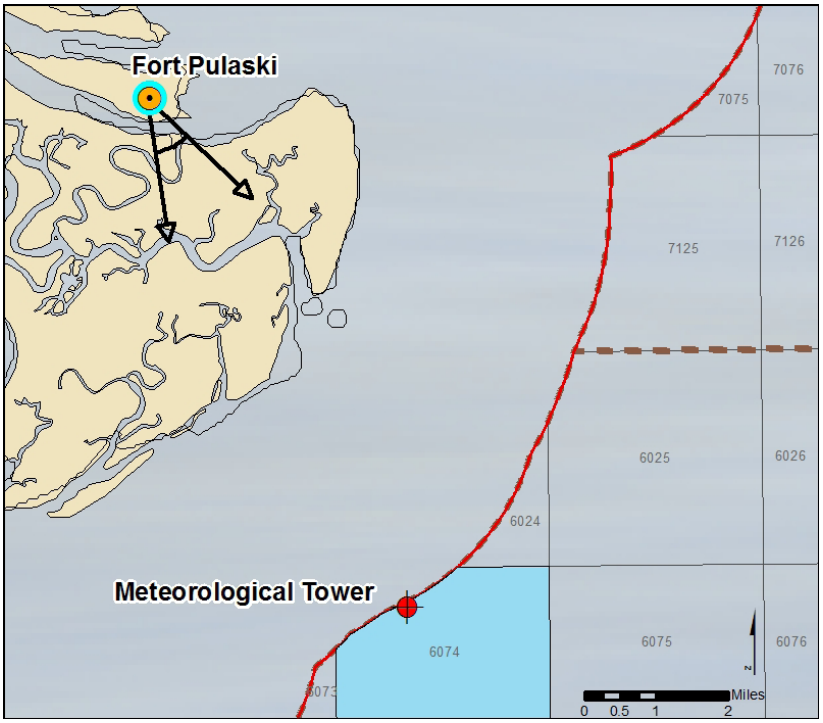
Base Photograph
Photo Name: 2013-08-10 BOEM GA 0536
Date: August 10, 2013
Time: 4:14 PM
GPS Coordinates[1]: lat 32.026997°, long -80.890358°
Viewpoint Elevation: 9.3 m (30.5')
Eye Level: 1.7 m (5.5')
Original Image Size: 4,928 x 3,264 pixels

Sun and Weather
Sun Angle/Azimuth: 254.9°
Sun Elevation: 50°
Lighting Angle: Side lit
Weather Conditions: Sunny/Partly cloudy
Visibility[2]: 10 mi

Camera Properties
Camera Make/Model: Nikon D7000
Sensor Dimensions: 23.6 mm x 15.6 mm
Lens Make/Model: Nikkor DX AF-S 35 mm
Lens Focal Length: 35 mm
35 mm Equivalent Focal Length: 52.5 mm
Horizontal and Vertical Angles of View:
37.3° wide and 25.2° high
Azimuth from Viewpoint to Tower[3] : 152.9°

Tower 6074 Information
Height/Dimensions:
Platform Height: 12.2 m (40') above MLW
Lattice Tower Height: 67 m (220')
Total Height: 79.2 m (260') above MLW
Instrument House: A bldg. 8'H x 7'W x 13.25'L
FAA L-864 light height: 80m (262.5') above MLW
FAA L-810 light height: 39.6m (130') above MLW
Navigation light height: 13.7m (45') above MLW

CONTEXT MAP



VIEWING INSTRUCTIONS

The simulation is properly printed on an 8.5" x 11" sheet. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the proper perspective when viewed at 15" from the eye, or at a distance of approx. twice the image height.

NOTES

- Lens smudges were adjusted in Photoshop.
- This simulation is taken from a larger panoramic simulation prepared for BOEM
- In reformatting this simulation for inclusion in the EA, its size was reduced to approximately 3051 x 2020 pixels

PANORAMA

Panoramic simulation over view is sized 124° x 55°. The single-frame simulation is shown within the red box, and is 37.3° x 25.2°

ENVIRONMENTAL ASSESSMENT FOR WIND RESOURCES: OFFSHORE GEORGIA

Fort Pulaski National Monument Simulation, Afternoon Simulated Meteorological Tower 6074

T. J. Boyle Associates
landscape architects • planning consultants

Simulation

Fort Pulaski Bridge

Night-Time

Simulated Meteorological Tower
OCS Block 6074 at 6.92 nm

GENERAL INFORMATION

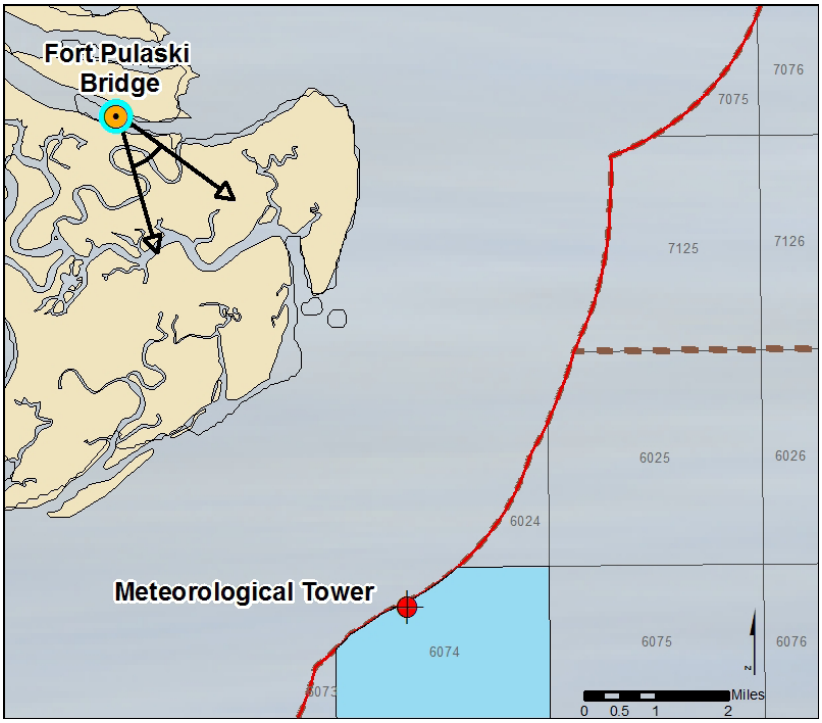
Base Photograph
Photo Name: 2013-08-10 BOEM GA 0582
Date: August 10, 2013
Time: 11:04 PM
GPS Coordinates[1]: lat 32.026997°, long -80.890358°
Viewpoint Elevation: 3.8 m (12.5')
Eye Level: 1.7 m (5.5')
Original Image Size: 4,928 x 3,264 pixels

Sun and Weather
Sun Angle/Azimuth: N/A
Sun Elevation: N/A
Lighting Angle: N/A
Weather Conditions: Starlit
Visibility[2]: N/A

Camera Properties
Camera Make/Model: Nikon D7000
Sensor Dimensions: 23.6 mm x 15.6 mm
Lens Make/Model: Nikkor DX AF-S 35 mm
Lens Focal Length: 35 mm
35 mm Equivalent Focal Length: 52.5 mm
Horizontal and Vertical Angles of View:
37.3° wide and 25.2° high
Azimuth from Viewpoint to Tower[3] : 152.9°

Tower 6074 Information
Height/Dimensions:
Platform Height: 12.2 m (40') above MLW
Lattice Tower Height: 67 m (220')
Total Height: 79.2 m (260') above MLW
Instrument House: A bldg. 8'H x 7'W x 13.25'L
FAA L-864 light height: 80m (262.5') above MLW
FAA L-810 light height: 39.6m (130') above MLW
Navigation light height: 13.7m (45') above MLW

CONTEXT MAP



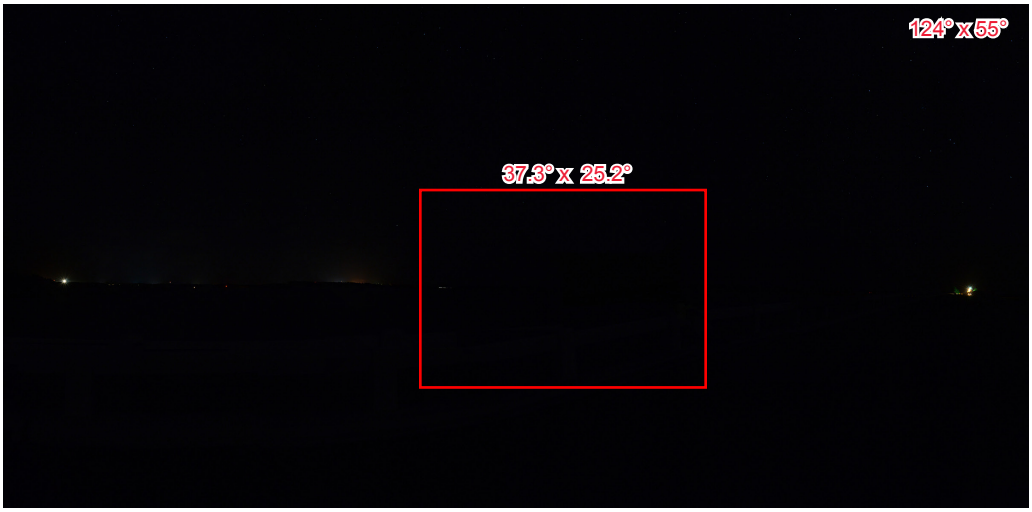
VIEWING INSTRUCTIONS

The simulation is properly printed on an 8.5" x 11" sheet. If viewed on a computer monitor, use the highest screen resolution. The simulated image is at the proper perspective when viewed at 15" from the eye, or at a distance of approx. twice the image height.

NOTES

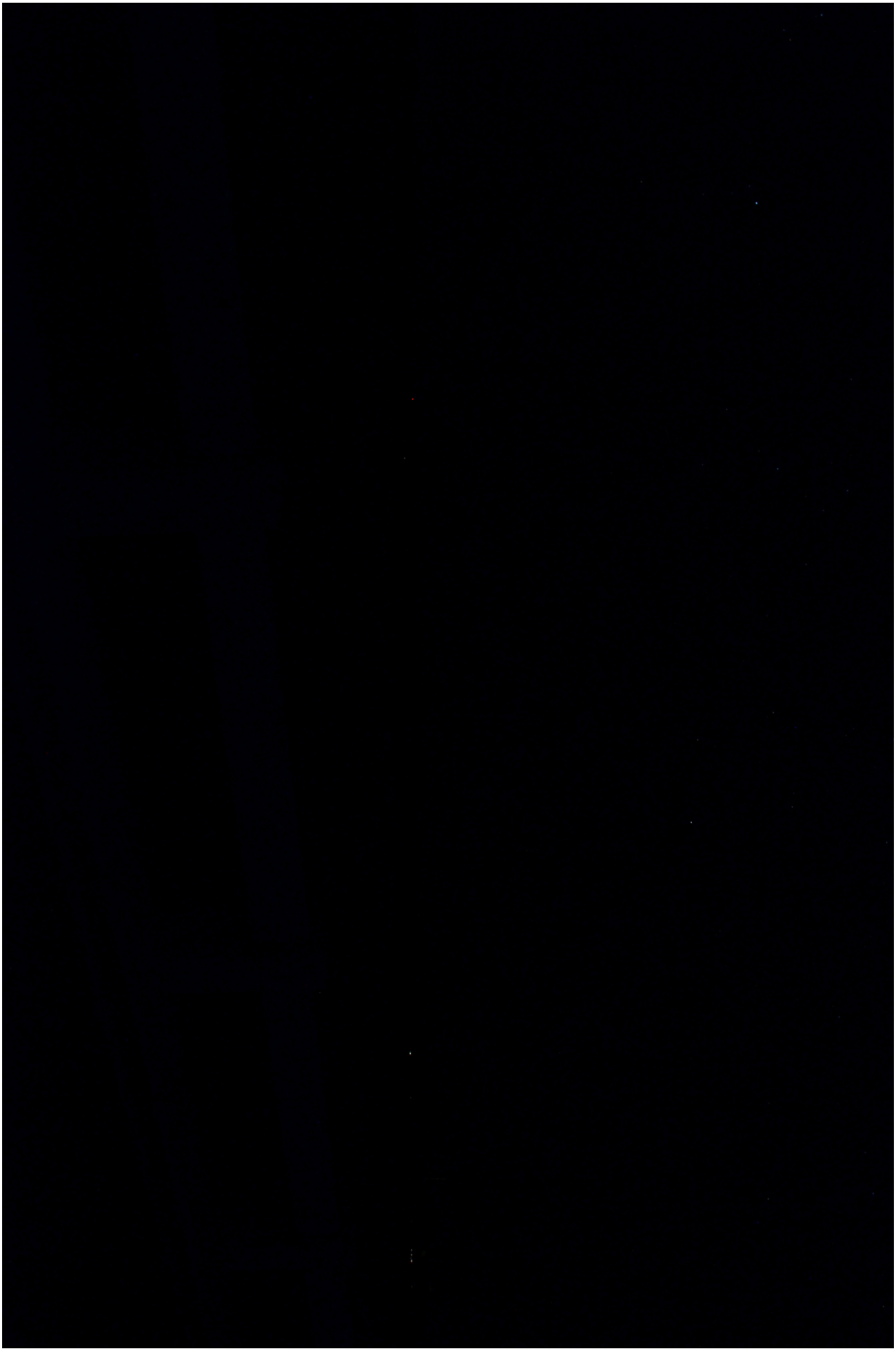
- Lens smudges were adjusted in Photoshop.
- This simulation is taken from a larger panoramic simulation prepared for BOEM
- In reformatting this simulation for inclusion in the EA, its size was reduced to approximately 3051 x 2020 pixels

PANORAMA



Panoramic simulation over view is sized 124° x 55°. The single-frame simulation is shown within the red box, and is 37.3° x 25.2°

T. J. Boyle Associates
landscape architects • planning consultants



ENVIRONMENTAL ASSESSMENT FOR WIND RESOURCES: OFFSHORE GEORGIA

Fort Pulaski National Monument Simulation, Night-Time, Simulated Meteorological Tower 6074

T. J. Boyle Associates
landscape architects • planning consultants

APPENDIX C

PROGRAMMATIC AGREEMENT

MAY 2 3 2013

PROGRAMMATIC AGREEMENT
Among
The U.S. Department of the Interior, Bureau of Ocean Energy Management;
the State Historic Preservation Officers of North Carolina, South Carolina, Georgia, and Florida;
The Catawba Indian Nation and
The Advisory Council on Historic Preservation;
Regarding
Review of Outer Continental Shelf Renewable Energy Activities under
Section 106 of the National Historic Preservation Act

WHEREAS, the Outer Continental Shelf Lands Act (OCSLA) grants the Secretary of the Interior the authority to issue leases, easements, or rights-of-way on the Outer Continental Shelf (OCS) for the purpose of renewable energy development, including wind energy development (*see* 43 U.S.C. § 1337(p)(1)(C)), and to promulgate regulations to carry out this authority (*see* 43 U.S.C. § (p)(8)); and

WHEREAS, the Secretary delegated this authority to the former Minerals Management Service (MMS), now the Bureau of Ocean Energy Management (BOEM), and promulgated final regulations implementing this authority at 30 CFR § 585; and

WHEREAS, under the renewable energy regulations, the issuance of leases and subsequent approval of wind energy development on the OCS is a staged decision-making process that occurs in distinct phases; and

WHEREAS, BOEM may issue commercial leases, limited leases, research leases, interim policy leases, Right-of-Way (ROW) grants, or Right-of-Use and Easement (RUE) grants on the OCS, and

WHEREAS, *Outer Continental Shelf* (OCS) means all submerged lands lying seaward and outside of the area of lands beneath navigable waters, as defined in section 2 of the Submerged Lands Act (43 U.S.C. 1301), whose subsoil and seabed appertain to the United States and are subject to its jurisdiction and control. *See* 30 CFR § 585.112; and

WHEREAS, *Commercial lease* means a lease, issued under the renewable energy regulations at 30 CFR § 585, that specifies the terms and conditions under which a person can conduct commercial activities. *See* 30 CFR § 585.112; and

WHEREAS, *Commercial activities* mean, for renewable energy leases and grants, all activities associated with the generation, storage, or transmission of electricity or other energy product from a renewable energy project on the OCS, and for which such electricity or other energy product is intended for distribution, sale, or other commercial use, except for electricity or other energy product distributed or sold pursuant to technology-testing activities on a limited lease. This term also includes activities associated with all stages of development, including initial site characterization and assessment, facility construction, and project decommissioning. *See* 30 CFR § 585.112; and

WHEREAS, *Limited lease* means a lease, issued under the renewable energy regulations at 30 CFR § 585, that specifies the terms and conditions under which a person may conduct activities on the OCS that support the production of energy, but do not result in the production of electricity or other energy product for sale, distribution, or other commercial use exceeding a limit specified in the lease. *See* 30 CFR § 585.112; and

WHEREAS, *Research lease* means an OCS lease, ROW grant, and/or RUE grant, issued under the renewable energy regulations at 30 CFR § 585.238, to a Federal agency or a state for renewable energy research activities that support the future production, transportation, or transmission of renewable energy. *See* 30 CFR § 585.112; and

WHEREAS, *Interim Policy lease* means a lease, issued under the interim policy announced in November 2007, before the issuance of the final regulations in April 2009, which allowed for limited leasing for resource data collection and technology testing activities. The Interim Policy leases have a five year term and provide no subsequent commercial rights. *See* 72 FR 62673; and

WHEREAS, *ROW grant* means an authorization, issued under the renewable energy regulations at 30 CFR § 585, to use a portion of the OCS for the construction and use of a cable or pipeline for the purpose of gathering, transmitting, distributing, or otherwise transporting electricity or other energy product generated or produced from renewable energy. An ROW grant authorizes the holder to install on the OCS cables, pipelines, and associated facilities that involve the transportation or transmission of electricity or other energy product from renewable energy projects. *See* 30 CFR § 585.112; and

WHEREAS, *RUE grant* means an easement, issued under the renewable energy regulations at 30 CFR § 585, that authorizes use of a designated portion of the OCS to support activities on a lease or other use authorization for renewable energy activities. An RUE grant authorizes the holder to construct and maintain facilities or other installations on the OCS that support the production, transportation, or transmission of electricity or other energy product from any renewable energy resource. *See* 30 CFR § 585.112; and

WHEREAS, *Qualified marine archaeologist* means a person who meets the Secretary of the Interior's Professional Qualification Standards for Archaeology (48 FR 44738 – 44739), and has experience analyzing marine geophysical data; and

WHEREAS, Commercial leases/limited leases and ROW and RUE grants do not grant the lessee or grantee the right to construct any facilities; rather, the lease or grant grants the lessee or grantee the right to use the leased area to develop its plans, which must be submitted to and approved by BOEM before the lessee or grantee implements its plans. *See* 30 CFR § 585.600 and 585.601; and

WHEREAS, under BOEM's renewable energy regulations at 30 CFR § 585, BOEM may review and approve, approve with modifications, or disapprove Site Assessment Plans (SAPs), Construction and Operations Plans (COPs), and General Activities Plans (GAPs), collectively "plans". *See* 30 CFR § 585.613(e), 585.628(f), 585.648(e); and

WHEREAS, under the Interim Policy, BOEM may review and object to project plans; and

WHEREAS, BOEM has determined that issuing leases and grants and approving plans constitute undertakings subject to Section 106 of the National Historic Preservation Act (NHPA; 16 U.S.C. § 470f), and its implementing regulations (36 CFR § 800); and

WHEREAS, the issuance of a commercial or limited lease, or a ROW or RUE grant has the potential to cause effects on historic properties insofar as it may lead to the lessee conducting geotechnical testing; and

WHEREAS, the issuance of a research or interim policy lease or approval of a plan has the potential to cause effects on historic properties insofar as it may lead to the lessee conducting additional geotechnical testing; constructing and operating site assessment facilities and renewable energy structures; and placing and operating a transmission cable; and

WHEREAS, BOEM may issue multiple renewable energy leases and grants and approve multiple plans associated with each lease or grant issued on the OCS offshore the Atlantic states; and

WHEREAS, BOEM has determined that the implementation of the Offshore Renewable Energy Program is complex, as the decisions on these undertakings are phased, pursuant to 36 CFR § 800.14(b); and

WHEREAS, 36 CFR § 800.4(b)(2) provides for deferral of final identification and evaluation of historic properties when provided for in an agreement executed pursuant to 36 CFR §800.14(b); and

WHEREAS, BOEM has determined that the identification and evaluation of historic properties shall be conducted through a phased approach, pursuant to 36 CFR § 800.4(b)(2), where the final identification of historic properties may occur after the issuance of a lease or grant and before the approval of a plan as a lessee conducts site characterization surveys in preparation for plan submittal (*see* 30 CFR 585); and

WHEREAS, the deferral of final identification and evaluation of historic properties could result in the discovery of unknown significant historic properties that could impact project planning, siting, and timelines; and

WHEREAS, 36 CFR § 800.14(b)(3) provides for developing programmatic agreements (agreements) for complex or multiple undertakings and § 800.14(b)(1) provides for using agreements when effects on historic properties cannot be fully determined prior to approval of an undertaking (*see* 800.14(b)(1)(ii)), and for other circumstances warranting a departure from the normal Section 106 process (*see* 800.14(b)(1)(v)); and

WHEREAS, the Section 106 consultations described in this agreement will be used to establish a process for identifying historic properties located within the undertakings' Areas of Potential Effects (APE), and to assess the potential adverse effects and to avoid, reduce, or resolve any such effects through the process set forth in this agreement; and

WHEREAS, historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register (*see* 36 CFR § 800.16(l)(1)); and

WHEREAS, BOEM has identified and consulted with the State Historic Preservation Officers (SHPOs) for NC, SC, GA, and FL, (collectively, "the SHPOs"); and

WHEREAS, the Seminole Tribe of Florida and the Catawba Indian Nation are Tribes, as defined at 36 CFR § 800.16(m), have chosen to consult with BOEM and participate in development of this agreement; and

WHEREAS, BOEM shall continue to consult with these and other Tribes to identify properties of religious and cultural significance that may be eligible for listing in the National Register of Historic Places (including Traditional Cultural Properties or TCPs) and that may be affected by these undertakings; and

WHEREAS, BOEM involves the public and identifies other consulting parties through notifications, requests for comments, existing renewable energy task forces, contact with SHPOs, NEPA scoping meetings and communications for these proposed actions; and

WHEREAS, BOEM, the SHPOs, the Catawba Indian Nation, and the Advisory Council on Historic Preservation (ACHP) are signatories to this agreement.

NOW, THEREFORE, the signatories agree that Section 106 review shall be conducted in accordance with the following stipulations.

STIPULATIONS

I. For the undertakings of issuing a commercial or limited lease, or a ROW or RUE grant, the signatories agree that:

A. The APE will be defined as the depth and breadth of the seabed that could potentially be impacted by geotechnical testing.

B. A reasonable and good faith effort to carry out appropriate identification of historic properties within the APE is presented in BOEM's Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 585 (hereafter, *Guidelines*; *see* 36 CFR § 800.4(b)(1)). Should BOEM wish to alter any archaeological survey-related information included in its *Guidelines*, BOEM will first consult with the signatories.

C. Prior to lease or grant under this part, BOEM will identify consulting parties, pursuant to 36 CFR 800.3(f). BOEM will consult on existing, non-proprietary information regarding the proposed undertaking and the geographic extent of the APE, as defined in Stipulation I.A. BOEM also will solicit additional information on historic properties within the APE from the consulting parties and the public.

D. BOEM will require lessees and grantees to avoid adverse effects to historic properties where practicable through lease stipulations. Prior to issuing a lease or grant under this part, BOEM will record a finding of *No historic properties affected*, consistent with 36 CFR § 800.4(d). If adverse effects to historic properties cannot be avoided, BOEM will make a determination of *Historic properties affected* and follow 36 CFR § 800.4(d)(2); and resolve any adverse effect by following 36 CFR § 800.6.

II. For the undertakings of approving a plan, except as described under Stipulation IV (below), the signatories agree that:

A. The APE will be defined as the depth and breadth of the seabed that could potentially be impacted by seafloor/bottom-disturbing activities associated with the undertakings; the onshore viewshed from which renewable energy structures would be visible; and where applicable, the depth and breadth, and viewshed of onshore locations where transmission lines come ashore until they connect to existing grid structures.

B. The following constitute a reasonable and good faith effort to carry out appropriate identification of historic properties; *see* 36 CFR § 800.4(b)(1):

1. for the identification of historic properties within the seabed portion of the APE located on the OCS, historic property identification survey results generated in accordance with BOEM's *Guidelines*; and

2. for the identification of historic properties within the seabed portion of the APE located in state waters, within the viewshed portion of the APE, and within the onshore terrestrial portion of the APE, historic property identification survey(s) conducted in a manner acceptable to the affected SHPO (or affected Tribe, if on tribal lands).

C. Prior to approving a plan, BOEM will identify consulting parties, pursuant to 36 CFR 800.3(f). BOEM will consult on existing, non-proprietary information regarding the proposed undertaking and the geographic extent of the APE, as defined in Stipulation II.A. BOEM also will solicit from the consulting parties and the public additional information on historic properties within the APE.

D. Prior to approving a plan, BOEM will treat all identified potential historic properties as historic properties eligible for inclusion on the National Register unless BOEM determines that a historic property is ineligible, pursuant to 36 CFR § 800.4(c).

E. Prior to approving a plan, BOEM will avoid all identified historic properties by requiring the lessee to relocate elements of the proposed project which may affect properties, resulting in a finding of *No historic properties affected* (36 CFR § 800.4(d)(1)).

1. For the seabed portion of the APE, if a potential historic property is identified, and the lessee chooses to conduct additional investigations (e.g. diver investigation, Remotely Operated Vehicle [ROV] survey, or other methods),

and if additional investigations demonstrate that a potential historic property does not exist, then BOEM will make a determination of *No historic properties affected* and follow 36 CFR § 800.4(d)(1).

2. If a historic property may be affected, BOEM will evaluate the historic significance of the property, in accordance with 800.4(c); make a determination of *Historic properties affected* and follow 36 CFR § 800.4(d)(2); and resolve any adverse effects by following 36 CFR § 800.6.

III. For the undertakings of issuing a research or interim policy lease, except as described under Stipulation IV (below), the signatories agree that:

A. The APE will be defined as the depth and breadth of the seabed that could potentially be impacted by seafloor/bottom-disturbing activities associated with the undertakings; the onshore viewshed from which renewable energy structures would be visible; and where applicable, the depth and breadth, and viewshed of onshore locations where transmission lines come ashore until they connect to existing grid structures.

B. The following constitute a reasonable and good faith effort to carry out appropriate identification of historic properties; *see* 36 CFR § 800.4(b)(1):

1. for the identification of historic properties within the seabed portion of the APE located on the OCS, historic property identification survey results generated in accordance with BOEM's *Guidelines*; and

2. for the identification of historic properties within the seabed portion of the APE located in state waters, within the viewshed portion of the APE, and within the onshore terrestrial portion of the APE, historic property identification survey(s) conducted in a manner acceptable to the affected SHPO (or affected Tribe, if on tribal lands).

C. Prior to issuing a research or interim policy lease under this part, BOEM will identify consulting parties, pursuant to 36 CFR 800.3(f). BOEM will consult on existing, non-proprietary information regarding the proposed undertaking and the geographic extent of the APE, as defined in Stipulation III.A. BOEM also will solicit from the consulting parties and the public additional information on historic properties within the APE.

D. Prior to issuing a research or interim policy lease under this part, BOEM will require lessees and grantees to avoid adverse effects to historic properties where practicable through lease stipulations. Prior to issuing a lease or grant under this part, BOEM will record a finding of *No historic properties affected*, consistent with 36 CFR § 800.4(d). If adverse effects to historic properties cannot be avoided, BOEM will make a determination of *Historic properties affected* and follow 36 CFR § 800.4(d)(2); and resolve any adverse effect by following 36 CFR § 800.6.

IV. Exempted Categories

Pursuant to 36 CFR § 800.14(c), the signatories agree to exempt from Section 106 review the following categories of activities:

A. Archaeological Sampling: Vibracores or other direct samples collected, by or under the supervision of a Qualified Marine Archaeologist, for the purposes – at least in part – of historic property identification or National Register eligibility testing and evaluation.

B. Meteorological Towers and/or Buoys: Proposed construction and operation of meteorological towers and/or installation of meteorological buoys when the results of geophysical data collected meet the standards established in BOEM's *Guidelines* and either: 1) resulted in the identification of no archaeological site within the seabed portion of the APE for the tower and/or buoy, or 2) if the project APE can be relocated to an area that does not contain an archaeological site, if any such sites are identified during geophysical survey. The signatories agree that offshore meteorological towers and/or buoys have no effect on onshore historic properties since they are temporary in nature and indistinguishable from lighted vessel traffic.

V. Tribal Consultation. BOEM shall continue to consult with the Tribes throughout the implementation of this agreement in a government-to-government manner consistent with Executive Order 13175, Presidential memoranda, and any Department of the Interior policies, on subjects related to the undertakings.

VI. Public Participation

A. Because BOEM and the signatories recognize the importance of public participation in the Section 106 process, BOEM shall continue to provide opportunities for public participation in Section 106-related activities, and shall consult with the signatories on possible approaches for keeping the public involved and informed throughout the term of the agreement.

B. BOEM shall keep the public informed and may produce reports on historic properties and on the Section 106 process that may be made available to the public at BOEM's headquarters, on the BOEM website, and through other reasonable means insofar as the information shared conforms to the confidentiality clause of this agreement.

VII. Confidentiality. Because BOEM and the signatories agree that it is important to withhold from disclosure sensitive information such as that which is protected by NHPA Section 304 (16 U.S.C. § 470w-3) (*e.g.*, the location, character and ownership of an historic resource, if disclosure would cause a significant invasion of privacy, risk harm to the historic resources, or impede the use of a traditional religious site by practitioners), BOEM shall:

A. Request that each signatory inform the other signatories if, by law or policy, it is unable to withhold sensitive data from public release.

B. Arrange for the signatories to consult as needed on how to protect such information collected or generated under this agreement.

C. Follow, as appropriate, 36 CFR § 800.11(c) for authorization to withhold information pursuant to NHPA Section 304, and otherwise withhold sensitive information to the extent allowable by laws including the Freedom of Information Act, 5 U.S.C. § 552, through the Department of the Interior regulations at 43 CFR Part 2.

D. Request that the signatories agree that materials generated during consultation be treated by the signatories as internal and pre-decisional until they are formally released, although the signatories understand that they may need to be released by one of the signatories if required by law.

VIII. Administrative Stipulations

A. In coordinating reviews, BOEM shall follow this process:

1. Standard Review: The signatories shall have a standard review period of thirty (30) calendar days for commenting on all documents which are developed under the terms of this agreement, from the date they are received by the signatory.

2. Expedited Request for Review: The signatories recognize the time-sensitive nature of this work and shall attempt to expedite comments or concurrence when BOEM so requests. The expedited comment period shall not be less than fifteen (15) calendar days from the date such a request is received by the signatory.

3. If a signatory cannot meet BOEM's expedited review period request, it shall notify BOEM in writing within the fifteen (15) calendar day period. If a signatory fails to provide comments or respond within the time frame requested by BOEM (either standard or expedited), then BOEM may proceed as though it has received concurrence from that signatory. BOEM shall consider all comments received within the review period.

4. Unless otherwise indicated below, all signatories will send correspondence and materials for review via electronic media unless a signatory requests, in writing, that BOEM transmit the materials by an alternate method specified by that signatory. Should BOEM transmit the review materials by the alternate method, the review period will begin on the date the materials were received by the signatory, as confirmed by delivery receipt.

a. SC SHPO Review Specifications: All materials for formal review will be sent to SC SHPO in hard copy.

b. GA SHPO Review Specifications: All materials for formal review will be sent to GA SHPO in hard copy. Except in exceptional, emergency circumstances, BOEM acknowledges that GA SHPO cannot meet expedited review requests.

5. Each signatory shall designate a point of contact for carrying out this agreement and provide this contact's information to the other signatories, updating it as necessary while this agreement is in force. Updating a point of contact alone shall not necessitate an amendment to this agreement.

B. Dispute Resolution. Should any signatory object in writing to BOEM regarding an action carried out in accordance with this agreement, or lack of compliance with the terms of this agreement, the Signatories shall consult to resolve the objection. Should the Signatories be unable to resolve the disagreement, BOEM shall forward its background information on the dispute as well as its proposed resolution of the dispute to the ACHP. Within 45 calendar days after receipt of all pertinent documentation, the ACHP shall either: (1) provide BOEM with written recommendations, which BOEM shall take into account in reaching a final decision regarding the dispute; or (2) notify BOEM that it shall comment pursuant to 36 CFR § 800.7(c), and proceed to comment. BOEM shall take this ACHP comment into account, in accordance with 36 CFR § 800.7(c)(4). Any ACHP recommendation or comment shall be understood to pertain only to the subject matter of the dispute; BOEM's responsibility to carry out all actions under this agreement that are not subjects of dispute shall remain unchanged.

C. Amendments. Any signatory may propose to BOEM in writing that this agreement be amended, whereupon BOEM shall consult with the signatories to consider such amendment. This agreement may then be amended when agreed to in writing by all signatories, becoming effective on the date that the amendment is executed by the ACHP as the last signatory.

D. Coordination with other Federal Agencies. In the event that another Federal agency believes it has Section 106 responsibilities related to the undertakings which are the subject of this agreement, BOEM will request to coordinate its review with those other agencies. Additionally, that agency may attempt to satisfy its Section 106 responsibilities by agreeing in writing to the terms of this agreement and notifying and consulting with the SHPOs and the ACHP. Any modifications to this agreement that may be necessary for meeting that agency's Section 106 obligations shall be considered in accordance with this agreement.

E. Adding Concurring Parties. In the event that another party wishes to assert its support of this agreement, that party may prepare a letter indicating its concurrence, which BOEM will attach to the agreement and circulate among the signatories.

F. Term of Agreement.

1. The agreement shall remain in full force for twenty-five (25) years from the date the agreement is executed, defined as the date the last signatory signs, unless otherwise extended by amendment in accordance with this agreement. The term is related to the standard length of the operations term of commercial leases, which is given at 30 CFR § 585.235.

2. The signatories agree to meet every five years, beginning from the date the agreement is executed, to discuss the agreement and to determine whether amendment or termination is necessary.

G. Termination.

1. If any signatory determines that the terms of the agreement cannot be carried out or are not being carried out, that signatory shall notify the other signatories in writing and consult with them to seek amendment of the agreement. If within sixty (60) calendar days of such notification, an amendment cannot be made, any signatory may terminate the agreement upon written notice to the other Signatories.

2. If termination is occasioned by BOEM's final decision on the last plan considered under the Renewable Energy Regulations at 30 CFR § 585, BOEM shall notify the signatories and the public, in writing.

H. Anti-Deficiency Act. Pursuant to 31 U.S.C. § 1341(a)(1), nothing in this agreement shall be construed as binding the United States to expend in any one fiscal year any sum in excess of appropriations made by Congress for this purpose, or to involve the United States in any contract or obligation for the further expenditure of money in excess of such appropriations.

I. Existing Law and Rights. Nothing in this agreement shall abrogate existing laws or the rights of any consulting party or signatory to this agreement.

J. Compliance with Section 106. Execution and implementation of this agreement evidences that BOEM has satisfied its Section 106 responsibilities for all aspects of these proposed undertakings by taking into account the effects of these undertakings on historic properties and affording the ACHP a reasonable opportunity to comment with regard to the undertakings.

bc: Official File
OREP Chron
BOEM: OREP: BCarrier:jl: 05/9/2013: 703-787-1623
Filename: AEAU/ERB/Environmental Compliance/2011-ATL-009NC/106-G2G/South Atlantic PA

Programmatic Agreement concerning Review of Renewable Energy Activities under Section 106 of National Historic Preservation Act

Maureen A. Bornholdt

Date: May 23, 2013

Maureen A. Bornholdt
Program Manager
Office of Renewable Energy Programs

Programmatic Agreement concerning Review of Renewable Energy Activities under Section 106 of National Historic Preservation Act

W. Eric Emerson Date: 6-26-13

Dr. W. Eric Emerson
South Carolina State Historic Preservation Officer

Programmatic Agreement concerning Review of Renewable Energy Activities under Section 106 of National Historic Preservation Act

Date: 3 JUNE '15

Dr. David Crass
Georgia Deputy State Historic Preservation Officer,
Director, Historic Preservation Division

Programmatic Agreement concerning Review of Renewable Energy Activities under Section 106 of National Historic Preservation Act

Robert F. Bendus Date: 6/19/13

Robert F. Bendus
Florida State Historic Preservation Officer
Director, Division of Historical Resources

Jun 27 13 11:10a Catawba Cultural Center 8033285791 p.1

Programmatic Agreement concerning Review of Renewable Energy Activities under Section 106 of National Historic Preservation Act

Winonah H. Haire Date: 6/27/13

Dr. Winonah Haire
Tribal Historic Preservation Officer
Catawba Indian Nation

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the sound use of our land and water resources, protecting our fish, wildlife and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island communities.

The Bureau of Ocean Energy Management

The Bureau of Ocean Energy Management (BOEM) works to manage the exploration and development of the nation's offshore resources in a way that appropriately balances economic development, energy independence, and environmental protection through oil and gas leases, renewable energy development and environmental reviews and studies.

BOEM
Bureau of Ocean Energy Management

www.boem.gov