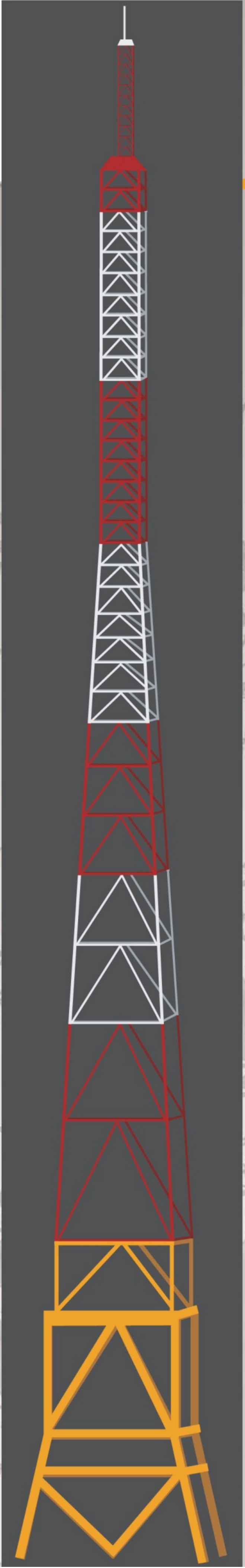

April 7, 2011

Southern Company
Interim Policy Lease Application

Data Collection Project
Offshore of Tybee Island, Georgia

prepared for:

Bureau of Ocean Energy Management,
Regulation and Enforcement
Outer Continental Shelf Alternative Energy Program
Interim Policy Lease

Mail Stop 4090
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Southern Company

SOUTHERN COMPANY

and

Geo-Marine, Inc.

GEO-MARINE GMI
A Subsidiary of Applied Research Associates, Inc.

Southern Company IP Lease Application

Bureau of Ocean Energy Management,

Regulation and Enforcement

Outer Continental Shelf (OCS) Alternative Energy Program

Interim Policy Lease

April 7, 2011

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LIST OF ACRONYMS AND ABBREVIATIONS

µs	Microsecond(s)
ac	Acre(s)
AMP	Air Monitoring Program
ASMFC	Atlantic States Marine Fisheries Commission
AWEA	American Wind Energy Association
AWOIS	Automated Wreck and Obstruction Information System
BMP	Best Management Practice
BOEMRE	Bureau of Ocean Energy Management, Regulation, and Enforcement
BR	Biosphere Reserve
BSH	Biologically Sensitive Habitat
CAA	Clean Air Act
CFR	Code of Federal Regulations
CMAN	Coastal Marine Automated Network
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRD	Coastal Resources Division
CWA	Clean Water Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
dB re 1 µPa	Decibel(s) with a Reference of One Micropascal
dB	Decibel(s)
DCC	Data Collection Configuration
DNR	Department of Natural Resources
DoD	Department of Defense
DOT	Department of Transportation
DPS	Distinct Population Segment
EERE	*E*nergy Efficiency and Renewable Energy
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
EPD	Environmental Protection Division
ERH	Eastern Region Headquarters
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FMC	Fisheries Management Council
FMP	Fishery Management Plan
FR	Federal Register
ft	Foot (Feet)
G&G	Geological and Geophysical
GA	Georgia
gal	Gallon(s)
GCMA	Georgia Coastal Management Act
GEFA	Georgia Environmental Finance Authority

LIST OF ACRONYMS AND ABBREVIATIONS
(*continued*)

GHG	Greenhouse Gas
GHPA	Georgia Historic Preservation Act
GMI	Geo-Marine, Inc.
GRNMS	Gray's Reef National Marine Sanctuary
GT SEI	Georgia Institute of Technology, Strategic Energy Institute
ha	Hectare(s)
HAPC	Habitat Area of Particular Concern
HMS	Highly Migratory Species
hp	Horsepower
Hz	Hertz
IBA	Important Bird Area
in.	Inch(es)
IP	Interim Policy
ISFMP	Interstate Fisheries Management Program
kHz	Kilohertz
km	Kilometer(s)
km^2	Square Kilometer(s)
lb	Pound(s)
LIDAR	Light Detection and Ranging
m	Meter(s)
MAFMC	Mid-Atlantic Fishery Management Council
MBTA	Migratory Bird Treaty Act
mi	Mile(s)
mi^2	Square Mile(s)
mm	Millimeter(s)
MMO	Marine Mammal Observer
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
mph	Mile(s) per Hour
MSD	Marine Sanitation Device
MSFCM	Magnuson-Stevens Fisheries Conservation
MSFCMA	Magnuson-Stevens Fisheries Conservation Act
MSR	Mandatory Ship Reporting
MU	Management Unit
NAAQS	National Ambient Air Quality Standards
NAD	North American Datum
NDBC	National Data Buoy Center
NEPA	National Environmental Policy Act
NERR	National Estuarine Research Reserve
NGS	National Geographic Society
NJDEP	New Jersey Department of Environmental Protection
NM	Nautical Mile(s)
NM^2	Square Nautical Mile(s)

LIST OF ACRONYMS AND ABBREVIATIONS
(*continued*)

NMFS	National Marine Fisheries Service
NMS	National Marine Sanctuary
NOAA	National Oceanic and Atmospheric Administration
NO_x	Nitrogen Oxides
NREL	National Renewable Energy Laboratory
NTL	Notice to Lessee and Operator
NWR	National Wildlife Refuge
NWS	National Weather Service
O_3	Ozone
OAQPS	Office of Air Quality Planning and Standards
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OFGA	Official Code of Georgia
OPAREA	Operating Area
OREC	Ocean Renewable Energy Coalition
P.L.	Public Law
Pb	Lead
PM	Particulate Matter
ppm	Parts per Million
PV	Photovoltaic
RL	Received Level
RMS dB	Root-Mean-Square Decibel
SAB	South Atlantic Bight
SABSOON	South Atlantic Bight Synoptic Offshore Observational Network
SACE GAWWG	Southern Alliance for Clean Energy – Georgia Wind Working Group
SAFMC	South Atlantic Fisheries Management Council
SAR	Stock Assessment Report
SAV	Submerged Aquatic Vegetation
SFA	Sustainable Fisheries Act
SHPO	State Historic Preservation Office
SL	Source Level
SMZ	Special Management Zone
SODAR	Sonic Detection and Ranging
SO_x	Sulfur Oxides
SPL	Sound Pressure Level
SST	Sea Surface Temperature
SUSLME	Southeast United States Continental Shelf Large Marine Ecosystem
TACS	Tactical Aircrew Combat System
TI-VPR	Thermal Imaging-Vertically Pointed Radar
U.S.	United States
U.S.C.	United States Code
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USACE	United States Army Corps of Engineers

LIST OF ACRONYMS AND ABBREVIATIONS
(*continued*)

USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compound
WHSR	Western Hemisphere Shorebird Reserve
WRD	Wildlife Resources Division

1.0 INTRODUCTION

This Section provides the background for applying for a Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE) Interim Policy (IP) lease to place a Data Collection Configuration (DCC) on the Outer Continental Shelf (OCS) off the coast of Georgia to collect site-specific wind and environmental data. This lease application is solely for the proposed DCC.

Southern Company Research and Environmental Affairs (Southern Company), with the assistance of Georgia Power Company Environmental Affairs, is proposing to continue research on the wind resources off the coast of Tybee Island, Georgia. This research will follow a study begun in 2005 by Southern Company and the Georgia Institute of Technology, Strategic Energy Institute (GT SEI) to examine the wind power generation potential off the Georgia coast. The publication *SOUTHERN WINDS Summary Report 2007, A study of wind power generation potential off the Georgia coast* (2007 Report) gives the results of this study and provides the foundation for continuing site-specific offshore research and data collection.

In the 2007 Report, the results from an analysis conducted by GT SEI of wind data collected from a nearby Navy platform via the South Atlantic Bight Synoptic Offshore Observational Network (SABSOON), a nearby National Oceanic and Atmospheric Administration (NOAA) buoy and a nearby offshore lighthouse tower were presented. These results showed that an area off the coast of Georgia may be classified as a Class 4 wind regime, which potentially could provide enough energy for an offshore wind farm. The 2007 Report can be downloaded at http://www.southerncompany.com/planetpower/pdfs/WindReport.pdf.

Southern Company submitted a confidential nomination of interest to the United States (U.S.) Department of the Interior, Minerals Management Service (MMS), now BOEMRE, regarding the leasing of three block areas on the OCS pursuant to its IP on offshore alternative energy resource assessment and technology testing under Section 388 of the Energy Policy Act of 2005 in order to continue research and collect site-specific offshore data. In response to the nomination, BOEMRE sent correspondence on July 23, 2008, to inform Southern Company it was prepared to engage in a process of negotiation, analysis, and consultation focused on noncompetitive issuance of an alternative energy limited lease authorizing resource assessment in the three specified OCS block areas. The three OCS block areas were selected by Southern Company based on the results of the 2007 Report. These blocks appeared to have minimal logistical and environmental constraints and were in an area expected to have good wind resources with very few conflicts with other known uses.

This lease application has been prepared in accordance with BOEMRE's *Alternative Energy Program, Interim Policy, Project Application Guidance for Outer Continental Shelf Alternative Energy Program, Interim Policy Leases* (Project Application Guidance). Furthermore, previously approved BOEMRE lease applications were used as guidelines in developing the technical approach for this application.

If and when BOEMRE approves Southern Company's IP lease application and the lease terms are negotiated and acceptable to both parties, Southern Company intends to select a single preferred block area from the three previously designated OCS block areas in order to install either a meteorological tower or an alternative DCC. The data collection equipment to be used in the selected OCS block will be designed and assembled with the necessary instrumentation to measure wind speed, direction, shear, and other characteristics and potentially with instrumentation to collect other environmental data for an as yet-to-be-determined specified time period. This data collected will help Southern Company determine the feasibility of wind generation off the Georgia coast and, thus, complete the study that was begun in 2005.

1.1 Identifying Information

This Section identifies the lessee/operator and current contractors/consultants. Any additional contractors, consultants, and collaborators will be reported to BOEMRE. If the operator changes, Form MMS-1123 will be completed and submitted to designate the new operator.

The lessee and operator is Southern Company.

Table 1-0. Lessee and Contractors/Consultants.

Lessee	Primary Point-of-Contact	Email
Southern Company Executive Sponsor	Chris M. Hobson Senior Vice President, Chief Environmental Officer Southern Company Services	cmhobson@southernco.com
Southern Company Research Project Lead Principal Engineer	Elizabeth F. Philpot, PE Principal Engineer Southern Company Services 600 North 18th Street BIN 14N-8195-APC HDQS Birmingham, AL 35203-2206 Work: (205) 257-5315 Cell: (205) 746-3059	efphilpo@southernco.com
Southern Company Lease Application Project Manager & Primary Point-of-Contact	George A. Martin Environmental Specialist Georgia Power Company 241 Ralph McGill Boulevard, NE Bin 10221 Atlanta, GA 30308-3374 Work:(404) 506-1357 Cell: (404) 717-2844	gamartin@southernco.com
Contractors/Consultants		
Coastal Point Energy	Herman Schellstede & Associates, Inc. Chief Technology Officer Coastal Point Energy 109 Bridge Street New Iberia, LA 70563	windenergy@bellsouth.net
Geo-Marine, Inc.	Greg Rosier Renewable Energy Project Coordinator Geo-Marine, Inc. 2201 K Avenue, Suite A2 Plano, TX 75074	grosier@geo-marine.com

1.2 The Site Assessment Concept

This Section discusses the purpose of this Project and describes the site assessment, location of the onshore support base and Project schedule.

Southern Company proposes to place a DCC in federal waters approximately 6 – 11 nautical miles (NM) off the coast of Tybee Island, Georgia (**Figure 2-1 location plat map**). As stated above, the purpose of this Project is to further the research on the offshore wind and environmental resources through site-specific data collection. Site-specific data is necessary to validate the viability of the wind resource, to satisfy wind turbine manufacturers who require site-specific data, and to better inform Southern Company management for future business decisions.

BOEMRE has divided the OCS into blocks that each measure nine square miles in area. The smallest piece of an OCS block that BOEMRE allows for an IP lease is $1/16^{th}$ of an OCS block or approximately 356 acres (ac) (Sub Block). The three OCS blocks Southern Company has identified as being of interest are Brunswick NH 17-02 OCS blocks numbered 6074, 6174, and 6126. The latitudes and longitudes for the approximate center points of Sub Blocks of interest within each of these have been listed in **Table 1-1**. With BOEMRE concurrence, Southern Company would like to reserve the right to shift the DCC location within the OCS blocks as necessary as site assessment information is developed through potential geophysical/ geotechnical investigations, archaeological and biological surveys and other efforts that might affect placement of the proposed DCC.

Table 1-1. OCS Block Locations & Sub Block North American Datum (NAD) 83 Points.

OCS Block (Figure 2-1 Reference)	NAD 83 Latitude (Decimal)	NAD 83 Longitude (Decimal)
Block 6074 (Figure 2-1 Alternative Site 1)	31ºN 54’ 14.828712” (31.904108)	80ºW 49’ 41.2632093” (-80.828162)
Block 6174 (Figure 2-1 Alternative Site 2)	31ºN 50’ 12.9181804” (31.8368884)	80ºW 49’ 40.5334877” (-80.8278815)
Block 6126 (Figure 2-1 Preferred Alternative)	31ºN 52’ 13.87276” (31.870498)	80ºW 43’ 12.4549983” (-80.7201042)

These OCS blocks were selected based on the results of the 2007 Report. During the 2007 Report study period all of the OCS blocks off the coast of Georgia were considered and evaluated, but the specified OCS blocks fell within the OCS areas considered to have the best wind resource potential and to be optimally located for grid interconnection.

The OCS blocks were selected such that site assessment and DCC placement would not interfere with or impact known structures/obstructions, shipping lanes/fairways, marine sanctuaries, fishing grounds and havens, sand borrow areas, dump sites, shipwrecks, buoys, artificial and natural reefs, hard bottoms, other uses, and military activities in the surrounding area; however, with further consideration given to distances from shore, ocean floor geological resource factors, and onshore tie in substation locations, OCS Block 6126 has become Southern Company’s preferred OCS block for site assessment and potential DCC placement.

Several data collection technologies also have been considered for this Project. Recently, many more data collection options besides meteorological towers have been developed though their acceptability to third-party financiers remains unclear.

Currently Southern Company's data collection preference is a DCC characterized by a traditional fixed offshore meteorological tower with anemometers and other data collection instrumentation, as appropriate, and this preference is presented in this application; however, Southern Company is continuing to evaluate Light Detection and Ranging (LIDAR) and Sonic Detection and Ranging (SODAR) technologies such as NRG Systems' WINDCUBE® V2 LIDAR technology and Lockheed Martin Coherent's WindTracer® SODAR. These technologies may provide a more economic and accurate option. If Southern Company's data collection technology preference changes, BOEMRE will be consulted to revise this application as appropriate.

Site assessment activities will include all activities BOEMRE may require in accordance with the Project Application Guidance and its referenced various Notice to Lessee and Operator (NTL) documents. For example, activities may include but not be limited to geotechnical, shallow hazards, biological and archaeological surveys and other similar activities supporting the development of site information. These activities will produce the data required to fully assess the preferred DCC site and technology and are discussed in detail in Sections 2.2 through 2.13 of this application. Existing relevant data and data from future data gathering may subsequently provide information that will lead to decisions further minimizing any impacts associated with the placement of the DCC. Specific technologies deployed for site assessment and data collection will reflect currently accepted standard scientific methods to appropriately characterize the Project.

Examples of the possible instrumentation and equipment to be installed on the proposed DCC are listed in **Table 1-2**. This instrumentation and equipment will be used to measure, at a minimum, site-specific wind resource characteristics such as speed, shear, direction, time period and velocity. Other data such as air and water temperature, humidity, rainfall, barometric pressure, lightning occurrence, current and tidal characteristics, wave heights and time periods, and avian, marine and substrate resource data may also be collected.

The proposed DCC installation would take place after all of the required site assessment activities are completed. As stated above, Southern Company's data collection preference is a DCC characterized by a traditional fixed offshore meteorological tower with anemometers and other data collection instrumentation. This traditional meteorological tower will be comprised of a climbable free standing 220-foot (ft) three legged lattice tower secured to a platform deck 40 ft above the mean high water line. The platform deck will be secured to the platform jacket (tripod) below, which will extend to the ocean floor and mud mat.

The DCC will be marked with appropriate visual and audible navigational warning devices in accordance with U.S. Coast Guard (USCG) and Federal Aviation Administration (FAA) requirements. Navigational warning devices may include a specific day-marker paint color scheme, a navigation/tower lighting configuration and flashing patterns (visual aid lights), a fog detector and fog horn, a radar reflector and appropriate warning signage.

Table 1-2. Potential Meteorological Tower Instrumentation and Equipment (or equivalents).

Item	Location (meters [m] above platform)	Model Number
Hub – Height Cup Anemometers (two)	70 m	RisO P2546A
Wind Direction Sensors (two)	67 m	Met One 020c-1 and NRG 200P
3-D Ultrasonic Anemometer	67 m	RM Young 810000
Temperature/ Relative Humidity	67 m	Met One 083-D
Barometric Pressure Sensor	3 m	Met One 092
47-m Cup Anemometer Primary	47 m	RisO P2546A
47-m Cup Anemometer Secondary	47 m	NRG #40
Wind Direction Sensors (two)	47 m	NRG 200P
27-m Cup Anemometer Primary	27 m	RisO P2546A
27-m Cup Anemometer Secondary	27 m	NRG #40
7-m Cup Anemometer Primary	7 m	RisO P2546A
7-m Cup Anemometer Secondary	7 m	NRG #40
Temperature	7 m	Met One 064-2
Temperature	2 m (below MLT)	Global Water WQ101B
Rain Sensor	3 m	Campbell Scientific 237 leaf wetness sensor
Data Logger	3 m	Campbell Scientific CR1000 with cellular Communications and solar panel

The DCC may also have stairs with handrails or other safety climbing systems with rest and working platforms at the various instrumentation and equipment heights, a fall arrest system on ladders, vessel bumpers and guides to protect lower ladders from inadvertent collisions, a safe shelter/maintenance work area or instrument house complete with first aid, emergency equipment and any appropriate welfare facilities. The structure will also have sacrificial anodes (cathodic protection for metal corrosion), data transmission capabilities, and solar photovoltaic power generation.

Once fabricated on shore, the met tower is designed to be installed in sections offshore. The foundation pilings would be installed with a vibratory and/or impact hammer. The entire structure has been designed, with appropriate maintenance, to have a useful life of at least thirty years.

The probable location for the onshore support base and Project construction staging area will be Plant Kraft in Port Wentworth, Georgia. This plant is owned and operated by Georgia Power, a Southern Company entity. Plant Kraft is located at latitude 32°9'3.7321999"N and longitude 81°8'2.4041771"W or 32.1510367 and -81.1340012. Plant Kraft is located on the Savannah River which discharges downstream directly into the Atlantic Ocean adjacent to Tybee Island northeast of the Project area.

The long-term operation and maintenance staging base during the life of the Project will probably be at Plant Kraft or at another Georgia Power facility located in close proximity. This will allow direct access to the Savannah River. Alternate onshore base locations are available within the Port of Savannah near Plant Kraft. Georgia Power also has a substation on Tybee Island located off the beach shoreward from the Project area.

The final Project schedule will depend on the lease application and negotiation process, lease conditions, project permitting, site assessment activities, assessment data analysis and data results-driven decisions, final DCC design, fabrication and delivery onshore staging activities, budgeting and other factors. Taking these factors into account, the placement of the DCC is anticipated to begin in 2012. The fabricated DCC components and equipment on derrick barges will take approximately twelve days to travel from the onshore support base to the Project site and to be installed.

The schedule for decommissioning of the DCC will depend on the business decisions made after site-specific wind resource data is collected and analyzed. For example, if the wind resources are proven to be adequate, Southern Company may want to conduct technology testing and deployment. Southern Company at that time may apply to BOEMRE to engage in those activities with continuing DCC maintenance and operation.

If site-specific wind resource data does not support further wind power generation technology testing and deployment, in addition to DCC removal and decommissioning, Southern Company would like to retain the option of transferring the Lease to a qualified federal, state or local entity for continuing offshore data collection and/or research. If transfer of the Lease with ownership and operational responsibilities to a third party is desired, it will be conducted in close consultation with BOEMRE in compliance with all applicable laws and regulations. Additional discussion on the decommissioning of the DCC is presented in Section 2.13.

1.3 A Listing of All Federal, State, and Local Authorizations, Approvals, and Permits

This Section outlines federal, state and local authorizations, approvals and permits that may be required for Project site assessment and DCC installation activities. This is a preliminary list of approvals, permits, and other authorizations that may be required for additional and subsequent activities such as continuing environmental data collection, DCC structural modifications, maintenance, normal operations, potential decommissioning, and other unforeseen circumstances. Subsequent to the filing of this application, Southern Company plans on initiating coordination with representatives from the agencies listed below to discuss its potential responsibilities under the statutes described below.

Terms, conditions, limitations, timelines, and other compliance requirements of regulatory authorizations and permits will be adhered to.

Table 1-3. Federal, State, and Local Authorizations, Approvals, and Permits.

Authorizations, Approvals, and Permits	Issuing Agency/Authority	Originating Statute	Status
Department of the Army Permit	U.S. Army Corps of Engineers (USACE), Savannah District, in consultation with the U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries), and the Georgia (GA) State Historic Preservation Office (SHPO)	Nationwide Permitting under Section 10 of the Rivers and Harbors Act of 1899, 33 U.S. Code (U.S.C.) 403 et seq.; Section 404 of the Clean Water Act (CWA), 33 U.S.C. 1344 et seq.; Outer Continental Shelf Lands Act (OCSLA), 43 U.S.C. 1331 et seq.	Preconstruction Notice to be developed/filed if required for Project actions
Fish and Wildlife Service Consultation and Technical Review	USFWS	Endangered Species Act (ESA), 16 U.S.C. 1531 et seq.; Migratory Bird Treaty Act (MBTA), 16 U.S.C. 1703 et seq.	Applicant will coordinate with agency in due course
NOAA Fisheries Consultation and Technical Review	NOAA Fisheries Service	ESA; Marine Mammal Protection Act (MMPA), 16 U.S.C. 1361 et seq.; Magnuson-Stevens Fisheries Conservation and Management Act (MSFCM), 16 U.S.C. 1801 et seq.	Applicant will coordinate with agency in due course
National Historic Preservation Act Section 106 Consultation	GA SHPO	National Historic Preservation Act, 16 U.S.C. 470 et seq.; Historic Areas/Sites Georgia Historic Preservation Act (GHPA) 44-10-1; Department of Natural Resources (DNR) Submerged Cultural Resources 12-3-80	Applicant will coordinate with agency in due course
Nationwide Permit or Water Quality Certification	DNR, Environmental Protection Division (EPD), Water Protection Branch	CWA, Section 401, 33 U.S.C. 1341 et seq.	To be developed, if needed on a project-specific basis, as per USACE permitting requirements

Table 1-3 (*continued*). Federal, State, and Local Authorizations, Approvals, and Permits.

Authorizations, Approvals, and Permits	Issuing Agency/Authority	Originating Statute	Status
GA Coastal Management Program Potential Use/Resource Impact Review/Determination	DNR, Coastal Resources Division	Coastal Zone Management Act (CZMA) of 1972, 16 U.S.C. 1451 et seq.; Federal Consistency 15 Code of Federal Regulations (CFR) 930; Georgia Coastal Management Act (GCMA) Official Code of Georgia (OCGA) 12-5-320	Application to be developed/filed if Project actions impact the coastal zone of Georgia
Outer Continental Shelf (OCS) Air Permit	Environmental Protection Agency (EPA), Region IV	Clean Air Act (CAA), 42 U.S.C. 7401 et seq.; 40 CFR Part 55	Permit application to be filed if required by 40 CFR 55
Consultation and Technical Review	U.S. Coast Guard (USCG)	14 U.S.C. 81 - Navigation Aids Approvals – see also 33 CFR 62 – USA aids to navigation 33 CFR 64 – Marking of structures, and other obstructions 33 CFR 66 – Private aids to navigation 33 CFR 67 – Aids to navigation on fixed structures 33 CFR 322 – Permits for structures or work in or affecting navigable waters of the USA 33 CFR 403 – Obstruction of navigable waters generally	Applicant will coordinate with agency in due course
Consultation and Technical Review; Notice of Proposed Construction or Alteration Federal Aviation Administration (FAA) Form 7460-1	Department of Transportation (DOT) FAA non-USCG lighting requirements and notice of proposed construction	49 U.S.C. 44718 et seq.; 14 CFR 77 – Objects affecting navigable space	Applicant will coordinate with agency in due course

1.4 Non-profit and Public Agency Coordination

This Section lists the private, non-profit, and public groups, individuals and agencies Southern Company has coordinated, consulted or otherwise communicated with thus far regarding the wind resource evaluation off the coast of Georgia. The communication with external organizations has been conducted through electronic pathways, U.S. Mail and in-person meetings which were either one-on-one or group meetings, public forums or open meetings. In the group settings, the information had been communicated through formal presentations, open dialogue and question-and-answer sessions. Ongoing communications will include the activities discussed in Section 1.3 above and continuing consultation with public, private and non-governmental organizations. After filing this Lease Application, Southern Company will subsequently contact key individuals and organizations to inform them of this filing to continue the Southern Company GT SEI research begun in 2005 as described in the 2007 Report

List of Private, Non-profit, and Public Group, Individual and Agency Communications Regarding Offshore Wind Resource Research (to date)

- U.S. Department of Energy – Energy Efficiency and Renewable Energy (EERE)
- U.S. Department of the Interior – MMS/BOEMRE, U.S. Fish and Wildlife Service (USFWS)
- U.S. Department of the Army – Army Corps of Engineers (USACE)
- U.S. Coast Guard (USCG)
- U.S. Environmental Protection Agency (EPA)
- Georgia Department of Natural Resources – Environmental Protection Division (EPD), Coastal Resources Division (CRD), Wildlife Resources Division (WRD), Georgia Environmental Finance Authority (GEFA)
- South Atlantic Fisheries Management Council (SAFMC)
- City of Tybee Island
- Tybee Island Chamber of Commerce
- Oatland Island Wildlife Center of Savannah, Georgia
- The National Renewable Energy Laboratory (NREL)
- Skidaway Institute of Oceanography
- Georgia Institute of Technology – GT SEI
- University of Georgia
- American Wind Energy Association (AWEA)
- Southern Alliance for Clean Energy – Georgia Wind Working Group (SACE GAWWG)
- Ocean Renewable Energy Coalition (OREC)
- Southeastern Wind Summit
- General Electric
- Siemens
- Vestas
- Environmental Services, Inc.
- Normandeau Associates, Inc.
- NRG Systems
- Lockheed Martin Coherent Technologies
- Garrad Hassan
- Santee Cooper

1.5 Other Information

This section provides a place holder for additional information required by MMS/BOEMRE to accept this Project application.

2.0 INSTALLATION OF STRUCTURES

The following sections discuss the potential impact producing factors of the DCC project and analyze the physical, biological, and other environmental characteristics of the three potential lease blocks.

2.1 Location Plat (Map)

The preferred DCC site is near the center of BOEMRE OCS Block 6126. This block is located entirely within federal waters outside of Georgia's territorial 3-mile (mi) range. Southern Company has chosen this location as the preferred site in order to avoid known structures, facilities, areas of environmental or cultural significance and areas of active use. This site is also believed to have favorable wind resources as well as geological characteristics conducive to installing DCC piles. **Figure 2-1** illustrates the preferred and alternative DCC locations in relationship to the Georgia coast and known existing structures and obstructions as well as other potentially sensitive areas.

2.2 Geotechnical Survey and Shallow Hazards Survey

Geotechnical and shallow hazard surveys have not been conducted for the purposes of this application. Once the lease application and site assessment plan is approved it may be necessary to conduct all or a combination of the geotechnical surveys described below to insure safe and stable placement of the DCC supporting piles and structures.

Generalized geotechnical and shallow hazard surveys may utilize and be comprised of side scan sonar surveys to map the benthos in and adjacent to the proposed DCC location; magnetometer surveys to examine and verify iron bearing anomalies such as sunken vessels or pipelines; sub-bottom profile surveys to examine the DCC location area geology and possibly cultural resource research; and core sampling surveys to examine local fine geological detail necessary to make decisions regarding construction methods and materials. At a minimum, an 1,800-meter (m) x 1,800-m rectilinear grid centered on the proposed DCC will be surveyed. Survey design plans will meet requirements and follow protocols as set forth by MMS NTLs (2009) and any new BOEMRE guidelines.

Side-scan Sonar Surveys

Side-scan sonar utilizes high frequency sound pulses and acoustic backscatter to provide data on the types and textures of seafloor geological features. These data will make it possible to analyze the physical and, in many cases, the biological nature of the benthic surface environment. Side scan sonar is also useful for identifying sediment transport features such as sand waves, mud deposits, ripples, ridges, fish trawling scars, and scouring patterns.

Magnetometer Surveys

Magnetometer data is useful if the area has the potential for the presence of unmarked shipwrecks or abandoned pipes or other man-made metal objects. Magnetometers are capable of detecting and aiding in the identification of iron or other objects having a distinct magnetic signature.

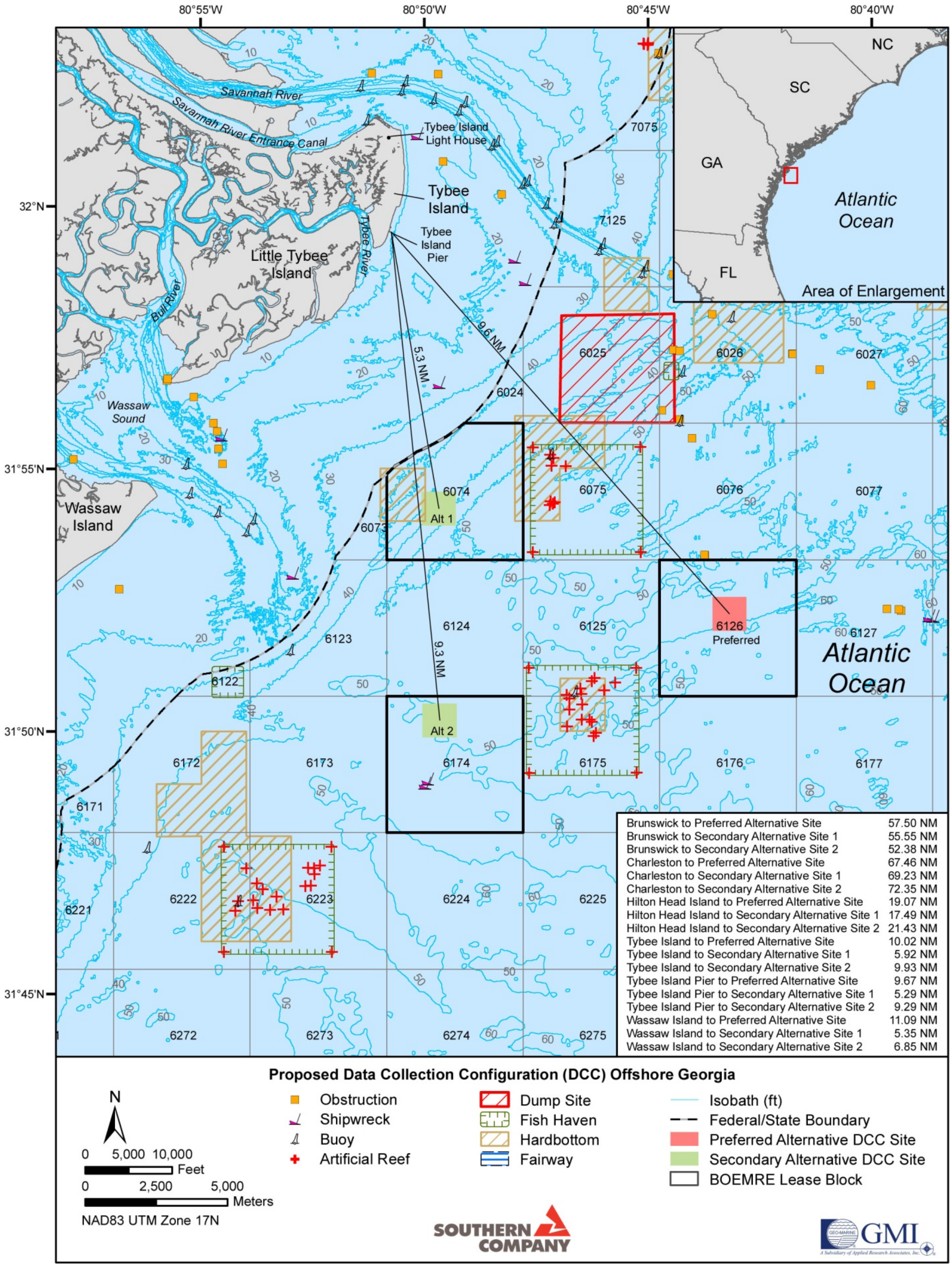

Figure 2-1. Proposed Data Collection Configuration (DCC) location plat map.

Sub-bottom Profiling Surveys

Sub-bottom profiling utilizes a chirping low frequency sonar wave to vertically penetrate the seabed to collect data useful to examine sedimentary and geological formations and possibly investigate buried cultural resources such as shipwrecks. The principal application of sub-bottom profiling is to utilize low frequency acoustic waves to vertically penetrate the upper 20 m of the seabed with different frequency waves which reflect off of substrates of varying densities thereby producing a profile of the seabed, bed form, and geology.

Core Sampling

Core samplers consist of a tube with a closing mechanism or valve at the upper end that is closed by a messenger after penetration into the benthic sediments. The vacuum created by closing the valve prevents the sediment section from washing out of the sampling tube which allows for the examination of a cross-section or slice of the sediment. This cross-section can then be used to examine sediment deposition and characteristics.

General Survey Guidelines

During geotechnical and shallow hazard surveys, a 500-m exclusion zone for marine mammals and turtles will be implemented to prevent and/or mitigate possible impacts to individual or groups of animals moving into or out of the proposed survey area. Survey equipment will comply with U.S. EPA noise standards. Marine mammal observers (MMOs) will be employed to monitor the 500-m exclusion zone for the presence of marine mammals during survey operations. The MMOs will initiate monitoring thirty minutes prior to geotechnical survey commencement and continue observation monitoring during and until thirty minutes after survey operations end. Surveys will cease if any target species are observed entering or leaving the exclusion zone and will not commence until thirty minutes have passed with no further observations. Geotechnical and shallow hazard survey operations will only take place during daylight hours. At the conclusion of the surveys, a report will be completed within 90 days and submitted to the USACE, BOEMRE, and National Marine Fisheries Service (NMFS). The report will:

a. Summarize all survey activities, monitoring activities, and estimates of any target species taken as a result of survey activities;
b. Provide dates and geo-referenced locations for all observed species;
c. Describe and record any and all observed injuries or mortality for listed species (this will also be reported immediately on and for any occurrences); and
d. Report all other concerns regarding target species.

2.3 Biological Survey

A field biological survey has not been conducted for the purposes of this application but Section 2.8.2 provides a detailed discussion of all known occurrences of animals and environments within and adjacent to the proposed OCS blocks compiled during extensive desktop studies. Consultations with BOEMRE, USFWS, and NMFS will determine if additional biological surveys are necessary at the proposed DCC location. Survey design plans will meet requirements and follow protocols as set forth by MMS NTLs (2009) and any new BOEMRE guidelines.

General biological surveys provide a characterization of the plants and animals commonly and routinely found within the survey area. Typical surveys may include otter trawls for examining pelagic fish, demersal fish and invertebrates; benthic grab sampling to examine benthic sediment macrofauna and infauna; aerial and shipboard surveys to examine utilization of the DCC installation area by large marine mammals, seabirds, migrating birds, bats, and migrating pelagic fish, and underwater video surveys (if necessary and as conditions allow) to further characterize the benthic communities and environments.

General Survey Guidelines

Surveys will provide coverage of the proposed DCC installation area and all areas within 100 m of possible areas of seafloor disturbance (coring, pile driving, anchoring, etc.). Surveys will be comprehensive to ensure all possibly impacted habitat is delineated. Surveys of targeted areas will characterize substrate types and benthic communities within the area of study. Small habitat sites will be characterized at 100 percent. Biological surveys may also include, if necessary and as conditions allow: underwater color videography and still photography at 8 megapixels or better resolution; differential geographical position system coordinates that provide bearing, time, and water depth for video and still images; and appropriate scales for perspective. Still imagery will be provided at a frequency useful to determine the extent, type, and percent cover for all sensitive habitats. Density estimates, as appropriate and necessary, will be provided based on survey data collected during all of the types of surveys being utilized. Reporting will follow the protocol as described in the geotechnical survey section previously discussed in Section 2.2.

2.4 General Structure and Project Design, Fabrication, and Installation Information

Section 2.4 provides information about the components of the DCC including a description of the sequencing for installing DCC components. Emergency DCC repair contingencies are also discussed.

The four main components of the DCC are the pilings, jacket, platform deck, and tower. The components will be transported and installed utilizing a cargo barge, derrick barge and anchor handling vessels. At the Project site, piles will be lifted into position and driven into the sea bed to the desired depth of approximately 16 m (53 ft) by using either impact or vibratory methods. Installation of the piles will take place using the derrick barge equipped with an 8-part anchoring system. Following pile driving, the jacket will be attached to the piles, leveled, and welded into place. Next, the platform deck will be lifted into position on the pile – jacket assembly and securely welded to the assembly. The platform deck is a three legged tripod structure supporting an individual meteorological tower and is equipped with a deck house, lights, horns, swing ropes, and tower structure legs. Once the platform deck is welded in position, the pre-assembled tower will be secured to the tower structure legs and erected to the design height of 67 m (220 ft) above the platform deck. FAA lighting and various instruments will be mounted and interconnected to the control console located on the platform deck. Once DCC installation is complete, the entire structure will be inspected and all supporting vessels will be demobilized.

Southern Company will utilize sound engineering practices throughout the design, construction, normal operation and maintenance and in any emergency situation involving the DCC. In the event that unforeseen emergency DCC repairs become necessary as a result of events such as accidental vessel or aircraft collisions, force majeure, vandalism and/or other unplanned events, Southern Company will implement immediate actions including but not limited to the following based upon the nature of the emergency: the DCC will be taken out of service; the necessary personnel to fully access the emergency will be dispatched to the DCC site; the emergency situation will be contained; additional immediate emergency support will be acquired and dispatched to fully control the emergency. Once the immediate emergency situation is contained a DCC damage assessment will be conducted to determine the extent of repair necessary. Depending upon the emergency event and the outcome of the damage assessment Southern Company will decide to repair or decommission the DCC. If DCC repair is selected a Root Cause Analysis may be performed and corrective actions will be implemented. Corrective actions may include DCC engineering, safety, and instrumentation modifications and or the implementation of new operation procedures. Throughout any DCC emergency event Southern Company actions will be undertaken with appropriate BOEMRE consultation.

2.5 Description of the Deployment Activities

This section describes the safety, prevention and environmental protection features of the Project.

Southern Company employs a Target Zero safety strategy for accident prevention, which consists of four core safety beliefs: Safety Takes Precedence Over All Other Requirements, Safety Is A Personal Value, All Hazards Can Be Controlled, and The Spirit Of Safety Is Constant. Company-related activities conducted by all employees must comply with Target Zero. Any contractors or consultants retained by Southern Company are contractually required to implement a comprehensive safety program comparable to Target Zero. Safety comes first at Southern Company and as such our Target Zero Safety Strategy will be employed for all IP lease authorized activities.

Southern Company will comply with all federal, state and local authorizations, approvals and permits that may be required for Project site assessment and DCC installation activities as outlined in Section 1.3. Compliance with Section 1.3 and Section 2.8, to satisfy the NEPA and other relevant federal laws, will ensure the implementation of the relevant and applicable environmental protection features appropriate for all Project site assessment and DCC placement activities. Examples of potential environmental protection features may include scheduling project activities to minimize impacts to aquatic resources, employing methods to characterize natural resources and utilizing materials that have minor environmental impacts. Additionally, Southern Company will communicate with the appropriate stakeholders including private, non-profit and public organizations, individuals and resource agencies such as those listed in Section1.4.

2.6 Support Vessels, Offshore Vehicles

Southern Company anticipates the following vessels will be used to facilitate the construction and installation of the DCC. Details regarding each vessel's length, displacement, engine horse power, and fuel capacity have been included in **Table 2-1**. Georgia Power's Plant Kraft will be used to support (birth) vessels during the proposed DCC installation, operation, and decommissioning.

Table 2-1. Projected vessel usage and specifications for construction of a data collection configuration (DCC).

Vessel Type	Hours on Site	Length (feet)	Displacement (tons)	Engines (horsepower)	Fuel capacity (gallons)
Class A-1, Derrick Barge w/Diesel Crane	288	215		Crane – 950	100,000
Anchor Handling Vessel	144	95	1,300	4300	20,000
Support Tug	72	65	300	1500	14,000
Crew boat	96	51	100	550	1,800
High Speed Vessel	102	50	100	600	1,800

- **Derrick Barge:** The derrick barge will be used to transport and erect the DCC structure.
- **Anchor Handling Vessel:** The anchor handling vessel will be used to deploy the derrick barge's 8-part anchoring system.
- **Support Tug:** The support tug will be used to guide and position the derrick barge from the shipyard in Louisiana to the proposed DCC site off Georgia.
- **Crew Boat:** The crew boat will be used to house the construction crew. It has support facilities (e.g., sanitation/hoteling facilities) capable of supporting the crew.
- **High Speed Vessel:** The high speed vessel will be used to shuttle personnel from the crew and cargo support docks at Plant Kraft in Port Wentworth, Georgia.

2.7 Archaeological Resources

While coastal Georgia is known to be rich in archaeological resources (NERRS, 2008), there are no reports or data to suggest that significant archaeological resources are located within the proposed OCS blocks, and therefore, no mitigation relating to archaeological resources should be necessary. Geo-Marine, Inc. (GMI), on behalf of Southern Company, contacted the Georgia Department of Natural Resources (DNR), Historic Preservation Division (SHPO), and was referred to the Savannah, Georgia USACE underwater archaeologist. The Automated Wreck and Obstruction Information System (AWOIS) database was also queried in an effort to locate any archaeological resources possibly found in the lease block area. These efforts have returned no evidence of any significant archaeological resources within the project area.

While it is possible that underwater archaeological resources exist within the proposed OCS blocks it is doubtful that any major resources would have gone unrecorded by previous archaeological explorations and research projects. Vessels dating from the 15^{th} to 20^{th} centuries are reported within 4.8 km (2.6 NM) of the U.S. Atlantic coast and so have the potential to be present offshore Georgia. Vessel types could include: wooden ships, ironclads, military and war vessels, German submarines, and wind, oar, paddle, pole, steam, and diesel-powered vessels. Since its opening in the mid 1700s, the Port of Savannah has been involved in multiple wars (i.e., Revolutionary War, War of 1812, Civil War, and World Wars I and II; Elliott et al., 2000; Symonds and Clipson, 2001). The naval aspect of these events lends to the potential for archaeological resource sites to be present within the vicinity of the proposed OCS blocks. Additional resources may include ships sunk during periods of conflict and dump or debris scatter, such as brick, rock, and other material from ballast discard (Elliott et al., 2000). Other unreported shipwrecks may have resulted from natural and man-made events and are possibly located in the project area.

Survey design plans will meet requirements and follow protocols as set forth by MMS NTLs (2009) and any new BOEMRE guidelines. If any archaeological resources are identified during surveys, all sea floor disturbing activities will be halted and additional site surveys will be conducted prior to continuation of project activities. Southern Company will contact BOEMRE and USACE to determine the significance of the find and implement a mitigation plan to avoid disturbing the area.

2.8 NEPA and Other Federal Compliance

As a component of this application, a desktop analysis was conducted to determine the existing physical, biological, socioeconomic and cultural resources in the proposed OCS blocks. The results from this analysis are presented in the following sections. These sections will also examine the impact producing factors resulting from the site assessment concept (Section 1.2) that may potentially impact these resources.

2.8.1 Impact-Producing Factors

Infrastructure and impact-producing factors (activities) may occur during the meteorological and oceanographic collection facilities project (MMS, 2009b). The identification and description of activities, equipment, materials, and processes that have the potential to impact natural and human resources in areas proposed for DCC use fall into two main categories: those occurring under routine conditions and those under non-routine conditions (MMS, 2009c).

2.8.1.1 Site Assessment, Construction, Routine Operations, and Decommissioning

Under routine conditions, the expected lifecycle of a DCC can be divided into four distinct phases: (1) site assessment surveys, (2) construction, (3) routine operation/maintenance, and (4) decommissioning. Each of these phases involves a different set of activities and possible impacts which are addressed in the following sections.

Site Assessment Survey Phase

During this phase, site-specific studies are conducted to collect information on ocean-bottom characteristics (e.g., depth contours, sediment type, stratification, and transport; benthic habitats; potential archaeological resources); local meteorological and oceanographic data (e.g., wind speed and direction, wave height, currents, and seasonal fluctuations); and biological resources (Hiscock et al., 2002).

Construction Phase

The construction phase may include impacts from: (1) vessel traffic; (2) foundation construction (tripod); and (3) sediment removal and disposal. Most construction materials and equipment are staged onshore and then transported to the construction site by a construction vessel or barge and ocean tug.

Routine Operational/Maintenance Phase

The DCC is designed to have a 30-year lifespan. Routine operation and maintenance consists of the physical presence and back-up operation (in an emergency setting) of the DCC and the vessel traffic required for routine and/or emergency maintenance. The potential impacts of the routine operation and maintenance phase of the DCC may be derived from emissions, collisions, and visual presence and lighting from the vessels used for maintenance. In addition, the visual presence, and habitat modification resulting from the DCC and associated foundations or scour protection may also potentially result during the operation phase.

Decommissioning Phase

At the conclusion of the lease term and depending on site circumstances and business decisions, Southern Company may exercise the option to remove the DCC and associated equipment, and to the extent possible, return the area to its pre-existing condition. Much of the activity during full decommissioning is similar to construction. Similar vessels and equipment are used to remove the DCC, foundation, and scour protection. The potential impacts of air emissions, vessel collisions, vessel presence and lighting, noise and avoidance are the same as identified under the potential impacts of the construction phase. The potential impacts unique to the decommissioning phase are associated with the removal of the hard surfaces provided by the structures and the habitat formation on and around the pile structure.

Impact-producing factors as listed in Appendix A of the MMS Alternative Energy Program IP and identified for this project operating under normal conditions are discussed in the following sections.

- **Emissions**

Primary greenhouse gas (GHG) emissions (e.g., carbon dioxide: CO_2) associated with the DCC life cycle will be from engine exhaust of ocean vessel traffic (e.g., tug boat or barge) and heavy equipment (e.g., pile drivers, crane). Most emissions result from internal combustion engines burning diesel fuel. Emissions to a much lesser extent may include nitrogen oxides (NO_x) and carbon monoxide (CO), lesser amounts of volatile organic compounds (VOCs) and particulate matter ($PM_{2.5}$ and PM_{10}), mostly in the form of $PM_{2.5}$, and negligible amounts of sulfur oxides (SO_x). These emissions may be emitted during all phases of the DCC project with amounts varying as a result of different levels of activities associated with each phase (MMS, 2007, 2009b).

Air emissions during the site assessment surveys will result from the geological and geophysical surveying/sampling and natural resource monitoring activities. Impacts will be limited to emission sources from internal combustion engines from vessels, generators, or other equipment used for such investigations. Overall, air emissions during these activities are expected to be small, intermittent, and temporary. Total impacts on the ambient air quality during site assessment surveys are anticipated to be insignificant.

Construction impacts to air quality may be greater than during the site assessment survey phase due to the greater number of support vessels and equipment (i.e., crane, pile driver) required during project installation efforts. Offshore construction may result in air impacts primarily in the form of diesel engine exhaust. Estimated emissions levels of criteria pollutants and CO_2 during the offshore construction phase are presented in **Table 2-2**.

Overall, it is anticipated that GHG emissions resulting from the estimated 12-day offshore construction phase will be both short-term and minor. These GHG emission levels are expected to be minor compared to existing on-going activities (e.g., shipping and commercial/recreational boating) in the vicinity of the proposed DCC site.

Routine operation of the DCC is expected to have negligible impacts to air quality. Controlling and monitoring of on-site equipment will be performed remotely by an electronic data acquisition system powered by batteries charged by solar photovoltaic (PV) panels that produce no emissions. Air emissions are expected only from boat exhaust from support vessels used to conduct regular inspections of navigational lights and structural integrity, and to maintain equipment.

Air emissions during the course of decommissioning are expected to consist of the same pollutants emitted during the construction phase; however, these emissions are expected to be lower in volume and shorter in duration due to the timeframe needed to complete this task and are anticipated to be insignificant.

Mitigation measures to reduce anticipated engine emissions will include the proper maintenance of heavy equipment (crane) and offshore vessels (derrick barges) to minimize air emissions of diesel-powered engines and use of ultra low-sulfur diesel fuel to reduce potential SO_2 emissions. Section 2.12 provides a summary of all measures that may be utilized to avoid, minimize and mitigate impacts to marine and coastal environments.

- **Sea Bottom Disturbances**

The DCC footprint may cover a bottom area up to a few hundred square feet since it is anticipated to be supported by a tripod (three-pile) structure. In addition, a scour control system, if utilized, may cover an area of approximately a 9 m (30 ft) radius around each piling (MMS, 2009b).

Table 2-2. Estimated emissions in tons for data collection configuration (DCC) site during the construction phase.

Construction Equipment	HP	Hours	Emissions (tons)						
			NO_X	CO	SO_X	PM-10	CO_2	Total	Tons/hour
Emissions Factor <600 HP			0.0310	0.0068	0.0021	0.0022	1.1500		
Emissions Factor >600 HP			0.0240	0.0055	0.0081	0.0007	1.1600		
Vessel Power Generator	300	288	1.3392	0.29376	0.08856	0.09504	49.68	51.49656	0.1788075
Welding Machine	800	144	1.7856	0.39168	0.11808	0.12672	66.24	68.66208	0.47682
250-ton Crane Unit	950	168	1.9152	0.4389	0.645582	0.05586	92.568	95.623542	0.56918775
Deck Winches	400	48	0.2976	0.06528	0.01968	0.02112	11.04	11.44368	0.23841
Sewerage System	5	288	0.02232	0.004896	0.001476	0.001584	0.828	0.858276	0.00298013
Support Tug	1500	72	1.296	0.297	0.43686	0.0378	62.64	64.70766	0.8987175
Pile Driving System	500	65	0.50375	0.1105	0.033313	0.03575	18.6875	19.3708125	0.2980125
Crew Change Vessel	550	96	0.8184	0.17952	0.05412	0.05808	30.36	31.47012	0.32781375
High Speed Vessel	600	102	0.9486	0.20808	0.06273	0.06732	35.19	36.47673	0.357615
Anchor Handling Vessel (Louisiana port)	4300	144	7.4304	1.7028	2.504664	0.21672	359.136	370.990584	2.5763235
Total		**1415**	**16.36**	**3.69**	**3.97**	**0.72**	**726.37**	**751.1**	**0.531**
Units = Total tons emitted									

Minor sea bottom disturbances that may possibly occur to the seafloor during each phase of the DCC project are predicated on site-specific conditions. These disturbances may result from pile driving, anchoring, coring, and scour. **Appendix A** gives an illustration of the 8-part anchoring scheme with a 305-m (1,000-ft) anchor radius. Potential physical impacts include the acceleration of geologic processes (e.g., erosion or mass movement on the seafloor) and alteration of seafloor topography. In addition, these disturbances may affect benthic biology by altering the availability of various habitat types through disturbance of sediments, impacting benthic organisms, and increasing turbidity. The amount and duration of increased turbidity is dependent upon the level of activity, sediment grain size, current velocity, and water depth (MMS, 2009c). Water quality should not be significantly impacted to a degree that interferes with normal benthic biology and ecology. The DCC project is anticipated to produce minor temporary impacts to the seafloor during all four phases.

Mitigation measures to reduce impacts to the seafloor will include the utilization of a scour protection system such as boulder mounds and sea grass mattresses around each of the DCC foundation legs. Section 2.12 provides a summary of all measures that may be utilized to avoid, minimize and mitigate impacts to marine and coastal environments.

- **Wastes and Overboard Discharges**

The discharge or disposal of solid trash and debris from the DCC and vessels is prohibited by BOEMRE (30 Code of Federal Regulations [CFR] 250.300: Pollution Prevention) and the USCG (MARPOL, Annex V.P.L. 100-200 [101 Statute 1458]). The discharge of any oil or oily mixtures is prohibited under 33 CFR 151.10 (Control of Oil Discharges). The same discharge criteria apply for bilge water (33 CFR 151.10). All other trash and debris will be returned to shore for proper disposal.

All vessels with toilet facilities must have a marine sanitation device (MSD) that complies with 40 CFR 140 and 33 CFR 159. Vessels complying with 33 CFR 159 are not subject to state and local MSD requirements. A Type II MSD macerates waste solids so that the discharge contains no suspended particles and the bacteria count is below 200 per 100 millimeters (mm). Type III MSD are holding tanks and are the most common type of MSD found on boats. These systems are designed to retain or treat the waste until it can be disposed of at the proper shore-side facilities. State and local governments regulate domestic or grey water discharges. Domestic waste consists of all types of wastes generated in the living spaces on board a ship including grey water that is generated from dishwater, shower, laundry, bath and washbasin drains. Grey water should not be processed through MSD, which is specifically designed to handle sewage (MMS, 2009b).

Mitigation measures will include the implementation of Best Management Practices (BMPs) on each vessel during the four phases of the DCC project. All vessels utilized will be expected to comply with USCG requirements relating to prevention and control of oil spills. 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 DCC project. Section 2.12 provides a summary of all measures that may be utilized to avoid, minimize and mitigate impacts to marine and coastal environments.

- **Noise**

Noise may affect the proposed DCC location during site assessment surveys, construction, and decommissioning of the DCC. **Tables 2-3** and **2-4** present descriptions of the character and intensity of various above-water and below-water noise sources utilized during three of the four phases of DCC project. Noise caused by diesel powered equipment and acoustic devices during site assessment surveys is expected to be minor and temporary compared to existing on-going activities in the vicinity of the DCC site. No significant above or below water noise is anticipated to result from the operation of the DCC.

Underwater noise during construction of the DCC will consist of increased noise levels and pressure waves from pile driving operations. Typical pile driving activities will likely result in sound levels peaking at 200 decibels with a reference of one micropascal (dB re 1 μPa) root-mean-square decibel (RMS dB) in close proximity to the construction activity, with sound predominately being generated at frequencies in the range of 100 to 1,000 hertz (Hz). Estimating offshore pile driving source levels and effective underwater sound attenuation rates is complex due to site-specific and operational variables. Sound pressure levels are dependent on several factors including water column depth, benthic sediment composition, bathymetric profile, pile diameter, force of impact hammer, and pile driving method (vibratory versus impact). Section 2.10 shows an estimate of noise and in-water acoustic levels at the pile driving source and an estimate of the distance at which sound pressure levels will decrease to 180, 160 and 120 decibels (dB).

Table 2-3. Above-water noise sources.

Noise Source	Duration	Frequency Range	Frequency of Peak Level (Hz)	Peak Sound Level (dB re 20 μPa)	Reference Distance (ft)
Ship/barge/boat[1,2,3]	Intermittent to continuous, up to several hours/day	Broadband, 20 to 50,000 Hz	250 to 2,000	68 to 98	Near source
Pile driving[1, 3]	50- to 100-μs pulses/beat, 30 to 60 beats/ minutes, 1 to 2 hours/pile	Broadband	200	110	49.2
Construction[3]	Intermittent to continuous	Broadband	Broadband	68 to 99	49.2

dB re 20 μPa – decibels with a reference of 20 micropascals
Hz = hertz
ft = feet
μs = microsecond(s)
[1] Thomsen et al., 2006
[2] LGL, 1991
[3] WSDOT, 2005

Table 2-4. Below-water noise sources.

Noise Source	Duration	Frequency Range	Frequency of Peak Level (Hz)	Peak Sound Level (dB re 20 μPa)	Reference Distance (ft)
Ship/barge/boat[1,2,3]	Intermittent to continuous, up to several hours/day	Broadband, 20 to 50,000 Hz	250 to 2,000	130 to 160	3.28
Pile driving[1, 3]	50- to 100-μs pulses/beat, 30 to 60 beats/minutes, 1 to 2 hours/pile	Broadband	200	Up to 200	98.4

dB re 20 μPa – decibels with a reference of 20 micropascals
Hz = hertz
ft = feet
μs = microsecond(s)
[1] Thomsen et al., 2006
[2] LGL, 1991
[3] WSDOT, 2005

Appropriate BMPs will be employed during site assessment surveys and DCC construction to minimize and mitigate noise generated from acoustic site assessment devices and pile driving activities. Examples of these BMPs which may be used include (1) pile caps and air curtains to significantly reduce the amplitude of pile driving signals, (2) a ramp-up period, which initiates pile driving operations slowly allowing marine species to move away from the source before maximum pressure waves are generated, (3) the development of safety zones to visually monitor for sensitive species and upon detection to stop site assessment surveys and pile driving activities entirely until the sensitive species leave the area, and (4) the schedule of pile driving activity when sensitive species are not likely to be present in the area. Section 2.12 provides a summary of all measures that may be utilized to avoid, minimize and mitigate impacts to marine and coastal environments.

- **Onshore Facility Construction or Modification**

It is anticipated that no onshore facilities will be constructed or modified for this project. The fabrication of the platform deck, jacket, and pilings is anticipated to be done at an existing shipyard. This facility will not require any construction or modification as this is a typical activity of a shipyard. Georgia Power's Plant Kraft will be used to support/birth vessels during DCC installation, maintenance, operation, and decommissioning. No significant impact on land use or coastal infrastructure is expected.

- **Vessel Traffic**

Vessel activity during site assessment surveys will be short and intermittent. Several vessels will be utilized during construction, operation, maintenance and decommissioning of the DCC. **Table 2-5** gives a description of vessels and the estimated usage.

During routine operation and maintenance, data will be monitored and processed remotely. The structure and instrumentation will be accessed by boat for routine maintenance. Approximately 40 routine operation and maintenance trips may take place over the 5-year life of the DCC lease. These vessel trips will not require any addition to, or expansion of, onshore facilities. It is projected that crew boats 15.5 to 17.4 m (51 to 57 ft) in length with 400- to 1,000-horsepower (hp) engines and 1,800-gallon (gal) fuel capacity will be used to service the structure.

Table 2-5. Projected vessel usage for DCC construction, operation and decommissioning.

Vessel Type	Trips by Project Phase (round trips)			Time On Site by Phase (hours)		
	Construction	Operation	Decommissioning	Construction	Operation	Decommissioning
Class A-1, Derrick Barge w/ Diesel Crane	1	0	1	288	0	288
Anchor Handling Vessel	2	0	2	144	0	144
Support Tug	2	0	2	72	0	72
Crew Boat	1	35 - 40	1	96	105 - 120	96
High Speed Vessel	4	0	4	102	0	102

Vessel activity during the decommissioning phase is anticipated to be similar to vessel activity during construction. Due to the short duration of vessel activity during each of the four phases of the DCC project and the lack of shipping lanes within the proposed OCS blocks, impacts to vessel traffic or conflicts with waterway use are not expected.

- **Lights and Electromagnetic Forces**

Since the DCC will be approximately 67 m (220 ft) tall, aviation and marine navigation safety lighting will be installed and maintained in accordance with FAA and USCG regulations. Aviation warning lights are required for DCCs greater than 61 m (200 ft) tall. Normally these are low intensity red lights flashing approximately 24 times per minute. Navigation warning lights consisting of two amber lights, typically 11 m (35 ft) above the water line, are required and are regulated by the USCG under 33 CFR 66 (Private Aids to Navigation). As allowed by the FAA and USCG, lighting will be used that minimizes visibility from shore (e.g., non-flashing and directional lighting). During the operation phase, biological organisms, primarily bats and birds, may be attracted to the DCC because of the presence of the FAA and USCG required lighting and navigational systems (MMS, 2007).

The brightness and orientation of these lights may attract and potentially result in resident and migratory bird/tower collisions, especially during foggy and dark conditions. Under normal weather conditions, bat and bird/tower collisions are not likely for a single DCC with few moving parts. In addition, the location of the proposed OCS blocks is well away from breeding and roosting areas and is unlikely to present a significant threat to most breeding birds.

There are no electromagnetic force impacts expected as a result of DCC project development or operation.

2.8.1.2 Environmental Hazards and Accidental Events

The following sections discuss the impact-producing factors, as listed in Appendix A of the Project Application Guidance, identified for this project under non-routine conditions that might cause impacts to human health.

- **Environmental Hazards**

Environmental hazards anticipated during the lifecycle of a DCC that are related to an everyday work routine are natural events, such as hurricanes and severe storms.

Depending upon the severity of a natural event (hurricane or severe storm), fixed components of a DCC could be damaged or destroyed, resulting in economic, safety, and/or environmental consequences. Moreover, marine vessels used in constructing, servicing, or maintaining the DCC could also be impacted, potentially resulting in loss of life and the release of hazardous materials (e.g., diesel fuel) to the environment (MMS, 2007).

In examining the listing of major hurricane tracks (Category 3 to 5) from 1851 through 2004, the last major hurricane to have occurred within the proposed OCS blocks was in 1894, and the last major hurricanes to have occurred to the south/northeast of the OCS blocks was in 1854, 1893 and 1959 (Stewart and Bulpitt, 2007). Any outer bands produced by hurricanes and/or tropical storms that occur adjacent to the OCS blocks could cause potential damage to the DCC from the storm surge (high waves) and strong winds (Knox, 2008).

- **Accidental Events**

Accidental events encountered during the lifecycle of a DCC that are related to daily activities include structural failures, vessel collisions, and fluid spills.

Structural Failures

Structures, including a DCC placed in a marine environment, may interact with existing forces to contribute to increase local sediment that leads to scour. Wave action, tidal circulation, and storm waves interact with sediment on the surface of the OCS, inducing sediment reworking and/or transport. Episodic sediment movement caused by ocean currents and waves can cause erosion or scour in the vicinity of submarine cables and around the base of offshore structures and mooring. Erosion caused by scour may undermine their structural foundations leading to a potential failure (MMS, 2009b). Artificial seagrass mats and/or boulder mounds and filter layer material may be utilized to mitigate scour. Section 2.12 summarizes measures that may be utilized to avoid, minimize and mitigate impacts to marine and coastal environments.

Vessel Collisions

A DCC located in the proposed OCS blocks could potentially cause a navigational risk to marine vessels and marine life, resulting in economic, safety and environmental consequences. Though unlikely, a collision between a ship and a DCC could result in the loss of the entire DCC, as well as personal injury and the spill of petroleum products. Marine life collisions could result in serious injury to the animal and/or damage to the DCC; however, since these are fixed platforms, it is anticipated that marine life can sense the presence of fixed structures and would avoid colliding with them (MMS, 2009b).

Vessel traffic in the vicinity of the proposed OCS blocks is discussed in the above section entitled Vessel Traffic. Safety fairways, traffic separation schemes, and anchorages are the most effective means of preventing vessel collisions with a DCC. Vessels associated with site assessment surveys, construction, maintenance or decommissioning of the DCC, may collide with marine mammals, turtles, and other species during transit. To limit or prevent such collisions, NOAA Fisheries Service provides all boat operators with *Whale Watching Guidelines* derived from the Marine Mammal Protection Act (MMPA). These NMFS guidelines suggest safe navigational practices based on speed and distance limitations when encountering marine mammals. The frequency of vessel collisions with these marine organisms probably varies as a function of their spatial and temporal distribution patterns,, the pathway of maritime traffic vessel speed, the number of vessel trips, and the navigational visibility (MMS, 2009b). It should be noted that coastal traffic is more predictable than offshore traffic.

Fluid Spills

All construction, operation, and decommissioning vessels utilized will comply with USCG requirements relating to prevention and control of oil spills. In order to mitigate potential spills from liquid wastes at the DCC during construction, spill kits will be available at the DCC itself as well as onboard the construction, maintenance, and decommissioning vessels. Section 2.12 summarizes measures that may be utilized to avoid, minimize and mitigate impact to marine and coastal environments.

2.8.2 Affected Environment

The following sections discuss the existing physical oceanography, climate, surficial sediments, and shallow hazards associated with the OCS blocks and the immediate vicinity. Also presented are water, air, noise, and visual qualities associated with the installation of the proposed DCC in the vicinity of the proposed OCS blocks. Following the description of each resource's existing condition, when applicable, a discussion of the potential impacts from relevant impact producing factors is provided. When different impacts are anticipated to occur among the three alternative blocks, those different impacts are described.

2.8.2.1 Physical Resources

The U.S. East Coast is geologically characterized by a slowly subsiding, passive margin (Hutchinson and Grow, 1985; Klitgord et al., 1988; Smith, 1996; Byrnes et al., 2004). The outer continental shelf off the coast of Georgia is 121 km (75 mi) wide (Atkinson et al., 1983; Blanton et al., 2003; Edwards et al., 2006) and is part of the South Atlantic Bight (SAB) marine geographic province. The SAB spans the U.S. Atlantic coast from Cape Hatteras, North Carolina to Cape Canaveral, Florida. The SAB can be segmented into four sub-regions: Carolina Capes, Charleston, Georgia Bight, and Florida Straits (Martins and Pelegri, 2006). Additionally, the OCS consists of three bathymetric zones: the inner shelf (0-66 ft) in depth, the middle shelf (69-131 ft), and the outer shelf (135-197 ft) (Atkinson et al., 1983). The proposed lease blocks are located on the inner shelf of the Georgia Bight.

- **Physical Oceanography**

Water Temperature

The shallow waters of the inner shelf quickly respond to atmospheric thermal forcing and generally follow the trend of air temperature changes. Shelf waters experience highest temperatures in August and September and cooling of surface waters begins in the fall (Atkinson et al., 1983). Calculations by Atkinson et al. indicate heating of inner shelf waters from March through July while cooling occurs from October through February (Atkinson et al., 1983). This trend is also reflected in the data acquired from National Data Buoy Center (NDBC) Station #41008 (**Figure 2-2**) located in Gray's Reef National Marine Sanctuary (GRNMS; 31°24'9"N 80°52'9"W), approximately 25 NM south-southeast of the study area.

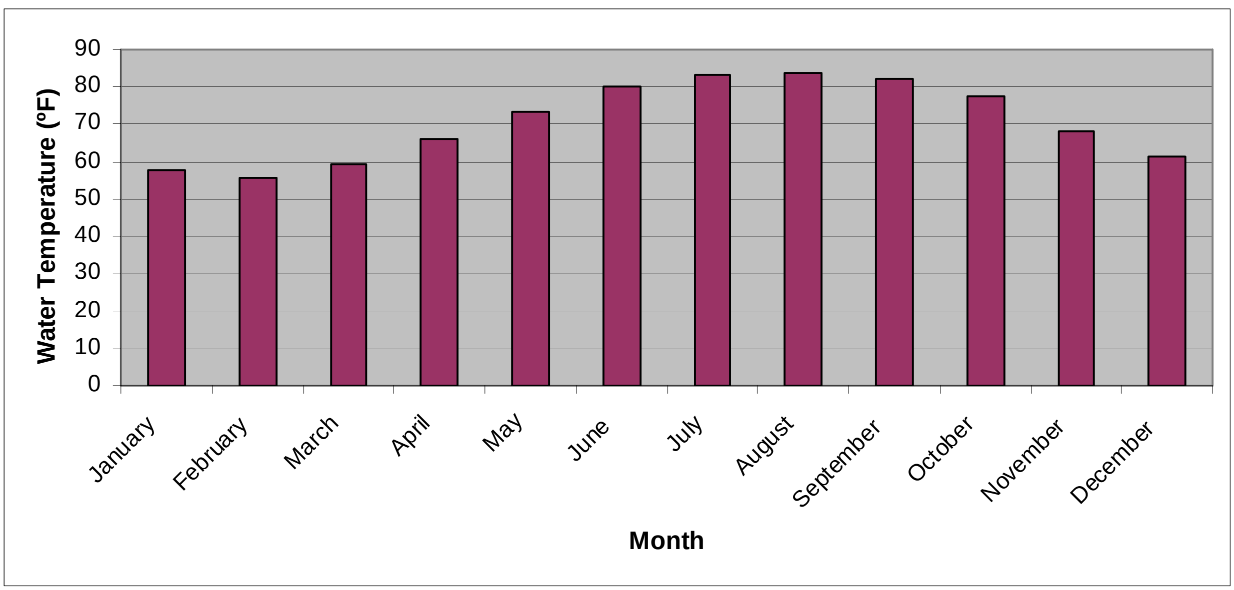

Figure 2-2. The average monthly sea surface temperatures from NDBC Station #41008 between 1998 and 2009. Data source: NDBC (2010).

Currents and Circulation

Inner shelf currents and circulation patterns of the Georgia Bight are strongly influenced by river discharge and atmospheric forcing (Blanton et al., 2003; Edwards et al., 2006). The coastal region is occupied by low-density water of riverine origin that forms a coastal frontal zone. The

Savannah and Altamaha Rivers constitute major sources of freshwater to the northern offshore region of Georgia Bight (Moran et al., 1991; Edwards et al., 2006). Riverine outflow reaches a maximum during spring months (Blanton et al., 2003; Atkinson et al., 1983; Edwards et al., 2006).

Surface currents are a major factor of circulation within the proposed OCS blocks resulting from interactions between the atmosphere and the water surface (wind-driven circulation) (Pickard and Emery, 1990). The direction of surface currents within the proposed blocks is dependent upon the seasonal wind regime: south-southeast in winter, northerly during summer, and south-southwest in the fall. Due to the transitional rotation of the wind field in the spring, surface currents also exhibit northward rotation during this season (Blanton et al., 2003; Edwards et al., 2006).

- **Climate**

The climate of northeast coastal Georgia is moderate with warm summers (average 77°F [UGA 2002]) and mild winters with an average daily temperature of 51.7°F in Savannah (Georgia State Climate Office, 1998). Monthly air temperature data compiled from the Gray's Reef buoy (**Figure 2-3**) indicate winter (January to March [Gitschlag, 1996]) temperatures above 50°F. A warming trend is observed during the latter part of winter and throughout the spring (April to June [Gitschlag, 1996]). Highest temperatures are generally seen from July to September (summer [Gitschlag, 1996]) and air temperatures begin to cool beginning in fall (October to December [Gitschlag, 1996; NDBC, 2010]).

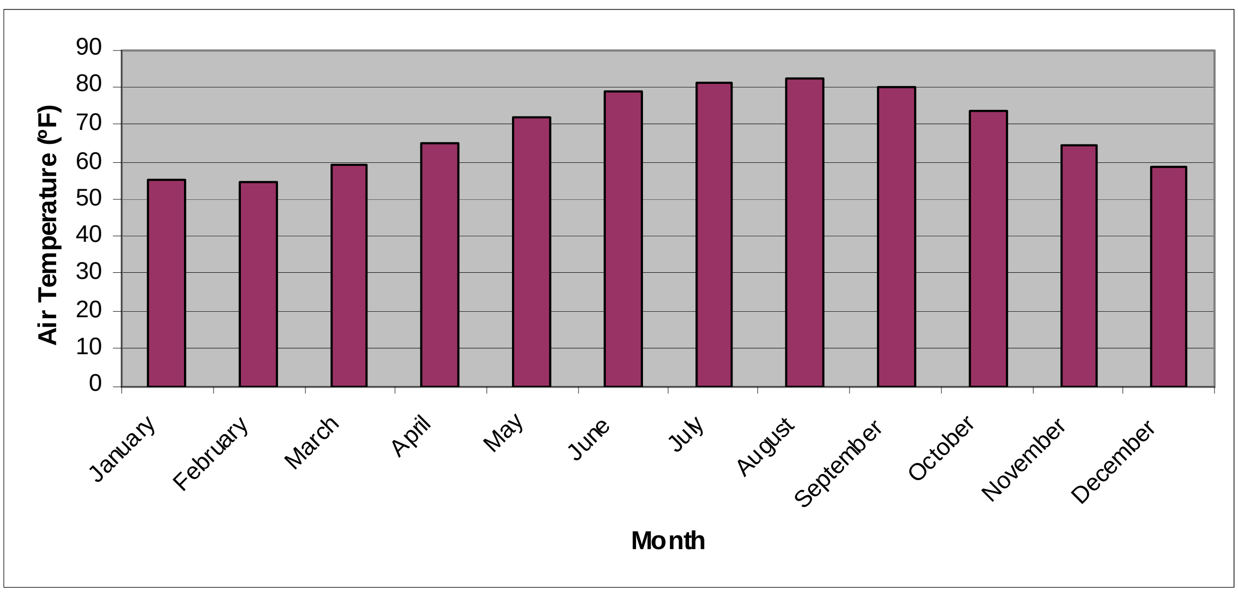

Figure 2-3. The average monthly air temperatures from NDBC Station #41008 located in Gray's Reef National Marine Sanctuary (31°24'9"N 80°52'9"W), approximately 25 NM south-southeast of the lease blocks, between 1998 and 2009. Data source: NDBC (2010).

Local winds exhibit seasonal patterns within the proposed OCS blocks. Northwesterlies, winds from the northwest, flow perpendicular to the coast and are dominant in winter months. Varied wind currents are experienced in the spring as rotation turns poleward. During the summer, southerly winds prevail and flow parallel to the coast ("along-shelf"). In August, winds are weak and, like spring, represent a transition period as rotation turns toward the equator. Northeasterlies dominate in the fall season and, like summer, exhibit along-shelf orientation within the study area (Weber and Blanton, 1980; Atkinson et al., 1983; Blanton et al., 1985; Blanton et al., 2003).

In a study completed by Elliott and Schwartz (2006) regarding Georgia offshore wind mapping, wind speed data were compiled from multiple stations including the coastal marine automated network (CMAN), USCG, NDBC, and SABSOON platforms. These data identified peak winds from October to March with highest speeds occurring in October and February (Elliott and Schwartz, 2006); however, average monthly wind speeds for Savannah, Georgia collected from Weather Underground archived data from 2001 through 2009 (**Figure 2-4**) disagreed with Elliott and Schwartz (2006) on the persistence of high winds. These data indicate maximum wind speeds from September through April with highest speeds in March and April. Weakest winds were observed by Elliott and Schwartz (2006) from May to August, and data from Weather Underground, Savannah Airport, mirrored their findings (Weather Underground, 2010). Elliott and Schwartz (2006) also identified diurnal variation of wind speeds with the strongest winds occurring during the night and the weakest occurring at midday.

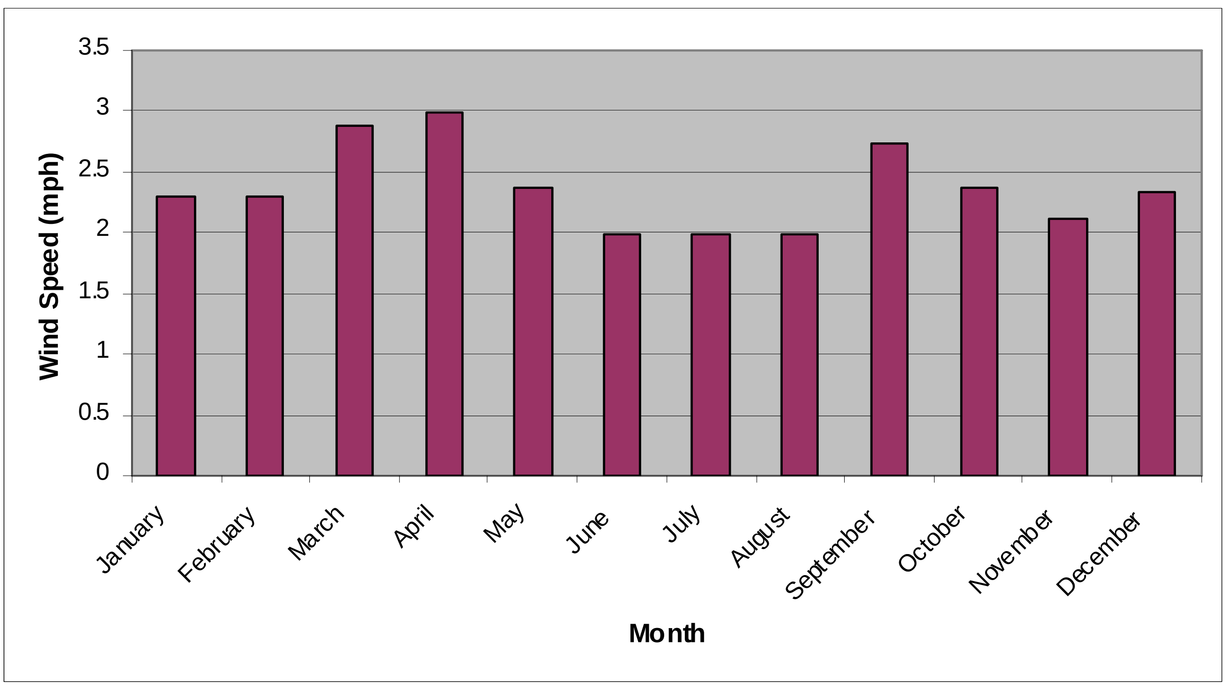

Figure 2-4. The average monthly wind speeds from Weather Underground archived data between January 2001 and December 2009. Data source: Weather Underground (2010).

Additional wind regimes, typical of coastal regions, include sea and land breezes. A sea breeze is formed when warm continental air rises and moves offshore while cooler oceanic air moves onshore (i.e., dense cool air displaces less dense warm air; **Figure 2-5**) (Hammer, 2006). A land breeze is the exact opposite, and they dissipate as they move seaward while the sea breeze forms at the coast (Tunney, 1996).

These wind circulation systems exhibit both monthly and diurnal variation. Tunney (1996) identified a sea breeze season for the Savannah, Georgia region to typically begin in March and continue through October. He considered the sea breeze season as the time period when the average monthly maximum air temperature is higher than the average sea surface temperature (SST). Additionally, he noted that daily sea breezes were most likely to occur when the average hourly temperature surpassed the monthly average SST. Tunney finally concluded that sea breezes are typical during the day when the continental land mass is warmer than the offshore surface waters while land breezes generally occur during the night when offshore waters are warmer than the coastal land mass (Tunney, 1996).

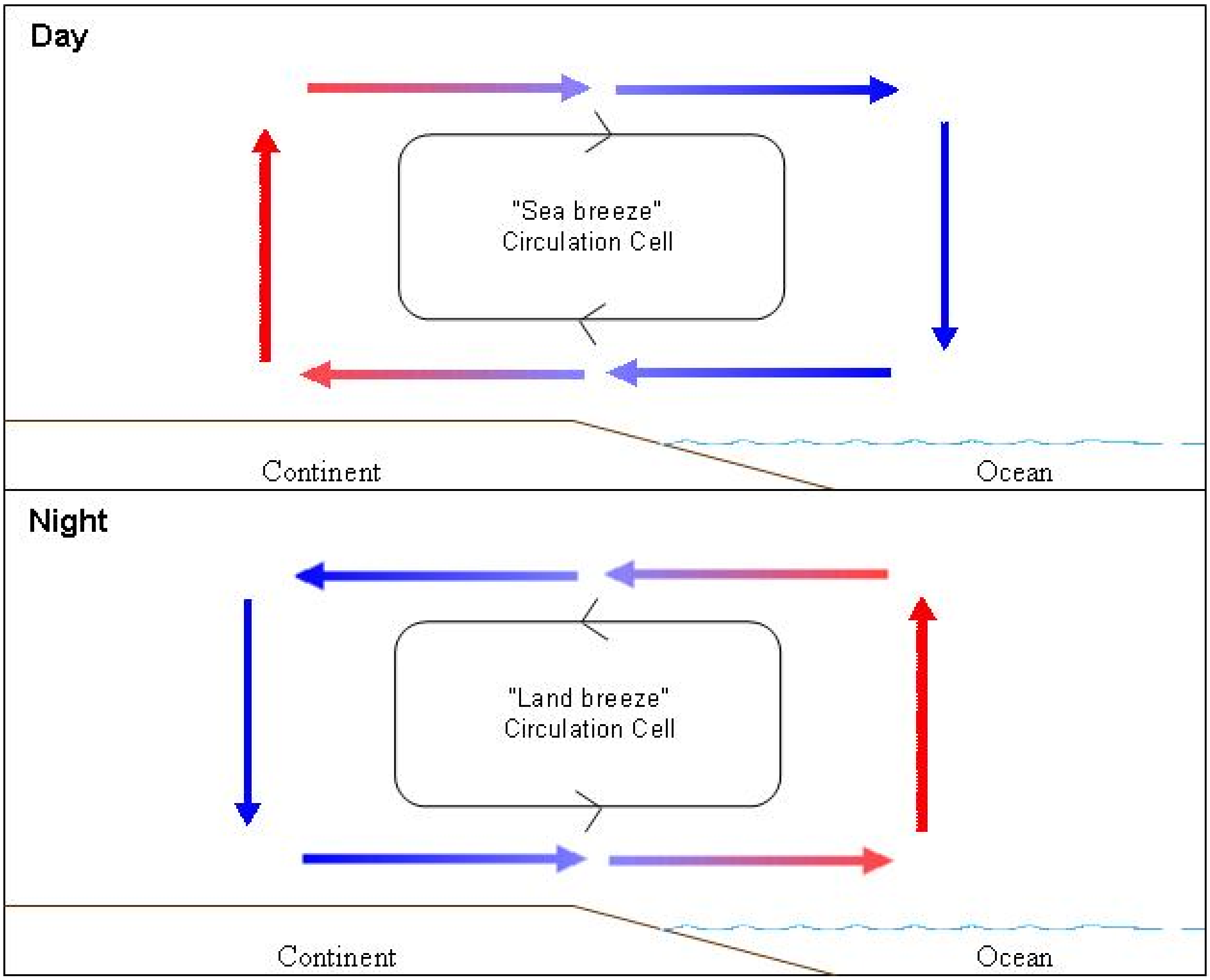

Figure 2-5. Sea breeze and land breeze convection cell patterns. Land heats up and cools down more easily than the ocean. During the day, the land warms faster than water, so air over the coastal land mass heats up and becomes less dense. As the warm air mass rises it is displaced by a cooler and denser air mass moving onshore from over the water. This circulation cell is sea breeze. Alternately, a land breeze occurs at night when the land loses heat faster than the water. The warmer air, now over the water, rises and is displaced by cooler and denser air moving offshore from the land. Source information: Abbs and Physick (1992), Tunney (1996), and Bowers (2004).

Tunney (1996) studied summer (July – August) land and sea breeze development for Wassaw Sound located slightly north of the OCS blocks. He recorded land breezes beginning at 0500 (local time) with winds less than 2.24 miles per hour (mph). At 0700 wind speeds reached their maximum (little more than 2.24 mph) and persisted as far as 3.73 mi offshore. The land breeze ended after 0800 hours. Conversely, the average sea breeze event began no later than 1100 (local time) along the coast with associated winds of 5.6 mph. Wind speeds reached 14.54 mph no more than four hours later and extended to 68.35 mi offshore. The sea breeze ended after 2000 hours (Tunney, 1996).

Thunderstorms and major storm events (e.g., tropical cyclones) occur in the region typically during the summer and fall seasons. Energy for both types of storm systems is derived from air-sea gradients of heat and humidity with formation occurring as hot, humid air masses come into contact with frontal systems (Joyce, 1987). Tropical cyclones are non-frontal, low pressure, rotating systems that develop over tropical waters and are essentially driven by heat transfers from the ocean to the atmosphere. These major weather systems include tropical depressions and storms and all hurricane categories (Elsner and Kara, 1999; NOAA 2009a; NOAA/NWS, 2010). The official Atlantic hurricane season begins 1 June and ends 30 November; however, most hurricane events generally occur from mid August to late October (Landsea, 1993; Landsea et al., 1998; McAdie et al., 2009; NOAA/NWS, 2010) with the majority of all events occurring in September (**Figure 2-6**; Landsea, 1993; Landsea et al., 1998; McAdie et al., 2009).

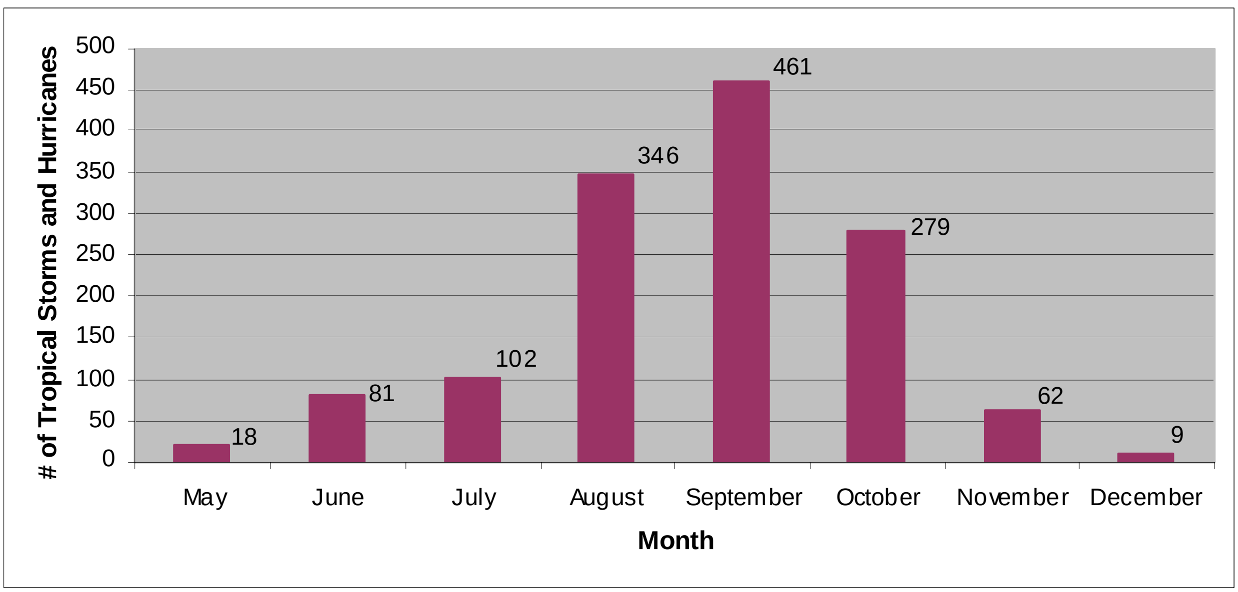

Figure 2-6. The total number of North Atlantic basin tropical storm and hurricane events per month for all years from 1851 to 2006 (McAdie et al., 2009).

Although several tropical cyclone systems have tracked within the vicinity of the proposed OCS blocks since 1851 (NOAA/NWS, 2010; **Figure 2-7**) there have been no major hurricane landfalls along the Georgia coast in more than 100 years (Bulpitt et al., 2006); however, systems passing offshore have the potential to impact the proposed blocks with high winds, excess rainfall, and tornadic activity (Donnelly et al., 2004). Since 1998 at least four tropical cyclones have caused wind gusts in excess of 50 mph: Hurricane Earl in 1998; Hurricanes Floyd and Irene in 1999; and Hurricane Gabrielle in 2001 (Pasch et al., 1998; Lawrence et al., 2001; Beven et al., 2003; NDBC, 2010). The maximum wind gust, recorded between 1998 and 2009 at GRNMS buoy Station #41008, was 68.5 mph which coincided with the passing of Hurricane Floyd on September 15, 1999 (Lawrence et al., 2001; NDBC, 2010). Additionally, heavy rainfall (3.94 to 7.87 inches) was reported in eastern Georgia due to Tropical Storm Barry in June 2007 (Brennan et al., 2009) and some systems have led to the development of multiple tornadoes (e.g., Hurricane Earl in September 1998) (Pasch et al., 1998).

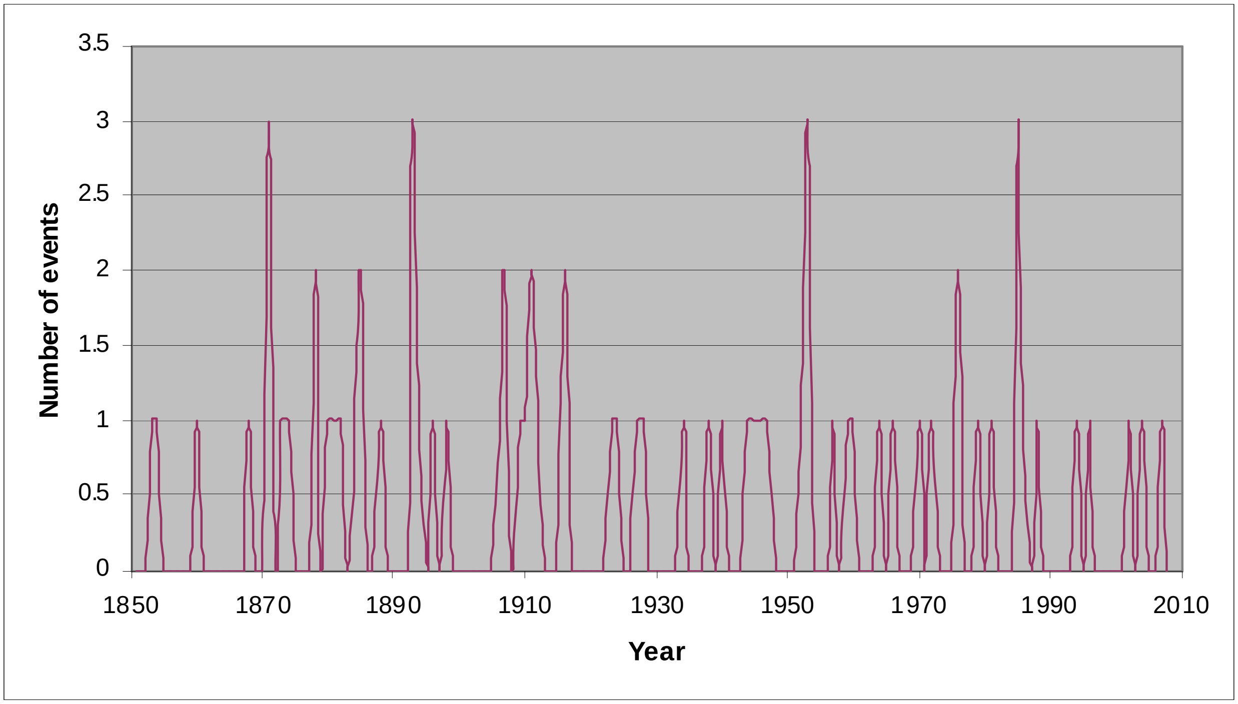

Figure 2-7. The total number of storm events (extratropical storms, subtropical depressions and storms, tropical depressions and storms, and hurricanes [all categories]) in the vicinity of the OCS blocks offshore Georgia from 1851 to 2008 (NOAA, 2009b). Years in which no storm events were recorded are represented as zero.

Precipitation in the northeastern Georgia coastal region is seasonally dependent. Hot and humid summer conditions make this season prime for thunderstorm and tropical cyclone activity. Precipitation during the summer wet season averages about 20 in. while the winter dry season averages approximately 10 in. or less (GA State Climate Office, 1998). Monthly precipitation normals collected from the National Weather Service (NWS) Eastern Region Headquarters (ERH) ranged from a maximum of 7.2 in. for August to 2.4 in. for November (**Figure 2-8**; NWS ERH – Hunter U.S. Army Airfield, 2010a-l). Annual rainfall accumulation averages 50 in. or more (GA State Climate Office, 1998; NWS ERH, 2010a-l) and frozen precipitation (snow or sleet) is extremely rare (GA State Climate Office, 1998).

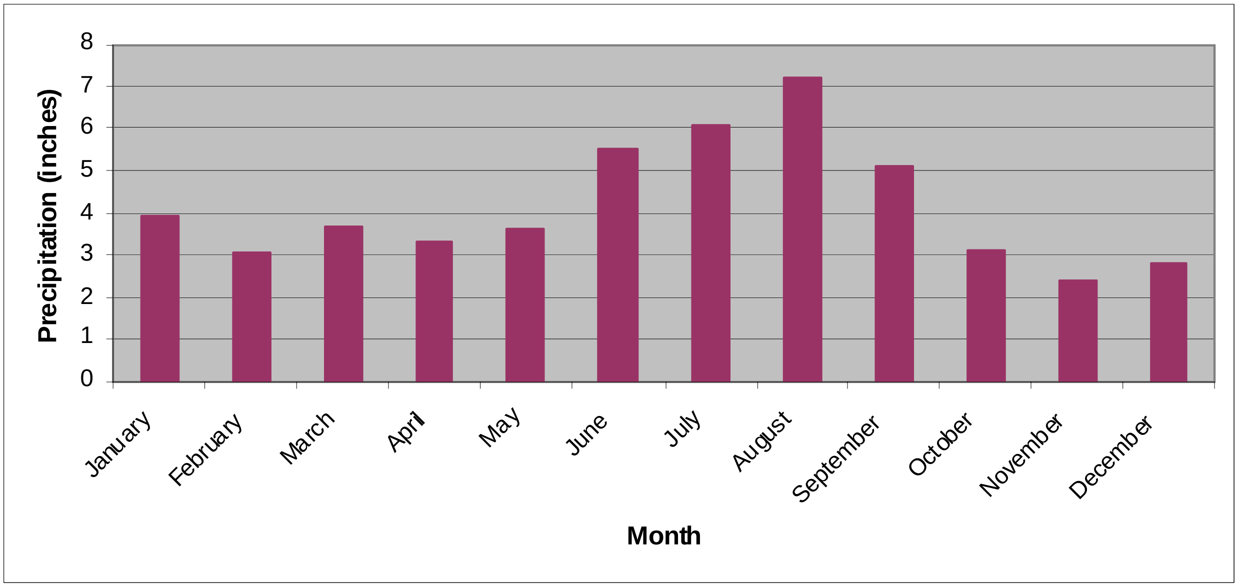

Figure 2-8. Monthly total precipitation normals for Savannah, Georgia. Data source: NWS ERH (2010a-l).

- **Surficial Sediments**

The Georgia Bight spans the Atlantic coast of Georgia. The OCS off central Georgia is about 75 mi wide and bathymetry slopes gently seaward (Gorsline, 1963; Atkinson et al., 1983; Blanton et al., 2003; Edwards et al., 2006). Present-day surficial sediments of the inner shelf region of the proposed OCS blocks are dominated by fine-grained silty detrital sands (Gorsline, 1963). A patch of gravelly-sand is also observed north of the proposed OCS blocks (**Figure 2-9**) and is most likely derived from rocky outcrops related to older sediments (Hollister, 1973). Additionally, patches of hardbottom (natural and artificial reefs and non-living hard ground) are scattered across the seafloor in OCS block 6074 (**Figure 2-9**; Wilder and Norris, 2002).

Section 2.8.2.2 Benthic Communities discusses potential impacts to surficial sediments. No significant impacts to surficial sediments are anticipated as a result from the DCC project.

- **Shallow Hazards**

Shallow hazards in the vicinity of the proposed OCS blocks are composed of both submerged and non-submerged obstructions (**Figure 2-10**). Submerged hazards include a variety of unnamed shipwrecks, the Tybee dump site, and other obstructions (USGS, 2000; Captain Segull's Nautical Charts Inc., 2005) while buoys (e.g., NOAA weather buoys) and U.S. Navy Tactical Aircrew Combat System (TACS) support towers constitute non-submerged structures (GDNR, 2001; GDNR, 2010a; NDBC, 2010). Based on existing data there are no known obstructions within the preferred OCS block (6126) and alternative OCS block one (6074). Alternative OCS block two (6174) has two known shipwrecks within the block boundaries.

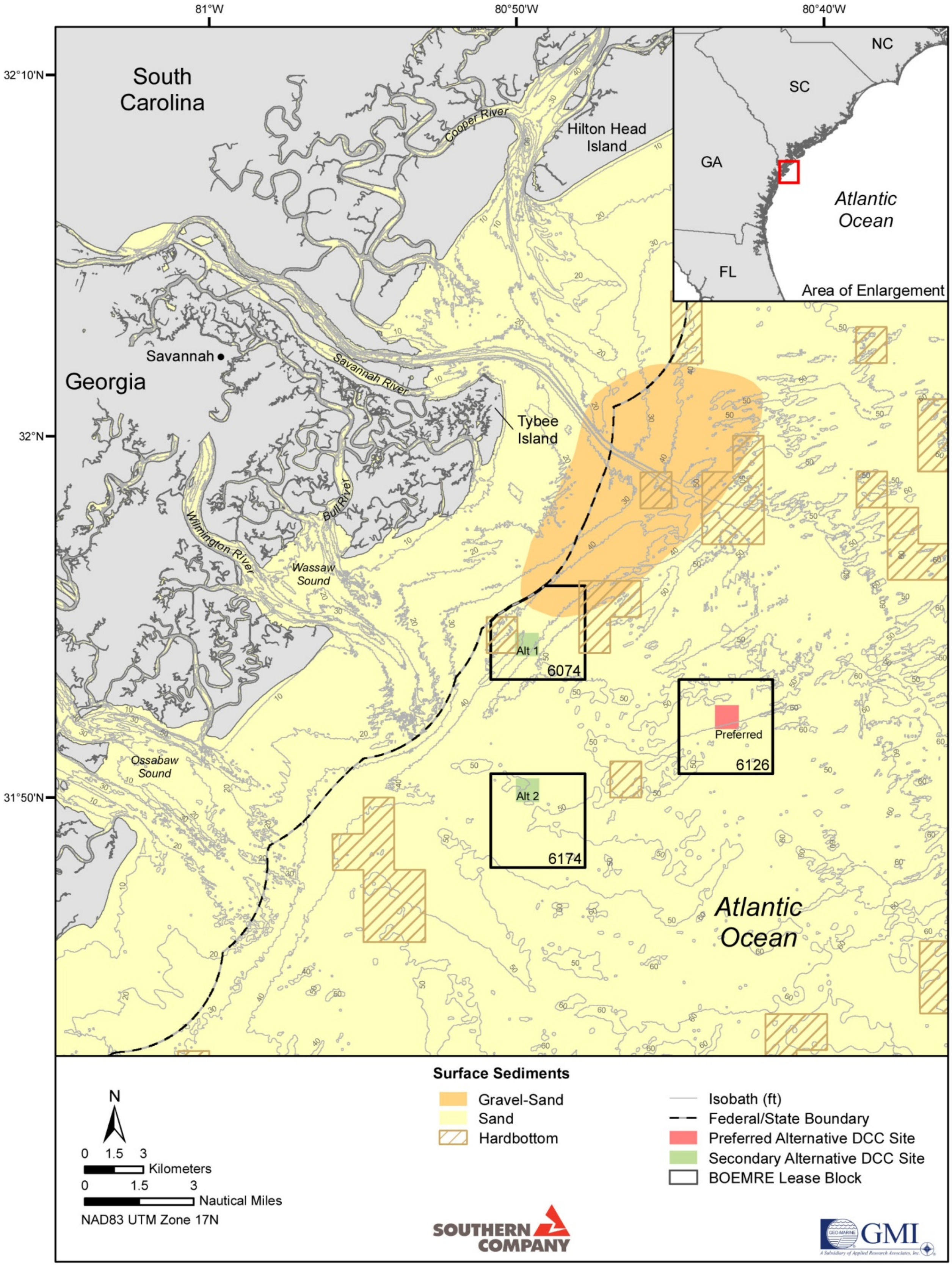

Figure 2-9. Surficial sediments within the OCS blocks (USGS, 2000).

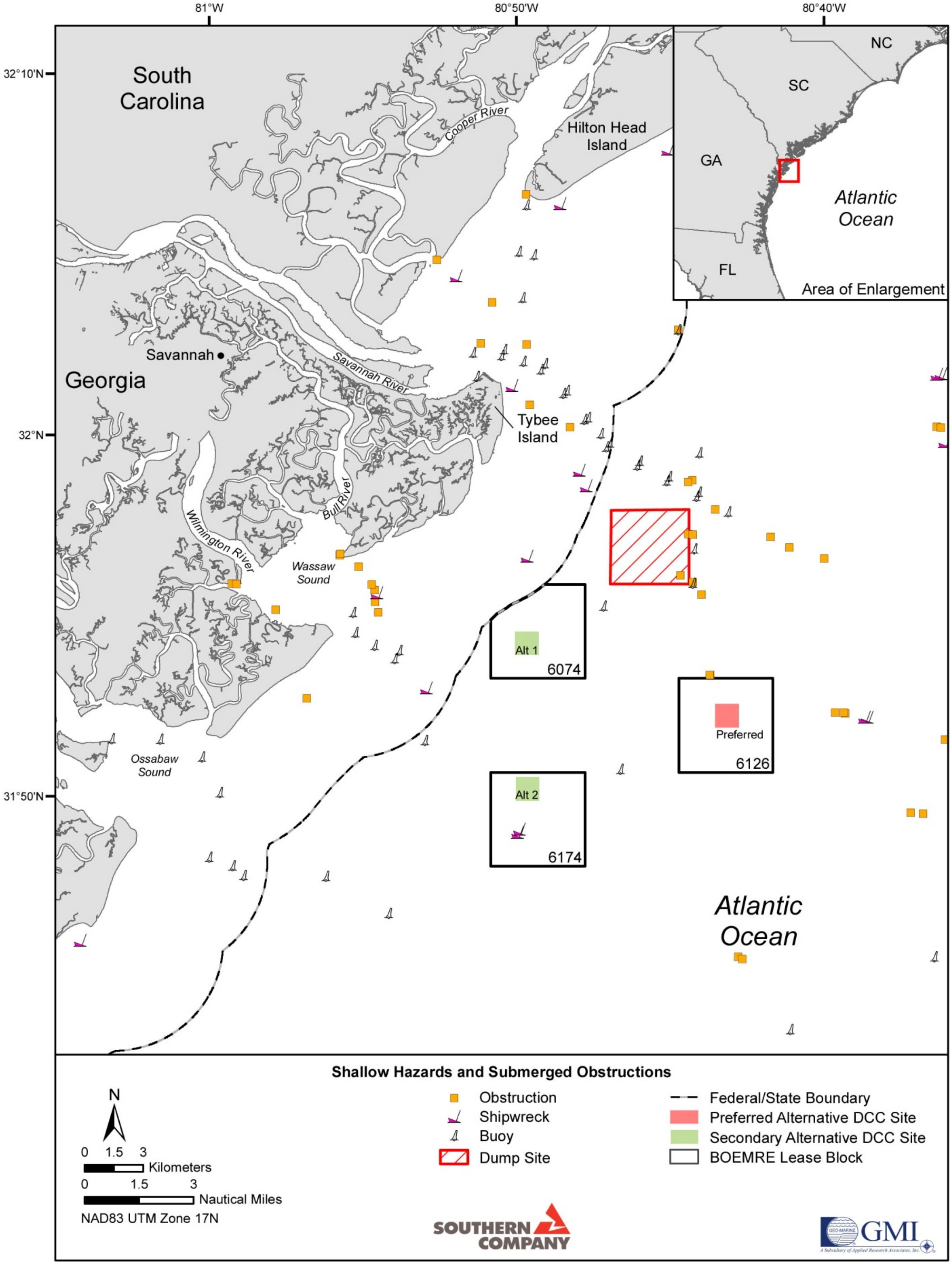

Figure 2-10. Shallow hazards and submerged obstructions within the OCS blocks (NOAA, 2010).

Possible Impacts Discussion

Construction of offshore installations may impact the marine environment through the alteration or destruction of key habitats and/or archaeologically significant sites. Shipwrecks provide both historical value and an important habitat for commercial and recreational fish species as well as benthic organisms. Due to their ecological value, shipwrecks may be considered Biologically Sensitive Habitats (BSHs). The lease process does not require a detailed site survey prior to construction unless and until key habitats or archaeologically significant sites are discovered. There is no evidence or data suggesting that BSH or significant historical sites exist in any of the proposed OCS blocks. The MMS Preliminary Draft Lease Stipulations Report stipulates that for any BSH located or discovered within 328 ft of proposed seafloor disturbance or within 3,281 f of locations in which activities could result in turbidity plumes (e.g., excavation), a detailed site survey must be conducted before any activities begin and at a minimum must include both color videography and still photography. Additionally, in an effort to ensure full habitat delineation, surveys should include a range outside the boundary of the BSH, even if outside the OCS block. Benthic communities and substrate composition must be classified in all site surveys. Furthermore, surveys conducted for a small site must include the entire area (100%) while larger survey sites may be completed using transect methods with no more than 65.6 ft between each transect line (MMS, 2010a).

Based on existing literature there are no known BSH within the proposed preferred OCS block that would trigger MMS Preliminary Draft Lease Stipulations requirements. If BSH is observed during site characterization surveys, Southern Company will notify the USACE and BOEMRE and other appropriate agency personnel to discuss possible impacts and project development plans.

- **Water Quality**

Natural processes that result in events at the water-sediment interface, such as storm and hurricane events, have the potential to significantly impact sediment distribution and suspension (i.e., turbidity) within the water column. For example, Hurricane Isabel made landfall on the Outer Banks of North Carolina in 2003 and during its approach and track over the region, bottom sediments and surficial sediment suspension increased substantially within Onslow Bay. Increased currents and turbidity resulted in a southwest transport of fine and medium grained sediments in the Bay (Wren and Leonard, 2005).

Possible Impacts Discussion

There are no anticipated pre-construction impacts to water quality. Construction vessels will dispose of all bilge water and other associated wastes in appropriate facilities when at dock. Spill kits will be available for emergency use aboard all and any survey vessels utilized during the pre-construction assessment phase as well as at any land-based staging areas. BMPs for construction and support practices will be followed at all times and during all phases of the project.

The construction activities may impact water quality but any impacts are expected to be minor and short-lived. Increased activity from maritime support vessels as well as crane and other activities may disrupt sediments for short periods of time but these sediment loads are not expected to significantly exceed ambient background loads typical of coastal Georgia. Pile driving procedures disrupt the seafloor and have the potential to cause minor turbidity plumes as well as small-scale redistribution of local sediments. There are no expected impacts to water quality during operational activity. Possible cumulative impacts to coastal waters are expected to be insignificant.

- **Air Quality**

The U.S. EPA Office of Air Quality Planning and Standards (OAQPS) has established National Ambient Air Quality Standards (NAAQS) as required by the Clean Air Act (CAA) (40 CFR part 50). These standards apply up to 25 mi offshore (EPA, 2010). The standards identify, include, and regulate emissions of six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), and particulate matter (PM_{10} and $PM_{2.5}$). The DNR EPD Air Protection Branch conducts an Ambient Monitoring Program (AMP) which measures the levels of these criteria pollutants by region (with the exception that lead is not included for Savannah). Data from 1996 to April 2010 for the Savannah region, indicated 13 days in which the region exceeded standards for O_3 and $PM_{2.5}$. **Table 2-6** shows the data and exceedance information (GDNR, 2010b).

Table 2-6. Georgia Department of Natural Resources ambient air quality program data. Exceedances for the Savannah, Georgia region from 1996 to April 2010 (GDNR, 2010b).

Criteria Pollutant	Date Exceeded	Quality Standard*	Measured Value	Exceedance Value
O_3 (ppm) 8-hour average	30 July 1999	0.08	0.088	0.008
	1 August 1999	0.08	0.085	0.005
	2 August 1999	0.08	0.088	0.008
	3 June 2000	0.08	0.095	0.015
$PM_{2.5}$ (µg/m^3) 24-hour average	2 May 2007	35.0	50.1	15.1
	3 May 2007	35.0	61.9	26.9
	17 May 2007	35.0	59.2	24.2
	6 August 2007	35.0	50.7	15.7
	7 August 2007	35.0	43.3	8.3
	8 August 2007	35.0	47.0	12.0
	9 August 2007	35.0	52.3	17.3
	1 April 2010	35.0	40.7	5.7
	2 April 2010	35.0	35.0	0

*National Ambient Air Quality Standards (EPA, 2010).
ppm = parts per million by volume
µg/m^3 = micrograms per cubic meter

As of the writing of this report, monitoring for lead concentrations is only required in areas where industry release is at least 1 ton/year or in population areas of at least 500,000. The Savannah region does not meet either condition and therefore. air quality measurements for lead are not required. The Savannah region is currently in attainment for all criteria pollutants (Pers.

Comm. Susan Zimmer-Dauphinee, Georgia EPD, April 2010), and project activities and construction are not expected to impact regional air quality.

The CAA regulations include provisions (Part D, subparts 1 and 2) for planning procedures, maintenance plans, control, and guidance regarding nonattainment areas. General provisions for any criteria pollutant are contained in subpart 1, while subpart 2 is reserved specifically for the emission levels of the criteria pollutant O_3. Five O_3 classification levels (marginal, moderate, serious, severe, and extreme) are established in this section and range from 0.121 to 0.138 ppm (marginal) to 0.280 ppm and greater (extreme) (Title I: Clean Air Act).

Currently, there are 156 federal mandated Class 1 areas within the U.S. The air quality within these Class 1 areas has the highest level of air quality protection and is not allowed to deteriorate as a result of unnatural factors. (NPS AQD 1981). These areas include all international parks, national wilderness areas, national memorial parks in excess of 5,000 ac, and national parks in excess of 6,000 ac that were in existence as of August 7, 1977. The Wolf Island Wilderness area, located approximately 50 km (27 NM) southwest of the proposed OCS blocks, is the only Class 1 Air Quality Area within 100 km (54 NM) (**Figure 2-11**).

Possible Impacts Discussion

Air quality may be impacted during the pre-construction phase due to survey assessment activities which may require the use of exhaust producing machines and/or vehicles, including but not limited to land based equipment and maritime support vessels. Such activities would be temporary and long-term impacts are not expected.

Construction activities may impact air quality through the use of maritime support vessels, cranes, pile-driving, and other heavy equipment. These construction activities are temporary and long-term impacts to ambient air quality are not expected. Section 2.8.1.1 provides further air emissions information.

There are no expected impacts to air quality from DCC operations as all equipment installed on the DCC will be powered by non-emitting sources, including a solar PV array and battery bank. Maintenance of the DCC may impact ambient air quality due to exhaust emissions from vessels and equipment use, though impacts will be minimal and temporary.

- **Noise Quality**

The ambient sound level of an area is defined by the total noise generated within the specific environment, and is usually comprised of sound emanating from natural and artificial sources. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. The sounds associated with these activities can be categorized into above-water noise and below-water noise sources. Above-water noise is sound generated from vibrations in the air, whereas below-water noise is sound generated as minute variations in water pressure (MMS, 2009c). Existing sources of underwater noise in the vicinity of the OCS blocks may include waves, ship traffic and marine animals. Ambient (primarily wind and waves) sound levels can range from 103 to 117 dB depending on ocean bottom topography, wind speeds and sea conditions.

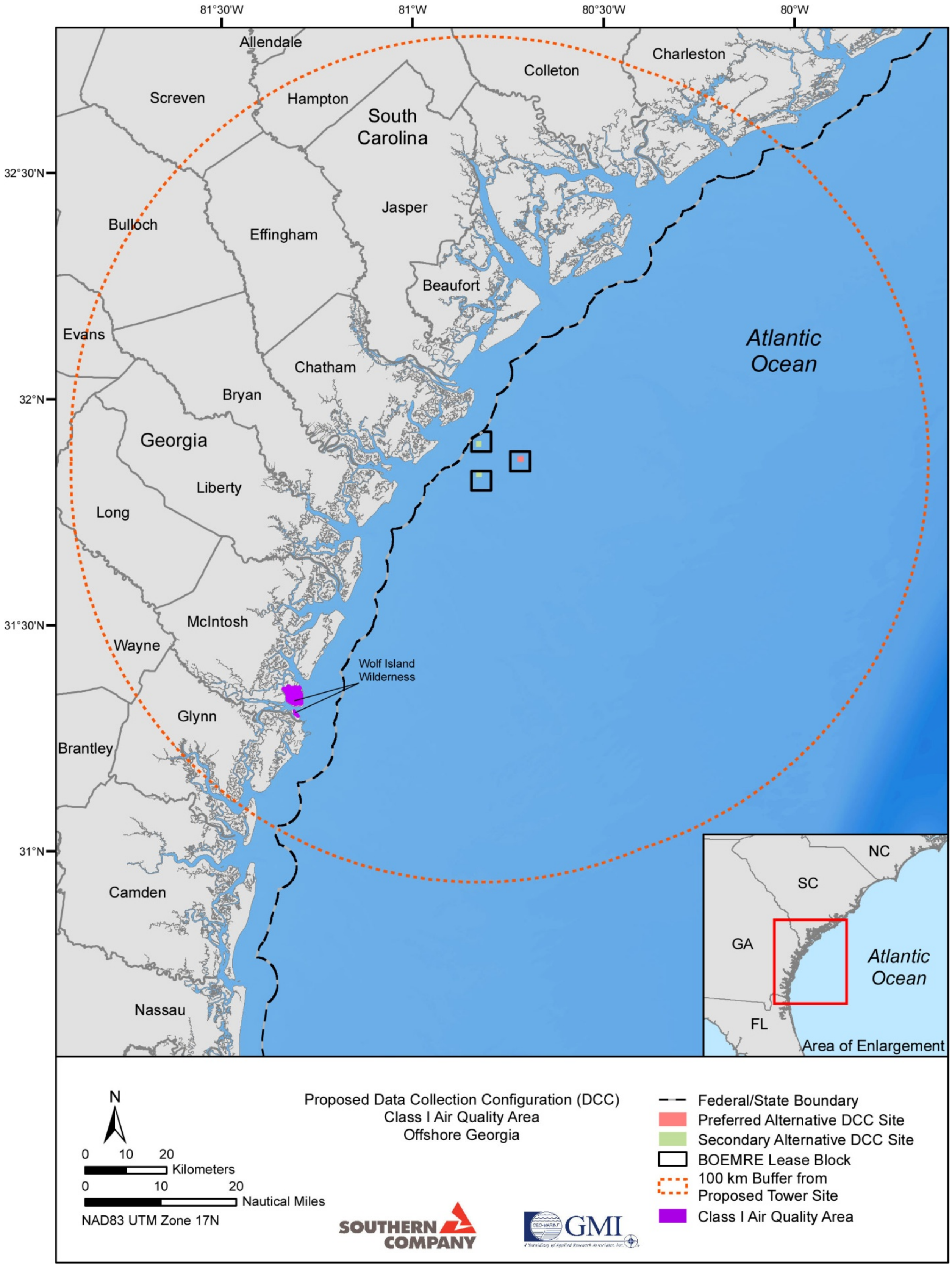

Figure 2-11. Proposed DCC class 1 air quality areas.

Possible Impacts Discussion

Noise quality may be impacted during the pre-construction phase due to increased boat activity during site assessment surveys. Such surveys would identify: bathymetry, seafloor morphology, topography, sub-seafloor geology/stratigraphy, and obstructions on or below the seafloor. Additionally, noise may be produced from equipment utilized to conduct site surveys. Site assessment surveys could include multi-beam and side scan sonar, magnetometer, and sub-benthic profiling. Noise generated during acoustic surveys may physically and/or behaviorally affect marine mammals, sea turtles, and fish, as well as other wildlife. Possible physical effects include: temporary or permanent hearing loss, discomfort and injury, and masking of marine animal communications (Richardson et al., 1995; Davis et al., 1998; Gordon et al., 1998).

Offshore activities involved with DCC construction may possibly create noise both in air and in water, which may affect both humans and wildlife. Above water noise during the DCC project is anticipated to be insignificant compared to ongoing activities in the vicinity of the proposed OCs blocks. It is anticipated that any noise produced during construction will not be at a level that will disturb normal human or terrestrial wildlife activity.

Tower support structure installation entails the use of a large hammer administering quick blows to steel monopoles (support structures) until reaching the desired depth within the substrate. Noise and noise pressure measurements show pile driving to account for the greatest anthropogenic noise produced during construction activities (Betke et al., 2004; Madsen et al., 2006). Pile driving procedures for one pile foundation can span several hours, depending on substrate composition, with impact blows delivered at a rate of approximately one blow per second. Hammer and monopile size as well as sediment and bedrock composition influence generated noise levels (Madsen et al., 2006).

Sound pressure levels (SPLs) are sixty times greater in water than in air for identical sound source intensity (Au and Hastings, 2008; Ketten, 1998). Previous studies have shown underwater SPLs approximately 200 dB re 1 μPa (an acoustic unit of measure) and greater at distances of 100 m (328 ft) from the sound source (Caltrans, 2001; Bailey et al., 2010).

Additional noise sources during construction include ship and barge noise, and crew boat operations (Scholik and Yan, 2002), and the use of hand tools and small machinery (Medwin et al., 1973; Wahlberg and Westerberg, 2005). Although noise emissions from construction activities are transient and unlikely to permeate inland, potential impacts to marine life will be addressed using observers to monitor marine mammals and techniques such as bubble screens and pile caps to reduce these possible effects.

As previously stated, noise emission is not expected during DCC operation, but noise generation may occur during routine maintenance. This noise would be similar to that generated during construction activities from ship and barge operations (Scholik and Yan, 2002) as well as noise from any tools or machinery utilized (Medwin et al., 1973; Wahlberg and Westerberg, 2005). The noise produced during this phase, however, would occur over a much shorter period of time. Section 2.8.1.1 discusses the possible impacts to noise quality.

- **Visual Quality**

Offshore installations have the potential to affect visual quality simply through the presence of the structure within the oceanscape. The visual quality of the coastal scene may be impacted for several counties in Georgia and South Carolina.

Possible Impacts Discussion

Visual quality could be impacted during the pre-construction phase due to shipping and aerial traffic needed to conduct the required site assessment surveys. Such pre-construction activities would be temporary and long-term impacts are not expected.

Construction of the DCC is anticipated to take approximately twelve days, but this time frame depends on weather conditions and material or human resource issues. Construction vehicles, platforms, and support vessels may be seen from shore areas during all phases of construction. There are no long-term visual impacts expected to result from construction activities.

Offshore installations have the potential to affect visual and aesthetic quality through a phenomenon known as "glint." Glint can occur when sunlight is reflected directly off the metal and glass surfaces of instruments on a DCC. Glint is not expected to be a problem and any occurrences should be minor due to the small reflective surfaces found on the DCC and associated equipment.

If installed at the preferred site, the DCC will be approximately 10 NM from Tybee Island as shown in **Figure 2-1**. At this distance the view of the DCC structure has a small potential to affect visual quality of the ocean/coastal scene due to its relatively small dimensions. To further reduce the potential impacts to the visual quality, non-reflective paints will be used.

2.8.2.2 Biological Resources

This section presents the biological resources that may be found within or in the vicinity of the proposed OCS blocks. These resources include coastal environments, benthic communities, coastal and marine birds, fish and essential fish habitat, sea turtles and marine mammals. Following the discussion of each resource, any potential impacts resulting from the proposed DCC activities are provided.

- **Coastal Environments and Wetlands**

Ecosystems in the Georgia coastal counties are comprised of barrier islands, tidal rivers, coastal forests, estuaries, wetlands, salt marshes, and open water areas. These habitats are of particular importance for a variety of species including many species of birds (e.g., egrets, warblers), marine mammals (e.g., North Atlantic right whale, bottlenose dolphin, West Indian manatee), and reptiles (e.g., snakes, sea turtles).

Barrier Islands

Georgia has one of the most complete chains of large barrier islands that run from Savannah in the north to St. Mary's in the south. A barrier island is defined as an elongated, sandy strip of land formed parallel to the main coast by wind and wave action. Barrier islands protect the mainland from ocean and storm impacts and provide important habitat for many plants and animals.

There are eight major barrier island groups, including Tybee Island, along the southern portion of coastal South Carolina and the Georgia coast.

Dunes

Barrier island topography is characterized by sand dunes and gently sloping ridges (USFWS, 2008a, 2010a). Dunes are mounds of sand, created as wind-blown sand piles up behind an obstruction or trapped among beach vegetation. Sand dunes found on Georgia barrier islands are typically 3 m (10 ft) or more in height with steep leeward and gentler windward slopes (USFWS, 2010a).

Wetlands

Wetlands are areas periodically, regularly, or permanently inundated with shallow water such as saltwater, brackish, and freshwater marshes. Wetlands provide significant habitat for a variety of wildlife (fishes, invertebrates, birds) and plant species (USFWS, 2010a).

Marsh systems typically form behind barrier islands and are considered one of the most productive ecosystems in North America. Marshes provide the foundation of the marine food chain as well as serving as nurseries for many marine species. Additionally, due to high productivity and biodiversity of these environments, marsh systems and their associated barrier islands are ecologically significant to various migratory birds (USFWS, 2010a).

Georgia boasts an extensive belt of marsh wetlands spanning its 161 km (100 mi) of coastline. The salt marsh ecosystems separate the barrier islands from the mainland (Kundell and Woolf, 1986). The majority of wetlands along the Georgia coast are estuarine and marine; freshwater forested/shrub; and freshwater emergent. River associated lake habitats are also found throughout coastal Georgia (USFWS, 2010a).

Open Water

Open water regions located offshore of coastal Georgia are utilized by a variety of marine species, such as marine mammals and sea turtles, as calving, migratory, breeding, and/or feeding grounds.

Some baleen whale species make annual, long-distance migrations from higher latitude feeding grounds to lower latitude breeding and calving grounds (Kraus et al., 1986; Corkeron and

Connor, 1999; Rizzo and Schulte, 2009; Stern, 2009). Other species make well-documented seasonal movements that are associated directly or indirectly with SST changes throughout the year (Leatherwood et al., 1984; Rusin et al., 2000; Neumann, 2001; Torres et al., 2005). Based on known distribution and occurrences, North Atlantic right (*Eubalaena glacialis*) and humpback (*Megaptera novaeangliae*) whales, the West Indian manatee (*Trichechus manatus*), and some stocks of bottlenose dolphins (*Tursiops truncatus*) may occur seasonally in or near the proposed OCS blocks (Keller et al., 2006; McLellan et al., 2001; Lefebvre et al., 2001; Waring et al., 2009a, 2009b). Fin whales (*Balaenoptera physalus*), common minke whales (*B. acutorostrata*), and Atlantic spotted dolphins (*Stenella frontalis*) may occur there at any time of the year, and resident stocks of bottlenose dolphins are documented in coastal Georgia year-round (Waring et al., 2009a, 2009b).

Sea turtle species found off the Georgia coast are known to make seasonal movements along the Atlantic coast of the U.S., moving northward as SSTs rise (Renaud, 1995; Hays et al., 2001; Plotkin and Spotila, 2002; James et al., 2005; Maier et al., 2005; Eckert et al., 2006; Mansfield, 2006). The waters of coastal Georgia provide year-round habitat for multiple species (Schwartz, 1989a; Ruckdeschel et al., 2000; Ruckdeschel and Shoop, 2006). For example, loggerhead turtles (*Caretta caretta*), leatherback turtles (*Dermochelys coriacea*), and green turtles (*Chelonia mydas*) nest on the barrier islands along the southeast U.S. coast (Plotkin and Spotila, 2002; Rabon et al., 2003; Williams et al., 2006). Juvenile individuals of these species use waters of the U.S. Atlantic coast as nursery and foraging habitats, both in nearshore waters such as estuaries and lagoons and far offshore in the waters of the Gulf Stream (Keinath et al., 1996; Musick and Limpus, 1997).

Federal Protected Areas

- **National Marine Sanctuary**

The GRNMS is a large protected reef off the Georgia coast. GRNMS is one of the largest, 41 km^2 (16 mi^2), near-shore live-bottom reefs found in the southeastern U.S. National Marine Sanctuaries (NMSs) are managed by the NOAA Office of National Marine Sanctuaries with the mission "to protect and conserve their resources and to allow uses that are compatible with resource protection" (GRNMS, 2010).

GRNMS is one of only four NMSs off the U.S. east coast; others are Stellwagen Bank (Massachusetts), Monitor (North Carolina), and the Florida Keys. GRNMS lies in 18 to 21 m (60 to 70 ft) of water, about 32 km (17 NM) off mid-coastal Georgia. The 41 km^2 (16 mi^2) protected area supports approximately 150 fish species, 65 species of macroalgae (Kendall et al., 2003), and 300 species of marine invertebrate (Wenner et al., 1983). Additionally, many marine mammal and sea turtle species may utilize sanctuary waters throughout the year.

- **National Wildlife Refuge**

The National Wildlife Refuge (NWR) System is managed by the USFWS and is the world's largest assemblage of lands set aside specifically for the protection of fish and wildlife (USFWS, 2010a).

There are seven refuges along south coastal South Carolina and coastal Georgia, encompassing about 112 km^2 (43 mi^2); Pinckney Island NWR, Savannah NWR (largest), Tybee NWR, Wassaw NWR, Harris Neck NWR, Blackbeard Island NWR, and Wolf Island NWR ("Complex") (USFWS 2008a, 2010a).

The Complex consists of many diverse environments such as barrier islands, wetlands, tidal creeks and rivers, forested areas, and grasslands. These habitats are of great importance to various species of birds, fishes, and other wildlife (USFWS, 2010a). More than 300 avian species, both migratory and resident, have been recorded utilizing various regions within the Complex; some species are threatened and endangered such as the wood stork, peregrine falcon, piping plover, and red-cockaded woodpecker. Additionally, the refuges are important habitats for many species of amphibian, reptile (including five sea turtle species), a variety of fishes, and marine mammals such as the West Indian manatee and bottlenose dolphin (USFWS, 2008a, 2010a).

- **Biosphere Reserve**

Biosphere reserves (BRs) are protected areas of representative terrestrial and coastal environments which have been internationally recognized under the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Man and the Biosphere Program for their value in conservation and in providing the scientific knowledge, skill and human values to support sustainable development.

There are three BRs for the U.S.; the Aleutian Islands, Carolinian-South Atlantic, and Central California Coast. The Blackbeard Island NWR and Wolf Island NWR, both located southwest of the proposed OCS blocks, are included within the Carolinian-South Atlantic BR.

<u>State Protected Areas</u>

- **Georgia Important Bird Area**

Important Bird Areas (IBAs) are sites providing essential habitat for one or more breeding, wintering, or migratory avian species.

Georgia IBAs include: Altamaha Waterfowl Management Area, Altamaha River Delta, Harris Neck NWR, Little Tybee Island, Ossabaw Island, St. Catherine's Island, Savannah NWR, and Wassaw NWR (GDNR, 2007).

- **Western Hemisphere Shorebird Reserve**

The Western Hemisphere Shorebird Reserve (WHSR) Network aims to "conserve shorebirds and their habitats through a network of key sites across the Americas" (WHSRN, 2010). The Network joins wetlands and uplands significant for migratory shorebirds. The program is non-regulatory and aims to assist in habitat management and environmental protection and education through research, collaboration, and training efforts (WHSRN, 2010).

The Altamaha River Delta is a designated shorebird reserve. The reserve is characterized as regionally important indicating that at least 20,000 shorebirds utilize the area annually or at least 1% of a species' biogeographical population (WHSRN, 2010). The Altamaha River Delta is one of the most important habitats in Georgia for seabirds and shorebirds such as the American oystercatcher, piping plover, least tern, red knot, and marbled godwits (The Nature Conservancy, 2010).

- **National Estuarine Research Reserve**

The National Estuarine Research Reserve (NERR) System is a network of more than 5261 km^2 (1.3 million ac) of coastal and estuarine habitats protected for long-term research, water quality monitoring, education, and coastal stewardship. The System is administered by NOAA and managed by the states (NERRS, 2010).

There is one NERR in the state of Georgia. The Sapelo Island NERR is located along the coast of Georgia just north of Wolf Island and supports a variety of ongoing ecological and estuarine research projects (SI NERR, 2010).

♦ **Benthic Communities**

Benthic communities are composed of a variety of sediments and substrates and are home to many species of marine organisms. Physical, chemical, and biological ocean processes influence the types of organisms that occur in these marine habitats. Benthic organisms, such as crustaceans, echinoderms, anthozoans, annelids, mollusks, and demersal fishes play a major role in shaping benthic substrates and breaking down organic material which provides the base for many food chains and species (Sumich, 1988). Benthic communities and the food chains/webs they support are impacted and modified by sedimentation from storms, anthropogenic disturbances and naturally occurring transport mechanisms. Increases in sedimentation caused by storms, currents, waves, and anthropogenic disturbances, such as coastal development and dredging, can negatively impact the benthic fauna and flora communities which in turn affect food webs and ecosystems (Jones et al., 1985; Rogers, 1990; Liddel et al., 1997).

The southeastern U.S. OCS benthic communities consist primarily of two natural types: soft bottoms (unconsolidated sediments) and live/hardbottoms. Benthic fauna found in coastal Georgia waters are representative of the Carolinian Zoogeographical Province inshore, with a distinct resemblance to the Caribbean Zoogeographical Province in offshore areas and particularly on live/hardbottom habitat (Sandifer et al., 1980).

Soft Bottom Communities

The marine coastal ecosystem along the OCS falls entirely within a region characterized as the "turbulent zone" where soft (sand and ground shell) bottom sediments are ripple-marked due to wave action down to a depth of approximately 20 m (66 ft) (Day et al., 1971). Nearshore benthic communities have been studied in some detail off coastal Georgia (Frankenberg, 1965, 1971; Smith, 1971, 1973; Dorjes, 1972, 1977; Leiper, 1973; Frankenberg and Leiper, 1977). Soft bottom areas may be virtual aquatic deserts, with shifting sandy topography that prevents the colonization of large plant and animal communities (Lenz, 1999). Therefore, the benthic community may be patchily distributed (Brooks et al., 2006). Cutter and Diaz (1998) found benthic habitat to be higher in structured versus homogeneous sand bottoms. Soft bottom communities on the OCS provide habitat for organisms such as polychaetes (worms), archiannelids (worms), bivalves, amphipods, and asteroids (starfish) (Posey et al., 1998; Hobbs, 2002) with abundance and species diversity comparable to nearshore and intertidal areas (Posey et al., 1998). Factors affecting species distribution and abundance include depth, sediment type, grain size, temperature, and salinity (Brooks et al., 2004). 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; CAN, 1979). These nearshore benthic communities are numerically dominated by Spionidae polychaetes (i.e., *Spiophanes bombyx*) and small crustaceans common to sandy sediments (Szedlmayer and Lee, 2004), while the overall benthic biomass was dominated by echinoderms and bivalves (*Tellina* spp.) (Smith, 1971, 1973). More recent work conducted on Georgia's inner shelf (within 9 km to 17 km (4.9 to 9.2 NM) from land and a water depth ranging from 7 m to 13 m (23.0 to 42.6 ft)) support earlier findings that polychaetes (*Mediomastus* spp., *Spiophanes bombyx*, and *Owenia fusiformis*) and crustaceans (*Oxyurostylis smithii*) numerically comprised 77% of the population (Cooksey et al., 2004; Hyland et al., 2006).

The coastal waters of Georgia, particularly near the mouths of rivers like the Savannah and Wilmington Rivers inshore of the proposed OCS blocks, are characteristically turbid due to the transport of organic and inorganic materials out of river-estuarine systems (Dorjes, 1977). Leiper (1973) found that the proportion of deposit feeders is highest inshore where the export of detrital material (from salt marshes) is relatively high while the percentage of suspension feeders increases as distances offshore increase. Although the nearshore infauna is taxonomically rich, Tenore et al. (1978) reported that the macrofaunal biomass is low over much of the Georgia OCS due to an unfavorable sediment regime and from low nutrient levels exported from coastal river-estuarine systems (e.g., Savannah, Wilmington, and Ogeechee Rivers) inshore of the OCS blocks (Guadagnoli et al., 2005).

Live/Hardbottom Communities

Live/hardbottom 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) and are composed of limestone and sandstone outcrops that rise 1 to 3 m (3.3 to 9.8 ft) above the surrounding sandy substratum. Live/hardbottom communities are areas of low, rough, or broken relief consisting of naturally-occurring hard or rocky outcroppings that are usually covered by a thin layer of sand. The geological and biological architecture of these three-dimensional substrates (including limestone outcroppings, coquina shells, and coral skeletons) provide shelter and substrate for benthic and demersal organisms (Jones et al., 1985; Cahoon et al., 1999). These outcrops are colonized by corals, sponges, and other diverse epifaunal components and support unique fish assemblages compared to surrounding sandy habitats (Sedberry and Van Dolah, 1984). Live/hardbottom communities are focal sites for activities of many species of small schooling fishes as well as mid-water and demersal piscivorous fishes (Kracker et al., 2008). Live/hardbottom communities may also support rich, sessile biological assemblages (e.g., gorgonians [sea fans and sea whips], ascidians, bryozoans, hard corals, hydroids, anemones, encrusting algae, and sponges) and favor relatively dense aggregations of sea turtles, commercial and recreational fishes, and other fauna (Thompson et al., 1999).

On the OCS between Cape Fear, North Carolina and Cape Canaveral, Florida, live/hardbottom communities and assemblages of isolated, non-reef building corals appear to occur as three general morphotypes (Henry and Giles, 1977; Barans and Henry, 1984).

- Type I are relatively smooth, flat-lying rock outcrops (<1.6-ft relief) covered by a thin, sandy layer. This type of live/hardbottom is widely distributed with a sparse to moderately abundant sponge/octocoral community in relatively shallow water (approximate water depth = 19 m to 27 m (62.3 to 88.6 ft)).
- Type II occur as rocky outcrops exhibiting moderate relief (0.5 to 2 m (1.6 to 6.6 ft)). Their distribution is restricted to the inner and mid OCS with a moderately abundant to abundant sponge/octocoral community (approximate water depth = 28 to 55 m (91.8 to 180.4 ft)).
- Type III occur as discontinuous but generally well-defined, high relief (2 to 15 m (6.6 to 49.2 ft)) outcrops manifested as rocky ridges, scarps, and pinnacles. They are located along the OCS margin with a moderately abundant to abundant sponge/octocoral community at depths ranging from approximately 56 to 100 m (183.7 to 328.0 ft.).

Of the three general morphotypes, Type I live/hardbottom communities are present within or adjacent to OCS block 6074 and situated between OCS blocks 6174 and the preferred 6126; **Figure 2-12**). These inner shelf live/hardbottom communities in Georgia waters are most likely colonized by epifaunal amphipods (*Luconacia incerta* and *Erichthonius brasiliensis*) in winter and spring and polychaetes (*Syllis spongicola* and *Malacoceros glutaeus*) in summer and fall (Wenner et al., 1984). Abundances of organisms remain constant throughout the year with less diverse populations on the inner OCS due to warmer water temperatures and consistent oceanographic conditions (Wenner et al., 1984). Sponges, bryozoans, corals, and anemones numerically dominate the macrobenthic community during all seasons. Sponges (*Homaxinella waltonsmithii*, *Spheciospongia vesparium*, *Cliona caribbaea*, and *Halichondria bowerbanki*) are the most important invertebrate group overall on the inner OCS, comprising 60 to 78% of the total biomass (Wenner et al., 1984).

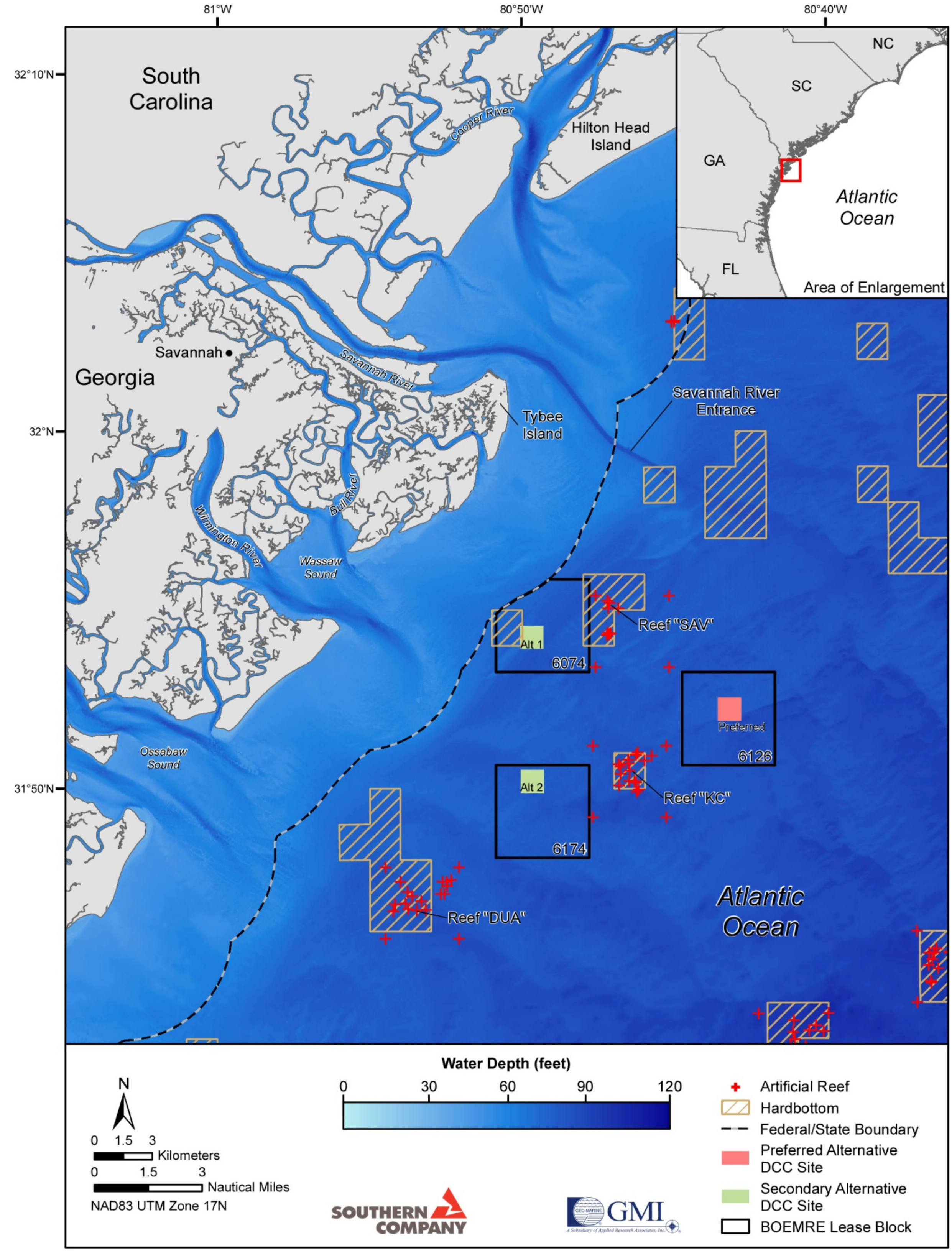

Figure 2-12. Location of live/hardbottom communities and artificial reefs within or adjacent to the OCS blocks (GDNR, 2001; SEAMAP, 2001).

NOAA's Office of Coastal Management reports that 3 to 30% of the SAB OCS is covered by hardbottom communities (SAFMC, 1998). Much of the OCS from Cape Hatteras, North Carolina to Cape Canaveral, Florida has yet to be fully surveyed to assess the distribution of hardbottom communities due to their patchy nature (SAFMC, 1998). The highest concentrations of live/hardbottom communities on the inner OCS occur north (off Cape Fear, North Carolina) and south (between an area north of Jacksonville and Cape Canaveral, Florida) of the proposed OCS blocks (SEAMAP, 2001). Although most live/hardbottom habitats occur at depths greater than 27 m (88.6 ft), many are also found at depths from 16 to 27 m (52.5 to 88.6 ft) outside the proposed OCS blocks off coastal North Carolina and South Carolina and within GRNMS off Georgia's coast (SAFMC, 2009).

Parker et al. (1983) suggest that the rock-coral-sponge habitat accounts for 30% or 739 km^2 (182,635 ac) of the substrate between the 27-m (88.56-ft) and 101-m (331.28-ft) isobaths from Cape Fear, North Carolina to Cape Canaveral, Florida. Off the southeastern U.S. coastline, Barans and Burrell's (1976) estimate of hardbottom cover within the 19- to 55-m (62.3- to 180.4-ft) depth range accounted for 652 km^2 (161,152 ac.). Hardbottom communities are present within OCS block 6074 with a sizable amount adjacent to its eastern boundary (**Figure 2-12**). Hardbottom habitat and communities are found within and adjacent to the OCS blocks at depths between 9 m and 15 m (29.5 ft and 49.2 ft) (Ojeda et al., 2004). Hardbottom communities are not present in OCS block 6126.

Corals

Shallow water coral reefs and communities, sponges, seagrasses, macroalgae, and artificial benthic habitats exist within the Carolinian Zoogeographic Province. Many variables (e.g., depth, light, temperature) influence the occurrence and density of these groups of organisms (DeBlieu et al., 2005). There are no tropical reefs within the OCS blocks or vicinity but there are temperate anthozoans found on the OCS that not only use photosynthesis as a mode of nutrition but also consume zooplankton (Huntsman and Macintyre, 1971; BLM, 1976; Reed, 1980; Miller, 1995). Temperate anthozoans are limited in their distribution by biotic factors such as competition for substrate from macroalgae and other factors not clearly understood (Miller, 1995). Physical-environmental factors influencing growth of temperate corals are not as clearly understood as they are for tropical corals (Miller, 1995).

Although there are no true coral reefs similar in size, structure, or composition within the proposed OCS blocks or vicinity, there are isolated coral patches or mounds of reef-building and non-reef building and live/hardbottom habitat with coral communities throughout the Florida-Hatteras OCS (DeVictor and Morton, 2007; SAFMC, 1998). North of the proposed OCS blocks, reef-building corals (*Siderastrea siderea* and *Solenastrea hyades*) occur in isolated patches, and non-reef building corals (*Oculina arbuscula* and *Astrangia danae*) occur as small discrete colonies at various locations on the inner OCS (depth = 20 to 40 m [65.6 to 131.2 ft] and 3 to 40 m [9.8 to 131.2 ft], respectively, southeast of Cape Fear, North Carolina [Macintyre and Pilkey, 1969; Huntsman and Macintyre, 1971]). Reports from Georgia waters indicate that the coral fauna is largely the same as that found in North Carolina coastal waters, except the coral patches are more sparsely distributed (Powles and Barans, 1980; SAFMC, 1998).

Along the broad, sandy continental shelf, the offshore areas of live/hardbottom habitat range from rocky areas with little vertical relief support and patchy communities of corals, sponges, and macroalgae to areas of high-relief outcroppings with abundant invertebrate growth. Off the Georgia coast south of the proposed OCS blocks, there are considerable live/hardbottom habitats (i.e., GRNMS) that have been studied. These areas have more tropical coral and sponge species than North Carolina and the northern section of South Carolina due to the warmer water temperatures from the Gulf Stream current (~60.8°F in January to ~84.2°F in August), higher salinities (34.3 to 36.6 ppm), and consistent circulation patterns (northward flowing current) from year to year (Wenner et al., 1984). Two typical low-relief live/hardbottom habitats, GRNMS and an area off St. Catherine's Island, may be representative of the live/hardbottom sites within and adjacent to OCS block 6074 (Van Dolah et al., 1987). These areas support numerous species of plants (macroalgae), sessile invertebrates (sponges and hard/soft corals), and reef fishes such as groupers (Serranidae), grunts (Haemulidae), snappers (Lutjanidae), sea basses (Serranidae), triggerfish (Balistidae), tilefish (Malacanthidae), blennies (Blenniidae), gobies (Gobiidae), sharks (elasmobranchs), and eels (Anguilliformes) (SEAMAP, 2001).

Sponges

Sponges (Porifera) are multicellular filter feeders that rely on water currents for food by ingesting microscopic organisms through dermal pores (Ruzicka and Gleason, 2009). They live at all temperatures and latitudes and can be vase-like, tubular, spherical, or fingerlike in shape (Kaplan, 1982).

Sponges dominate many benthic communities in tropical and temperate regions and are commonly observed on both hard and soft bottom habitats (Wenner et al., 1983). Their abundance, distribution, and diversity have been relatively well documented in tropical Florida, the Caribbean, and Bermuda as well as in some temperate locations from North Carolina to Cape Cod, Massachusetts (Freeman et al., 2007). Information on sponge communities is more limited for the southern portions of the SAB (SCWMRD, 1982: Wenner et al., 1983). Both GRNMS and an area east of St. Catherine's Island are known to support abundant sponge communities and may be representative of the live/hardbottom sites within and adjacent to the proposed OCS blocks (Van Dolah et al., 1987). The preferred block (6126) does not have any known live/hardbottom areas. Recent surveys conducted at various temperate hardbottom sites off coastal Georgia, including GRNMS, described 52 species that encompassed three major habitat types, each with a distinctive set of sponges and sponge growth forms (Freeman et al., 2007).

Seagrasses

Georgia and South Carolina lack seagrass beds (SAFMC, 2009). From southern North Carolina through southern Georgia, highly turbid freshwater discharges, suspended sediments, a large tidal amplitude (up to 3 m (9.8 ft)), and the lack of protected shallow sounds combine to prevent the permanent establishment of seagrass beds within or near the OCS blocks (Sandifer et al., 1980; Duarte, 2002; Green and Short, 2003).

Macroalgae

Eighty-one macroalgal species occur in Georgia and are represented by the following species: green (*Ulva*, *Enteromorpha*, *Codium*, and *Cladophora*), red (*Porphyra*, *Polysiphonia*, *Audouinella*, and *Erythrotrichia*), and brown (*Sagrassum filipendula*) (Chapman, 1971, 1973; Searles, 1981, 1984). Macroscopic or multicellular (attached) algae occur in coastal waters and adjacent estuarine systems within the OCS blocks and are represented by three algal groups: green (Chlorophyta), brown (Phaeophyta), and red (Rhodophyta) (Searles, 1988). These macroalgae are part of a warm-temperate flora of approximately 320 species which occupy the seacoast of the U.S. from Cape Canaveral, Florida to Cape Hatteras, North Carolina (Searles, 1984). Most of the area in the vicinity of the OCS blocks does not provide appropriate habitat for macroalgae due to the large expanses of soft (unconsolidated) bottom (~60 to 80%) on which these plants cannot colonize, but the macroalgae that do occur in Georgia's coastal waters colonize a variety of natural and artificial substrates (e.g., remnant, subtidally-exposed geological formations [hardbottoms]; shell and shell fragments; shipwrecks; artificial reefs; sea buoys; and harbor jetties) (Sandifer et al., 1980). Macroalgal species recorded by Chapman's (1971) survey from Sapelo Island, Georgia; Hay and Sutherland's (1988) survey of rubble structures in the SAB; and Searles' (1988) survey from GRNMS were similar in composition and are likely to be indicative of the species that may occur on the natural (live/hardbottom) and artificial (jetties: Savannah River) substrates within or adjacent to OCS block 6074.

Artificial Benthic Habitats

Artificial benthic habitats alter the seafloor and under the right conditions can benefit benthic communities and fisheries. When solid hard objects with numerous and varied surfaces (e.g., artificial reefs and shipwrecks) are introduced to the areas of the seafloor predominantly composed of soft sediments they provide the appropriate substrate necessary for the settlement and colonization of epibenthic organisms such as macroalgae, sponges, barnacles, hard/soft corals, anemones, and hydroids (Bohnsack et al., 1991). These artificial benthic habitats behave ecologically like natural hardbottom communities (Fitzhardinge and Bailey-Brock, 1989; Bohnsack et al., 1991).

Artificial reefs, sometimes referred to as man-made reefs, are broadly defined to include any structure placed on the seabed either deliberately or accidentally (i.e., shipwrecks) and can act similarly to natural hardbottom or reefs (SAFMC, 2009). Artificial reefs are constructed from natural materials (e.g., wood, quarry rock, and shells) and man-made materials (e.g., concrete reef balls, surplused steel vessels, Liberty ships, subway cars, U.S. Army battle tanks, and oil platforms) (Artificial Reef Subcommittee, 1997). Man-made reefs are constructed for a variety of purposes, are particularly popular sites for recreational fishing and diving, and can be considered a fishery management tool (SAFMC, 2009).

Georgia's artificial reef program is maintained by the DNR (GDNR, 2001) and requires construction permits from the USACE with review and approval by the USCG and the EPA (SAFMC, 2009). Artificial reef locations are considered live/hardbottom habitat and are classified as Special Management Zones (SMZs) under the SAFMC Snapper-Grouper Fishery Management Plan (FMP) (SAFMC, 2009).

To date, DNR has initiated reef construction at 22 sites 4.6 to 130 km (2.5 to 70.0 NM) offshore and at 15 estuarine locations in Georgia's waters. One of these artificial reef sites (**Figure 2-12**) is located within or adjacent to OCS block 6074 while none are known to exist within OCS blocks 6126 and 6174. Two inshore artificial reefs are west of the proposed OCS blocks in Bull River and Joe's Cut in Wassaw Sound. Georgia's inshore artificial reef sites are typically small and largely intertidal in order to promote oyster reef development. Offshore, the majority of the artificial reefs are located in exclusive economic zone (EEZ) waters east of the coastal trawling grounds at a distance of 11 to 43 km (6 to 23 NM) and at depths ranging from 9 to 21 m (29.9 to 69.7 ft). In addition, three deepwater reefs have been constructed in 42 to 49 m (139.1 to 160.1 ft) of water 93 to 130 km (50 to 70 NM) offshore to address a growing recreational component targeting bluewater fishes. The permitted estuarine and coastal beach reef sites are limited in size and the offshore EEZ sites typically average 14 km^2 (4 NM^2).

Possible Impacts and Discussion

With regard to the relatively small footprint and potentially temporary nature of the proposed DCC, construction impacts to the benthic community will result in a small amount of habitat loss and minor turbidity from the installation of the DCC pilings. Sediment resuspension and any turbidity plume generated during pile driving construction and scour protection placement are unlikely to be of greater local magnitude than that caused by any typical tropical depression/ storm events and should have a temporary minor effect on the non-vegetated benthic organisms (i.e., polychaetes and small crustaceans) and their life cycle. In addition, any loss of soft-bottom habitat will be negligible relative to the benthic habitat available to species in the surrounding area. There are no expected impacts during the operation of the DCC.

If full decommissioning is exercised, support piles and scour protection systems would be removed to below the mudline according to BOEMRE requirements. Each pile would be cut by a high pressure water jet cutting tool deployed on the interior of each pile. Sand that was forced into the hollow pile during installation into the seabed would then be removed from the pilings. Any impacts associated with these processes should be short-lived and would not significantly alter the benthic habitat in the proposed OCS blocks.

- **Marine and Coastal Birds**

The marine (open-ocean) habitats of the proposed OCS blocks and adjacent coastal shoreline habitats are within the SAB and the Atlantic Flyway. Many marine and terrestrial birds use the Atlantic Flyway during spring and fall migration (USFWS, 1998; MMS, 2009).

Seabirds, waterfowl, waders, shorebirds, and songbirds are found in the SAB and its adjoining nearshore coastal aquatic and terrestrial habitats. Fifty-four seabird species potentially occur in the SAB (**Appendix B-1**) and over 300 bird species are documented from the nearshore aquatic and terrestrial coastal habitats to the west of the proposed OCS blocks. The coastal list (**Appendix B-1**) includes birds that are known from both coastal marine, coastal nearshore, and coastal terrestrial habitats (USFWS, 1998).

Listed Species

Based on available data, the potential occurrence of bird species over and adjacent to the three proposed OCS blocks and over and adjacent to the coastline is presented in the following sections. The information presented is limited to species in marine (open-ocean) inner shelf habitats (i.e., 0-20 m in depth and 0-49 km off Georgia) and in coastal waters and shoreline habitats during at least one season of the year (Beaton et al., 2003). Additional recent occurrence status data can be found in Beaton et al. (2003).

Two federally listed threatened bird species, roseate tern (*Sterna dougallii dougallii*) and piping plover (*Charadrius melodus*; except those populations found in the Great Lakes watershed), and one federal candidate species, red knot (*Calidris canutus rufa*) occur in the SAB (Georgia Ornithological Society, 2009; GDNR, 2010c; USFWS, 2010b). These species have the potential to occur as migrants over the OCS blocks and may utilize the nearshore coastal waters and coastline habitats west of the proposed OCS blocks for foraging and roosting during spring and fall migration and/or during the winter season.

Roseate Tern

The western Atlantic breeding population of roseate tern is listed as endangered along the U.S. Atlantic Coast from North Carolina to Maine, in Canada, and Bermuda. It is listed as threatened in the remaining areas of the western hemisphere. No critical habitat is designated for the three OCS blocks or along the coastline west of the three OCS blocks (USFWS, 2010c).

Roseate terns are medium-sized terns that generally nest on offshore islands, barrier beaches, and salt marsh islands and forage over open-ocean waters (Cornell Laboratory of Ornithology, 2010a). During migration, they are observed migrating over the open ocean or roosting on sandy shores and shoals along the coast or on islands and cays (DoN, 2001). Roseate terns are very rarely observed offshore or along the coastline in Georgia. Only four provisional sight records have been accepted for the species (Georgia Ornithological Society, 2009); however, little is known about their occurrence and abundance status because of low seabird survey efforts conducted in the SAB during the migration seasons. Roseate terns are thought to be marine (open-ocean) migrants and therefore are likely to have limited occurrences over the proposed OCS blocks. Also, the only recorded observation of roseate terns in Georgia waters was near Everett, Georgia, which is in Glynn County in 1954), and this does not provide a basis for expecting their occurrence at or near the proposed OCS blocks.

Piping Plover

Three specific populations of piping plovers occur in North America (Atlantic, Great Lakes, and Great Plains). Piping plover populations are listed as endangered in the Great Lakes watershed and threatened in the Atlantic and Great Plains. The Atlantic population nests along the coast north of Georgia and the other populations nest at scattered sites throughout the Great Lakes and Great Plains. Piping plovers migrate between summer breeding areas and over-wintering areas. Piping plovers from these populations are found during winter along the South Atlantic Coast, Gulf of New Mexico, and Caribbean beaches and barrier islands (USFWS, 2010d).

Piping plovers are small shorebirds that inhabit sandy beaches along coastlines and islands during the breeding season. During migration, this species forage along inland lake, pond, playa, and river margins and on sandy beaches and mudflats along coastal areas (including islands). Coastal sandy beaches and mudflats are used during the winter season (USFWS, 2010d). Piping plover is listed as an uncommon migrant and winter resident bird in coastal areas west of the three OCS blocks (Beaton et al., 2003).

Critical wintering habitat is listed for the piping plover on the coastline west of the three proposed OCS blocks in Chatham County, Georgia (Federal Register [FR]: 66(132): 36037-36100). Critical habitat is defined in Section 3(5)(A) of the Endangered Species Act (ESA) as "The specific areas within the geographic area occupied by a species at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and that may require special management considerations or protections; and (II) specific areas outside the geographic area required by a species at the time it is listed, upon determination that such areas are essential for conservation of the species." Five critical winter habitat units have been designated for the piping plover in Chatham County, Georgia. A brief description of each unit is provided in **Table 2-7.**

The potential for migrant piping plover to occur offshore over the three proposed OCS blocks is unknown because little is known about their migratory behavior, migration corridors and relative abundance during migration (MMS, 2009); however, there are no documented observations in the vicinity of the three OCS blocks.

Table 2-7. Winter Critical Habitats Designations for Piping Plover in Chatham County, Georgia.

Unit No.	Unit Name	Acreage	Description
GA-1	Tybee Island	91	North tip: Majority privately owned
GA-2	Little Tybee Island	1,776	Majority within State Heritage Preserve
GA-3	North Wassaw Island	276	Within the Wassaw National Wildlife Refuge
GA-4	South Wassaw Island	151	Within the Wassaw National Wildlife Refuge
GA-5	Ossabow Island	1,072	Within Ossabow State Heritage Preserve

Source: Federal Register 66(132); 36037-36100

Red Knot

Three subspecies of red knot are known to occur in the Western Hemisphere: *Calidris canutus rufa*, *Calidris canutus islandica*, and *Calidris canutus roselaari*. The *rufa* subspecies population of red knot is listed as a candidate species for listing under the ESA. Red knots of the *rufa* subspecies are long distance migrants that travel 15,000 km (8099 NM) between their summer range in the high Arctic north of Hudson Bay to their winter range in Tierra del Fuego in southern South America. This subspecies utilizes ocean coastlines and bays for foraging during migration (Cornell Lab of Ornithology, 2010b). *Calidris canutus islandica* is known to winter along the Gulf of Mexico and Caribbean. Red knots are also known to winter along the Atlantic and Pacific coastlines during the winter (Cornell Lab of Ornithology, 2010b).

Red knots of the *rufa* subspecies may occur as migrants on or over the coast and offshore over the three proposed OCS blocks. In addition, this subspecies may forage along coastal shorelines west of the OCS blocks during migration and during the winter.

Federal Birds of Conservation Concern

The USFWS has created a list of Birds of Conservation Concern. The bird species of conservation concern were placed on this list by the USFWS as a result of population declines, naturally or human-caused small ranges or population sizes, threats to habitat, and other factors. The proposed OCS blocks and adjacent coastline are within Bird Control Region 27: Southeastern Atlantic Coastal Plain. Twenty-one marine (open-ocean) and coastal bird species are listed by the USFWS as species of conservation concern for Bird Control Region 27 (**Table 2-8**).

Table 2-8. Open-ocean and Coastal Shoreline Birds Listed as Federal Bird Species of Concern for the Southeast Coastal Plain.

Common Name	Scientific Name
Red-throated Loon	*Gavia stellata*
Black-capped Petrel	*Pterodroma hasitata*
Audubon's Shearwater	*Puffinus lherminieri*
American Swallow-tailed Kite	*Elanoides forficatus*
Peregrine Falcon	*Falco peregrinus*
Black Rail	*Laterallus jamaicensis*
Limpkin	*Aramus guarauna*
Snowy Plover (c)	*Charadrius alexandria*
Wilson's Plover	*Charadrius wilsonia*
American Oystercatcher	*Haematopus palliatus*
Whimbrel	*Numenius phaeopus*
Long-billed Curlew (nb)	*Numenius americana*
Marbled Godwit (nb)	*Limosa fedoa*
Red Knot (*rufa* spp.) (a) (nb)	*Calidris canutus rufa*
Semipalmated Sandpiper	*Caldris pusilla*
Buff-breasted Sandpiper	*Tryngites subruficallis*
Short-billed Dowitcher	*Limnodromus griseus*
Least tern (c)	*Sturnula antillarum*
Gull-billed Tern	*Sterna nilotica*
Sandwich Tern	*Sterna sandvicensis*

a = ESA candidate
c = non-listed subspecies or populations of threatened or endangered species
nb = non-breeding
Source: USFWS, 2008b

Migratory Birds

Migratory bird species are protected by the federal government under the Migratory Bird Treaty Act (MBTA). The MBTA (16 U.S.C. 703-712) authorizes the U.S. commitment to international conventions for the protection of migratory bird resources. The conventions protect selected species of migratory birds which reside in each treaty country some time during their annual life cycle. All selected migratory birds and their parts including nests, eggs, and feathers are fully protected under the MBTA (DoD and NGS, 2005). Over 800 bird species known to occur in the U.S. are protected by the MBTA.

State Protected Species

Protected species are classified as endangered, threatened, or rare by the State of Georgia. The status of the eight protected avian species potentially occurring over the proposed OCS blocks and along the coastline west of the OCS blocks and their habitat requirements are listed in **Table 2-9.**

Table 2-9. State Listed Protected Species Potentially Occurring at Offshore and Coastal Sites.

Common Name	Scientific Name	Status	Habitat in Georgia
Peregrine Falcon	*Falco peregrinus*	R	Seacoasts; rocky cliffs & ledges
Wilson's Plover	*Charadrius wilsonia*	T	Sandy beaches and tidal flats
Piping Plover	*Charadrius melodus*	T	Sandy beaches and tidal flats
American Oystercatcher	*Haematopus palliatus*	R	Sandy beaches; tidal flats; salt marshes
Red Knot	*Calidris canutus rufa*	R	Beaches; exposed mudflats
Gull-billed Tern	*Sterna nilotica*	T	Sandy beaches; salt marshes; fields
Least Tern	*Sterna antillarum*	R	Sandy beaches, sandbars
Black Skimmer	*Rynchops niger*	R	Sandy beaches; tidal ponds

R = Rare
T = Threatened
Source: Georgia Department of Natural Resources, 2010

Most of the state listed protected species have similar habitat requirements and most are likely to be present along or over the coastline west of the three OCS blocks. The only known exceptions are peregrine falcon which migrate offshore and least tern which forage offshore and may potentially occur over the three OCS blocks. In addition, the potential for migrant listed birds to occur in the vicinity of OCS block 6126 is unknown, because there is little data and information about migratory behavior, migration corridors, and relative abundance during migration.

Marine Birds

Common marine (open-ocean) birds that might be present year-round include: brown pelican (*Pelecanus occidentalis*), laughing gull (*Leucophaeus atricilla*), royal tern (*Thalasseus maxima*), and Foster's tern (*Sterna fosteri)*. Birds present during the spring (March-May) and fall (August-

November) migration and/or during winter (December-February) seasons over open-ocean waters within or adjacent to the OCS blocks include common loon (*Gavia immer*), northern gannet (*Morus bassanus*), lesser scaup (*Aythya affinis*), black scoter (*Melanitta niger*), surf scoter (*Melanitta perspicillata*), Bonaparte's gull (*Chroicephalus philadephia*), ring-billed gull (*Larus delawarensis*), herring gull (*Larus argentatus*), common tern (*Sterna hirundo*; spring/fall only), and black tern (*Childonias niger*; fall only) (Beaton et al., 2003).

Coastal Birds

Common birds present over nearshore coastal waters adjacent to the OCS blocks year-round include: brown pelican, willet (*Tringa semipalmata*), sanderling (*Calidris alba*), laughing gull, ring-billed gull, royal tern, Foster's tern, and black skimmer (*Rynchops niger*). Common birds present during the spring and fall migration seasons and/or during the winter season over and in coastal waters include: horned grebe (*Podiceps auritus*), common loon, lesser scaup, black scoter, red-breasted merganser (*Mergus serrator*), peregrine falcon (*Falco peregrinus*), ring-billed gull, herring gull, and common tern (spring/fall only). On the coastline, common species during migration and/or during the winter include black-bellied plover (*Pluvialis squatarola*), semipalmated plover (*Charadrius semipalmatus*), whimbrel (*Numenius phaeopus*), red knot (*Calidris canutus*), semipalmated sandpiper (*Calidris pusilla*), western sandpiper (*Calidris mauri*), dunlin (*Calidris alpina*), least sandpiper (*Caldris minutilla*), short-billed dowitcher (*Limnodromus griseus*), ring-billed gull, and herring gull (Beaton et al., 2003).

Possible Impacts and Discussion

Construction, operation, and decommissioning phases of the DCC project may result in minor disturbance to individuals of some bird species. Potential impacts and disturbances to be considered include construction activities such as pile driving and crane operations, obstruction of flight pathways by the DCC, and small boat and barge movements and activities. As previously discussed, there are a number of species that fall under the MBTA and are permanent residents on the coast that may be found in the vicinity of the three OCS blocks. The OCS blocks and associated DCC locations have been carefully selected to maximize available wind energy while minimizing impacts to bird and other animal species.

Bird collisions with boats and the DCC are not likely and should be at or below collision rates with other marine structures such as lighthouses. Navigation lights of both boats and the DCC may create collision issues for nighttime migrating species but the impact is not expected to be a serious problem. Furthermore, experience with other similar structures and projects has not resulted in major incidents. Navigation lights have been located in nearshore coastal waters for decades and have not resulted in large numbers of bird mortalities. Gehring et al. (2009) provide a summary of bird interactions and collisions with communication towers and report that normal daytime species avoidance is usual for project towers once construction is final. Lights will comply with FAA guidelines and will be minimized to the extent possible while maintaining safety and operational requirements.

While every effort has been made to site the DCC to avoid and minimize impacts to birds, offshore platforms may encourage perching and roosting by migrating and/or foraging birds.

Appropriate deterrent devices, such as anti-perching mesh netting, may be utilized to discourage perching and nesting activity and will help prevent impacts to bird species that might become acclimatized to the DCC.

♦ **Fish and Essential Fish Habitat**

The zoogeography of marine ichthyofauna is closely tied to oceanographic processes such as water temperatures and currents and topographical features on the continental shelves (Moyle and Cech, 2000). Coastal waters off the southeastern U.S. fall into the Carolinian Zoogeographical Province which extends from the Florida-Georgia border northwards to Cape Hatteras, North Carolina (Briggs, 1974). This region is located within the SAB and the Southeast U.S. Continental Shelf Large Marine Ecosystem (SUSLME) (Shertzer et al., 2009). Because of its high productivity, the SUSLME supports economically important commercial and recreational fisheries (Aquarone, 2008), including reef fish (hardbottom and artificial structures), demersal fish (estuaries and inner shelf), and pelagic fish (inner and outer shelves) (Manooch, 1988). More than 350 fish species occur in Georgia's coastal, inner shelf, and mid-shelf areas (Dahlberg, 1975; Freeman and Walford, 1976). The proposed OCS blocks are located along Georgia's coast and on the inner shelf that extends from southeastern Tybee Island to the central part of Wassaw Island approximately 5.5 to 14 km (3.0 to 7.7 NM) offshore at depths ranging from 9 to 15 m (29.9 to 49.9 ft).

Distribution

The dynamic interplay of the dominant offshore Gulf Stream current that passes to the east of the OCS blocks and the nearshore currents (i.e., Georgia water) has a profound effect on the overall ichthyofauna (Gray et al., 1968; Ekberg and Huntsman, 1985). The strong Gulf Stream current flowing from the Dry Tortugas, Florida to Cape Hatteras, North Carolina serves as a habitat for a variety of subtropical marine fish and shellfish. Most of these marine fish and shellfish spawn pelagic eggs with the majority of these species utilizing the Gulf Stream water column during their life history cycle. Larvae of reef, demersal, and pelagic fishes and larvae of shrimp, lobsters, and crabs are found throughout the water column (Leis, 1991; Yeung and McGowan, 1991; Criales and McGowan, 1994; Epifanio et al., 2001; Hare and Govoni, 2005; Marancik et al., 2005) with long-distance planktonic transport retention being highest on the Georgia OCS between 20 m (65.6 ft) and 40 m (131.2 ft) water depths (Hare and Walsh, 2007). Fish species move in and out of the OCS blocks depending on their temperature tolerances, prey availability, and other environmental/ecological variables (Struhasker, 1969). Ecological groups of fish that occur in the SAB in and adjacent to the OCS blocks include the estuarine-dependent community, coastal community, which includes nearshore ocean waters and surf zone, reef-associated community which includes live/hardbottom and artificial structures, and pelagic community (Schwartz, 1989b).

Ichthyofaunal Communities

Although the proposed OCS blocks do not include any estuaries or nearshore ocean waters and surf zones, the waters in the vicinity of the OCS blocks are important to both estuarine-dependent and coastal communities (Schwartz, 1989b). The Savannah River and Ossabaw Sound estuaries serve as nursery and maturation areas for various fish species such as spotted seatrout [*Cynoscion nebulosus*], spot [*Leiostomus xanthurus*], Atlantic croaker [*Micropognias undulatus*], summer flounder [*Paralichthys dentatus*], Atlantic menhaden [*Brevoortia tyrannus*], and bay anchovy [*Anchoa mitchilli*] during some stage of their development. These estuaries are also important in the life history of commercially valuable invertebrates, such as blue crab (*Callinectes sapidus*), American oyster (*Crassostrea virginica*), and white shrimp (*Litopenaeus setiferus*) and brown shrimp (*Farfantepenaeus aztecus*) (Nelson et al., 1991; Nelson and Monaco, 2000).

The nearshore ocean waters are important corridors for seasonal fish migrations and larval transport in and out of estuarine waters, and the surf zone forms a productive ecosystem, providing nursery areas, major fishery zones, and migratory pathways (Hackney et al., 1996). Juvenile bluefish (*Pomatomus saltatrix*), Florida pompano (*Trachinotus carolinus*), and Gulf kingfish (*Menticirrhus littoralis*) use the nearshore ocean waters and the surf zone as a nursery (Hackney et al., 1996), while red drum (*Sciaenops ocellatus*), Spanish mackerel (*Scomberomorus maculatus*), and black sea bass (*Centropristis striata*) seasonally migrate between estuarine and ocean waters (SAFMC, 2009). Based on limited data, 130 species of fish are known from the ocean surf zone between middle North Carolina and southern Georgia (Ross, 1996).

The broad, shallow, gradually-sloping continental shelf off Georgia consists of unconsolidated sediment, primarily medium to coarse quartz and carbonate sands (Nelson et al., 1999), interspersed with rocky reefs and artificial structures such as man-made reefs and shipwrecks (Parker et al., 1983; GDNR, 2001). The unconsolidated sediments cover a majority of the shelf area (~60 to 80%), whereas the rocky reefs comprised of flat hardbottoms with little vertical relief and ledges or rocky outcrops with vertical relief up to several meters tall, cover about 30% (Parker et al., 1983). Both the flat-hardbottom and ledge ecosystems are termed live/hardbottom and are characterized by a high diversity of tropical and temperate reef fish (Chester et al., 1984; Parker and Mays, 1998; Lindeman et al., 2000) and dense colonization of sessile invertebrates (Wenner et al., 1983; Kendall et al., 2009). Reef fish partition their environment by depth, bottom topography, and temperature which allow for this high diversity (Miller and Richards, 1980; Grimes et al., 1982; Kendall et al., 2009). A maximum of 164 species have been reported from rocky reef habitats (Chester et al., 1984; Parker et al., 1994; Baron et al., 2004).

Fish found on constructed artificial structures such as artificial reefs and shipwrecks and coastal jetties tend to be a subset of those species found on offshore live/hardbottom habitats (Hay and Sutherland, 1988; GDNR, 2001). Arena et al. (2007) reported grunts (Haemulidae), jacks (Carangidae), and snappers (Lutjanidae) comprising the majority of species on shipwreck habitats. Reef fish associated with hardbottoms include tropical species such as groupers (*Epinephelus* and *Mycteroperca* species), snappers (*Lutjanus* and *Rhomboplites* species), porgies (*Pagrus* and *Calamus* species), and grunts (*Haemulon* species), and temperate species such as black sea bass (*Centropristis striata*) and spottail pinfish (*Diplodus holbrookii*) (Huntsman and Manooch, 1978; GDNR, 2010d).

On Georgia's continental shelf, Sedberry and Van Dolah (1984) reported the live/hardbottom and artificial reef areas to be inhabited primarily by black sea bass, scup (*Stenotomus chrysops*), and associated temperate species due to the cooler temperatures.

A large number of fish inhabit the pelagic community as adults and juveniles. Coastal pelagic, such as king mackerel [*Scomberomorus cavalla*]) and cobia [*Rachycentron canadum*], highly migratory species (HMS) such as sharks, tunas [*Thunnus* spp.], and billfish [Istiophoridae], and anadromous fish species such as striped bass [*Morone saxatilis*] and shad/river herring [*Alosa* spp.] occur in the neritic zone and are dependent on the water column for migration and adequate foraging (Huntsman and Manooch, 1978). In addition, the boundaries of water masses or coastal fronts in the nearshore ocean waters are important foraging areas for mackerels and wahoo (*Acanthocybium solanderi*) (SAMFC, 1998). HMS are associated with physiographic and hydrographic features such as ocean fronts, current boundaries, the continental shelf margin, or seamounts (NMFS, 1999a, NMFS, 1999b). Another diverse and productive pelagic habitat is the floating mats of *Sargassum*, species of macro algae, which provide cover, camouflage, and a food source for larval and juvenile fishes (SAFMC, 2002). Casazza and Ross (2008) reported that Sargassum provides a substantial nursery habitat for many juvenile fishes off the U.S. southeastern coastline. Over 100 species of fish, including reef, coastal demersal, and coastal pelagic, epipelagic, and mesopelagic species, have been collected or observed in association with Sargassum habitats. The large juvenile and adult fish communities of the shallow coastal zone (< 1 m (3.28 ft)) and the continental shelf (9 to 80 m (29.5 to 262.4 ft)) comprise about 150 species, including both pelagic (e.g. bluefish, cobia) and demersal species (e.g. red drum) (Wenner et al., 1979a. 1979b, 1979c, 1979d, Wenner and Sedberry, 1989).

Managed Fish and Invertebrate Species

In inshore waters (5.5 km (3 NM) from shore) the Atlantic States Marine Fisheries Commission (ASMFC) manages marine fishery resources through the Interstate Fisheries Management Program (ISFMP) in State waters and works cooperatively with the Fishery Management Councils (FMC) on management of some species in Federal waters. The ASFMC coordinates the conservation and management of 21 Atlantic coastal fish species and two species groups (shad and river herring) and coastal sharks (ASMFC 2009). In offshore waters (370 km (200 NM) from shore), the SAFMC manages a total of 90 species of fish and invertebrates, which does not include the ~300 species of corals and two species of *Sargassum*. The Mid-Atlantic Fishery Management Council (MAFMC) manages 12 species, and the NMFS manages 44 HMS species (SAFMC, 1998; MAFMC and ASMFC, 1998a, 1998b, MAFMC and NEFMC, 1999; NMFS, 2009). Both FMC and the NMFS manages the commercial and recreational fisheries for these species in Federal waters and designates Essential Fish Habitat or EFH (50 CFR 600.10) and Habitat Areas of Particular Concern or HAPCs (50 CFR 600.805-815) under the Magnuson-Stevens Fishery Conservation and Management Act or MSFCMA) (P.L. 94-265), as amended by the Sustainable Fisheries Act or SFA (P.L. 104-297). The FMCs or NMFS may designate EFH and/or HAPC for federal management species outside their region of jurisdiction, whereas the interstate Marine Fisheries Commission identifies all habitats and HAPCs but refrains from identifying EFH (Greene et al., 2009).

Essential Fish Habitat

EFH has been designated for 53 fish and invertebrate species. within the proposed OCS blocks. The numerous species of corals were not included in this designation. These designated species are hereafter referred to as managed species. Within this report, these managed species are categorized as temperate, subtropical-tropical, and HMS. Of the 53 species with EFH designation, three are classified as temperate, 38 are considered tropical-subtropical, and 12 are defined as HMS (**Appendix C-1**).

The EFH within or adjacent to the OCS blocks are classified by habitat type and are described below.

Benthic Substrates (not including live/hardbottom) –Seafloor substrate on the continental shelf and slope consists of soft or unconsolidated sediments such as gravel, cobbles, pebbles, sand, clay, mud, silt, and shell fragments and the water-sediment interface directly above the bottom substrate. This substrate is used by variety of species such as members of shrimp Management Unit (MU) and demersal fish for spawning, nesting, development, dispersal, and feeding (SAFMC, 1998; NMFS, 1999a, 1999b).

Live/Hardbottom – Areas of the seafloor associated with hard substrate such as rocks, boulders, outcroppings of hard rock, or hard, tightly compacted sediments support communities of living organisms such as sponges, mussels, hydroids, amphipod tubes, red algae (Rhodphyta), bryozoans, and corals in oceanic waters or oysters and bivalves in inshore waters (SAFMC, 1998). This type of habitat is used by many adult members of the snapper grouper complex MU for feeding, shelter, and spawning (SAFMC, 1998) and may contain isolated coral patches or mounds of temperate hard and soft corals (DeVictor and Morton, 2007; SAFMC, 2009). The SAFMC (1998) defines hardbottom as constituting "a group of communities characterized by a thin veneer of live corals and other biota overlying assorted sediment types."

Artificial Reef – Man-made structures composed of various types of materials are used primarily by adults especially spawning adults (SAFMC, 1998). The SAFMC (1998) defines artificial reefs as any area within marine waters in which suitable structures or materials have intentionally been placed for the purpose of creating, restoring, or improving the long-term habitat for the eventual exploitation, conservation, or preservation of the resulting marine ecosystems that are naturally established on these materials. The SAFMC (1998) does not consider shipwrecks as EFH under this definition.

Pelagic *Sargassum* – Mats or aggregations of the pelagic species of brown algae *Sargassum* (*Sargassum natans* and *S. fluitans*) provide an important habitat for numerous fishes, especially the ichthyoplankton of the snapper grouper complex MU. Pelagic *Sargassum* aggregations occur primarily on the surface of the ocean or in the upper surface layer of the water column. *Sargassum* occurs primarily within the physical bounds of the North Atlantic Gyre or Sargasso Sea between 20°N and 40°N and between 30°W and the western edge of the Gulf Stream (Dooley, 1972; SAFMC, 2002). As the areal extent and abundance of *Sargassum* at any single oceanic location is dynamic and totally unpredictable (Butler et al., 1983), the occurrence of pelagic *Sargassum* is considered from the shoreline to the U.S. EEZ (Ruebsamen, 2005).

Water Column – All waters from the ocean surface to 1 m above the ocean floor comprise the water column. Specifically, the water column is defined as the specific "structural" components of the water path providing habitat for a broad array of managed species and their lifestages within the species. The structural components of the water column that help define EFH include environmental parameters such as salinity, water temperature, nutrients, density, light, and depth. They are not static but change both in time and space (SAFMC, 1998).

Currents – Surface circulation features such as the Gulf Stream provide a dispersal mechanism for larvae of many fish such as snapper grouper complex MU and coastal pelagic migratory and invertebrates such as shrimp and lobsters (SAFMC, 1998). Flowing roughly parallel to the coastline from the Florida Straits to Cape Hatteras, North Carolina, the Gulf Stream is the dominant surface current in the SAB and SUSLME. It is bordered to the west by cool nearshore and slope waters and to the east by the warm Sargasso Sea (SAFMC, 1998).

Nearshore – Nearshore habitats are adjacent to the OCS blocks and are those found in state waters such as the waters from estuaries to the waters 5.5 km (3 NM) from shore. They include a diversity of habitats such as tidal freshwater palustrine, estuarine, and marine emergent wetlands; tidal palustrine forested areas; estuarine scrub/shrub habitat; submerged aquatic vegetation (SAV) or seagrass, macroalgae, etc.; subtidal and intertidal non-vegetated flats; oyster reef and shell banks; unconsolidated bottoms or soft sediments; tidal freshwater and tidal creeks; state-designated nursery habitats; and sandy shoals of capes and offshore bars (SAFMC, 1998).

HAPC – Twenty-five species have designated HAPC for some or all lifestages within or adjacent to the OCS blocks and include the following habitat types with their respective species type:

- All lifestages for the 18 species of snapper-grouper complex MU utilize medium to high profile offshore hardbottom habitat where spawning normally occurs. Furthermore, these species utilize pelagic and benthic *Sargassum*, coral habitats and reefs, artificial reef SMZs; and areas with fishing gear restrictions or harvest regulations (SAFMC, 2007). Additional designated HAPC for this MU include seagrass habitat, oyster/shell habitat, all coastal inlets, all state-designated nursery habitats, and nearshore hardbottom habitat (< 4 m (13.1 ft)).

- All lifestages of the coastal migratory pelagic MU (cobia, king mackerel, and Spanish mackerel) – pelagic *Sargassum*.

- All lifestages of the red drum – all coastal inlets; all state-designated nursery habitats of particular importance to red drum; documented sites of spawning aggregations; barrier islands and their inlets; the entire estuarine system in Georgia; and inlets, adjoining channels, sounds, and outer bars of ocean inlets.

- All lifestages for members of the penaeid shrimp MU (brown, pink [*Farantepenaeus duoranrum*], and white) – all coastal inlets, state-designated nursery areas, and state-identified overwintering areas.

Detailed information about each managed species with EFH designation within the proposed OCS blocks been listed in **Appendix C-1.**

Atlantic States Marine Fisheries Commission Species

The ASMFC consists of 15 coastal states (Maine to Florida) that border the Atlantic Ocean. Similar to Regional FMCs, the ASMFC serves as the primary marine resource management organization that coordinates the conservation and management of the State of Georgia's shared nearshore fishery resources such as marine, shell, and anadromous for sustainable use. Within the proposed OCS blocks, the ASMFC manages 18 Atlantic coastal fish species and two species groups (ASMFC, 2009). Six of these species that are managed by the ASMFC in Georgia state waters have EFH and/or HAPC designation under the MSFCMA and/or ASMFC. Twelve species and the two species groups, the spiny dogfish/coastal sharks and shad/river herring, that have HAPC designation by the ASMFC are listed in **Appendix C-2**. Currently 40 species of coastal sharks (**Appendix C-3**) are managed by ASMFC (2008). Twenty of the forty shark species which occur in Georgia state waters are in the proposed OCS blocks (**Appendix C-3**). Fourteen of these have EFH designation.

Detailed information about these shark species is presented in **Appendix C-3** and this information can be found in the Final Amendments 1 and 2 to the 2006 Consolidated HMS FMP for EFH (NMFS, 2009, 2010a). HAPC designations in or adjacent to the OCS blocks pertaining to the 10 ASMFC non-designated EFH species and the shad/river herring group have been described in the managed species section of the ASMFC (2010) website and by Greene et al. (2009).

Protected Fish Species

Within or near the vicinity of the proposed OCS blocks, there are various fish species found that are either protected by the federal government such as USFWS and NMFS and/or the state of Georgia. These species warrant protection because population levels have declined to levels that could threaten or endanger the species' existence throughout all or a significant portion of its range. The shortnose sturgeon (*Acipenser brevirostrum*) is the only fish species protected by the federal government under the ESA and is classified as endangered that may be found in the Savannah and Ogeechee rivers near the OCS blocks. This species is also designated as endangered under the state of Georgia (GDNR, 2010c); however, there are no records of shortnose sturgeon within the OCS blocks (NMFS, 1998), and this species is not known to make coastal migrations (Dadswell et al., 1984).

In addition, there are six species of concern and one candidate species found within or in the vicinity of the proposed OCS blocks. Species of concern are those species which the NMFS considers to be threatened or of conservation concern because there is insufficient information available to indicate a need to list the species under the ESA. Candidate species are species that are the subject of either a petition to list or status review and for which NMFS or USFWS has determined that listing may be or is warranted (NMFS, 2006a). Fish species classified as species of concern that may be found within or near the vicinity of the OCS blocks include the following: alewife (*Alosa pseudoharengus*), blueback herring (*A. aestivalis*), dusky shark

(*Carcharhinus obscurus*), sand tiger shark (*Carcharius taurus*), speckled hind (*Epinephelus drummondhayi*), and Warsaw grouper (*E. nigritus*). One candidate species that may be found within or near the vicinity of the OCS blocks is the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). This species has reproducing subpopulations of fewer than 300 spawning adults in the Savannah and Ogeechee rivers near the OCS blocks (Grunwald et al., 2008). Juveniles and adults tend to emigrate from these river systems to marine nearshore foraging areas possibly in gravel and sand substrate habitats at depths ranging from 10 to 50 m (32.8 to 164.0 ft) (ASSRT, 2007). Currently, NMFS is preparing a determination on whether listing this species or multiple distinct population segments (DPSs) such as South Atlantic of this species as threatened is warranted (NRDC, 2009; NMFS, 2010b).

Possible Impacts and Discussion

During the construction and decommissioning of the DCC, impacts to the finfish/shellfish population, EFH, and protected species could result from the following threats: (1) noise generated by increased vessel traffic, pile driving, and high pressure water jet cutting tool activities supporting the DCC removal, (2) loss or alteration of habitat, (3) degradation of water quality resulting from temporary sediment resuspension and turbidity plume, (4) exposure to fuel and/or chemical spills, and (5) lighting. In general, all of the above impacts should be short-term and minor except for pile driving. Both above-water and below-water noises would be greater as installation and removal of the piles would require the use of a pile driver and high pressure water jet cutting tool, respectively. These increased noises during the actual pile driving into the bottom substrate and the deploying of the high pressure water jet cutting tool to the pile below the seabed may cause fish, particularly pelagic species, to vacate or avoid the general area temporarily. Overall, since most fish and shellfish species are highly motile and exhibit seasonal changes in distribution, impacts from the installation and removal of the piles should not be significant (Tetra Tech EC Inc., 2008, 2009).

A small area of bottom substrate equivalent to the footprint of the pile columns and scour protection placement would change from soft, sandy sediments to a hard, metal/rock surface. This habitat alteration would render the area temporarily unavailable to species with a preference for soft substrate and may result in attracting species that prefer the hard pile column and scour protection for the time it is in use. Sediment resuspension and a turbidity plume generated during the pile driving and scour protection placement are unlikely to be of greater local magnitude than that caused by any typical tropical depression/storm event and should have a temporary minor effect on all species (Tetra Tech EC Inc., 2008, 2009).

The potential that construction/decommissioning vessels will have an accidental spill, most likely a fuel spill, exists, but is generally low. Lights on the DCC could attract fish depending on the brightness and orientation of the lights. Consultation with the FAA and USCG will help to minimize any possible adverse impacts resulting from the required lighting for both aviation and marine navigation (Tetra Tech EC Inc., 2008, 2009). Section 2.12 summarizes measures that may be utilized to avoid, minimize, and mitigate impact to marine and coastal environments.

- **Sea Turtles**

Six species of sea turtle have the potential to occur in the three proposed OCS blocks (**Table 2-10**). There are records of all of these species in coastal Georgia, with the exception of the olive ridley turtle (*Lepidochelys olivacea*) (Ruckdeschel et al., 2000; Ruckdeschel and Shoop, 2006; Williams et al., 2006); however, based on known distributions, habitat associations, and available occurrence records from sightings, strandings, and bycatches, only four of these species are expected to occur in the vicinity of the proposed OCS blocks.

Hawksbill (*Eretmochelys imbricata*) and olive ridley sea turtles are not expected to occur in the shallow, coastal waters of Georgia. The hawksbill turtle is a tropical species and is not common in nearshore waters north of southern Florida (Meylan and Redlow, 2006; NMFS and USFWS, 2007c); however, there are reports of juvenile hawksbill turtles along the eastern seaboard of the U.S., including offshore of Georgia, but these individuals normally occur much farther offshore than the proposed OCS blocks (Parker, 1995; Ruckdeschel and Shoop, 2006). The primary range of olive ridley turtles is much farther south than the southeastern U.S., and occurrences of this species in mainland U.S. waters are considered exceptional (Foley et al., 2003; Ruckdeschel and Shoop, 2006).

The four species of sea turtles which may occur in Georgia's coastal waters include the leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and Kemp's ridley turtles (*Lepidochelys kempii*). All of these species are known to make seasonal movements along the Atlantic coast of the U.S., moving northward as sea surface temperatures rise (Renaud, 1995; Hays et al., 2001; Plotkin and Spotila, 2002; James et al., 2005; Maier et al., 2005; Eckert et al., 2006; Mansfield, 2006). The waters of coastal Georgia provide year-round habitat for all four species (Schwartz, 1989a; Ruckdeschel et al., 2000; Ruckdeschel and Shoop, 2006). Loggerhead, leatherback, and green turtles nest on the barrier islands along the southeast U.S. coast, most commonly in Florida but also regularly in Georgia (Plotkin and Spotila, 2002; Rabon et al., 2003; Williams et al., 2006). Juvenile individuals of these species use waters of the U.S. Atlantic coast as nursery and foraging habitats, both in nearshore waters such as estuaries and lagoons and far offshore in the waters of the Gulf Stream (Keinath et al., 1996; Musick and Limpus, 1997).

All species of sea turtles are listed as either threatened or endangered under the ESA. **Table 2-10** provides a list of all the sea turtle species with the potential to occur in the proposed OCS blocks. Occurrence of each species in the proposed OCS blocks is designated as either "May Occur" or "Not Expected" based on the criteria mentioned above. ESA and Georgia State designations are provided where applicable. The most recent estimates of abundance are provided for each species when available.

Four species of sea turtle may occur in the vicinity of the proposed OCS blocks based on their known distribution and habitat associations. A brief overview of each species' status and expected occurrence patterns within the shallow waters of coastal Georgia, including in the vicinity of the proposed OCS blocks, is provided below. Ruckdeschel et al. (2000) and Ruckdeschel and Shoop (2006) provide more information on sea turtle distribution in Georgia.

Table 2-10. Sea turtle species with the potential to occur in the vicinity of the three proposed OCS blocks.

Common Name	Scientific Name	ESA Status	Georgia State Status	Abundance	Occurrence
Order Testudines (turtles)					
Suborder Cryptodira (hidden-necked turtles)					
Family Dermochelyidae					
Leatherback turtle	*Dermochelys coriacea*	Endangered	Endangered	17,000 to 52,000[1]	May Occur
Family Cheloniidae (hard-shelled turtles)					
Loggerhead turtle	*Caretta caretta*	Threatened[2]	Endangered	Unknown[3]	May Occur
Green turtle	*Chelonia mydas*	Endangered[4]	Threatened	Unknown[5]	May Occur
Kemp's ridley turtle	*Lepidochelys kempii*	Endangered	Endangered	7,000 to 8,000[6]	May Occur
Olive ridley turtle	*Lepidochelys olivacea*	Threatened	None	Unknown[7]	Not Expected
Hawksbill turtle	*Eretmochelys imbricata*	Endangered	Endangered	3,072 to 5,603[8]	Not Expected

[1] This is the current best estimate of abundance for adult leatherback turtles in the western North Atlantic and represents the middle 90% of modeled abundances (i.e., 5^{th} to 95^{th} percentile) (TEWG, 2007).

[2] The Northwest Atlantic population of loggerheads is currently proposed for listing as a distinct population segment and for reclassification to endangered status (USFWS, 2010e).

[3] There are no current estimates of abundance for loggerheads in the western North Atlantic (TEWG, 2009; USFWS, 2010e).

[4] The Florida breeding population of green turtles is listed as endangered under the ESA and all other breeding populations in the western North Atlantic are listed as threatened under the ESA. Green turtles found in Georgia coastal waters should be treated as endangered due to the difficulty in identifying to which breeding population an individual belongs.

[5] There are no current estimates of abundance for green turtles in the western North Atlantic. Based on trends in the number of nesting females, this population is thought to be increasing (NMFS and USFWS, 2007b).

[6] This is the best estimate of abundance of adult females during the 2006 nesting season; the number of males in the population may be considerably less than this estimate (NMFS and USFWS, 2007e).

[7] There are no current estimates of abundance for this species in the western North Atlantic (NMFS and USFWS, 2007a). Although it is considered to be the most abundant sea turtle species on a global scale (Pritchard, 1997), it is thought to be the least abundant species in the western North Atlantic (Marcovaldi, 2001; Godfrey and Chevalier, 2004).

[8] This is the most recent abundance estimate for nesting females in the North Atlantic Ocean (NMFS and USFWS, 2007c).

Leatherback Turtle (*Dermochelys coriacea*)

Leatherbacks are listed as endangered under the ESA (NMFS and USFWS, 1992). This species occurs commonly in the coastal and offshore waters of Georgia, including in the vicinity of the proposed OCS blocks (Eckert et al., 2006; Murphy et al., 2006). Leatherbacks nest regularly along the east coast of Florida and less commonly on the barrier islands of Georgia and South Carolina (Rabon et al., 2003). Leatherback movement along the east coast of the U.S. is seasonal, with individuals moving north from Florida in late winter and early spring to the coasts of Georgia and the Carolinas (NMFS, 1995, 2000). By summer and fall, leatherbacks may be found from Florida to Canada (Bleakney, 1965; CETAP, 1982; Shoop and Kenney, 1992; James and Herman, 2001; Thompson et al., 2001; James et al., 2006). Leatherback turtles may occur in the proposed OCS blocks during any time of year.

Loggerhead Turtle (*Caretta caretta*)

Loggerhead turtles are listed as threatened under the ESA (NMFS and USFWS, 1991). There are multiple management stocks of loggerhead turtles in the U.S. based on genetics and geographic distribution. The stock that nests in the vicinity of the proposed lease OCS blocks is the Northern U.S. Subpopulation (TEWG, 2009). Loggerheads move north along the U.S. Atlantic coast beginning in spring in response to warming sea surface temperatures, but not all loggerheads leave the southeast U.S. during this time of year. During the summer, adult females are known to nest in Georgia, including on Wassaw Island (Plotkin and Spotila, 2002), which is inshore of the three proposed OCS blocks and is closest to OCS block 6074 and furthest from OCS block 6126. Juvenile loggerheads use the waters of coastal Georgia as summer foraging grounds (Frick et al., 2001). Loggerheads overwinter in the waters south of Cape Hatteras, including the waters of coastal Georgia (Epperly et al., 1995b; McLellan et al., 2001). Loggerhead turtles may occur year-round in the vicinity of the proposed OCS blocks.

Green Turtle (*Chelonia mydas*)

Green turtles are listed as threatened under the ESA, with the exception of the Mexican Pacific coast and Florida breeding populations, which are listed as endangered (NMFS and USFWS, 2007d). Green turtles occur in the waters of coastal Georgia in nearshore and estuarine environments (Ruckdeschel et al., 2000; Williams et al., 2006). Green turtles nest frequently on the Atlantic coast of Florida, and there are incidences of green turtles nesting in Georgia, including on Wassaw Island which is inshore of the proposed OCS blocks and is closest to OCS block 6074 and furthest from OCS block 6126 (Ruckdeschel et al., 2000; Williams et al., 2006; Witherington et al., 2006). Most green turtles that are sighted or stranded north of Florida are late juvenile and subadult individuals (Lazell, 1980; Burke et al., 1992; Ruckdeschel et al., 2000). The movement of green turtles, particularly juveniles, along the Atlantic coast of the U.S. is closely tied to changes in sea surface temperature, with a northward movement of individuals in the summer and fall and a southward movement to areas off the southeast U.S. during winter (Epperly et al., 1995a; Witherington et al., 2006). Green turtles may occur year-round in the vicinity of the proposed OCS blocks.

Kemp's Ridley Turtle (*Lepidochelys kempii*)

Kemp's ridley turtles are listed as endangered under the ESA (NMFS and USFWS, 2007e). Kemp's ridley turtles are endemic to the Atlantic Ocean and occur primarily in the Gulf of Mexico and western North Atlantic (Schmid and Barichivich, 2006). Kemp's ridley turtles nest mainly on the Mexican and Texas Gulf coasts, but there are cases of this species nesting along the Atlantic coast of Florida as well as in Georgia and the Carolinas (Plotkin and Spotila, 2002; Schmid and Barichivich, 2006). This species may be found foraging in bays and sounds from the northeast U.S. south to Florida. The offshore waters of the western North Atlantic represent developmental habitat for Kemp's ridley turtles, and most of the individuals found in the northern portion of the range such as north of Florida are juveniles (Keinath et al., 1987; Morreale and Standora, 2005; Schmid and Barichivich, 2006). There are stranding records for this species in Georgia from all seasons, and these are primarily juvenile individuals (Ruckdeschel et al., 2000; Ruckdeschel et al., 2005). Kemp's ridley turtles, particularly juveniles and subadults, may occur year-round in the vicinity of the three OCS blocks.

Possible Impacts and Discussion

The siting of a DCC in any of the three proposed OCS blocks has the potential to impact sea turtle species found in the surrounding waters. These potential impacts may include behavioral disturbance, injury or mortality, and local population-level effects such as reduced survival and reproductive rates. These impacts come from the activities associated with assessment of the site, construction of the DCC, operation and maintenance of the DCC, and decommissioning of the DCC. The *Programmatic Environmental Impact Statement for Alternative Energy Development and Production* (MMS, 2007) provides a detailed discussion of the potential impacts to sea turtles from the development of renewable energy facilities. The following is a brief discussion of potential impacts and the mitigation measures that may be employed in order to minimize any impacts that may occur.

All species of sea turtles that may be in the vicinity of the proposed OCS blocks can occur during any time of year. These species may be impacted by the siting and placement of the DCC within the proposed OCS blocks. These impacts may be either direct or indirect in nature. Direct impacts may occur as a result of a project vessel striking a turtle on or near the surface and may also be associated with the ingestion of construction materials that are lost overboard during the course of DCC placement. A possible indirect impact may be the temporary displacement from habitat as turtles move out of the way of construction activities. The introduction of acoustic sources into the marine environment also may cause individuals to react if they detect the noise; however, because sea turtles hear in low frequency (<1 kilohertz [kHz]), they are less likely to be impacted by noise (Ketten and Bartol, 2006; Viada et al., 2008).

Potential impacts to sea turtles may be reduced by employing mitigation measures as outlined in the *Environmental Assessment for the Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey* (MMS, 2009). These measures include using trained protected species observers to watch for sea turtles. These observers may help reduce and/or minimize turtle and vessel strikes. Observers will also identify and document sea turtles present in the OCS block and record any behavioral changes that may be associated with site assessment, construction, or decommissioning activities. Also, reasonable disturbance prevention and mitigation might include the use of bubble screens during pile driving and decommissioning activities. Section 2.12 summarizes measures that may be utilized to avoid, minimize and mitigate impacts to marine and coastal environments.

- **Marine Mammals**

There are 35 species of marine mammals with the potential to occur in the proposed OCS blocks. These include 32 species of cetaceans such as whales and dolphins, 2 species of pinnipeds such as seals, and 1 sirenian such as manatees (**Table 2-11**). There are occurrence records from sightings, strandings, or bycatch records for all of these species within state or federal waters off the coast of Georgia; however, based on known distribution, habitat associations, types of occurrence records, and movement patterns, only nine species may occur within the three OCS lease blocks. The remaining 22 species are not expected to be found in the OCS blocks.

The species not expected to be found generally remain farther offshore or farther north than the three proposed OCS blocks, which are in very shallow, nearshore waters; however, the occurrence and distribution of marine mammals may be affected by numerous factors, including species demography, evolutionary history, the ecology and oceanography of a given area, habitat availability, and anthropogenic influences (Bjørge, 2002; Bowen et al., 2002; Stevick et al., 2002; Stevick et al., 2008; Forcada, 2009). Temporal and spatial variation in these associated factors, the behavior of individual animals, and any other of a number of unknown causes may result in occurrences of these species within or near to the three OCS blocks.

The species with potential occurrence in the proposed OCS blocks are known to occur commonly in the waters of coastal Georgia; however, not all of these species occur in the vicinity of the three OCS blocks year-round. Some baleen whale species make annual, long-distance migrations from higher latitude feeding grounds to lower latitude breeding and calving grounds (Kraus et al., 1986; Corkeron and Connor, 1999; Rizzo and Schulte, 2009; Stern, 2009). Other species make well-documented seasonal movements that are associated directly or indirectly with sea surface temperature changes throughout the year (Leatherwood et al., 1984; Rusin et al., 2000; Neumann, 2001; Torres et al., 2005). Based on known distribution and occurrences, North Atlantic right (*Eubalaena glacialis*) and humpback (*Megaptera novaeangliae*) whales, the West Indian manatee (*Trichechus manatus*), and some pods of bottlenose dolphins (*Tursiops truncatus*) may occur seasonally in or near the OCS blocks (Keller et al., 2006; McLellan et al., 2001; Lefebvre et al., 2001; Waring et al., 2009b). Fin whales (*Balaenoptera physalus*), common minke whales (*B. acutorostrata*), and Atlantic spotted dolphins (*Stenella frontalis*) may occur there at any time of the year, and resident stocks of bottlenose dolphins are documented in coastal Georgia year-round (Waring et al., 2009).

Table 2-11. Marine mammal species with the potential to occur in the vicinity of the proposed OCS blocks.

Common Name	Scientific Name	ESA Status	Georgia State Status	Abundance	Occurrence
Order Cetacea					
Suborder Mysticeti (baleen whales)					
Family Balaenidae (right whales)					
North Atlantic right whale	*Eubalaena glacialis*	Endangered	Endangered	438[1]	May Occur
Family Balaenopteridae (rorquals)					
Humpback whale	*Megaptera novaeangliae*	Endangered	Endangered	847	May Occur
Common minke whale	*Balaenoptera acutorostrata*			3,312	May Occur
Bryde's whale	*Balaenoptera edeni*			Unknown[2]	Not Expected
Sei whale	*Balaenoptera borealis*	Endangered		386	Not Expected
Fin whale	*Balaenoptera physalus*	Endangered		2,269	May Occur
Blue whale	*Balaenoptera musculus*	Endangered		Unknown	Not Expected
Suborder Odontoceti (toothed whales)					
Family Physeteridae (sperm whale)					
Sperm whale	*Physeter macrocephalus*	Endangered		4,804	Not Expected
Family Kogiidae					
Dwarf sperm whale	*Kogia sima*			395[3]	Not Expected
Pygmy sperm whale	*Kogia breviceps*			395	Not Expected
Family Ziphiidae (beaked whales)				3,513[4]	
Cuvier's beaked whale	*Ziphius cavirostris*				Not Expected
True's beaked whale	*Mesoplodon mirus*				Not Expected
Gervais' beaked whale	*Mesoplodon europaeus*				Not Expected
Blainville's beaked whale	*Mesoplodon densirostris*				Not Expected
Sowerby's beaked whale	*Mesoplodon bidens*				Not Expected
Family Delphinidae (dolphins)					
Rough-toothed dolphin	*Steno bredanensis*			Unknown	Not Expected
Bottlenose dolphin	*Tursiops truncatus*			16,337[5]	May Occur
Pantropical spotted dolphin	*Stenella attenuata*			4,439	Not Expected
Atlantic spotted dolphin	*Stenella frontalis*			50,978	May Occur
Spinner dolphin	*Stenella longirostris*			Unknown	Not Expected
Striped dolphin	*Stenella coeruleoalba*			94,462	Not Expected
Clymene dolphin	*Stenella clymene*			Unknown	Not Expected

Table 2-11 (*continued*). Marine mammal species with the potential to occur in the vicinity of the proposed OCS blocks.

Common Name	Scientific Name	ESA Status	Georgia State Status	Abundance	Occurrence
Order Cetacea					
Suborder Odontoceti (toothed whales)					
Family Delphinidae (dolphins)					
Short-beaked common dolphin	*Delphinus delphis*			120,743	Not Expected
Fraser's dolphin	*Lagenodelphis hosei*			Unknown	Not Expected
Risso's dolphin	*Grampus griseus*			20,479	Not Expected
Melon-headed whale	*Peponocephala electra*			Unknown	Not Expected
False killer whale	*Pseudorca crassidens*			Unknown[6]	Not Expected
Pygmy killer whale	*Feresa attenuata*			Unknown	Not Expected
Killer whale	*Orcinus orca*			Unknown	Not Expected
Long-finned pilot whale	*Globicephala melas*			31,139[7]	May Occur
Short-finned pilot whale	*Globicephala macrorhynchus*				May Occur
Family Phocoenidae (porpoises)					
Harbor porpoise	*Phocoena phocoena*			89,054	Not Expected
Order Carnivora					
Suborder Pinnipedia					
Family Phocidae (true seals)					
Hooded seal	*Cystophora cristata*			592,100	May Occur
Harbor seal	*Phoca vitulina*			99,340	Not Expected
Order Sirenia					
Family Trichechidae					
West Indian manatee	*Trichechus manatus*	Endangered	Endangered	3,802[8]	May Occur

1 This is the current best estimate of catalogued individuals from 2008 and does not represent a population estimate (NARWC, 2009).
2 NMFS does not develop a stock assessment report (SAR) for this species in the western North Atlantic. The source for this information is Kato and Perrin (2009).
3 This estimate of abundance is for undifferentiated members of the genus *Kogia*.
4 This estimate of abundance is for beaked whales and includes *Ziphius cavirostris* and undifferentiated members of the genus *Mesoplodon*.
5 This estimate of abundance is the combined best estimates for bottlenose dolphin stocks expected to occur in or near to the proposed lease areas for which abundance is known. These are the Southern Migratory Stock and the Georgia Coastal Resident Stock.
6 NMFS does not develop a SAR for this species in the western North Atlantic. The source for this information is Baird (2009).
7 This estimate of abundance is for undifferentiated members of the genus *Globicephala*.
8 This estimate is the most recent minimum count of the Florida stock of West Indian manatees based on the synoptic surveys conducted in January 2010 (FWRI, 2010).

All marine mammals are protected by federal law under the MMPA. Several species are afforded additional protection under the ESA. **Table 2-11** provides a list of all the marine mammal species with the potential to occur in the proposed OCS blocks. Occurrence of each species in the OCS blocks is designated as either "May Occur" or "Not Expected" based on the criteria mentioned above. ESA and Georgia State designations are provided where applicable. The current best estimate of abundance is provided for each species when available. Abundances are from the most recent Final NOAA Stock Assessment Reports (Waring et al., 2009b) and represent the current best estimate used for management in U.S. waters, unless otherwise noted.

There are nine species which may occur in the vicinity of the proposed OCS blocks due to their known, regular occurrence in the shallow waters of coastal Georgia or based on their known habitat associations (**Table 2-11**). These include eight species of cetacean and one species of sirenian, the West Indian manatee. The following sections provide a brief overview of each species' status and occurrence patterns within the shallow waters of coastal Georgia, including in the vicinity of the three OCS blocks. Species afforded protection under the ESA are discussed first. Remaining species follow the taxonomic order of **Table 2-11**. Jefferson et al. (2008) and Waring et al. (2009b) provides additional information on these species and their distribution in the North Atlantic Ocean.

Threatened and Endangered Marine Mammal Species

North Atlantic Right Whale (*Eubalaena glacialis*)

The North Atlantic right whale is listed as endangered under the ESA (NMFS, 2008). This species occurs commonly in the waters of coastal Georgia, including in the vicinity of the three proposed OCS blocks (Kraus et al., 1988; McLellan et al., 2002; Garrison et al., 2005; Pabst et al., 2009; Schulte and Taylor, 2009). There is a strong seasonality to North Atlantic right whale occurrence in this area; many individuals undergo an annual migration along the east coast of the U.S. (Kraus et al., 1986; Knowlton et al., 2002). They follow a well-defined pathway from summer feeding grounds off eastern Canada and the northeast U.S. to winter breeding and calving grounds off the southeast U.S., including coastal Georgia. Although the movement and occurrence of North Atlantic right whales in southeast U.S. waters is typically during winter, there are numerous records of individuals present in these waters during other seasons, as well as sightings of individuals in northeast waters during the winter (Caldwell and Caldwell, 1974; Kraus et al., 1988; NOAA, 2008; Pabst et al., 2009). North Atlantic right whales may occur in the vicinity of the three OCS blocks at any time of the year.

The waters off Georgia and northern Florida are the only known calving ground for western North Atlantic right whales, and this region is designated as critical habitat under the ESA (**Figure 2-13**). A Mandatory Ship Reporting (MSR) zone surrounds the critical habitat area and is in effect from November through April each year (USCG, 2001). The MSR zone requires vessels transiting the area to report the presence of right whales and provides information to mariners to assist in preventing vessel collisions with individual animals. The closest of the three proposed OCS blocks is approximately 20 NM from the MSR and 35 NM from the designated critical habitat.

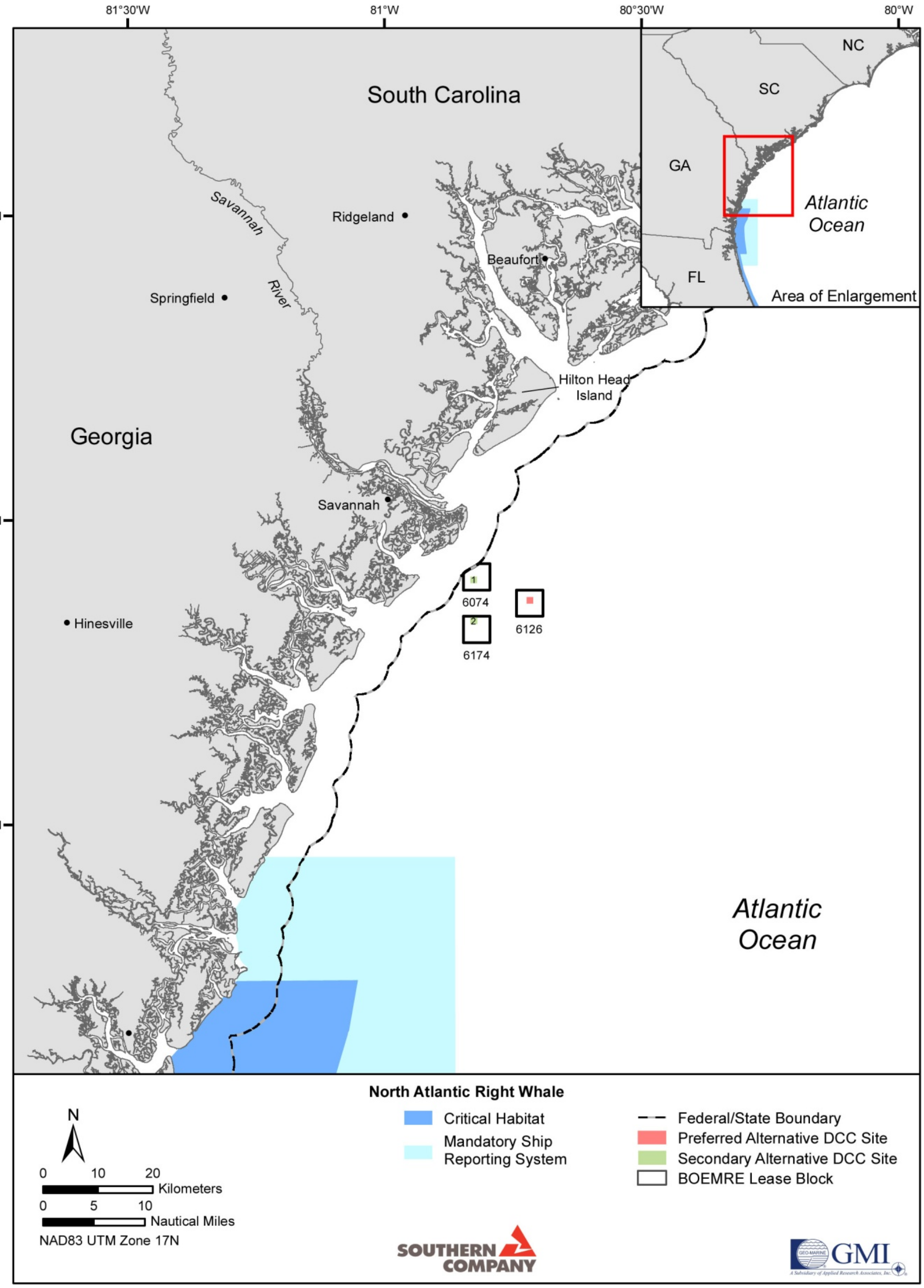

Figure 2-13. The locations of North Atlantic right whale critical habitat and Mandatory Ship Reporting zone in the vicinity of the proposed OCS blocks (NMFS, 1994; USCG, 2001).

Humpback Whale (*Megaptera novaeangliae*)

Humpback whales are listed as endangered under the ESA (NMFS, 1991). Humpback whales are distributed widely in the western North Atlantic and have a strongly seasonal occurrence along the U.S. east coast. They are known to occur in the coastal waters of Georgia, including in the vicinity of the three proposed OCS blocks (CETAP, 1982; McLellan et al., 2002). In U.S. waters, the largest numbers of humpback whales are found in feeding grounds off the northeast and mid-Atlantic coasts during spring and summer (CETAP, 1982; Whitehead, 1982; Kenney and Winn, 1986; Weinrich et al., 1997; Hamazaki, 2002; Stevick et al., 2008). During the winter, many individuals migrate to the breeding and calving grounds in the West Indies (Dawbin, 1966; Whitehead and Moore, 1982; Smith et al., 1999; Stevick et al., 2003). Winter sightings of humpback whales, including juveniles, along the U.S. Atlantic coast from Florida to Virginia suggest that this area may be a supplemental winter feeding ground (Clapham et al., 1993; Swingle et al., 1993; Wiley et al., 1995; Laerm et al., 1997; Barco et al., 2002). Migrating humpback whales along the U.S. east coast do not use coastal waters as regularly and discriminately as North Atlantic right whales; however, they are known to occur in shallow, coastal waters from Maine to Florida (CETAP, 1982; Swingle et al., 1993; McLellan et al., 2001; Schulte and Taylor, 2009). Due to the well-known seasonal movement of this species in the North Atlantic, it is more likely that this species may occur in the vicinity of the three OCS blocks during the winter, but humpback whales may occur in the region during any time of year.

Fin Whale (*Balaenoptera physalus*)

Fin whales are listed as endangered under the ESA (NMFS, 2006b). The general movement patterns and seasonality of this species in the western North Atlantic are not well understood. It is thought that many individuals migrate, moving southward to breeding/calving grounds in the fall and northward to feeding grounds in the spring (Clark, 1995; Aguilar, 2009). Some individuals are thought to move offshore during the winter (Clark, 1995), while others may move to lower latitudes south of Bermuda to the West Indies; however, it is certain that not all individuals in the western North Atlantic stock undergo this seasonal migration (Hain et al., 1992; Aguilar, 2009). Fin whales are sighted more commonly north of the U.S. mid-Atlantic than in areas south of this region (CETAP, 1982; Hain et al., 1992). There are sightings and strandings of this species along the southeast U.S. coast (NARWC, 2010), and based on these records and a known association with continental shelf waters, fin whales may to occur in the vicinity of the proposed OCS blocks during any time of year.

West Indian Manatee (*Trichechus manatus*)

The West Indian manatee is listed as endangered under the ESA (USFWS, 2001). This species occurs in subtropical and tropical waters of the western North Atlantic (Lefebvre et al., 2001). They are found primarily along the Atlantic and Gulf coasts of Florida. West Indian manatees are very sensitive to cold temperatures, and during winter months, most individuals may be found in inshore and nearshore coastal waters of southern Florida or in springs and warm water outfalls in northern Florida. During the spring and summer when sea surface temperatures increase, West Indian manatees on the Atlantic coast disperse northward into Georgia and South Carolina waters and are reported frequently in coastal rivers (Lefebvre et al., 2001). West Indian manatees generally prefer nearshore, shallow habitats (Lefebvre et al., 2000); however, individuals have been sighted offshore and are known to make wide-ranging movements (Reid, 2000; Lefebvre et al., 2001; Fertl et al., 2005; Alvarez-Alemán et al., 2007). Manatees may occur in the vicinity of the proposed OCS blocks during all seasons except winter.

Under the ESA, critical habitat for the West Indian manatee is designated south of the proposed OCS blocks (**Figure 2-14**). The critical habitat primarily includes inshore waters of Florida. The closest of the three OCS blocks is approximately 56 km (30 NM) from the designated critical habitat.

Non-Threatened and Non-Endangered Marine Mammal Species

Common Minke Whale (*Balaenoptera acutorostrata*)

The common minke whale occurs in both continental shelf and offshore waters of the western North Atlantic (Slijper et al., 1964; Horwood, 1990; Mitchell, 1991; Nieukirk et al., 2004). They are sighted commonly in waters of the U.S. northeast and mid-Atlantic continental shelf and are more prevalent during summer (Schmidly, 1981; Murphy, 1995; Hamazaki, 2002; Risch et al., 2009; Waring et al., 2009b). During fall and winter, they are thought to move offshore and southward from Bermuda to the West Indies (Mitchell, 1991; Mellinger et al., 2000); however, there are many observations of this species over the continental shelf from South Carolina to Florida during all seasons (NARWC, 2010). Based on these observations and their known habitat associations, minke whales may occur in the vicinity of the OCS blocks during any time of year.

Bottlenose Dolphin (*Tursiops truncatus*)

Bottlenose dolphins occur regularly in the coastal and offshore waters of the U.S. Atlantic, particularly in the mid-Atlantic and farther south. They occur in numerous stocks and may be resident or transient to the area depending on the population to which they belong. The bottlenose dolphins in the vicinity of the proposed OCS blocks belong to six separate stocks: Northern Georgia/Southern South Carolina Estuarine System Stock, Southern Georgia Estuarine System Stock, South Carolina Coastal Resident Stock, Georgia Coastal Resident Stock, Southern Migratory Stock, and the Western North Atlantic Offshore Stock (Waring et al., 2009b). The Northern Georgia/Southern South Carolina Estuarine System Stock is found in the inshore estuarine waters of northern Georgia and southern South Carolina, including the nearshore waters off Tybee Island, Wassaw Sound and Ossabow Sound. These animals tend to remain inside the barrier island system but may potentially move into the OCS blocks. The Southern Georgia Estuarine System Stock is found along the Georgia coast from south of Altamaha Sound to the southern end of Cumberland Island. This stock inhabits the inshore and nearshore estuaries and sounds in the vicinity of Brunswick, Georgia. Although individuals from this stock are thought to occur south of the three OCS lease blocks, the stock identity of animals in the coastal areas of Georgia north of Altamaha Sound and south of Ossabow Sound is unresolved. Individuals from either of these estuarine system stocks may occur there and may be present in the vicinity of the OCS blocks (Waring et al., 2009b).

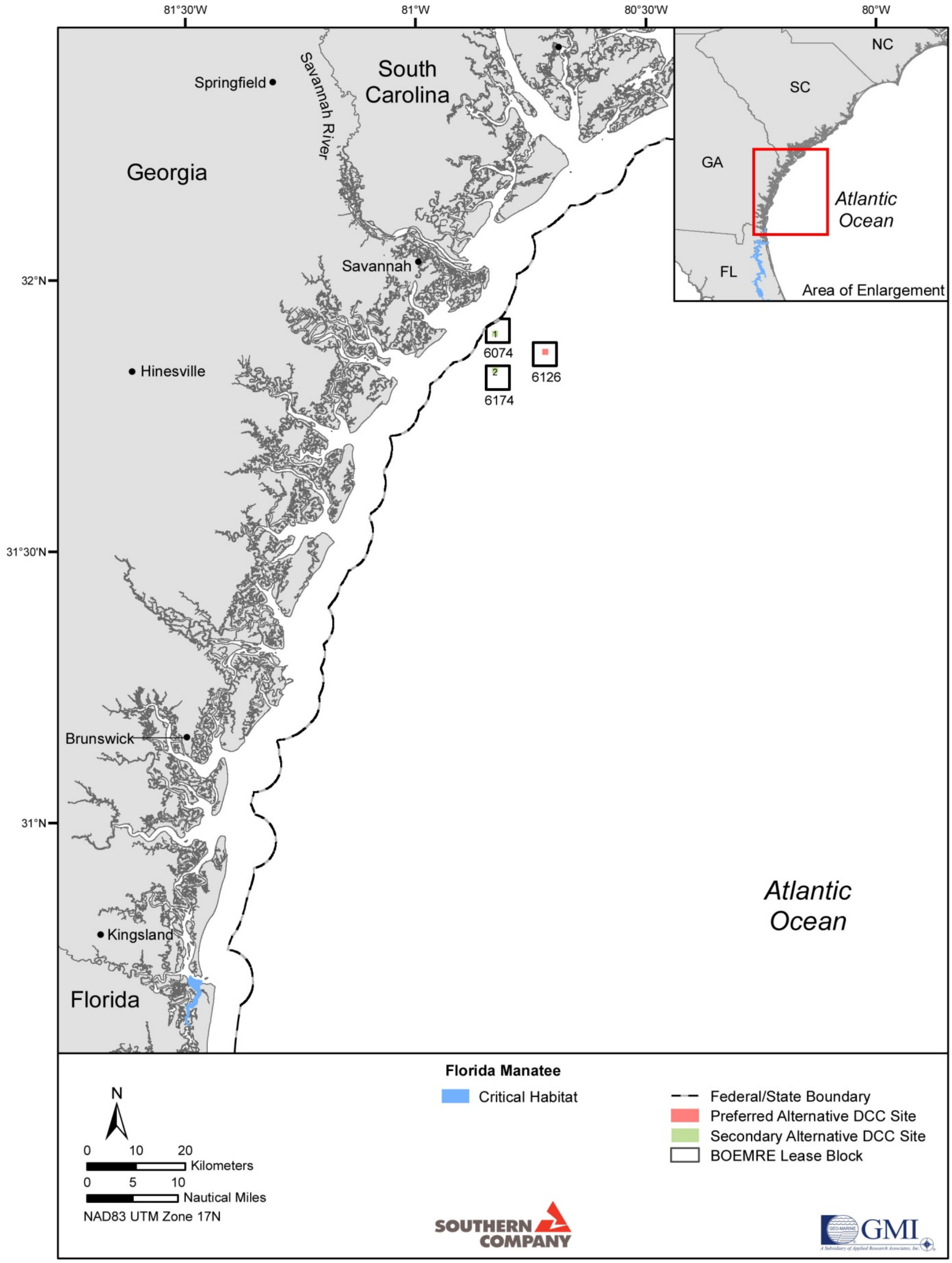

Figure 2-14. The location of critical habitat for the West Indian manatee in the vicinity of the proposed OCS blocks (USFWS, 1976).

Bottlenose dolphins that occur in the coastal waters of Georgia outside of the estuaries and sounds may be from as many as four separate stocks. Two of these stocks are resident to the area and the other two occur transiently. The two resident stocks are the South Carolina Coastal Resident Stock and the Georgia Coastal Resident Stock. Individuals from the South Carolina Coastal Resident Stock occur primarily north of Georgia, but they may occur in the vicinity of the three OCS blocks. Individuals from the Georgia Coastal Resident Stock occur year-round in the vicinity of the OCS blocks. The transient stocks are the Southern Migratory Stock and the Western North Atlantic Offshore Stock. The Southern Migratory Stock occurs off Virginia and North Carolina during the summer and moves south to the coasts of South Carolina, Georgia, and northern Florida during the winter (Waring et al., 2009b). Individuals from this stock are may occur regularly within the three OCS blocks, particularly during winter. Individuals from the Western North Atlantic Offshore Stock are generally found over the OCS and continental slope (CETAP, 1982; Kenney, 1990; Garrison et al., 2003b; Waring et al., 2009b); however, individuals from this stock have been sighted in nearshore areas (Wiley et al., 1994; Garrison et al., 2003b; Waring et al., 2009b) and may occur in the vicinity of the three OCS blocks.

Atlantic Spotted Dolphin (*Stenella frontalis*)

Atlantic spotted dolphins occur in the western North Atlantic from the northeast U.S. to the Caribbean, including the waters of coastal Georgia (Perrin et al., 1987). They occur as two morphotypes – a heavily spotted, robust nearshore form and a lightly spotted, more slender form that occurs in deeper, offshore waters (Perrin et al., 1987). Based on survey data, Atlantic spotted dolphins in the southeast U.S. occur primarily in OCS waters (Garrison et al., 2003a). They may spend more time feeding in the OCS in winter than during summer (Griffin et al., 2005). There are numerous sightings of this species in the vicinity of the proposed OCS blocks during all seasons. Atlantic spotted dolphins may occur in the OCS blocks and may occur during any time of the year.

Long-finned and Short-finned Pilot Whale (*Globicephala melas* and *G. macrorhynchus*)

Pilot whales occur globally as two species, long-finned and short-finned. It is often difficult to classify individuals to species at sea, so in areas where there is overlap in distribution such as in the North Atlantic Ocean, they are often recorded more generally as *Globicephala spp.* Long-finned pilot whales are associated with cold-temperate waters, whereas short-finned pilot whales are distributed more commonly in warm-temperate to subtropical waters (Abend and Smith, 1999). This general distributional dichotomy is apparent along the U.S. Atlantic coast where long-finned pilot whales are encountered more frequently north of Cape Hatteras and short-finned pilot whales more commonly south of that region (CETAP, Caldwell and Golley, 1965; Irvine et al., 1979; 1982; Payne and Heinemann, 1993). Pilot whales tend to be distributed over the OCS break and continental slope in the western North Atlantic (CETAP, 1982; Payne and Heinemann, 1993). Sightings data show a peak in the occurrence of pilot whales in the OCS waters of the mid-Atlantic from March through June (Payne et al., 1990). Sighting and stranding data support the presence of pilot whales in the OCS waters of the southeast U.S. Atlantic, including in the coastal waters of Georgia, from all seasons (Caldwell and Caldwell, 1974; Irvine et al., 1979; CETAP, 1982; CWS, 2006; NARWC, 2010). There is anecdotal evidence of pilot whales in the nearshore coastal waters of Georgia during the summer (DeCurtis, C., Geo-Marine, Inc., Pers. Comm., 19 May 2010). Pilot whales may occur in the vicinity of the proposed OCS blocks and may occur during any time of year.

Possible Impacts and Discussion

The siting of a DCC in any of the proposed OCS blocks has the potential to impact marine mammal species that are found in the waters surrounding the site. These potential impacts may include behavioral disturbance, harassment, injury or mortality, and population-level effects such as reduced reproductive capacity or reduced survival. These impacts come from the activities associated with assessment of the site, construction of the DCC, operation and maintenance of the DCC, and decommissioning upon termination of data collection. The *Programmatic Environmental Impact Statement for Alternative Energy Development and Production* (MMS, 2007) provides a detailed discussion of the potential impacts to marine mammals from the development of renewable energy facilities. The following is a brief discussion of potential impacts and the mitigation measures that may be employed in order to minimize potential impacts to marine mammals.

Vessel movements are associated with all of the stages of a DCC project. Vessels traveling to, from, and within the OCS blocks have the potential to impact marine mammals directly such as a shipstrike or indirectly such as behavioral disturbance. Many species of cetaceans are known to move out of the way of oncoming vessels and are not expected to be impacted directly by vessel movements; however, shipstrike is a leading cause of injury and death to several species of endangered large whales along the eastern seaboard (Laist et al., 2001). Injury and mortality from shipstrikes may be mitigated by adhering to vessel speed restrictions in the vicinity of major ports which includes the proposed OCS blocks as well as implementing, as necessary, the proposed mitigation measures outlined in the *Environmental Assessment for the Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey* (MMS, 2009). Section 2.12 summarizes measures that may be utilized to avoid, minimize and mitigate impacts to marine and coastal environments.

Field Site Assessment

The topography and sub-surface stratigraphy of the proposed location for the placement of the DCC within OCS block 6126 may be characterized using high-resolution sonic imagers and sub-bottom profiling. These geological and geophysical (G&G) surveys generally employ directional, low energy, and high-frequency signals. Some of the equipment used such as a Geopulse “boomer” may result in non-directional acoustic input to the marine environment. The frequency range used by G&G survey equipment is within the hearing range of marine mammals, particularly odontocetes or toothed whales; however, the acoustic energy emitted by the equipment is localized and attenuates quickly to levels which do not cause harm or harassment. In previous site-characterization studies for the placement of DCCs on the Atlantic OCS, NMFS anticipated no harm or harassment to marine mammals outside of a 500 m (1,640 ft) exclusion zone around the acoustic source (MMS 2010a).

The species that may be exposed to acoustic energy during G&G surveys for a DCC placement vary depending on the exact location of survey activities and the time of year during which the survey activities take place; however, acoustic impacts will be mitigated through the establishment of an exclusion zone. This exclusion zone represents a discrete area that is monitored visually from the survey vessel by trained marine mammal observers who can spot, identify, track, and document the presence of marine mammals near or within the zone. Because the exclusion zone is monitored visually, survey activities will only occur during daylight hours and under favorable weather conditions when the entire zone is visible. The size of the exclusion zone will be determined in consultation with NMFS and will depend upon the species most likely to be encountered and the survey equipment used. If a marine mammal enters the exclusion zone, the acoustic surveys will be temporarily shut down and will resume when the mammal clears the zone or when thirty minutes have passed without further sightings. Alternatively, NMFS may issue an incidental take permit for a certain number of takes per species expected to be encountered during G&G activities. This would result in the continuation of survey activity despite the presence of marine mammals in the vicinity until the number of allowable takes is met.

Construction

Construction activities for the installation of the DCC also have the potential to impact marine mammals. Noise from construction may exceed the threshold or180 dB for harm or harassment to marine mammals and may require mitigation. This noise may be mitigated similarly to that of G&G activities by employing an exclusion zone and a team of trained observers to monitor the zone. Construction noise is likely to be more intense and in a broader frequency range than the acoustic energy from G&G surveys. It is also possible that it will be more variable. For example, the noise may be louder one day than another. Due to the potential for variability, acoustic monitoring may be used in addition to visual monitoring. Acoustic monitoring can be done in real time by measuring sound pressure levels at discrete distances from the acoustic source and adjusting the size of the exclusion zone accordingly. Acoustic levels are anticipated to be the highest while pile driving or ~210 dB. Section 2.10 provides an estimate of the distance in which in-water acoustic levels during pile driving will decrease to 180, 160, and 120 dB. Harassment or harm to marine mammals within the exclusion zone during construction activities may be mitigated by the utilization of a bubble screen, or by shutting down acoustic equipment while marine mammals are present in the exclusion zone. Alternatively or in addition, an authorization for incidental take may be issued by NMFS. As with G&G activities, visual monitoring requires that construction only take place during daylight hours and under favorable weather conditions when the entire exclusion zone is visible.

Decommissioning

Noise associated with decommissioning comes from pile-cutting and is expected to be minimal. Observers will be present to watch for marine mammals during this process.

- **Bats**

This section reviews past and present world-wide scientific literature concerning the offshore occurrence of bats. Foraging and migration by bats over oceans is poorly understood. The frequency of occurrence and abundance of migratory bats and their migration corridors over the western North Atlantic Ocean is unknown because of the absence of comprehensive ocean-based bat surveys. No bat occurrence or abundance data is known to be available for Georgia or nearby South Carolina offshore waters. The following discussion is based on a literature review and available, land-based bat occurrence data for Georgia.

Literature Review

Bats have been documented as occurring over oceans throughout the world (MMS, 2009). In the western North Atlantic Ocean, bats were first documented on the northern end of Cape Cod about 40.2 to 80.5 km (25 to 50 mi) from the mainland, where bats were not known to breed, during the fall of 1890 and 1891 (Miller, 1897). Multiple observations have been published documenting the occurrence of bats circling and then coming to roost on boats 161 km (100 mi) or further offshore (Norton, 1930; Griffin, 1940; Mackiewicz and Backus, 1956). Cryan (2003) reported occasional observations of silver-haired bat (*Lasionycterus noctivagans*), eastern red bat (*Lasiurus borealis*), and hoary bat (*Lasiurus cincereus*) from ships at sea and from offshore islands such as Bermuda where bats do not breed. In the eastern Pacific Ocean, the hoary bat was documented using Southeast Fallaron Island (32 km [19.9 mi] from the coast) as a stopover site during migration over the ocean (Cryan and Brown, 2007). Over the Baltic Sea, bats were observed foraging during migration. Non-migrating bats have also been observed foraging over the ocean at distances far from land. Ahlen et al. (2007) reported that the majority of observed bats flew and hunted over the sea during calm weather. During the literature search, no bat occurrence data was found for the South Atlantic Ocean.

More recently, research on offshore bat occurrence was conducted during the *New Jersey Department of Environmental Protection (NJDEP) Ocean Wind Ecological Baseline Study* (Geo-Marine, Inc., 2010; Sjollema, 2010). These offshore bat studies were the first to be reported for the western North Atlantic Ocean.

During the New Jersey study, nocturnal studies were conducted with two types of equipment, a thermal imaging-vertically pointed radar (TI-VPR) mounted on a jack-up barge and Anabat II detectors mounted on a ship conducting transect surveys. The TI-VPR data were collected from stationary offshore locations from 1 to 19 km (0.6 to 11.9 mi) offshore in spring 2008 and from 9 to 19 km (5.9 to 11.9 mi) in fall 2008. The survey area was limited to a 20° area directly above the jack-up barge up to an altitude of 457 m (1,500 ft). Foraging bats were identified and enumerated from the recorded TI-VPR data by their erratic non-linear flight pattern. Count data was corrected for the survey area and reported as the total corrected count (Geo-Marine, Inc., 2010). For the Anabat study the ship conducted nocturnal transect surveys from 4 to 35 km (2.5 to 21.7 mi) offshore in the study area. Bat calls were identified by replaying the recorded Anabat files and matching vocalizations to known vocalizations of species from the region (Sjollema, 2010).

Nightly TI-VPR surveys were conducted from 24 to 26 March, 3 to 12 April, 14 to 18 April, 25 to 30 April and from 1 to 11 May during spring 2008 (180 hrs). The total corrected bat count for all survey dates was 21 or 0.12/night hour, which is approximately 1 bat per night assuming an 8-hour night during spring 2008. In fall 2008, nightly sampling was limited and conducted from 1 to 19 October (161 hours). The total corrected bat count was 24 or 0.15/night hour, which is approximately 1.4 bats per night assuming an 8-hour night during the fall survey. Slightly more bats were detected per unit of survey effort in fall than in spring (Geo-Marine, Inc., 2010).

A preliminary analysis of the New Jersey offshore Anabat data has been completed. During the offshore transect surveys, four bat species were identified: big brown (*Epistesicus fuscus*)/silver-haired bat, eastern red bat, hoary bat, and various *Myotis* bat species. The mean offshore bat observation distance was 11.32 km (7 mi) (Sjollema, 2010).

Potential Bat Occurrence in the Study Area

Of the 15 bat species known to occur in Georgia, eight species have either been documented as occurring or are thought to occur in the two Georgia counties (Chatham and Liberty) to the west of the three proposed OCS blocks (**Table 2-12**). One of these species, Indiana bat (*Myotis sodalis*), has been listed as an endangered species by the USFWS (2010b) and the State of Georgia (2006). Rafinesque's big-eared bat (*Corynorhinus rafinesque*) is listed as a protected species by the State of Georgia (2006).

Table 2-12. Bats known to occur or potentially occurring in Chatham and Liberty counties near the three proposed OCS blocks.

Common Name	Scientific Name	Occurrence Status
Rafinesque's Big-eared Bat	*Corynorhinus rafinesque*	Rare
Big Brown Bat	*Eptesicus fuscus*	Uncommon to Common
Eastern Red Bat	*Lasiurus borealis*	Unknown
Hoary Bat	*Lasiurus cinereus*	Unknown
Little Brown Bat	*Myotis lucifugus*	Common
Indiana Myotis (Bat)	*Myotis sodalis*	Unknown
Evening Bat	*Nycteiceius humeralis*	Abundant
Eastern Pipistrelle	*Pipistrellus subflavus*	Abundant

Source: The University of Georgia, 2010.

Many bat species are permanent residents throughout the year while other bat species move or migrate between summer and winter ranges. Migrant bat species can generally be characterized as long-distance (i.e., >161 km (87 NM) or short-distance (i.e., <161 km (87 NM) migrants. The long-distance migrants generally leave their summer ranges and travel south to their winter ranges such as in the southern U.S. and farther south between August and early October and return during April and May. Short-distance migrants in Massachusetts generally migrate later in fall and early in spring since hibernation generally occurs between mid-October and late April (MMS, 2010b). Therefore, short-term migrations are more likely to occur later in southern areas of U.S. because of the warmer climate. In the southern U.S., some bat species may remain active during mild winter weather (University of Georgia, 2010).

Several bat species (e.g., eastern red bat, hoary bat, and silver-haired bat) have been identified as long-distance migrants (Cryan, 2003; Cryan and Brown, 2007; Kunz et al., 2007). Hoary bats have been documented as wintering south of North Carolina along the east coast of the U.S. (England et al., 2001). In contrast, big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), and eastern pipsistrelle (*Pipistrellus subflavus*) have been documented as short-distance migrants and most are thought to move no more 80 km (50 mi) between hibernacula and their summer range (Degraaf and Yamasaki, 2001). Migrations of Rafinesque's big-eared bat and evening bat (*Nycteiceius humeralis*) have not been documented in the literature.

Based on all known coastal county occurrences, eastern red bat and hoary bat are the most likely long-distance migrant bats which could potentially occur over the proposed OCS blocks. Big brown bat, a short-distance migrant, has been documented as occurring offshore. The potential offshore occurrence status of Rafinesque's big-eared bat, little brown bat, evening bat, and the Indiana bat are unknown, but the potential exists that these species may migrate and/or forage offshore.

Possible Impacts and Discussion

The construction, operation, and decommissioning phases of this project may potentially result in limited disturbance to individuals of some bat species. Potential impacts and disturbances include construction activities such as pile driving and crane operations, obstruction of foraging and migration pathways by the DCC, and small boat and barge movements and activities. As discussed, some bat species are permanent residents of coastal Georgia and may be found in the vicinity of the proposed OCS blocks. The degree to which these species may utilize marine waters is not well understood. Bats have been found 209 km (113 NM) offshore of the Maine coastline (Goodale and Divoll, 2009) and many use coastal waters for foraging. Arnett et al. (2007) and Holland (2007) suggest that bats utilize nearshore waters as migration pathways or flyways.

Bat collisions with project boats, cranes, and the DCC are not likely and should be at or below collision rates with other marine structures such as lighthouses. Bats are very capable of avoiding stationary objects and it is doubtful that the DCC poses a significant risk to foraging or migrating bats. Construction activities which will take place during daylight hours should not impact bat dusk/crepuscular foraging flights.

Increased vessel traffic from construction or operational maintenance is not expected to result in any serious impacts or effects on bats foraging or moving through the OCS blocks.

2.8.2.3 Socioeconomic and Human Resources

The natural resources of Georgia are among the most diverse in the U.S. Among the most economically important natural resources in Georgia are coastal and offshore habitats and associated fisheries. The Georgia nearshore coastal habitats consist of five major river estuaries (Savannah, Satilla, Ogeechee, Altamaha, and St. Mary's), 3,862 km (2,400 mi) of tidal creeks, 14 barrier islands, and 296,119 km (184,000 mi) of tidal waters (GDNR, 2010e). Overall, the Georgia coastline is approximately 161 km (100 miles) long and is dominated by 1,619 km^2 (400,000 ac) of coastal salt marshes. Many important commercial and recreational marine species are found in Georgia estuaries (Dahlberg, 1972). Georgia coastal marshes represent about one-third of all the coastal marshes on the east coast (Guadagnoli et al., 2005).

♦ **Commercial Fisheries**

Commercial fisheries are an important component of Georgia's coastal economy. In 2008, commercial fisheries in Georgia ranked 23rd in economic value and total landings in the U.S. (NMFS, 2010c). In terms of east coast states, commercial fisheries in Georgia ranked 13th in economic value and total landings (NMFS, 2010c) with the value of commercial fisheries in Georgia ranging from $11,034,982 (7,792,379 pounds [lb]) in 2007 to $13,464,688 (9,638,070 lb) in 2005 (NMFS, 2010c). There are three primary commercial fishing ports in Georgia: Darien-Bellville, Savannah, and Brunswick with other small fishing ports scattered across the coastal community. The two main types of commercial fishing gears used in Georgia coastal waters are otter trawls and traps or pots. Otter trawls are used to target shrimp, while traps or pots are used to target blue crabs. Other commercial fishing gear used to target commercial species includes hand gears (long-lines and other), reels (hydraulic and electric), cast nets, and gillnets.

The primary commercial species harvested in Georgia waters are shrimp, blue crab, finfish, and sharks. White shrimp and blue crab represented 75% of the commercial fishing landings value during 2005 through 2008 (NMFS, 2010c). Commercial fishing landings are off-loaded in Georgia throughout the year with most landings occurring in early summer, May and June, and late summer, (September and October. In most years, peak commercial fishing landings occur in September and October (**Figure 2-15**).

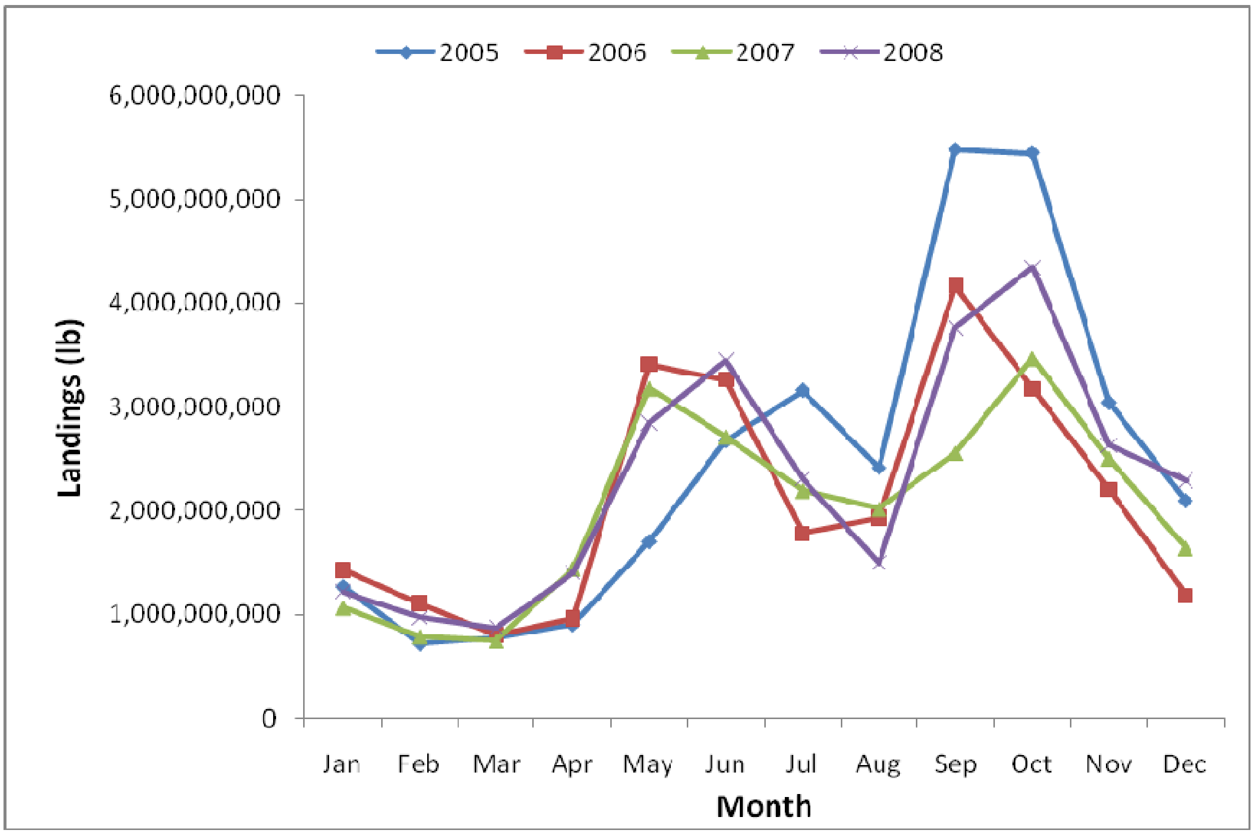

Figure 2-15. Monthly commercial fisheries landings in Georgia during 2005 through 2008 (NMFS, 2010c).

♦ **Recreational Resources**

Recreational activities in offshore Georgia waters are primarily comprised of game and sport fishing, whale watching, sailing, power cruising, and other leisure activities such as jetskiing, waterskiing, shellfishing and shrimping, sport diving, and bird watching. Georgia ranks 14th nationally with 318,212 registered recreational vessels () (USCG, 2005) as listed through 2005 (NMMA, 2007).

Recreational Fishing

Recreational fishing in Georgia is an important economic activity that supports many jobs in the coastal counties. In terms of sales impacts and the contribution of these activities to gross domestic product (value-added impacts), recreational fisheries in Georgia were $311 and $162 million, respectively (NMFS, 2010d). Of the total, state taxes generated by angler purchases in 2008 were $11 million and federal taxes $15 million (NMFS, 2010d). Recreational fishing in Georgia includes harvesting fish and/or shellfish (GDNR, 2010f). The GDNR allows the public to recreationally harvest clams and oysters from designated areas in Chatham, McIntosh, Glynn, and Camden counties (GDNR, 2010f). The total number of recreational fishing trips taken in Georgia state and federal waters during 2005 through 2009 was 4,701,471.

The total number of fish taken (observed or recorded) by recreational anglers fishing in Georgia waters from 2005 to 2008 was 7,258,558. The primary species taken by recreational anglers are kingfish, spotted seatrout, and red drum with the most fish harvested being kingfish and spotted seatrout.

The offshore waters within or in the vicinity of the proposed OCS blocks offer anglers the opportunity to pursue a variety of coastal fish such as red drum, kingfish, tarpon, jack crevalle, and sharks. Nearshore and offshore anglers also target benthic species such as grouper and black seabass. There are many popular benthic species found in the deeper waters off Georgia (SAFMC, 2005). Popular fishing sites for anglers targeting cobia, grouper, and red snapper are often the low relief, hardbottom, and artificial reefs. In general, relative fish abundance (e.g., black seabass) is higher at hard-bottom sites (Barkoukis, 2006). Among the most important fishing sites off the coast of Georgia are artificial reef structures. Walsh et al., (2006) indicates that most of the benthic habitat is comprised of sand. Since most of the bottom is sand, artificial reefs serve as important habitat for many fish, and are popular fishing hotspots for anglers (GDNR, 2001). The majority of artificial reefs in Georgia's coastal waters are located 11 to 43 km (7 to 27 mi) offshore in 9 to 23 m (30 to 75 ft) water depths. Similarly, many anglers target a variety of fish at hard-bottom locations. Other popular fishing sites for nearshore anglers are USCG Navigational Aids and Navy Towers, which can attract a variety of fish such as tripletail and cobia) at different times of the year. Several of these artificial reef structures are located in the vicinity of the three OCS lease blocks. The two primary techniques that recreational anglers use to target nearshore and offshore fish are bottom fishing or trolling. Despite the distance (> 120 km (65 NM) from shore and the three OCS lease blocks, an important fishing area is the western edge of the Gulf Stream current, which generally flows along the continental shelf (55 to 64 m (180 to 210-ft) depth profile). Offshore anglers target sailfish, blue marlin, and tuna either on the edge of the Gulf Stream current or in warm water eddies formed by the Gulf Stream current.

Other Recreational Activities and Tourism

Tourism is the second largest industry in Georgia generating around $21 billion, supporting over 240,000 jobs and contributing $1.6 billion in state and local tax revenue (GDED, 2010). The Georgia coastal region offers a wide range of activities for residents and tourists throughout the year. In addition to the recreational fishing mentioned previously, residents and tourists enjoy other coastal activities such as boating, swimming, sunbathing, wildlife viewing, scuba diving, surfing, and golfing. They visit historical sites, state and national parks, and beaches. Many of these public areas are located in coastal counties and include the following protected areas: the Cumberland Island National Seashore, Wolf Island NWR, Sapelo Island NERR, Blackbeard Island NWR, Harris Neck NWR, Tybee NWR, and the Wassaw NWR.

Cumberland Island National Seashore in southeastern Georgia encompasses 14,737 hectares (ha; 36,415 ac) of barrier island and salt marsh. The island provides nesting habitat for shorebirds and loggerhead sea turtles, and the nearby waters provide habitat for green and leatherback sea turtles as well as West Indian manatees and North Atlantic right whales (NPCA, 2009; Baugh et al., 1989; Ruckdeschel et al., 2000; Sabine III et al., 2008).

The largest of the four NWRs in Georgia is the Wassaw NWR, which is located inshore of the three OCS blocks. The Wassaw NWR encompasses 4,068 ha (10,053 ac) of beaches, maritime forest, and salt marshes. This NWR provides nesting habitat for loggerhead, green, and Kemp's ridley sea turtles and supports rookeries for egrets and herons (USFWS, 2010f; Williams and Frick, 2001; Williams et al., 2006). Visitors enjoy recreational activities including bird watching, beachcombing, and hiking (USFWS, 2010f). OCS block 6074 is the closest to Wassaw NWR and OCS block 6126 is the furthest from Wassaw NWR.

The Sapelo Island NERR comprises 6,677 ha (16,500 ac) of maritime forest, hammock land, and tidal salt marsh along the central coastline of Georgia. Sapelo Island NERR is home to a variety of wildlife including deer, alligators, birds, and turtles. Recreational activities in the NERR include camping, public tours, boating, swimming, hunting, bird watching, and wildlife photography (NERRS, 2008).

Marine wildlife tours, particularly dolphin tours, are also popular activities for tourists in coastal Georgia. Over 17 operators conduct dedicated dolphin-watch tours from coastal Georgia. Most of these tours depart from Savannah, Jekyll Island, Tybee Island, and St. Simons Island and operate around the barrier islands, bays, waterways, tidal creeks, and inland rivers near and within the protected areas mentioned above.

Another marine protected area and tourism/recreation hotspot in the vicinity of the three OCS blocks is the GRNMS. Gray's Reef is located 32 km (17 NM) east of Sapelo Island and encompasses an area of 57.4 km^2 (14,184 ac.). Recreational divers usually dive the deeper offshore sites, such as Gray's Reef, due to poor visibility in nearshore areas (GDNR, 2001). Gray's Reef is a nearshore live-bottom reef that consists of limestone hardbottom geology. This reef is known for its large and varied populations of fish (Hunt, 1974). Because of the diversity of marine life, Gray's Reef is one of the most popular sportfishing and diving destinations along the southeastern U.S. (Sedberry et al., 1998). Georgia's artificial reefs and shipwrecks are also hotspots for recreational divers and commercial and recreational fishing (GDNR, 2001).

- **OCS and Coastal Infrastructure**

The waters off the Georgia coast. represent a multiple-use zone with existing infrastructure and defined zones for numerous activities. These waters support commercial shipping and transportation, military operations, waste disposal sites, borrow areas for beach renourishment, state and federal protected areas, infrastructure for telecommunication and electricity, oil and gas pipelines, and myriad general recreational uses including numerous marinas. The Port of Savannah and Port of Brunswick are the major commercial ports in Georgia with Savannah being the closest port to the three OCS lease blocks.

There are no ocean uses, such as sand borrow areas, communication cables, pipelines, dumpsites, or other dangerous or designated areas known to exist within the three OCS blocks or the immediate area of the blocks. OCS block 6126 is located approximately 17 km (9 NM) offshore and construction, operation, and decommissioning activities will not affect the coastal zone or activities within the coastal zone. This project is consistent and compliant with both Coastal Zone Management (CZM) policy as well as the state of Georgia goals to continue to develop regional resources. The construction and operation of the DCC should have no impact on or result in alterations to land-based or nearshore use patterns.

- **Land Use Patterns**

Georgia Power's Plant Kraft will be used as a staging area for the construction, operation, maintenance and decommissioning of the DCC. Operation of the DCC will not result in any changes to current land use patterns or nearshore activities.

- **Archaeological Resources**

There is no evidence that significant archaeological resources are found within the proposed OCS blocks and therefore, no mitigation should be necessary. Section 2.7 provides more information on the cultural resources evaluation conducted.

- **Competing Use of State Waters and OCS**

Waters in the SAB support a large volume of maritime traffic heading to and from ports, as well as vessels traveling to other ports north and south of the proposed OCS blocks. Vessels using these ports include commercial, recreational, military, and research vessels (DoN, 2009a).

Coastal Georgia waters are important for both commercial and recreational activities. Traditional shrimp trawling competes with shipping vessels across coastal Georgia nearshore and offshore waters. Recreational boating and fishing are common in the waters near the three proposed OCS blocks.

Coastal Zone Management Act (CZMA) Section 307(c)(3)(A) addresses the requirement of any applicant for a federal license/permit to conduct activity in or adjacent to a coastal zone which may affect land or water use or other natural resources of the state coastal zone area in compliance with applicable laws and regulations. The DNR assists all jurisdictional agencies to assess possible effects of any project within the CZM area and achieve compliance with CZMA rules.

Nearshore shipping lanes aid ocean-going vessels in avoiding navigational conflicts and collisions in areas leading into and out of major ports such as the Savannah River entrance. These commercial shipping lanes are controlled by the use of directional commercially used waterways for larger vessels such as cargo and container ships and tankers within or adjacent to the OCS blocks (DoN, 2009b). Commercial shipping in the area of the proposed OCS blocks is managed by offshore traffic separation schemes and precautionary areas designated by 33 CFR 167. These shipping lanes have no designation, and vessels generally follow routes determined by their destination, depth requirements, and current weather conditions (DoN, 2009b).

Depending on season and weather conditions, recreational watercraft may be found throughout the OCS blocks. In addition, some larger recreational vessels, in particular sailboats and motor cruisers in the 75-ft or larger class open ocean vessels (e.g., traveling to the Bahamas), might favor courses in the vicinity of the OCS blocks. Popular sport diving sites consist of natural and artificial reefs in coastal Georgia waters (DoN, 2009b).

The Jacksonville Range Military Complex geographically encompasses the nearshore and offshore Charleston and Jacksonville Operating Areas (OPAREAs). The largest naval facility in the OPAREAs is the Naval Submarine Base at Kings Bay, Georgia located approximately 137 km (74 NM) south of the proposed OCS blocks. Submarine operations occur throughout all the deepwater portions of the OPAREAs extending south and north and offshore to the Jacksonville Range Complex limits (DoN, 2009b).

- **Demographic Patterns and Employment**

The state of Georgia had a population of almost 10 million people as of July 2009 indicating a 20.1% growth rate between April 1, 2000 and July 1, 2009 (U.S. Census Bureau, 2010). As of June 2010, approximately 4.7 million of those were part of the civilian labor force. All of the coastal counties of Georgia (**Table 2-13**) have experienced positive growth in the last ten years, particularly Chatham and Bryan counties which include the city of Savannah and vicinity, Glynn County which includes the city of Brunswick, and Camden County.

Georgia hosts numerous employment sectors that may be broken down generally into service-providing, goods-providing, and government jobs. In all of Georgia's coastal counties, the service industry employs far more workers than the goods-providing industry. In Camden, Liberty, and McIntosh counties, the government sector employs more than a third of workers. The *per capita* income for all coastal counties is given in **Table 2-13** and is significantly higher in Chatham/Bryan and Glynn counties which include the Savannah area and Brunswick, respectively.

Table 2-13. Population, percent population growth, and per capita income for Georgia's six coastal counties.

Coastal County	Population (2009)	% Growth (2000 to 2009)	*Per Capita* Income (2008)
Chatham County	256,992	10.6	$41,022
Bryan County	32,559	39.0	$36,567
Liberty County	62,186	0.9	$28,104
McIntosh County	11,378	4.9	$26,718
Glynn County	76,820	13.7	$39,792
Camden County	48,277	10.6	$30,316

Sources: U.S. Census Bureau (2010), GDOL (2010)

Potential Impacts and Recommended Mitigation Measures

Water recreational activities such as boating and recreational fishing may be temporarily disrupted due to the increased ship traffic during the 12-day construction of the DCC; however, construction activities will be temporary and long-term impacts are not expected.

The three proposed OCS blocks are approximately 5.5 to 17 km (3 to 9 NM) offshore of Chatham and Bryan counties. It is highly unlikely that the installation and operation of the DCC in one of the three OCS blocks will alter the demographic and employment patterns of the area; however, any changes would probably be limited to Chatham and Bryan counties due to the location of the OCS blocks.

2.8.3 Consultations

Section 1.4 lists private, non-profit and public groups, individuals and agencies Southern Company has consulted regarding this project.

2.9 Expected Air and Greenhouse Gas Emissions

Air and greenhouse gas emissions during site assessment surveys and DCC operation are anticipated to be minor and insignificant compared to ongoing activities in the vicinity of the proposed OCS blocks. The maximum expected air and greenhouse gas emissions during construction are provided in a tabular format in Section 2.8.1.1.

2.10 Expected Noise and In-water Acoustic Levels

Pile driving activities will likely result in sound levels peaking conservatively at 210 dB re 1 μPa RMS dB in close proximity to the construction activity, with sound predominately being generated at frequencies in the range of 100 to 1,000 Hz. Estimating offshore pile driving source and received levels and effective underwater sound attenuation rates is complex due to site-specific and operational variables. Sound pressure levels are dependent on several factors including water column depth, benthic sediment composition, bathymetric profile and pile diameter. The proposed DCC platform will be comprised of a tri-pile design with each pile measuring 36 in diameter. If the source level (SL) is 210 dB re 1 μPa at 1 m, then using the equation for spherical spreading, the received levels (RLs) of 180 dB, 160 dB and 120 dB will likely be measured at 32 m (105 ft), 320 m (1,050 ft), and 32,000 m (104,987 ft), respectively, after attenuation given normal oceanographic and environmental conditions. Once site specific oceanographic and environmental data is collected, the variables mentioned above will be used to recalculate these values.

2.11 List of Solid and Liquid Wastes

Section 2.8.2 gives information on the projected liquid and solid wastes generated during the DCC construction phase. As previously stated, all waste will be held on vessels and disposed of at an appropriately permitted facility onshore.

2.12 Measures for Avoiding, Minimizing, Reducing, and Eliminating Environmental Impacts

Table 2-14 summarizes the potential impacts resulting from the site assessment surveys, construction, operation, and decommissioning of the proposed DCC. Measures that may be taken to mitigate these impacts are presented throughout this application and are also summarized in this table for convenient reference. Overall, the impacts resulting from the DCC Project are expected to have minor and temporary effects on environmental resources.

2.13 Decommissioning and Site Clearance Procedures

Decommissioning of the DCC is contingent upon the nature of site specific wind resource data and many related business decisions that may lead to next steps such as technology testing and deployment. If site specific wind resource data support technology testing, Southern Company may apply to BOEMRE to engage in those activities with continuing DCC maintenance and operation.

If site specific wind resource data do not support further wind power generation technology testing and deployment, Southern Company would like to retain the option of transferring the Lease to a qualified state, federal or local entity for continuing offshore data collection and/or research. Any effort to keep the DCC in long term service, undertake or transferring the Lease with ownership and operational responsibilities to a third party would be in close consultation with BOEMRE in compliance with all applicable laws and regulations. In addition, depending on site characteristics and the environmental impacts of full decommissioning, some measure of decommissioning-in-place may be proposed.

Should the DCC be decommissioned prior to lease expiration, Southern Company will submit a decommissioning plan to BOEMRE for approval before any decommissioning operations are anticipated to commence. Under such circumstances, Southern Company would remove the DCC and associated equipment, and to the extent possible, return the area to its pre-existing condition. As part of the decommissioning phase, support piles and scour protection systems would likely be removed to below the mudline according to BOEMRE requirements. Each pile would be cut by a high pressure water jet cutting tool deployed on the interior of each pile. Sand that will be forced into the hollow pile during installation into the seabed would then be removed from the pilings; however, Southern Company may propose to decommission-in-place a portion of the facility, depending on environmental impacts of full decommissioning.

Table 2-14. Potential impacts to environmental resources and possible mitigation measures.

Resource	Possible Impacts			Mitigation
	Site Assessment Surveys	Construction/ Decommissioning	Operation	
Physical Oceanography and Meteorology	None	None	None	None
Bottom Sediments	Minor temporary re-suspension of sediment during geotechnical surveys (coring)	Minor temporary disturbances to sediments from pile driving during DCC installation and anchoring of construction vessels	Minor and localized scouring of the sea bottom at the DCC foundations	Utilize appropriate scour protection devices (e.g., boulder mounds and sea grass mattresses)
Shallow Hazards	None	None	None	None
Water Quality; Solid and Hazardous Wastes	Potential for accidental discharge of solid and hazardous wastes from survey vessels	Potential for accidental discharge of solid and hazardous wastes from construction vessels	Potential for accidental discharge of solid and hazardous wastes from vessels	All wastes generated during the project will be held onboard the vessels and disposed of at an onshore facility. All vessels utilized will comply with USCG rules and best management practices relating to prevention and control of oil spills. Spill kits will be available on the tower as well as all vessels.
Air Quality	Minor temporary impacts to air quality may occur from vessels and equipment operation during surveys	Minor temporary impacts to air quality may occur from construction vessels and equipment	Maintenance activities may cause minor impacts to air quality. The DCC itself will cause no impacts to air quality as all power generation will be from renewable sources (e.g., solar panels and wind turbines) and batteries.	All equipment will use ultra low sulfur diesel and be properly maintained. The closest Class 1 air quality area is 50 km (27 NM) from the proposed OCS blocks.

Table 2-14 (*continued*). Potential impacts to environmental resources and possible mitigation measures.

Resource	Possible Impacts			Mitigation
	Site Assessment Surveys	Construction/ Decommissioning	Operation	
Noise & Visual Quality	None	Minor temporary noise may be caused by diesel powered construction equipment such as the pile driver and generators.	The DCC will not emit noise. The presence of the DCC will have a minor impact on the visual quality of the immediate coastline.	Best management practices (e.g., pile caps and air curtains, ramp-up periods, safety zones, sensitive scheduling of activities) will be employed to minimize and mitigate noise generated from site assessment and pile driving activities. Lighting will be used that minimizes visibility from shore. Non-reflective paints will be used. If installed at the preferred site, the DCC will be approximately 17 km (9 NM) from the nearest shore which minimizes noise and visual impacts.
Coastal Environments and Wetlands; Terrestrial Biota	None	None	None	None
Benthic Communities	None	Minor habitat loss and turbidity from the installation of the DCC pilings and scour protection placement	None	Appropriate scour protection devices will be utilized (e.g., boulder mounds and sea grass mattresses) to reduce habitat loss.
Coastal and Marine Birds; Bats	None	Minor temporary obstruction of flight pathways from pile driving and crane operations	Minimal potential of bird collisions with the DCC structure. Minimal potential for perching or nesting.	Anti perching devices may be utilized such as mesh netting. Where feasible, low intensity lighting will be utilized.

Table 2-14 (*continued*). Potential impacts to environmental resources and possible mitigation measures.

Resource	Possible Impacts			Mitigation
	Site Assessment Surveys	**Construction/ Decommissioning**	**Operation**	
Fish and Essential Fish Habitat	None	The minor, temporary noise generated by the short pile driving duration and the temporary resuspension of sediment may cause fish to vacate or avoid the area temporarily. Accidental fuel spills can negatively affect fish and other aquatic animals.	None	A spill management plan will be implemented. All vessels will comply with USCG rules and best management practices related to prevention and control of spills. No significant impacts to fish are expected from these minor, temporary disturbances.
Sea Turtles	There is a low potential for direct impacts due to vessel strikes during site assessment activities	Ingestion of accidental discharge of waste. Noise caused by construction activities may cause turtles to temporarily move out of the area. Low potential for vessel strikes.	None	Observers will be employed to watch for sea turtles which will help to minimize the risk of a vessel strikes. No significant impacts are expected.
Marine Mammals	There is a low potential for direct impacts due to vessel strikes during site assessment activities. Small potential for impacts from acoustic site characterization equipment.	Low potential for vessel strikes. Potential for impacts from noise generated from construction activities, specifically pile driving.	Low potential for vessel strikes from maintenance vessels.	A 500-m (4,921-ft) exclusion zone will be visually monitored by trained observers during G & G surveys as well as construction activities. Acoustic monitoring may be used in addition to visual monitoring. Construction and survey activities will cease if marine mammals enter the exclusion zone. Surveys and construction activity will occur only during daylight hours and under favorable weather conditions to facilitate the observation of the exclusion zone. Bubble screens may be utilized to mitigate noise during pile driving. Sound pressure levels will be monitored during pile driving. Marine mammal acoustical monitoring may also be conducted. Vessel speed restrictions will be utilized throughout the construction zone.

Table 2-14 (*continued*). Potential impacts to environmental resources and possible mitigation measures.

Resource	Possible Impacts			Mitigation
	Site Assessment Surveys	Construction/ Decommissioning	Operation	
Commercial Fisheries	None	None	None	The preferred alternative DCC site has been carefully chosen to avoid sensitive fish habitats and live bottom areas.
Recreational Resources	None	None	None	None
OCS and Coastal Infrastructure	None	None	None	None
Land Use Patterns	None	None	None	None
Archaeological Resources	None	None	None	If archaeological resources are discovered during site assessment surveys, all seafloor-disturbing activities will be stopped and BOEMRE will be notified. The DCC site will be moved appropriately and in consultation with BOEMRE to avoid the resource.
Competing Use of State Waters and OCS	None	None	None	None
Demographic Patterns and Employment	None	None	None	None

2.14 Other Information

This section serves as a place holder for any addition information as required by BOEMRE to accept this application.

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Appendix A

Proposed Vessels and Anchoring Patterns

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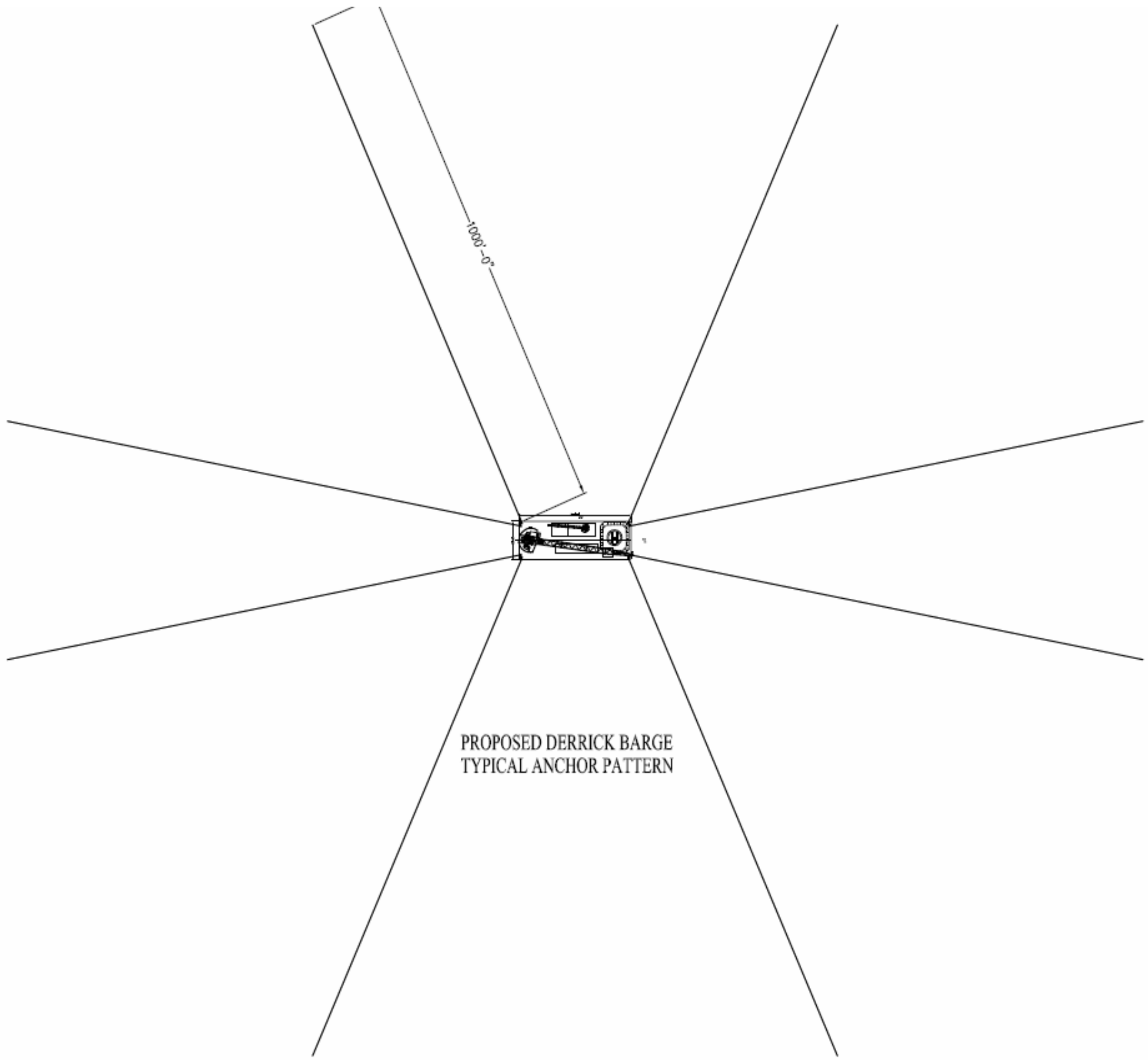
Derrick Barge with Crane

Supporting Tug

Proposed Derrick Barge Anchor Pattern



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Appendix B

Seabirds Potentially Occurring in the South Atlantic Bight

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Table B-1. Seabirds Potentially Occurring In the South Atlantic Bight Jacksonville Operating Areas.

Family and Scientific Name	Common Name
Alcidae	
Alca torda	Razorbill
Alle alle	Dovekie
Uria lomvia	Thick-billed Murre
Diomedeidae	
Thalassarche chlororhynchos	Yellow-nosed Albatross
Fregatidae	
Fregata magnificens	Magnificent Frigatebird
Gaviidae	
Gavia immer	Common Loon
Hydrobatidae	
Oceanites oceanicus	Wilson's Storm-petrel
Oceanodroma castro	Band-rumped Storm-petrel
Oceanodroma leucorhoa	Leach's Storm-petrel
Laridae	
Anous stolidus	Brown Noddy
Larus argentatus	Herring Gull
Larus atricilla	Laughing Gull
Larus delawarensis	Ring-billed Gull
Larus fuscus	Lesser black-backed Gull
Larus glaucoides	Iceland Gull
Larus hyperboreous	Glaucous Gull
Larus minutus	Little Gull
Larus ridibundus	Black-headed Gull
Larus thayeri	Thayer's Gull
Larus philadelphia	Bonaparte's Gull
Rissa tridactyla	Black-legged Kittiwake
Stercorarius maccormicki	South polar Skua
Sterna anaethetus	Bridled Tern
Sterna antillarum	Least Tern[1]
Sterna caspia	Caspian Tern
Sterna dougallii	Roseate Tern[2]
Sterna forsteri	Forster's Tern
Sterna fuscata	Sooty Tern
Sterna hirundo	Common Tern
Sterna maxima	Royal Tern
Sterna nilotica	Gull-billed Tern
Sterna sandvicensis	Sandwich Tern

Table B-1 (*continued*). Seabirds Potentially Occurring In the South Atlantic Bight Jacksonville Operating Areas.

Family and Scientific Name	Common Name
Pelecanidae	
Pelecanus erythroryhyncos	American White Pelican
Pelecanus occidentalis	Brown Pelican
Phaethontidae	
Phaethon aethereus	Red-billed Tropicbird
Phaethon lepturus	White-tailed Tropicbird
Phalacrocoracidae	
Phalacrocorax auritus	Double-crested Cormorant
Phalacrocorax carbo	Great Cormorant
Procellariidae	
Calonectris diomedea	Cory’s Shearwater
Fulmarus glacialis	Northern Fulmar
Pterodroma feae	Fea’s Petrel
Pterodroma hasitata	Black-capped Petrel
Puffinus gravis	Greater Shearwater
Puffinus griseus	Sooty Shearwater
Puffinus lherminieri	Audubon’s Shearwater
Puffinus puffinus	Manx Shearwater
Scolopacidae	
Phalaropus fulicarius	Red Phalarope
Phalaropus lobatus	Red-necked Phalarope
Sulidae	
Sula dactylatra	Masked Booby
Sula leucogaster	Brown Booby
Stercorariidae	
Stercorarius parasiticus	Parasitic Jaeger
Stercorarius longicaudus	Long-tailed Jaeger
Stercorarius pomarinus	Pomarine Jaeger

Source: DoN, 2009b

[1] Least tern is federally listed as endangered on the U.S. West coast and interior rivers.

[2] Northeast breeding population of the roseate tern is federally listed as endangered. Listed as threatened in other areas.

Appendix C

Essential Fish Habitat

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Table C-1. Management units (MU) and managed species with designated Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) within the OCS blocks by management agency, lifestage (E = egg, L = larva, J = juvenile, A = adult, S = spawning adult, N = neonate, All = all lifestages), fisheries stock status, and International Union for Conservation Nature (IUCN) Red List designation. Taxonomy follows Nelson et al. (2004) for fish and Turgeon et al. (1998) for mollusks.

Management Council/Unit and Managed Species	EFH/HAPC Lifestage	NMFS Fisheries Stock Status	IUCN Red List Designation
Mid-Atlantic Fishery Management Council (MAFMC)			
Bluefish MU[1]			
Bluefish (*Pomatomus saltrix*)	All		
Spiny Dogfish MU[2]			
Spiny dogfish (*Squalus acanthias*)	J, A		
Summer Flounder, Scup, and Black Sea Bass MU[1]			
Summer Flounder (*Paralichthys denotatus*)	All		
South Atlantic Fishery Management Council (SAFMC)			
Calico Scallop MU			
Atlantic calico scallop (*Aglopecten gibbus*)	All		
Coastal Migratory Pelagics MU[3]			
Cobia (*Rachycentron canadum*)	All/HAPC		
King mackerel (*Scomberomorus cavalla*)	All/HAPC		
Spanish mackerel (*Scomberomorus maculatus*)	All/HAPC		
Coral, Coral Reefs, and Live/Hard Bottom Habitat MU			
Corals (Hydrozoa and Anthozoa)	All		
Red Drum MU[4]			
Red drum (*Sciaenops ocellatus*)	A		
Shrimp MU			
Brown shrimp (*Farfantepenaeus aztecus*)	E, L, A		
Pink shrimp (*Farfantepenaeus duorarum*)	E, L, A	Overfished	
White shrimp (*Litopenaeus setiferus*)	E, L, A		
Snapper Grouper Complex MU			
Sea basses and Groupers (*Serranidae*)			
Goliath grouper (*Epinephelus itajara*)	HAPC		Critically Endangered

Table C-1 (*continued*). Management units (MU) and managed species with designated Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) within the OCS blocks by management agency, lifestage (E = egg, L = larva, J = juvenile, A = adult, S = spawning adult, N = neonate, All = all lifestages), fisheries stock status, and IUCN Red List designation. Taxonomy follows Nelson et al. (2004) for fish and Turgeon et al. (1998) for mollusks.

Management Council/Unit and Managed Species	EFH/HAPC Lifestage	NMFS Fisheries Stock Status	IUCN Red List Designation
South Atlantic Fishery Management Council (SAFMC)			
Snapper Grouper Complex MU			
Scamp (Mycteroperca phenax)	All/HAPC		Least Concern
Snowy grouper (*Epinephelus niveatus*)	All/HAPC	Overfished & Subject to Overfishing	Vulnerable
Speckled hind (*Epinephelus drummondhayi*)	All/HAPC	Subject to Overfishing	Critically Endangered
Warsaw grouper (*Epinephelus nigritus*)	All/HAPC		Critically Endangered
Yellowedge grouper (*Epinephelus flavolimbatus*)	E, L/HAPC		Vulnerable
Wreckfish (Polyprionidae)			
Wreckfish (*Polyprion americanus*)	All/HAPC		Data Deficient
Snappers (Lutjanidae)			
Blackfin snapper (*Lutjanus buccanella*)	All/HAPC		
Gray snapper (*Lutjanus griseus*)	All/HAPC		
Mutton snapper (*Lutjanus analis*)	HAPC		Vulnerable
Red snapper (*Lutjanus campechanus*)	All/HAPC	Overfished	
Silk snapper (*Lutjanus vivanus*)	All/HAPC		
Vermillion snapper (*Rhomboplites aurorubens*)	All/HAPC	Subject to Overfishing	
Porgies (Sparidae)			
Red porgy (*Pagrus pagrus*)	All/HAPC	Overfished	Endangered
Grunts (Haemulidae)			
White grunt (*Haemulon plumieri*)	All/HAPC		
Jacks (Carangidae)			
Greater amberjack (Seriola dumerili)	All/HAPC		
Tilefishes (Malacanthidae)			
Blueline tilefish (Caulolatilus microps)	All/HAPC		
Tilefish (Lopholatilus chamaeleonticeps)	All/HAPC		

Table C-1 (*continued*). Management units (MU) and managed species with designated Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) within the OCS blocks by management agency, lifestage (E = egg, L = larva, J = juvenile, A = adult, S = spawning adult, N = neonate, All = all lifestages), fisheries stock status, and IUCN Red List designation. Taxonomy follows Nelson et al. (2004) for fish and Turgeon et al. (1998) for mollusks.

Management Council/Unit and Managed Species	EFH/HAPC Lifestage	NMFS Fisheries Stock Status	IUCN Red List Designation
South Atlantic Fishery Management Council (SAFMC)			
Spiny Lobster MU[3]			
Caribbean spiny lobster (*Panulirus argus*)	All		
Rigged slipper lobster (*Scyllarides notifer*)	All		
National Marine Fisheries Service (NMFS)			
Large Coastal Sharks MU			
Blacktip shark (*Carcharhinus limbatus*)	All		Vulnerable
Bull shark (*Carcharhinus leucas*)	J		Near Threatened
Sandbar shark (*Carcharhinus plumbeus*)	N, J	Overfished & Subject to Overfishing	
Scalloped hammerhead shark (*Sphyrna lewini*)	All		
Great hammerhead shark (*Sphyrna mokarran*)	All		
Spinner shark (*Carcharhinus brevipinna*)	J		Vulnerable
Tiger shark (*Galeocerdo cuvier*)	All		Near Threatened
Small Coastal Sharks MU			
Atlantic sharpnose shark (*Rhizopriondon terraenovae*)	All		Least Concern
Blacknose shark (*Carcharhinus acronotus*)	J, A	Overfished & Subject to Overfishing	Near Threatened
Bonnethead shark (*Sphyrna tiburo*)	All		Least Concern
Finetooth shark (*Carcharhinus isodon*)	All		
Prohibited Species MU			
Dusky shark (*Carcharhinus obscurus*)	J, A	Overfished & Subject to Overfishing	
White shark (*Carcharodon carcharias*)	All		Vulnerable

[1] Jointly managed by the MAFMC and the ASMFC
[2] Jointly managed by the MAFMC (lead), the NEFMC (New England Fishery Management Council), and the ASMFC
[3] Jointly managed by the SAFMC (lead) and the GMFMC (Gulf of Mexico Fishery Management Council)
[4] Managed by the ASMFC

References: NMFS (2010e) and IUCN (2010)

Table C-2. Atlantic coastal fishes managed under the ASMFC Interstate Fishery Management Plans (IFMPs) (ASMFC 2009). Taxonomy follows Nelson et al. (2004) for fishes and McLaughlin et al. (2005) for crustaceans.

American eel (*Anguilla rsotrata*)	Shad and River herring
American lobster (*Homarus americanus*)[1]	American shad (*Alosa sapidissima*)
Atlantic croaker (*Micropogonias undulatus*)	Hickory shad (*Alosa mediocris*)
Atlantic herring (*Clupea harengus*)[1]	Alewife (*Alosa pseudoharengus*)
Atlantic menhaden (*Brevoortia tyrannus*)	Blueback herring (*Alosa aestivalis*)
Atlantic striped bass (*Morone saxatilis*)	
Atlantic sturgeon (*Acipenser oxyrhynchus*)	Spanish mackerel (*Scomberomorus maculates*)[3]
Black sea bass (*Centropristis striata*)[2]	Spiny dogfish (*Squalus acanthias*)[3]/Coastal sharks[4]
Bluefish (*Pomatomus saltatrix*)[3]	Spot (*Leiostomus xanthurus*)
Horseshoe crab (*Limulus polyphemus*)	Spotted seatrout (*Cynoscion nebulosus*)
Northern shrimp (*Pandalus borealis*)[1]	Summer flounder (*Paralichthys dentatus*)[3]
Red drum (*Sciaenops ocellatus*)[3]	Tautog (*Tautog onitis*)
Scup (*Stenotomus chrysops*)[2]	Weakfish (*Cynoscion regalis*)
	Winter flounder (*Pseudopleuronectes americanus*)[1]

[1] Not found in Georgia state waters
[2] EFH species part of snapper grouper complex MU; black sea bass is currently list as overfished
[3] EFH species
[4] **Table C-3** lists managed ISFMP Atlantic shark species

Table C-3. Atlantic coastal sharks managed under ASMFC ISFMP (Dahlberg 1972, 1975; Kohler et al. 1998; ASMFC 2008). Taxonomy follows Nelson et al. (2004) for fishes.

Atlantic angel (*Squatina dumeril*)	Longfin mako (*Isurus paucus*)
Atlantic sharpnose (*Rhizoprionodon terraenovae*)[1]	Narrowtooth (*Carcharhinus brachyurus*)
Basking (*Cetorhinus maximus*)	Night (*Carcharhinus signatus*)
Bigeye sand tiger (*Odontaspis noronhai*)	Nurse (*Ginglymostoma cirratum*)[2]
Bigeye sixgill (*Hexanchus nakamuri*)	Oceanic whitetip (*Carcharhinus longimanus*)
Bigeye thresher (*Alopias supercilious*)[2]	Porbeagle (*Lamna nasus*)
Bignose (*Carcharhinus altimus*)	Reef (*Carcarhinus perezii*)
Blacknose (*Carcharhinus acronotus*)[1]	Sand tiger (*Carcharias taurus*)[2]
Blacktip (*Carcharhinus limbatus*)[1]	Sandbar (*Carcarhinus plumbeus*)[1]
Blue (*Prionace glauca*)	Scalloped hammerhead (*Shpyrna lewini*)[1]
Bluntnose sixgill (*Hexanchus griseus*)	Sharpnose sevengill (*Heptranchias perlo*)
Bonnethead (*Sphyrna tiburo*)[1]	Shortfin mako (*Isurus oxyrinchus*)
Bull (*Carcharhinus leucas*)[1]	Silky (*Carcarhinus falciformis*)[2]
Caribbean sharpnose (*Rhizoprionodon porosus*)	Smalltail (*Carcharhinus porosus*)
Common thresher (*Alopias vulpinus*)	Smooth dogfish (*Mustelus canis*)[1]
Dusky (*Carcharhinus obscurus*)[1]	Smooth hammerhead (*Sphyrna zygaena*)[2]
Galapagos (*Carcharhinus galapagensis*)	Spinner (*Carcharhinus brevipinna*)[1]
Great hammerhead (*Sphyrna mokarran*)[1]	Tiger (*Galeocerdo cuvier*)[1]
Finetooth (*Carcharhinus isodon*)[1]	Whale (*Rhincodon typus*)
Lemon (*Negaprion brevirostris*)[2]	White (*Carcharodon carcharias*)[1]

[1]Atlantic coastal sharks with EFH designation in the study area
[2]Atlantic coastal sharks without EFH designation that have been reported in Georgia State waters