FINAL
ENVIRONMENTAL ASSESSMENT FOR BEACH SHORELINE PROTECTION AT PATRICK AIR FORCE BASE, FLORIDA

United States Air Force, 45th Space Wing
PAFB, FL.

Cooperating agency: U.S. Department of the Interior,
Bureau of Ocean Energy Management

FINDING OF NO SIGNIFICANT IMPACT (FONSI)
AND FINDING OF NO PRACTICABLE ALTERNATIVE (FONPA)

Beach Shoreline Protection
Patrick Air Force Base, Florida

Pursuant to the provisions of the National Environmental Policy Act (NEPA), 42 U.S. Code 4321 *et seq*, implementing Council on Environmental Quality Regulations, 40 Code of Federal Regulations (CFR) Parts 1500-1508, and CFR Part 989, *Environmental Impact Analysis Process* (EIAP), the United States Air Force (AF) 45th Space Wing (45 SW) with the cooperating agency of the United States Bureau of Ocean Energy Management (BOEM), previously known as the Mineral Management Service (MMS), conducted an assessment of the potential environmental consequences of the Proposed Action to dredge sand from an offshore source within the Canaveral Shoals Borrow Area (CS I and II), pump/truck and place sand at Patrick Air Force Base (PAFB) from the offshore site as well as the Cape Canaveral Air Force Station (CCAFS) upland/beach borrow area, in order to perform coastal shoreline protection along PAFB beaches. The Environmental Assessment (EA), *Beach Shoreline Protection*, *Patrick Air Force Base (PAFB), FL*, attached to this finding, considers the potential impacts of the Proposed Action on the natural and human environments. The following EAs contributed to the analysis and conclusions pertaining to this FONSI: *Environmental Assessment for Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals in the Brevard County (South Reach) Shore Protection Project* (at Appendix A); the *South Reach EA* is a supplement to two prior documents, the MMS/US Army Corps of Engineers (USACE) *Environmental Assessment, Issuance of a Non-competitive Lease for Canaveral Shoals II*, and the USACE *Environmental Assessment Brevard County Shore Protection Project Modifications: Borrow Area I and Borrow Area II*; all three of these documents were tiered off of the USACE *Brevard County Shore Protection Feasibility and Environmental Impact Statement (EIS*) (1996); *Development of a Borrow Source at Cape Canaveral Air Force Station, FL*. These NEPA documents are referenced, and pursuant to 40 CFR 1506 and 43 CFR 46 are deemed valid. The BOEM, as a cooperating agency and authority over the OCS sand borrow shoals, has reviewed this EA and analyses referenced therein, and determined that the potential impacts of the Proposed Action have been adequately addressed.

Proposed Action and Alternatives: The Proposed Action specifically involves obtaining a negotiated agreement with the BOEM to dredge within the Outer Continental Shelf (OCS) Canaveral Shoals (CS II), and pump and truck beach compatible sand along PAFB beaches. Should borrow sand also be necessary within Canaveral Shoals I (CS I), the 45 SW has coordinated with the Federal Department of Environmental Protection (FDEP) and obtained an easement. Sand from the CCAFS borrow site may also be trucked to PAFB based on beach/dune profile surveys that will determine the volume of material necessary.

Under the No Action Alternative, the lease with BOEM for use of OCS Canaveral Shoals offshore sand would not occur, fill would not be dredged or placed on PAFB, and the CCAFS borrow site would not be used, resulting in the continuation of a sand deficient PAFB beach/dune complex

Summary of Findings: The analyses of the affected environment and environmental consequences implementing the Proposed Action presented in the attached EA concluded that no significant adverse effects will result. No significant adverse cumulative impacts will result from activities associated with the project, when considered in conjunction with recent, past, and future projects within the project area.

Four areas of environmental consequences evaluated in the EA were determined to have the potential to result in minor impacts.

Air Quality: Proposed project activities would be expected to result in short-term, intermittent, insignificant air quality impacts from fugitive emissions (particulate matter) and other common air pollutants (nitrogen oxides, carbon monoxide, and sulfur dioxide) during in-water and construction activities from project equipment, vehicles, and ships.

Biological Resources: Federally protected sea turtles, more specifically loggerhead, Kemp's ridley and/or green species that may be in the dredge locations (CS I & II) may be adversely affected as acknowledged by the NMFS Protected Resources Division (PRD) Biological Opinion (BO) issued to PAFB on 30 April 2010 (Appendix B). Nesting sea turtles may also be adversely impacted as acknowledged by the United States Fish and Wildlife Service (USFWS) BO issued on 2 June 2009 (Appendix C). Per both the NMFS PRD and

USFWS PAFB BOs', incidental take was issued for sea turtles with acknowledgment that jeopardy to the species was not anticipated provided all 'Terms and Conditions' are followed. North Atlantic right and humpback whales, manatee, smalltooth sawfish, and migratory birds may be intermittently disturbed if they happen to be traveling through, foraging/feeding or resting in near CS I & II or PAFB project areas, however, no significant impacts are anticipated to these species with implementation of avoidance and impact minimization measures.

Essential Fish Habitat (EFH), protected under the Magnuson-Stevens Act, under the purview of the NMFS Habitat Conservation Division (HCD) will not be significantly impacted by the PAFB project.

Modifications in the 100-year floodplain and jurisdictional waters of the United States (under Section 10 of the Rivers and Harbors Act and Section 103 and 404 of the Clean Water Act) are necessary for beach shoreline protection. Mitigation for wetland impacts is not required as impacts are considered temporary with re-establishment of biota after sand stabilization, and with protection of the wetland area with buffers at the CCAFS borrow site.

Cultural Resources: As stated by the Florida State Division of Historical Resources/ State Historic Preservation Office (DHR/SHPO), the contractor will be made aware of existing delineated submerged resources, and should any unexpected discoveries of prehistoric or historic artifacts be encountered within the project area, all activities involving subsurface disturbances will cease in the immediate vicinity of such discoveries until their office has cleared. Therefore, no significant impacts to cultural resources are anticipated.

Occupational Safety and Health: Various health and safety hazards associated with heavy equipment operation and vehicular traffic exist. Some minor increases in noise are expected during operations as described in the EA (Section 4.8), however, the offshore location and construction avoidance zones on the beach will result in insignificant impacts to the public.

Mitigations: The NMFS PRD BO (NMFS F/SER/2009/03376), NMFS HCD CRs (F/SER4:GG/pw), and USFWS BO (FWS 41910-2009-F-0336) found at Appendices B, C and D of this EA describe the mitigations associated with the proposed action. These mitigations are also found in Section 4.3 of the attached EA. These mitigations are necessary to reach a determination than an EIS is not required. We have incorporated many of these mitigations into the proposed action as described in Chapter 2 of the attached EA. For the other mitigations, we commit to performing them before proposed action commences. All regulatory agencies through issuance of avoidance, minimization, and mitigation requirements have concurred that the proposed action will not jeopardize the continued existence of Federally listed species nor will result in significant adverse effect to fisheries resources. The Florida Department of Environmental Protection has issued the Consolidated Joint Coastal Permit (JCP) and Sovereign Submerged Land Authorization which authorized the proposed action with adherence to associated terms and conditions that follow Federal regulatory mitigation measures (see Section 4.3).

Practicable Alternatives: This FONSI/FONPA with associated documentation was made available to the affected public for a 30-day public comment period by placement on file in the local public libraries, Satellite Beach and Cape Canaveral, through advertisement placed in the *Florida Today*. No comments were received.

Executive Order (EO) 11988, *Floodplain Management*, directs each federal agency to provide leadership and take action to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for federally undertaken construction and improvement projects. If a project requires siting in a floodplain, the agency must design or modify its action to minimize potential harm to or within the floodplain, consistent with regulations issued in accordance with Section 2(d) of EO 11988. This FONSI/FONPA meets the requirement in the EO to circulate a notice containing an explanation of why the action is proposed to be located in the 100-year floodplain, prior to taking the action. EO 11990, *Protection of Wetlands*, directs each federal agency to provide leadership and take action to minimize destruction, loss or degradation of wetlands. This project will create insignificant, temporary wetland impacts.

No other practicable alternatives exist to construction activities within wetlands. Beach shoreline restoration necessitates activity within the 100-year floodplain and marine wetlands/regulated jurisdictional waters. The Proposed Action, by its nature and carefully engineered design, is enhancing the natural attributes within the flood zone by re-building the beach/dune profiles and slopes/elevations. Shoreline/beach/dune restoration re-stabilizes this environment that has become unbalanced due to varying degrees of storm erosion. No other more environmentally preferable alternative was identified that would meet the purpose and need.

Finding of No Practicable Alternative

Based upon my review of the facts and analyses contained in the attached EA, and pursuant to Executive Orders 11990 and 11988, the authority delegated by SAFO 780-1, and 32 CFR Part 989, I find that there are no practicable alternatives to this action that will occur in the 100-year floodplain and within wetlands/regulated jurisdictional waters, and that all practicable measures will be taken to minimize harm to wetlands and minimize potential harm to or within the floodplain.

Finding of No Significant Impact

Based upon my review of the facts and analyses contained in the attached EA, conducted in accordance with the provisions of NEPA, the CEQ Regulations, and 32 CFR 989, and with the proviso that all mitigations noted above will be undertaken, I conclude that the Proposed Action will not have a significant environmental impact, either by itself or cumulatively with other ongoing projects at PAFB, will not involve an element of high risk or uncertainty on the human environment, and its effects on the quality of the human environment are not highly controversial. Accordingly, an Environmental Impact Statement is not required. The signing of this FONSI/FONPA completes the environmental impact analysis process.

Joseph H Schwarz

JOSEPH H. SCHWARZ, Colonel, USAF
Deputy Director for Installations
and Mission Support

27 Feb 2012

Date

Acronyms and Abbreviations

AF	Air Force
AICUZ	Air Installation Compatible Use Zone
BCSPP	Brevard County Shore Protection Project
BOEM	Bureau of Ocean Energy Management
BMPs	Best Management Practices
BO	Biological Opinion
CCAFS	Cape Canaveral Air Force Station
CEQ	Council on Environmental Quality
45 CES/CEAN	45 Civil Engineering Squadron, Environmental Quality
45 CES/CEAO	45 Civil Engineering Squadron, Asset Optimization
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CRs	Conservation Recommendations
CRM	Cultural Resource Manager (45 SW)
CS	Canaveral Shoals (I/II)
CWA	Clean Water Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
dB	decibel
DoD	Department of Defense
DHR/SHPO	Department of Historical Resources/State Historic Preservation Office
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIAP	Environmental Impact Analysis Process
EO	Executive Order
EPA	Environmental Protection Agency
ERP	Environmental Resource Permit
ESA	Endangered Species Act
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FONPA	Finding of No Practicable Alternative
FONSI	Finding of No Significant Impact
HAPs	Hazardous Air Pollutants
HAZMAT	Hazardous Materials
HCD	Habitat Conservation Division (NMFS)
HUD	Housing and Urban Development
LMP	Light Management Plan
MBTA	Migratory Bird Treaty Act
MSDS	Material Safety Data Sheet
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NMFS	National Marine Fisheries Service

NPDES	National Pollutant Discharge Elimination System
NR	North Reach
NRHP	National Register of Historic Places
NOx	Nitrogen Oxides
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NTUs	Nephelometric Turbidity Units
O_3	Ozone
OCS	Outer Continental Shelf
ODC	Ozone Depleting Chemical
OSHA	Occupational Safety and Health Administration
PAFB	Patrick Air Force Base
PM	Particulate Matter
PPE	Personal Protective Equipment
PRD	Protected Resources Division (NMFS)
PTE	Potential to emit
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
SAFMC	South Atlantic Fishery Management Council
SEIS	Supplemental Environmental Impact Statement
SO_2	Sulfur Dioxide
SR	South Reach
SRA1A	State Route A1A
SSC	Species of Special Concern
45 SW	45th Space Wing
T&E	Threatened and Endangered
tpy	Tons per year
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

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Appendix B: Consultation with U.S. National Marine Fisheries Service, Protected Resources Division, Biological Opinion, PAFB Shoreline Restoration Project, FL

Appendix C: Consultation with U.S. Fish and Wildlife Service, Biological Opinion, PAFB Shoreline Restoration Project, FL

Appendix D: Consultation with U.S. National Marine Fisheries Service, Habitat Conservation Division, Conservation Recommendations and Correspondence, PAFB Shoreline Restoration Project, FL

Appendix E: Nearshore Rock Exposure Data Analysis Memorandum from Olsen Associates, Inc., to the 45 SW, Air Force, PAFB Shoreline Restoration Project, FL

Appendix F: Consultation with Department of Historic Resources/ State Historic Preservation Office, PAFB Shoreline Restoration Project, FL

1.0 PURPOSE AND NEED FOR ACTION

This Environmental Assessment (EA) has been prepared in accordance with the requirements of the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations, *Environmental Impact Analysis Process*, as promulgated in Title 32 of the Code of Federal Regulations (CFR) Part 989, and Department of Defense (DoD) Directive 6050. The EA evaluates the potential environmental consequences associated with the proposal to obtain a negotiated agreement with the Bureau of Ocean Energy Management (BOEM) to dredge within the Outer Continental Shelf (OCS) Canaveral Shoals (CS II), and pump, as well as truck from the Cape Canaveral Air Force Station (CCAFS) upland beach borrow area, beach compatible sand to restore and stabilize the coastal shoreline at Patrick Air Force Base (PAFB), Florida. Should borrow sand also be necessary within Canaveral Shoals I (CS I), the 45 SW would continue to coordinate with the Federal Department of Environmental Protection (FDEP) as this borrow area falls under Florida jurisdiction being located less than three nautical miles offshore (an easement has been obtained).

Chapter 1.0 of this EA describes the background and the purpose of and need for the Proposed Action. A description of the Proposed Action and Alternatives, including the No Action Alternative, is provided in Chapter 2.0. Chapter 3.0 describes the existing conditions of specified environmental resources that could be affected by implementation of the Proposed Action and alternatives. Chapter 4.0 addresses how those resources might be affected by implementation of the Proposed Action and alternatives.

1.1 Background and Location

Located on a barrier island on the east-central coast of Florida, south of the City of Cocoa Beach, PAFB covers approximately 1,937 acres bounded by the Atlantic Ocean on the east and the Banana River on the west. There is little topographic relief across PAFB, with elevations from 0 to 6.1 meters above mean sea level; the highest natural elevation corresponding to sand dunes along the Atlantic Ocean. From the dunes, the site gently slopes northwest toward the Banana River shoreline. State Road (SR) A1A, runs north-south bisecting the eastern side of PAFB and is the primary access artery of the base. Most of PAFB is west of SRA1A and developed. The coastal area has remained relatively undeveloped. The Archie Carr National Wildlife Refuge several miles to the south, and federally owned lands (CCAFS, Kennedy Space Center, and Canaveral National Seashore) several miles to the north are considered “natural” areas.

PAFB is currently the home of 45 SW Headquarters, and its mission includes the responsibilities for safety, planning, engineering support services, scheduling, test operations, launch and range operations, directing or supporting operations, test results evaluation, and providing similar support to other Department of Defense (DoD) and non-DoD programs. The PAFB shoreline protection project includes the 4.2 miles of beach/dune face along the Atlantic Ocean. CS I & II are approximately twelve (12) miles north of PAFB and roughly two to five miles offshore with CCAFS being the nearest land mass. Canaveral Shoals I water depths range from -8 to -17 feet, mean low water (MLW), while Canaveral Shoals II range from -10 to -46 feet MLW. Refer below to Figure 1-1 for locations of PAFB, CCAFS, CS I & II, and the South Reach.

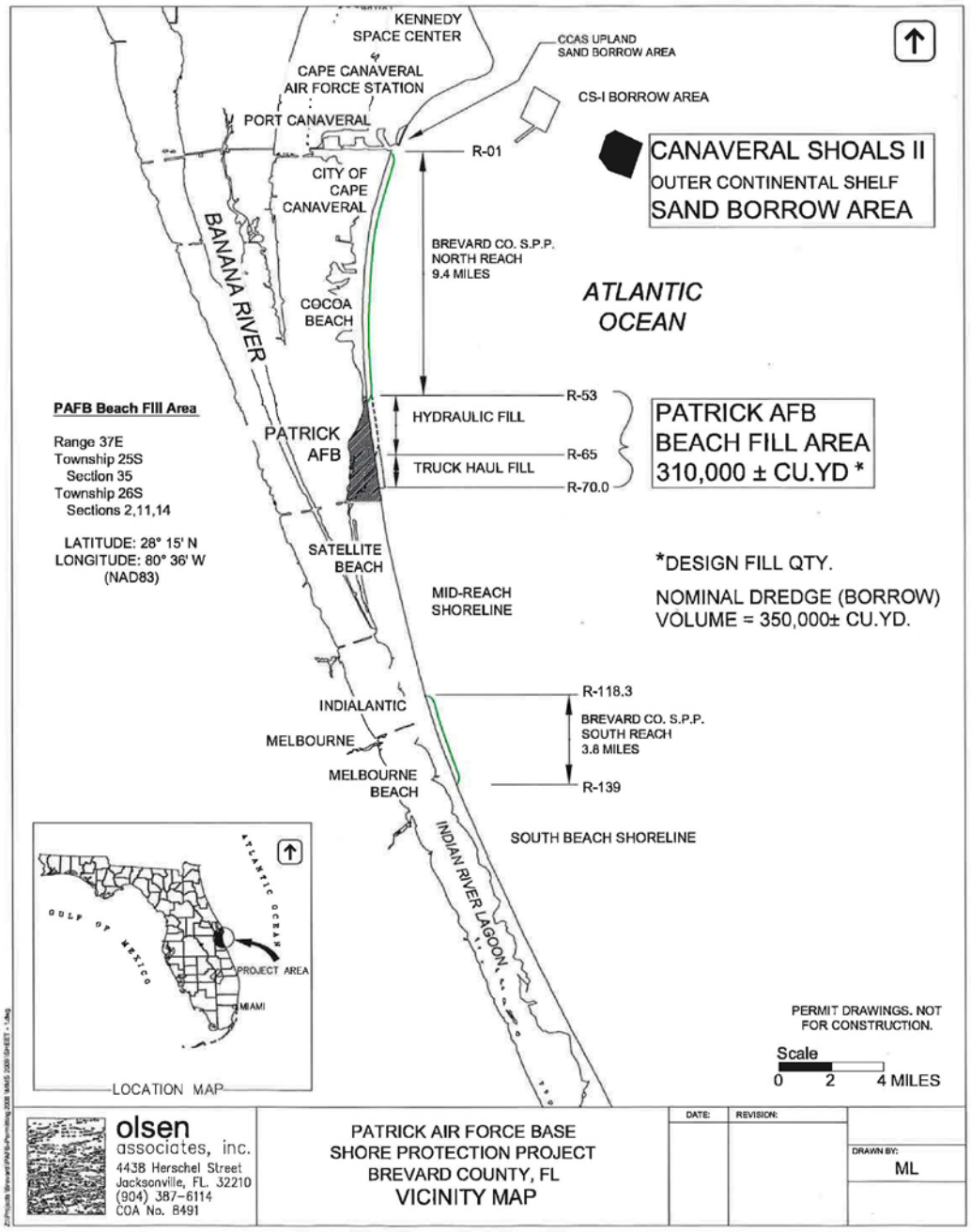

FIGURE 1-1: LOCATION MAP FOR PAFB, CCAFS, CS I & II AND SOUTH REACH SHORELINE PROTECTION PROJECTS

Historically, beach erosion along PAFB has been studied by the Army Corps of Engineers (USACE) since the late 1960s. In 1996, the USACE programmatically evaluated potential environmental effects resulting from beach restoration actions in the *Brevard County Shore Protection Feasibility and Environmental Impact Statement (EIS)*. In 1998, the USACE prepared an Environmental Assessment: Canaveral Shoals II to evaluate the potential effects of using CS II borrow area, not previously evaluated in the 1996 EIS. In 2005, the BOEM (then MMS) prepared an Environmental Assessment (EA) *Issuance of a Non-competitive Lease for Canaveral Shoals II* incorporating additional environmental information, primarily about potential impacts to physical processes and essential fish habitat through dredging actions for beach restoration. Both EAs tiered from the 1996 USACE EIS and were used to support BOEM's leasing decisions for 2002 and 2005. In 2009, a third EA (Appendix A), also tiered from the 1996 USACE EIS, was prepared by USACE and BOEM titled, *Environmental Assessment for Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals in Brevard County (South Reach) Shore Protection Project*. The 2009 USACE/BOEM EA supplemented the earlier analyses.

Beach restoration at PAFB began in the 1980s with use of borrow sediment from the Trident spoil site at CCAFS. Various projects occurred over the years, and some upland sediment (one source was in Palm Bay, FL) was used on occasion for PAFB beach/dune restoration in the 1980s/1990s. The BOEM, then MMS, authorized use of the OCS Canaveral Shoals borrow area to PAFB. Hydraulic dredging and pumping of the CS II borrow material for PAFB beaches was initially conducted in 2000/2001 after storm damage; CS II was used again by PAFB in 2005 after a destructive hurricane season in 2004. This EA is tiered from the 1996 USACE EIS and analyzes actions similar to those analyzed in the 2009 USACE/BOEM South Reach EA (located just south of PAFB), but is specific for shoreline protection/beach restoration proposed at PAFB. This EA includes new information based on research regarding potential environmental impacts of dredging and effects on protected species and habitat. Approximate maximum requirements for borrow material for the full PAFB beach/dune template are projected as 350,000 cubic yards, for a design beach fill volume of 310,000 cubic yards for the Proposed Action based on a current deficit of just under 272,000 cubic yards, of course final volume will be dependent on current profiling prior to final construction design.

1.2 Purpose and Need for Action

The purpose and need of the Proposed Action is to stabilize and restore the PAFB shoreline that has been eroded due to storm activity since 2005 in order to protect Air Force and State of Florida infrastructure. The Proposed Action involves obtaining a negotiated agreement with the BOEM to dredge within the OCS, CS II, and pump and truck beach compatible sand along PAFB beaches. Should borrow sand also be necessary within CS I, the 45 SW would coordinate with the FDEP as this borrow area falls under Florida jurisdiction being located less than three nautical miles offshore (easement obtained). Additionally, dredged material from the CS I access channel may be placed in the approved Offshore Dredged Material Disposal Site (ODMDS) or the Nearshore Disposal Area, both off of Cocoa Beach, FL, with Environmental Protection Agency and USACE approval through Section 103 of the Marine Protection, Research, and Sanctuaries Act, as required.

Should another sand source be necessary, the CCAFS borrow site may be utilized. An estimated deficit of 271,500 cubic yards of beach quality sand along PAFB beaches, as measured by beach profiling surveys conducted in December 2008, since 2005 has made subsequent restoration efforts more critical. The Proposed Action of PAFB shoreline protection entails rebuilding of the beach and dune profile by hydraulically pumping beach compatible sand/fill, dredged from either the offshore CS II and/or CS I, onto the PAFB beach according to beach profile survey results prior to project commencement but with a maximum of 350,000 cubic yards dredging for a projected 310,000 cubic yards of design beach fill. A negotiated agreement/lease is being developed with the BOEM for use of Federal offshore sand resources at CS II.

Accomplishment of the Proposed Action would stabilize the shoreline, protect Air Force and State infrastructure, enhance beach use by Florida residents and tourists, and restore beach/dune profiles which enable protected sea turtles to cue in on key elevations for successful nesting as well as provide for foraging and nesting areas for migratory birds.

The purpose of the BOEM action is to respond to the request for use of OCS under the authority granted to the Department of the Interior by the Outer Continental Shelf Lands Act (OCSLA). The proposed action is necessary because the Secretary of the Interior delegated to the BOEM the authority granted in the OCSLA to authorize the use of OCS sand resources for the purpose of shore protection and beach restoration. The BOEM action does not cause additional effects than those anticipated under the PAFB proposed action.

1.3 Scope of the Environmental Assessment

This EA evaluates the potential site-specific environmental consequences associated with the alternatives considered for the Proposed Action to restore PAFB beach and the No Action Alternative. This EA was produced using available information to the maximum extent possible. All applicable environmental data necessary was collected to describe current environmental conditions. This EA supplements and supports existing analyses and updated potential environmental effects resulting from renourishment of PAFB beach. Previous NEPA documents reviewed all affected resources (refer to Section 5, Table 5.1 for additional NEPA documents). New information was evaluated to determine if any resources and effects previously analyzed should be re-evaluated or if newly available information could potentially alter previous effect determinations. This EA elaborates on previous NEPA documents, but it does not change the conclusions of any prior analyses. Pursuant to 40 CFR 1506 and 43 CFR 46, the existing analyses and review of these documents are incorporated by reference where applicable. The following aspects were identified for analysis in this EA for PAFB beach renourishment: Air Installation Compatible Use Zone & Land Use, Air Quality, Biological and Cultural Resources, Geology and Soils, Hazardous Materials and Wastes, Infrastructure and Transportation, Occupational Safety and Health, Socioeconomics, and Water Resources.

1.4 Agencies Involved in Environmental Analysis

The Finding of No Significant Impact (FONSI)/ Finding of No Practicable Alternative (FONPA) with associated documentation was made available to the affected public for a

30-day public comment period by placement on file in the local public libraries, Satellite Beach and Cape Canaveral, through an advertisement for public review placed in the Local Section of the *Florida Today*, a locally reviewed newspaper. No public comments were received. The Florida Department of Environmental Protection (FDEP) has deemed the Proposed Action to be consistent with the Florida Coastal Management Program and its relevant goals, policies, and objectives through issuance of the Joint Coastal Permit. The NMFS PRD has concurred that the Proposed Action is not likely to jeopardize the existence of Federally listed species under their purview (Appendix B). The USFWS has concurred that the Proposed Action is not likely to jeopardize the existence of Federally listed species under their purview (Appendix C). Shoreline and seabed profiling have shown no long-term trends indicating burial/sedimentation impacts to the hardbottom/rock (Essential Fish Habitat-EFH) relative to the natural, historic variability found with this high energy nearshore environment. The NMFS HCD accepted the actions proposed by the 45 SW to implement conservation measures that document and protect EFH, and agreed with the monitoring protocol established by the 45 SW (Appendix D). Identified submerged cultural artifacts will be protected and should any unexpected discoveries be encountered in the project area (borrow, sand placement and sand pump-out sites), activities will cease until DHR/SHPO, the 45 SW CRM, and BOEM are notified and DHR/SHPO clears the project for re-commencement (Appendix F).

The Florida State Clearinghouse reviews EAs for projects planned at PAFB pursuant to Gubernatorial Executive Order 95-359; the Coastal Zone Management Act; 16 U.S.C. SS 1451-1464, as amended; and the National Environmental Policy Act, 42 U.S.C. SS 4321, 4331-4335, and 4341-4347. Per FL Statute Section 373.428, the State's final concurrence of the project's consistency with the Florida Coastal Management Program is determined through the environmental permitting process. The Consolidated Joint Coastal Permit (JCP) and Sovereign Submerged Land Authorization have been issued by the State which authorized the proposed action with adherence to associated terms and conditions.

2.0 Description of Proposed Action and Alternatives

This Section describes the Proposed Action and the alternatives that were considered to accomplish the Proposed Action.

2.1 Proposed Action

The Proposed Action of PAFB shoreline protection entails rebuilding of the beach and dune profile by hydraulically pumping beach compatible sand/fill, dredged from either the offshore Canaveral Shoals Sand Borrow Area I or II (CS I or II), and/or trucking sand from the CCAFS borrow site, onto the PAFB beach according to beach profile survey results prior to project commencement (maximum placement of 310,000 cubic yards and up to 80,000 cubic yards upland). A negotiated agreement/lease is being developed with BOEM for use of Federal offshore sand resources at CS II. Coordination with FDEP and USACE will occur should CS I be considered necessary for borrow material as it is under jurisdiction of the State of Florida because it is located within three nautical miles offshore (an easement has been obtained). Refer to Figure 2-1 for the PAFB Shore Protection Project Schematic, and Figures 2-2 and 2-3 for CS I and II borrow areas, respectively. Similar to the USACE South Reach project, BOEM is a cooperating agency for the PAFB project, and is recognized as such within this NEPA document and by regulatory agencies that have issued Biological Opinions per consultation requirements under the Endangered Species Act, etc. In addition to directly pumping sand excavated from CS by barge onto the North PAFB Beach, a temporary stockpile area atop the beach berm from FDEP reference monuments R61 to R65 (Central PAFB beach) will be utilized to “truck haul” the dredged sand material throughout the central and southern PAFB beach. The sand will then be mechanically manipulated (dozer and dump truck transport, etc.) into the PAFB beach template between monuments R53 and R65 with the fill template thin tapering from R65 to R70.

Dune restoration (above mean high water) for the remaining PAFB South Beach from monuments R70 to R75.4 has recently occurred (2011) and may potentially occur again during the beach template project depending on the severity of erosion. Any additional derelict concrete and rock debris, visible due to erosion, will be removed from the beach prior to sand placement. The rock/boulder revetment that was set into the back dune behind Facility 969 will be rebuilt if necessary using any fallen boulders displaced by wave action and erosion, and sand will be filled and profiled to rebuild the foredune in front of the landward revetment as much as practicable. Excavated upland/back dune, beach quality sand (65,000 cubic yards) from CCAFS was “truck hauled” to PAFB for dune restoration above mean high water as an interim measure while awaiting approvals for obtaining dredged offshore sand (borrow site actions are covered under the *Environmental Assessment for the Development of a Borrow Source at Cape Canaveral Air Force Station* with FONSI dated 6 September 2007, hereby referenced). Sediment/sand from the CCAFS borrow site may be trucked to PAFB again depending on volumetric needs based on beach profiling prior to final construction design for the Proposed Action.

The PAFB Proposed Action is a substantially similar action as that addressed in the referenced August 2009 *MMS/USACE EA for Brevard County (South Reach) Shoreline Protection Project* and is incorporated within this document. The South Reach is from

Melbourne Beach through Indialantic which is approximately 6 miles south of PAFB, both in Brevard County, FL. The PAFB beach is approximately 4.2 miles while the South Reach beach is approximately 3.8 miles. Location maps of project areas are found at Figure 1-1 and in Appendix A. This recent Brevard County South Reach EA documented that there were no significant impacts associated with shoreline protection and lease renewal with BOEM (formerly MMS) to authorize dredging of Federal sand resources from CS II and received a Finding of No Significant Impact (20 August 2009). BOEM has been a cooperating agency for both the USACE South Reach and PAFB projects, and was included as such in consultation with the United States Fish and Wildlife Service (USFWS), National Marine Fisheries (NMFS) under the Endangered Species Act and Magnuson-Stevens Act, and Division of Historical Resources/State Historic Preservation Office (DHR/SHPO).

Similar to the USACE South Reach action (Appendix A), the PAFB project would occur between 1 November and April 30 to avoid most sea turtle nesting activity. As in the past, proposed renourishment of the PAFB project area from offshore sand sources would be constructed with one or more hopper dredges. Hopper dredging is expected to occur over approximate 40 days to obtain and deliver the necessary volume. The time estimated to complete each dredge and placement cycle, including idle time, is approximately 6 hours per load. Hopper dredging would be limited to a relatively small footprint in the designated borrow area. Efficient dredging practice entails excavating sand in 2 to 5-foot thicknesses along relatively straight and adjacent runs along the seabed. The sand dredged from the hydraulic suction heads would be discharged into the vessel's open hopper, and most of the seawater effluent would spill over the sides of the hopper. The hopper dredge(s) would transport the dredged material a distance of approximately 14 miles (each way) to temporary pump-outs positioned approximately 0.5 to 1 miles from shore, and the sand would be pumped directly from the hopper barge through a temporary submerged pipeline to the beach in a slurry with seawater. The pipeline is placed on sand seabed in areas determined not to feature exposed hardbottom. Per the Joint Coastal Permit, pipeline corridors will be noted on the final construction drawings after the results of the pre-construction surveys are reviewed by the project engineers. The placement and relocation of the nearshore mooring buoys used during pump-out may involve the use of tender tugboats and a pipeline hauler or crane. The sand slurry is discharged from the pipeline onto the beach, from which the seawater flows back to the sea and the sand is deposited upon the beach and shaped by bulldozers.

Hopper dredges would be utilized to pipe and pump sand from the dredge/barge to the beach to stockpiling areas from which trucks and dozers would work the sand into the profile template. The dune template would include an elevation of +12.6 to +15 feet (to match existing) North American Vertical Datum (NAVD) with a berm elevation varying between +9 feet and +10 feet NAVD. The beach berm will have a shore-facing slope of approximately 1-foot vertical to 50-foot horizontal [1(v):50(h)]. The dune will generally have a shore-facing slope of roughly 1(v):1.5(h), transitioning to a 1(v):4(h) slope and intercepting the top of berm at an elevation +10 feet NAVD, then a fore-berm sloping seaward at 1(v):8(h) above mean high water (and 1[v]:18[h] below mean high water north of R-65) to the intersection with the existing seabed. The fill template is as per prior permits issued for similar dredge and beach restoration actions in 2001 and again in 2005. The berm has been designed to accommodate sea turtle nesting. Unlike a typical beach berm, the seaward elevation of this berm would be lower in order to reduce potential scarping resulting from storm activity or the natural equilibration of the beach. Scarping, the formation of steep vertical slopes formed by wave action/erosion fronting

the berm of the beach, can prevent sea turtles from being able to crawl up onto the beach and nest. This design also reduces ponding of water.

The offshore borrow sites of CS I & II are found in water depths of -10 to -46 feet NGVD. The CS I access channel has a cut depth of -24.9 feet NGVD (-23 ft MLW, -26.3 ft NAVD) and the borrow area has a maximum dredge depth of -28.9 feet NGVD (-27 ft MLW, -30.3 ft NAVD). Non-beach compatible material found in the access channel below the cut depth of -24.9 feet NGVD will be disposed in the approved Offshore Dredged Material Disposal Site (ODMDS) or Nearshore Disposal Area, both off of Cocoa Beach FL, with Environmental Protection Agency and USACE approval through Section 103 of the Marine Protection, Research, and Sanctuaries Act, as required. The CS I borrow area is divided into five subsections with varying cut depths, and the CS II borrow area is divided into five subareas with varying cut depths. Please refer to Figures 2-2 to 2-3 for schematics of CS I & II. A hopper dredge will be used to collect the sand and it will then be pumped to the beach through pipeline. Please refer to Figure 2-4 for a schematic of a general section of the PAFB beach/dune template. Figure 2-5 illustrates the dune restoration template, above mean high water, for the PAFB South Beach where nearshore hardbottom/rock reef exists. A photograph of the erosion along PAFB beaches is found at Figure 2-6 (Tides Club, approximately in between FDEP markers R68 and R69).

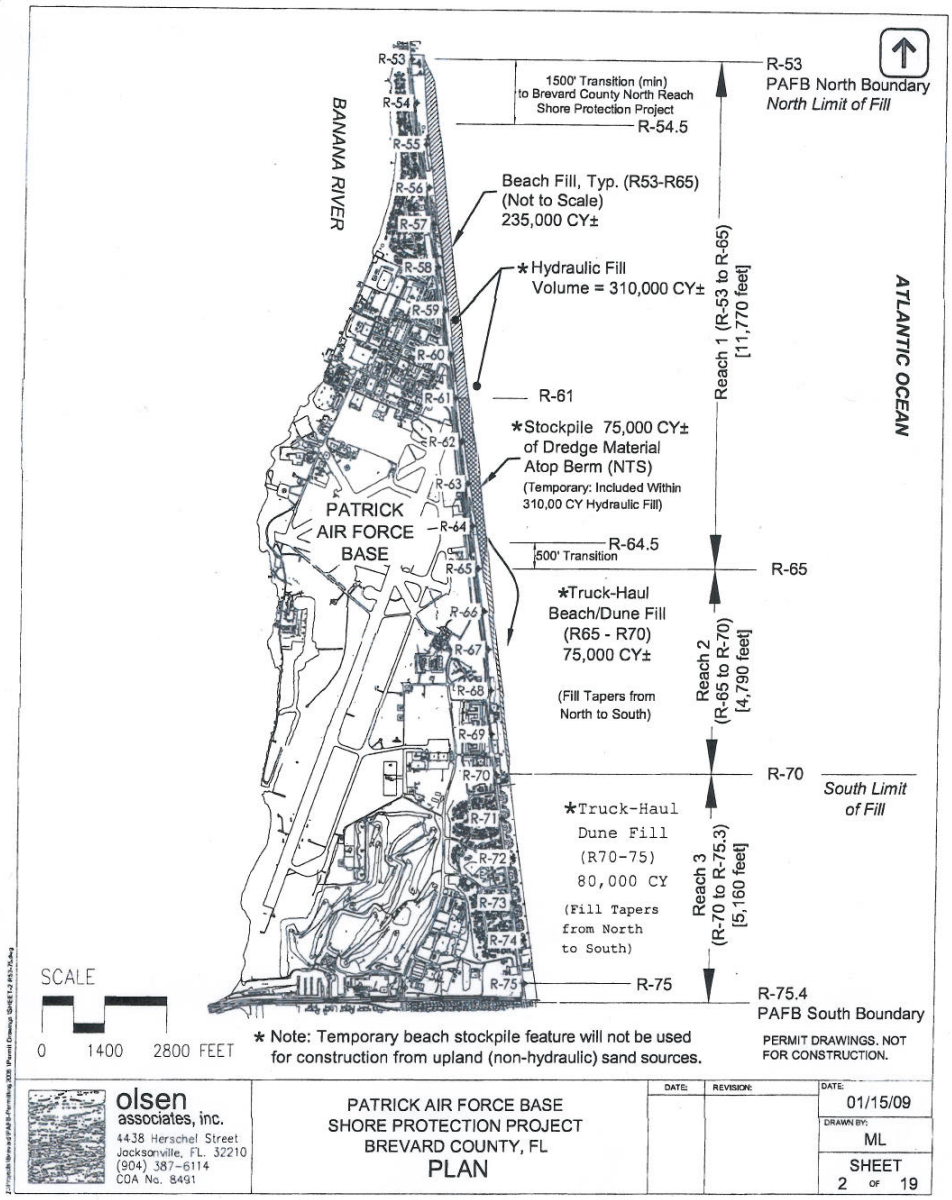

FIGURE 2-1: PAFB SHORE PROTECTION PROJECT PLAN SCHEMATIC

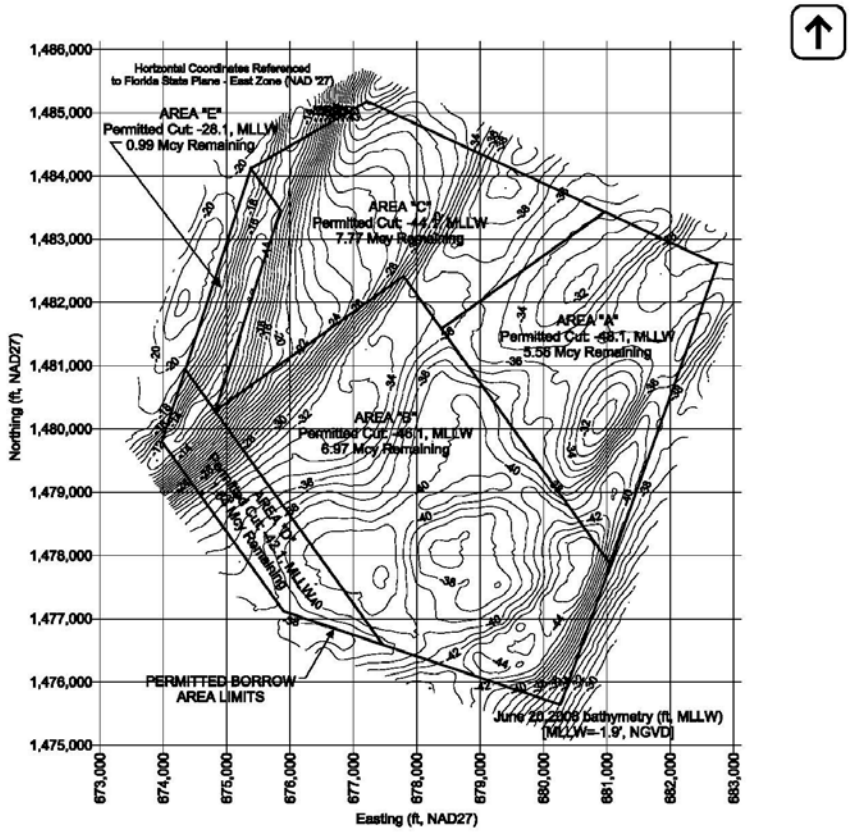

TABLE: Canaveral Shoals II Boundary Coordinates

PT	NAD27 Easting (FT)	NAD27 Northing (FT)	NAD83 Easting (FT)	NAD83 Northing (FT)	NAD83 Latitude	NAD83 Longitude
A	677,218.0	1,485,178.6	833,454.9	1,485,342.9	28.418717	80.448451
B	682,740.0	1,482,600.0	838,976.9	1,482,764.3	28.411554	80.431310
C	680,267.4	1,475,638.1	836,504.3	1,475,802.4	28.392439	80.439102
D	675,899.5	1,477,115.5	832,136.4	1,477,279.8	28.396557	80.452666
E	673,977.0	1,479,797.3	830,213.8	1,479,961.6	28.403957	80.458609
F	675,381.2	1,484,113.1	831,618.0	1,484,277.4	28.415809	80.454180

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PATRICK AIR FORCE BASE
SHORE PROTECTION PROJECT
BREVARD COUNTY, FL
CANAVERAL SHOALS II
BORROW AREA

DATE: | REVISION: | DATE: 01/15/09 | DRAWN BY: ML | SHEET 14 OF 19

FIGURE 2-2: CANAVERAL SHOALS II BORROW AREA

PERMIT DRAWINGS. NOT
FOR CONSTRUCTION.

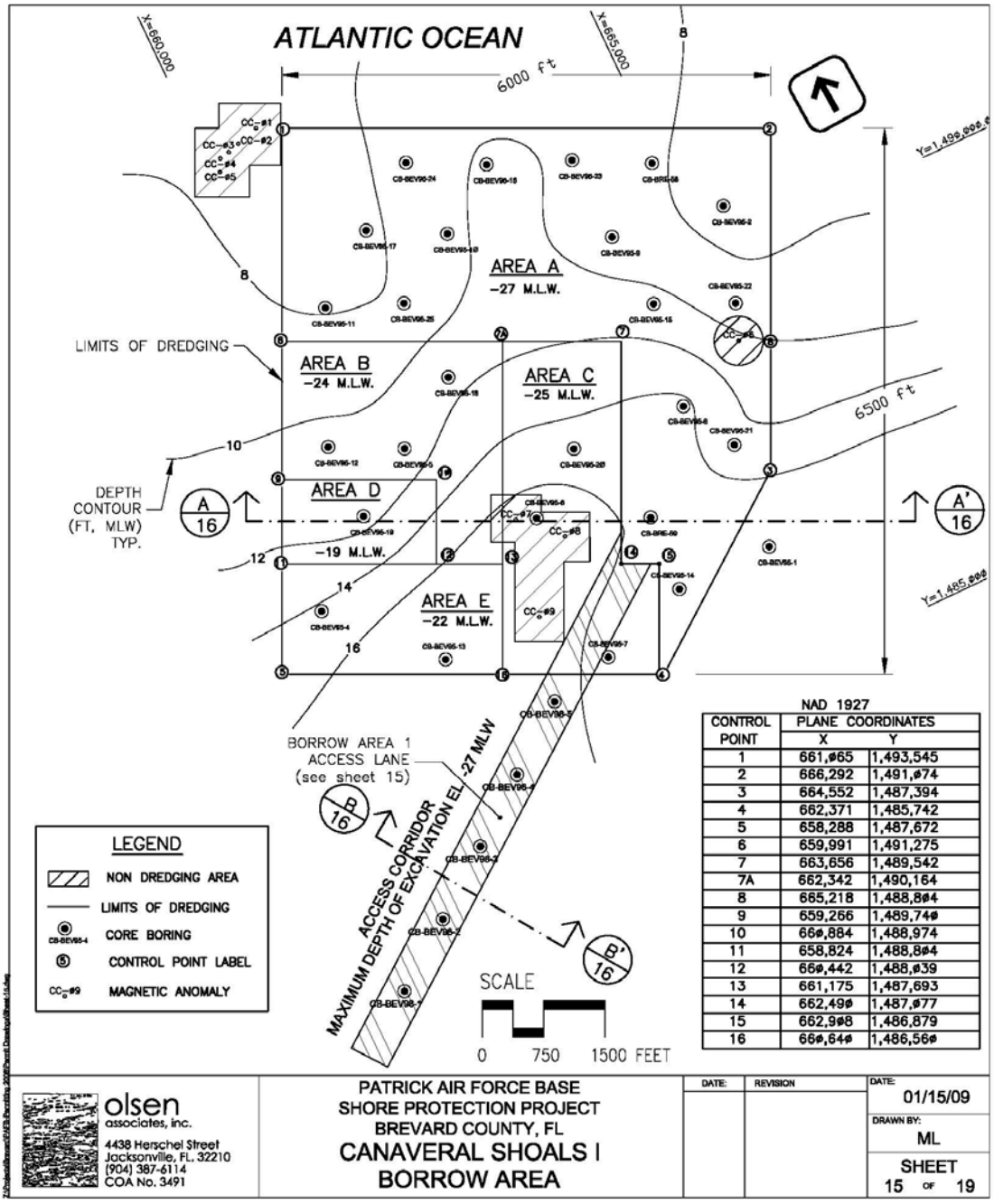


FIGURE 2-3: CANAVERAL SHOALS I BORROW AREA

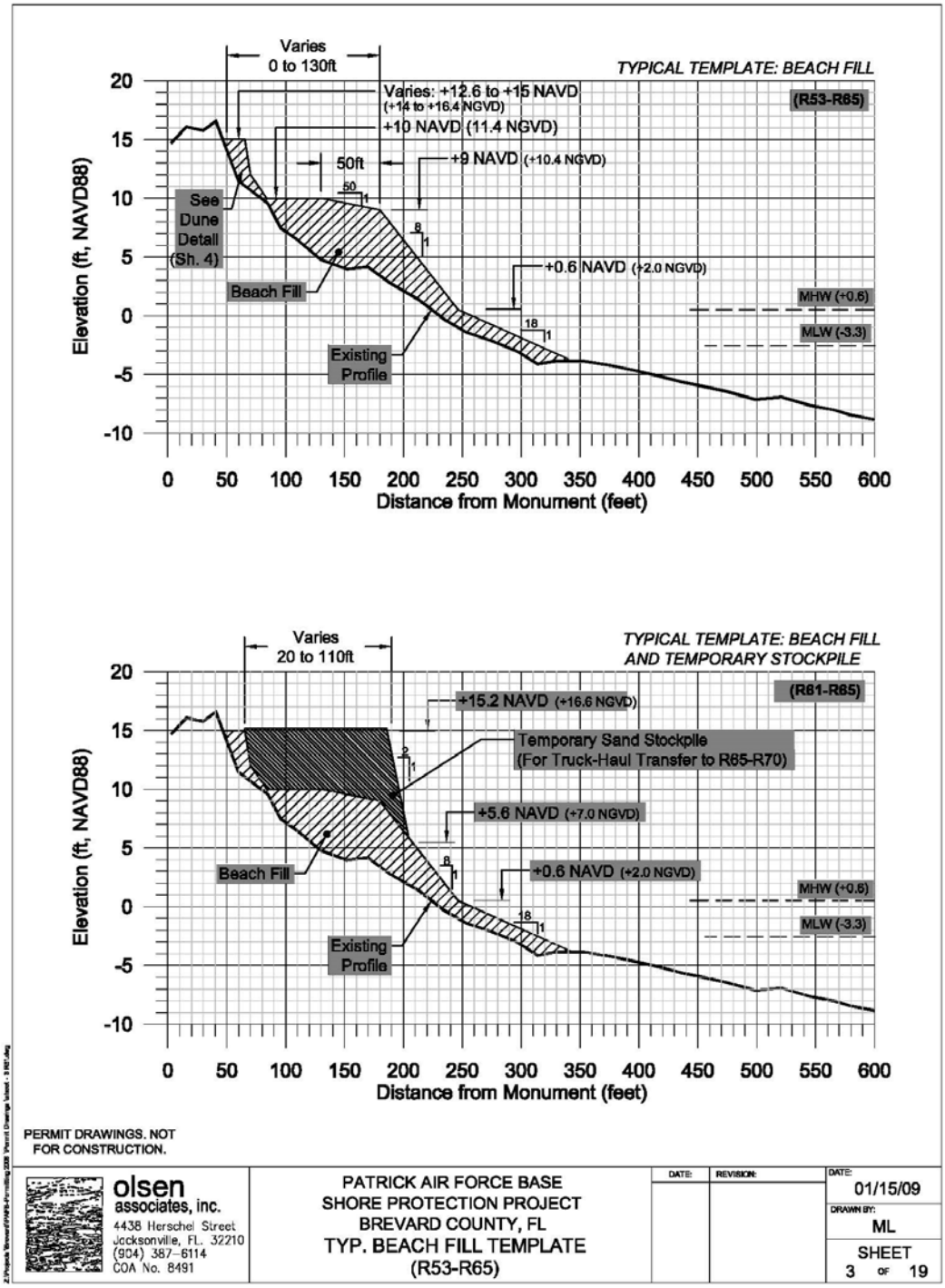
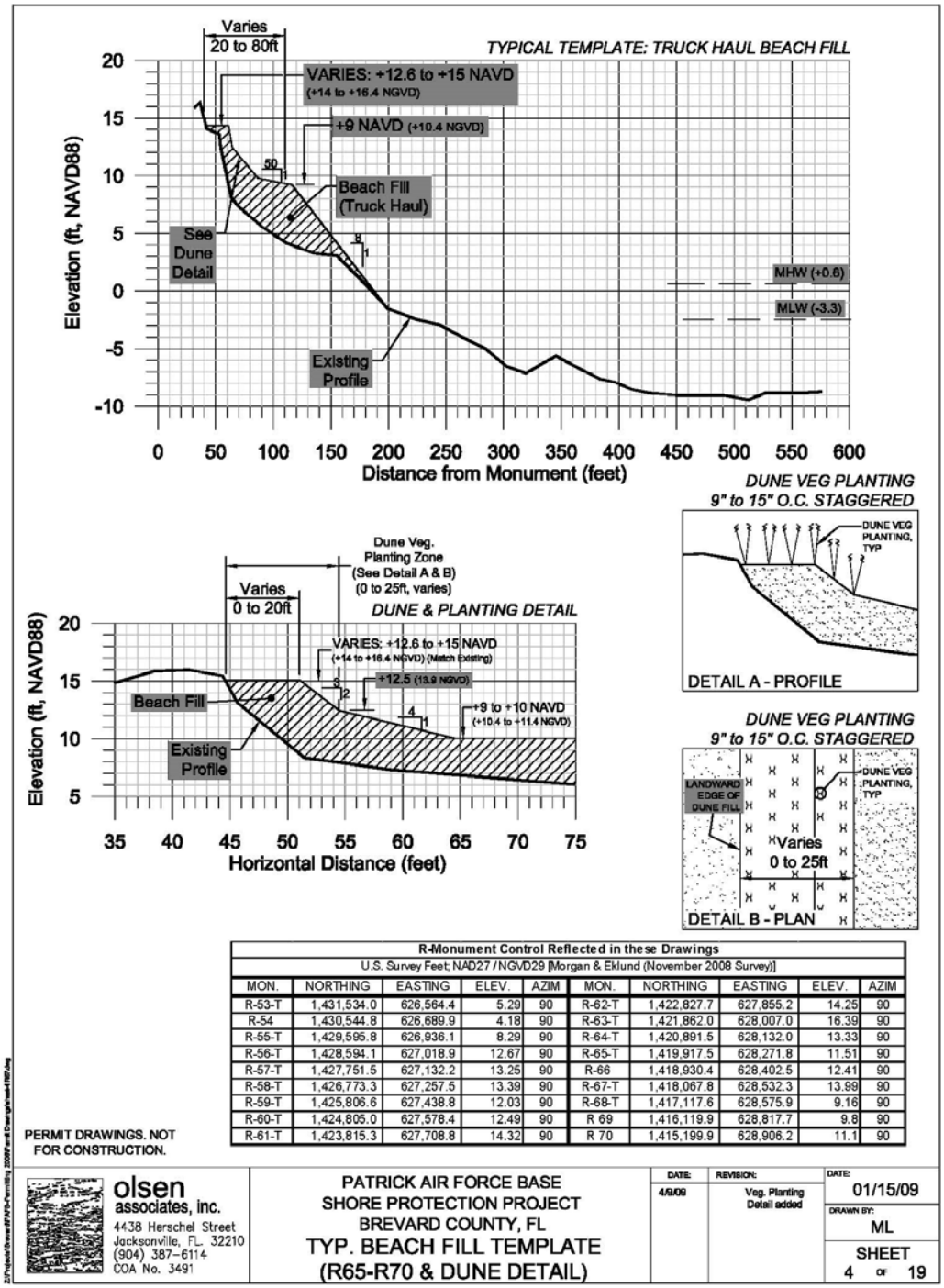


Figure 2-4(A): TYPICAL CROSS SECTION, PAFB SHORELINE PROJECT TEMPLATE



R-Monument Control Reflected in these Drawings
U.S. Survey Feet; NAD27 / NGVD29 [Morgan & Eklund (November 2008 Survey)]

MON.	NORTHING	EASTING	ELEV.	AZIM	MON.	NORTHING	EASTING	ELEV.	AZIM
R-53-T	1,431,534.0	626,564.4	5.29	90	R-62-T	1,422,827.7	627,855.2	14.25	90
R-54	1,430,544.8	626,689.9	4.18	90	R-63-T	1,421,862.0	628,007.0	16.39	90
R-55-T	1,429,595.8	626,936.1	8.29	90	R-64-T	1,420,891.5	628,132.0	13.33	90
R-56-T	1,428,594.1	627,018.9	12.67	90	R-65-T	1,419,917.5	628,271.8	11.51	90
R-57-T	1,427,751.5	627,132.2	13.25	90	R-66	1,418,930.4	628,402.5	12.41	90
R-58-T	1,426,773.3	627,257.5	13.39	90	R-67-T	1,418,067.8	628,532.3	13.99	90
R-59-T	1,425,806.6	627,438.8	12.03	90	R-68-T	1,417,117.6	628,575.9	9.16	90
R-60-T	1,424,805.0	627,578.4	12.49	90	R 69	1,416,119.9	628,817.7	9.8	90
R-61-T	1,423,815.3	627,708.8	14.32	90	R 70	1,415,199.9	628,906.2	11.1	90

Figure 2-4(B): TYPICAL CROSS SECTION, PAFB SHORELINE PROJECT TEMPLATE

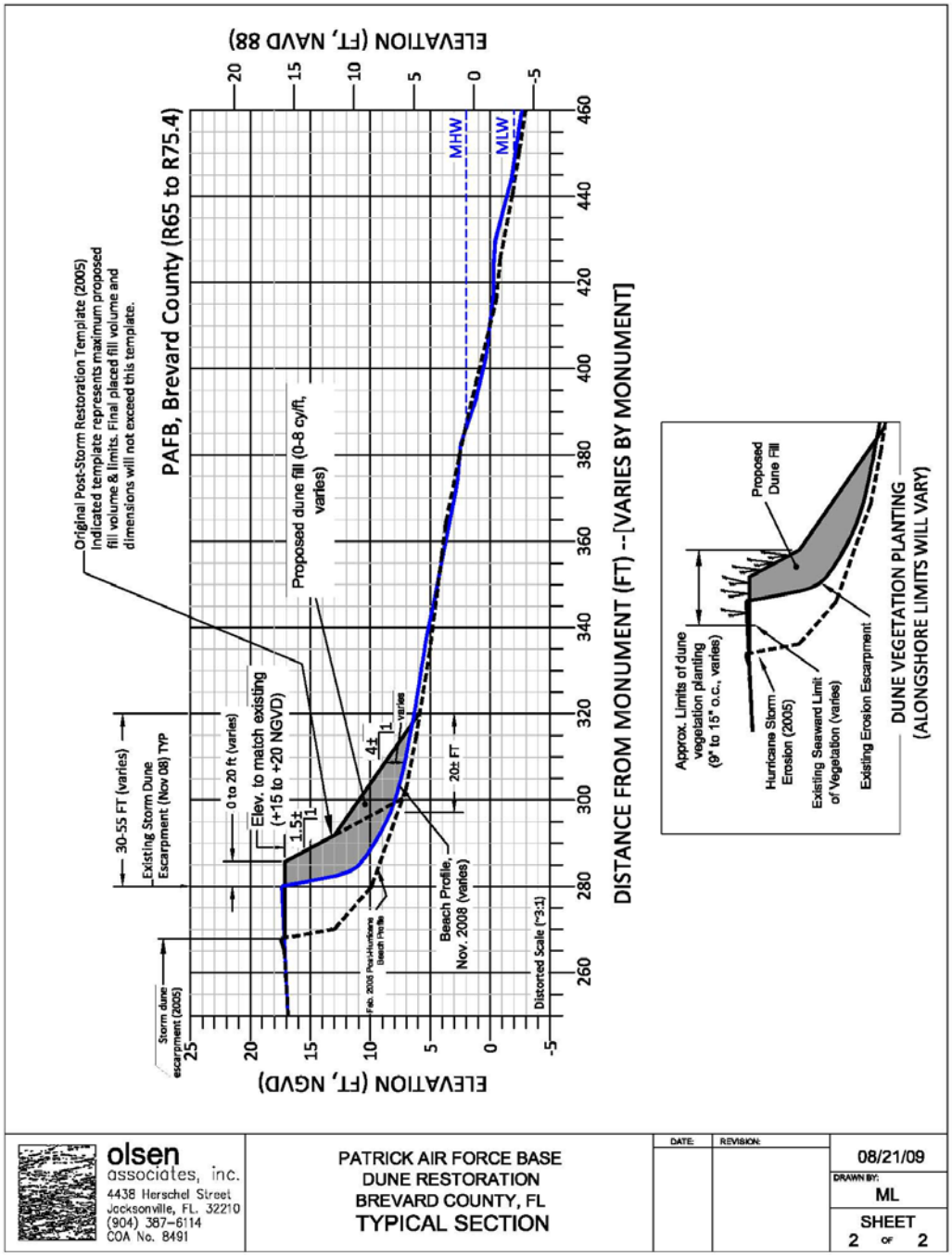


Figure 2-5: TYPICAL CROSS SECTION, PAFB SHORELINE PROJECT, DUNE (ABOVE MEAN HIGH WATER)

Figure 2-6: BEACH/DUNE EROSION, PAFB SHORELINE PROJECT, TIDES CLUB (FDEP R68.5), NOVEMBER 2010

2.2 Alternatives Not Carried Forward

The selected alternatives of using only an upland sand source or revetment construction have been presented because of historical analyses conducted in the *Brevard County, FL., Feasibility Report and Environmental Impact Statement* (EIS) (1996, Record of Decision 2000). This more recent analyses documented many other studies of various shore protection alternatives from Brevard County from as early as the 1960s. Several alternatives were evaluated in this extensive EIS to include non-structural measures such as establishing “no-growth programs,” relocating beach side infrastructure, and condemning beachside land to structural measures such as seawalls, revetments, groins breakwaters, and combinations of these. Sand by-passing around Port Canaveral to allow dredged material to be pumped to the downdrift beaches was another earlier alternative which has been occurring, but it has been assumed that substantial material needed for PAFB eroded beaches does not reach most of PAFB through by-passing and subsequent natural drift. This initial broad range of alternatives has narrowed over time to alternatives that, even though reasonable, have been found to have more environmentally damaging effects and are not being evaluated in this EA as viable alternatives.

Use of Sole Upland Sand Source

There are limited upland sand sources that meet the beach quality/grain size and consistency requirements that are imposed through permitting and Biological Opinion to reduce water quality issues and sea turtle nesting impacts. Upland sand, especially from a source that can supply a large volume, typically doesn't have the coarseness required for beach quality and results in too many clay and silt particles that cause water turbidity problems and potential impacts to aquatic resources. Additionally, the limited coarseness causes sand compaction problems that aren't generally remedied with a one-time tilling event. Compaction restricts the sea turtles' abilities to dig the nest, limits oxygen to any incubating eggs, and can cause moisture retention which can drown eggs/hatchlings. The tilling practice to attempt to correct compaction has its own disadvantages of destroying the natural biota in the beach environment. Sole use of an upland sand source would increase air emissions as well due to the transportation requirements, number of hauls and trucks necessary to move and place sand on the beach from a borrow source potentially hundreds of miles away. There would also be a disruption in traffic patterns near PAFB with requirements to stage and queue a large number of trucks as they enter and leave the beach project area; and SRA1A is already a high traffic area because of the volume of vehicles using the only beachside highway on the barrier island. Even though the CCAFS borrow site has beach compatible material since this "upland" location is within the beach back dune and is an accretional area due to the Port Canaveral jetty location just to the south, there isn't enough material at this location to fill a full PAFB shoreline restoration template. This alternative for an upland sand source for the entire PAFB beach restoration project is not preferred, and has been removed from further evaluation because of the complications associated with sand quality, significant transportation cost increases, unknown volumetric availabilities, higher costs associated with corrective actions and monitoring because of inferior sand quality, and more environmentally adverse impacts to air, water, flora and fauna.

Revetment Construction

Placement of hardening structures on the beach in an attempt to protect PAFB and SRA1A infrastructure has been removed from further evaluation because it has been found that this serves to transfer the problem of erosion further down the beach. According to the Army Corps of Engineers, revetments have provided temporary relief but have not reduced beach erosion (USACE EIS 1996). In addition to lacking the means to prevent/reduce beach erosion, revetment structures have been strongly opposed by Federal and State natural resource management agencies (USFWS and Florida Fish and Wildlife Conservation Commission [FWC]) because of the impact to beach habitat used by several coastal and marine species.

2.3 No Action Alternative

Under the No Action Alternative, the PAFB beach would be left in an eroded state, the CS I & II offshore sand source would not be utilized, and the lease with BOEM would not occur; the No Action Alternative doesn't meet the purpose and need and is not preferred.

2.4 Summary of Potential Environmental Issues

Ten broad environmental components were initially considered to provide a context for understanding the potential effects of the Proposed Action alternatives and as a basis for assessing the significance of potential impacts. The areas of environmental consideration are: Air Installation Compatible Use Zone (AICUZ) & land use, air quality, biological resources, cultural resources, geology and soils, hazardous materials and waste, infrastructure and transportation, occupational safety and health, socioeconomics, and water resources.

No significant impacts from implementation of the alternatives, the No Action Alternative, or the Proposed Action have been identified for any of the resource areas examined in this document. If shoreline restoration doesn't occur at PAFB, there is the potential for adverse impacts, over an undetermined period of time, to listed sea turtle and potentially migratory shorebird species due to poor habitat quality with storm erosion to this characteristic historical "sand deficit" beach. Evaluation of the eroded beaches' effect on sea turtle nesting and hatching success would be required to determine significance of the effects.

Analysis by the 45 SW has determined that no impacts, or less than significant impacts, would be anticipated to AICUZ & land use, air quality, cultural resources, occupational safety and health, hazardous materials and waste, geology and soils, infrastructure and transportation and socioeconomics. Brief overviews of these resource areas along with biological and water resources will be within Section 3, Affected Environment. Additionally, this EA is incorporating by reference the 2009 MMS/USACE EA which provides analysis for cultural resources, air quality and threatened and endangered species (Appendix A). Analyses for most of the resource areas were incorporated in prior USACE EAs and an EIS, also incorporated by reference. More detailed analyses of potential impacts to the aspects of Biological and Water Resources along with some brief impact analysis for the other aspects noted above, specific to the PAFB Proposed Action, are presented in Section 4.

3.0 AFFECTED ENVIRONMENT

In compliance with NEPA and CEQ guidelines, The USAF, 45 SW has described the affected environment, evaluated potential environmental effects resulting from the proposed action, and developed and described alternatives to the proposed action in this EA. Prior NEPA documents prepared by the 45 SW for beach/dune restoration efforts were documented through the Air Force Environmental Impact Analysis Process and the Air Force Form 813 (32 CFR 989 and 40 CFR 1501.3) which provided a categorically exclusion specifically identifying previously approved documents which were determined to have insignificant impact with Findings of No Significant Impact or Record of Decision. The documents identified were prior USACE NEPA documents for Brevard County beach/shoreline protection, they are: the USACE EA: CS I & II *(*FONSI dated 14 October 1999), the USACE Brevard County Environmental Impact Statement (EIS), with corresponding Record of Decision dated 14 November 2000, and the MMS EA for South Reach and PAFB (FONSI dated 21 January 2005). Each sequential EA/EIS was prepared to supplement previous analyses of impacts to determine if there would be a significant effect on the human environment, in light of new information, associated with proposed shoreline restoration (sand/fill placement) within Brevard County and offshore borrow site usage as well issuance of new negotiated agreements with BOEM (MMS). This PAFB EA is also referencing the 2009 MMS/USACE South Reach EA (FONSI signed 20 August 2009). Finally, although in draft form, data for this PAFB EA was also obtained from the USACE *Draft Integrated General Reevaluation Report and Supplemental Environmental Impact Statement (SEIS) for Brevard County, Florida, Hurricane and Storm Damage Reduction Project, Mid-Reach Section* (USACE 2009). Referencing and tiering from other documents minimizes duplication of effort as required per 40 CFR 1502.20 and 32 CFR 989.10. Additional baseline data for PAFB can be referenced from the *45 SW's Integrated Natural Resource Management Plan* (2009) for such areas as surface and groundwater, soils, native flora and fauna, threatened and endangered species, land use, etc. This section will briefly provide an overview of resources and provide information either not discussed in the prior NEPA documents, specific for Air Force regulations and guidance, or specific for PAFB. This Chapter describes the existing environment of the Proposed Action area for defined resources/categories. This information serves as a baseline from which to identify and evaluate potential environmental changes resulting from implementation of the Proposed Action. Detailed analyses of resource impacts are found at Section 4 specific to the PAFB Shoreline Protection Project Proposed Action.

3.1 Air Installation Compatible Use Zone (AICUZ) & Land Use

Air Installation Compatible Use Zone (AICUZ)

Air Force Air Installation Compatible Use Zones (AICUZ) guidelines are based on operational factors that aim to influence the use of land near airfields by informing and working with local governments on the dangers and annoyances related to military airfields. These include height restrictions, noise contours and aircraft accident potential zones (APZ). The AICUZ program includes land use compatibility guidelines based on these factors, which are defined in order to minimize the exposure of the public to noise and safety hazards, provide safer aircraft operations and help protect the airfield from encroachment by incompatible land development. Air Force guidance on the AICUZ

program is found in Air Force Instruction (AFI) 32-7063, *Air Installation Compatible Use Zone Program*. The airfield APZ does cross over parts of the PAFB Beach and into the ocean. All equipment use within the APZ will be coordinated with 45 SW Airfield Operations so notices can be made to pilots to prevent/reduce accident risk.

Land Use

In recognition of the increasing pressures of over-development upon the nation's coastal resources, Congress enacted the Coastal Zone Management Act (CZMA) in 1972. The CZMA encourages states to preserve, protect, develop, and, where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. The Secretary of Commerce delegated the administration of the CZMA to the National Oceanic and Atmospheric Administration (NOAA). The Office of Ocean and Coastal Resource Management administers individual state programs. The provisions of the CZMA must be followed to include a Federal Consistency Determination. The requirements for such determinations can be found in 15 CFR Section 930. Activities will be undertaken in a manner consistent to the “maximum practicable” with the enforceable policies of the approved management program of the state. The FDEP has reviewed this action and provided a determination of consistency with the State Coastal Zone Management Program. An easement will also be required through FDEP for use of CS I and the disposal area offshore of Cocoa Beach pursuant to Florida Statute, Chapter 253.77 as these are classified as sovereign submerged lands.

3.2 Air Quality

The following air quality/air emissions information is provided to supplement the data within the 2009 MMS/USACE EA (Appendix A). Air Force Instruction (AFI) 32-7040, *Air Quality Compliance and Resource Management*, identifies AF requirements for an air quality compliance program. Other applicable air quality requirements pertaining to the Proposed Action are identified in the following Tables 3-1 and 3-2. Specific estimated emissions for beach restoration for the South Reach are found in Table 3 of Appendix A. The South Reach project needed approximately four (4) times the amount of sand compared to that requested for the PAFB project as well as requiring a greater travel distance from sand source to project location, of course leading to more dredge and operational hours, i.e., more emissions, compared to the proposed PAFB project. Refer to Chapter 4, Section 4.2 for additional information. Therefore, assuming the same type of dredge equipment was used, the PAFB project emission projections can be estimated to be about one quarter of the amount estimated for the South Reach. Potential emissions from the PAFB project in combination with ambient concentrations are well within the National Ambient Air Quality Standards (NAAQS).

Table 3-1: Summary of Air Quality Requirements

Law or Rule	Permit/Action(s)	Requirement	Agency or Organization
NAAQS 40 CFR Part 50 NAAQS Implementation Plans 40 CFR Part 51	Clean Air Act (CAA, as amended in 1990) requires EPA to set National Ambient Air Quality Standards for pollutants considered harmful to public health and the environment.	EPA Office of Air Quality Planning and Standards (OAQPS) has set National Ambient Air Quality Standards for six principal pollutants, called "criteria" pollutants (carbon monoxide, lead, nitrogen dioxide, particulate matter (PM10), particulate matter (PM2.5), ozone, and sulfur dioxide).	USEPA
FAAQS Florida Administrative Code (FAC), Chapter 62	CAA gives states the authority to establish air quality rules and regulations.	These rules and regulations must be equivalent to, or more stringent than, the federal program.	FDEP, Division of Air Resource Management
Title V of the Clean Air Act 40 CFR Part 70	Designed to improve compliance by clarifying what facilities (sources) must do to control air pollution.	Permits include pollution-control requirements from federal or state regulations that apply to a source.	USEPA, FDEP, Division of Air Resource Management
NESHAPs Section 112 of CAA 40 CFR Parts 61 and 63	National Emissions Standards for Hazardous Air Pollutants are emissions standards set by the USEPA for an air pollutant not covered by NAAQS that may cause an increase in fatalities or in serious, irreversible, or incapacitating illness.	The standards for a particular source category require the maximum degree of emission reduction that the EPA determines to be achievable, which is known as the Maximum Achievable Control Technology (MACT)	USEPA
AFI 32-7086, Chapter 4	Minimize loss and conduct recovery, recycling, and reuse of ozone depleting substances (ODS) to the maximum extent practicable.	Manage to minimize releases of ODSs into the environment.	AF
AFI 32-7040	Estimate air emissions for inclusion in the Air Emissions Inventory	Track vehicle/equipment use and welding/soldering activities.	AF

PAFB is currently authorized to operate under the Florida Department of Environmental Protection (FDEP) Title V Air Permit No. 0090021-007-AV, renewed in 2007. The permit is valid for a five-year period and will expire on 30 April 2012.

Major sources of pollutants at PAFB include steam boilers, surface coating operations, and fuel storage tanks. Other sources of pollutants at the base are considered insignificant activities under Title V rules as only stationary sources are considered. For Title V purposes, a major source of air emissions has the potential to emit (PTE) in excess of 100 tons per year (tpy) of any criteria air pollutants, 25 tpy for total hazardous air pollutants (HAPs), or 10 tpy for a single HAP. PAFB is currently operating as a synthetic minor generator of HAP emissions under federally enforceable operating limitations. Beach restoration events aren't required to be reported through Title V permitting because construction activities aren't generating pollutants from stationary sources. Mobile sources, aircraft operations, outdoor weapons training, construction activities, etc., also generate pollutants at PAFB. Air emission inventories for PAFB have indicated that particulate matter (PM) has become a major criteria air pollutant when considering the increased construction/demolition activities that have been occurring in the past three years. Greenhouse gas emission reduction through energy efficiency and sustainability, however, is the goal of the Federal government recently mandated through Executive Order 13423, *Strengthening Federal Environmental, Energy and Transportation Management*. Currently there are no published thresholds of significance for greenhouse gas emissions, but the Federal government recognizes the need to reduce energy consumption and shift to renewable and alternative fuels to reduce emissions. Energy improvements such as replacement of old HVAC equipment, installation of energy management controls, and metering for energy use are being implemented at PAFB and are expected to eliminate millions of tons of greenhouse gases annually once completed. Air quality analyses are found in Sections 4.2 & 4.9.

Ambient Air Quality

The EPA has established National Ambient Air Quality Standards (NAAQS) for six principle pollutants under 40 CFR Part 50. The NAAQS consists of primary standards and secondary standards. The primary standards have been established to protect human health. The secondary standards have been established to protect the public welfare. The standards have been established for six principle pollutants, which are referred to as "criteria" pollutants. The criteria pollutants include ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter with an aerodynamic diameter less than 2.5 or 10 microns ($PM_{2.5}$, PM_{10}), and lead (Pb). Criteria air pollutant emission data for Brevard County and PAFB for 2002 was extracted from the EPA AirData website (http://www.epa.gov/air/data/repsco.html) and presented in Table 3-2 on the following page. More recent years of data are unavailable for Brevard County at this time so a comparison with 2002 data is provided.

Table 3-2: Criteria Air Pollutant Data for PAFB and Brevard County, FL

Location	Emissions Year	Air Emissions (Tons)							
	2002	CO	NOX	VOC	SO2	PM2.5	PM10	NH3	Total
USAF/ PAFB		1.16	1.41	33	0.02	0.17	0.17	0.07	36
Brevard Co.		218,319	46,403	45,561	25,865	6,712	13,350	1,527	357,737*
	2002	Sum of 188 HAPs Emissions (lbs/yr)				Sum of 33 Urban HAPs Emissions (lbs/yr)			
USAF/ PAFB		0.0011				0.0011			
Brevard Co.		16,722,681				3,351,360			

* Totals are sum of Point Source Emissions and Nonpoint + Mobile Source Emissions

The FDEP has adopted the federal NAAQS to regulate ambient air quality in the state of Florida. In addition, the FDEP has promulgated state Ambient Air Quality Standards (AAQS) (FAC Chapter 62-204). Table 3-3 on the following page presents the NAAQS and AAQS for the regulated criteria pollutants.

Table 3-3: Summaries of National Ambient Air Quality Standards and Florida Ambient Air Quality Standards

Pollutant	Averaging Period	Florida AAQS	Primary NAAQS	Secondary NAAQS
Carbon Monoxide (CO)	8-Hour 1-Hour	9 ppm (10,000 μg/m^3) 35 ppm (40,000 μg/m^3)	9 ppm (10,000 μg/m^3) 35 ppm (40,000 μg/m^3)	-- --
Lead (Pb)	Quarterly[a]	1.5 μg/m^3	1.5 μg/m^3	1.5 μg/m^3
Nitrogen Dioxide (NO_2)	Annual[a] 1-Hour	100 μg/m^3 (0.05 ppm) --	0.053 ppm (100 μg/m^3) 0.100 ppm	0.053 ppm (100 μg/m^3) --
Ozone (O_3)f	1-Hour[b] 8-Hour[c]	0.12 ppm --	0.12 ppm 0.08 ppm	0.12 ppm 0.08 ppm
Particulate Matter (PM_{10})	Annual[a] 24-Hour[b]	50 μg/m^3 150 μg/m^3	50 μg/m^3 150 μg/m^3	50 μg/m^3 150 μg/m^3
Particulate Matter ($PM_{2.5}$)f	Annual[a] 24-Hour[d]	-- --	15 μg/m^3 65 μg/m^3	15 μg/m^3 65 μg/m^3

Sulfur Dioxide (SO_2)	Annual	60 µg/m^3 (0.02 ppm)	0.03 ppm	--
	24-Hour[e]	260 µg/m^3 (0.10 ppm)	0.14 ppm	--
	3-Hour[e]	1,300 µg/m^3 (0.5 ppm)	--	0.5 ppm
	1-Hour[e]	--	0.075 ppm	--

Notes:
a. Arithmetic mean
b. Not to be exceeded on more than an average of one day per year over a three-year period
c. Not to be exceeded by the three-year average of the 4th highest daily maximum
d. Not to be exceeded by the three-year average of the 98th percentile of the 24-hour averages
e. Not to be exceeded more than once per year
f. Please refer to 40 CFR 50 regarding the final promulgation of the 8-Hour ozone and PM2.5 standards.

Regional Air Quality

Air quality is defined as either “in attainment” or “nonattainment” with respect to regulatory air quality standards. An area with air quality better than the NAAQS is designated in attainment. An area where pollutant concentrations exceed the NAAQS, with a frequency specified by the regulation, is classified as nonattainment.

In Florida, regional air quality is assessed at the county level. PAFB is located within Brevard County which has been designated by both EPA and FDEP to be in attainment for all criteria pollutants. Ambient air monitoring records from monitoring stations maintained by the appropriate state or local agency for the affected environment were examined to characterize the existing air quality. Table 3-4 shows EPA compiled data for 2005, 2006 and 2007 for monitored air concentrations in Brevard County.

Table 3-4: Summary of Air Quality Monitoring for 2005, 2006, and 2007

Year	State/ County	2000 Population	CO 8-hr (ppm)	Pb Qmax ($\mu g/m^3$)	NO_2 AM (ppm)	O_3 1-hr (ppm)	O_3 8-hr (ppm)	PM_{10} 24-hr ($\mu g/m^3$)	$PM_{2.5}$ Wtd AM ($\mu g/m^3$)	$PM_{2.5}$ 24-hr ($\mu g/m^3$)	SO_2 AM (ppm)	SO_2 24-hr (ppm)
2005	**Brevard County, FL**	**476230**	ND	ND	ND	0.081	0.072	48	8.3	18	ND	ND
2006	**Brevard County, FL**	**476230**	ND	ND	ND	0.089	0.077	26	9	28	ND	ND
2007	**Brevard County, FL**	**476230**	ND	ND	ND	---	0.068	34	7.3	20	0.001	0.005

CO - Highest second maximum non-overlapping 8-hour concentration (applicable NAAQS is 9 ppm)

Pb - Highest quarterly maximum concentration (applicable NAAQS is 1.5 $\mu g/m^3$)

NO_2 - Highest arithmetic mean concentration (applicable NAAQS is 0.053 ppm)

O_3 (8-hour) - Highest fourth daily maximum 8-hour concentration (applicable NAAQS is 0.075 ppm)

PM_{10} - Highest second maximum 24-hour concentration (applicable NAAQS is 150 µg/m3)

$PM_{2.5}$ - Highest weighted annual mean concentration (applicable NAAQS is 15 $\mu g/m^3$)

- Highest 98th percentile 24-hour concentration (applicable NAAQS is 35 $\mu g/m^3$)

SO_2 - Highest annual mean concentration (applicable NAAQS is 0.03 ppm)

- Highest second maximum 24-hour concentration (applicable NAAQS is 0.14 ppm)

ND - Indicates data not available

IN - Indicates insufficient data to calculate summary statistic

Wtd - Weighted

AM - Annual mean

Qmax - Quarterly maximum

$\mu g/m^3$ - Units are micrograms per cubic meter

ppm - Units are parts per million

3.3 Biological Resources

The AF is committed to the long-term management of all natural areas on its installations, as directed by the Sikes Act and AFI 32-7064, *Integrated Natural Resources Management*. Long-term management objectives are identified in the 2009 *45 SW Integrated Natural Resources Management Plan (45 SW INRMP)* with specific land-management objectives such as conservation of threatened and endangered species, habitat restoration, and wetland protection. Specific Natural Resource requirements relating to the Proposed Action are identified in Table 3-5.

Table 3-5: Summary of Natural Resources Requirements

Law or Rule	Permit/Action(s)	Requirement	Agency or Organization
Coastal Zone Management Act 16 U.S.C. § 1451, et seq	Coordination with FDEP and Federal Consistency Determination	Consistent with FL State Coastal Management Plan to conserve and protect coastal environment through standards and criteria for regulations and guidelines for uses of the coastal zone. Includes requirements through permitting for beach compatible sand for fill, beach profiling, turbidity monitoring, etc.	NOAA & FDEP
Endangered Species Act 16 U.S.C. § 1531, et seq.	Consultation with US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), and if necessary, obtain and comply with biological opinions/incidental take permits, comply with existing Threatened and Endangered (T&E) permits	Conserve ecosystems that support T&E species. Section 7 requires Federal agencies to ensure that any action authorized, funded or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.	USFWS & NMFS
Magnuson-Stevens Fishery Conservation & Management Act 16 U.S.C. § 1801, et seq.	Consultation with National Marine Fisheries Service (NMFS for actions that may adversely affect fisheries and essential fish habitat (EFH)	Conserve fisheries for commercial and recreational economies, and ecological stability. Federal agencies must consult if any action authorized, funded or carried out by them is likely to adversely affect fisheries resources or their habitat.	NOAA/NMFS
Marine Mammal Protection Act 16 U.S.C. § 1361, et seq.	Consultation with National Marine Fisheries Service if adverse affect potential	Prevent these species and population stocks from diminishing beyond the point at which they cease to be a significant functioning element in the ecosystem of which they are a part.	NOAA/NMFS

Law or Rule	Permit/Action(s)	Requirement	Agency or Organization
Sikes Act 16 U.S.C. § 670, et seq	Cooperation between the Department of Interior and Department of Defense with State agencies to plan, develop and maintain fish and wildlife resources on U.S. military installations	Development of an Integrated Natural Resource Management Plan (45 SW properties) that is reviewed/approved by USFWS, NMFS, & FDEP/FWC	DoD
Migratory Bird Treaty Act 16 U.S.C.; § 703-712	Consult with USFWS as necessary	Prohibits destruction of the eggs or nest of migratory birds without a permit. Beach nesting locations must be protected and avoided during beach restoration activities.	USFWS
Executive Order (EO) 11988	If the only practicable alternative requires siting in a floodplain, design or modify proposed action to minimize potential harm and prepare Finding of No Practicable Alternative	Reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values served by floodplains. Consider alternatives to avoid adverse effects in the floodplains.	DoD
EO 13112	Remove and control invasive species	Prevent the introduction of invasive species and provide for their control and minimize the economic, ecological, and human health impacts that invasive species cause.	DoD
AFI 32-7064	Long-term management of all natural areas on the Installation	Protect listed species, biodiversity, wetlands, etc.	DoD/AF
45 SW Instruction 32-7001	Use full cut off, well shielded, low wattage, low pressure sodium or amber lights	Reduce the amount of exterior lighting visible from the beach during the sea turtle nesting season (1 May – 31 October) from 2100 to 0600 to reduce sea turtle hatchling mortality caused by disorientation.	45 SW

The following information on existing biological resources that may be affected by the Proposed Action was derived from several sources; much of the information included has been extracted from the Biological Assessment provided by the AF to NMFS, the *45 SW INRMP,* survey data collected for threatened and endangered species, references found in Section 6 in this EA, and the 2009 MMS/USACE EA (Appendix A).

The Proposed Action of PAFB beach restoration occurs within coastal habitat which includes the dune and its associated vegetation and communities, the sand beach which

includes wildlife nesting and foraging habitat, and the Atlantic Ocean which is aquatic habitat. Additionally, hardbottom and benthic habitats are found adjacent to the PAFB project area offshore within the Atlantic Ocean waters, and sandy shoal habitats are found within the offshore, Atlantic Ocean borrow area (Canaveral Shoals); all of which include associated marine flora and fauna.

Threatened, Endangered and Special Concern Species

No Federal-listed Threatened and Endangered (T&E) plant species have been identified at PAFB or CCAFS. The following plants listed by the State of Florida have been observed on the upper beach/dune: beach star, inkberry, and prickly pear cactus. For a more comprehensive list of species known to occur near or within PAFB and CCAFS boundaries refer to the *45 SW INRMP*.

Several T&E animals and Species of Special Concern (SSC) may occur in areas within and adjacent to the proposed project site: Atlantic loggerhead turtle, Atlantic green sea turtle, leatherback turtle, hawksbill turtle, Kemp's ridley turtle, North Atlantic right whale, humpback whale, smalltooth sawfish, piping plover, great blue heron, American oystercatcher, brown pelican, black skimmer, and least tern. Table 3-6 below contains Federally listed species that may be found in the project area (PAFB and offshore).

Table 3-6: Federally Listed Species Potentially Occurring Along Florida's Atlantic Coast

Common and Scientific Names	Status	Life Stages Present	Abundance Within the Project Area	Seasonal Presence	Nesting/ Calving/ Pupping Season
North Atlantic right whale (*Eubalaena glacilis*	E	Adults, calves	Rare	Fall and Spring migrations, Winter calving	December-March
Humpback whale (*Megaptera novaeangliae*)	E	Adults, calves	Rare	Spring and Fall migrations (generally deep water)	December-April
Florida manatee (*Trichechus manatus latirostris*)	E	Adults, calves	Rare	Summer, Spring, Fall (migrate to warmer springs and spring-fed rivers)	Year-round (peak Spring)
Loggerhead sea turtle (*Caretta caretta*)	T	Adults,subadults, juveniles,and hatchlings	Most Common	Year-round (most abundant during summer nesting)	April-September
Green sea turtle (*Chelonia mydas*)	E[1]	Adults,subadults, juveniles,and hatchlings	Common	Year-round	July-September

Hawksbill sea turtle (*Eretmochelys imbricata*)	E	Adults,subadults, juveniles,and hatchlings	Rare	Year-round	June-September
Kemp's ridley sea turtle (*Lepidochelys kempi*)	E	Juveniles,and subadults	Rare	Year-round (most abundant during summer nesting)	(No nesting in area)
Leatherback sea turtle (*Dermochelys coriacea*)	E	Adults, subadults, juveniles, hatchlings	Rare	March-October	March-July
Smalltooth sawfish (*Pristis pectinata*)	E	Large juvenile, adults	Rare	Year-round	N/A (generally rivers, estuaries)
Piping plover (*Charadrius melodus*)	T	Adults, juveniles	Rare	Winter	Breed outside of Florida (North)

E = endangered, T = threatened under the Endangered Species Act of 1973.

[1] Green sea turtles are listed as threatened except in Florida, where breeding populations are listed as endangered

There is no formally designated critical habitat on PAFB, as defined under Section 4 of the Endangered Species Act (ESA). Three species of sea turtles, the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and leatherback (*Demochelys coriacea*), listed under the ESA nest on PAFB and CCAFS, and can be found in the Atlantic Ocean waters adjacent to the bases and near Canaveral Shoals (CS I & II). Threatened and endangered sea turtle nesting/hatching activity on PAFB has been documented for over twenty years with a range in total sea turtle nest numbers from 608 to 1,993 between the years 1987 to 2010; these numbers are much less than the range in the same time period observed in the South Reach (1,205-3,500 nests). The South Reach is considered the most important nesting location in Brevard County by sea turtle biologists (Archie Carr National Wildlife Refuge). Specific nesting numbers data for the loggerhead and green sea turtle species for PAFB and CCAFS are found in Figures 3-1 and 3-2 below.

Loggerheads are the most abundant species found during the nesting season (May – October) within and near the project areas. The loggerhead was listed as threatened throughout its range in 1978. Off Cape Canaveral in Brevard County, loggerheads utilize both the inner shelf and mid-shelf during all seasons except winter, when they tend to congregate on the mid-shelf (Schroeder and Thompson 1987). Henwood (1987) found that three distinct groups of loggerheads (adult males, adult females, and subadults) moved into inner shelf waters off Cape Canaveral at different times of the year. Adult males were most abundant in April and May, adult females from May to July, and subadults during the remainder of the year.

These data suggest that nesting adult females are short-term residents that migrate into the area on 2- and 3-year intervals and reside elsewhere during non-nesting years. Adult males do not seem to migrate with adult females but may reside in the vicinity of nesting beaches throughout the year. Following nesting activities, many adult loggerheads disperse to islands in the Caribbean Sea, waters off southern Florida, and the Gulf of Mexico (Meylan and Bjorndal 1983; Nelson 1988). Nesting ranged from 608 to 1,993 nests between 1987 through 2010 for PAFB's seven kilometers of beach and 1,195 to 3,581 nests for CCAFS's 21 kilometers of beach, respectively (see Figure 3-1). As noted, the pattern for nesting in the project area follows the same trend seen for Peninsular Florida nesting data. Annual loggerhead nest totals for Florida ranged from 32,942 to 85,988 nests from 1987-2008; an analysis of index nesting beach survey data has shown a decline in loggerhead nesting. Results of the analysis indicated that there has been a decrease of 26% over the 20-year period from 1989-2008 and a 41% decline since 1998. The mean annual rate of decline for the 20-year period was 1.6% (NMFS and FWS 2008).

Leatherback sea turtle nests were not observed on PAFB until 1997 (one nest) although surveys have been conducted at PAFB since 1987. Currently, however, one to two leatherback nests have been observed at PAFB almost annually since 2003. The maximum number of leatherback nests rose to 4 in 2009, although no nests or false crawls were found at PAFB in 2010 (Ehrhart and Sterner 2009, and Sterner 2010). Leatherback nesting at CCAFS also lacks a pattern similar to PAFB, but has generally averaged one to three nests since 1996. The maximum number of leatherback nests at CCAFS rose to 9 in 2009. No documented nests of hawksbill or Kemp's ridley have been reported on CCAFS or PAFB. Hawksbill turtles are considered rare in the nearshore waters of Brevard County and are more likely to be found, although still in small numbers, further south foraging on reef habitat. Kemp's ridley turtles nest primarily in Mexico and occur mainly in coastal areas of the Gulf of Mexico and the northwestern Atlantic Ocean. The Kemp's ridley turtle is fairly rare in the waters within the project area; although observations have occurred offshore of Cape Canaveral and along CCAFS through dead strandings documented on the beach.

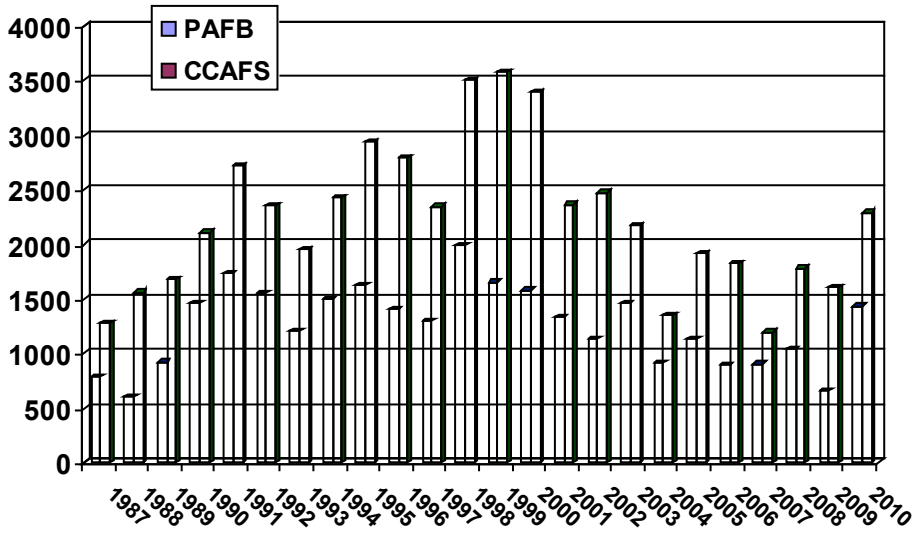


Figure 3-1: Loggerhead Sea Turtle Nest Totals for PAFB & CCAFS, 1987-2010

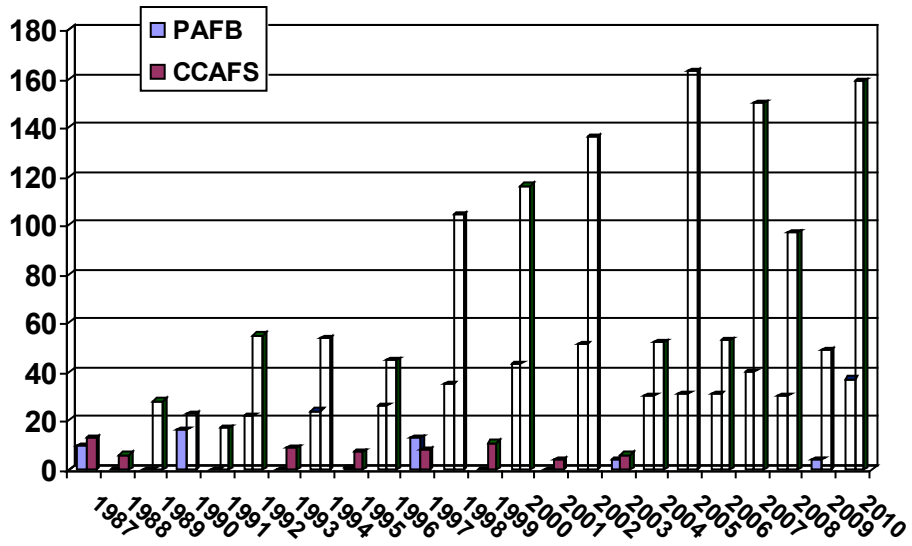


Figure 3-2: Green Sea Turtle Nest Totals for PAFB & CCAFS, 1987 to 2010

Southern Brevard County has the greatest density of sea turtle nests in Florida and probably produces more turtle hatchlings per kilometer than any other beach in Florida (Ehrhart and Witherington 1987). Loggerhead, green, and leatherback turtles account for all nests in the area (Meylan et al. 1995). In general, Florida appears to be an important year round habitat for juvenile through adult loggerhead and green sea turtles. Adult male and female green turtles are found more prevalently during the nesting season from June to August. Inner shelf (nearshore) hard bottom habitats in Brevard County, including worm (Sabellariid) reef, coquina, and limestone outcroppings, are important developmental habitat for juvenile green turtles (Holloway-Adkins and Provancha 2005). A sub-population of juvenile green turtles is also found in CCAFS's Trident Basin near Port Canaveral (Ehrhart and Redfoot 1996; Redfoot 1997). This population, approximated between 20 to 120 turtles, feeds on the algal growth on the intertidal and subtidal riprap rocks and wharf pilings (Ehrhart and Redfoot 2009). Additionally, small numbers of juvenile green sea turtles and smaller numbers of juvenile to subadult loggerhead sea turtles are anticipated to utilize the hardbottom adjacent to PAFB's shoreline based on data collected for the Mid Reach (Holloway-Adkins and Provancha 2005), just to the south of PAFB. High and low relief of the hardbottom allow for sheltered rest areas for sea turtles, and the abundance of algae provides a favored food source.

The West Indian manatee is distinct from the Amazonian manatee and the West African manatee. Genetic and morphological evidence has shown that the manatee found in Florida is actually a subspecies of the West Indian and is called the Florida manatee (*Trichechus manatus latirostris*). Preferred food by the manatee is submerged, emergent and floating aquatic vegetation. Manatees in Florida are occasionally sighted in the Atlantic Ocean, but generally are found in warmer, shallow estuarine waters, the Gulf of Mexico, and within/near fresh springs or spring-fed rivers especially during the winter months when ocean water temperatures are the coldest. The most significant problem presently faced by manatees in Florida is death or injury from boat strikes (FWS 2001). Manatee survivability depends on maintenance of the integrity of ecosystems

and habitat sufficient to support a viable manatee population (FWS 2001). Manatees have rarely been spotted in the Atlantic Ocean waters adjacent to PAFB and CCAFS.

The North Atlantic right whale, *Eubalaena glacialis* (Müller 1776), is a large baleen whale. Adults are generally between 45 and 55 feet in length and can weigh up to 70 tons. Females are larger than males. The North Atlantic has been listed as endangered since 1973. The best estimate of population size for the North Atlantic right whale in 1991, when the first recovery plan was adopted, was 350 animals (NMFS 2005). The population is currently believed to contain only about 361 individuals and it remains unclear whether its abundance is static, undergoing modest growth or, as recent modeling suggests, currently in decline. There have been no apparent signs of recovery in the last fifteen years (NMFS 2010a). Per the NMFS Recovery Plan for the species, the North Atlantic right whale primarily occurs in coastal or shelf waters. Individuals from the western North Atlantic population range from winter calving and nursery areas in coastal waters off the southeastern United States to summer feeding grounds in New England waters and north to the Bay of Fundy and Scotian Shelf. For much of the year, their distribution is strongly correlated with the distribution of their prey, which appears to be primarily calanoid copepods in the Northern Hemisphere. It appears that not all reproductively active females return to calving and nursery grounds each year; furthermore, the whereabouts of much of the population during winter remains unknown. Known wintering areas for this population are along the southeastern U.S. coast, where calving occurs from December through March (Winn 1984; Kraus *et al.* 1986; International Whaling Commission 1986). The project area for sand borrow (CS I/II) is in fairly shallow waters off the southeastern U.S. within this critical habitat where calving has the potential to occur. The NMFS website provides additional information: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/rightwhale_northatlantic.htm. A map defining the critical habitat for North Atlantic right whales within the project area can be found at: http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/n_rightwhale_se.pdf.

Another protected whale species that is known to occur in coastal waters off the southeastern U.S. is the humpback, *Megaptera novaeangliae*. Humpbacks were listed as endangered in 1973. Prior to commercial whaling, the worldwide population of humpbacks was thought to be over 125,000 (NMFS 1991). The overall North Atlantic population is estimated at about 7,698 (NMFS 2010). Humpbacks feed opportunistically along the continental shelf, but the largest numbers occur from mid-April to mid-November in the western section of the Gulf of Maine, and from July to October in the eastern section around the Bay of Fundy. From late December through early April, most North Atlantic humpback whale populations are found near the Bahamian Archipelago, the Dominican Republic, western edge of Puerto Rico, and the Lesser Antilles south to Venezuela (NMFS 1991).

The smalltooth sawfish has become rare along the southeastern Atlantic and northern Gulf of Mexico coasts of the US during the past 30 years, and its known primary range is now reduced to the coastal waters of Everglades National Park in extreme southern Florida. Fishing and habitat degradation have extirpated the smalltooth sawfish from much of its former range. The smalltooth sawfish is distributed in tropical and subtropical waters world-wide. Critical habitat has been designated along the southwestern coast of Florida between Charlotte Harbor and Florida Bay, over approximately 250 miles from PAFB. Normally inhabiting shallow waters (10 m or less) often near river mouths or in estuarine lagoons over sandy or muddy substrates, the sawfish may also occur in deeper waters (20 m) of the continental shelf. The National Sawfish Encounter Database

(Simpendorfer and Wiley 2006) managed by the Florida Museum of Natural History, University of Florida, revealed seven encounters for Brevard County from as far back as 1895. Six of the observations occurred in the Indian River Lagoon and three occurred in the Atlantic coastal waters. A recent observation occurred in 2010 near Sebastian Inlet (30 miles south of PAFB) when University of Central Florida students were netting for a sea turtle population survey (Andrew Sterner, personal communication).

The piping plover, (*Charadrius melodus*), is a species listed Federally in 1985. The piping plover is a small, migratory shorebird that breeds only in three geographic regions of North America: on sandy beaches along the Atlantic Ocean, on sandy shorelines throughout the Great Lakes, and on riverine systems and prairie wetlands of the Northern Great Plains. The Great Lakes population is listed as endangered, whereas the Atlantic Coast and Great Plains populations are listed as threatened. The United States Fish and Wildlife Service recently designated 137 areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas as critical habitat for the wintering population of the piping plover. The critical habitat includes approximately 2,891 kilometers of mapped shoreline and approximately 165,211 acres along the Gulf and Atlantic Coasts and margins of interior bays, inlets, and lagoons. Though this species does not breed in Florida, individuals from the three breeding populations winter in Florida (USFWS 1999). The complete winter distribution of the piping plover remains to be determined, but generally the plover arrives from July through September and returns to breeding sites from February to May. Neither PAFB nor CCAFS are listed as critical wintering habitat for the piping plover. The closest critical habitat is found north of CCAFS in a small area near Daytona Beach and south of PAFB in a small area in Palm Beach County.

Two distinct Southeast population segments of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) were proposed for listing by the NMFS in the Federal Register (NMFS 2010b). Atlantic sturgeon may live up to 60 years, are omnivorous benthic feeders, may not spawn annually, and are an estuarine-dependent, anadromous species. The South Atlantic population is not known to occur south of the St. John's River in Florida. Spawning adults migrate upriver in spring, which occurs February and March in southern systems, and in some southern rivers also have a fall spawning migration (NMFS 2010b). After development, juvenile sturgeon remain in the river and continue to move further downstream into brackish waters until they become residents of estuarine waters for months or years before moving to the Atlantic Ocean. The NMFS considers the range of the Southeast population of Atlantic sturgeon in Atlantic Ocean waters to be from South Carolina through the northern most extent of Florida (roughly Duval County, Jacksonville area) (NMFS 2010b).

Migratory Birds and Wildlife

Many species of pelagic, migrant and coastal birds are found along southeastern U.S. coastal beaches, wetlands, and adjacent inner shelf waters. The USFWS has designated an extensive number of species as priority birds of conservation concern. Some of these shorebirds, waterfowl, wading birds, sea birds, raptors and passerines may be present in or adjacent to the project area. PAFB is located along one of the major migratory flyways for neo-tropical migrants that breed in eastern North America. During biological surveys conducted at PAFB by the Air Force in 1996 and again from 2007-2010, many neotropical migrants were observed using the dune and beach habitat. Species observed on/over PAFB beaches, include, but aren't limited to, sanderlings,

black bellied plover, gulls, gannets, royal terns, least terns, lesser yellowlegs, pelicans, great blue herons, ospreys and ruddy turnstones. Migratory birds are protected under the Migratory Bird Treaty Act. There are no FWC recognized Important Birding Areas (IBA) in the footprint of the proposed project. Many coastal species use a specific habitat for nesting, but forage over a much larger coastal and marine landscape (Guilfoyle et al 2007). Offshore sand ridges may be foraging grounds for various waterbirds including seabirds, loons and sea ducks. Species must likely to occur in the dredging area are pelagic birds, pelicans, gulls, and terns (Zarillo et al 2009).

Other wildlife that may be present on PAFB beaches and dunes include various insects, crabs, common mice, snakes, fox, rabbit, armadillo, raccoon, etc. Dolphins are also found within the offshore waters of the project area and are protected under the Marine Mammal Protection Act from being hunted, harassed, captured or killed. The common dolphin species that may be found in the Atlantic Ocean waters of the project area are the short-beaked common (*Delphinus delphis*), bottlenose (*Tursiops truncates*), and Atlantic spotted (*Stenella frontalis).* Population size estimates for these three species for Atlantic waters along the eastern United States are roughly 269,000 based on aerial surveys (http:///www.nmfs.noaa.gov/pr/pdfs/sars/species.htm#dolphins).

Essential Fish Habitat

The definition of Essential Fish Habitat (EFH) is “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity” [16 U.S.C. § 1801(10)]. Additional interpretation includes aquatic area waters’ physical, chemical, and biological properties that are used, or historically have been used, by fish and substrate that includes sediment, hardbottom, structures underlying the waters, and associated biological communities (50 CFR Part 600). The South Atlantic Fishery Management Council (SAFMC) of the NMFS is responsible for managing fisheries and habitat within the waters of the project area. Within EFH designations, Habitat Areas of Particular Concern (HAPC) have also been identified. The NMFS applies this designation by using three criteria of importance of ecological functions: sensitivity to human degradation, probability and extent of effects from development activities, and rarity of the habitat.

Nearshore hardbottom habitat is considered EFH-HAPC because of their use by juvenile and adult fishes of commercial value (snapper-grouper) (CSA International, Inc. 2009). The EFH designation is also applicable to nearshore hardbottom because of use by penaeid shrimp, some pelagic fish species (cobia, King mackerel, etc.), and other less commercially valued species such as red drum, other sciaenids, and coastal sharks. Nearshore hardbottom, found along east Florida, generally takes the form of coquina and worm reefs (sabellarid polychaetes). The water depth at which this habitat occurs is usually from 0-4 meters and is strongly subjected to wind and wave/tide events, seasonal and storm erosion, and seabed/sand fluctuations. Situated among expanses of bare sand bottom, hardbottom structural features have a variety of ecosystem functions, including settlement, feeding and nursery areas, spawning sites, and shelter for a myriad of invertebrates, fishes, and sea turtles. Algae are commonly found on hardbottom habitat and contribute to oxygen and nutrient production while providing shelter and food source for several genera of invertebrates, fishes, and the sea turtle. Greater numbers of annual algal species in intertidal and shallow subtidal waters have been found along the east Florida coast compared to deeper (>31 m) waters off the Florida coast (CSA International, Inc. 2009). These year-round annual species also adapt to the stressful environmental conditions of the turbid, shallow intertidal waters by

becoming resilient toward changes in sedimentation and/or becoming opportunistic in settlement, and dispersing fragments greater distances from the source than predicted for many rocky intertidal species (CSA International, Inc. 2009).

In shallow areas of the nearshore, the hardbottom habitat is generally the only natural habitat that can support an abundance of early life stages of fishes and invertebrates which can result in more nursery structure thus leading to increased local diversity and the introduction of predators and prey into the local food web (CSA International, Inc. 2009). Diversity, abundance and community structure of sessile and motile invertebrates are highly variable based on latitude, depth, seasonality, hydrodynamics, substrate characteristics and other biotic and abotic factors. One sessile invertebrate, the polychaete (*Phragmatopoma lapidosa*), has been considered a keystone contributor to the biodiversity of hardbottoms along the Florida coast because of their reef building nature ("worm reef" or "Sabellariid worm rock") which provides food and shelter. However, no information is currently available that describes the diversity and abundance of polychaetes along latitudes and depths for the east Florida coast (CSA International, Inc. 2009).

Empirical information is highly limited on the amount of connectivity between shallow patches of hardbottom and deeper reefs for fishes and invertebrates of east Florida (CSA International, Inc. 2009). Assumptions have been made that nearshore hardbottom is used during early life stages for fish species that ontogenetically migrate into deeper water based on some available information. Predation, growth, and larval recruitment are some ecological drivers that may affect migration from nearshore hardbottom to deeper habitats. Brevard County is said to have roughly 42.3 acres of hardbottom within roughly 115 kilometers of shoreline from FDEP monuments R70 to R118 (CSA International, Inc. 2009). PAFB is at the northern limit of hardbottom presence; the nearshore intertidal and subtidal waters adjacent to PAFB contain approximately nine acres of exposed hardbottom as calculated from spectral image analysis from 2001 aerial photography (Olsen Associates, Inc. 2003). Further calculations made during post-construction PAFB beach profile and hardbottom monitoring have varied; two prior years of surveys (2008 and 2009) indicated rock exposure 30% and 55%, respectively, greater than pre-project (2001-2004) conditions, and the current 2010 survey indicated exposure about 43% less than the pre-project conditions (Olsen Associates, Inc. 2010). The surveys have provided evidence that exposed rock/hardbottom area has varied significantly between locations and survey dates, therefore indicating that the previously documented nine acres of exposed hardbottom adjacent to PAFB is quite variable naturally.

In addition to nearshore hardbottom habitat, the NMFS also designates sandy shoals of capes, offshore bars and shelf currents/water column as EFH, therefore, the borrow areas of Canaveral Shoals I and II (see Figs 1-1, 2-2, & 2-3) and areas offshore of PAFB are also included as EFH. Extensive fish and infaunal research has been compiled within the 2009 USACE *Draft Reevaluation of the Mid-Reach SEIS* that can be referenced (see Section 6). Infauna, demersal soft and hard bottom fish assemblages, and coastal pelagic fish discussed in the referenced SEIS would also be found in the nearshore and offshore of PAFB and CS I & II project areas. Natural variability exists in the infauna (benthic) communities due to the patchy nature of "microhabitats" that can be distinct based on the parameters of depth, substrate type, temperature, light penetration, food availability, disturbance, currents, and predation pressure (Howe et al 1997). Additionally, shifting sand can significantly affect macroinvertebrate abundance

as organisms that are motile or that can burrow will predominate within these unstable areas.

Recovery, rates of infilling of dredge locations in CS II (CS I hasn't been dredged yet), and grain size distribution have also been studied in depth to determine effects to infauna and fish assemblages that utilize this sandy shoal habitat. Surveys conducted across CS II between September 2000 and June 2008 (prior to initial dredging and prior to the most recent dredge activity, respectively) indicate a net volumetric recovery rate of approximately 152,000 cubic yards per year (cy/yr), on annual average. Depending upon the survey interval, the computed value varies between 98,000 and 182,000 cy/yr (Olsen Associates, Inc. 2008b). Monitoring data indicate that seabed infilling occurs across the entirety of the borrow area after dredging, more or less, typically with up to 2-feet of vertical accretion over several years (Olsen Associates, Inc. 2008b).

Wetlands and Floodplains

Wetlands are the transition zones between dry upland ecosystems and deeper aquatic habitats. Each wetland area is unique according to its surrounding geologic, hydrologic, and climatic conditions. Wetlands provide flood control, aquifer recharge, coastal protection, and act to help filter pollutants from the ecosystem. Wetlands often support a wide range of rare and endangered aquatic plants and wildlife. The nearshore area within the Atlantic Ocean waters are considered as Sovereign Submerged Land by FDEP and also as jurisdictional waters of the United States by the Army Corps of Engineers (USACE) under Section 404 and 401 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. The USFWS classifies this beach/water interface as marine wetlands. Actions occurring in these waters or affecting these waters are considered regulated actions and require permitting through the USACE and FDEP. Per EO 11990, *Wetland Protection*, Federal agencies are to include all practical measures to minimize harm to wetlands. Actions occurring near wetlands within the CCAFS sand borrow site were analyzed within the *Development of a CCAFS Borrow Site EA* (FONSI 6 Sept 07). Requirements for protection of these wetlands through the State are identified in the Joint Coastal Permit.

A floodplain is the lowland adjacent to a river, lake, or ocean. Floodplains are designated by the frequency of the flood that is large enough to cover them. Flood frequencies, such as the 100-year flood, are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur.

Section 1 of Executive Order (EO) 11988, *Floodplain Management*, directs each federal agency to provide leadership and take action to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for federally undertaken construction and improvement projects. If it is determined that the only practicable alternative consistent with the law and with the policy set forth in this EO requires siting in a floodplain, the agency is required to minimize potential harm to or within the floodplain which may include designing or modifying its action in order to reduce loss of property, and minimize the potential for the risk of loss of life. According to Federal Emergency Management Agency (FEMA) maps, the Proposed Action site is located the 100-year floodplain. All areas adjacent to the Atlantic Ocean have base flood elevations from 12-16 ft (referenced from NGVD 1929) with associated coastal flooding and velocity hazards due to wave action.

3.4 Cultural Resources

Cultural resources include prehistoric-archaeological, historic, architectural, and Native American resources. Areas of potential impact include properties, structures, landscapes, or traditional cultural sites that qualify for listing in the National Register of Historic Places. Section 106 of the National Historic Preservation Act of 1966 (as amended) requires federal agencies to consider the effects of their actions on historic properties. Underwater surveys and diver identifications within the borrow area (Canaveral Shoals) between 1994 to 2002 (DHR/SHPO file numbers 942533, 992156, 2000-02415, 2001-316, and 2002-06980) identified several potentially significant anomalies of which now only eight are considered potentially significant (some being modern debris from the space program). These offshore anomalies within the borrow areas are marked on maps used by the dredge personnel and are avoided with buffer zones of 200-feet per DHR/SHPO requirements. Additionally treasure salvors surveyed the nearshore area off of PAFB (SEARCH, Inc.; DHR/SHPO file number 14676) and didn't find any buried cultural resources. No onshore resources have been identified. All probable resources that may be affected by the proposed actions have been identified in the project area (borrow, placement, and pump-out areas). Refer to the 2009 MMS/USACE EA (Appendix A) for details on the history and reports concerning submerged cultural resources within the borrow area.

3.5 Geology and Soils

Sediments underlying PAFB have accumulated in alternating periods of deposition and erosion since the Eocene. Surface sediments are of Pleistocene and Recent ages. Fluctuating sea levels with the alternating glacial/interglacial cycles have shaped the formation of the barrier island where PAFB is located.

In general, barrier islands have sandy, well-drained soils on the central and eastern portions of the islands, and poorly-drained tidal swamps along their western shore. Soils of PAFB reflect the complexity of soil forming factors (parent material, topography, time, and biota) on the landscape. Numerous soil series are represented. Within a given area, soils vary from well to poorly drained. On well drained sites of differing ages, leaching has modified soil properties. Parent material differences (sand, loam, clay, coquina*)* are also reflected in the soil pattern.

The soils of PAFB are mapped in the soil surveys for Brevard County (Huckle et al 1974) and Volusia County (Baldwin et al 1980). The primary source of parent material for PAFB soils is sands of mixed terrestrial and biogenic origin. The terrestrial material originated from southern rivers carrying sediments eroded from highly weathered Coastal Plain and Piedmont soils; these sediments are quartzose with low feldspar content (Milliman 1972). These sediments moved south through longshore transport and may have been reworked repeatedly. The biogenic carbonate fraction of the sand is primarily of mollusk or barnacle origin with lesser contributions of coralline algae and lithoclasts; some may be reworked from offshore deposits of coquina and oolitic limestone (Milliman 1972). Differences in age and parent material account for some soil differences, but on landscapes of Merritt Island with similar age, topography has a dramatic effect on soil formation. Relatively small elevation changes cause dramatic differences in the position of the water table that, in turn, affect leaching, accumulation of

organic matter, and formation of soil horizons. In addition, proximity to the lagoon systems influences soil salinity.

Soils for CCAFS were discussed in the *Development of a CCAFS Borrow Site EA* and are not discussed in this EA. However, offshore of CCAFS, sediment from Canaveral Shoals has been assessed through numerous geo-technical sampling and analyses events. Recent and historical geo-technical information conclude that the borrow source material meets the criteria for beach placement as described in the Florida Sand Rule (62B-41.007) such that there are less than 10% fines (CS I & II generally has less than 5% fines) and particle size distribution (grain size) ranging between 0.062 and 4.76 mm (Olsen Associates, Inc. 2010b).

3.6 Hazardous Materials and Waste

Hazardous materials typically associated with construction activities, such as lubricants and fuels, would be used during the Proposed Action. Any hazardous waste would be identified, removed, and disposed of in accordance with current regulations. Although not anticipated, if additional hazardous materials/waste are generated due to the implementation of the Proposed Action they will be identified and removed in accordance with existing regulations. AFI 32-7042, *Solid and Hazardous Waste Compliance*, identifies compliance requirements for all solid and hazardous waste, except radioactive waste. Applicable hazardous materials and waste requirements are summarized in Table 3-7.

Table 3-7: Summary of Hazardous Materials and Waste Requirements

Permit/Action(s)	Requirement	Agency or Organization
AFI 32-7042	Solid and Hazardous Waste Compliance	AF
AFI 32-7086	Hazardous Materials Management	AF

3.7 Infrastructure and Transportation

Infrastructure and transportation includes utilities, transportation networks, and other associated amenities. An approved Air Force Form 103 (Work Clearance) is required prior to initiation of any site work/excavation. Refer to Table 3-8 below for a requirements summary.

Table 3-8: Summary of Infrastructure and Transportation Requirements

Permit/Action(s)	Requirement	Agency or Organization
AF Form 103 Utility Locate/Excavation Permit	Any excavation activity	45 SW Civil Engineering Squadron

Permit/Action(s)	Requirement	Agency or Organization
State and County Transportation Coordination (FDOT)	Any change to access points to major State Roads (A1A); Any change to traffic patterns or signals	Florida Department of Transportation Brevard County Traffic Engineering

3.8 Occupational Safety and Health

AFI 91-301, *Air Force Occupational and Environmental Safety, Fire Protection, and Health* program summarizes AF requirements for the protection of health and safety. Common safety hazards associated with heavy equipment operation and construction activities would exist. All appropriate regulations, including Occupational Safety and Health Administration (OSHA) regulation 29 CFR 1926, *Safety and Health Regulations for Construction*, would be followed during project activities to minimize potential impacts. Bird attractants will be minimized with dredge pumping and placement per 45 SW OPLAN 91-212*, Bird Hazard Reduction Plan.*

Noise

The EPA administers the Noise Control Act of 1972, and has identified 65 dB (A-scale) as an acceptable noise level for compatible land uses. This level is not regarded as a noise standard, but as a basis to set appropriate standards that should also factor in local considerations and issues.

Health and Safety

Table 3-9 below identifies specific guidance with implementation of the Proposed Action.

Table 3-9: Summary of Health and Safety Requirements

Law/Regulation/Rule	Requirement	Agency or Organization
Occupational Safety and Health Standards, 29 CFR 1910	Protect health and safety of workers	Occupational Safety and Health Administration
Safety and Health Regulations for Construction, 29 CFR 1926	Protect health and safety of workers	Occupational Safety and Health Administration
45 SW OPLAN 91-212, Bird Hazard Reduction Plan	Protect aircrew and aircraft from bird/wildlife strike damage/injury/death.	45 SW

3.9 Socioeconomics

Socioeconomics encompasses such interrelated resources as population, employment, income, temporary living quarters (during construction activities), commerce/industry,

public finance, and disproportionate impact on low income or minority populations. Per EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, Federal agencies are to analyze environmental effects, including human health, economic, and social effects, including affects on minority and low-income communities; and devise mitigation measures for significant effects on minority and low-income communities.

3.10 Water Resources

Groundwater at PAFB occurs under unconfined (water table), semi-confined, and confined (artesian) conditions. The unconfined aquifer, composed of Holocene and Pleistocene age surficial deposits of marine sand, shell fragments, and sand conglomerate of the Anastasia Formation, is recharged by direct infiltration or rainfall. This aquifer exists in dynamic equilibrium with rainfall and with the fresh-saline water interface. The generalized direction of groundwater flow in the surficial aquifer is westward, toward the Banana River. Localized flow in the surficial aquifer is from topographic highs (mounds, swells, dune ridges) toward surface water bodies (creeks, ponds, drainage canals). Discharge is from evapotranspiration, seepage to canals and ditches, seepage into interior wetland swales, and seepage into impoundments, lagoons, and the Atlantic Ocean. The Atlantic Ocean encompasses the surface waters within the project area. Refer to the jurisdictional waters discussion under the Biological Resources in Section 3.2. The proposed action will require turbidity monitoring per permit requirements as the USACE and FDEP regulate beach restoration actions that affect surface waters under their purview. Additionally, Environmental Protection Agency and USACE approval through Section 103 of the Marine Protection, Research, and Sanctuaries Act, may be required for placement of dredged material from the CS I access channel in the approved Offshore Dredged Material Disposal Site (ODMDS) or the Nearshore Disposal Area, both off of Cocoa Beach, FL.

4.0 ENVIRONMENTAL CONSEQUENCES

This Chapter describes potential environmental impacts associated with activities under the Proposed Action and the No Action Alternative. Components of the affected environment that are of greater concern are described in greater detail.

Federal, State, and local environmental laws and regulations were reviewed to assist in determining established thresholds for assessing environmental impacts (if any) in fulfillment of NEPA requirements. Proposed activities were evaluated to determine their potential to result in significant environmental consequences using an approach based on the interpretation of significance outlined in the CEQ regulations for implementing the procedural provisions of NEPA (40 CFR 1500-1508) and 32 CFR 989, *The Environmental Impact Analysis Process* (2003) for the Air Force.

Guidelines established by the CEQ (40 CFR 1508.27) specify that significance should be determined in relationship to both context and intensity (severity). The assessment of potential impacts and the determination of their significance are based on the requirements in 40 CFR 1508.27. Three levels of impact can be identified:

- No Impact - No impact is predicted
- No Significant Impact - An impact is predicted, but the impact does not meet the intensity/context significance criteria for the specific resource
- Significant Impact - An impact is predicted that meets the intensity/context significance criteria for the specific resource

Factors contributing to the intensity or severity of the impact include the following:

- The degree to which the action affects public health or safety;
- Unique characteristics of the geographic area such as proximity to cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas;
- The degree to which effects of the action on the quality of the human environment are likely to be highly uncertain or controversial;
- The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration
- Whether the action is related to other actions with individually insignificant, but cumulatively significant impacts;
- The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed or eligible for listing on the National Register of Historic Places (NRHP), or may cause loss or destruction of significant scientific or cultural resources;

- The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the ESA; and

- Whether the action threatens to violate a federal, state, or local law or requirements imposed for environmental protection.

Thresholds for determining impact significance are based on the applicable compliance standard. When feasible, these criteria correspond to federal- or state-recognized criteria, and are determined using the associated standardized methods. In the absence of a compliance standard, the thresholds are based upon a federal- or state-recommended guidance or professional standards/best professional judgment.

4.1 Air Installation Compatible Use Zone (AICUZ) & Land Use

Air Installation Compatible Use Zone (AICUZ)

The proposed site is not in conflict with the Airfield Clear Zone and Accident Potential Zones (APZ) as long as coordination with the Base Airfield Operations occurs when construction equipment is within these zones as the APZ extends over PAFB beaches. No impacts to the base's AICUZ would be anticipated from the Proposed Action. Under the No Action Alternative, no impacts to AICUZ/APZ would occur as there would be no construction activities.

Land Use

The CZMA contains environmental compliance implications for many federal projects and programs "directly affecting" the states' coastal zones. Federal property is exempt from the definition of the states' coastal zones, but activities occurring on federal property that directly affect the states' coastal zones must comply with the CZMA. The section of the Act most significant to the Proposed Action is Section 307, "Coordination and Cooperation." Section 307(c)(1)(A) mandates that each federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent, to the maximum extent practicable, with the enforceable policies of approved state management programs.

Applicable federal actions must be consistent with NOAA's federal consistency regulations at 15 CFR Part 930. Federal consistency is required for federal actions that are defined as federal activities, including any development projects (15 CFR Part 930, Subpart C). Subpart C regulations require that all federal activities and development projects be consistent to the maximum extent practicable with federally approved state Coastal Zone Management (CZM) programs. Activities must be reviewed to determine which directly affect the coastal zone of states with approved plans and provide a written "consistency determination" to the authorized state CZM agency for all activities directly affecting the state's coastal zone. The Proposed Action has been deemed consistent with Florida's CZM program through issuance of the Joint Coastal Permit.

No significant impacts to Land Use would be expected as a result of the No Action Alternative or the Proposed Action.

4.2 Air Quality

PAFB is located in an area that is in attainment for all criteria air pollutants; therefore, a conformity determination is not required. However, several sources of air emissions were considered that could result from implementation of the Proposed Action. Changes in local air quality resulting from these sources would not be significant. Potential specific sources of air pollution are reviewed in this section.

Vehicle/Equipment Use

Non-road diesel engines are used in machines that perform a wide range of important jobs in our economy. They also contribute greatly to air pollution in many of our nation's cities and towns. Examples of land-based non-road applications using diesel engines include construction equipment such as backhoes, material handling equipment such as heavy forklifts, industrial equipment, and utility equipment such as generators and pumps. The two main pollutants of concern in diesel exhaust that affect human health are nitrogen oxides (NOx) and particulate matter (PM). The construction sector is a significant contributor to these emissions, creating 32% of all mobile-source NOx emissions and 37% of PM emissions. A typical idling diesel engine in an on-road tractor consumes 1.2 gallons of fuel per hour at high idle and 0.6 gallons per hour at low idle. There is a lack of detailed data concerning non-road equipment idling. Fuel consumption for non-road equipment at idle varies by equipment type. A typical mid-size track-type tractor consumes approximately one gallon per hour at idle (USEPA 2007).

For an on-road truck, eliminating one hour of idling reduces PM emissions by two grams, NOx emissions by 136 grams and CO2 emissions by 6,848 grams. For non-road equipment, emissions benefits vary by equipment type. For a typical backhoe loader, reducing a single hour of unnecessary idling would reduce PM emissions by 13 grams, NOx emissions by 155 grams, CO emissions by 65 grams, and CO2 emissions by a similar amount (USEPA 2007).

Three operating strategies to reduce diesel emissions include: (1) equipment idle control and reduction, (2) engine preventive maintenance, and (3) equipment operator training. Table 4-1 summarizes the costs and benefits of each operating strategy.

Table 4-1: Operating Strategies Summary

Operating Strategy	Costs	Benefits
Equipment Idle Reduction and Control	Administrative costs for training and tracking of idling If on-board idle reduction equipment is used, upfront investment in equipment is required	Reduced PM, NOx, carbon monoxide (CO), and HC emissions Significant fuel cost savings Longer engine life and reduced maintenance costs
Engine Preventive Maintenance	Low administrative costs for tracking equipment maintenance needs	Reduced PM, NOx, CO, and HC emissions

	If customized software is used to track maintenance, significant upfront investment in software may be required	Reduced fuel consumption Reduction in high cost engine failures Longer equipment life and reduced maintenance costs
Equipment Operator Training	Upfront investment in operator training – cost varies by training program	Reduced PM, NOx, CO, and HC emissions Improved operator efficiency Reduced fuel consumption

From: USEPA 2007

Construction equipment/vehicles would emit exhaust (CO, NO_x, and SO_2) during project activities, and dust particles (*i.e.*, PM) may also be suspended. Under 40 CFR Part 93, the *de minimis* levels are 100 tons per year each for NO_x and VOCs. Emissions generated from the operation of diesel-fueled construction equipment during construction are expected to be below the *de minimis* levels of the Clean Air Act's General Conformity regulations. The current Title V Air Operating Permit would not need to be amended due to these activities, as the impacts associated with the Proposed Action would be minor and are covered by the existing permits. Generally, the contractor conducting the work is consistently attempting to find ways to save money to increase profit so it is assumed that the least amount of use of heavy equipment, truck trips, and idling would occur which would minimize construction vehicle emissions.

Emission data related to use of the dredge/barge equipment was discussed in the 2009 *MMS/USACE South Reach EA* (Appendix A). Emissions were estimated using power requirements, duration of operations, and emission factors for the various equipment types from the USEPA's *Compilation of Air Pollution Emissions Factors, AP-42, Volume 1 (2002)*. Calculations were made for both waters within State of Florida limits (less than three nautical miles offshore) and Federal waters because there is no provision for classification in the Clean Air Act for attainment status outside of state water boundaries. Dredging emissions were considered to be the largest contributor to the total inventory, however, the beach restoration action for the South Reach was considered to only have a localized, temporary increase in concentrations of NOx, CO, VOC, and PM. The PAFB proposed beach restoration project will only need approximately one-quarter of the amount of sand dredged for the South Reach project and is closer to the CS I & II borrow site (60% less sailing distance than the South Reach), therefore, emissions will be much less with a smaller number of dredge hours and less travel necessary to get to the PAFB beach placement site (on the order of 15% of the South Reach projected emissions), even with the potential addition of travel from the CCAFS upland borrow site if necessary. Total increases of emissions due to this proposed PAFB project are relatively minor in context with existing point, non-point and mobile source emissions in Brevard County (Table 3 in Appendix A & Table 3-2 in Section 3 of this document). The criteria pollutant levels for the Proposed Action would be well within the NAAQS.

No significant impacts to Air Quality would be anticipated as a result of the Proposed Action or the No Action Alternative.

4.3 Biological Resources

Threatened, Endangered and Special Concern Species

No federally-listed T&E plant species have been identified at PAFB. The following State listed plants have been observed on the upper beach/dune: beach star, inkberry, and prickly pear cactus. These species will be minimally impacted as the sand placement template doesn't include work landward of the eroded dune. Some temporary impacts may occur if these species are next to the eroded dune, but growth over a newly constructed dune is expected to occur over time in addition to growth of the newly planted native dune vegetation. A new dune would also serve to prevent further damage to native, coastal dune species as wave action/damage would first erode the dune face before reaching the more established, upper dune vegetation.

There is no formally designated critical habitat at PAFB, as defined under Section 4 of the ESA. The current Federally listed species present that have the potential to occur within the Proposed Action area on PAFB are: Atlantic loggerhead turtle, Atlantic green sea turtle, leatherback turtle, hawksbill turtle, Kemp's ridley, and piping plover. The current Federally listed species present that have the potential to occur within the Proposed Action area outside of PAFB are: North Atlantic right whale, humpback whale, Florida manatee, Atlantic loggerhead turtle, Atlantic green sea turtle, leatherback turtle, hawksbill turtle, Kemp's ridley, smalltooth sawfish, and piping plover.

The Proposed Action activities have the potential to impact threatened and endangered species due to the use of hopper dredge and placement of sand within nesting/hatching habitat. Prior dredge events at CS II (April/May 2005) caused the death, or take, of three loggerhead sea turtles during a Brevard County beach project that occurred after the last PAFB beach restoration project. The 45 SW determined that the Proposed Action involving in-water actions may affect North Atlantic right and humpback whales, sea turtle species, and the smalltooth sawfish, but may only inadvertently, adversely affect the loggerhead and green sea turtles because of their presence in the CS II area during proposed winter/early spring dredging and based on dredging incidents during prior years. Additionally, the 45 SW's opinion concerning actions on PAFB beach was that listed sea turtles and manatee may be affected (under purview of the USFWS), but no adverse effect to these species would occur. Consultation with the NMFS Protected Resource Division (PRD) under Section 7 of the Endangered Species Act (ESA) was completed and a Biological Opinion (BO) was issued (NMFS F/SER/2009/03376, Appendix B). Consultation with the USFWS was also completed in accordance with Section 7 of the ESA and a BO was issued (FWS Log 41910-2009-F-0336, Appendix C).

The terms and conditions required per the NMFS BO issued to the 45 SW include the conditions in the Regional NMFS BO (1997 & 1995) involving the use of hopper dredges in channels and borrow areas along the Southeast U.S. Atlantic coast. These conditions include the use of turtle deflectors, maintaining protected wildlife species' observers on the dredge ships, participation in the Right Whale Early Warning System, implementation of the *NMFS' Southeast Region Vessel Strike Avoidance Measures and Reporting for Mariners*, maintaining a 500-yard buffer between the vessel and any North Atlantic right whale [50 CFR 224.103(c)], and operating vessels at 10 knots or less during the right whale calving season (15 Nov- 15 April) when traveling between the shoreline to 5 nautical miles. Other conditions in the NMFS BO for PAFB, to limit the take of sea turtles, include relocation trawling, minimal use of dredge/construction

lighting from 1 March to 31 October, participation in the sea turtle stranding network, and a 400-ft buffer zone establishment around hardgrounds/hardbottom. Additionally, the *NMFS' Sea Turtle and Smalltooth Sawfish Construction Conditions* (23 March 2006, Appendix B) were also included as conditions in the BO.

Similar to the USFWS opinion for the South Reach project, the USFWS BO for PAFB included terms and conditions requiring utilization of beach compatible sand that is of the right weight and coarseness, a beach work window from 1 November to 31 April, sea turtle nesting surveys, nest relocation if necessary, sand compaction and scarp formation surveys with mechanical correction (tilling and/or scarp removal) if necessary, and light management for construction lighting. Fill material from CS II is a suitable medium for nesting sea turtles as supported by high hatching success along PAFB beaches (62.1% for loggerheads, and 53.3% for greens; rates recorded for 2009 were very similar)(Ehrhart & Sterner 2010), but compaction will still be tested per the BO due to heavy equipment traversing the fill during placement. In addition to sea turtle protection requirements, the USFWS BO requires adherence to the *Standard Manatee Construction Conditions for In-Water Work* (2009) to prevent/reduce impacts specifically for manatee. Conditions include manatee awareness by all vessel personnel, appropriate signage on the vessel, and operation shut down if a manatee is within 50-feet with start up once the manatee has moved beyond this distance.

The 45 SW has committed to adherence to the terms of the BOs issued by NMFS PRD and the USFWS to prevent jeopardy to the continued existence of listed species that may be affected by the Proposed Action. Following the terms and conditions will prevent and/or reduce sea turtle, manatee and whale mortality/injury and minimize impacts to their habitat as well. The NMFS PRD concurred that marine mammals and smalltooth sawfish were not likely to be adversely affected in the consultation response letter to the USACE for the South Reach project (Appendix A), repeated that no adverse impacts to these species were anticipated in the BO issued to PAFB (Appendix B) as long as BO terms and conditions were followed, and stated that no take of marine mammals was authorized. The NMFS concluded in their BO that the use of a hopper dredge is likely to adversely affect loggerhead, green and Kemp's ridley sea turtles because of potential injury or death, therefore, a lethal take was expected of up to two sea turtles by dredge (over 2 potential nourishment events in a 10-year period) and a lethal take of up to two sea turtles by relocation trawling (out of an estimated 162 non-lethal sea turtle "takes" in a 10-year period) with non-lethal "taking" of potentially 162 sea turtles with relocation trawling over a 10-year period (116 loggerhead, 44 green, and 2 Kemp's ridley). Despite this potential take, the NMFS concluded that the proposed action is not likely to adversely affect the continued existence of these species through detailed jeopardy analyses using species' abundance, distribution, and reproductive success (Appendix B). Per the NMFS PRD BO's Incidental Take Statement, re-initiation of consultation under the ESA will be required if any take estimate is exceeded. In compliance with the NMFS PRD BO's, the following protective measures shall be implemented to minimize risk of wildlife injury/death:

- The Contractor shall instruct all personnel associated with the project of the potential presence of threatened and endangered species, such as whales, manatee, sea turtles and smalltooth sawfish, and the need to avoid collisions with these animals or harming them in any way.

- All construction personnel shall be advised that there are civil and criminal

penalties for harming, harassing, or killing species listed under the ESA and MMPA. The Contractor may be held responsible for any threatened and endangered species harmed, harassed, or killed as a result of construction activities.

- During dredging operations, an observer approved by the NMFS shall be aboard the dredge to monitor for the presence of sea turtles, manatee, and whales as well as monitor the dredge equipment hopper, screening and dragheads to determine if an animal has been entrained.

- Any take concerning a sea turtle or sighting of any injured or incapacitated sea turtle shall be reported immediately to the AF/USACE contracting officer to coordinate with the Sea Turtle Stranding and Salvage Network.

- During evening hours or when there is limited visibility due to fog or sea states greater than Beaufort 3, the tug/barge or dredge operator shall slow down to 5 knots or less when traversing between areas if whales have been spotted within 15 nautical miles (nm) of the vessels path within the previous 24 hours.

- During the period 1 December through 30 March, daily aerial surveys within 15 nm of the dredging and placement sites will be conducted by others to monitor for the presence of the right whale. Right whale sightings will be immediately communicated by marine radio to the dredging contractor. Dredge and barge operators will ensure their radio equipment is set to receive contacts from the Right Whale Early Warning System (EWS).

- The tug/barge or dredge operator shall maintain a 500-yard buffer between the vessel and any whale and steer away from the whale at a slow, safe speed in compliance with the NMFS' Vessel Strike Avoidance and Reporting Guidelines. No take of whales is authorized. Dredge-related vessels working at the borrow site and traveling to and from the borrow area and the beach fill area will travel at no greater than 10 knots during North Atlantic right whale calving season (15 November to 15 April) while within the right whale calving area from between the shoreline and out to 5 nautical miles.

- If a stranded/injured/incapacitated whale is observed within the construction site, the contractor is requested to immediately contact the NMFS Whale Stranding Network pager number at 305-862-2850.

- Hopper dredge drag heads shall be equipped with sea turtle deflectors which are rigidly attached. No dredging shall be performed by a hopper dredge without an installed turtle deflector device approved by the USACE contracting officer.

- The Contractor shall install baskets or screening over the hopper inflow(s) with no greater than 4" x 4" openings. The method selected shall depend on the construction of the dredge used and shall be approved by the contracting officer prior to commencement of dredging. The screening shall provide 100% screening of the hopper inflow(s). The screens and/or baskets shall remain in place throughout the performance of the work.

- The Contractor shall install and maintain floodlights suitable for illumination of the baskets or screening to allow the observer to safely monitor the hopper basket(s) during non-daylight hours or other periods of poor visibility. Safe access shall be provided to the inflow baskets or screens to allow the observer to inspect for turtles, turtle parts or damage.

- The Contractor shall operate the hopper dredge to minimize the possibility of taking sea turtles and to comply with the requirements stated in the Incidental Take Statement provided by the NMFS in their RBO.

- The turtle deflector device and inflow screens shall be maintained in operation condition for the entire dredging operation.

- When initiating dredging, suction through the drag heads shall be allowed just long enough to prime the pumps, and then the drag heads must be placed firmly on the bottom. When lifting the drag heads from the bottom, suction through the drag heads shall be allowed just long enough to clear the lines, and then must cease. Pumping water through the drag heads shall cease while maneuvering or during travel to/from the disposal area.

- Raising the drag head off the bottom to increase suction velocities is not acceptable.

- The Contractor shall keep the drag head buried a minimum of 6 inches in the sediment at all times and the pumps shall be disengaged when the drag heads are not firmly on the bottom.

- During turning operations the pumps must either be shut off or reduced in speed to the point where no suction velocity or vacuum exists.

- If siltation barriers are used, they shall be made of material in which manatees and smalltooth sawfish cannot become entangled, are properly secured, and are regularly monitored to avoid entrapment. Barriers shall not block entry to or exit from essential habitat.

- All vessels associated with the project shall operate at “no wake/idle” speeds at all times while in waters where the draft of the vessel provides less than a four-foot clearance from the bottom, and vessels shall follow routes of deep water whenever possible. Boats used to transport personnel shall be shallow-draft vessels, preferably of the light-displacement category, where navigational safety permits. Mooring bumpers shall be placed on all barges, tugs, and similar large vessels wherever and whenever there is a potential for manatees to be crushed between two moored vessels. The bumpers shall provide a minimum standoff distance of 4 feet.

- Pre-dredge relocation trawling shall commence no earlier than 72 hours prior to start of dredging and relocation trawling shall be implemented simultaneous with hopper dredging if two or more turtles are taken within a 24-hour period during dredging. Relocation trawl tow-time duration shall not exceed 42 minutes and trawl speeds shall not exceed 3.5 knots. All sea turtles captured by relocation

trawling shall be flipper-tagged prior to release or PIT tagged by a trained observer per protocol. A PIT-tag scanner will be used to check all captured sea turtles for the presence of tags. Reports will be submitted to the appropriate regulatory agencies.

- If sea turtle, manatee or smalltooth sawfish are sighted within 100 yards of the project area, all appropriate precautions shall be implemented by the Contractor to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet of these species. If a sea turtle, manatee, or smalltooth sawfish is closer than 50 feet to moving equipment or the project area, the equipment shall be shut down and all construction activities shall cease within the waterway to ensure protection of the manatee. Construction activities shall not resume until the sea turtle, manatee or smalltooth sawfish has departed the project area.

- Dredging will not occur within a minimum of 400 ft from any significant hardground areas or bottom structures that serve as attractants to sea turtles for foraging or shelter. NMFS considers a significant hardground to have a horizontal distance of at least 150 ft and an average elevation above the sand of 1.5 ft or greater and algae growing on it.

The USFWS concluded in their PAFB BO that incidental take to sea turtles may occur across the PAFB beach due to relocation mortality, accidentally missing nests during survey, harassment of sea turtles using adjacent beaches due to construction activities, nest destruction due to scarp formation (and/or leveling activities, etc., but agreed that the PAFB proposed action is not likely to jeopardize the continued existence of listed sea turtles and is not likely to destroy or adversely modify critical habitat (none is found for sea turtles in the continental U.S.). As related to future potential truck haul events using the CCAFS borrow site, consultation will occur again with USFWS to determine if new terms and conditions may be necessary to address potential impacts to listed species analyzed in the CCAFS Borrow Site EA (FONSI, 6 Sept 2007). Per Joint Coastal Permit conditions, only qualified individuals will perform the in-water biological monitoring which includes a survey of abundance of sea turtles.

In addition to impacts directly associated with construction activities, indirect impacts may occur due to accidental spills that could impact land/waters/habitat within the project area. Historically, no known mortality of T & E species has occurred due to spills occurring within the project area. If a spill should occur, however, spill response teams available through the U.S. Coast Guard, the PAFB Spill Response contract, and commercial sources located at Port Canaveral are capable of cleaning up most spill incidents and reacting to or reporting any wildlife distress to the appropriate authorities.

Wintering piping plover are not found at CCAFS or PAFB, however, impacts have been analyzed at other locations that show effects on the piping plover's food base, permanent habitat loss and direct disturbance of individual birds due to dredging projects and shoreline manipulations in wintering areas. Beach restoration can cause damage or destruction of washover areas which have been documented to be used by piping plovers both as feeding and roosting areas (Zonick 2000). In addition to construction impacts, indirect impacts related to noise and activity on the beach may cause harassment of shorebirds that may reduce foraging time. Rodgers and Smith (1997)

documented that shorebirds are more easily flushed than other species of coastal birds possibly because shorebirds on the wintering grounds are migrant species that rarely interact with humans. In Texas, it has been documented that the effects of people on piping plover have caused increased shifts in habitat use and decreased foraging time with more time devoted to alertness (Burger 1991; Staine and Burger 1994). Though piping plover do not breed in Florida, individuals from the three breeding populations winter in Florida (USFWS 1999). The complete winter distribution of the piping plover remains to be determined, but generally the plover arrives from July through September and returns to breeding sites from February to May. Neither PAFB nor CCAFS are listed as critical wintering habitat for the piping plover. The closest critical habitat is found north of CCAFS in a small area near Daytona Beach and south of PAFB in a small area in Palm Beach County. In addition, the Space Coast Audubon Society (website) has considered piping plover observations to be rare in Brevard County. Taking this information into account, it is felt that no adverse effect to the piping plover will occur as no destruction of habitat, to include washover areas, would occur and more importantly because this species would rarely be in the project area.

No impacts are anticipated to the Atlantic sturgeon, candidate species, proposed for listing by the NMFS. The Southeast population segment isn't known to frequent the Atlantic Ocean waters in the project area which are over 140 miles south of the sturgeon's southernmost range (75 FR 61904 2010). The St. John's River, which flows to the north, is the southernmost inland riverine range for Atlantic sturgeon spawning adults, sub-adults, juveniles, and larvae. The project will have no affect on the St. John's River, and a rare occurrence of an Atlantic sturgeon in the Atlantic Ocean waters in the project area would be minimally disturbed by dredge and placement activities, and the sturgeon would avoid the area and simply move to another feeding location.

Under the Sikes Act, an INRMP is used to establish goals and objectives to conserve and rehabilitate natural resources on military installations. The 45 SW INRMP addresses the requirement for responsible management and tracking of T&E species, habitat (and its quality), restoration activities, etc. The regulatory requirements associated with the Proposed Action activities on military lands have been incorporated into the *45 SW INRMP* to acknowledge the avoidance, minimization, and mitigation measures that are required to be followed by the associated project contractors and 45 SW personnel managing the contract and natural resources.

As related specifically to T&E species potentially affected by the Proposed Action, if post-construction monitoring determines unanticipated project-related impacts to protected species or their habitat or should new species be listed, re-consultation will occur, a mitigation plan will be developed by the 45 SW, and it will be reviewed by the appropriate regulatory authority based on the species or habitat affected. With implementation of the measures to protect threatened and endangered species and their habitats, mentioned in the preceding paragraphs, no significant impacts causing jeopardy to the potentially affected species would be expected from the Proposed Action. The regulatory agencies, USFWS and NMFS PRD, concurred with this determination. Under the No Action Alternative, beach restoration and lease for use of offshore sand resources would not occur, therefore no significant adverse impacts would occur to protected species, however some impact to sea turtle nesting habitat may occur due to continued erosion of the nesting beach which would degrade the natural beach profile that sea turtles use a cue for nesting site location, although this adverse effect

may be observed over an undetermined amount of time and its significance would be determined through data evaluation.

Migratory Birds and Wildlife

Noise rather than the sight of machines appears to cause disturbance to migratory birds and wildlife. The combination of increased noise levels and human activity would likely cause temporary displacement of some animals that forage, feed, nest, or have dens within a 15-meter radius (or greater for more sensitive species) of noise sources.

In order to avoid attracting birds and other wildlife to the work site, the contractor would keep the construction area, including storage areas, free from accumulation of waste materials or rubbish at all times. Additionally, to reduce bird attraction due to organic materials in the dredge spoil and reduce aircraft/bird strike risk, filters will be of the appropriate size on the suction piping to limit larger organics and the spoil will be moved quickly so organics desiccate more rapidly and become less attractive as a food source. Upon completion, the contractor would leave the work site in a clean and neat condition, satisfactory to the contract terms. No significant impacts are anticipated to birds or wildlife in the proposed action area to include the action of hydraulic sand pump or truck haul from the CCAFS borrow site or due to the No Action Alternative.

During surveys conducted at PAFB, many neotropical migrants were observed using the dune/beach habitat for loafing and foraging. No nesting of migratory birds has been reported on PAFB beaches. However, per permit requirements, nesting shorebird surveys for both PAFB and the CCAFS borrow site (if to be utilized) will be conducted beginning 1 April or 10 days prior to project commencement and through the project period which is required to end by 30 April to prevent impacts to nesting sea turtles (the official beginning of the sea turtle season is 1 May). Any migratory bird nesting areas will be marked with a 300-ft buffer zone and all construction activities will be prohibited in this zone. The buffer may be extended if birds appear agitated. No significant impacts to migratory birds are anticipated since nesting has not been observed within the Proposed Action locations. However some short-term, intermittent impacts to shorebird feeding/foraging/resting may occur due to construction and noise activity. No impacts are anticipated due to the No Action Alternative unless severe erosion permanently removed potential nesting/foraging habitat.

Dolphins are also found within the offshore waters of the project area and are protected under the Marine Mammal Protection Act from being hunted, harassed, captured or killed. No significant impacts to dolphins are anticipated since these species are highly mobile within the Proposed Action locations. However some short-term, intermittent impacts due to dredging/pump out and noise may occur to dolphins if they are in the area feeding/foraging/resting. Dolphins will not be harassed and dredge/pump-out vessels will have appropriate personnel on board to notify vessel operators should sightings/observations indicate that actions are necessary to minimize stress and impact to dolphins. No impacts to dolphins are anticipated due to the No Action Alternative.

Essential Fish Habitat

The EFH rule defines an adverse affect as any impact which reduces quality and/or quantity of EFH. Adverse affects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site-specific or

habitat wide impacts, including individual, cumulative, or synergistic consequences of actions. Beach restoration effects have been studied with varying results from limiting infauna larval recruitment because of the use of poor quality nourishment sediments, to burial of hardbottom with recovery times dependent on depth of burial to length of time buried, to no effects with mobility of juvenile fish and adaptability by intertidal species because of natural survival mechanisms related to storm events (Nelson 1993). Specifically, for the PAFB project area, no significant adverse effects to the nearshore hardbottom, defined as EFH, have occurred based on five years of shoreline and seabed profiling which have shown no long-term trends in regard to accretion or erosion of the profile or burial/sedimentation impacts to the hardbottom/rock relative to the natural, historic variability. Variability can be attributed to the highly turbid nature of this nearshore environment. Surveys conducted in the Mid-Reach, close to the southern boundary of PAFB, documented a nearshore environment with nearly year-round suspended sediments and high turbidity due to almost constant wave action (USACE Draft Revaluation SEIS 2010).

Natural variability has also been supported through physical hardbottom monitoring along the PAFB project areas. The 2009 PAFB survey data for the nearshore hardbottom indicated greater exposed hardbottom along all transect lines than any prior surveys including the two pre-project (2001, 2004), the 2005 pre-construction survey and all post-construction surveys from 2005 to 2008 (Appendix E). In addition, variability was observed during the 2010 surveys as apparent landward migration of sand across the nearshore profile which created the least surveyed hardbottom exposure since survey in 2001; keeping in mind that beach restoration events haven't occurred along PAFB since 2005 after hurricane erosion in 2004 (Olsen Associates, Inc. 2010c). The only other survey year that also documented reduced hardbottom exposure was in 2006 which was assumed to be a result of post-storm recovery after the 2004/2005 hurricane season (Olsen Associates, Inc. 2010c), again a shoreward migration of offshore sediment. Both the 2006 and 2010 survey years corresponded to periods of overall net increases in sand volumes along regional beaches considered as an effect of onshore movement of sand from deep water (Olsen Associates, Inc. 2010c).

Hardbottom monitoring surveys will continue through 2012 (one year intervals for a period of seven years post-construction from 2005) per the prior NMFS Habitat Conservation Division's (HCD) Conservation Recommendations (CRs) accepted by the 45 SW. For the Proposed Action, the 45 SW has committed to continuing physical monitoring of hardbottom for at least five years after project construction to include the full PAFB project area up to 2000 ft south as well as conducting a pre-project biological survey to quantify the amount of live worm rock and document utilization of hardbottom by macroinvertebrates and fish. Per JCP conditions, only qualified individuals will perform the in-water biological monitoring of hardbottom, epibiota and fishes per the approved protocol. The PAFB beach template will continue to avoid and minimize impacts to the nearshore hardbottom, and monitoring will provide the data to support the beach fill design. Along with hardbottom EFH, the EFH within the borrow area (CS II) and offshore areas adjacent to beaches similar to PAFB consisting of sandy shoals of capes, offshore bars and shelf currents/water column have also been addressed with considerable baseline data and impact analyses within the *2005 USACE/MMS (BOEM) Canaveral Shoals II Sand and Gravel Borrow EA* as well as the *2009 USACE Draft Reevaluation of the Mid-Reach SEIS*. Infauna, epifauna, and fish assemblages have been sampled and multi-disciplinary biological and physical studies have been completed. The Environmental Studies Program, required through the Outer Continental

Shelf Lands Act (OCSLA), also has substantial information related to physical, biological and socioeconomic aspects of Federal mineral use. Please reference these NEPA documents and the BOEM website for detailed information (http://www.boemre.gov/offshore/research.htm). Brief overviews of the previously analyzed reports and new data will be discussed below.

Impacts due to dredging cause removal of infauna and creation of sedimentation plumes with extraction processes, short-term loss and changes in benthic communities, changes in prey base, and trophic energy transfer alterations (Nairn and Johnson 2001). Studies have documented that benthic communities will have different species abundance and dominance from pre- to post-dredge; however, the more serious potential long-term and cumulative ecological impact is if the trophic energy transfer from the benthos to the fish population is less than what is being provided pre-dredge (Nairn and Johnson 2001). The use of microhabitats, created by ridge and shoal structures, is significant for finfish species as they settle out into different areas as they develop and exploit feeding opportunities (Brooks et al 2004). Changes in these microhabitats can affect the annelid, crustacean and bivalve prey that juvenile fish depend on. Sediment resuspension caused by dredging is another indirect effect that can impact not only the immediate benthic community but also the surrounding community structure due to differential susceptibility to burial of adults or recruiting organisms. Additionally, decomposing animals after burial may make the sediments uninhabitable due to the release of acids and other toxic products (Brooks et al 2004).

Physical borrow source structure and disturbances can also affect marine species. The BOEM has funded a significant amount of research to examine potential alteration in local field waves due to excavation in borrow areas, cumulative physical effects of multiple dredging events, baseline benthic ecological conditions, infauna (polychaetes, crustaceans, mollusks, etc.), epifauna, demersal fishes and sediment grain size. In general, egg and larval stages of demersal EFH species would be temporarily affected by benthic habitat disturbance during the time of construction, but some would experience mortality due to lack of motility. Displacement would result in mortality and/or dispersal of some benthic organisms thus temporarily disrupting feeding for some benthic-oriented juvenile EFH species in the area. However, pelagic juveniles and adult EFH species would be less affected as there would be short-term benefits with increased feeding on injured or displaced benthic invertebrates. In addition, several EFH species would be able to find suitable prey in areas adjacent to the proposed action borrow site. Finally, noise hasn't been considered a major issue for most fish species as they have relatively narrow hearing thresholds. Some studies looking at pile driving noises found that no injury to finfish was predicted as species avoid the area as a protective action (Nedwell et al 2004). However, noise may interfere (mask) with fish communication (Cordarin et al 2009; Vasconcels et al 2007) and cause some generalized stress (Wysocki et al 2006). Other studies found that dredge equipment operated within hearing thresholds (60-80 dB) for many fish species, and that fish may leave the area temporarily if levels were as high as 160 dB (Continental Shelf Associates, Inc. 2004).

Several potential effects have been identified above but there are mitigation actions that may be able to lessen these. For example, providing sufficient recovery time between dredge events (generally two to three years for shallow water coastal sands) has been found effective in allowing recolonization and re-establishment of some pre-dredge diversity (Hitchcock et al 2002). Additional research has demonstrated benthic

assemblage recovery from anthropogenic disturbance from three months to two and a half years along the U.S. eastern continental shelf (Brooks et al 2006). Other potential mitigation actions are to dredge during generally non-reproductive seasons and to prevent full scale dredging across the entire borrow site as increased and prolonged exposure may cause adverse effects or a level of stress that reduces the community's tolerance to other impacts (Hitchcock et al 2002). Recolonization success for benthic infauna following cessation of dredging has been documented with studies that have noted almost complete infaunal community re-establishment within two years. Also data suggest that excavation/sand removal between late fall to early spring is less stressful to benthic communities (USACE Re-evaluation Draft SEIS 2009).

In addition to effects to infauna, the NMFS HCD noted concerns about borrow area infilling, borrow area sediment grain size, rate of infilling, and nearshore hardbottom biological monitoring. NMFS HCD CRs for the PAFB Proposed Action, the 45 SW response to these CRs, and subsequent correspondence are found at Appendix D. The NMFS concluded that the PAFB project design incorporates considerable efforts to avoid and minimize impacts to EFH hardbottom, but still felt that implementation of three CRs would complement the existing physical data and help to discern potential indirect impacts from sedimentation and turbidity, quantify and document EFH and habitat use, and identify shoal infilling, their rates and sediment grain size distributions. Surveys conducted across CS II between 2000 and 2009 have indicated a net volumetric recovery rate of approximately 152,000 cy/yr with infilling occurring across the entirety of the borrow area (Olsen Assoc Inc. 2010b). Dredging activity at CS II in 2005 and in 2010 was located in a downdrift flank of a migrating sand ridge/shoal; this shoal has created the greatest recent increases in seabed elevation (Olsen Assoc Inc. 2010b).

Sampling of the CS II sediment from the 2003, 2005, and 2010 dredging events have indicated no significant difference in grain size distribution between the initial and subsequent dredge events (Olsen Associates Inc. 2010c). Grain size distributions of excavated sediments are more or less identical to the average of core boring samples from the borrow area prior to excavation. Similarity between samples indicates no significant differences between the grain size distribution of the sediment that infills the borrow area to that of the pre-dredge seabed. Infilling rates of the borrow area are required to be assessed pre-, post- and three-years after each dredge activity per permitting and BOEM requirements. Generally infilling of borrow areas is not rapid and losses are perceived from pre- to post-dredge, but over a period of several years (5-10), even if one dredge event occurs during this time frame, the CS II area has generally seen up to 2-ft of accretion across the entirety of the borrow area (Olsen Assoc Inc. 2010b). Finally, a baseline biological hardbottom survey for the nearshore adjacent to Mid-Reach and the most southern portion PAFB project area was conducted using data from 2000/2001 (Olsen Associates Inc. 2003). Some quantifiable information about Sabellariid worm rock was reproduced with an estimate of approximately nine acres of worm rock along PAFB's southern nearshore from R70 to R75.4. A biological baseline for the nearshore hardbottom adjacent to the PAFB project area is necessary to allow for documentation and potential future comparisons from the northern limit of hardbottom occurrence to the southern with inclusion of surveys for macroinvertebrates, macroalgae, fish, and sea turtles utilizing the hardbottom.

In consideration of the data discussed above, most of the NMFS's concerns have been or will be addressed. The 45 SW has agreed to implement the NMFS CRs by: 1) requiring the dredge contractor to identify their approach to efficiently utilize the sand

resource with a focus upon areas that are expected to infill most quickly as identified through prior monitoring surveys of the borrow area (CS II) or through engineering determination (CS I as it hasn't been dredged previously), 2) continuation of physical monitoring at the borrow area at pre-, post- and three-years post-construction to assess seabed recovery relative to the dredging activity, 3) continuation of sampling of sediment grain size distribution of the material that infills the borrow area, 4) continuation of physical monitoring of the beach and nearshore hardbottom seabed profile with extension of the monitoring for the entire PAFB project area from R53 to R77, which includes monitoring an additional 2000-ft south per the approved Physical Monitoring Plan accepted by NMFS and approved by the FDEP to also include topographic and bathymetric surveys of the beach, offshore, and borrow site areas, and engineering analyses, and 5) conduct a pre-project biological monitoring survey of the nearshore hardbottom according to the Biological Monitoring Plan accepted by the NMFS and approved by FDEP to include, but not limited to, epibiota cover and taxonomic composition, sea turtle use and abundance, and identification of fish species.

If monitoring post-construction determines unanticipated project-related impacts to EFH, re-consultation will occur, a mitigation plan will be developed by the 45 SW, and it will be reviewed by the appropriate regulatory authority based on the species or habitat affected. With implementation of the measures mentioned above to protect EFH and fishery resources, no significant adverse impacts would be expected from the Proposed Action. Under the No Action Alternative, beach restoration and lease for use of offshore sand resources would not occur, therefore no significant adverse impacts to EFH would occur.

Wetlands and Floodplains

Section 1 of EO 11988, *Floodplain Management*, directs each federal agency to provide leadership and take action to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for federally undertaken construction and improvement projects. It has been determined that the only practicable alternative consistent with the law and with the policy set forth in this EO requires construction within the floodplain. The Proposed Action will enhance the floodplain and will minimize the potential for the risk of loss of life and property by restoring the dune/beach profile. Regulated jurisdictional waters/marine wetlands are also located in the PAFB Proposed Action area. No other more environmentally preferable alternative was identified that would satisfy the requirements for PAFB beach restoration. The wetlands near the CCAFS borrow site are discussed in the referenced CCAFS Borrow Site EA. After the CCAFS Borrow Site EA FONSI was signed, and during the Joint Coastal Permit process (2011) for the proposed PAFB project, it was determined by FDEP that no impact should occur to this small wetland area as long as a 150-ft buffer is established and erosion control devices are installed. The hydroperiod of the wetland should be monitored with piezometers (density of one per quarter acre) for one year prior to disturbance should work need to occur between the 100 to 150-ft buffer and for one year after disturbance to determine if an adverse impact has occurred; the 45 SW has agreed to these terms. Newly constructed dunes will be planted with native dune vegetation in compliance with sea turtle and shorebird monitoring requirements and prohibitions, and one annual post-construction dune vegetation monitoring survey will be conducted. No significant adverse impacts are anticipated to wetlands, and some beneficial effects are expected for the floodplain.

4.4 Cultural Resources

As during previous dredging events, identified cultural resources and previously identified potentially significant locations shall be protected by providing a location map to the dredging contractor and requiring them to maintain a 200-foot buffer zone around each of these sites. Refer to Appendix A for all prior documentation covering survey data for submerged cultural resources in the project area. Refer also to the consultation correspondence with the Division of Historic Resources/State Historic Preservation Office (DHR/SHPO) at Appendix F specifically for the PAFB project. In 2001, the DHR/SHPO concurred with the USACE determination that the space debris discovered within CS II was potentially significant and potentially eligible for listing in the National Register. No archeological or historical artifacts are anticipated in the nearshore off of PAFB as treasure salvors surveyed this area, and didn't identify any cultural resources. Additional anomalies found along the Mid-Reach (includes the south end of PAFB), through magnetometer and side scan sonar (SEARCH, Inc.; DHR/SHPO file number 14676) surveys, were assumed to not be affected by vessel staging with beach restoration because diver testing projected that they were covered with greater than 10 ft of sand due to the nature of the turbid nearshore where sand constantly accumulates from wave and surge action. No additional cultural survey work was recommended in the Mid-Reach as the investigators felt that the anomalies would always be buried by sand based on their nearshore location and sand movement to the nearshore.

As during previous dredging events and as stated by DHR/SHPO, the contractor will be made aware of existing delineated submerged resources and must maintain a buffer zone around them, and should any unexpected discoveries of prehistoric or historic artifacts be encountered within the project area, all activities involving subsurface disturbances will cease in the immediate vicinity of such discoveries until their office has cleared project re-commencement either verbally or through written authorization. Additionally, the Air Force 45 SW Cultural Resource Manager (CRM) will work with DHR/SHPO to ensure that if any space program resources are discovered they will be properly protected. The BOEM will also work with DHR/SHPO should shipwreck remains be unexpectedly discovered (30 CFR 250.194 and 30 CFR 250.1010). Therefore, no significant impacts to cultural resources in the project area (borrow, placement or pump-out areas), as result of the proposed action, are anticipated with implementation of the measures to protect existing identified resources, cease of work if an unexpected discovery occurs, and immediate notification to DHR/SHPO so they can determine if the resource is significant or not and make the determination of the best means to protect the resource. No impacts to Cultural Resources are anticipated from the Proposed Action Alternative or the No Action Alternative.

4.5 Geology and Soils

No contamination has been identified by the 45 CES/CEAN Installation Restoration Program (IRP). Borrow sediment will be analyzed per permit and BO requirements, and is anticipated to be beach compatible meeting required grain size characteristics, etc., as has been discussed in Section 3.5 and is expected based on prior analyses from CS II and the CCAFS borrow site. The beach template will provide a profile that enhances the beach/dune slope, and dune revegetation will occur to stabilize/bind the sand and reduce erosion of the upper beach/dune. Temporally and spatially variable beach sand volume losses occur due to isolated storm events or abnormally severe storm seasons,

but these episodic losses can be offset by recovery as the beach regains an equilibrium condition (USACE 2009). However, relatively moderate long-term volume losses along the PAFB beach, similar to the Mid Reach, suggest that there are background erosional forces independent of the large storms that impact the area, therefore, beach restoration is necessary at this point to protect soil resources. Sand testing after placement will occur to demonstrate that manipulation of the borrow sand has not created compact conditions that may negatively affect sea turtle nesting success. The protocol provided by the USFWS and through permitting for compaction testing will be followed, and tilling of the sand will occur if failures are observed. If testing doesn't support a need for tilling then it will not be required. No significant adverse impacts to Geology and Soil Resources, and some beneficial effects, are anticipated from the Proposed Action. Some negative effects may occur due to the No Action Alternative as beach/dune sands are eroded with only some natural recovery and an overall erosional state.

4.6 Hazardous Materials and Waste

Solid waste generated during Proposed Action activities will be managed in accordance with the instructions set forth in the specifications of the contract. The contractor shall be responsible for sampling all wastes to determine whether they are hazardous or non-hazardous per the Resource Conservation and Recovery Act (RCRA). Results of laboratory analyses shall be provided to the Contracting Officer. All containers utilized for the management of wastes shall be new and meet the Department of Transportation's performance-oriented packaging requirements. All containers will be labeled to accurately reflect the contents. Management of hazardous waste shall be completed in accordance with 40 CFR 260-279 and OPLAN 19-14. The contractor will assume all liabilities for improper waste disposal. All AF hazardous waste is to remain on base and would be shipped off-site by the AF under an Environmental Protection Agency (EPA) identification number. Locations of accumulation sites shall be approved by 45 CES/CEAN prior to hazardous waste generation. Off-site disposal of non-hazardous solid waste shall be the responsibility of the contractor.

Hazardous material (HAZMAT) authorization shall be in accordance with Air Force Instruction (AFI) 32-7086, *Hazardous Materials Management*. Contractors will submit a HAZMAT Authorization Work Sheet, with the required supporting documentation; including a manufacturer specific Material Safety Data Sheet (MSDS) and the estimated quantities for the work, as required. All petroleum storage tanks shall have secondary containment and will be stored off the beach (upland location) to prevent impacts to water quality and reduce accidental releases.

With implementation of the above-mentioned measures no significant impacts from Hazardous Materials and Waste would be expected from either the Proposed Action or the No Action Alternative.

In the event of a mechanical failure of the dredge equipment or barge in which an oil or other hazardous substance spill may occur within the waters, immediate spill response measures shall occur to contain the spill per the protocols established in the contractor's Safety and Emergency Spill Response Plans. Absorbent booms, emulsifiers, and other strategies would be used to contain the hazardous/petroleum substance and collection would occur as much as practicable.

4.7 Infrastructure and Transportation

Modifications to SRA1A will not be required for the Proposed Action. With truck movement of CCAFS beach borrow sand, the contractor will monitor traffic flow and provide assistance to truck drivers to establish safe queuing and ingress/egress onto A1A per FDOT requirements. The dredge operators will follow all safety procedures required for vessel transportation and will stay in contact with the Coast Guard for wildlife concerns. All construction lighting will be coordinated with 45 CES Environmental to ensure the appropriate balance of safety, energy conservation, reduced light pollution, and sea turtle protection per BO requirements.

With implementation of all appropriate safety measures, no significant impacts to Infrastructure and Transportation would be expected from either the Proposed Action or No Action Alternative.

4.8 Occupational Safety and Health

Construction activities may generate noise of approximately 60-95 decibels depending on the distance from the noise source, which although not continuous, could be disruptive for brief periods to wildlife and individuals in the immediate area. When personnel are subjected to excessive noise, feasible administrative or engineering controls would be utilized (set hours of operation, hearing protection, etc.).

Noise impacts from the operation of construction equipment are usually limited to a distance of 1,000 feet or less. Construction equipment associated with the Proposed Action typically have a dBA between 65 and 100, at a distance of 50 feet (USEPA, 1971). The proposed project is located adjacent to a highway and there are no sensitive receptors (*e.g.,* schools, hospitals) in the vicinity. All work activities would be confined to daylight hours to avoid nuisance noise in the evenings.

In accordance with 29 CFR 1910, protection against the effects of noise exposure shall be provided. When employees are subjected to sound levels, exceeding those listed in Table 4-2, feasible administrative or engineering controls shall be utilized. If such controls do not reduce sound levels to the levels presented in Table 4-2, hearing protection shall be provided and used to reduce exposure.

Table 4-2: Permissible Noise Exposures

Duration Per Day (Hours)	Slow Response Sound Level (dBA)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

All contractors shall have established Work and Safety Plans that meet current regulations. Heavy equipment operators will be mindful of people utilizing the beach and signage will be installed to notify beach goers of the construction. A temporary construction waiver will be received to cover requirements when working within the PAFB airfield Clear Zone and Accident Potential Zone. Notification to Base Operations and the PAFB Control Tower shall occur when construction is in these areas so aircrew can be informed prior to flying operations. Additionally the 45 SW OPLAN 91-212, Bird Hazard Reduction Plan shall be followed such that dredge spoil will be managed to minimize bird attraction. Dredge spoils when pumped onto the beach haven't attracted birds or created increased risk to aircraft in the past. The sand source proposed for this action (CS II) was used in 2001 and again in 2005 and bird activity did not increase when borrow material was placed on PAFB. To ensure minimal attractiveness to birds, dredge filters will be maintained to reduce organic material sucked in with the borrow sand and placed borrow sand will be moved quickly with bulldozers to increase desiccation of organics to reduce the attractiveness to birds as a food source. With implementation of these actions, no significant impacts to Occupational Safety and Health would occur. No impacts would occur with the No Action Alternative.

4.9 Socioeconomics

It is not anticipated that the Proposed Action will affect employment patterns on a permanent basis, induce substantial growth or growth-related impacts, or impact low income or minority populations. No anticipated impacts to SRA1A should occur to cause socioeconomic impacts. Short term employment during construction/dredging activities would be anticipated. As discussed in the Biological Resources section some short-term impacts to fish species in larval to juvenile stages may occur with dredging, but no long-term impacts to fisheries commerce are anticipated from the Proposed Action or cumulative dredging events as long as measures are taken to provide time for recovery and reduce the borrow impact area. In prior socioeconomic analyses, invertebrate species comprised 47% of all landed seafood in Brevard County while finfish accounted for 39%, yet the fishermen interviewed did not perceive dredging to be a problem. The decline in the fishing industry in Brevard County, according to local fishermen, can be attributed to the 1994 Florida net ban in waters within three miles of the Atlantic shore; then the decline was compounded by the extension of this ban into inland waters in addition to the NMFS regulations on fishing seasons and by-catch (Tomlinson et al 2007). Some fishermen were concerned with dredging and dumping of spoil material from port inlets into offshore waters because of the high silt content and potential for effects to food sources for finfish. The sediment within Canaveral Shoals is much coarser compared to material that settles within port inlets, and as discussed in the Biological Resources section, dredging effects are localized and short-term to the infaunal community (food source for finfish). Therefore, no adverse impacts to the socioeconomics of the base, local community, low income or minority populations would be anticipated from the Proposed Action. However, the beach restoration efforts will create an improved recreational beach that has no user fees, therefore benefitting families of all incomes. Since the PAFB beach doesn't support any commercial industries, no impacts to Socioeconomics would occur from the No Action Alternative, although beach conditions will not be optimum for the local community and tourists.

4.10 Water Resources

The surface waters of the Atlantic Ocean are within the Proposed Action area. Turbidity monitoring will occur throughout the project as required per permits. Background levels of turbidity will be measured prior to construction/sand placement because of the high energy nature of the Atlantic Ocean so that construction monitoring can be measured against a standard. Turbidity can reduce oxygen levels by causing absorption of heat through the suspended sediments as well as reduce photosynthetic activity of algae and other plant species by scattering the light that is penetrating the water. Turbidity monitoring will be conducted per permit conditions while the barge is actively dewatering or discharging overflow, and when sand placement plumes are observed beyond the approved mixing zone; results will be reported to FDEP per the permit. Turbidity has not been an issue during prior dredge events with NTUs remaining well below the allowable permittable 29 NTUs above background at the edge of the 150-meter mixing zone. For example, measured turbidity associated with the most recent dredging of CS-II and beach fill placement along the Brevard County South Reach project in 2010, analogous to the proposed project at PAFB, averaged 5.4 NTU and 3.5 NTU above background respectively, with 90% of all values less than 9 NTU above background (and 18.5 NTU singular maximum above background) (Olsen Associates, Inc., 2010c). The monitoring requirements and reporting established in the Joint Coastal Permit will be followed such that frequency of sampling and locations and reporting submittals will be in compliance. Corrective actions will be taken to return turbidity to acceptable levels should higher levels occur. Also at the borrow site suspended sediment concentrations should only be localized at the dredge location as tides and wave action flush waters away from the dredge location and sediments rapidly settle out. Additionally, approval will be received through the Environmental Protection Agency and USACE, as required, for placement of dredged material from the CS I access channel in the approved Offshore Dredged Material Disposal Site (ODMDS) or the Nearshore Disposal Area (both off of Cocoa Beach, FL) to further prevent water quality violations.

With implementation of measures to reduce turbidity and prevent water quality violations, no significant impacts to Water Resources would be expected from the Proposed Action. No impacts to Water Resources would occur under the No Action Alternative.

4.11 Conflicts with Federal, State, or Local Land Use Plans, Policies, and Controls

The Proposed Action and No Action Alternative would have no impact on existing land use and presents no conflicts with Federal, regional, state, or local land use plans, policies, or controls.

4.12 Energy Requirements and Conservation Potential

Existing energy sources are considered adequate to meet the requirements of the Proposed Action. Energy Policy Act (Public law 109-58, Aug 5, 2005), National Energy Conservation Policy Act and Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management* requirements are being implemented through base resource/asset management and planning. As discussed under Air Quality, there is a potential for conservation through equipment idling controls,

however, economic considerations from the contractor must be evaluated to determine if this conservation potential is feasible. Additionally, regulatory permits and Biological Opinions include conditions for performance of daily beach surveys for nesting sea turtles and shorebirds, relocation trawling of sea turtles, various sampling of borrow sediments, etc., which are required, therefore, no significant potential exists for energy conservation without the sacrifice of efficiency/shorter construction periods or consideration of economic cost-benefit analyses.

4.13 Natural or Depletable Resource Requirements and Conservation Potential

Other than the use of vehicle/vessel/equipment fuels and offshore sand resources for the Proposed Action activities, there are no significant uses of natural or depletable resources.

4.14 Irreversible or Irretrievable Commitment of Resources

Although the Proposed Action would result in some irreversible and irretrievable commitment of resources such as fuel and labor, this commitment of resources is not significantly different from that necessary for regular activities taking place through other Federal projects in general.

4.15 Adverse Environmental Effects that Cannot be Avoided

Adverse environmental effects from the Proposed Action that cannot be avoided include construction-related emissions of exhaust products (greenhouse gases) and some fugitive dust and temporary displacement of wildlife during construction due to noise and construction/excavation activities. Temporary impacts to the borrow site and the sand placement site due to disturbance are also unavoidable. However, through implementation of the program actions and measures described within this document, these effects are anticipated to have a less than significant impact on environmental resources.

4.16 Relationship Between Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

The Proposed Action provides enhancement of one aspect of the human environment, the beach. This particular habitat has been used by various wildlife and humans throughout history, and should be considered essential for long-term use. It is felt that beach restoration, although causing some disturbances to the human environment, if implemented responsibly with integrated natural resource protection within the engineering will support long-term productivity of the beach/dune habitat.

4.17 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Based on guidance provided by the Federal Interagency Working Group on Environmental Justice, adverse may be defined as "having a deleterious effect on human health or the environment that is significant, unacceptable, or above generally accepted norms." Adverse human health effects include bodily impairment, infirmity, illness, or death. Adverse environmental effects may include ecological, cultural, human health, economic, or social impacts when interrelated to impacts on the natural or physical environment.

The Proposed Action area is not located adjacent to minority populations or low-income population centers. Census data for Brevard County and surrounding counties is provided in Table 4-3 on the following page. The proposed action will not produce excessive pollution or create a hazardous situation that would affect the surrounding community, regardless of economic background. Therefore, it is concluded that the Proposed Action would not result in disproportionately high or adverse human health or environmental effects on minority or low-income populations. The Proposed Action would not substantially affect human health or the environment and would not exclude persons from participation, deny persons the benefits, or subject persons to discrimination because of their race, color, or national origin. In accordance with EO 12898, the public will have the opportunity to review this EA and comment on its actions accordingly.

Economic impacts are not expected to adversely affect any particular group. Construction personnel would be drawn from the local workforce and provide short-term economic benefits to the local area. Some beneficial effect to the community is anticipated as there are no fees for use of PAFB beach and the restoration action will provide for a natural beach profile that improves accessibility for beachgoers.

Table 4-3: Census Data Comparison for Brevard and Surrounding Counties

Statistics (%)	Brevard	Indian River	Orange	Osceola	Volusia
White persons	86.9	89.8	72.5	84.4	87.3
Black persons	9.4	8.4	20.7	10.1	10.0
American Indian and Alaska Native persons	0.4	0.3	0.5	0.6	0.4
Asian persons	1.8	0.9	4.3	2.8	1.3
Native Hawaiian and other Pacific Islander	0.1	0.0	0.1	0.2	0.0

persons					
Persons below poverty	10.1	10.0	13.2	13.1	12.2

U.S. Census Data, 2005

4.18 Cumulative Impacts Summary

Cumulative impact as shown in 40 CFR 1508.7 is "…the impact on the environment which results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Potential cumulative impacts of the proposed project activities are evaluated by determining (1) whether the Proposed Action would have an impact on a given resource and (2) what is the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions regardless of the agency that undertakes the action. Time crowded perturbations, space crowded perturbations, indirect and synergistic impacts, and combinations thereof are considered in this analysis of cumulative effects.

The Proposed Action areas of PAFB, Canaveral Shoals (CS) and CCAFS have been disturbed to various degrees due to human impacts. Beach restoration has been conducted along the East Coast of Florida since the 1960s. Beach restoration has occurred at PAFB as early as the 1980s. The OCS CS borrow site has been used by Brevard County and PAFB for several projects over the last 10 years, and increased use is anticipated should climate change predictions of more severe weather be accurate. The time bounds for this cumulative effects analysis are from the early 1950s through the completion of any out-year maintenance cycles for several Federally authorized shore protection projects in Brevard County, which under their 50-year project authorization will expire around 2050. Construction and maintenance of the Canaveral Harbor Federal navigation project in 1950-54 resulted in beach erosion that extended southward from the inlet entrance to at least PAFB (Kriebel et al 2002). PAFB beaches will likely be renourished every 5-10 years depending on the frequency and intensity of storms. There are no quantifiable impacts associated with past PAFB beach restoration attempts, but it can be assumed that any poor borrow sediments used in the past have been eroded off the beach. Recent beach restoration, within the past 10 years, has been more mindful of environmental impacts and has restored PAFB beach to higher quality, viable habitat. During the World War II era, all of the dune vegetation had been stripped to allow for weapons placement and direct access to the water. The PAFB dune vegetation that has been re-planted over the years has effectively reduced storm surge trespass inland, and has acted as a natural light barrier which has reduced sea turtle disorientations. It is expected that intervening periods between nourishments will generally allow for physical and biological recovery and equilibration of the beach. Beach restoration activities and functions have and will continue to occur in the area, so it is assumed that there will be no significant changes in impacts unless new methods are employed, the frequency of beach restoration significantly increases, or new species or habitat are listed under the ESA.

Reasonably foreseeable future offshore dredging and beach nourishment activities along the project-adjacent coastline include periodic renourishment of the Brevard County Shore Protection Project (BCSPP) North Reach (NR) and South Reach (SR), initial construction of the BCSPP Mid Reach (MR), and sand bypassing across Canaveral Harbor Inlet. The BCSPP/NR project is approximately 9.6 miles long and is located immediately north, or updrift, of the PAFB project shoreline. Its nominal renourishment interval is six years, using sand from the CS borrow areas; however, its stable performance since 2005 suggests that the actual future renourishment requirements of the NR will be less than initially predicted. Sand drifts southward from the NR project area and along the northern PAFB shoreline, and the long alongshore transition (taper) design of the PAFB beach fill project at the distal end of the NR has greatly reduced end-losses of the NR project. Thus, by design, there is a beneficial physical relationship between the NR and PAFB projects that increases the stability, and reduces the erosion and renourishment requirements of, both the NR and PAFB projects. To the extent that sand placed to the NR drifts into PAFB, then less sand is required to renourish the PAFB shoreline, and vice-versa. Placement of sand to one project can decrease the dredging and nourishment requirement of the other, resulting in little or no net increase in effects.

The BCSPP/SR project is approximately 4 miles long and is located about 7.8 miles south of PAFB. Its nominal renourishment interval is six years, using sand from the CS borrow areas, and is expected to be renourished at about six year intervals in the future. The BCSPP/MR project is 7.8 miles long and located immediately south of the PAFB shoreline. Sand for this project will be from the CS borrow areas and/or upland borrow areas. The width and beach fill placement volume of this project is small in order to minimize impact to nearshore hardgrounds/hardbottom, and is anticipated to have little or no effect upon the PAFB project. The predicted performance and effects of the MR project has taken into account the presence and probable future renourishment of the PAFB beach fill project.

Sand bypassing across Canaveral Harbor Entrance transfers the equivalent of about 156,000 cubic yards per year at nominal six year intervals from the CCAFS shoreline north of the inlet to the City of Cape Canaveral shoreline within about 2.3 miles south of the inlet. Most of the sand from this activity ultimately drifts southward and nourishes the BCSPP/NR and northern PAFB project areas. Like the NR project, sand that is dredged and directly or indirectly deposited from these projects along the PAFB shoreline decreases the amount of sand required for renourishment along PAFB.

Other future beach renourishment activities may include small-scale dune reconstruction after storm impacts along the MR shoreline and along the Brevard County South Beaches shoreline (12 to 24 miles south of PAFB). Other activities may additionally include smal-scale placement of sand in the nearshore along the South Beaches shoreline, distant from the PAFB shoreline.

It is expected that there will be cumulative air emissions with multiple projects at PAFB including large facility construction (MILCON) funded projects being worked from FY2011-15, however emission estimations for the PAFB beach restoration action are not significant, and significant cumulative impacts would not occur when combined with projected emissions for Brevard County. Disturbances such as burial, reduced prey availability, changes in microclimate/relief, sedimentation plumes, loss of recruiting organisms, and emigration are expected to occur to infauna, epifauna, and demersal and pelagic fishes, but the periods between borrow excavation events are expected to

be long enough to allow for physical and biological recovery of the borrow area. However, some changes in benthic community species composition and abundance may occur; although this shouldn't be considered a significant cumulative impact as long as the trophic energy transfer from the benthos to the fish population is not less than what is being provided pre-dredge. Additionally, the high levels of adaptability of species in the nearshore environment suggest that small cumulative impacts may not cause long-term adverse effects. According to studies of year-round annual algal species found on hardbottom in the nearshore, they adapt within these stressful environmental conditions of the turbid, shallow intertidal waters by becoming resilient toward changes in sedimentation and/or becoming opportunistic in settlement, and disperse greater distances from the source (CSA International, Inc. 2009). In addition to benthic and other smaller species, the larger marine mammals and other aquatic wildlife may be disturbed by vessels, but with regulatory speed restrictions, wildlife observers on vessels, avoidance and sighting notification requirements, impacts will be minimal especially considering the limited duration of any dredging operations. Behavioral modifications and displacement of foraging wildlife will be temporary; most beach restoration events across Brevard County have been staggered to prevent a significant cumulative effect of wildlife displacement and harassment.

Emergency beach restoration, should it become more frequent and be required across all of Brevard County at the same time, may create cumulative impacts that may need further evaluation. The USFWS and NMFS PRD have not considered that the cumulative impacts of beach restoration in Brevard County, considering the current cycles of the events, will cause jeopardy to any listed species. Sea turtle nesting data has also found that hatching and emerging success rebounds quickly after the initial beach restoration event, and the re-sloping of the beach/dune profile is a beneficial effect as the sea turtles use this grade to cue in on nesting location (above mean high water). However, care must be taken to prevent over-design of the slope (higher dune grade) such that disorientation of sea turtles increases due to greater visibility of artificial lighting west of the dune vegetation. In addition to potential construction impacts, natural disturbances causing erosion, and daily human disturbances caused by beach users, pets, artificial lighting, and predators may decrease nesting/foraging success and modify fledgling or hatchling (birds and sea turtles) behaviors and survivability. The amount and intensity of disturbances will determine if wildlife behavior modification and displacement from preferred nesting/foraging areas will be temporary. Beach renourishment, when constructed with environmental protection measures, should increase habitat lost by erosion. Educating the public of conservation measures they can take through beach access signs, pamphlets, and internet sources should reduce human disturbance occurrences, but there is still a proportion of the public that won't make the effort to be precautionary.

Offshore biological resources, including infaunal and epifaunal invertebrates and demersal and pelagic fishes, should recover from dredge disturbances such as burial, reduced prey availability and emigration (Peterson and Bishop 2005) as most species in shifting sand dominated environments are adapted to severe physical changes. Vertical relief modification to the seafloor of the CS borrow site with dredging will cause some negative effect, but there are adjacent undisturbed sand ridges that can provide suitable habitat as well as the ability for rebuilding of the disturbed seafloor ridges with adequate recovery periods between dredging cycles. There is also the potential for beneficial effects through the removal or creation of vertical relief by dredging. Natural variability also plays a significant role in changes to the seafloor as well as exposure and burial of

hardbottom (EFH) habitat; historical monitoring for the PAFB project has supported this. Tides, wave action, natural turbidity, longshore and offshore to nearshore sand transport will affect EFH. The NMFS HCD should evaluate this natural variability and the parameters at play in this high energy, nearshore environment, and determine the effects of climate change to include sea level rise and potentially more intense storm events on hardbottom so impacts related to beach restoration projects can be distinguished in the future for more accurate cumulative impact analyses.

Beach compatible sand found in the Canaveral Shoals offshore borrow sites are not likely to be depleted over the life of the current or anticipated authorized projects along Brevard County. The volume of sand potentially excavated from CS II for Brevard County projects using a 6-year interval until 2048 may represent a removal of approximately 36% of the total usable volume according to prior calculations (MMS/USACE EA 2005). However, the potential for depletion is possible should there be more intense storm/erosion damage to coastal beaches and/or if more entities/State governments are granted use of these resources. Additional sand sources may also be needed if CS II must be avoided to allow time for recovery between renourishment intervals. As for localized impacts short-term turbidity and sedimentation will occur at the borrow and placement sites, but monitoring and preventative measures will be taken to minimize long-term impact. Impacts of recreational and commercial fishing, coastal development, recreational boating, and increased beach use (direct human impact of walking on nearshore hardbottom and damaging dune vegetation) have historically contributed and will continue to contribute to offshore and beach resource impacts within the project area. Potential future impacts could be renewable energy projects (offshore wind harvesting), oil exploration or artificial reef creation, although these may not be “reasonably” foreseeable unless regulatory and/or legislative changes occur.

Reasonably foreseeable future impacts combined with past and present impacts for the Project Area may create some adverse and beneficial impacts when the proposed action is considered in context, however there is no anticipation of any significant cumulative impacts. Table 5.1 summarizes impacts identifying past, present and reasonably foreseeable future conditions in consideration of each of the resources. The relatively small footprint of effect, short-duration and potential for recovery from the effects attributable to dredging and placement operations led to the determination that the Proposed Action for the PAFB shoreline restoration project will contribute a small but negligible incremental effect to cumulative impacts when added to the impacts of other past, present and reasonably foreseeable actions affecting the project area.

5.0 Conclusion

The AF conducted an assessment of the potential environmental consequences associated with the PAFB beach shoreline restoration proposed action. The alternative considered to the Proposed Action and analyzed within this document was the No Action Alternative, in which no lease would occur for use of Federal offshore borrow sand and PAFB beach restoration would not be carried forward.

No significant environmental impacts were identified that would require the completion of an Environmental Impact Statement. However, some less than significant and some beneficial effects were identified and are summarized on the following pages in Table 5-1, along with mitigation/minimization measures and applicable regulatory guidance.

Table 5-1: Environmental Impacts and Mitigation Summary

ENVIRONMENTAL RESOURCE	1996 EIS IMPACTS	1998 EA IMPACTS	2005 EA IMPACTS	2009 EA IMPACTS	2011 EA IMPACTS	MITIGATION
AESTHETICS	Temporary adverse visual impact from construction equipment; long-term positive visual impact from restored beach(5.27)	Not evaluated.	Not evaluated.	Not evaluated.	Not evaluated.	Not applicable.
AIR QUALITY	Temporary and localized decrease in air quality from construction-equipment emissions. (5.33)	Temporary and localized decrease in air quality from construction-equipment emissions. (5.1)	Not evaluated.	Temporary and localized decrease in air quality from construction-equipment emissions. Estimated emissions within national ambient air quality standards.	Temporary and localized decrease in air quality from construction-equipment emissions. Estimated emissions within national ambient air quality standards and ¼ of the amount estimated for the 2009 USACE EA.	Follow operating strategies to reduce diesel emissions at project placement site. (Table 4-1)

ENVIRONMENTAL RESOURCE	1996 EIS IMPACTS	1998 EA IMPACTS	2005 EA IMPACTS	2009 EA IMPACTS	2011 EA IMPACTS	MITIGATION
AICUZ AND LAND USE	Not evaluated.	Not evaluated.	Not evaluated.	Not evaluated.	Project within a small area of the Aircraft Accident Potential Zone (APZ) CZMA compliance	Coordination with Airfield Operations when in the APZ for NOTAMs for aircraft/pilot safety Project subject to Federal consistency review and determination.
THREATENED AND ENDANGERED SPECIES	Potential increase of nesting habitat for sea turtles; potential disturbance and take of sea turtles, right whales, and related to beach scarping, lighting, dredge entrainment, and vessel strike.(5.09)	Possible entrainment dredge may lead to injury and mortality sea turtles (5.6). Noise and vessel collision may lead to injury and mortality of marine mammals (5.7). Effects to marine turtles and marine mammals may be avoided or minimized with protective measures.	Dredging may affect, but not likely to adversely affect smalltooth sawfish with approved protective measures. No effect to Johnson's seagrass or Southeastern beach mouse since no critical habitat in project area. (p.21-24)	Hopper dredging and beach placement may adversely affect marine turtles. Adverse effects to sea turtles, marine mammals, and smalltooth sawfish may be avoided or minimized with protective measures.	Potential to impact threatened and endangered species due to the use of the hopper dredge, placement of sand within nesting/hatching habitat, and use of artificial lighting. Potential to affect North Atlantic right and humpback whales and smalltooth sawfish may be avoided or minimized with mitigation measures.	Implement terms and conditions of 1) NMFS 1995/1997 Regional Biological Opinions, 2) NMFS 2010 BO, 3) 2009 FWS BO, and 2008 USFWS BO and 45 SWI 32-7001

ENVIRONMENTAL RESOURCE	1996 EIS IMPACTS	1998 EA IMPACTS	2005 EA IMPACTS	2009 EA IMPACTS	2011 EA IMPACTS	MITIGATION
BENTHIC RESOURCES	Short-term and localized reduction in beach infaunal invertebrates. (5.01)	Possible mortality for nonmotile invertebrates in immediate area of dredging. Temporary and localized defaunation from bottom disturbance, sub-lethal effects from elevation turbidity, burial, and habitat degradation. Long term suppression not expected due to dredging intervals. Recolonization expected to occur.(5.5)	Possible mortality for nonmotile invertebrates in immediate area of dredging. Temporary and localized defaunation from bottom disturbance, sub-lethal effects from elevated turbidity, burial, and habitat degradation. Long term suppression not expected due to dredging intervals and highly adaptive benthic assemblages. Recolonization of physically dominated environment expected to occur within 2-3 yrs. (p. 5-9)	Not evaluated.	Possible mortality for nonmotile invertebrates in immediate area of dredging. Temporary and localized defaunation from bottom disturbance, sub-lethal effects from elevation turbidity, burial, and habitat degradation. Long term suppression not expected due to dredging intervals. Recolonization expected to occur.	Reduce turbidity as much as practicable. Provide for recovery time (research indicated 3 months to 2.5 years) between fill excavation/dredge events.
FISH AND ESSENTIAL FISH HABITAT (EFH)	Short and localized disturbance of surf zone habitat and fish during pump-out and sand re-distribution from elevated noise and	Fish and EFH would be temporarily and locally impacted by dredge activity including sub-lethal and lethal effects related to turbidity, prey availability, and	Possible entrainment and sub-lethal effects from turbidity, noise, and burial. Effects are expected to be minor because of species mobility, avoidance behavior,	Not evaluated.	Possible entrainment and sub-lethal effects from turbidity, noise, and burial. Effects are expected to be minor because of species mobility, avoidance behavior,	Continuation of hardbottom surveys with physical and biological monitoring per agreement with NMFS CRs. All pipelines are to

ENVIRONMENTAL RESOURCE	1996 EIS IMPACTS	1998 EA IMPACTS	2005 EA IMPACTS	2009 EA IMPACTS	2011 EA IMPACTS	MITIGATION
	Turbidity levels, as well as burial. Potential burial of nearshore coquina and scattered worm rock outcrops by longshore transport. (5.01)	dredge entrainment or burial. Long term disruption not expected due to fish mobility and dredging intervals.(5.9)	and widespread occurrence of comparable habitat. Possible trophic effects from benthic disturbance and locally reduced prey. EFH could be temporarily and locally physically disturbed by dredging or beach shaping activity. Long term suppression not expected due to dredging intervals and widely available habitat. Minor impact to nearshore rock habitat (Habitat of Particular Concern) from burial may be avoided or mitigated with protective measures. (p. 9-24)		and widespread occurrence of comparable habitat. Possible trophic effects from benthic disturbance and locally reduced prey. EFH could be temporarily and locally physically disturbed by dredging or beach shaping activity. Long term suppression not expected due to dredging intervals and widely available habitat. Minor impact to nearshore rock habitat (Habitat of Particular Concern) from burial may be avoided or mitigated with protective measures.	be placed in areas devoid of hardbottom per FDEP Permit. Follow CRs as outlined in the NMFS correspondence dated Jan. 20, 2011.

ENVIRONMENTAL RESOURCE	1996 EIS IMPACTS	1998 EA IMPACTS	2005 EA IMPACTS	2009 EA IMPACTS	2011 EA IMPACTS	MITIGATION
NON-THREATENED MARINE MAMMALS	Not evaluated.	No adverse impacts are anticipated because of species avoidance mechanisms, but strikes are possible.(5.8)	Not evaluated.	Not evaluated.	Not evaluated.	See mitigation for Threatened and Endangered Species.
BIRDS AND WILDLIFE	Short and localized disruption of feeding, foraging, and nesting during construction activities. (5.01) See U.S. FWS Coordination Act Report (1995).	Not evaluated.	Not evaluated.	Not evaluated.	Short and localized disruption of feeding, foraging, and nesting during construction activities. Noise may cause disturbance to birds and wildlife however the effects are expected to be temporary. No significant impacts are expected.	Nesting shorebird surveys will be conducted beginning April 1 or 10 days prior to project commencement and through the project period, which is required to end by April 30. Nesting areas will be marked w/ 300 foot buffer. Follow requirements in MBTA and MMPA.
PHYSICAL OCEANOGRAPHY	Not evaluated.	Minor effects to incident wave field & longshore transport due to bathymetric modification. Infilling of dredge cuts likely from southerly sediment transport.	Changes to offshore bathymetry may result in minor effects in offshore sediment transport pathways, incident wave field, & longshore transport. Infilling over long-	Not evaluated.	Not evaluated.	Conduct pre- and post-construction bathymetric surveys to monitor physical changes in borrow area per an approved Physical Monitoring Plan

ENVIRONMENTAL RESOURCE	1996 EIS IMPACTS	1998 EA IMPACTS	2005 EA IMPACTS	2009 EA IMPACTS	2011 EA IMPACTS	MITIGATION
		(5.2)	term. (p.24-39)			(2009).
BEACH COMPATIBILITY / COASTAL HABITAT	Stabilization of eroding beach and dune habitats (5.01).	No adverse impacts are anticipated. (5.4)	No significant adverse impacts anticipated from proposed action. Minor negative effects associated with No Action Alternative due to beach/dune erosion.	Not evaluated.	No significant adverse impacts anticipated from proposed action. Planting dune vegetation after sand placement for positive stabilization effect. Preventing spread of invasive vegetative species through proper equipment handling/washing procedures. Minor negative effects associated with No Action Alternative due to beach/dune erosion.	Implement best construction practices, beach sampling, and beach profiling requirements of Florida DEP permit conditions. Compliance with EO 11988 for floodplain management and protection.

ENVIRONMENTAL RESOURCE	1996 EIS IMPACTS	1998 EA IMPACTS	2005 EA IMPACTS	2009 EA IMPACTS	2011 EA IMPACTS	MITIGATION
ARCHAEOLOGY/ CULTURAL RESOURCES	No historic or cultural properties identified in the placement area along South Reach. (5.19)	Sixteen targets detected within CS II. No effect with designation of protective buffer zones. (5.10)	No effect since investigations indicate no prehistoric sites within CS II or immediate placement area	Diver investigation revealed 8 space debris sites of cultural significance within/in the vicinity of CS II. No effect with designation of protective buffer zones.	Diver investigation revealed 8 space debris sites of cultural significance within/in the vicinity of CS II. No effect with designation of protective buffer zones.	Implement 200-ft avoidance buffer on 8 identified sites; Notify DHR/SHPO, BOEM, and 45 SW CRM for “unexpected discovery” if occurrence exists.
WATER QUALITY	Temporary, minor impacts (elevated turbidity, decreased dissolved oxygen) in placement area. (5.24)	Temporary, minor impacts (elevated turbidity, decreased dissolved oxygen) to the water column in borrow area. Accidental spills or toxic materials are not expected. (5.3)	Not evaluated.	Not evaluated.	Temporary, minor impacts (elevated turbidity, decreased dissolved oxygen) to the water column in borrow area. Accidental spills or toxic materials are not expected.	Monitoring water quality conditions per requirements of FDEP. Implement marine pollution control plan. Ensure compliance with U.S. Coast Guard & U.S. EPA Vessel Permit. Obtain USACE and EPA approval for use of ODMDS or NDA for CS I channel spoil.
HAZARDOUS MATERIALS AND WASTE	Not evaluated.	Not evaluated.	Not evaluated.	Not evaluated.	Contamination due to improper handling	Follow Safety Plan, Spill Response, & BMPs

ENVIRONMENTAL RESOURCE	1996 EIS IMPACTS	1998 EA IMPACTS	2005 EA IMPACTS	2009 EA IMPACTS	2011 EA IMPACTS	MITIGATION
INFRASTRUCTURE AND TRANSPORTATION	Not evaluated.	Not evaluated.	Not evaluated.	Not evaluated.	Impacts to SR A1A traffic flow or FDOT facilities	Coordination with FDOT/Brevard County Traffic, and obtain required FDOT permits
OCCUPATIONAL SAFETY AND HEALTH	Not evaluated.	Not evaluated.	Not evaluated.	Not evaluated.	Short-term noise impacts to workers and surrounding personnel	Use administrative or engineering controls and PPE where necessary
RECREATION AND TOURISM	Significantly increased area for beach recreation; temporary and localized visual and noise impact from construction activities. (5.30)	Local and short-term disruption to navigation. Recreational opportunities and tourism would benefit from beach nourishment. (5.11)	Not evaluated.	Not evaluated.	Not evaluated.	Publish Local Notice to Mariners.
CUMULATIVE IMPACTS	Restore beach and ecosystem and prevent property damage. (5.37)	Not evaluated.	Proposed, past & future use of CS II & beach nourishments minor to possibly moderate impacts. Primary concern are long-term impacts to nearshore hardbottom located north of South Reach. (p.39-46)	Not evaluated.	No anticipation of significant cumul. impacts. Some minor possible impacts w/ proposed, past & future use of CS II & beach nourishments. Minor impacts due to cum. air emissions w/ multiple PAFB projects.	See mitigation for Essential Fish Habitat/Fisheries and Air Quality.

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APPENDIX A

Army Corps of Engineers and Mineral Management Service Environmental Assessment for Issuance of a Negotiated Agreement for Use of OCS Sand from Canaveral Shoals (2009), Brevard County (South Reach), FL

FINDING OF NO SIGNIFICANT IMPACT

Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals in the Brevard County (South Reach) Shore Protection Project

Pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality regulations implementing NEPA (40 CFR 1500) and Department of the Interior (DOI) regulations implementing NEPA (43 CFR 46), the Minerals Management Service (MMS) and the U.S. Army Corps of Engineers (USACE), Jacksonville District, as cooperating agencies, prepared an environmental assessment (EA) to determine whether the issuance of a negotiated agreement for the use of OCS sand from Canaveral Shoals in the Brevard County (South Reach) Shore Protection Project would have a significant effect on the human environment and whether an environmental impact statement (EIS) should be prepared. The MMS has reviewed this EA and analyses incorporated by referenced therein and determined that the potential impacts of the proposed action have been adequately addressed.

The MMS's proposed action is the issuance of a negotiated agreement, and its purpose is to authorize use of an offshore borrow area so that the project proponents, the USACE and local sponsor Brevard County, can obtain the necessary sand resources for a beach restoration project. Public Law 103-426 gives the MMS the authority to convey on a noncompetitive basis the rights to OCS sediment resources for use in beach nourishment projects. The project is needed to reduce shoreline erosion and protect valuable property along the South Reach coastline in Brevard County, Florida. The Brevard County Shore Protection Project was authorized for initial and maintenance construction by Section 101(b)(7) of the Water Resources Development Act of 1996, Public Law 104-303.

In 1996, the USACE programmatically evaluated potential environmental effects resulting from the proposed action and alternatives to the proposed action in its *Brevard County Shore Protection Feasibility and Environmental Impact Statement* (EIS). In 1998, the USACE prepared an *Environmental Assessment: Canaveral Shoals II* (1998 to evaluate the potential effects of using the Canaveral Shoals II borrow area, not previously evaluated in the 1996 EIS. In 2005 the MMS prepared an *Environmental Assessment, Issuance of a Non-competitive Lease for Canaveral Shoals II* incorporating additional environmental information, primarily about potential impacts to physical processes and essential fish habitat resulting from. Both EAs tiered from the 1996 EIS and were used by the MMS to support leasing decisions in 2002 and 2005. This EA incorporates by reference those analyses that have been determined to still be valid and augments a subset of analyses in light of new information.

The USACE and MMS identified and reviewed new information to determine if any resources should be re-evaluated, or if the new information would result in significantly different effects determinations. No new information was identified that necessitated a re-analysis of the impacts of proposed action. New information was identified that further supports or elaborates on the analyses or information presented in existing NEPA documents, but it did not change the conclusions of any of those analyses. Based on the analyses in the EA, no new significant impacts were identified that were not already adequately addressed, nor was it necessary to change the conclusions of the types, levels, or locations of impacts described in those documents

Alternatives to the Proposed Action

The only alternative to the MMS's proposed action is no action. However, the potential impacts resulting from the MMS' no action actually depend on the course of action subsequently pursued by the USACE and local sponsor, which could include identification of a different offshore or upland sand source. In the case of the no project alternative, habitat deterioration and coastal erosion continue, and the likelihood and frequency of property and storm damage increases.

Consultations and Public Involvement

The USACE, as the lead Federal agency, and the MMS, as required by statute and regulation, coordinated with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Florida Department of Environmental Protection, and the Florida State Historic Preservation Office in support of this leasing decision. After signature of this Finding of No Significant Impact (FONSI), a Notice of Availability of the FONSI and EA will be prepared and published by the MMS in the Federal Register or by other appropriate means.

Conclusion

The MMS has considered the consequences of the proposed action of entering into a negotiated agreement with the USACE and Brevard County for use of OCS sand from Canaveral Shoals. The MMS jointly prepared and independently reviewed the EA and finds that it complies with the relevant provisions of the CEQ regulations implementing NEPA, DOI regulations implementing NEPA, and other Marine Mineral Program requirements. Based on the NEPA and consultation process coordinated cooperatively by the USACE and MMS, appropriate terms and conditions will be incorporated into the negotiated agreement to avoid, minimize, and/or mitigate any foreseeable adverse impacts.

Based on the evaluation of potential impacts and mitigating measures discussed in the attached EA (Attachment 1), the MMS finds that entering into a negotiated agreement, with the implementation of the mitigating measures, does not constitute a major Federal action significantly affecting the quality of the human environment, in the sense of NEPA Section 102(2)(C), and will not require preparation of an EIS.

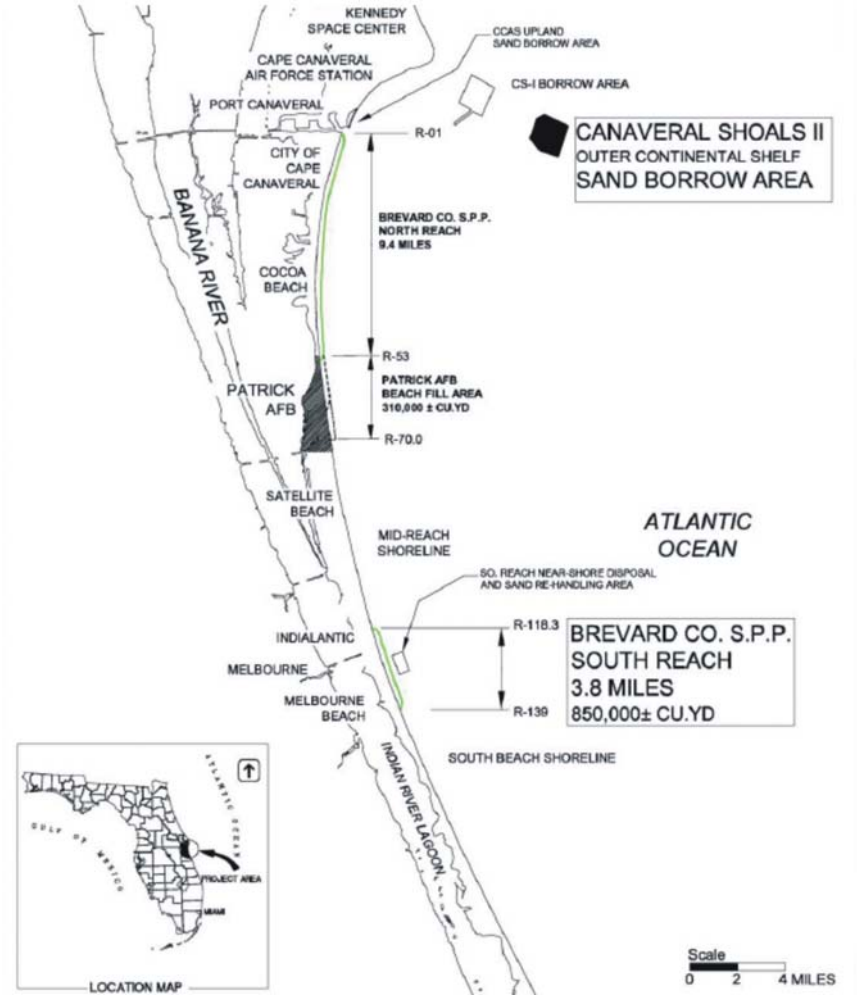
James J. Kendall
Chief, Environmental Division

08/20/09
Date

OCS EIS/EA
MMS 2009-047

Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals in the Brevard County (South Reach) Shore Protection Project

Environmental Assessment



U.S. Department of the Interior
Minerals Management Service
Environmental Division

Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Canaveral Shoals in the Brevard County (South Reach) Shore Protection Project

Environmental Assessment

U.S. Army Corps of Engineers, Jacksonville District
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1 INTRODUCTION

This Environmental Assessment (EA) presents an updated evaluation of the potential environmental effects associated with the Minerals Management Service (MMS) authorizing access to 1,300,000 cubic yards of Outer Continental Shelf (OCS) sand from the Canaveral Shoals Borrow Area II (CS II) offshore Cape Canaveral, Florida. The MMS proposes to enter into a noncompetitive agreement with the U.S. Army Corps of Engineers, Jacksonville District and Brevard County, Florida, so that they can extract, transport, and place sand from CS II along 3.8 miles of eroded shoreline known as the South Reach (Figure 1).

Pursuant to the National Environmental Policy Act of 1969 (NEPA), the USACE described the affected environment, evaluated potential environmental effects resulting from the proposed action, and developed and described alternatives to the proposed action in its *Brevard County Shore Protection Feasibility and Environmental Impact Statement* (EIS) (USACE 1996; Appendix A). The USACE prepared an *Environmental Assessment: Canaveral Shoals II* (1998; Appendix B) to evaluate the potential impacts of using the CS II borrow area, not considered in the 1996 EIS. In 2005 the MMS prepared an *Environmental Assessment, Issuance of a Non-competitive Lease for Canaveral Shoals II* (Appendix C) incorporating additional environmental information developed through its Environmental Studies Program. Both EAs tiered from the 1996 EIS and were used by the MMS to support leasing decisions in 2002 and 2005. This EA, prepared by the USACE and MMS as cooperating agencies, supplements these existing environmental analyses. Its purpose is to update potential environmental effects resulting from the issuance of a new negotiated agreement, and to determine if the proposed action, in light of new information, would have a significant effect on the human environment and whether an EIS must be prepared.

The USACE and MMS identified and reviewed new information to determine if any resources should be re-evaluated or if the new information would alter effects determinations. No new information was identified that would necessitate a re-analysis of the impacts of proposed action. This EA further supports or elaborates on the analyses or information presented in existing NEPA documents, but it does not change the conclusions of any of those analyses. Pursuant to 43 CFR 46, the analyses are deemed valid and are incorporated by reference.

The MMS has integrated the process of NEPA compliance with other environmental requirements, including the Coastal Zone Management Act (CZMA), Endangered Species Act (ESA), Magnuson-Stevens Fishery Management and Conservation Act (FCMA), and National Historic Preservation Act (NHPA). The USACE has served in the role of lead federal agency for environmental compliance activities, while the MMS has acted in a cooperating role. Pursuant to Subpart D of the implementing regulations for the CZMA (15 CFR 930), Brevard County provided a consistency concurrence from the Florida Department of Environmental Protection, dated October 8, 2001, indicating the proposed action is consistent with the Florida's Coastal Zone Management Program (Appendix D). The USACE submitted the draft EA in lieu of a biological assessment to the National Marine Fisheries Service (NMFS) on May 14, 2009 to initiate informal consultation for the recently listed smalltooth sawfish. The potential impacts on sea turtles, North Atlantic right whales, and humpback whales were previously coordinated with NMFS and are covered under 1997 Regional Biological Opinion. On July 30, 2009, NMFS

provided written concurrence that the proposed action may affect, but is not likely to adversely affect smalltooth sawfish (Appendix E). The draft EA was also submitted to the U.S. Fish and Wildlife Service (FWS) on May 15, 2009 to re-initiate formal consultation with regard to nesting sea turtles and the West Indian manatee. No critical habitat for piping plover or beach mouse is documented in the highly-developed South Reach project area. On June 18, 2009, the FWS issued a biological opinion, concurring with the USACE's effects determination on nesting sea turtles and manatee (Appendix F). The USACE consulted with NMFS concerning Essential Fish Habitat in late 2004 using existing NEPA documents; a supporting detailed assessment of Essential Fish Habitat was provided in the MMS EA (2005). NMFS issued Conservation Recommendations on January 12, 2005 focusing on protecting sensitive nearshore rock habitat and communities (Appendix G). Post-construction monitoring surveys have been performed annually from 2006 through 2008 to monitor potential impacts. Results indicate that the nearshore rock habitat and communities have not been adversely affected by placement of sand on the South Reach. In its May 14, 2009, correspondence to NMFS, the USACE and local sponsor committed to monitor nearshore rock in post-construction years 1, 2, 3, and 5. The USACE coordinated Section 106 compliance efforts with the Florida State Historic Preservation Officer (SHPO) in 2001. The SHPO confirmed eight targets as debris from Air Force or NASA programs and suggested they could be eligible for listing in the National Register (Appendix H).

2 PURPOSE AND NEED FOR THE PROPOSED ACTION

The Brevard County Shore Protection Project is authorized by Section 101(b)(7) of the Water Resources Development Act of 1996, Public Law 104-303, to reduce damage to structures and shorefront property related to erosion and storms. Initial construction of the South Reach segment was completed in 2002 and 2003 and involved the placement of approximately 1.6 million cubic yards of sand on the beach. The South Reach was last renourished in 2005 under authorization of the Flood Control and Coastal Emergencies Act. Since 2005, storm activity has severely eroded this portion of the Brevard County shoreline. Tropical Storm Fay, in particular, stalled over Brevard County in 2008 and caused extensive beach erosion along the South Reach. The proposed action is needed to authorize access to an additional 1,300,000 cubic yards of OCS sand from CS II to re-nourish the South Reach.

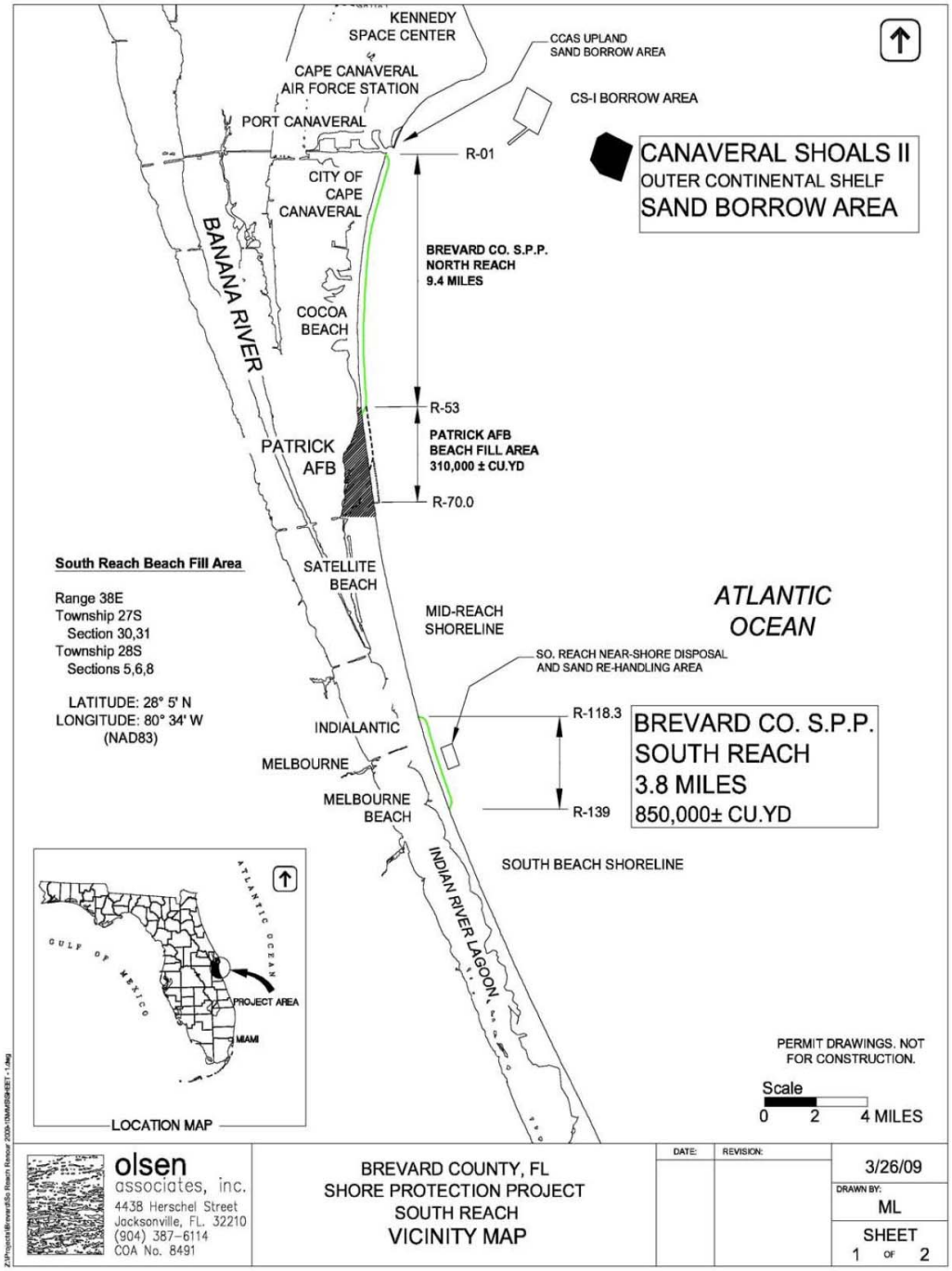
3 DESCRIPTION OF THE PROPOSED ACTION

The MMS's proposed action is the issuance of a negotiated agreement to authorize use of OCS sand from the CS II borrow area. The connected federal action undertaken by the USACE is the maintenance construction, including dredging, transport, and placement of sand. A detailed description of the project and project area can be found in the previous EAs (USACE 1998; MMS 2005). In summary, CS II is an open ocean borrow site, roughly 5 miles from its nearest landward point (Cape Canaveral Air Force Station). It is approximately 6,000 x 6,500 feet with existing depths ranging from -11 to -42 feet. From the core borings and sediment analysis, the substrate of the site consists of beach quality sand (medium sand with a significant shell fraction) which meets the criteria of the Florida Sand Rule. Approximately 20 million cubic yards of sand are currently available in CS II. The South Reach includes 3.8 miles of actively eroding shoreline in the vicinity of Melbourne Beach and Indialantic.

The proposed action would occur between November 1 and April 30 in order to avoid most sea turtle nesting activities. As in the past, the proposed South Reach project would be reconstructed with one or more hopper dredges. Hopper dredging is expected to occur over approximately 163 days to obtain the necessary volume. The time estimated to complete each dredge and placement cycle, including idle time, is approximately 12 hours per load. Hopper dredging would be limited to a relatively small footprint in the designated borrow area. Efficient dredging practice entails excavating sand in 2 to 5 foot thicknesses along relatively straight and adjacent runs along the seabed. The sand dredged from the hydraulic suction heads would be discharged into the vessel's open hopper, and most of the seawater effluent would spill over the sides of the hopper. The hopper dredges would transport the dredged material a distance of approximately 24 miles to pump-outs positioned approximately 0.5 to 1 mile from shore (USACE 1998); the material would be pumped directly from the hopper barge via pipeline to the beach. The placement and relocation of the nearshore mooring buoys used during pump-out may involve the use of tender tugboats and a pipeline hauler or crane. Alternatively, dredged material may be placed by the hopper dredges into previously permitted rehandling areas and henceforth dredged from the rehandling area and pumped onto the beach via a cutterhead pipeline dredge. The permitted 4,500-ft alongshore by 2,450-ft wide rehandling area is located centrally located along the project beach fill area between 2,600- and 5,050-ft from shore. Use of the rehandling area is at the Contractor's option.

The beach construction template would include a 100 foot wide berm with an elevation of +8.1 feet NGVD (with +/- 0.5-ft tolerance) at its seaward edge and elevation +9.6 at its landward edge with a 1V:67H slope. Landward of the sloped segment, the berm (elevation 9.6 feet) is flat and of variable width, depending on the position of the existing beach. The landward end of the template will include a dune feature with crest elevation +10.6 feet with 1V: 10H seaward and landward facing slopes. The landward end of the template toes into the existing beach profile at +8.9 ft. This berm has been designed to be turtle friendly. Unlike a typical beach berm, the seaward elevation of this berm would be lower in order to reduce potential scarping resulting from storm activity or the natural equilibration of the beach. Scarping, the formation of steep slopes, can prevent sea turtles from being able to crawl up onto the beach and nest. This design also reduces ponding of water. The use of up to three bulldozers and/or pipeline movers and two trucks is projected during beach shaping activities.

Figure 1. Brevard County, Florida Federal Shore Protection Project Area



4 DESCRIPTION OF THE AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

Pursuant to the NEPA, the proposed action is evaluated to determine the potential environmental effects that may result from issuing a noncompetitive agreement to authorize use of OCS sand resources for beach nourishment. As previously stated, this EA supplements the EIS prepared by the USACE in 1996 and EAs prepared by the USACE in 1998 and the MMS in 2005. It provides additional information on the status of and potential effects to archaeology/cultural resources, air quality, and threatened and endangered species (sea turtles, whales, manatees, and smalltooth sawfish). The reasons for providing this additional evaluation include the following: 1) results of diver surveys conducted within CS II and measures proposed to protect identified cultural resource sites were not described in the previous assessments; 2) there was no evaluation of air quality in the 2005 assessment, and the air quality assessment provided in the 1998 EA needs refinement; 3) interactions between sea turtles, whales, manatees and hopper dredges were documented during the 2005 dredging event; 4) new information about as the potential impacts to nesting sea turtles is available and additional protective measures are recommended; and 5) new information on the recently listed smalltooth sawfish is available and new protective measures for this species are recommended.

Previous NEPA documents (USACE 1996; USACE 1998; MMS 2005) evaluated impacts to other resources including aesthetics, beach and coastal habitat, benthic resources, birds and wildlife, fish and essential fish habitat, non-threatened marine mammals, physical oceanography, recreation and tourism, threatened and endangered species, water quality, and cumulative impacts. These evaluations have been determined to be still valid since the project limits and construction methodologies, scope, and timing have remained the same, the information presented in these evaluations is otherwise valid, and relevant Federal laws have not changed in a manner that would require re-evaluation of these resources. The existing analyses adequately address most of the potential environmental effects of the proposed action and are incorporated by reference and summarized in Table 1.

Table 1: Summary of Environmental Impacts and Mitigation

ENVIRONMENTAL RESOURCE	1996 EIS IMPACTS	1998 EA IMPACTS	2005 EA IMPACTS	2009 EA IMPACTS	MITIGATION (See 8.0 for Proposed Mitigation Measures)
AESTHETICS	Temporary adverse visual impact from construction equipment; long-term positive visual impact from restored beach (5.27)	Not evaluated.	Not evaluated.	Not evaluated.	
AIR QUALITY	Temporary and localized decrease in air quality from construction-equipment emissions. (5.33)	Temporary and localized decrease in air quality from construction-equipment emissions. (5.1)	Not evaluated.	Temporary and localized decrease in air quality from construction-equipment emissions. Estimated emissions within national ambient air quality standards.	
ARCHAEOLOGY/ CULTURAL RESOURCES	No historic or cultural properties identified in the placement area along South Reach. (5.19)	Sixteen targets detected within CS II. No effect with designation of protective buffer zones. (5.10)	No effect since investigations indicate no prehistoric sites within CS II or immediate placement area (p. 4)	Diver investigation revealed 8 space debris sites of cultural significance within or in the vicinity of CS II. No effect with designation of protective buffer zones.	Implement 200 foot avoidance buffer on 8 identified space debris sites; implement chance find clause as necessary. Implement dredge with positioning equipment.
BEACH COMPATIBILITY / COASTAL HABITAT	Stabilization of eroding beach and dune habitats (5.01).	No adverse impacts are anticipated. (5.4)	Not evaluated.	Not evaluated.	Implement best construction practices, beach sampling, and beach profiling requirements of Florida DEP Consistency Certification.
BENTHIC RESOURCES	Short-term and localized reduction in beach infaunal invertebrates. (5.01)	Possible mortality for nonmotile invertebrates in immediate area of dredging. Temporary and localized defaunation from bottom disturbance, sub-lethal effects from elevation turbidity, burial, and habitat degradation. Long term suppression not expected due to dredging intervals. Recolonization expected to occur. (5.5)	Possible mortality for nonmotile invertebrates in immediate area of dredging. Temporary and localized defaunation from bottom disturbance, sub-lethal effects from elevated turbidity, burial, and habitat degradation. Long term suppression not expected due to dredging intervals and highly adaptive benthic assemblages. Recolonization of physically dominated	Not evaluated.	

			environment expected to occur within 2-3 years. (p. 5-9)		
BIRDS AND WILDLIFE	Short and localized disruption of feeding, foraging, and nesting during construction activities. (5.01) See U.S. FWS Coordination Act Report (1995).	Not evaluated.	Not evaluated.	Not evaluated.	
FISH AND ESSENTIAL FISH HABITAT (EFH)	Short and localized disturbance of surf zone habitat and fish during pump-out and sand re-distribution from elevated noise and Turbidity levels, as well as burial. Potential burial of nearshore coquina and scattered worm rock outcrops by longshore transport. (5.01)	Fish and EFH would be temporarily and locally impacted by dredge activity including sub-lethal and lethal effects related to turbidity, prey availability, and dredge entrainment or burial. Long term disruption not expected due to fish mobility and dredging intervals. (5.9)	Possible entrainment and sub-lethal effects from turbidity, noise, and burial. Effects are expected to be minor because of species mobility, avoidance behavior, and widespread occurrence of comparable habitat. Possible trophic effects from benthic disturbance and locally reduced prey. EFH could be temporarily and locally physically disturbed by dredging or beach shaping activity. Long term suppression not expected due to dredging intervals and widely available habitat. Minor impact to nearshore rock habitat (Habitat of Particular Concern) from burial may be avoided or mitigated with protective measures. (p. 9-24)	Not evaluated.	No beach fill within 50 feet of any coquina or worm rock outcrops and continue monitoring program per NMFS Conservation Recommendations.
NON-THREATENED MARINE MAMMALS	Not evaluated.	No adverse impacts are anticipated because of species avoidance mechanisms, but strikes are possible. (5.8)	Not evaluated.	Not evaluated.	See mitigation for Threatened and Endangered Species.
PHYSICAL OCEANOGRAPHY	Not evaluated.	Minor effects anticipated to incident wave field and longshore transport due to bathymetric modification. Infilling of dredge cuts likely from southerly sediment	Modification of offshore bathymetry may result in minor effects in offshore sediment transport pathways, incident wave field, and longshore transport. Infilling	Not evaluated.	Conduct pre- and post-construction bathymetric surveys to monitor physical changes in borrow area.

		transport. (5.2)	anticipated over long-term. (p.24-39)		
RECREATION AND TOURISM	Significantly increased area for beach recreation; temporary and localized visual and noise impact from construction activities. (5.30)	Local and short-term disruption to navigation. Recreational opportunities and tourism would benefit from beach nourishment. (5.11)	Not evaluated.	Not evaluated.	Publish Local Notice to Mariners.
THREATENED AND ENDANGERED SPECIES	Potential increase of nesting habitat for sea turtles; potential disturbance and take of sea turtles, right whales, and related to beach scarping, lighting, dredge entrainment, and vessel strike. (5.09)	Possible entrainment dredge may lead to injury and mortality sea turtles (5.6). Noise and vessel collision may lead to injury and mortality of marine mammals (5.7). Effects to marine turtles and marine mammals may be avoided or minimized with protective measures.	Dredging may affect, but not likely to adversely affect smalltooth sawfish with approved protective measures. No effect to Johnson's seagrass or Southeastern beach mouse since no critical habitat in project area. (p.21-24)	Hopper dredging and beach placement may adversely affect marine turtles. Adverse effects to sea turtles, marine mammals, and smalltooth sawfish may be avoided or minimized with protective measures.	Implement terms and conditions of 1) NMFS 1995/1997 Regional Biological Opinions, 2) NMFS 2009 Concurrence, and 3) 2009 FWS BO.
WATER QUALITY	Temporary, minor impacts (elevated turbidity, decreased dissolved oxygen) in placement area. (5.24)	Temporary, minor impacts (elevated turbidity, decreased dissolved oxygen) to the water column in borrow area. Accidental spills or toxic materials are not expected. (5.3)	Not evaluated.	Not evaluated.	Monitoring water quality conditions per requirements of Florida DEP Consistency Certification. Implement marine pollution control plan. Ensure compliance with U.S. Coast Guard requirements and U.S. EPA Vessel General Permit as applicable.
CUMULATIVE IMPACTS	Restore beach and ecosystem and prevent property damage. (5.37)	Not evaluated.	Currently proposed, past and future use of CS II and beach nourishments expected to be minor to possibly moderate. Of primary concern are long-term impacts to nearshore hardbottom located north of South Reach. (p.39-46)	Not evaluated.	See mitigation for Fish and Essential Fish Habitat

4.1 Archaeology/Cultural Resources

Underwater surveys and diver identifications have been conducted in the proposed borrow area. This effort is documented in a number of reports dating from 1994, and all of these reports were coordinated with the Florida SHPO.

The 1994 report "*A Cultural Resources Survey of Proposed Borrow Area, Vicinity of Cape Canaveral, Brevard County, Florida"* (DHR file No. 942533) identified six potentially significant targets within CS II. The 1999 report "*A Submerged Cultural Resources Remote Sensing Survey of Four Proposed Borrow Areas and Archaeological Diver Identification and Evaluation of Eight Potentially Significant submerged Targets for the Brevard County Shore Protection Project, Brevard County, Florida"* (DHR Nos. 992156 and 2000-02415) determined that the targets identified in 1994 were not significant, but identified eight additional potentially significant targets in an expanded borrow area. In 2001, a diver investigation was conducted in order to identify these eight targets. The State of Florida asked that an additional six anomalies also be investigated. The results of the diver evaluations revealed that some of these objects were products of the United States space and/or missile programs, one was the remains of a modern fishing vessel, and another was identified as a section of steel cable. The space or missile debris consisted of cylinders of various lengths, some of which were capped with shallow convex-shaped objects. Motor components and ferrous objects were also discovered which were associated with the space program. In one case, a partial label was identified on a motor with information on the manufacturer. It was determined that the motor was a component of a Delta II rocket which was launched on 14 February 1989. The objective of this particular mission was to place a NAVSTAR II-1 satellite into orbit. All of these findings are documented in the 2001 report "*Archaeological Diver Identification and Evaluation of Fourteen Potentially Significant Submerged Targets for the Brevard County Shore Protection Project"* (DHR file No. 2001-316). The USACE has determined that these space and missile program objects are potentially significant cultural resources. Additional areas were surveyed in 2002 which is documented in "*A Cultural Resources Marine Remote Sensing Survey of the Offshore Borrow and Re-Handling Areas South Reach Brevard County Shore Protection Project, Brevard County, Florida"* (DHR file No. 2002-06980); however, no anomalies were identified.

In 2001, the SHPO concurred with the USACE determination that the space debris discovered within CS II, while modern, are potentially significant cultural resources. Their association with NASA and the U.S. Air Force missile program suggests that these objects may be potentially eligible for listing in the National Register. As during previous dredging events, these resources shall be protected by requiring the dredging contractor to maintain a buffer zone around each of these sites. Therefore, significant impacts to cultural resources in the borrow area are not anticipated provided the mitigation below is implemented:

<u>Onshore Prehistoric or Historic Resources</u>

If the USACE discovers any previously unknown historic or archeological property, the USACE must immediately notify the MMS of any finding. The USACE will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

Offshore Historic Resources

The eight anomalies shall be avoided during dredging operations by at least 200 feet, as described in Table 2.

Table 2: Archaeological avoidance areas

Target	Area/Block	Amplitude (gammas)	Duration (ft)	FL East State Plane Coordinates NAD 1927 (X /Y Coordinate)	Avoidance Radius (ft)
C2-01	Canaveral Shoals II	422	120	667682/1487363	200
C2-02	Canaveral Shoals II	330	85	670907/1485875	200
C2-08	Canaveral Shoals II	147	140	675523/1482444	200
C2-12	Canaveral Shoals II	51	125	679892/1482496	200
C2-13	Canaveral Shoals II	36	110	681022/1480316	200
C2-14	Canaveral Shoals II	61	165	681364/1480843	200
C2-16	Canaveral Shoals II	52	100	676571/1481617	200
C2-17	Canaveral Shoals II	65	75	670297/1486107	200

If the USACE determines that the anomalies listed in Table 2 cannot be avoided during dredging operations, the USACE shall notify the MMS. The USACE, subject to the availability of appropriations and in accordance with the requirements of applicable law, may conduct further investigations to assess the significance of the objects producing the signatures in accordance with the criteria at 36 CFR Part 60.4, "Criteria for evaluation."

The proposed investigation procedures shall be discussed with the MMS archaeologist prior to commencing fieldwork. At a minimum, this assessment must include an analysis of the age, physical composition, and structural integrity of the object (i.e., wood or metal, intact or dispersed). Measured drawings and/or underwater video or still photographs of the feature shall be made for documentation and submitted with the final "Report of Findings." A "Report of Findings" prepared in accordance with the archaeological report writing standards specified in the MMS Notice To Lessees (NTL) 2005-G07 must be submitted to the MMS for approval within ten work days of the completion of fieldwork.

Offshore Chance Finds Clause

In the event that the dredge operators, discover any archaeological resource while conducting dredging operations in the CSII Borrow Area, the USACE shall require that dredge operations will be halted immediately within the borrow area. The USACE shall then immediately report the discovery to the MMS. If investigations determine that the resource is significant, the parties shall together determine how best to protect it.

4.2 Air Quality

Criteria air pollutant emissions were estimated for the proposed dredging of Federal sand from CS II and placement along the South Reach using estimates of power requirements, duration of operations, and emission factors for the various equipment types. Multiplying horsepower rating, activity rating factor (percent of total power), and operating time yields the energy used. The energy used multiplied by an engine-specific emission factor yields the emission estimate. Operational data from the 2005 nourishment cycle was used to estimate power requirements and duration for each phase of the proposed hopper dredging activity. The horsepower rating of the dredge plant was assumed for each activity as follows: propulsion (3500 hp), dredging (2000 hp), pumping (2000 hp), and auxiliary (1165 hp). Different rating or loading factors were used for dredging, propulsion, and pumping. The estimated duration of dredging was approximately 163 days. The estimated time to complete each dredge cycle, including idle time, was approximately 12 hours per load. It was assumed that about 3,983 yd^3 of material would be moved in each cycle, requiring about 326 loads to excavate enough material to place 1.048 million yd^3 of sand on the beach. The placement and relocation of the nearshore mooring buoys used during pump-out may involve up to two tender tugboats, and a pipeline hauler / crane would also be used. It was assumed that the buoy would need to be moved at most five times during the project, with each move taking approximately 12 hours. It was assumed that a crew/supply vessel would operate daily for four hours as well.

All dredging was assumed to occur at CS II, whereas 60% of hopper transport and crew/supply vessel activities were assumed to occur over state waters or at the placement site. The beach fill related estimates assumed the use of up to three bulldozers/pipeline movers and two trucks, each operating eighty percent of the time for the duration of the project.

Emission factors for the diesel engines on the hopper dredge, barge, tugboats were obtained from EPA's *Compilation of Air Pollutant Emissions Factors, AP-42, Volume 1* (2002). Emission factors for tiered equipment used in beach construction were derived from NONROAD model (5a) estimates. Total project emissions of nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOC), and particulate matter (PM) are presented in Table 3.

The proposed action may result in small, localized, temporary increases in concentrations of NOx, SO_2, CO, VOC, and PM. Since the project is located in an attainment area, there is no requirement to prepare a conformity determination. Nonetheless, estimates were tallied to determine the portion of total emissions that would occur within state limits. Since the Federal waters attainment status is unclassified, there is no provision for any classification in the Clean Air Act for waters outside of the boundaries of state waters. Calculating the increase in emissions that may occur within the state limits was done by subtracting out the dredging-related and 40% of transport emissions, since those activities would take place entirely over Federal waters.

Table 3: Estimated emissions for the preferred alternative (tons per year)

Activity	Emissions (tons)					
	NOx	SO2	CO	VOC	$PM_{2.5}$	PM_{10}
Dredge Plant (Hopper)						
Dredging/Operation	64.2	1.1	14.7	1.7	1.0	1.1
Turning/Sail	37.7	0.6	8.6	1.0	0.6	0.6
Pump-out	8.7	0.1	2.0	0.2	0.1	0.1
Idle / Connect-Disconnect	9.1	0.2	2.1	0.2	0.1	0.2
Supporting Offshore Activities	3.9	0.1	0.9	0.1	0.1	0.1
Beach Fill	12.4	2.3	5.9	0.9	1.0	1.0
Total Emissions	135.9	4.3	34.2	4.1	3.0	3.0
Total Emissions within State	53.5	3.0	15.3	1.9	1.7	1.7
Total Emissions at CS II	82.4	1.4	18.9	2.2	1.4	1.4
2002 Brevard County Emissions Nonpoint + Mobile (Point and Nonpoint + Mobile)	34,251 (46,403)	10,318 (25,865)	216,995 (218,319)	44,902 (45,561)	5,548 (6,712)	11,989 (13,350)
Brevard County 2002 emissions from EPA National Emission Inventory http://www.epa.gov/air/data/						

Emissions associated with the dredge plant would be the largest contribution to the inventory. However, the total increases are relatively minor in context of the existing point and nonpoint and mobile source emissions in Brevard County (Table 3). Projected emissions from the proposed action would not adversely impact air quality given the relatively low level of emissions and the likelihood for prevailing offshore winds. With the proposed action, the criteria pollutant levels would be well within the national ambient air quality standards.

4.3 Threatened and Endangered Species

Sea turtles - Offshore

In 2005 the Weeks Marine hopper dredges *BE Lindholm* and *RN Weeks*, as well as the subcontracted Bean Stuyvesant hopper dredge *Stuyvesant*, were used to excavate Federal sand from CS II and transport it to the South Reach placement area. The dredging was performed in compliance with the 1997 NMFS regional biological opinion (RBO) concerning the use of hopper dredges in channels and borrows areas along the Southeast U.S. Atlantic coast. Terms and conditions within the RBO include the use of rigid turtle deflectors, which are installed on the dragheads of the dredge. The deflectors move, or deflect, turtles which may be resting on the bottom away from the draghead. All dredge activities were monitored by two endangered species observers which were approved by the NMFS. The observers periodically checked the intake screens leading to the hopper for entrained sea turtles and their parts.

A total of 128 "dredge days" were observed in 2005. During this time frame, three loggerhead sea turtle (*Caretta caretta*) mortalities, or take, were documented. All occurred on the dredge *Lindholm*. Given the efficiency of the screening on the dredges, it is unlikely that additional turtle mortalities went unrecorded. According to the observers, the take numbers were not considered particularly high given the location, season, and number of turtle observations. Each of the mortalities were coordinated with NMFS and were applied to the USACE-South Atlantic Division authorized annual incidental take limit of 35 loggerhead sea turtles associated with hopper dredging.

The USACE has previously determined that the use of a hopper dredge may affect sea turtles (USACE 1998). NMFS has concurred with this determination in their 1997 RBO and July 30, 2009, concurrence, and determined that take resulting from hopper dredging activity will not jeopardize the continued existence of any sea turtle species (Appendix E). In compliance with the NMFS RBO, the following protective measures, in summary, shall be implemented to minimize the risk of taking sea turtles during proposed hopper dredging activities at CS II:

- The Contractor shall instruct all personnel associated with the project of the potential presence of threatened and endangered species, such as sea turtles, and the need to avoid collisions with these animals or harming them in any way.

- All construction personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing sea turtles, which are protected under the Endangered Species Act. The Contractor may be held responsible for any threatened and endangered species harmed, harassed, or killed as a result of construction activities.

- During dredging operations, an observer approved by the NMFS shall be aboard the dredge to monitor for the presence of sea turtles.

- Any take concerning a sea turtle or sighting of any injured or incapacitated sea turtle shall be reported immediately to the USACE contracting officer.

- Hopper dredge drag heads shall be equipped with rigid sea turtle deflectors which are rigidly attached. No dredging shall be performed by a hopper dredge without an installed turtle deflector device approved by the USACE contracting officer.

- The Contractor shall install baskets or screening over the hopper inflow(s) with no greater than 4" x 4" openings. The method selected shall depend on the construction of the dredge used and shall be approved by the contracting officer prior to commencement of dredging. The screening shall provide 100% screening of the hopper inflow(s). The screens and/or baskets shall remain in place throughout the performance of the work.

- The Contractor shall install and maintain floodlights suitable for illumination of the baskets or screening to allow the observer to safely monitor the hopper basket(s) during non-daylight hours or other periods of poor visibility. Safe access shall be provided to the inflow baskets or screens to allow the observer to inspect for turtles, turtle parts or damage.

- The Contractor shall operate the hopper dredge to minimize the possibility of taking sea turtles and to comply with the requirements stated in the Incidental Take Statement provided by the NMFS in their RBO.

- The turtle deflector device and inflow screens shall be maintained in operation condition for the entire dredging operation.

- When initiating dredging, suction through the drag heads shall be allowed just long enough to prime the pumps, and then the drag heads must be placed firmly on the bottom. When lifting the drag heads from the bottom, suction through the drag heads shall be allowed just long enough to clear the lines, and then must cease. Pumping water through the drag heads shall cease while maneuvering or during travel to/from the disposal area.

- Raising the drag head off the bottom to increase suction velocities is not acceptable.

- The Contractor shall keep the drag head buried a minimum of 6 inches in the sediment at all times.

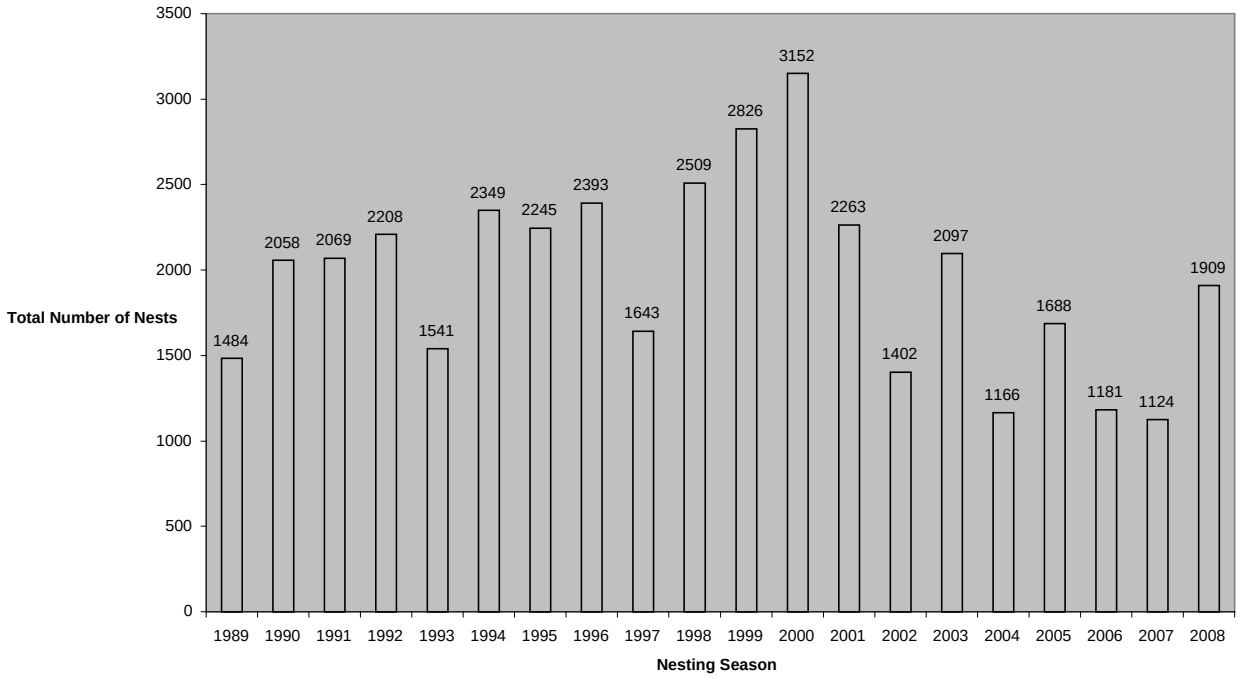
- During turning operations the pumps must either be shut off or reduced in speed to the point where no suction velocity or vacuum exists.

The entire suite of terms and conditions to implement the prudent measures required by NMFS is provided in the NMFS 1995 and 1997 Regional Biological Opinions of Hopper Dredging along the South Atlantic Coast. The 1997 RBO authorized annual incidental take, by injury or mortality, of 35 loggerheads, 7 Kemp’s ridley, 7 green turtles, and 2 hawksbill. Any takes will be counted against the regional incidental take statement.

Sea Turtles - Onshore

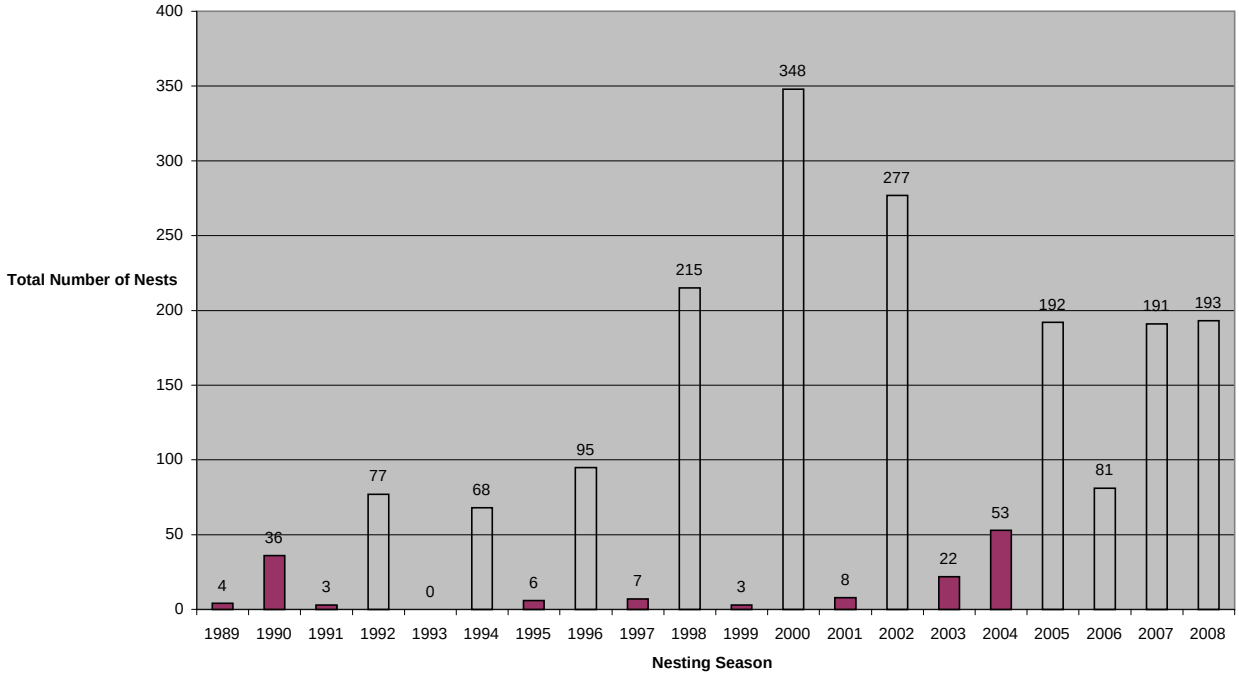
Three sea turtle species are known to nest within the South Reach beach placement area. In order of abundance, they are the loggerhead, green, and leatherback sea turtles. Densities of loggerhead turtle nests reported along the South Reach are shown on Figure 2. Nest densities recorded from the South Reach area ranged from 185 to 518 nests per km between 1989 through 2008 nesting seasons (Ehrhart and Williamson 2009).

Figure 2. Loggerhead Nest Totals for the South Reach, 1989 through 2008



Densities of green turtle nests reported along the South Reach from 1989 through 2008 are shown in Figure 3. Nest densities recorded from the South Reach area ranged from 0 to 57 nests per km during this time frame (Ehrhart and Williamson 2009).

Figure 3. Green Turtle Nest Totals for the South Reach, 1989-2008



Leatherback nests in Brevard County are relatively few in number when compared with Florida beaches to the south, especially Martin and Palm Beach Counties (NMFS and USFWS, 1992; B. Brost 2002, pers. comm.). Leatherback nesting within the South Reach ranged from 0 to 7 between 2005 and 2008 (Ehrhart et al. 2006-2009).

Results of prior annual monitoring of sea turtle nesting activity in Brevard County on beaches nourished in 2000-03 and 2005 with offshore borrow sand from Canaveral Shoals II, as proposed for this project, indicate that the fill material is suitable for sea turtle nesting purposes and compatible with sea turtle nesting behavior and hatching success. The hatchling success ratio in the South Reach study area was similar and reasonably high for loggerheads (78.25%), green turtles (70.55), and leatherbacks (66.23%) (Ehrhart and Hirsch 2008). These results were reported to be comparable to many Florida beaches and exceeded documented statewide means of 50.77% for hatching and 48.03% for hatchling emergence success for loggerhead sea turtles (Geomar 2008). These and prior-year data provide evidence of the overall high quality of the fill material as an incubation medium (Ehrhart and Hirsch 2008) which may be attributed to the relatively coarse sand grain size of the fill material that includes well-graded shell fragments which may have prevented the hydraulically placed fill material from excessive compaction that would otherwise adversely affect sea turtle nesting success (Geomar 2008).

The USACE has determined that the beach placement of dredged material may affect nesting sea turtles, and the U.S. Fish and Wildlife Service (USFWS) issued a biological opinion, dated June 18, 2009, concurring with this determination (Appendix F). The FWS determined that no more than the following types of incidental take may result from the proposed action: (I) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests

deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female tunics attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service. The terms and conditions of the Biological Opinion shall be implemented in order to avoid or minimize take of sea turtles. These conditions, in abbreviated summary, include:

- Use of beach quality sand suitable for sea turtle nesting, incubation and hatchling emergence.
- No construction activity or equipment on the beach from May 1 through October 31.
- Daily early morning nesting surveys and restricted nest relocation and/or avoidance beginning March 1 if beach construction activities occur between March 1 and April 30.
- Daily early morning nesting surveys beginning 65 days prior to construction, through September 30 for beach construction activity from November 1 through 30.
- Measurement of sand compaction and tilling of the nourished beach if required, prior to March 1, after construction and for three subsequent years.
- Visual surveys for escarpments after construction and for three subsequent years, and removal of escarpments prior to March 1 (and thereafter, pursuant to coordination with the USFWS and FWC) that interfere with sea turtle nesting.
- Requisite meetings between the construction contractor, USFWS, FWC and marine turtle State permit holder.
- Minimization of storage of construction equipment upon the beach from March 1 through April 30 and from November 1 through 30.
- Avoidance and minimization of lighting of the beach and nearshore waters, and upon offshore equipment, from March 1 through April 30 and from November 1 through 30.

<u>Whales</u>

Endangered species observers recorded one right whale (*Eubalaena glacialis*) and approximately four humpback whales (*Megaptera novaeanglia*) during hopper dredging activities at CS II in 2005. The sighting of the right whale occurred during the month of March, and the observers felt that this was unusually late in the winter calving season for the species. Information on the sighting was also reported to the USN Whale Sighting Node, and the information was then relayed across the pager system that alerts military and merchant mariners to right whale locations. None of the dredging activities had any adverse effects on these species.

The USACE has previously determined that hopper dredging activities may affect, but is not likely to adversely affect protected species of whales. With implementation of the necessary protective measures, NMFS determined in the July 30, 2009 concurrence that the risk to North Atlantic right whales and humpback whales is discountable (Appendix E). In compliance with the NMFS RBO, during the period December through March, barges or dredges moving through project waters shall implement the following precautionary measures in order to protect whales:

- The Contractor shall instruct all personnel associated with the project of the potential presence of threatened and endangered species, such as whales, and the need to avoid collisions with these animals or harming them in any way.

- All construction personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing whales, which are protected under the Endangered Species Act and the Marine Mammal Protection Act. The Contractor may be held responsible for any protected species harmed, harassed, or killed as a result of construction activities.

- During dredging operations, an observer approved by the NMFS shall be aboard the dredge to monitor for the presence of whales.

- During the period 1 December through 30 March, daily aerial surveys within 15 nm of the dredging and placement sites will be conducted by others to monitor for the presence of the right whale. Right whale sightings will be immediately communicated by marine radio to the dredging contractor. During evening hours or when there is limited visibility due to fog or sea states greater than Beaufort 3, the tug/barge or dredge operator shall slow down to 5 knots or less when traversing between areas if whales have been spotted within 15 nautical miles (nm) of the vessels path within the previous 24 hours.

- If a right whale or any other species of whale is reported within the area, then the vessel operator will be required to follow the NMFS' Southeast Region Vessel Strike Avoidance Measures and Reporting for Mariners. The tug/barge or dredge operator shall maintain a 500-yard buffer between the vessel and any whale.

- If a stranded/injured/incapacitated whale is observed within the construction site, the contractor is requested to immediately contact the NMFS Whale Stranding Network pager number at 305-862-2850.

The entire suite of terms and conditions to implement the prudent measures required by NMFS is provided in the NMFS 1995 and 1997 Regional Biological Opinions of Hopper Dredging along the South Atlantic Coast.

<u>West Indian Manatee</u>

A single West Indian manatee (*Trichechus manatus*) was sighted during dredging activities during the 2005 dredging event. This was not considered unusual as this species prefers inshore grass beds, structures where macro-algae proliferates, sources of freshwater such as creeks and

not the open ocean. The manatee was not adversely affected by dredging activities.

The USACE has determined that the proposed project may affect, but is not likely to adversely affect the manatee, and the FWS has concurred with this determination. The terms and conditions of the Biological Opinion shall be implemented in order to avoid or minimize take of manatees (Appendix F). These conditions include the following Standard Manatee Construction Conditions:

- The Contractor shall instruct all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees.

- All construction personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Endangered Species Act and Marine Mammal Protection Act. The Contractor may be held responsible for any manatee harmed, harassed, or killed as a result of construction activities.

- If siltation barriers are used, they shall be made of material in which manatees cannot become entangled, are properly secured, and are regularly monitored to avoid manatee entrapment. Barriers shall not block manatee entry to or exit from essential habitat.

- All vessels associated with the project shall operate at "no wake/idle" speeds at all times while in waters where the draft of the vessel provides less than a four-foot clearance from the bottom, and vessels shall follow routes of deep water whenever possible. Boats used to transport personnel shall be shallow-draft vessels, preferably of the light-displacement category, where navigational safety permits. Mooring bumpers shall be placed on all barges, tugs, and similar large vessels wherever and whenever there is a potential for manatees to be crushed between two moored vessels. The bumpers shall provide a minimum standoff distance of 4 feet.

- If a manatee is sighted within 100 yards of the project area, all appropriate precautions shall be implemented by the Contractor to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet of a manatee. If a manatee is closer than 50 feet to moving equipment or the project area, the equipment shall be shut down and all construction activities shall cease within the waterway to ensure protection of the manatee. Construction activities shall not resume until the manatee has departed the project area.

- Prior to commencement of construction, each vessel involved in construction activities shall display at the vessel control station or in a prominent location, visible to all employees operating the vessel, a temporary sign at least 8.5 x 11" reading, "CAUTION: MANATEE HABITAT/IDLE SPEED IS REQUIRED IN CONSTRUCTION AREA." In the absence of a vessel, a temporary 3' x 4' sign reading "CAUTION: MANATEE AREA" will be posted adjacent to the issued construction permit. A second temporary sign measuring 8.5 x 11" reading "CAUTION: MANATEE HABITAT. EQUIPMENT MUST BE SHUTDOWN IMMEDIATELY IF A MANATEE COMES WITHIN 50

FEET OF OPERATION" shall be posted at the dredge operator control station and at a location prominently adjacent to the issued construction permit. The Contractor shall remove the signs upon completion of construction.

- Any collisions with a manatee or sighting of any injured or incapacitated manatee shall be reported immediately to the USACE. The Contractor shall also immediately report any collision with and/or injury to a manatee to the Florida Fish and Wildlife Conservation Commission (FWC) "Manatee Hotline" 1-888-404-FWCC (3922) as well as the U.S. Fish and Wildlife Service, Jacksonville Field Office.

In addition, Brevard County with the FWC will continue to conduct sea turtle monitoring for a minimum of two additional nesting seasons after the nourishment event if placed-sand remains.

Smalltooth Sawfish

Smalltooth sawfish (*Pristis pectinata*) is currently listed as endangered by NMFS and may rarely occur within the project area; however, it has not been observed during previous dredging events. The National Sawfish Encounter Database (Simpendorfer and Wiley, 2006) managed by the Florida Museum of Natural History, University of Florida revealed 9 encounters for Brevard County from as far back as 1895. Six of the observations occurred in the Indian River Lagoon and three occurred in the Atlantic coastal waters. Currently, the core of the smalltooth sawfish Distinct Population Segment is surviving and reproducing in the waters of southwest Florida and Florida Bay, primarily within the jurisdictional boundaries of Everglades National Park where important habitat features are still present and less fragmented than in other parts of the historic range. The NMFS proposed critical habitat for the sawfish in 2008, but the project area does not overlap any of these proposed locations.

In their July 30, 2009 concurrence, NMFS determined that the smalltooth sawfish may be affected, but is not likely to be adversely affected by the proposed action. The project area is not a known nursery or foraging area for smalltooth sawfish, and it does not support the type of habitat favored by juvenile sawfish. While adults may move through or forage in the project area, NMFS determined that the project would not impact the sawfish from critical habitat loss or entrainment. The risk of injury was presumed to be discountable due to the species' mobility and implementation of NMFS' Smalltooth Sawfish Construction Conditions. In order to protect this species, the USACE proposes to implement the smalltooth sawfish construction conditions, which include the following:

- The Contractor shall instruct all personnel associated with the project of the potential presence of this species and the need to avoid collisions with smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of sawfish.

- The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing smalltooth sawfish, which are protected under the Endangered Species Act.

- Siltation barriers shall be made of material in which a smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment.

- All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

- If a smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

- Any collision with and/or injury to a smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

5 ALTERNATIVE TO THE PROPOSED ACTION

The MMS considered the following as an alternative to the proposed action:

Do Not Authorize Use of OCS Sands: Under this alternative, the USACE and Brevard County would not be authorize to access offshore sands in the CSII borrow area. The project proponents could either:

(a) Re-evaluate the project to choose another alternative method or sand source to restore the South Reach, or
(b) locate an onshore source of comparable high-quality sand.

Option A would not minimize overall environmental effects because of the need to protect the shoreline associated with the Brevard County project by either constructing new or augmenting existing protection mechanisms for the beaches. Option is B is not considered to be viable as sources of approved onshore sand are limited. Plus, even if a sufficient amount of high-quality sand is located onshore, Option B is likely to result in increased environmental disruption/effect from the onshore excavation of and overland transport.

6 CONSULTATION AND COORDINATION

List of agencies and persons consulted:
National Marine Fisheries Service, Southeast Regional Office
U.S. Fish and Wildlife Service, North Florida Ecological Services Office
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8 PROPOSED MITIGATION MEASURES

The following mitigation measures are proposed to avoid, reduce, or eliminate environmental impacts associated with the proposed action (herein referred to as the "Project"). Mitigation measures in the form of terms and conditions are added to the negotiated agreement and are shall be considered enforceable as part of the agreement. Application of terms and conditions will be individually considered by the Director or Associate Director of the MMS. Minor modifications to the proposed mitigation measures may be made during the noncompetitive negotiated agreement process if comments indicate changes are necessary or if conditions warrant.

Plans and Performance Requirements

The USACE will provide the MMS with a copy of the Project's "Construction Solicitation and Specifications Plan" (herein referred to as the "Plan"). No activity or operation authorized by the negotiated agreement (herein referred to as the Memorandum of Agreement or MOA) at the CSII Borrow Area shall be carried out until the MMS has had an opportunity to review and comment on the Plan, thus ensuring that each activity or operation is conducted in a manner that is in compliance with the provisions and requirements of the MOA. The USACE will ensure that all operations at the CSII Borrow Area are conducted in accordance with the final approved Plan and all terms and conditions in this MOA, as well as all applicable regulations, orders, guidelines, and directives specified or referenced herein.

The preferred method of obtaining and conveying sediment from the CSII Borrow Area involves the use of a hopper dredge. The USACE will allow MMS to review and comment on any modifications to the Plan, including the use of a cutterhead dredge, or submerged or floated pipelines to convey sediment, that may affect the project area, before implementation of the modification. Said comments shall be delivered in a timely fashion in order to not delay the Corps' construction contract.

The USACE, at the reasonable request of the MMS, shall allow access, at the site of any operation subject to safety regulations, to any authorized Federal inspector and shall provide the MMS any documents and records that are pertinent to occupational or public health, safety, or environmental protection as may be requested.

Notification of Activity in or near the Borrow Area

The USACE will notify the MMS at dredgeinfo@mms.gov of the commencement and termination of operations at the CSII Borrow Area within 24 hours after the USACE receives such notification from its contractor(s) for the Project. The MMS will notify the USACE in a timely manner of any OCS activity within the jurisdiction of the DOI that may adversely affect the USACE's ability to use OCS sand for the Project.

Environmental Responsibilities and Environmental Compliance

The USACE is the lead agency on behalf of the Federal government to ensure the Project complies with applicable environmental laws.

The USACE will serve as the lead federal agency for Endangered Species Act (ESA) Section 7 compliance concerning protected species under the purview of U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS). The USACE will instruct its contractor to implement the mitigation terms, conditions, and measures required by the FWS, NMFS, and MMS pursuant to applicable federal laws and regulations. The required mitigation terms, conditions, and measures are reflected in the attached Biological Opinions, Conservation Recommendations, and Consistency Determination.

Dredge Positioning

During all phases of the Project, the USACE will ensure that the dredge and any bottom-disturbing equipment is outfitted with an onboard global positioning system (GPS) capable of maintaining and recording location within an accuracy range of no more than plus or minus 3 meters. The GPS must be installed as close to the cutterhead or draghead as practicable.

During dredging operations, the USACE will immediately notify the MMS at dredgeinfo@mms.gov if dredging occurs outside of the approved borrow area. Anchoring, spudding, or other bottom disturbing activity is to be avoided outside the authorized borrow area.

Local Notice to Mariners

The USACE shall require its contractor(s) for the Project to place a notice in the U.S. Coast Guard Local Notice to Mariners regarding the timeframe and location of dredging and construction operations in advance of commencement of dredging.

Marine Pollution Control and Contingency Plan

The USACE will require its contractors and subcontractors to prepare for and take all necessary precautions to prevent discharges of oil and releases of waste and hazardous materials that may impair water quality. In the event of an occurrence, notification and response will be in accordance with applicable requirements of 40 C.F.R. 300. All dredging and support operations shall be compliant with U.S. Coast Guard regulations and the Environmental Protection Agency's Vessel General Permit, as applicable. The USACE will notify the MMS of any occurrences and remedial actions and provide copies of reports of the incident and resultant actions at dredgeinfo@mms.gov.

Encounter of Ordinance

If any ordinance is encountered while conducting dredging activities at the CSII Borrow Area, the USACE will report the discovery within 24 hours to Ms. Renee Orr, Chief, MMS Leasing Division, at (703) 787-1215 and dredgeinfo@mms.gov.

Cultural Resources

Onshore Prehistoric or Historic Resources

If the USACE discovers any previously unknown historic or archeological remains while accomplishing activity in Brevard County, FL authorized by Section 101(b)(7) of the Water Resources Development Act of 1996, Public Law 104-303, the USACE must immediately notify the MMS of any finding. The USACE will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

Offshore Historic Resources

An archaeological survey was conducted in 2001 and was reported "Archaeological Diver Identification and Evaluation of Fourteen Potentially Significant Submerged Targets for the Brevard County Shore Protection Project" (DHR file No. 2001-316). Eight anomalies, from a 1999 survey, were identified as debris from the space program and potentially significant, and avoidance was recommended. The eight anomalies shall be avoided during dredging operations by at least 200 feet, as described in the table below.

Table: Archaeological avoidance areas

Target	Area/Block	Amplitude (gammas)	Duration (ft)	FL East State Plane Coord. NAD 1927 (X /Y Coordinate)	Avoidance Radius (ft)
C2-01	Canaveral Shoals II	422	120	667682/1487363	200
C2-02	Canaveral Shoals II	330	85	670907/1485875	200
C2-08	Canaveral Shoals II	147	140	675523/1482444	200
C2-12	Canaveral Shoals II	51	125	679892/1482496	200
C2-13	Canaveral Shoals II	36	110	681022/1480316	200
C2-14	Canaveral Shoals II	61	165	681364/1480843	200
C2-16	Canaveral Shoals II	52	100	676571/1481617	200
C2-17	Canaveral Shoals II	65	75	670297/1486107	200

If the USACE determines that the anomalies listed in Table 2 cannot be avoided during dredging operations, the USACE shall notify the MMS. The USACE, subject to the availability of appropriations and in accordance with the requirements of applicable law, may conduct further investigations to assess the significance of the objects producing the signatures in accordance

with the criteria at 36 CFR section 60.4, "Criteria for evaluation."

The proposed investigation procedures shall be discussed with the MMS archaeologist prior to commencing fieldwork. At a minimum, this assessment must include an analysis of the age, physical composition, and structural integrity of the object (*i.e.*, wood or metal, intact or dispersed). Measured drawings and/or underwater video or still photographs of the feature shall be made for documentation and submitted with the final "Report of Findings." A "Report of Findings" prepared in accordance with the archaeological report writing standards specified in the MMS Notice To Lessees (NTL) 2005-G07 must be submitted to the MMS for approval within ten work days of the completion of fieldwork.

Offshore Chance Finds Clause

In the event that the dredge operators, discover any archaeological resource while conducting dredging operations in the CSII Borrow Area, the USACE shall require that dredge operations will be halted immediately within the borrow area. The USACE shall then immediately report the discovery to Ms. Renee Orr, Chief, MMS Leasing Division, at (703) 787-1215. If investigations determine that the resource is significant, the parties shall together determine how best to protect it.

Bathymetric Surveys

The USACE and the County will provide the MMS with pre- and post-dredging bathymetric surveys of the CSII Borrow Area. The pre-dredging survey will be conducted within 30 days prior to dredging. The post-dredging survey will be conducted within 30 days after the completion of dredging. Additional bathymetry surveys are recommended at 1 year and 3 years following the completion of dredging. Hydrographic surveys will be performed in accordance with the U.S. Army Corps of Engineers Hydrographic Surveying Manual EM 1110-2-1003 unless specified otherwise. Survey lines of the specific dredge area, within the CSII Borrow Area, will be established at no greater than 50 m intervals perpendicular to a baseline. Three equidistant cross-tie lines will be established parallel to the same baseline. Survey lines will extend at least 50 m beyond the edge of the dredge areas. All data shall be collected in such a manner that post-dredging bathymetry surveys are compatible with the pre-dredging bathymetric survey data to enable the latter to be subtracted from the former to calculate the volume of sand removed, the shape of the excavation, and nature of post-dredging bathymetric change.

Copies of pre-dredging and post-dredging hydrographic data will be submitted to MMS within thirty (30) days after each survey is completed. The delivery format for data submission is an ASCII file containing x,y,z data. The horizontal data will be provided in the North American Datum of 1983 (NAD '83) Florida State Plane East Zone, U.S. survey feet. Vertical data will be tidally corrected and provided in the North American Vertical Datum of 1988 (NAVD '88), U.S. survey feet. An 8.5x11" plan view plot of the pre- and post-construction data will be provided showing the individual survey points, as well as contour lines at appropriate elevation intervals. These plots will be provided in PDF format. All data will be submitted to dredgeinfo@mms.gov within 30 days of completion.

Submittal of Production and Volume Information

The USACE, in cooperation with the dredge operator, shall submit to the MMS and the County on a biweekly basis a summary of the dredge head track lines, outlining any deviations from the original Plan. A color-coded plot of the cutterhead or drag arms will be submitted, showing any horizontal or vertical dredge violations. This map will be provided in PDF format. The USACE will provide a biweekly update of the construction progress including estimated volumetric production rates to MMS. The biweekly deliverables will be provided electronically to dredgeinfo@mms.gov. The project completion report, as described in paragraph 13 below, will also include production and volume information.

Project Completion Report

A project completion report will be submitted by Brevard County to MMS within 90 days following completion of the activities authorized under this MOA. This report and supporting materials should be sent to Ms. Renee Orr, Chief, MMS Leasing Division, 381 Elden Street, MS 4010, Herndon, Virginia 20170 and dredgeinfo@mms.gov. The report shall contain, at a minimum, the following information:

- the names and titles of the project managers overseeing the effort (for USACE, the engineering firm (if applicable), and the contractor), including contact information (phone numbers, mailing addresses, and email addresses);
- the location and description of the project, including the final total volume of material extracted from the borrow area and the volume of material actually placed on the beach or shoreline (including a description of the volume calculation method used to determine these volumes);
- ASCII files containing the x,y,z and time stamp of the cutterhead or drag arm locations;
- a narrative describing the final, as-built features, boundaries, and acreage, including the restored beach width and length;
- a table, an example of which is illustrated below, showing the various key project cost elements;

	Project Cost Estimate ($)	Cost Incurred as of Construction Completion ($)
Construction		
Engineering and Design		
Inspections/Contract Administration		
Total		

- a table, an example of which is illustrated below, showing the various items of work construction, final quantities, and monetary amounts;

Item No.	Item	Estimated Quantity	Unit	Unit Price	Estimated Amount	Final Quantity	Bid Unit Price	Final Amount	% Over/ Under
1	Mobilization and Demobilization								
2	Beach Fill								
3	Any beach or offshore hard structure placed or removed								

- a listing of construction and construction oversight information, including the prime and subcontractors, contract costs, etc.;
- a list of all major equipment used to construct the project;
- a narrative discussing the construction sequences and activities, and, if applicable, any problems encountered and solutions;
- a list and description of any construction change orders issued, if applicable;
- a list and description of any safety-related issues or accidents reported during the life of the project;
- a narrative and any appropriate tables describing any environmental surveys or efforts associated with the project and costs associated with these surveys or efforts;
- a table listing significant construction dates beginning with bid opening and ending with final acceptance of the project by the USACE;
  digital appendices containing the as-built drawings, beach-fill cross-sections, and survey data; and any additional pertinent comments.

9 APPENDICES

Appendix A. Army Corps of Engineers Environmental Impact Statement (1996)

Appendix B. Army Corps of Engineers Environmental Assessment (1998)

Appendix C. Minerals Management Service Environmental Assessment (2005)

Appendix D. Florida Dept. of Environmental Protection Consistency Certification (2001)

Appendix E. National Marine Fisheries Service (NMFS) Concurrence (2009)

Appendix F. U.S. Fish and Wildlife Service Biological Opinion (2009)

Appendix G. NMFS Essential Fish Habitat Conservation Recommendations (2005)

Appendix H. Florida State Historic Preservation Officer Coordination (2001)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

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JUL 30 2009

F/SER31:AL

Mr. Eric P. Summa
Planning Division, Environmental Branch
Jacksonville District Corps of Engineers
Department of the Army
P.O. Box 4970
Jacksonville, FL 32232-0019

Mr. James Bennett
Minerals Management Service
381 Elden Street
Mail Stop 4042
Herndon, VA 20170

Re: Brevard County (South Reach) Shore Protection Project

Dear Mr. Summa and Mr. Bennett:

This letter responds to your May 14, 2009, letter and biological assessment (BA) regarding the referenced project. Your letter indicated that the Corps of Engineers (COE), as the lead federal action agency, requested informal consultation with the National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act (ESA). The COE is proposing to hopper dredge up to 1,300,000 cubic yards of sand from Canaveral Shoals I or II (borrow areas) and place it on 3.8 miles of shoreline, known as South Reach. Your letter stated that the Minerals Management Servie (MMS) agreed to be a cooperating agency on this project. The MMS has jurisdiction over borrow areas located in federal waters. As such, the COE will need a lease from the MMS if sand is to be dredged from a borrow area located in federal waters. NMFS requested additional information via e-mail on July 14 and 16, 2009, and you responded on the same dates. You determined that the proposed activity may affect sea turtles, North Atlantic right whales, and humpback whales, and may affect but is not likely to adversely affect smalltooth sawfish. NMFS' determinations regarding the effects of the proposed action are based on the description of the action in this informal consultation. You are reminded that any changes to the proposed action may negate the findings of the present consultation and may require reinitiation of consultation with NMFS.

The project is located along 3.8 miles of shoreline (known as South Reach) in the vicinity of Melbourne Beach and Indialantic in Brevard County, Florida. The sand will be obtained using a hopper dredge from one of two potential borrow areas, Canaveral Shoals I or II, located approximately 2-3 miles and 5 miles, respectively, from Cape Canaveral Air Force Station.

Initial construction of the South Reach segment of the Brevard County Shore Protection Project was completed in 2002 and 2003 and involved the placement of approximately 1,600,000 cubic yards of sand on the beach. Due to storm damage and erosion during the 2004 hurricane season, a subsequent renourishment was completed in 2005. Sand for both of these renourishments was obtained from the Canaveral Shoals II borrow area. According to the BA, since 2005, storm activity has severely eroded the South Reach segment. The COE and Brevard County (local sponsor) propose to renourish the South Reach segment by placing approximately 1,300,000 cubic yards of sand on the beach. The project would be constructed with one or more hopper dredges. According to the BA, the dredged sand may be pumped directly from the barge to the beach or it may be temporarily placed in a previously permitted rehandling area. If a rehandling area is used, the material would be dredged from the rehandling area and pumped onto the beach via cutterhead dredge. The permitted rehandling area is located along the project beach fill area between 2,600 and 5,050 feet from shore. According to the COE, no hardbottom impacts are proposed for this project. In-water construction is expected to take no more than 166 days to complete. The following conservation measures will be required to avoid or minimize potential interactions with protected species:

1) The COE will place material on the beach between November 1 and April 30 to avoid the majority of sea turtle nesting activities (U.S. Fish and Wildlife Service's Biological Opinion for the South Reach beach renourishment project, dated June 18, 2009).

2) The COE will require the contractor(s) to follow the Terms and Conditions in NMFS' 1997 Regional Biological Opinion (RBO) on Hopper Dredging along the South Atlantic Coast. The 1997 RBO incorporates (by reference) NMFS' 1995 Biological Opinion on hopper dredging of channels and beach nourishment activities in the southeastern United States from North Carolina through Florida East Coast. The contractor(s) will be required to follow the Terms and Conditions in the 1997 and 1995 Biological Opinions mentioned above. As per Term and Condition #7 in NMFS' 1995 Biological Opinion, the COE is required to participate in the Right Whale Early Warning System (EWS). In accordance with Term and Condition #7, the COE participates as a member of the EWS network for right whales. The purpose of this network is to assure that right whales are afforded every level of protection while in the southeast United States' calving area[1]. Term and Condition #7 further requires the COE to follow the protocol established within the EWS for dredging projects that occur in the right whale calving area from December through March. During the calving season, aerial survey teams fly over the waters of Florida and Georgia to locate right whales. There are also land-based volunteers that look for right whales from the beach. Any information provided by observers is reported to the EWS network. The network disseminates right whale location information to mariners in the waters of Florida and Georgia within half an hour of a right whale sighting via the typical marine communication network and a right whale pager network (http://research.myfwc.com/features/view_article.asp?id=7239). As per the COE's

[1] In the southeastern United States, this calving area is located in coastal waters between 31 degrees 15 seconds N (approximately located at the mouth of the Altamaha River in Georgia) and 30 degrees 15 seconds N (approximately Jacksonville, Florida) from the shoreline east to 15 nm offshore; and the waters between 30 degrees 15 seconds N and 28 degrees 00 seconds N (approximately Sebastian Inlet, Florida) from the shoreline out to 5 nm.

contract for this project, right whale sightings will be communicated by marine radio to the dredging contractor's dredge. If a right whale or any other species of whale is reported within the area, then the contractor will be required to follow the enclosed NMFS' Southeast Region Vessel Strike Avoidance Measures and Reporting for Mariners (revised February 2008). By law, vessels shall maintain a 500-yard buffer between the vessel and any North Atlantic right whale [as required by federal regulation 50 CFR 224.103 (c)].

3) As per Term and Condition #8 in NMFS' 1995 Biological Opinion, the COE will require the following: During the period December through March, barges or dredges moving through the North Atlantic right whale (Eubalaena glacilis) calving area shall take the following precautions: During evening hours or when there is limited visibility due to fog or sea states greater than Beaufort 3, the tug/barge or dredge operator shall slow down to 5 knots or less when traversing between areas if whales have been spotted within 15 nautical miles (nm) of the vessel's path within the previous 24 hours.

4) The COE will require the contractor(s) to follow the enclosed NMFS' March 23, 2006, Sea Turtle and Smalltooth Sawfish Construction Conditions.

Five species of sea turtles (loggerhead, green, hawksbill, Kemp's ridley, and leatherback), the North Atlantic right whale, humpback whale, and smalltooth sawfish, protected by the ESA, can be found in or near the action area and may be affected by the project. The project site is located within a known calving area for the North Atlantic right whale.

The BA states that a hopper dredge(s) is proposed and a cutterhead dredge may be used. NMFS biological opinions (referenced above) on COE dredging have previously and consistently found that cutterhead dredges are not likely to adversely affect listed species under our purview. NMFS has no new information that would change the basis of that conclusion. However, NMFS has determined that hopper dredges may adversely affect loggerhead, green, Kemp's ridley, and hawksbill sea turtles and may also adversely affect North Atlantic right whales and humpback whales. NMFS also determined that hopper dredges are not likely to adversely affect leatherback sea turtles. With implementation of the conservation measures described above, including the Terms and Conditions (7 and 8) in NMFS' 1995 Biological Opinion on hopper dredging in the southeast, we believe that the risk of injury to endangered whales is discountable. Any incidental take of loggerhead, green, Kemp's ridley, or hawksbill sea turtles due to hopper dredging has been previously authorized in NMFS' 1997 RBO on Hopper Dredging along the South Atlantic Coast. The 1997 RBO authorized annual incidental take, by injury or mortality, of 35 loggerheads, 7 Kemp's ridleys, 7 green turtles, and 2 hawksbills. For fiscal year 2009, the COE has reported 6 incidental sea turtle takes by hopper dredge in the South Atlantic Division. Five of the reported takes were loggerhead turtles and 1 reported take was a green turtle (http://el.erdc.usace.army.mil/seaturtles/info.cfm?Type=Division&Code=SAD).

Smalltooth sawfish were listed subsequent to the 1997 RBO. NMFS concurs that smalltooth sawfish are not likely to be adversely affected by the proposed project. Effects on smalltooth sawfish include the risk of injury from construction activities. Due to the species' mobility and the implementation of NMFS' Sea Turtle and Smalltooth Sawfish Construction Conditions, the

risk of injury will be discountable. If smalltooth sawfish are in the area, they are likely to be adults. Smalltooth sawfish may be associated with a number of habitats.[2] Juveniles (<1m) are often closely associated with mangroves and shallow, euryhaline waters close to shore, while adults have been observed in various habitats and water depths. The project area is not a known nursery or foraging area for smalltooth sawfish. Further, the project area does not support the type of habitat (i.e., mangroves and shallow, euryhaline waters close to shore) that is favored by juvenile sawfish. While adults may move through the area or forage there, NMFS does not believe that this project would have any effect on sawfish from habitat loss.

This concludes your consultation responsibilities under the ESA for species under NMFS' purview. Consultation must be reinitiated if a take occurs or new information reveals effects of the action not previously considered, or the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action.

We have enclosed additional information on other statutory requirements that may apply to this action, and on NMFS' Public Consultation Tracking System to allow you to track the status of ESA consultations. If you have any questions, please contact Audra Livergood at (954) 356-7100 or by e-mail at Audra.Livergood@noaa.gov. Thank you for your continued cooperation in the conservation of listed species.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosures (3)

File: 1514-22.F.1.FL
Ref: I/SER/2009/02797

O:\SECTION7\INFORMAL\Defense\Army\COE\COE-JAX\2009\Dredge-nourish\02797 South Reach_Brevard County (GC).doc

[2] Simpendorfer, C.A. 2006. Movement and habitat use of smalltooth sawfish. Final Report to the National Marine Fisheries Service, Grant number WC133F-04-SE-1543. Mote Marine Laboratory Technical Report 1070.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
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SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

The permittee shall comply with the following protected species construction conditions:

a. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles and smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of these species.

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.

c. Siltation barriers shall be made of material in which a sea turtle or smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers may not block sea turtle or smalltooth sawfish entry to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.

d. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

e. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

f. Any collision with and/or injury to a sea turtle or smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

g. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Revised: March 23, 2006

Vessel Strike Avoidance Measures and Reporting for Mariners NOAA Fisheries Service, Southeast Region

Background

The National Marine Fisheries Service (NMFS) has determined that collisions with vessels can injure or kill protected species (e.g., endangered and threatened species, and marine mammals). The following standard measures should be implemented to reduce the risk associated with vessel strikes or disturbance of these protected species to discountable levels. NMFS should be contacted to identify any additional conservation and recovery issues of concern, and to assist in the development of measures that may be necessary.

Protected Species Identification Training

Vessel crews should use an Atlantic and Gulf of Mexico reference guide that helps identify protected species that might be encountered in U.S. waters of the Atlantic Ocean, including the Caribbean Sea, and Gulf of Mexico. Additional training should be provided regarding information and resources available regarding federal laws and regulations for protected species, ship strike information, critical habitat, migratory routes and seasonal abundance, and recent sightings of protected species.

Vessel Strike Avoidance

In order to avoid causing injury or death to marine mammals and sea turtles the following measures should be taken when consistent with safe navigation:

1. Vessel operators and crews shall maintain a vigilant watch for marine mammals and sea turtles to avoid striking sighted protected species.

2. When whales are sighted, maintain a distance of 100 yards or greater between the whale and the vessel.

3. When sea turtles or small cetaceans are sighted, attempt to maintain a distance of 50 yards or greater between the animal and the vessel whenever possible.

4. When small cetaceans are sighted while a vessel is underway (e.g., bow-riding), attempt to remain parallel to the animal's course. Avoid excessive speed or abrupt changes in direction until the cetacean has left the area.

5. Reduce vessel speed to 10 knots or less when mother/calf pairs, groups, or large assemblages of cetaceans are observed near an underway vessel, when safety permits. A single cetacean at the surface may indicate the presence of submerged animals in the vicinity; therefore, prudent precautionary measures should always be exercised. The vessel shall attempt to route around the animals, maintaining a minimum distance of 100 yards whenever possible.

APPENDIX B

Consultation with U.S. National Marine Fisheries Service, Protected Resources Division, Biological Opinion, PAFB Shoreline Restoration Project, FL

UNITED STATES DEPARTMENT OF COMMERCE
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F/SER31:AL

APR 30 2010

Mr. Patrick Giniewski, DAFC
U.S. Air Force
45 CES/CEA
1224 Jupiter Street, MS 9125
Patrick AFB, FL 32925-3343

Mr. Geoffrey Wikel
Minerals Management Service
381 Elden Street
Mail Stop 4042
Herndon, VA 20170

Ms. Irene Sadowski
Jacksonville District Corps of Engineers
Cocoa Regulatory Office
400 High Point Drive, Suite 600
Cocoa, FL 32926

Re: Beach Renourishment Project at Patrick Air Force Base, Florida

Dear Mr. Giniewski, Mr. Wikel, and Ms. Sadowski:

This constitutes the National Marine Fisheries Service's (NMFS) biological opinion based on our review of the U.S. Air Force's proposed action to place between 310,000 and 350,000 cubic yards of sand along the shoreline at Patrick Air Force Base, located in Brevard County, Florida. The purpose of this project is to renourish approximately 11,480 linear feet of shoreline. The material will be excavated from the Canaveral Shoals borrow areas using a hopper dredge. Because hopper dredging is known to have the potential to kill ESA-listed species of sea turtles, formal consultation was required. The biological opinion analyzes the project's effects on green (*Chelonia mydas)*, loggerhead (*Caretta caretta),* and Kemp's ridley (*Lepidochelys kempii)* sea turtles, in accordance with section 7 of the Endangered Species Act (ESA) of 1973, and is based on information provided in your request for section 7 consultation, biological assessment dated May 2009; and subsequent information provided in phone and e-mail correspondence. Formal consultation was initiated on October 16, 2009. On February 24, 2010, NMFS requested a 60-day extension to complete our biological opinion; the Air Force responded affirmatively to our request on March 8, 2010.

The Air Force has informed NMFS that the Minerals Management Service is a cooperating agency on the project. In addition, we understand that the Air Force has applied for a permit from the U.S. Army Corps of Engineers to conduct the work.

It is NMFS' biological opinion that the action, as proposed, is likely to adversely affect loggerhead, green, and Kemp's ridley sea turtles, but is not likely to jeopardize their continued existence. This concludes your consultation responsibilities under the ESA for species under NMFS' purview. Consultation must be reinitiated if a take occurs or new information reveals effects of the action not previously considered, or the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action.

We look forward to further cooperation with you on other Air Force projects to ensure the conservation and recovery of our threatened and endangered marine species. If you have any questions regarding this consultation, please contact Audra Livergood, fishery biologist, at (954) 356-7100, or by e-mail at Audra.Livergood@noaa.gov.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosures

File: 1514-22.S
Ref: F/SER/2009/03376

Endangered Species Act – Section 7 Consultation
Biological Opinion

Action Agencies: United States Air Force, Patrick Air Force Base (PAFB), lead agency; Minerals Management Service (MMS), cooperating agency; and U.S. Army Corps of Engineers (COE), Jacksonville District

Activity: Dredging and beach renourishment located in Brevard County, Florida (Consultation Number F/SER/2009/03376)

Consulting Agency: National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida

Approved By:

Roy E. Crabtree, Ph.D., Regional Administrator
NMFS, Southeast Regional Office
St. Petersburg, Florida

Date Issued: 4/30/10

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Background

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*), requires that each federal agency shall ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species; section 7(a)(2) requires federal agencies to consult with the appropriate Secretary on any such action. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) share responsibilities for administering the ESA.

Consultation is required when a federal action agency determines that a proposed action "may affect" listed species or designated critical habitat. Consultation is concluded after NMFS determines that the action is not likely to adversely affect listed species or critical habitat or issues a biological opinion (opinion) that identifies whether a proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify critical habitat. The opinion states the amount or extent of incidental take of the listed species that may occur, develops measures (i.e., reasonable and prudent measures - RPMs) to reduce the effect of take, and recommends conservation measures to further conserve the species. Notably, no incidental destruction or adverse modification of critical habitat can be authorized, and thus there are no reasonable and prudent measures, only reasonable and prudent alternatives that must avoid destruction or adverse modification.

This document represents NMFS' biological opinion for species listed under the ESA, as well as our conference opinion for the Northwest Atlantic Distinct Population Segment (DPS) of loggerhead sea turtles, which is proposed for listing under the ESA, based on our review of impacts associated with the U.S. Air Force's proposed dredging and beach renourishment project. Conference is only required where the proposed action "is likely to jeopardize" the proposed species. However, we are already consulting formally on the action and its effects on loggerhead sea turtles; therefore, we will also specifically evaluate its effects on the proposed Northwest Atlantic DPS. This opinion analyzes project effects on loggerhead, Kemp's ridley, leatherback, hawksbill, and green sea turtles, and smalltooth sawfish, in accordance with section 7 of the ESA, and is based on project information provided by the Air Force. Information was also obtained from other sources, including the Army Corps of Engineers (COE), the Florida Fish and Wildlife Conservation Commission (FWC), and published and unpublished literature cited herein.

BIOLOGICAL OPINION

1.0 CONSULTATION HISTORY

NMFS received an undated consultation request and biological assessment (BA) (dated May 2009) from the Air Force on June 8, 2009. The Air Force determined that the proposed activity is likely to adversely affect loggerhead and green sea turtles. However, their determination is that the proposed activity is not likely to adversely affect North Atlantic right and humpback whales, leatherback and hawksbill sea turtles, and smalltooth sawfish. The proposed activity entails dredging, dune repair, and beach renourishment. Multiple requests for additional information (RAI) were sent by NMFS to the Air Force. The RAIs and subsequent responses from the Air Force are dated as follows: RAI No. 1: August 18, 2009, responses received August 18 and 20, 2009; RAI No. 2: August 20, 2009, responses received on August 20, 24, and 27, 2009; RAI No. 3: October 1, 2009, response received on October 9, 2009; and RAI No. 4: October 13, 2009, response received on October 16, 2009. On August 18, 2009, we informed the Air Force that formal consultation would be required. Formal consultation was initiated on October 16, 2009. Subsequent to initiation of formal consultation, NMFS requested additional information to clarify whether nearshore hardbottom would be impacted by the proposed action. Additional information was requested on February 19, February 24, and March 4, 2010. The Air Force responded on February 22, March 2, March 3, and March 5, 2010. By letter dated February 24, 2010, NMFS requested a 60-day extension to complete our biological opinion. The Air Force granted our extension request via letter dated March 8, 2010. On April 21, 2010, NMFS sent a request for additional information via e-mail and the Air Force responded on the same date.

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 Proposed Action

The Air Force proposes to renourish 11,480 linear feet of shoreline and repair the South Beach dune profile that has eroded due to storm/high tide activity since the 2005 beach renourishment. The proposed work entails mechanical placement (truck hauling) of material to repair the dune, and offshore dredging of material for the beach renourishment component. The project is located at 28.25°N, 80.60°W (NAD 83) in Brevard County, Florida, between Florida Department of Environmental Protection (DEP) reference monuments R-53 and R-75.4.

The Air Force proposes to place approximately 80,000 cubic yards of sand for the dune repair component of the project. This sand would be obtained from an upland site (the upland Cape Canaveral Air Force Station Sand Borrow Area). Between DEP reference monuments R-70 and R-75.4, above the mean high water line, only dune repair will occur. In addition, the Air Force proposes to use a hopper dredge to excavate approximately 310,000-350,000 cubic yards of material from the Canaveral Shoals offshore borrow areas I and/or II, located approximately 12 miles north of Patrick Air Force Base (PAFB) and about 2-5 miles offshore. Water depths at borrow areas I and II range from -8 to -17 feet and -10 to -46 feet, respectively. The proposed action includes dredging the material, hydraulically pumping it onto PAFB North Beach, and mechanically distributing the material per profiling specifications from R-53 to R-65. A stockpile

area will be developed between DEP reference monuments R-61 and R-65 to allow truck hauling of sand south of R-65 for beach restoration along the PAFB Central and South Beaches (Air Force Biological Assessment, May 2009).

The Air Force's BA stated that the proposed action would not adversely affect nearshore hardbottom, which is important developmental habitat for juvenile green sea turtles (*Chelonia mydas)*. The Air Force's determination is based on the monitoring results from the previous two renourishments in 2005 and 2000, which were provided to NMFS. The Air Force's consultant, Olsen Associates, Inc., has been conducting annual monitoring of the amount of exposed nearshore hardbottom in the project area to determine if this hardbottom has been affected by sedimentation (i.e., burial) from the previous two renourishments. Based on the results of the monitoring, the amount of exposed hardbottom in the most recent (July 2009) survey is the greatest observed since quantitative data have been available (beginning in 2001 and 2004). By transect line measure, there was 55 percent more exposed hardbottom in 2009 than in both 2001 and 2004. Likewise, there was 30 percent more exposed hardbottom in 2008 than in both 2001 and 2004. In each year since renourishment in 2005, the total amount of exposed hardbottom has been greater than in the baseline (2004) conditions – with the exception of 2006, during which large sand bars were migrating ashore, across the rock terrace, along most of Brevard County. Even in 2006, the amount of exposed hardbottom increased or remained the same nearest the fill from the 2005 project (i.e., at DEP reference monuments R-70 to R-73), where one would expect hardbottom exposure to decrease the most if there was significant alongshore diffusion of sand from the prior beach renourishment activity (March 4, 2010, memorandum from Dr. Kevin Bodge, Olsen Associates, Inc.). The results of the monitoring suggest there has not been a quantifiable effect on the amount of exposed hardbottom due to the two most recent renourishments (in 2005 and 2000). This may be due to the small amount of fill that was placed and the project design, which aims to minimize the amount of fill placed below mean high water in areas where hardbottom is known to occur. Nearshore hardbottom is patchily distributed from DEP reference monuments R-65 to R-70 and becomes more frequent from DEP reference monuments R-70 to R-75.4 and south of the project area. Because nearshore hardbottom is present, the project template was designed as slope/profile repair above mean high water with limited fill placement (approximately 2,481 cubic yards) and grading between mean high water and mean low water, decreasing in extent from north to south between DEP reference monuments R-65 to R-70 (where hardbottom is patchily distributed). However, in the segment where nearshore hardbottom is more frequent (between DEP reference monuments R-70 to R-75.4), only dune restoration above the mean high water line is proposed in order to prevent/minimize impacts to nearshore hardbottom. As previously stated, the hardbottom monitoring reports submitted by the Air Force show that this nearshore hardbottom has not been affected by sedimentation from the past two beach renourishment events at PAFB (in 2005 and 2000), both of which used the same fill template that is proposed for this project and entailed dune restoration only (above the mean high water line) in the segment where nearshore hardbottom is more prevalent.

The Air Force has requested a biological opinion from NMFS to cover ten years and two renourishment cycles (one renourishment every five years although dependent on storm effect intensity). The proposed action would be the same as described above for each dredging/renourishment event, unless severe erosion occurs due to frequent or intense storm

activity, which may necessitate changes to the proposed action. Thus, changes in the proposed action that would result in more than two dredging/renourishment events over the next 10 years may require reinitiation of consultation.

The Air Force has proposed the following Conservation Measures to be included as part of the proposed action:

1) Construction will take place outside of the primary sea turtle nesting season and will be limited to November 1 through April 30. If the beach renourishment project is conducted between March 1 and April 30, surveys for early nesting sea turtles are required. If the beach renourishment project is conducted between November 1 and 30, surveys for late nesting sea turtles are required. If nests are found in the beach renourishment area, they must be relocated (USFWS biological opinion, June 2, 2009).

2) The Air Force will comply with NMFS' March 23, 2006, Sea Turtle and Smalltooth Sawfish Construction Conditions (enclosed).

3) The Air Force will comply with the Terms and Conditions in NMFS' September 25, 1997, regional biological opinion (RBO) on hopper dredging along the South Atlantic Coast of the United States (NMFS 1997). The 1997 RBO incorporates (by reference) NMFS' 1995 biological opinion on hopper dredging of channels and beach nourishment activities in the southeastern United States from North Carolina through Florida East Coast. The contractor(s) will be required to follow the Terms and Conditions in the 1997 and 1995 biological opinions mentioned above. As per Term and Condition #7 in NMFS' 1995 biological opinion, the Air Force will participate in the Right Whale Early Warning System (EWS). The purpose of this network is to assure that North Atlantic right whales undergoing their seasonal migrations southward are afforded every level of protection while in the southeast United States' calving area.[1] Term and Condition #7 requires the following protocol for dredging projects that occur in the right whale calving area from December through March: During the calving season, aerial survey teams fly over the waters of Florida and Georgia to locate right whales. There are also land-based volunteers who look for right whales from the beach. Any information provided by observers is reported to the EWS network. The network disseminates right whale location information to mariners in the waters of Florida and Georgia within half an hour of a right whale sighting via the typical marine communication network and a right whale pager network (http://research.myfwc.com/features/view_article.asp?id=7239). Dredge and barge operators will ensure that their radio equipment is on and set to receive any contacts from the EWS network, and if notified that a whale is in or near their area of operation they will take all practicable measures to avoid contact with the whale and ensure compliance with

[1] In the southeastern United States, this calving area is located in coastal waters between 31 degrees 15 seconds N (approximately located at the mouth of the Altamaha River in Georgia) and 30 degrees 15 seconds N (approximately Jacksonville, Florida) from the shoreline east to 15 nmi offshore; and the waters between 30 degrees 15 seconds N and 28 degrees 00 seconds N (approximately Sebastian Inlet, Florida) from the shoreline out to 5 nmi.

the right whale avoidance regulation requirements described in Conservation measure 5 below.

4) Dredge-related vessels working at the borrow site, and traveling to and from the borrow area and the beach fill area will travel at no greater than 10 knots during the North Atlantic right whale calving season (November 15 through April 15) and between 10 and 15 knots, depending on sea state, the rest of the year.

5) The Air Force will comply with NMFS' Vessel Strike Avoidance and Reporting Guidelines (revised February 2008) (enclosed). By law, vessels shall maintain a 500-yard buffer between the vessel and any North Atlantic right whale, and underway vessels within 500 yards of a right whale must steer a course away from the whale and immediately leave the area at a slow, safe speed [as required by federal regulation 50 CFR 224.103 (c)].

2.2 Action Area

The action area for a biological opinion is defined as all the areas affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for this activity includes 11,480 linear feet of shoreline (above and below mean high water) between DEP reference monuments R-53 and R-75 where the Air Force proposes to place sand for beach renourishment, the South Beach dune located between DEP reference monuments R-65 and R-75 above the mean high water line where the Air Force proposes to place sand for dune repair, the borrow areas (Canaveral Shoals I and II) located approximately 12 miles north of PAFB and about 2-5 miles offshore, and the ocean areas between the borrow areas and the placement areas.

3.0 STATUS OF LISTED SPECIES AND CRITICAL HABITAT

The following endangered (E) and threatened (T) species under the jurisdiction of NMFS may occur in or near the action area:

Common Name	Scientific Name	Status
Sea Turtles		
Loggerhead sea turtle	*Caretta caretta*[2]	E/T
Green sea turtle	*Chelonia mydas*[3]	E/T
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
Leatherback sea turtle	*Dermochelys coriacea*	E
Hawksbill sea turtle	*Eretmochelys imbricata*	E
Fish		
Smalltooth sawfish	*Pristis pectinata*	E

[2] NMFS and USFWS published a proposed rule in the Federal Register on March 16, 2010 to list nine Distinct Population Segments (DPSs) of loggerhead turtles worldwide, seven of which are endangered (including the Northwest Atlantic Ocean DPS) and two of which are threatened (75 FR 12598).

[3] Green turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered.

Marine Mammals

North Atlantic right whale	*Eubalaena glacilis*	E
Humpback whale	*Megaptera novaeangliae*	E

3.1 Species Not Likely to Be Adversely Affected

Smalltooth Sawfish

NMFS believes the project may affect, but is not likely to adversely affect, smalltooth sawfish. The current known range for smalltooth sawfish has contracted to the nearshore and offshore waters of Florida; smalltooth sawfish have also been observed in riverine systems. However, this species is relatively common only in the Everglades region of southwest Florida and the frequency of sightings are generally reduced as you go north along the Atlantic coast. Along the entire coast of Brevard County, there have been only seven reported smalltooth sawfish sightings between 1998-2008 (Mote Marine Lab sawfish database). Due to short-term elevated noise levels, NMFS believes that the likelihood of a sawfish being adversely affected by the project is discountable because smalltooth sawfish are likely to avoid the area during construction operations. Also, the Air Force will comply with NMFS' March 23, 2006, Sea Turtle and Smalltooth Sawfish Construction Conditions, which will further reduce the potential for interactions with smalltooth sawfish from the proposed project. For the dredging portion of the project, NMFS does not expect any adverse effects from the hopper dredge(s) used to excavate sand at the borrow areas or during dredging-related relocation trawling. The borrow areas are offshore and at the northern extreme of the county. Sawfish are very rare in the area, and no takes of sawfish by hopper dredges are known to have occurred. While sawfish can be taken by trawls, none have ever been taken by relocation trawling conducted for/during the extensive past use of those borrow areas, likely due to their rarity compared to other areas of the state in which they have been captured by trawls. In addition, the action area does not contain the essential features (i.e., red mangroves and shallow water depths less than 1 meter) for which sawfish in South Florida have a strong affinity. Based on the preceding, we believe that the likelihood of smalltooth sawfish being adversely affected by the proposed action is discountable. As a result, this species will not be discussed further in this opinion.

Marine Mammals

NMFS has analyzed the routes of potential effects on North Atlantic right whales and humpback whales from the proposed action and, based on our analysis, determined that potential effects are limited to the following: injury from potential interactions with construction (i.e., dredging) equipment (e.g., a dredge vessel striking a whale) and temporary avoidance of the area during construction (i.e., dredging/renourishment) operations.

The project is scheduled to be implemented during the annual right whale calving season, and dredge vessels will operate in and travel across the calving grounds. However, NMFS believes the proposed project may affect, but is not likely to adversely affect North Atlantic right whales and humpback whales. NMFS concludes that the project's construction effects are discountable. In addition, the contractors will be required to abide by the 10-knot speed restriction during North Atlantic right whale calving season and participate in the right whale Early Warning System

(discussed in Conservation Measures 4 and 3 above, respectively) and follow NMFS' Vessel Strike Avoidance and Reporting guidelines (discussed in Conservation Measure 5 above). With implementation of these Conservation Measures, NMFS believes that the likelihood of right whales and humpback whales being adversely affected by the proposed action is discountable. As a result, these species will not be discussed further in this opinion.

Sea Turtles

NMFS has analyzed the routes of potential effects on five species of sea turtles (loggerhead, Kemp's ridley, leatherback, hawksbill, and green) from the proposed action and, based on our analysis, determined that potential direct and indirect effects are limited to the following: injury or death from potential interactions with construction equipment, temporary avoidance of the area during construction operations, and loss of nearshore foraging and resting habitat. Responsibility for ESA consultation on the effects related to failure to nest (i.e., "false crawls") and/or loss of nests and nesting habitat are the purview of the U.S. Fish and Wildlife Service (USFWS) and will not be discussed in this biological opinion. The USFWS completed their biological opinion on June 2, 2009.

NMFS believes the proposed project may affect, but is not likely to adversely affect leatherback and hawksbill sea turtles, and is likely to adversely affect loggerhead, green, and Kemp's ridley sea turtles, as described below.

Because the Air Force will comply with NMFS' March 23, 2006, Sea Turtle and Smalltooth Sawfish Construction Conditions, we believe this will reduce the potential for interactions with sea turtles from the proposed project. However, the potential for injury and/or death exists because a hopper dredge has been proposed. The Air Force has agreed to follow the Terms and Conditions in NMFS' 1997 RBO (which incorporates the 1995 biological opinion's Terms and Conditions by reference) to reduce the potential for take, but even with implementation of the Terms and Conditions, the potential for take is not discountable. Based on the best available data from the COE (http://el.erdc.usace.army.mil/seaturtles/info.cfm?Type=District&Code=SAJ), we believe only loggerhead and Kemp's ridley sea turtles are likely to be adversely affected by hopper dredging in the action area. We believe leatherback and hawksbill sea turtles are not likely to be adversely affected.

Leatherback sea turtles tend to be pelagic (i.e., open ocean) foragers and are uncommon in shallow nearshore waters, except during nesting season. Based on the information provided in the Air Force's biological assessment, leatherbacks nest on the shoreline of Patrick Air Force Base in small numbers (3 nests were reported in 2007 and 2 nests were reported in 2008). However, because the proposed work would not occur during the majority of sea turtle nesting season (work is prohibited from May 1 – October 31), leatherbacks are unlikely to be found in the action area outside of nesting season, the Air Force is required to follow NMFS' March 23, 2006, Sea Turtle and Smalltooth Sawfish Construction Conditions, and NMFS' determined in the 1997 RBO that leatherback sea turtles are unlikely to be adversely affected by hopper dredging (we have not received any new information that would change the basis of this determination), NMFS believes that the likelihood of leatherback sea turtles in the marine environment being adversely affected by

the proposed project is discountable. As a result, this species will not be discussed further in this opinion.

Hawksbill sea turtles are also rare in the nearshore waters of Brevard County. Based on a review of various in-water studies conducted in southeast Florida, researchers have suggested that hawksbill sea turtles (as well as juvenile green sea turtles) utilize nearshore hardbottom habitat as nighttime resting areas. Wershoven and Wershoven (1988) captured 134 green turtles and 4 hawksbill turtles while diving on a 1.5-km stretch of reef in nearby Broward County. Lawrence Wood has surveyed reef habitats in Palm Beach County for the presence of hawksbill sea turtles. Wood reports that habitats in which hawksbill turtles have been observed can be characterized as "steep ledges with undercuts that include artificial reef wrecks, thick octocoral/a.k.a. gorgonian pastures, and sparse sandy patch reefs." Based on Wood's (2006, 2007) observations, most of the hawksbill turtles he has observed have been seen foraging on reef habitats (located waterward of nearshore hardbottom habitat) where prey items, such as sponges, are more abundant. These offshore reef habitat types are far less abundant off Brevard County and hawksbill turtles are not found as frequently as in waters to the south. NMFS analyzed FWC's stranding data in Brevard County for the years 2000-2005. During this period, only 5 of the 1165 total sea turtle strandings for Brevard County consisted of hawksbill turtles. As a result, the potential for impacts to hawksbill sea turtles is considered discountable and this species will not be discussed further in this opinion.

The remainder of this document will focus on the effects of the action on loggerhead, Kemp's ridley, and green sea turtles.

3.2 Status of Species Likely to be Affected

NMFS believes the proposed action is likely to adversely affect loggerhead, Kemp's ridley, and green sea turtles. The status of these species is discussed in the following sections.

3.2.1 Loggerhead Sea Turtle

The loggerhead sea turtle was listed as a threatened species throughout its global range on July 28, 1978. It was listed because of direct take, incidental capture in various fisheries, and the alteration and destruction of its habitat. Loggerhead sea turtles inhabit the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. The majority of loggerhead nesting occurs in the Western Atlantic Ocean (South Florida, United States), and the western Indian Ocean (Masirah, Oman); in both locations nesting assemblages have more than 10,000 females nesting each year (NMFS and USFWS 2008). Loggerhead sea turtles are the most abundant species of sea turtle in U.S. waters.

On March 16, 2010, NMFS and the USFWS published a proposed rule in the Federal Register to list nine Distinct Population Segments (DPSs) of loggerhead sea turtles as endangered or threatened under the ESA (75 FR 12598). This proposed rule represents NMFS' and USFWS' 12-month findings on petitions to list North Pacific populations and Northwest Atlantic populations as endangered and includes a proposed rule to designate nine DPSs worldwide. As per the proposed

rule, the Loggerhead Biological Review Team concluded, and NMFS concurred, that nine DPSs exist worldwide and are comprised of the following: 1) Northwest Atlantic Ocean (endangered), 2) Northeast Atlantic Ocean (endangered), 3) South Atlantic Ocean (threatened), 4) Mediterranean Sea (endangered), 5) North Pacific Ocean (endangered), 6) South Pacific Ocean (endangered), 7) North Indian Ocean (endangered), 8) Southeast Indo-Pacific Ocean (endangered), and 9) Southwest Indian Ocean (threatened). This opinion also represents NMFS' conference opinion for the Northwest Atlantic DPS of loggerhead sea turtles, which is proposed for listing under the ESA. Conference consultations are required if a proposed action is likely to jeopardize the continued existence of a species proposed to be listed, and are discretionary in other circumstances. If there is no intervening new information or change in circumstances, or change in the proposed action, a conference opinion can be adopted as the governing opinion if a rule proposing to list a species is finalized.

3.2.1.1 Pacific Ocean

In the Pacific Ocean, major loggerhead nesting grounds are generally located in temperate and subtropical regions with scattered nesting in the tropics. Within the Pacific Ocean, loggerhead sea turtles are represented by a northwestern Pacific nesting aggregation (located in Japan) and a smaller southwestern nesting aggregation that occurs in Eastern Australia (Great Barrier Reef and Queensland) and New Caledonia (NMFS SEFSC 2001). There are no reported loggerhead nesting sites in the eastern or central Pacific Ocean basin. Data from 1995 estimated the Japanese nesting aggregation at 1,000 female loggerhead sea turtles (Bolten et al. 1996). More recent information suggests that nest numbers have increased somewhat over the period 1998-2004 (NMFS and USFWS 2007). However, this time period is too short to make a determination of the overall trend in nesting (NMFS and USFWS 2007). Recent genetic analyses on female loggerheads nesting in Japan suggest that this "subpopulation" is comprised of genetically distinct nesting colonies (Hatase et al. 2002) with precise natal homing of individual females. As a result, Hatase et al. (2002) indicate that loss of one of these colonies would decrease the genetic diversity of Japanese loggerheads; recolonization of the site would not be expected on an ecological time scale. In Australia, long-term census data have been collected at some rookeries since the late 1960s and early 1970s, and nearly all the data show marked declines in nesting populations since the mid-1980s (Limpus and Limpus 2003). The nesting aggregation in Queensland, Australia, was as low as 300 females in 1997.

Pacific loggerhead turtles are captured, injured, or killed in numerous Pacific fisheries including Japanese longline fisheries in the Western Pacific Ocean and South China Seas; direct harvest and commercial fisheries off Baja California, Mexico; commercial and artisanal swordfish fisheries off Chile, Columbia, Ecuador, and Peru; purse seine fisheries for tuna in the eastern tropical Pacific Ocean; and California/Oregon drift gillnet fisheries. In Australia, where turtles are taken in bottom trawl and longline fisheries, efforts have been made to reduce fishery bycatch (NMFS and USFWS 2007).

In addition, the abundance of loggerhead sea turtles in nesting colonies throughout the Pacific basin has declined dramatically over the past 10 to 20 years. Loggerhead turtle colonies in the Western Pacific Ocean have been reduced to a fraction of their former abundance by the combined

effects of human activities that have reduced the number of nesting females and reduced the reproductive success of females that manage to nest (e.g., due to egg poaching).

3.2.1.2 Indian Ocean

Loggerhead sea turtles are distributed throughout the Indian Ocean, along most mainland coasts and island groups (Baldwin et al. 2003). Throughout the Indian Ocean, loggerhead sea turtles face many of the same threats as in other parts of the world including loss of nesting beach habitat, fishery interactions, and turtle meat and/or egg harvesting.

In the southwestern Indian Ocean, loggerhead nesting has shown signs of recovery in South Africa where protection measures have been in place for decades. However, in other southwestern areas (e.g., Madagascar and Mozambique) loggerhead nesting groups are still affected by subsistence hunting of adults and eggs (Baldwin et al. 2003). The largest known nesting group of loggerheads in the world occurs in Oman in the Northern Indian Ocean. An estimated 20,000-40,000 females nest each year at Masirah, the largest nesting site within Oman (Baldwin et al. 2003). In the Eastern Indian Ocean, all known nesting sites are found in Western Australia (Dodd 1988). As has been found in other areas, nesting numbers are disproportionate within the area, with the majority of nesting occurring at a single location. This may, however, be the result of fox predation on eggs at other Western Australia nesting sites (Baldwin et al. 2003).

3.2.1.3 Mediterranean Sea

Nesting in the Mediterranean is confined almost exclusively to the eastern basin. The highest level of nesting in the Mediterranean occurs in Greece, with an average of 3,050 nests per year. There is a long history of exploitation of loggerheads in the Mediterranean. Although much of this is now prohibited, some directed take still occurs. Loggerheads in the Mediterranean also face the threat of habitat degradation, incidental fishery interactions, vessel strikes, and marine pollution (Margaritoulis et al. 2003). Longline fisheries, in particular, are believed to catch thousands of juvenile loggerheads each year (NMFS and USFWS 2007), although genetic analyses indicate that only a portion of the loggerheads captured originate from nesting groups in the Mediterranean (Laurent et al. 1998).

3.2.1.4 Atlantic Ocean

In the Western Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf coast of Florida. Previous section 7 analyses have recognized at least five Western Atlantic subpopulations, divided geographically as follows: (1) a northern nesting subpopulation, occurring from North Carolina to Northeast Florida at about 29°N; (2) a South Florida nesting subpopulation, occurring from 29°N on the east coast to Sarasota on the west coast; (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting subpopulation, occurring on the Eastern Yucatán Peninsula, Mexico (Márquez 1990 and Turtle Expert Working Group or TEWG 2000); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (NMFS SEFSC 2001). The recently published recovery plan for the Northwest Atlantic

population of loggerhead sea turtles concluded, based on recent advances in genetic analyses, that there is no genetic distinction between loggerheads nesting on adjacent beaches along the Florida Peninsula and that specific boundaries for subpopulations could not be designated based on genetic differences alone. Thus, the plan uses a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries, in addition to genetic differences, to identify recovery units. The recovery units are: (1) the Northern Recovery Unit (Florida/Georgia border north through southern Virginia); (2) the Peninsular Florida Recovery Unit (Florida/Georgia border through Pinellas County, Florida); (3) the Dry Tortugas Recovery Unit (islands located west of Key West, Florida); (4) the Northern Gulf of Mexico Recovery Unit (Franklin County, Florida, through Texas); and (5) the Greater Caribbean Recovery Unit (Mexico through French Guiana, the Bahamas, Lesser Antilles, and Greater Antilles) (NMFS and USFWS 2008). The recovery plan concluded that all recovery units are essential to the recovery of the species. The Loggerhead Biological Review Team determined that loggerhead turtles in the Atlantic meet the required characteristics to be separated into three DPSs, the Northwest Atlantic DPS, Northeast Atlantic DPS, and South Atlantic DPS (Conant et al. 2009).

Life History and Distribution

Past literature gave an estimated age at maturity of 21-35 years (Frazer and Ehrhart 1985, Frazer et al. 1994) with the benthic immature stage lasting at least 10-25 years. However, based on new data from tag returns, strandings, and nesting surveys, NMFS SEFSC (2001) estimated ages of maturity ranging from 20-38 years and benthic immature stage lasting from 14-32 years.

Mating takes place in late March-early June, and eggs are laid throughout the summer, with a mean clutch size of 100-126 eggs in the southeastern United States. Individual females nest multiple times during a nesting season, with a mean of 4.1 nests per individual (Murphy and Hopkins 1984). Nesting migrations for an individual female loggerhead are usually on an interval of 2-3 years, but can vary from 1-7 years (Dodd 1988). Generally, loggerhead sea turtles originating from the Western Atlantic nesting aggregations are believed to lead a pelagic existence in the North Atlantic Gyre for as long as 7-12 years or more. Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm straight-line carapace length, they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic and Gulf of Mexico, although some loggerheads may move back and forth between the pelagic and benthic environment (Witzell 2002). Benthic immature loggerheads (sea turtles that have come back to inshore and nearshore waters), the life stage following the pelagic immature stage, have been found from Cape Cod, Massachusetts, to southern Texas, and occasionally strand on beaches in northeastern Mexico.

Tagging studies have shown loggerheads that have entered the benthic environment undertake routine migrations along the coast that are limited by seasonal water temperatures. Loggerhead sea turtles occur year-round in offshore waters off North Carolina where water temperature is influenced by the Gulf Stream. As coastal water temperatures warm in the spring, loggerheads begin to immigrate to North Carolina inshore waters (e.g., Pamlico and Core Sounds) and also move up the coast (Epperly et al. 1995a-c), occurring in Virginia foraging areas as early as April and on the most northern foraging grounds in the Gulf of Maine in June. The trend is reversed in the fall as water temperatures cool. The large majority of loggerheads leave the Gulf of Maine by

mid-September but some may remain in mid-Atlantic and Northeast areas until late fall. By December, loggerheads have emigrated from inshore North Carolina waters and coastal waters to the north to waters offshore of North Carolina, particularly off Cape Hatteras, and waters further south where the influence of the Gulf Stream provides temperatures favorable to sea turtles ($\geq$ 11°C) (Epperly et al. 1995a-c). Loggerhead sea turtles are year-round residents of Central and South Florida.

Pelagic and benthic juveniles are omnivorous and forage on crabs, mollusks, jellyfish, and vegetation at or near the surface (Dodd 1988). Sub-adult and adult loggerheads are primarily coastal dwelling and typically prey on benthic invertebrates such as mollusks and decapod crustaceans in hardbottom habitats.

More recent studies are revealing that the loggerhead's life history is more complex than previously believed. Rather than making discrete developmental shifts from oceanic to neritic environments, research is showing that both adults and (presumed) neritic stage juveniles continue to use the oceanic environment and will move back and forth between the two habitats (Witzell 2002, Blumenthal et al. 2006, Hawkes et al. 2006, McClellan and Read 2007). One of the studies tracked the movements of adult females post-nesting and found a difference in habitat use was related to body size, with larger turtles staying in coastal waters and smaller turtles traveling to oceanic waters (Hawkes et al. 2006). A tracking study of large juveniles found that the habitat preferences of this life stage were also diverse, with some remaining in neritic waters while others moved off into oceanic waters (McClellan and Read 2007). However, unlike the Hawkes et al. study (2006), there was no significant difference in the body size of turtles that remained in neritic waters versus oceanic waters (McClellan and Read 2007). In either case, the research not only supports the need to revise the life history model for loggerheads but also demonstrates that threats to loggerheads in both the neritic and oceanic environments are likely impacting multiple life stages of this species.

Population Dynamics and Status

A number of stock assessments and similar reviews (TEWG 1998, TEWG 2000, NMFS SEFSC 2001, Heppell et al. 2003, NMFS and USFWS 2008, Conant et al. 2009, TEWG 2009) have examined the stock status of loggerheads in the Atlantic Ocean, but none have been able to develop a reliable estimate of absolute population size.

Numbers of nests and nesting females can vary widely from year to year. However, nesting beach surveys can provide a reliable assessment of trends in the adult female population, due to the strong nest site fidelity of females turtles, as long as such studies are sufficiently long and effort and methods are standardized (see, e.g., NMFS and USFWS 2008, Meylan 1982). NMFS and USFWS (2008) concluded that the lack of change in two important demographic parameters of loggerheads, remigration interval and clutch frequency, indicate that time series on numbers of nests can provide reliable information on trends in the female population. Recent analysis of available data for the Peninsular Florida Recovery Unit has led to the conclusion that the observed decline in nesting for that unit over the last several years can best be explained by an actual decline in the number of adult female loggerheads in the population (Witherington et al. 2009).

Annual nest totals from beaches within what NMFS and USFWS have defined as the Northern Recovery Unit (NRU) averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (GDNR unpublished data, NCWRC unpublished data, SCDNR unpublished data), representing approximately 1,272 nesting females per year (4.1 nests per female, Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3 percent annually. Nest totals from aerial surveys conducted by SCDNR showed a 1.9 percent annual decline in nesting in South Carolina since 1980. Nesting on Georgia's beaches has shown a 1.2 percent annual decline from 1989-2003 (GDNR unpublished data). Overall, there is strong statistical data to suggest the NRU has experienced a long-term decline. Data in 2008 has shown improved nesting numbers, but future nesting years will need to be analyzed to determine if a change in trend is occurring. In 2008, 841 loggerhead nests were observed compared to the 10-year average of 715 nests in North Carolina. In South Carolina, 2008 was the seventh highest nesting year on record since 1980, with 4,500 nests, but this did not change the long-term trend line indicating a decline on South Carolina beaches. Georgia beach surveys located a total of 1,648 nests in 2008. This number surpassed the previous statewide record of 1,504 nests in 2003. According to analyses by Georgia DNR, the 40-year time-series trend data show an overall decline in nesting, but the shorter comprehensive survey data (20 years) indicate a stable population (SCDNR 2008, GDNR unpublished data, NCWRC unpublished data, SCDNR unpublished data).

Another consideration that may add to the importance and vulnerability of the NRU is the sex ratios of this subpopulation. NMFS scientists have estimated that the Northern subpopulation produces 65 percent males (NMFS SEFSC 2001). However, research conducted over a limited time frame has found opposing sex ratios (Wyneken et al. 2004), so further information is needed to clarify the issue. Since nesting female loggerhead sea turtles exhibit nest fidelity, the continued existence of the Northern subpopulation is related to the number of female hatchlings that are produced. Producing fewer females will limit the number of subsequent offspring produced by the subpopulation.

The Peninsular Florida Recovery Unit (PFRU) is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census undertaken from 1989 to 2007 showed a mean of 64,513 loggerhead nests per year, representing approximately 15,735 nesting females per year (from NMFS and USFWS 2008). An analysis of index nesting beach data shows a decline in nesting by the PFRU between 1989 and 2008 of 26 percent over the period, and a mean annual rate of decline of 1.6 percent despite a large increase in nesting for 2008 (Witherington et al. 2009, NMFS and USFWS 2008). In 2009, nesting levels dropped well below 2008 levels, to approximately 33,000 nests (FWRI web site- Graph of Core Florida Index Nests for Loggerheads).

The remaining three recovery units—Dry Tortugas (DTRU), Northern Gulf of Mexico (NGMRU), and Greater Caribbean (GCRU)—are much smaller nesting assemblages but still considered essential to the continued existence of the species. Nesting surveys for the DTRU are conducted as part of Florida's statewide survey program. Survey effort has been relatively stable during the 9-year period from 1995-2004 (although the 2002 year was missed). Nest counts ranged from 168-270, with a mean of 246, but with no detectable trend during this period (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, Statewide Nesting Beach Survey

Data, NMFS and USFWS 2008). Nest counts for the NGMRU are focused on index beaches rather than all beaches where nesting occurs. The 12-year dataset (1997-2008) of index nesting beaches in the area shows a significant declining trend of 4.7 percent annually (NMFS and USFWS 2008). Similarly, nesting survey effort has been inconsistent among the GCRU nesting beaches and no trend can be determined for this subpopulation. Zurita et al. (2003) found a statistically significant increase in the number of nests on seven of the beaches on Quintana Roo, Mexico, from 1987-2001, where survey effort was consistent during the period. However, nesting has declined since 2001, and the previously reported increasing trend appears to not have been sustained (NMFS and USFWS 2008).

Determining the meaning of the nesting decline data is confounded by various in-water research that suggests the abundance of neritic juvenile loggerheads is steady or increasing (Ehrhart et al. 2007, M. Bresette pers. comm. regarding captures at the St. Lucie Power Plant, SCDNR unpublished SEAMAP-SA data, Epperly et al. 2007). Ehrhart et al. (2007) found no significant regression-line trend in the long-term dataset. However, notable increases in recent years and a statistically significant increase in CPUE of 102.4 percent from the 4-year period of 1982-1985 to the 2002-2005 periods were found. Epperly et al. (2007) determined the trends of increasing loggerhead catch rates from all the aforementioned studies in combination provide evidence there has been an increase in neritic juvenile loggerhead abundance in the southeastern United States in the recent past. A study led by the South Carolina Department of Natural Resources found that standardized trawl survey CPUEs for loggerheads from South Carolina to North Florida was 1.5 times higher in summer 2008 than summer 2000. However, even though there were persistent inter-annual increases from 2000-2008, the difference was not statistically significant, likely due to the relatively short time series. Comparison to other datasets from the 1950s through 1990s showed much higher CPUEs in recent years regionally and in the South Atlantic Bight, leading SCDNR to conclude that it is highly improbable that CPUE increases of such magnitude could occur without a real and substantial increase in actual abundance (Arendt et al. 2009). Whether this increase in abundance represents a true population increase among juveniles or merely a shift in spatial occurrence is not clear. NMFS and USFWS (2008), citing Bjorndal et al. (2005), caution about extrapolating localized in-water trends to the broader population and relating localized trends in neritic sites to population trends at nesting beaches. The apparent overall increase in the abundance of neritic loggerheads in the southeastern United States may be due to increased abundance of the largest Stage III individuals (oceanic/neritic juveniles, historically referred to as small benthic juveniles), which could indicate a relatively large cohort that will recruit to maturity in the near future. However, such an increase in adults may be temporary, as in-water studies throughout the eastern U.S. also indicate a substantial decrease in the abundance of the smallest Stage III loggerheads, a pattern also corroborated by stranding data (TEWG 2009).

The NMFS SEFSC has developed a preliminary stage/age demographic model to help determine the estimated impacts of mortality reductions on loggerhead sea turtle population dynamics (NMFS SEFSC 2009a). This model does not incorporate existing trends in the data (such as nesting trends) but instead relies on utilizing the available information on the relevant life-history parameters for sea turtles and then predicts future population trajectories based upon model runs using those parameters. Therefore, the model results do not build upon, but instead are complementary to, the trend data obtained through nest counts and other observations. The model

uses the range of published information for the various parameters including mortality by stage, stage duration (years in a stage), and fecundity parameters such as eggs per nest, nests per nesting female, hatchling emergence success, sex ratio, and remigration interval. Model runs were done for each individual recovery unit as well as the western North Atlantic population as a whole, and the resulting trajectories were found to be very similar. One of the most robust results from the model was an estimate of the adult female population size for the western North Atlantic in the 2004-2008 timeframe. The distribution resulting from the model runs suggest the adult female population size to be likely between approximately 20,000 to 40,000 individuals, with a low likelihood of being up to 70,000. A much less robust estimate for total benthic females in the western North Atlantic was also obtained, with a likely range of approximately 30,000-300,000 individuals, up to less than 1 million.

The results of one set of model runs suggest that the population is most likely declining, but this result was very sensitive to the choice of the position of the parameters within their range and hypothesized distributions. This example was run to predict the distribution of projected population trajectories for benthic females using a range of starting population numbers from the 30,000 estimated minimum to the greater than the 300,000 likely upper end of the range and declining trajectories were estimated for all of the population estimates. After 10,000 simulation runs of the models using the parameter ranges, 14 percent of the runs resulted in growing populations, while 86 percent resulted in declining populations. While this does not translate to an equivalent statement that there is an 86 percent chance of a declining population, it does illustrate that given the life history parameter information currently thought to comprise the likely range of possibilities, it appears most likely that with no changes to those parameters the population is projected to decline. Additional model runs using the range of values for each life history parameter, the assumption of non-uniform distribution for those parameters, and a 5 percent natural (non-anthropogenic) mortality for the benthic stages resulted in a determination that a 60-70 percent reduction in anthropogenic mortality in the benthic stages would be needed to bring 50 percent of the model runs to a static (zero growth or decline) or increasing trajectory.

As a result of the large uncertainty in our knowledge of loggerhead life history, at this point predicting the future populations or population trajectories of loggerhead sea turtles with precision is very uncertain. The model results, however, are useful in guiding future research needs to better understand the life history parameters that have the most significant impact in the model. Additionally, the model results provide valuable insights into the likely overall declining status of the species and in the impacts of large-scale changes to various life history parameters (such as mortality rates for given stages) and how they may change the trajectories. The results of the model, in conjunction with analyses conducted on nest count trends (such as Witherington et al. 2009) which have suggested that the population decline is real, provides a strong basis for the conclusion that the western North Atlantic loggerhead population is in decline. NMFS also convened a new Turtle Expert Working Group (TEWG) for loggerhead sea turtles that gathered available data and examined the potential causes of the nesting decline and what the decline means in terms of population status. The TEWG ultimately could not determine whether or not decreasing annual numbers of nests among the Western North Atlantic loggerhead subpopulations were due to stochastic processes resulting in fewer nests, a decreasing average reproductive output of the adult females, decreasing numbers of adult females, or a combination of those factors. Past

and present mortality factors that could impact current loggerhead nest numbers are many, and it is likely that several factors compound to create the current decline. Regardless of the source of the decline, it is clear that the reduced nesting will result in depressed recruitment to subsequent life stages over the coming decades (TEWG 2009).

Threats

The 5-year status review of loggerhead sea turtles recently completed by NMFS and the USFWS provides a summary of natural as well as anthropogenic threats to loggerhead sea turtles (NMFS and USFWS 2007). The Loggerhead Recovery Team also undertook a comprehensive evaluation of threats to the species, and described them separately for the terrestrial, neritic, and oceanic zones (NMFS and USFWS 2008). The diversity of sea turtles' life history leaves them susceptible to many natural and anthropogenic impacts, including impacts while they are on land, in the benthic environment, and in the pelagic environment. Hurricanes are particularly destructive to sea turtle nests. Sand accretion and rainfall that result from these storms, as well as wave action, can appreciably reduce hatchling success. For example, in 1992, all of the eggs over a 90-mile length of coastal Florida were destroyed by storm surges on beaches that were closest to the eye of Hurricane Andrew (Milton et al. 1994). Also, many nests were destroyed during the 2004 and 2005 hurricane seasons. Other sources of natural mortality include cold-stunning and biotoxin exposure. Cold-stunning is not considered a major source of mortality, but cold-stunning of loggerhead turtles has been reported at several locations in the northeast and southeast United States, including the Indian River Lagoon in Florida (Mendonca and Ehrhart 1982; Witherington and Ehrhart 1989) and Texas inshore waters (Hildebrand 1982; Shaver 1990). Cold stunning is a phenomenon during which turtles become incapacitated as a result of rapidly dropping water temperatures (Witherington and Ehrhart 1989; Morreale et al. 1992). As temperatures fall below 8°-10°C, turtles may lose their ability to swim and dive, often floating to the surface. The rate of cooling that precipitates cold stunning appears to be the primary threat, rather than the water temperature itself (Milton and Lutz 2003). Sea turtles that overwinter in inshore waters are most susceptible to cold stunning because temperature changes are most rapid in shallow water (Witherington and Ehrhart 1989).

Anthropogenic factors that impact hatchlings and adult female sea turtles on land or the success of nesting and hatching include: beach erosion, beach armoring and nourishment, artificial lighting, beach cleaning, increased human presence, recreational beach equipment, beach driving, coastal construction and fishing piers, exotic dune and beach vegetation, and poaching. An increase in human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs, and an increased presence of native species (e.g., raccoons, armadillos, and opossums), which raid and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the Northwest Atlantic coast (in areas like Merritt Island, Archie Carr, and Hobe Sound National Wildlife Refuges), other areas along these coasts have limited or no protection. Sea turtle nesting and hatching success on unprotected high density East Florida nesting beaches from Indian River to Broward County are affected by all of the above threats.

Loggerhead sea turtles are affected by a completely different set of anthropogenic threats in the marine environment. These include oil and gas exploration, coastal development, transportation,

marine pollution (which may have a direct impact, or an indirect impact by causing harmful algal blooms), underwater explosions, hopper dredging, offshore artificial lighting, power plant entrainment and/or impingement, entanglement in debris, ingestion of marine debris, marina and dock construction and operation, boat collisions, poaching, and fishery interactions. Loggerheads in the pelagic environment are exposed to a series of longline fisheries, which include the highly migratory species' Atlantic pelagic longline fisheries, an Azorean longline fleet, a Spanish longline fleet, and various longline fleets in the Mediterranean Sea (Aguilar et al. 1995, Bolten et al. 1994, Crouse 1999). Loggerheads in the benthic environment in waters off the coastal United States are exposed to a suite of fisheries in federal and state waters including trawl, purse seine, hook-and-line, gillnet, pound net, longline, and trap fisheries. The sizes and reproductive values of sea turtles taken by fisheries vary significantly, depending on the location and season of the fishery, and size-selectivity resulting from gear characteristics. Therefore, it is possible for fisheries that interact with fewer, more reproductively valuable turtles to have a greater detrimental effect on the population than one that takes greater numbers of less reproductively valuable turtles if the fishery removes a higher overall reproductive value from the population (Wallace et al. 2008). The Loggerhead Biological Review Team determined that the greatest threats to the proposed Northwest Atlantic DPS of loggerheads result from cumulative fishery bycatch in neritic and oceanic habitats (Conant et al. 2009). Attaining a more thorough understanding of the characteristics, as well as the quantity, of sea turtle bycatch across all fisheries is of great importance.

Hopper dredges are known to adversely affect loggerheads (NMFS 1995, 1997, and 2003). NMFS' 2003 Regional Biological Opinion (RBO) for the Gulf of Mexico authorized the COE to take, by injury or mortality, up to 40 loggerheads per fiscal year by hopper dredging. In addition, the total anticipated annual non-injurious take by relocation trawling (that is allowed under certain conditions of sea turtle abundance by the 2003 Incidental Take Statement) is expected to consist of 300 sea turtles, of any combination of the species, across all the COE Districts and hopper dredging projects (the relocation trawling takes are not allocated by districts). In addition to 300 non-injurious turtle takes by relocation trawling, NMFS estimated that 0-2 turtles would be killed or injured annually during relocation trawling in the Gulf of Mexico. NMFS' 1997 South Atlantic hopper dredging RBO authorizes the COE to take, by injury or mortality, of up to 35 loggerheads per fiscal year. Although hopper dredges can injure or kill loggerheads, implementation of the Reasonable and Prudent Measures and the Terms and Conditions in NMFS' 2003, 1997, and 1995 biological opinions on hopper dredging along the Gulf and Atlantic coasts, respectively, of the southeastern United States should minimize the impacts of incidental take on this species.

There is a large and growing body of literature on past, present, and future impacts of global climate change exacerbated and accelerated by human activities. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. NOAA's climate information portal provides basic background information on these and other measured or anticipated effects (see http://www.climate.gov).

Impacts on sea turtles currently cannot, for the most part, be predicted with any degree of certainty, however significant impacts to the hatchling sex ratios of loggerhead turtles may result (NMFS and USFWS 2007). In marine turtles, sex is determined by temperature in the middle third of

incubation, with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25°-35°C (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007). Loggerhead sea turtle hatchling size also appears to be influenced by incubation temperatures, with smaller hatchlings produced at higher temperatures.

The effects from increased temperatures may be exacerbated on developed nesting beaches where shoreline armoring and construction has denuded vegetation. Sea level rise from global climate change is also a potential problem, for areas with low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting sites and decrease available nesting habitat (Daniels et al. 1993, Fish et al. 2005, Baker et al. 2006). The loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as increased frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006, Baker et al. 2006).

Other changes in the marine ecosystem caused by global climate change (e.g., salinity, oceanic currents, dissolved oxygen levels, nutrient distribution, etc.) could influence the distribution and abundance of phytoplankton, zooplankton, submerged aquatic vegetation, forage fish, etc., which could ultimately affect the primary foraging areas of loggerhead sea turtles.

Actions have been taken to reduce anthropogenic impacts to loggerhead sea turtles from various sources, particularly since the early 1990s. These include lighting ordinances, predation control, and nest relocations to help increase hatchling survival, as well as measures to reduce the mortality of pelagic immatures, benthic immatures, and sexually mature age classes in various fisheries and other marine activities. Recent actions have taken significant steps towards reducing the environmental baseline and improving the status of all loggerhead subpopulations. For example, the TED regulation published on February 21, 2003 (68 FR 8456), which significantly increased TED escape-opening size requirements in the United States South Atlantic and Gulf of Mexico waters, represents a significant improvement in the baseline affecting loggerhead sea turtles. Shrimp trawling is considered to be the largest source of anthropogenic mortality on loggerheads.

3.2.1.5 Summary of Status for Loggerhead Sea Turtles

In the Pacific Ocean, loggerhead sea turtles are represented by a northwestern Pacific nesting aggregation (located in Japan) and a smaller southwestern nesting aggregation that occurs in Australia (Great Barrier Reef and Queensland) and New Caledonia. The abundance of loggerhead sea turtles on nesting colonies throughout the Pacific basin has declined dramatically over the past 10 to 20 years. Data from 1995 estimated the Japanese nesting aggregation at 1,000 female loggerhead sea turtles (Bolten et al. 1996), but it has probably declined since 1995 and continues to decline (Tillman 2000). The nesting aggregation in Queensland, Australia, was as low as 300 females in 1997.

In the Atlantic Ocean, absolute population size is not known, but based on extrapolation of nesting information, loggerheads are likely much more numerous than in the Pacific Ocean. NMFS recognizes five recovery units of loggerhead sea turtles in the western North Atlantic based on

genetic studies and management regimes. Cohorts from all of these are known to occur within the action area of this consultation. There are long-term declining nesting trends for the two largest Western Atlantic recovery units: the PFRU and the NRU. Furthermore, no long-term data suggest any of the loggerhead subpopulations throughout the entire North Atlantic are increasing in annual numbers of nests (TEWG 2009). Additionally, using both computation of susceptibility to quasi-extinction and stage-based deterministic modeling to determine the effects of known threats to the proposed Northwest Atlantic DPS, the Loggerhead Biological Review Team determined that this proposed DPS is likely to decline in the foreseeable future, driven primarily by the mortality of juvenile and adult loggerheads from fishery bycatch throughout the North Atlantic Ocean. These computations were done for each of the recovery units, and all of them resulted in an expected decline (Conant et al. 2009). Because of its size, the PFRU may be critical to the survival of the species in the Atlantic Ocean. In the past, this nesting aggregation was considered second in size only to the nesting aggregation on islands in the Arabian Sea off Oman (Ross 1979, Ehrhart 1989, NMFS 2008). However, the status of the Oman colony has not been evaluated recently; and it is located in an area of the world where it is highly vulnerable to disruptive events such as political upheavals, wars, catastrophic oil spills, and lack of strong protections for sea turtles (Meylan et al. 1995). Given the lack of updated information on this population, the status of loggerheads in the Indian Ocean basin overall is essentially unknown.

On March 16, 2010, NMFS and USFWS published a proposed rule in the federal register to list 9 DPSs of loggerhead sea turtles. In the Atlantic Ocean, loggerhead turtles would be listed as three DPSs (Northwest Atlantic DPS, Northeast Atlantic DPS, and South Atlantic DPS). NMFS and USFWS proposed to list the Northwest DPS, the one principally affected by this proposed action, and Northeast DPSs as endangered and the South Atlantic DPS as threatened (75 FR 12598).

All loggerhead subpopulations are faced with a multitude of natural and anthropogenic effects that negatively influence the status of the species. Many anthropogenic effects occur as a result of activities outside of U.S. jurisdiction (i.e., fisheries in international waters).

3.2.2 Kemp's Ridley Sea Turtle

The Kemp's ridley was listed as endangered on December 2, 1970. Internationally, the Kemp's ridley is considered the most endangered sea turtle (Zwinenberg 1977, Groombridge 1982, TEWG 2000). Kemp's ridleys nest primarily at Rancho Nuevo, a stretch of beach in Mexico's Tamaulipas State. This species occurs mainly in coastal areas of the Gulf of Mexico and the northwestern Atlantic Ocean. Occasional individuals reach European waters (Brongersma 1972). Adults of this species are usually confined to the Gulf of Mexico, although adult-sized individuals sometimes are found on the east coast of the United States.

Life History and Distribution

The TEWG (1998) estimates age at maturity from 7-15 years. Females return to their nesting beach about every 2 years (TEWG 1998). Nesting occurs from April into July and is essentially limited to the beaches of the western Gulf of Mexico, near Rancho Nuevo in southern Tamaulipas, Mexico. The mean clutch size for Kemp's ridleys is 100 eggs/nest, with an average of 2.5 nests/female/season.

Little is known of the movements of the post-hatchling stage (pelagic stage) within the Gulf of Mexico. Studies have shown the post-hatchling pelagic stage varies from 1-4 or more years, and the benthic immature stage lasts 7-9 years (Schmid and Witzell 1997). Benthic immature Kemp's ridleys have been found along the Eastern Seaboard of the United States and in the Gulf of Mexico. Atlantic benthic immature sea turtles travel northward as the water warms to feed in the productive, coastal waters off Georgia through New England, returning southward with the onset of winter (Lutcavage and Musick 1985, Henwood and Ogren 1987, Ogren 1989). Studies suggest that benthic immature Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud 1995).

Stomach contents of Kemp's ridleys along the lower Texas coast consisted of nearshore crabs and mollusks, as well as fish, shrimp, and other foods considered to be shrimp fishery discards (Shaver 1991). A 2005 dietary study of immature Kemp's ridleys off southwest Florida documented predation on benthic tunicates, a previously undocumented food source for this species (Witzell and Schmid 2005). These pelagic stage Kemp's ridleys presumably feed on the available *Sargassum* and associated infauna or other epipelagic species found in the Gulf of Mexico.

Population Dynamics and Status

Of the seven extant species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. Most of the population of adult females nest on the Rancho Nuevo beaches (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the mid-1980s nesting numbers were below 1,000 (with a low of 702 nests in 1985). However, the number of nests observed at Rancho Nuevo and nearby beaches increased at a mean rate of 11.3 percent per year from 1985 to 1999 (TEWG 2000), with 6,277 nests recorded in 2000 (USFWS 2000). These trends are further supported by 2004-2007 nesting data from Mexico. The number of nests over that period has increased from 7,147 in 2004 to 10,099 in 2005, to 12,143 in 2006, and 15,032 during the 2007 nesting season (Gladys Porter Zoo 2007). The official Mexican government estimate for Tamaulipas State for 2009 stands at 21,147 nests, with an additional 624 nests reported from Veracruz State (E. Hawk, NMFS, SERO, pers. comm., March 25, 2010; data obtained from CONAPESCA web site). A small nesting population is also emerging in the United States, primarily in Texas, rising from 6 nests in 1996 to 128 in 2007, 195 in 2008, and 197 in 2009 (Shaver, D., National Park Service, pers. comm., March 18, 2010). Based on current (2009) nesting numbers, and 2.5 nests per female, nesters may number over 8,700 at the present time.

A period of steady increase in benthic immature ridleys has been occurring since 1990 and appears to be due to increased hatchling production and an apparent increase in survival rates of immature sea turtles beginning in 1990. The increased survivorship of immature sea turtles is attributable, in part, to the introduction of TEDs in the United States' and Mexico's shrimping fleets. As demonstrated by nesting increases at the main nesting sites in Mexico, adult ridley numbers have increased over the last decade. The population model used by TEWG (2000) projected that Kemp's ridleys could reach the recovery plan's intermediate recovery goal of 10,000 nesters by the year 2015. Recent calculations of nesting females determined from nest counts show that the

population trend is increasing towards that recovery goal, with an estimate of 4,047 nesters in 2006 and 5,500 in 2007 (NMFS and USFWS 2007a, Gladys Porter Zoo 2007).

Next to loggerheads, Kemp's ridleys are the second most abundant sea turtle in Virginia and Maryland waters, arriving in these areas during May and June (Keinath et al. 1987, Musick and Limpus 1997). The juvenile population of Kemp's ridley sea turtles in Chesapeake Bay is estimated to be 211 to 1,083 sea turtles (Musick and Limpus 1997). These juveniles frequently forage in submerged aquatic grass beds for crabs (Musick and Limpus 1997). Kemp's ridleys consume a variety of crab species (including *Callinectes* spp., *Ovalipes* spp., *Libinia* spp., and *Cancer* spp.). Mollusks, shrimp, and fish are consumed less frequently (Bjorndal 1997). Upon leaving Chesapeake Bay in autumn, juvenile Kemp's ridleys migrate down the coast, passing Cape Hatteras in December and January (Musick and Limpus 1997). These larger juveniles are joined there by juveniles of the same size from North Carolina sounds and smaller juveniles from New York and New England to form one of the densest concentrations of Kemp's ridleys outside of the Gulf of Mexico (Musick and Limpus 1997, Epperly et al. 1995a, Epperly et al. 1995b).

Threats

Kemp's ridleys face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, natural predators at sea, and oceanic events such as cold-stunning. Although cold-stunning can occur throughout the range of the species, it may be a greater risk for sea turtles that utilize the more northern habitats of Cape Cod Bay and Long Island Sound. For example, in the winter of 1999-2000, there was a major cold-stunning event where 218 Kemp's ridleys, 54 loggerheads, and 5 green sea turtles were found on Cape Cod beaches (R. Prescott, NMFS, pers. comm. 2001). Annual cold-stunning events do not always occur at this magnitude; the extent of episodic major cold-stun events may be associated with numbers of sea turtles utilizing northeast waters in a given year, oceanographic conditions, and the occurrence of storm events in the late fall. Many cold-stunned sea turtles can survive if found early enough, but cold-stunning events can still represent a significant cause of natural mortality. A complete list of other indirect factors can be found in NMFS SEFSC (2001).

Although changes in the use of shrimp trawls and other trawl gear have helped to reduce mortality of Kemp's ridleys, this species is also affected by other sources of anthropogenic impacts similar to those discussed in previous sections. For example, in the spring of 2000, a total of 5 Kemp's ridley carcasses were recovered from the same North Carolina beaches where 275 loggerhead carcasses were found. Cause of death for most of the sea turtles recovered was unknown, but the mass mortality event was suspected to have been from a large-mesh gillnet fishery operating offshore in the preceding weeks. The 5 Kemp's ridley carcasses that were found are likely to have been only a minimum count of the number of Kemp's ridleys that were killed or seriously injured as a result of the fishery interaction because it is unlikely that all of the carcasses washed ashore.

Hopper dredges are known to adversely affect Kemp's ridley turtles (NMFS 1995, 1997, and 2003). NMFS' 2003 Regional Biological Opinion (RBO) for the Gulf of Mexico authorized the COE to take, by injury or mortality, up to 20 Kemp's ridley turtles per fiscal year by hopper dredging. In addition, the total anticipated annual non-injurious take by relocation trawling (that is allowed under certain conditions of sea turtle abundance by the 2003 Incidental Take Statement) is

expected to consist of 300 sea turtles, of any combination of the species, across all the COE Districts and hopper dredging projects (the relocation trawling takes are not allocated by districts). In addition to 300 non-injurious turtle takes by relocation trawling, NMFS estimated that 0-2 turtles would be killed or injured annually during relocation trawling in the Gulf of Mexico. NMFS' 1997 South Atlantic hopper dredging RBO authorizes the COE to take, by injury or mortality, of up to 7 Kemp's ridley turtles per fiscal year. Although hopper dredges can injure or kill Kemp's ridley turtles, implementation of the Reasonable and Prudent Measures and the Terms and Conditions in NMFS' 2003, 1997, and 1995 biological opinions on hopper dredging along the Gulf and Atlantic coasts, respectively, of the southeastern United States should minimize the impacts of incidental take on this species.

There is a large and growing body of literature on past, present, and future impacts of global climate change exacerbated and accelerated by human activities. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. NOAA's climate information portal provides basic background information on these and other measured or anticipated effects (see http://www.climate.gov).

Impacts on sea turtles currently cannot, for the most part, be predicted with any degree of certainty, however significant impacts to the hatchling sex ratios of Kemp's ridley turtles may result (NMFS and USFWS 2007a). In marine turtles, sex is determined by temperature in the middle third of incubation, with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25°-35°C (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007a). Kemp's ridley sea turtle hatchling size also appears to be influenced by incubation temperatures, with smaller hatchlings produced at higher temperatures.

The effects from increased temperatures may be exacerbated on developed nesting beaches where shoreline armoring and construction has denuded vegetation. Sea level rise from global climate change is also a potential problem, for areas with low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting sites and decrease available nesting habitat (Daniels et al. 1993, Fish et al. 2005, Baker et al. 2006). The loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as increased frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006, Baker et al. 2006).

Other changes in the marine ecosystem caused by global climate change (e.g., salinity, oceanic currents, dissolved oxygen levels, nutrient distribution, etc.) could influence the distribution and abundance of phytoplankton, zooplankton, submerged aquatic vegetation, forage fish, etc., which could ultimately affect the primary foraging areas of Kemp's ridley sea turtles.

3.2.2.1 Summary of Kemp's Ridley Status

The only major nesting site for Kemp's ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963). The number of nests observed at Rancho Nuevo and nearby beaches increased from 1985 to 2009. Nesting in Tamaulipas has also exceeded 12,000 nests per

year from 2004-2009 (Gladys Porter Zoo database), with over 21,000 nests (approximately 8,400 nesters) in 2009. Kemp's ridleys mature at an earlier age (7-15 years) than other chelonids; thus, "lag effects" as a result of unknown impacts to the non-breeding life stages would likely have been seen in the increasing nest trend beginning in 1985 (USFWS and NMFS 1991b).

The largest contributors to the decline of Kemp's ridleys in the past were commercial and local exploitation, especially poaching of nests at the Rancho Nuevo site, as well as the Gulf of Mexico trawl fisheries. The advent of TED regulations for trawlers and protections for the nesting beaches has allowed the species to begin to recover. Many threats to the future of the species remain, including interactions with fishing gear, marine pollution, foraging habitat destruction, illegal poaching of nests and potential threats to the nesting beaches from such sources as global climate change, development, and tourism pressures.

3.2.3 Green Sea Turtle

Green turtles are distributed circumglobally, and can be found in the Pacific, Indian and Atlantic Oceans as well as the Mediterranean Sea (NMFS and USFWS 1991a, Seminoff 2004, NMFS and USFWS 2007b). In 1978, the Atlantic population of the green sea turtle was listed as threatened under the ESA, except for the breeding populations in Florida and on the Pacific coast of Mexico, which were listed as endangered.

3.2.3.1 Pacific Ocean

Green turtles occur in the eastern, central, and western Pacific. Foraging areas are also found throughout the Pacific and along the southwestern U.S. coast (NMFS and USFWS 1998a). Nesting is known to occur in the Hawaiian Archipelago, American Samoa, Guam, and various other sites in the Pacific. The only major population (>2,000 nesting females) of green turtles in the western Pacific occurs in Australia and Malaysia, with smaller colonies throughout the area. Green turtles have generally been thought to be declining throughout the Pacific Ocean, with the exception of Hawaii, from a combination of overexploitation and habitat loss (Seminoff 2002). Indonesia has a widespread distribution of green turtles, but has experienced large declines over the past 50 years. Historically, green turtles were used in many areas of the Pacific for food. They were also commercially exploited and this, coupled with habitat degradation, led to their decline in the Pacific (NMFS and USFWS 1998a). Green turtles in the Pacific continue to be affected by poaching, habitat loss or degradation, fishing gear interactions, and fibropapillomatosis (NMFS and USFWS 1998a, NMFS 2004).

Hawaiian green turtles are genetically distinct and geographically isolated, and the population appears to be increasing in size despite the prevalence of fibropapilloma and spirochidiasis (Aguirre et al. 1998 in Balazs and Chaloupka 2003). The East Island nesting beach in Hawaii is showing a 5.7 percent annual growth rate over 25 plus years (Chaloupka et al. 2007). In the Eastern Pacific, mitochondrial DNA analysis has indicated that there are three key nesting populations: Michoacán, Mexico; Galapagos Islands, Ecuador; and Islas Revillagigedos, Mexico

(Dutton 2003). The number of nesting females per year exceeds 1,000 females at each site (NMFS and USFWS 2007b). However, historically, greater than 20,000 females per year are believed to have nested in Michoacán alone (Cliffton et al. 1982, NMFS and USFWS 2007b). Thus, the current number of nesting females is still far below what has historically occurred. There is also sporadic green turtle nesting along the Pacific coast of Costa Rica. However, at least a few of the non-Hawaiian nesting stocks in the Pacific have recently been found to be undergoing long-term increases. Datasets over 25 years in Chichi-jima, Japan; Heron Island, Australia; and Raine Island, Australia show increases (Chaloupka et al. 2007). These increases are thought to be the direct result of long-term conservation measures.

3.2.3.2 Indian Ocean

There are numerous nesting sites for green sea turtles in the Indian Ocean. One of the largest nesting sites for green sea turtles worldwide occurs on the beaches of Oman where an estimated 20,000 green sea turtles nest annually (Hirth 1997, Ferreira et al. 2003). Based on a review of the 32 index sites used to monitor green sea turtle nesting worldwide, Seminoff (2004) concluded that declines in green turtle nesting were evident for many of the Indian Ocean index sites. While several of these had not demonstrated further declines in the more recent past, only the Comoros Island index site in the western Indian Ocean showed evidence of increased nesting (Seminoff 2004).

3.2.3.3 Atlantic Ocean

Life History and Distribution
The estimated age at sexual maturity for green sea turtles is between 20-50 years (Balazs 1982, Frazer and Ehrhart 1985). Green sea turtle mating occurs in the waters off the nesting beaches. Each female deposits 1-7 clutches (usually 2-3) during the breeding season at 12-14 day intervals. Mean clutch size is highly variable among populations, but averages 110-115 eggs/nest. Females usually have 2-4 or more years between breeding seasons, whereas males may mate every year (Balazs 1983). After hatching, green sea turtles go through a post-hatchling pelagic stage where they are associated with drift lines of algae and other debris. At approximately 20- to 25-cm carapace length, juveniles leave pelagic habitats and enter benthic foraging areas (Bjorndal 1997).

Green sea turtles are primarily herbivorous, feeding on algae and sea grasses, but also occasionally consume jellyfish and sponges. The post-hatchling, pelagic-stage individuals are assumed to be omnivorous, but little data are available.

Green sea turtle foraging areas in the southeastern United States include any coastal shallow waters having macroalgae or seagrasses. This includes areas near mainland coastlines, islands, reefs, or shelves, as well as open-ocean surface waters, especially where advection from wind and currents concentrates pelagic organisms (Hirth 1997, NMFS and USFWS 1991a). Principal benthic foraging areas in the southeastern United States include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Doughty 1984, Hildebrand 1982, Shaver 1994), the Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Caldwell and Carr 1957, Carr 1984), Florida Bay and the Florida Keys (Schroeder and Foley 1995), the Indian River Lagoon

system, Florida (Ehrhart 1983), and the Atlantic Ocean off Florida from Brevard through Broward Counties (Wershoven and Wershoven 1992, Guseman and Ehrhart 1992). Adults of both sexes are presumed to migrate between nesting and foraging habitats along corridors adjacent to coastlines and reefs.

Population Dynamics and Status

Some of the principal feeding pastures in the western Atlantic Ocean include the upper west coast of Florida and the northwestern coast of the Yucatán Peninsula. Additional important foraging areas in the western Atlantic include the Mosquito Lagoon and Indian River Lagoon systems and nearshore wormrock reefs between Sebastian and Ft. Pierce Inlets in Florida, Florida Bay, the Culebra Archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Caribbean coast of Panama, the Miskito Coast in Nicaragua, and scattered areas along Colombia and Brazil (Hirth 1997). The summer developmental habitat for green turtles also encompasses estuarine and coastal waters from North Carolina to as far north as Long Island Sound (Musick and Limpus 1997).

The vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Meylan et al. 1995, Johnson and Ehrhart 1994). Green sea turtle nesting in Florida has been increasing since 1989 (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute Index Nesting Beach Survey Database). Nest counts can also be used to estimate the number of reproductively mature females nesting annually. The 5-year status review for the species identified eight geographic areas considered to be primary sites for green sea turtle nesting in the Atlantic/Caribbean and reviewed the trend in nest count data for each (NMFS and USFWS 2007b). These include: (1) Yucatán Peninsula, Mexico; (2) Tortuguero, Costa Rica; (3) Aves Island, Venezuela; (4) Galibi Reserve, Suriname; (5) Isla Trindade, Brazil; (6) Ascension Island, United Kingdom; (7) Bioko Island, Equatorial Guinea; and (8) Bijagos Achipelago (Guinea-Bissau) (NMFS and USFWS 2007b). Nesting at all of these sites was considered to be stable or increasing with the exception of Bioko Island and the Bijagos Archipelago where the lack of sufficient data precluded a meaningful trend assessment for either site (NMFS and USFWS 2007b). Seminoff (2004) likewise reviewed green sea turtle nesting data for eight sites in the western, eastern, and central Atlantic, including all of the above with the exception that nesting in Florida was reviewed in place of Isla Trindade, Brazil. Seminoff (2004) concluded that all sites in the central and western Atlantic showed increased nesting with the exception of nesting at Aves Island, Venezuela, while both sites in the eastern Atlantic demonstrated decreased nesting. These sites are not inclusive of all green sea turtle nesting in the Atlantic. However, other sites are not believed to support nesting levels high enough that would change the overall status of the species in the Atlantic (NMFS and USFWS 2007b).

By far, the most important nesting concentration for green turtles in the western Atlantic is in Tortuguero, Costa Rica (NMFS and USFWS 2007b). Nesting in the area has increased considerably since the 1970s, and nest count data from 1999-2003 suggest nesting by 17,402-37,290 females per year (NMFS and USFWS 2007b). The number of females nesting per year on beaches in the Yucatán, Aves Island, Galibi Reserve, and Isla Trindade number in the hundreds to low thousands, depending on the site (NMFS and USFWS 2007b). In the United States, certain Florida nesting beaches have been designated index beaches. Index beaches were established to

standardize data collection methods and effort on key nesting beaches. The pattern of green turtle nesting shows biennial peaks in abundance with a generally positive trend during the ten years of regular monitoring since establishment of the index beaches in 1989, perhaps due to increased protective legislation throughout the Caribbean (Meylan et al. 1995). An average of 5,039 green turtle nests were laid annually in Florida between 2001 and 2006, with a low of 581 in 2001 and a high of 9,644 in 2005 (NMFS and USFWS 2007b). Data from the index nesting beaches program in Florida support the dramatic increase in nesting. In 2007, there were 9,455 green turtle nests found just on index nesting beaches, the highest since index beach monitoring began in 1989. The number fell back to 6,385 in 2008, but that is thought to be part of the normal biennial nesting cycle for green turtles (FWC Index Nesting Beach Survey Database). Occasional nesting has been documented along the Gulf coast of Florida, at southwest Florida beaches, as well as the beaches on the Florida Panhandle (Meylan et al. 1995). More recently, green turtle nesting occurred on Bald Head Island, North Carolina; just east of the mouth of the Cape Fear River; on Onslow Island; and on Cape Hatteras National Seashore. Increased nesting has also been observed along the Atlantic coast of Florida, on beaches where only loggerhead nesting was observed in the past (Pritchard 1997). Recent modeling by Chaloupka et al. (2007) using data sets of 25 years or more has resulted in an estimate of the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9 percent, and the Tortuguero, Costa Rica, population growing at 4.9 percent annually.

There are no reliable estimates of the number of immature green sea turtles that inhabit coastal areas (where they come to forage) of the southeastern United States. However, information on incidental captures of immature green sea turtles at the St. Lucie Power Plant (they have averaged 215 green sea turtle captures per year since 1977) in St. Lucie County, Florida (on the Atlantic coast of Florida), show that the annual number of immature green sea turtles captured has increased significantly in the past 26 years (FPL 2002). Ehrhart et al. (2007) has also documented a significant increase in in-water abundance of green turtles in the Indian River Lagoon area. It is likely that immature green sea turtles foraging in the southeastern United States come from multiple genetic stocks; therefore, the status of immature green sea turtles in the southeastern United States might also be assessed from trends at all of the main regional nesting beaches, principally Florida, Yucatán, and Tortuguero.

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the overexploitation of green sea turtles for food and other products. Although intentional take of green sea turtles and their eggs is not extensive within the southeastern United States, green sea turtles that nest and forage in the region may spend large portions of their life history outside the region and outside U.S. jurisdiction, where exploitation is still a threat. However, there are still significant and ongoing threats to green sea turtles from human-related causes in the United States. These threats include beach armoring, erosion control, artificial lighting, beach disturbance (e.g., driving on the beach), pollution, foraging habitat loss as a result of direct destruction by dredging, siltation, boat damage, other human activities, and interactions with fishing gear. Sea sampling coverage in the pelagic driftnet, pelagic longline, Southeast shrimp trawl, and summer flounder bottom trawl fisheries has recorded takes of green turtles. There is also the increasing threat from green sea turtle fibropapillomatosis disease. Presently, this disease is cosmopolitan and has been

found to affect large numbers of animals in some areas, including Hawaii and Florida (Herbst 1994, Jacobson 1990, Jacobson et al. 1991).

Green sea turtles are also adversely effected by below average water temperatures, also known as cold-stunning. In the winter of 2009-10, approximately 893 green turtles died in Florida waters as a result of cold-stunning (Allen Foley, FWC, pers. comm.). The total number of turtles that died statewide was estimated to be 948 (a combination of green, loggerhead, Kemp's ridley, and hawksbill); however, green turtles seemed to be more vulnerable given that about 94 percent of the total dead was comprised of green turtles.

Hopper dredges are known to adversely affect green turtles (NMFS 1995, 1997, and 2003). NMFS' 2003 Regional Biological Opinion (RBO) for the Gulf of Mexico authorized the COE to take, by injury or mortality, up to 14 green turtles per fiscal year by hopper dredging. In addition, the total anticipated annual non-injurious take by relocation trawling (that is allowed under certain conditions of sea turtle abundance by the 2003 Incidental Take Statement) is expected to consist of 300 sea turtles, of any combination of the species, across all the COE Districts and hopper dredging projects (the relocation trawling takes are not allocated by districts). In addition to 300 non-injurious turtle takes by relocation trawling, NMFS estimated that 0-2 turtles would be killed or injured annually during relocation trawling in the Gulf of Mexico. NMFS' 1997 South Atlantic hopper dredging RBO authorizes the COE to take, by injury or mortality, of up to 7 green turtles per fiscal year. Although hopper dredges can injure or kill loggerheads, implementation of the Reasonable and Prudent Measures and the Terms and Conditions in NMFS' 2003, 1997, and 1995 biological opinions on hopper dredging along the Gulf and Atlantic coasts, respectively, of the southeastern United States should minimize the impacts of incidental take on this species.

There is a large and growing body of literature on past, present, and future impacts of global climate change exacerbated and accelerated by human activities. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. NOAA's climate information portal provides basic background information on these and other measured or anticipated effects (see http://www.climate.gov).

Impacts on sea turtles currently cannot, for the most part, be predicted with any degree of certainty, however significant impacts to the hatchling sex ratios of green turtles may result (NMFS and USFWS 2007b). In marine turtles, sex is determined by temperature in the middle third of incubation, with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25°-35°C (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007b). Green sea turtle hatchling size also appears to be influenced by incubation temperatures, with smaller hatchlings produced at higher temperatures (Glenn et al. 2003).

The effects from increased temperatures may be exacerbated on developed nesting beaches where shoreline armoring and construction has denuded vegetation. Sea level rise from global climate change is also a potential problem, for areas with low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting sites and decrease available nesting habitat (Daniels et al. 1993, Fish et al. 2005, Baker et al. 2006). The loss of habitat as a result of climate change could

be accelerated due to a combination of other environmental and oceanographic changes such as increased frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006, Baker et al. 2006).

Other changes in the marine ecosystem caused by global climate change (e.g., salinity, oceanic currents, dissolved oxygen levels, nutrient distribution, etc.) could influence the distribution and abundance of phytoplankton, zooplankton, submerged aquatic vegetation, forage fish, etc., which could ultimately affect the primary foraging areas of green sea turtles.

3.2.3.4 Summary of Status for Atlantic Green Sea Turtles

Green turtles range in the western Atlantic from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean, but are considered rare in benthic areas north of Cape Hatteras (Wynne and Schwartz 1999). Green turtles face many of the anthropogenic threats described above. In addition, green turtles are also susceptible to fibropapillomatosis, which can result in death. In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). Recent population estimates for the western Atlantic area are not available. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the over 20 years of regular monitoring since establishment of index beaches in Florida in 1989.

4.0 ENVIRONMENTAL BASELINE

This section contains a description of the effects of past and ongoing human activities leading to the current status of the species, their habitat, and the ecosystem, within the action area. The environmental baseline is a snapshot of the factors affecting the species and includes federal, state, tribal, local, and private actions already affecting the species, or that will occur contemporaneously with the consultation in progress. Unrelated, future federal actions affecting the same species in the action area that have completed formal or informal consultation are also part of the environmental baseline, as are implemented and ongoing federal and other actions within the action area that may benefit listed species.

4.1 Status of Loggerhead, Kemp's Ridley, and Green Sea Turtles in the Action Area

Loggerheads are circumglobal, occurring throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Loggerheads are the most abundant species of sea turtle found in U.S. coastal waters (http://www.NMFS.noaa.gov/pr/species/turtles/loggerhead.htm). Loggerhead sea turtles found in the immediate project area may travel widely throughout the Atlantic, Pacific, and Indian Oceans, and individuals found in the action area can potentially be affected by activities anywhere within this wide range.

Kemp's ridley sea turtles are distributed throughout the Gulf of Mexico and U.S. Atlantic seaboard, from Florida to New England. A few records exist for Kemp's ridleys near the Azores, waters off Morocco, and within the Mediterranean Sea (http://www.NMFS.noaa.gov/pr/species/turtles/kempsridley.htm). Similar to loggerheads, Kemp's ridley sea turtles found in the immediate project area may travel widely throughout their range, and

individuals found in the action area can potentially be affected by activities anywhere within their range.

Green sea turtles are also circumglobal, and can be found in the Pacific, Indian and Atlantic Oceans as well as the Mediterranean Sea (NMFS and USFWS 1991a, Seminoff 2004, NMFS and USFWS 2007b). In 1978, the Atlantic population of the green sea turtle was listed as threatened under the ESA, except for the breeding populations in Florida and on the Pacific coast of Mexico, which were listed as endangered. As with loggerheads and Kemp's ridleys, green sea turtles found in the immediate project area may travel widely throughout their range, and individuals found in the action area can potentially be affected by activities anywhere within their range.

Potential impacts outside of the action area are discussed and incorporated as part of the overall status of the species as detailed in Section 3.2 above. The following environmental baseline includes past and ongoing human activities in the action area that relate to the status of the species. Within the action area, there is limited information on the status of loggerhead and Kemp's ridley sea turtles regarding estimated numbers or population trends. According to the Air Force's biological assessment, Kemp's ridley sea turtles do not nest on the shoreline within the action area; however, loggerhead turtles do nest on the shoreline within the action area. In 2008, there were 1,000 reported loggerhead turtle nests on the Patrick Air Force Base shoreline (Air Force's Biological Assessment 2009). Based on our review of a 2005 protected species monitoring report for the 2005 Patrick Air Force Base (PAFB) and Brevard County beach renourishment projects (available on the COE's Sea Turtle Data Warehouse web site at http://el.erdc.usace.army.mil/seaturtles/pdfs/saj2005-2-ofr.pdf), loggerheads and Kemp's ridleys are known to occur within the action area for this project. While no turtle takes resulted from the 2005 PAFB project (dredging occurred from March 7-19, 2005), three loggerhead sea turtles were taken by hopper dredge during the Brevard County beach renourishment project in 2005 (dredging occurred from March 19, 2005 until – May 14, 2005). That project immediately followed the PAFB project, was located just south of the PAFB project, and used the same borrow area. In addition to three lethal loggerhead takes by hopper dredge, pre-dredge trawling for the 2005 Brevard County project captured and successfully relocated three loggerheads. After the second loggerhead turtle was taken by hopper dredge on May 3, 2005, relocation trawling was initiated; 25 turtles were successfully relocated between May 4-14, 2005 (24 loggerheads and one Kemp's ridley, http://el.erdc.usace.army.mil/seaturtles/project.cfm?Id=348&Code=Project). While this information demonstrates that loggerhead and Kemp's ridley sea turtles are known to occur in the action area, it does not provide quantitative information on status, trends, or density of these species in the action area. NMFS is not aware of any quantitative studies within the action area assessing the trend or density of in-water loggerhead or Kemp's ridley populations at this time. However, stranding data is available for Brevard County through 2007. Based on a search of the NMFS' Southeast Fisheries Science Center (SEFSC) Sea Turtle Stranding and Salvage Network data (available at http://www.sefsc.noaa.gov/seaturtlesprogram.jsp), there were 143 loggerhead turtles and 4 Kemp's ridley turtles that stranded in Brevard County in 2007.

Similar to loggerheads and Kemp's ridleys, there is limited information on the status of green turtles in the action area regarding estimated numbers or population trends. According the Air Force's Biological Assessment, there were approximately 30 green turtle nests on the PAFB

shoreline in 2008. It is known that juvenile green sea turtles show a preferential use of nearshore, high-energy hardbottom habitat in the area as both foraging grounds and refuge/rest areas. Even after scouring from storms eliminated the algal growth in an area for prolonged periods, juvenile green turtles continue to show a preferential use of that habitat. It is thought that foraging in such cases takes place in nearby deeper habitats but the turtles return to take refuge in the crevices of the nearshore rock (Dynamac Corporation 2005). There are no quantitative studies within the action area assessing the trend or density of in-water green turtle populations at this time. In 2003, 2004, and 2005, in-water surveys were conducted by Dynamac Corporation for the Brevard County Mid-Reach beach renourishment project, which is located just south of the PAFB project. A total of 163 turtles were sighted during visual transect surveys, only one of which was a loggerhead, the rest were greens. Net-capture studies over that same period yielded 29 captures, all of them green turtles. It is notable that of all of the green turtle sightings in the Brevard nearshore hardbottom habitat, no incidences of fibropapillomatosis have been seen. It is one of only two East Coast locations where that disease has never been found (Dynamac Corporation 2005). In addition, strandings data that is available on the SEFSC's website indicates there were 97 reported green turtle strandings in Brevard County in 2007. More recent data (for 2008 and 2009) is not yet available on the SEFSC's website.

4.1.1 Federal Actions

In recent years, NMFS has undertaken several ESA section 7 consultations to address the effects of federal actions on loggerhead, green, and Kemp's ridley sea turtles, and, when appropriate, has authorized the incidental taking of these species. Each of those consultations sought to develop ways of reducing the probability of adverse effects of the action on loggerhead, green, and Kemp's ridley sea turtles. Similarly, NMFS has undertaken recovery actions under the ESA and is addressing the problem of take of sea turtles in the fishing and shipping industries and other activities such as COE dredging operations. The summary below of anticipated sources of incidental take of sea turtles includes only those federal actions in the South Atlantic including the project area which have already concluded or are currently undergoing formal section 7 consultation.

Fisheries

Several types of fishing gear are known to adversely affect sea turtles. These gears, including gillnet, hook-and-line (i.e., vertical line and longline), and trawl gear, have all been documented as interacting with sea turtles. For all fisheries for which there is a Fishery Management Plan (FMP) or for which any federal action is taken to manage that fishery, the impacts have been evaluated via section 7 consultation. Formal section 7 consultations have been conducted on the following fisheries: the Atlantic highly migratory species (HMS) pelagic longline fishery; the HMS shark fishery; dolphin/wahoo fishery; the Southeast shrimp trawl fishery; the snapper/grouper hook-and-line fishery; and the coastal migratory pelagics fishery. A summary of each consultation is provided below.

On June 1, 2004, NMFS completed an opinion on the continued operation of the Atlantic HMS pelagic longline fishery in the Atlantic, Gulf of Mexico, and Caribbean (NMFS 2004a). The opinion found that the continued prosecution of the pelagic longline fishery was likely to

jeopardize the continued existence of leatherback sea turtles. However, NMFS implemented an RPA to allow for the continuation of the pelagic longline fishery without jeopardizing that species. The provisions of the RPA included measures to: (1) Reduce post-release mortality of leatherbacks; (2) improve monitoring of the effects of the fishery; (3) confirm the effectiveness of the hook and bait combinations that are required as part of the proposed action; and (4) take management action to avoid long-term elevations in leatherback takes or mortality. All other sea turtle species were found not likely to be jeopardized. The following amount of annual incidental take is anticipated in the future (2005 and beyond): 588 leatherbacks per year, 635 loggerheads, and a total of 35 individuals per year of either green, hawksbill, Kemp's ridley, and olive ridley turtles.

The Atlantic shark fisheries (Gulf of Mexico, Atlantic Ocean, and Caribbean Sea) include commercial shark bottom longline and drift gillnet fisheries and recreational shark fisheries under the FMP for Atlantic Tunas, Swordfish, and Sharks (HMS FMP). The shark bottom longline and drift gillnet fisheries were both found likely to adversely affect sea turtles. An ESA section 7 consultation was completed on October 29, 2003, on the continued operation of those fisheries and the July 2003 Proposed Rule for Draft Amendment 1 to the HMS FMP (NMFS 2003a). The opinion concluded the proposed action was not likely to jeopardize the continued existence of any listed sea turtles. An Incidental Take Statement (ITS) was provided authorizing incidental take of 5 live green turtles and 5 dead green turtles[4].

The FMP for the dolphin/wahoo fishery (U.S. Atlantic EEZ) was approved in December 2003. NMFS conducted a formal section 7 consultation to consider the effects of implementation of the FMP on sea turtles. The biological opinion concluded that loggerhead, leatherback, hawksbill, green, and Kemp's ridley sea turtles may be adversely affected by operation of the fishery. However, the proposed action was not expected to jeopardize the continued existence of any of these species. An ITS authorized incidental take of 2 live green turtles and 1 dead green turtle (this is a one-year estimate).

The Southeast shrimp trawl fishery affects more sea turtles than all other activities combined (NRC 1990). This fishery operates in the Gulf of Mexico and the South Atlantic (from the VA/NC border to the east coast of Florida). On December 2, 2002, NMFS completed the opinion for shrimp trawling in the southeastern United States under proposed revisions to the TED regulations (68 FR 8456, February 21, 2003). This opinion determined that the shrimp trawl fishery under the revised TED regulations would not jeopardize the continued existence of any sea turtle species. This determination was based, in part, on the opinion's analysis that shows the revised TED regulations are expected to reduce shrimp trawl related mortality by 94 percent for loggerheads and 97 percent for leatherbacks. For green turtles, the ITS authorized incidental take of 18,243 live turtles and 514 dead turtles (this is a one-year estimate).

A section 7 consultation on the South Atlantic snapper-grouper fishery (NMFS 2006) has recently been completed by NMFS. This fishery operates from the VA/NC border to the east coast of

[4] This is a five-year estimate. Green, Kemp's ridley, and hawksbill turtles were estimated to comprise no more than 30 turtle takes in combination over five years.

Florida. The fishery uses: spear and powerhead, black sea bass pot, and hook-and-line gear. Hook-and-line gear used in the fishery includes commercial bottom longline gear and commercial and recreational vertical line gear (e.g., handline, bandit gear, rod and reel). The consultation found only hook-and-line gear is likely to adversely affect, green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles. The consultation concluded the proposed action was not likely to jeopardize the continued existence of any of these species. An ITS was provided that authorized the incidental take of 25 live green turtles and 14 dead green turtles (this is a three-year estimate).

NMFS recently completed a section 7 consultation on the continued authorization of the coastal migratory pelagic fishery in the Gulf of Mexico and South Atlantic (NMFS 2007). This fishery operates in the U.S. EEZ from the NY/NJ border to the east coast of Florida and the Gulf of Mexico. In the Gulf of Mexico, hook-and-line, gillnet, and cast net gears are used. Gillnets are the primary gear type used by commercial fishermen in the South Atlantic region as well, while the recreational sector uses hook-and-line gear. The biological opinion concluded that green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles may be adversely affected by operation of the fishery. However, the proposed action was not expected to jeopardize the continued existence of any of these species. An ITS was provided that authorized the incidental take of zero live green turtles and 14 dead green turtles (this is a three-year estimate).

NMFS completed a section 7 consultation on the Gulf and South Atlantic Spiny Lobster FMP on August 27, 2009 (NMFS 2009a). The commercial component of the fishery consists of diving, bully net, and trapping sectors; recreational fishers are authorized to use bully net and hand-harvest gears. Of the gears used, traps are expected to result in adverse effects on sea turtles. In the Gulf of Mexico, fishing activity is limited to waters off southwest Florida and, although the FMP does authorize the use of traps in federal waters, historic and current effort is very limited. Thus, potential adverse effects on sea turtles are believed to also be very limited (e.g., no more than a couple of sea turtle entanglements annually). The consultation determined the continued authorization of the fishery would not jeopardize any listed species. An ITS was issued for sea turtle takes in the commercial trap sector of the fishery.

Dredging

The construction and maintenance of federal navigation channels and sand mining ("borrow") areas has been identified as a source of sea turtle mortality. Hopper dredges move relatively rapidly (compared to sea turtle swimming speeds) and can entrain and kill sea turtles as the drag arm of the moving dredge overtakes the slower moving sea turtle. The COE has biological opinions from NMFS covering the issue of hopper dredging in the Atlantic and Gulf of Mexico. Along the Atlantic coast of the southeastern United States, NMFS estimates that annual observed injury or mortality of sea turtles from hopper dredging may reach 35 loggerheads, 7 greens, 7 Kemp's ridleys, and 2 hawksbills (NMFS 1997).

Beach Nourishment

The activity of beach nourishment, especially when impacts include the loss of nearshore hardbottom habitat along the east coast of Florida, has been identified as a source of take for juvenile green sea turtles. Juvenile green turtles are known to utilize these high-energy, dynamic habitats for foraging and as refugia, and show a preference for this habitat even when abundant

deeper-water sites are available. The loss of such limited habitat, especially when considering the cumulative loss as a result of beach nourishment activities occurring along the entire range of the habitat and continually over time, is expected to result in loss of foraging opportunities and protective refuge, which constitutes take under the ESA. The stresses are also expected to contribute to additional mortality of individuals already in poor condition as a result of disease or other factors (NMFS 2008a).

NMFS issued a biological opinion on March 13, 2008, for proposed beach renourishment of Reach 8 in Palm Beach County, Florida (F/SER/2007/08929). Although this project was never constructed, NMFS authorized take of up to 19 green sea turtles associated with the permanent loss of 6.95 acres of nearshore hardbottom, which serves as foraging and resting habitat for juvenile green turtles. While it is NMFS' opinion that this project is likely to adversely affect green sea turtles, NMFS concluded that the proposed action was not likely to jeopardize their continued existence.

NMFS issued a biological opinion on September 4, 2008, for the Brevard County Mid-Reach beach renourishment project (F/SER/2005/06003). The Mid-Reach project is located just south of the PAFB project and used the same proposed borrow areas (Canaveral Shoals). A hopper dredge was also used for the Mid-Reach project. NMFS' authorized non-lethal take of up to 15 green turtles associated with the estimated loss of 2.95 acres of nearshore foraging and resting habitat. While it is NMFS' opinion that this project is likely to adversely affect green sea turtles, NMFS concluded that the proposed action was not likely to jeopardize their continued existence.

NMFS issued a biological opinion on January 9, 2009, for proposed beach renourishment of Juno Beach in Palm Beach County, Florida (F/SER/2008/04413). NMFS authorized the non-lethal take of 8 green sea turtles and the lethal take of one green sea turtle associated with the permanent loss of approximately 1.7 acres of nearshore hardbottom, which serves as foraging and resting habitat for juvenile green turtles. While it is NMFS' opinion that this project is likely to adversely affect green sea turtles, NMFS concluded that the proposed action was not likely to jeopardize their continued existence.

ESA Permits

The ESA allows the issuance of permits to take ESA-listed species for the purposes of scientific research (section 10(a)(1)(a)). In addition, the ESA allows for NMFS to enter into cooperative agreements with states developed under section 6 of the ESA, to assist in recovery actions of listed species. Prior to issuance of these authorizations, the proposal must be reviewed for compliance with section 7 of the ESA.

Sea turtles are the focus of research activities authorized by a section 10 permit under the ESA. Authorized activities range from photographing, weighing, and tagging sea turtles incidentally taken in fisheries, blood sampling, tissue sampling (biopsy), and performing laparoscopy on intentionally captured turtles. The number of authorized takes varies widely depending on the research and species involved but may involve the taking of hundreds of turtles annually. Most takes authorized under these permits are expected to be non-lethal. Before any research permit is issued, the proposal must be reviewed under the permit regulations (i.e., must show a benefit to the

species). In addition, since issuance of the permit is a federal activity, issuance of the permit by NMFS must also be reviewed for compliance with section 7(a)(2) of the ESA to ensure that issuance of the permit does not result in jeopardy to the species.

4.1.2 State or Private Actions

Vessel Traffic
Commercial traffic and recreational pursuits can have an adverse effect on sea turtles through propeller and boat strike damage. The extent of the impact on sea turtles is not known at this time.

State Fisheries
There are two commercial state fisheries that potentially operate in the action area – blue crab and white shrimp. There is a blue crab commercial fishery in Brevard County; however, this fishery primarily operates in inshore waters of the Atlantic Intracoastal Waterway and rivers (Lisa Gregg, FWC, personal communication, 4-23-10). In addition, there is a white shrimp fishery in Brevard County that operates in the Indian River Lagoon and along the east-central Florida coast (http://www.sms.si.edu/IRLSpec/Penaeu_setife.htm). Recreational fishing from private vessels and from shore also occurs in the area. Observations of state recreational fisheries have shown that loggerhead, leatherback, and green sea turtles are known to bite baited hooks, and loggerheads frequently ingest the hooks. Hooked turtles have been reported by the public fishing from boats, piers, and beach, banks, and jetties and from commercial fishermen fishing for reef fish and for sharks with both single rigs and bottom longlines (NMFS 2001). Additionally, lost fishing gear such as lines cut after snagging on rocks, or discarded hooks and line, can also pose an entanglement threat to sea turtles in the area. A detailed summary of the known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the TEWG reports (1998; 2000).

In-water Research Projects
In Florida, in-water sea turtle research has increased in recent years, but no coordinated trend monitoring program exists for in-water populations. The first step in developing such a program involves determining what research is actually taking place. Researchers in FWRI's marine turtle program inventoried all in-water marine turtle research that has been conducted in Florida. Through the use of interviews, questionnaires, and literature reviews, researchers compiled a comprehensive database containing detailed information on 36 research projects (21 active, 15 inactive) focusing on in-water aggregations of sea turtles. Geographic Information Systems (GIS) maps were also developed for each project that will serve as examples to in-water researchers of how GIS can be used to enhance their studies (FWRI online article 2008 http://research.myfwc.com/features/view_article.asp?id=27486).

The vast majority of in-water projects (24) are, or were, located on the southeast coast of Florida. Based on the information compiled, candidate projects were identified for inclusion in a statewide in-water index monitoring program that would provide trend information on sea turtles in Florida's waters. Recommendations were presented on how to develop such a program, which would include the measurement of capture effort, promotion of cooperation among in-water research

groups, and standardization of data collection methods resulting in a consistent set of measurements.

In addition to dedicated in-water studies, other projects and activities were identified that involve the collection of sea turtle data, often secondary to the primary purpose. These projects provide important data on general turtle distributions and can identify target areas for future in-depth studies. Many of these projects are conducted by other sections of FWRI, including capture efforts and aerial surveys for manatees or fish. Other data come from incidental capture in fisheries research projects, or by the fisheries themselves. Pre-dredge trawling, sea turtle aerial surveys, stranding networks, and satellite tracking of sea turtles also provide important distributional data. The end result of this project is a narrative document that will function as a guide to in-water research in Florida.

4.1.3 Other Potential Sources of Impacts in the Environmental Baseline

A number of activities that may indirectly affect listed species in the action area of this consultation include anthropogenic marine debris, climate change, and associated sea-level rise. The impacts from these activities are difficult to measure. Where possible, conservation actions are being implemented to monitor or study impacts from these sources.

Climate Change and Sea-level Rise
The IPCC (2007) has stated that global climate change is unequivocal. However, the impacts on sea turtles currently cannot, for the most part, be predicted with any degree of certainty. Climate change may significantly impact the hatchling sex ratios of green, loggerhead, and Kemp's ridley sea turtles (NMFS and USFWS 2007, 2007a-b; Wibbels 2003). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007, 2007a-b). Green sea turtle hatchling size may be influenced by incubation temperatures, with smaller hatchlings produced at higher temperatures (Glenn et al. 2003).

The effects from increased temperatures may be exacerbated on developed nesting beaches where shoreline armoring and construction has denuded vegetation. Sea level rise from global climate change (IPCC 2007) is also a potential problem, particularly for areas with low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting sites and decrease available nesting habitat (Daniels et al. 1993, Fish et al. 2005, Baker et al. 2006). The loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as increased frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006, Baker et al. 2006).

Other changes in the marine ecosystem caused by global climate change (e.g., salinity, oceanic currents, dissolved oxygen levels, nutrient distribution, etc.) could influence the distribution and abundance of phytoplankton, zooplankton, submerged aquatic vegetation, forage fish, etc., which could ultimately affect the primary foraging areas of green, loggerhead, and Kemp's ridley sea turtles.

Marine Pollution and Debris
Sources of pollutants along the Atlantic coastal regions include atmospheric loading of pollutants such as PCBs, stormwater runoff from coastal towns and cities into rivers and canals emptying into bays and the ocean, and groundwater and other discharges. Nutrient loading from land-based sources such as coastal community discharges is known to stimulate plankton blooms in closed or semi-closed estuarine systems. The effects on larger embayments are unknown. Although pathological effects of oil spills have been documented in laboratory studies of marine mammals and sea turtles (Vargo et al. 1986), the impacts of many other anthropogenic toxins have not been investigated. Sea turtles have also been known to ingest plastic and other types of marine debris, possibly mistaking these items for prey. The ingestion of plastic and other types of marine debris may lead to decreased fitness and possibly death in some cases.

4.1.4 Conservation and Recovery Actions Shaping the Environmental Baseline

NMFS and cooperating states have established an extensive network of Sea Turtle Stranding and Salvage Network (STSSN) participants along the Atlantic and Gulf of Mexico coasts that not only collect data on dead sea turtles, but also rescue and rehabilitate any live stranded sea turtles.

In response to the growing awareness of recreational fishery impacts on sea turtles, the Marine Recreational Fishery Statistics Survey (MRFSS) added a survey question regarding sea turtle interactions within recreational fisheries in 2006. NMFS is exploring potential revisions to MRFSS to quantify recreational encounters with sea turtles on a permanent basis.

5.0 EFFECTS OF THE ACTION

In this section of the opinion, we assess the effects of the proposed action on loggerhead, green, and Kemp's ridley sea turtles within the action area. The analysis in this section forms the foundation for our jeopardy analysis in Section 7. A jeopardy determination is reached if we would reasonably expect a proposed action to cause reductions in numbers, reproduction, or distribution that would appreciably reduce a listed species' likelihood of surviving and recovering in the wild.

The quantitative and qualitative analyses in this section are based upon the best scientific and commercial data available on sea turtle biology and the effects of the proposed action. When analyzing the effects of any action, it is important to consider indirect effects as well as the direct effects. Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects include aspects such as habitat loss and degradation, reduction of prey/foraging base, etc. Of the activities related to this project, NMFS believes that hopper dredging is likely to adversely affect loggerhead, green, and Kemp's ridley sea turtles. In addition, we believe that relocation trawling could adversely affect these species; however, we would expect relocation trawling to minimize the amount of lethal take by hopper dredge. While it is possible that relocation trawling could result in lethal take of sea turtles, this possibility is remote. Adverse effects from short duration trawls are rare, but are not discountable. The remainder of our analysis will focus on the potential for adverse effects to loggerhead, green, and

Kemp's ridley sea turtles in the action area from a combination of hopper dredging and relocation trawling.

Due to the extensive analyses provided in NMFS' 1991, 1995, 1997, and 2003 opinions, and publications by research organizations (e.g., National Research Council 1990) on the effects of hopper dredging on sea turtles, we will not repeat those analyses here but they are incorporated by reference. That effects of hopper dredging on sea turtles include direct injury and mortality has been well-documented in the southeastern and mid-Atlantic United States. Solutions, including modification of dredges and time/area closures, have been successfully implemented to reduce sea turtle mortality and injury in the United States (NMFS 1991, 1995, 1997; Nelson and Shafer 1996). In regards to the proposed action, we believe that loggerhead, Kemp's ridley, and green sea turtles may be killed by hopper dredging in association with beach renourishment in the action area. However, implementation of the Reasonable and Prudent Measures and the Terms and Conditions in NMFS' 1997 RBO on hopper dredging along the South Atlantic Coast (including relocation trawling to remove sea turtles from the dredge's path) is expected to minimize incidental take by hopper dredge. In rare cases, however, even properly conducted relocation trawling may injure or kill sea turtles (NMFS 2003). This usually occurs if the animals are already stressed due to compromised health or other factors (NMFS 2003). However, most sea turtles captured and relocated by qualified relocation trawlers suffer minimal or no harm. Nevertheless, we believe the non-discountable possibility exists that some loggerhead, Kemp's ridley, and green sea turtles in the action area may be harmed or killed by relocation trawling.

Some turtles captured during relocation trawling return to the dredge site and are subsequently recaptured. Sea turtle relocation studies by Standora et al. (1993) at Canaveral Channel relocated 34 turtles to six release sites of varying distances north and south of the channel. Ten turtles returned from southern release sites, and seven from northern sites, suggesting that there was no significant difference between directions. REMSA, a private company contracted to conduct relocation trawling, captured, tagged, and relocated 69 turtles in a 7-day period at Canaveral Channel in October 2002, with no recaptures; turtles were relocated a minimum of 3-4 miles away (Trish Bargo, REMSA, June 2, 2003 pers. comm. to Eric Hawk).

Prior to 1997, most relocation trawling in association with hopper dredging was performed by the COE under a NMFS ESA section 10 incidental take/research permit. Since then, however, relocation trawling has primarily been conducted by private companies. Recently, Coastwise Consulting, Inc., conducted over 132 days of relocation trawling at Morehead City, North Carolina; Charleston, South Carolina; and Kings Bay, Georgia (e-mail, C. Slay to E. Hawk, October 25, 2002). During the course of this work, at least 43 loggerheads, ten Kemp's ridleys, and one green turtle were successfully captured, tagged, and released. No dead or injured turtles were encountered and no captured turtles were recaptured during this work. Since around 1998 through 2002, Coastwise Consulting captured, tagged, and released approximately 80-90 turtles, with no evidence of injury or mortality (Pers. comm., C. Slay to E. Hawk, December 6, 2002). On the Atlantic coast, REMSA has also successfully tagged and relocated hundreds of sea turtles. For example, 69 turtles (55 loggerheads and 14 greens) were relocated in a 7-day period at Canaveral Channel in October 2002, with no significant injuries. Other sea turtle relocation contractors (R. Metzger in 2001; C. Oravetz in 2002) have also successfully and non-injuriously trawl-captured

and released sea turtles out of the path of oncoming hopper dredges. In the Gulf of Mexico, REMSA captured, tagged, and relocated 71 turtles at Aransas Pass with no apparent long-term ill effects to the turtles. Three injured turtles captured were subsequently transported to University of Texas Marine Science Institute rehabilitation facilities for treatment (two had old, non-trawl related injuries or wounds; the third turtle may have sustained an injury to its flipper, apparently from the door chain of the trawl, during capture). Three of the 71 captures were recaptures that were released around 1.5, three, and five miles, respectively, from the dredge site and exhibited no evidence that their capture, tag, release, and subsequent recapture, was in any way detrimental (NMFS 2003). The most recent data available on the COE's Sea Turtle Database Warehouse web site (http://el.erdc.usace.army.mil/seaturtles/info.cfm?Type=District&Code=SAJ) for Fiscal Year 2010 indicates that relocation trawling in the Jacksonville District has only been implemented for one project (King's Bay Entrance Channel); however, no sea turtles were captured.

The effects of capture and handling on sea turtles can result in elevated levels of stressor hormones, and can cause some discomfort during tagging procedures. Based on past observations obtained during similar research-trawling for turtles, these effects are expected to dissipate within a day (Stabenau and Vietti 1991). Since turtle recaptures are rare, and recaptures that do occur typically happen several days to weeks after initial capture, cumulative adverse effects of recapture are not expected.

Rarely, even properly conducted relocation trawling can result in accidental sea turtle deaths. Henwood (pers. comm. to E. Hawk, December 6, 2002) noted that trawl-captured loggerhead sea turtles died on several occasions during handling on deck during winter trawling in Canaveral Channel in the early 1980s, after short (approximately 30-minute) tow times. However, Henwood also noted that a significant number of the loggerheads captured at Canaveral during winter months appeared to be physically stressed and in poor shape compared to loggerheads captured in the summer months from the same site, which appeared much healthier and robust. Stressed or unhealthy turtles or turtles exposed to repeated forced submergences are more likely to be injured or killed during relocation trawling than healthy turtles (NMFS 2003). In November 2002, during relocation trawling conducted in York Spit, Virginia, a Kemp's ridley sea turtle was likely struck by one of the heavy trawl doors, or it may have been struck and killed by another vessel shortly before trawl net capture. The hopper dredge was not working in the area at the time (pers. comms. and e-mails, T. Bargo to E. Hawk, December 6 and 9, 2002).

NMFS Southeast Region biological opinions typically limit tow times for relocation trawling to 42 minutes or less measured from the time the trawl doors enter the water when setting the net to the time the trawl doors exit the water during haulback ("doors in - doors out"). The National Research Council report "Decline of the Sea Turtles: Causes and Prevention" (NRC 1990) suggested that limiting tow durations to 40 minutes in summer and 60 minutes in winter would yield sea turtle survival rates that approximate those required for the approval of new TED designs, i.e., 97 percent. The NRC report also concluded that mortality of turtles caught in shrimp trawls increases markedly for tow times greater than 60 minutes. Current NMFS' TED regulations allow, under very specific circumstances, for shrimpers with no mechanical-advantage trawl retrieval devices on board, to be exempt from federal TED requirements if they limit tow times to 55 minutes during April through October and 75 minutes from November through March. The

presumption is that these tow time limits will result in turtle survivability comparable to having TEDs installed.

In summary, NMFS believes that properly conducted and supervised relocation trawling (i.e., conducted according to NMFS-approved trawl speed and tow-time limits, and taking adequate precautions to release captured animals) and tagging is unlikely to result in injury or death of sea turtles (although capturing sea turtles during relocation trawling is considered take). NMFS estimates that, overall, sea turtle trawling and relocation efforts will result in considerably less than 0.5 percent mortality of captured turtles, primarily due to their being previously stressed or diseased or if struck by trawl doors or accidents on deck. On the other hand, hopper dredge entrainments invariably result in injury, and are almost always fatal. Although the likelihood of injury or death to a sea turtle from relocation trawling is rare, it is still a possibility and we must estimate lethal take to account for this potential adverse effect. In addition, we must also estimate the amount of non-lethal take (i.e., by stress) associated with the act of relocation trawling. As discussed above, relocation trawling may result in short-term stress to animals that are captured in the trawl, tagged, and then relocated several miles from the action area.

We must determine the number of turtles that may be killed (by hopper dredging and/or relocation trawling) and the number of turtles that may be taken, non-lethally, by the act of capturing and relocating them during relocation trawling. We will begin our analysis with an estimate of the number of turtles that may be killed by hopper dredging. We will use the 2005 Brevard County Shore Protection Project (SPP) as a proxy to estimate take from the proposed action. The Brevard County SPP is located just south of the action area. In the past, PAFB and the Brevard County SPP have used the same borrow area (i.e., Canaveral Shoals). Canaveral Shoals is also proposed for the current PAFB project. The COE has posted reported sea turtle takes from the Brevard County SPP on the internet for the years 2001-2003 and 2005 on their Sea Turtle Data Warehouse web site (http://el.erdc.usace.army.mil/seaturtles/info.cfm?Type=District&Code=SAJ). There have been no reported sea turtle takes from the previous two renourishments (in 2000 and 2005) at PAFB. However, sea turtle takes have occurred in association with the Brevard County SPP in 2001, 2002, and 2005. No sea turtle takes were reported in 2003 for the Brevard County SPP. All sea turtles taken by hopper dredge and relocation trawling were loggerheads, with the exception of one Kemp's ridley turtle that was taken by relocation trawling in 2005. The following table is a summary of the sea turtle takes associated with the Brevard County SPP from 2001-2003 and 2005.

Table 1: Summary of Sea Turtle Takes for the Brevard SPP from 2001-2003 and 2005

	Total takes by dredge	**Total takes by relocation trawling**	**Borrow Area**	**Dredging dates**	**Total # of dredge days**	**Total # of cubic yards dredged**
2001	1 adult loggerhead (3/31/01)	None conducted	Canaveral Shoals	10/1/00 – 2/23/01; 3/8/01-4/5/01	214	4,596,516
2002	1 subadult	None	Space Coast	1/13/02 –	77	1,632,105

	loggerhead (2/18/02)	conducted	Shoals	2/22/02; 2/24/02-4/4/02		
2003	None	None conducted	Canaveral Shoals	3/28/03-4/26/03	28	439,126
2005[5]	3 loggerheads (4/26/05 – adult; 5/3/05 – adult; 5/13/05 – unknown)	3 loggerheads (3/18-3/20/05); after 2nd turtle take by the dredge, relocation trawling began on 5/5-5/14/05; 24 loggerheads & 1 Kemp's ridley were relocated	Canaveral Shoals	3/19/05-5/14/05	128	900,000

The total number of cubic yards dredged for the Brevard County SPP for 2001, 2002, and 2005 (all years in which sea turtles were taken by hopper dredge) was 6,528,621. The total number of sea turtles (all loggerheads) that were taken by hopper dredge in association with the Brevard County SPP for the years 2001-2002 and 2005 is five (three loggerheads in 2005, one loggerhead in 2002 and another in 2001). If we divide the total number of cubic yards dredged (6,528,621) by the total number of sea turtles taken by hopper dredge (five), this equals one sea turtle take for every 1,305,724 cubic yards dredged. The proposed action would dredge approximately 350,000 cubic yards of material from Canaveral Shoals. Based on the calculations above, only a fraction of a turtle would be taken by the proposed action. Therefore, we must round up to one sea turtle take for every 350,000 cubic yards dredged. Although only loggerheads were taken by hopper dredge during the Brevard County SPPs, we have already established that the proposed action may also take (by hopper dredge) Kemp's ridley and green sea turtles. However, we believe that the proposed action would only kill (by hopper dredge) one sea turtle for every 350,000 cubic yards dredged. This individual could be any one of the species that may be adversely affected (i.e., loggerhead, Kemp's ridley, or green turtles).

Based on our assessment, we believe that the proposed action has the potential to kill (by hopper dredge) one sea turtle (either loggerhead, green, or Kemp's ridley) for every 350,000 cubic yards dredged. However, the current project schedule for PAFB is one renourishment event every five years. PAFB requested take coverage to cover two renourishment cycles (i.e., one renourishment event every five years multiplied by two cycles = ten years). Therefore, we believe the proposed

[5] It is worth noting that PAFB conducted a beach renourishment project using a hopper dredge and the Canaveral Shoals borrow area from March 7-19, 2005 without taking any sea turtles. The 2005 PAFB beach renourishment project immediately preceded the Brevard County SPP that same year.

action has the potential to kill (by hopper dredge) two sea turtles over a 10-year period (i.e., two renourishment cycles). The two sea turtles that may be killed by hopper dredge could be one of the species that may be adversely affected (e.g., two loggerheads) or it may be a combination of these species (i.e., one loggerhead and one green turtle; one loggerhead and one Kemp's ridley turtle; or one green and one Kemp's ridley turtle).

In addition to take by hopper dredge, we believe the proposed action has the potential to take sea turtles by relocation trawling. We believe that the majority of sea turtles affected by relocation trawling will not be injured or killed. As discussed earlier in this opinion, NMFS believes that properly conducted and supervised relocation trawling (i.e., observing NMFS-approved trawl speed and tow-time limits, and taking adequate precautions to release captured animals) and tagging is unlikely to result in injury to or death of sea turtles. Nevertheless, the effects of capture and handling on sea turtles during relocation trawling can result in elevated levels of stressor hormones and tagging procedures can cause some discomfort. Based on past observations obtained during similar research-trawling for turtles, these effects are expected to dissipate within a day (Stabenau and Vietti 1999). Since sea turtle recaptures are rare, and recaptures that do occur typically happen several days to weeks after initial capture, cumulative adverse effects of recapture are not expected.

In order to estimate the potential take of loggerhead, green, and Kemp's ridley sea turtles associated with relocation trawling for the PAFB project, we will use the Brevard County SPP 2005 dataset and the Canaveral Harbor Entrance Channel dredging 2002 and 2004 datasets as the basis for our estimate. Based on the data we have reviewed for past Brevard County SPPs, predominantly loggerhead sea turtles were captured during relocation trawling in 2005 (27 out of the 28 turtles captured and relocated were loggerheads; one Kemp's ridley was captured and relocated). Relocation trawling was not conducted during the Brevard County SPPs in the years prior to 2005.

Relocation trawling was conducted during 2002 and 2004 in association with hopper dredging at the Canaveral Harbor Entrance Channel (http://el.erdc.usace.army.mil/seaturtles/info.cfm?Type=District&Code=SAJ). In 2004, relocation trawling took a total of 119 sea turtles, of which 90 were loggerheads and 29 were greens. One small juvenile green turtle was injured (the incident report said its flipper and head were caught in the trawl net and it sustained a broken neck) and killed after drowning in the trawl net. However, incidents such as this are rare. In 2002, relocation trawling at Canaveral took a total of 69 turtles, of which 55 were loggerheads and 14 were greens. All turtles were successfully relocated (i.e., no reported injuries or deaths). Of the 69 turtles relocated, 14 were greens.

If we combine the 2005 Brevard County SPP dataset with the Canaveral 2002 and 2004 datasets, a total of 172 loggerhead turtles, 43 green turtles, and one Kemp's ridley turtle were taken by relocation trawling. Note that the 2005 Brevard County SPP did not take any green turtles by relocation trawling; however, NMFS believes there is a possibility that green turtles in the action area may be taken by relocation trawling, which is why we have included them in our analysis and we have incorporated the Canaveral project in order to estimate potential green turtle take by relocation trawling for the PAFB project. If we divide 172 (loggerheads) by 3 (the number of

projects in our calculation), the average is approximately 58 loggerhead turtles per project. Using the Brevard SPP 2005 project and the Canaveral 2002 and 2004 projects as proxies, NMFS believes that the proposed action has the potential to take (by relocation trawling) 58 loggerhead turtles per renourishment cycle. Therefore, over a 10-year period (i.e., two renourishment cycles), NMFS believes that the proposed action has the potential to take (by relocation trawling) up to 116 loggerhead turtles.

Only the Canaveral 2002 and 2004 dredging projects took green turtles by relocation trawling. A total of 43 green turtles were captured (one lethally in 2004) and 42 were relocated. If we divide 43 (greens) by 2 (the number of projects in our calculation that captured green turtles), the average is 21.5 or 22 green turtles per project. Using the Canaveral 2002 and 2004 dredging projects as proxies, NMFS believes that the proposed action has the potential to take (by relocation trawling) 22 green turtles per renourishment cycle. Therefore, over a 10-year period (i.e., two renourishment cycles), NMFS believes that the proposed action has the potential to take (by relocation trawling) up to 44 green turtles.

Only the Brevard SPP 2005 project took a Kemp's ridley turtle during relocation trawling. Using the Brevard SPP 2005 project as a proxy, NMFS believes that the proposed action has the potential to take (by relocation trawling) one Kemp's ridley turtle per renourishment cycle. Therefore, over a 10-year period (i.e., two renourishment cycles), NMFS believes that the proposed action has the potential to take (by relocation trawling) up to two Kemp's ridley turtles.

NMFS believes there is a remote possibility that relocation trawling could injure or kill a few sea turtles that may already have impaired health. Stressed or unhealthy turtles or turtles exposed to repeated forced submergences are more likely to be injured or killed during relocation trawling than healthy turtles (NMFS 2003). In addition, there is a remote possibility that sea turtles could be injured by the heavy trawl doors. Because the risk of injury and death do exist, it will also be necessary to authorize lethal take associated with relocation trawling. NMFS believes that the proposed action may injure or kill (by relocation trawling) one sea turtle (either loggerhead, green, or Kemp's ridley) per renourishment cycle (i.e., every five years). Thus, of the total take of sea turtles by relocation trawling estimated above, over a 10-year period that covers two renourishment cycles, two of these takes may be lethal (this could be two individuals of the same species or two individuals of different species limited to loggerhead, green, and Kemp's ridley sea turtles). This estimate of lethal take by relocation trawling is not in addition to the estimates provided above, rather it is part of the total estimated take by relocation trawling.

In summary, we believe the proposed action would kill (by hopper dredge) two sea turtles (any combination of loggerhead, green, or Kemp's ridley) over a 10-year period (i.e., two renourishment cycles). In addition, we believe the proposed action would take (by relocation trawling) up to 116 loggerhead, 44 green, and two Kemp's ridley sea turtles over a 10-year period. Of the estimated take by relocation trawling, NMFS believes that two of these individuals (any combination of loggerhead, green, or Kemp's ridley) may be taken lethally over a 10-year period.

6.0 CUMULATIVE EFFECTS

Cumulative effects are the effects of future state, local, or private activities that are reasonably certain to occur within the action area considered in this biological opinion. Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Within the action area, major future changes are not anticipated in ongoing human activities described in the environmental baseline. The present human uses of the action area, such as recreational boating and fishing, are expected to continue at the present levels of intensity in the near future as are their associated risks of injury or mortality to sea turtles posed by incidental capture by fishermen, vessel collisions, marine debris, chemical discharges, and man-made noises.

Beachfront development, lighting, and beach erosion control are all ongoing activities along the southeastern coast of the United States. These activities potentially reduce or degrade sea turtle nesting habitats or interfere with hatchling movement to sea. Human activities and development along nesting beaches may also discourage sea turtles from nesting sites. However, more and more coastal counties have or are adopting more stringent protective measures to protect hatchling sea turtles from the disorienting effects of beach lighting. Some of these measures were drafted in response to lawsuits brought against the counties by concerned citizens who charged the counties with failing to uphold the ESA by allowing unregulated beach lighting which results in takes of hatchlings.

NMFS presumes that any additional increases in recreational vessel activity in inshore and offshore waters of the Atlantic Ocean will likely increase the risk of turtles taken by injury or mortality in vessel collisions. Recreational hook-and-line fisheries have been known to lethally take sea turtles. Future cooperation between NMFS and the states on these issues should help decrease take of sea turtles caused by recreational activities. NMFS will continue to work with states to develop ESA section 6 agreements and section 10 permits to enhance programs to quantify and mitigate these takes.

7.0 JEOPARDY ANALYSIS

The analyses conducted in the previous sections of this opinion serve to provide a basis to determine whether the proposed action would be likely to jeopardize the continued existence of green, loggerhead, and Kemp's ridley sea turtles. In Section 5, we outlined how the proposed action can affect loggerhead, green, and Kemp's ridley sea turtles, and the extent of those effects in terms of an estimate of the number of sea turtles that would be taken. Now we turn to an assessment of their potential response to this impact, in terms of overall population effects from the estimated take, and whether those effects of the proposed action, when considered in the context of the status of the species (Section 3), the environmental baseline (Section 4), and the cumulative effects (Section 6), will jeopardize the continued existence of the species. "To jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and the recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). Thus, in making this determination, we must first determine

whether there will be a reduction in the reproduction, numbers, or distribution. Then, if there is a reduction in one or more of these elements, we evaluate whether it will cause an appreciable reduction in the likelihood of both the survival and the recovery of these species in the wild.

7.1 Green Sea Turtles

This section analyzes the effects of the action on the likelihood of survival of green sea turtles in the wild. In this context, the survival of a species considers its current risk of extinction and how that may be increased by the proposed action. In the following analysis, we demonstrate that potentially killing two sea turtles by hopper dredge (possibly both greens) and two sea turtles by relocation trawling (possibly both greens) and potentially non-injuriously taking 44 green turtles (by relocation trawling) in two dredging/renourishment events over a 10-year period will not appreciably reduce the species' likelihood of survival in the wild.

Reduction in Numbers and Reproduction
NMFS believes that the effects of the proposed action resulting in the lethal take of up to four green turtles over ten years (by a combination of hopper dredging and relocation trawling) is not likely to appreciably reduce the survival of this species in the wild. As explained below, this reduction in numbers is expected to be short-term, as these four individuals are expected to be replaced by recruitment from younger age classes and new individuals from the species' numerous nesting populations.

Although the proposed action is not anticipated to adversely affect green turtles due to loss of foraging habitat (i.e., because nearshore hardbottom impacts are not anticipated), it is still worth noting that nearshore hardbottom can be found within and adjacent to the action area, so it is likely that juvenile green turtles forage on the nearshore hardbottom within and near the action area. Because green turtles may be present, the proposed action has the potential to affect them if they are taken by hopper dredge and/or relocation trawling. Due to the presence of nearshore hardbottom within and near the action area and due to juvenile green turtles' particular affinity for foraging on nearshore hardbottom habitats in southeast and east-central Florida, NMFS believes that if green turtles are taken by the proposed action, they would most likely be juveniles.

There have been recent efforts to determine the nesting population origins of green turtles assembled in Florida foraging areas. Juvenile green turtles that forage on southeast and east-central Florida's nearshore hardbottom habitats originate from a wide variety of nesting stocks, and not just the Florida breeding population. Mitochondrial DNA analyses show numerous haplotypes for green turtles in Florida developmental habitats, and indicate that the juveniles assembled in these areas originate from Barbados, Costa Rica, Florida, Mexico, Venezuela, and Suriname (Bass and Witzell 2000, Bagley et al. 2000, Bolker et al. 2007). Thus, it is not likely that all of the green turtles expected to be taken by the proposed action (up to four lethally and 42 non-lethally over a 10-year period) would originate from, and thus impact the growth rate of, a single nesting population. Moreover, as reported in the August 2007 ESA 5-year review of the green sea turtle (NMFS and USFWS 2007b), nesting populations are stable or increasing in all rookery areas in the Western Atlantic Ocean, including rookeries in Costa Rica, Florida, Mexico, Venezuela, and Suriname.

Further, based on the results from the first 24 years of an ongoing study of the species composition, population structures, and population trends of green sea turtles in the central region of the Indian River Lagoon in Florida, Ehrhart et al. (2007) reported a 661 percent increase in juvenile green turtle capture rates at their study area in the central region of the Indian River Lagoon. This increase in capture rates is similar to those recorded at the St. Lucie Power Plant over the same period (Wilcox et al. 1998). During this 24-year period, green turtle nest deposition in Florida has increased exponentially (Ehrhart et al. 2007). Since 1982, Ehrhart et al. (2007) have surveyed marine turtle nesting on a 21-km stretch of beach in southern Brevard County, Florida, now part of the Archie Carr National Wildlife Refuge. From 1990-1991 to 2004-2005, green turtle nest deposition increased 358 percent in southeast Florida (Ehrhart et al. 2007). Since 1989, the Florida Fish and Wildlife Research Institute's results of monitoring from index nesting beaches have shown that 90 percent of green turtle nest deposition occurs in southeast Florida (Brevard through Miami-Dade Counties). The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the 21 years of regular monitoring since establishment of index beaches in Florida in 1989. Based on these positive trends in green turtle nesting and recruitment in Florida, we believe the anticipated reduction in numbers of four green turtles over ten years is not expected to appreciably reduce the species' likelihood of survival in the wild. Regarding the anticipated non-lethal take of 44 green turtles by relocation trawling over a 10-year period, we believe this part of the proposed action (i.e., relocating turtles away from the dredge area) would not result in a reduction in numbers.

All life stages are important to the survival and recovery of the species; however, it is important to note that individuals of one life stage are not equivalent to those of other life stages. For example, the take of male juveniles may affect survivorship and recruitment rates into the reproductive population in any given year, and yet not significantly reduce the reproductive potential of the population. However, the death of mature breeding females can have an immediate effect on the reproductive rate of the species. Sub-lethal effects on adult females may also reduce reproduction by hindering foraging success, as sufficient energy reserves are probably necessary for producing multiple clutches of eggs in a breeding year. Different age classes may be subject to relative rates of mortality, resilience, and overall effects of population dynamics. In the case of the proposed action, we would expect all green turtles that may be taken (four lethally and 44 non-lethally over ten years) to be juveniles since juveniles utilize the nearshore hardbottom and reef habitats in southeast and east-central Florida as foraging and resting areas and nearshore hardbottom is found within and near the action area. The non-lethal take of 44 juvenile green turtles over ten years is not expected to result in a reduction in reproduction, assuming that all of these individuals survive and reach reproductive age. In addition, the removal of four juvenile green turtles over a 10-year period is not expected to result in a reduction in reproduction since reproductive age individuals are not likely to be affected by the action. Thus, we do not expect a reduction in reproduction as a result of the anticipated take detailed above, and the anticipated amount of take is not expected to appreciably reduce the species' likelihood of survival in the wild.

Reduction in distribution

Green sea turtles are highly migratory, and individuals may range throughout the Gulf of Mexico, Atlantic Ocean, and Caribbean Sea. While the potential lethal take of four juvenile green turtles

over ten years would result in a short-term reduction in numbers as stated above, the loss is not significant in terms of local, regional, or global distribution. In addition, we would not expect the non-lethal take of 44 juvenile green turtles over ten years to affect distribution. While these individuals may be temporarily displaced from their foraging grounds by relocation trawling, we would expect these individuals to find adequate foraging and resting habitat nearby since there is no shortage of nearshore hardbottom in this area. Therefore, we would not expect any of the take associated with the proposed action to appreciably reduce the species' likelihood of survival in the wild.

In summary, the proposed action is not expected to reduce the reproduction or the distribution of green sea turtles. While a short-term reduction in numbers is expected, this reduction in numbers is not expected to measurably affect the species' status or trends. Therefore, the anticipated impacts are not expected to appreciably reduce the species' likelihood of survival in the wild.

In the above analysis on the effects of the action, we concluded the potential lethal take of four juvenile green turtles (by hopper dredging and relocation trawling) and the non-lethal take of 44 juvenile green turtles (by relocation trawling) over ten years would not be expected to appreciably reduce the likelihood of survival of the species in the wild. The following analysis considers the effects of the take on the likelihood of recovery in the wild. We consider the recovery objectives in the recovery plan prepared for the U.S. population of Atlantic green sea turtles that may be adversely affected by the predicted reduction in numbers of juvenile green turtles.

The recovery plan for the U.S. population of Atlantic green turtles (NMFS and USFWS 1991a) lists the following relevant recovery criterion over a period of 25 years:

> *A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.*

Ehrhart et al. (2007) have documented a 661 percent increase in juvenile green turtle capture rates at their study area in the central region of the Indian River Lagoon. This increase in capture rates is similar to those recorded at the St. Lucie Power Plant over the same period. During the same 24-year period, green turtle nest deposition in Florida has increased exponentially. From 1990-1991 and 2004-2005, green turtle nest deposition in southeast Florida (Brevard to Miami-Dade Counties) has increased 358 percent (from 2,721 to 12,464) in southeast Florida (Ehrhart et al. 2007). The increased capture rate of juvenile green turtles at the Ehrhart et al. (2007) study area and at the St. Lucie Power Plant suggests that the number of juvenile green turtles utilizing nearshore foraging areas in southeast and east-central Florida is increasing. Ehrhart et al. (2007) conclude that recovery efforts for the Florida green turtle population are producing positive results. Although current trends show an increase in both juvenile green turtles and nesting green turtles along the Atlantic coast of Florida, the cumulative loss of important developmental habitat for juvenile greens could eventually hamper the ability of the species to fully recover. The loss of limited, valuable developmental habitat could conceivably create a bottleneck that could limit recovery in the future despite the current increasing population trend. There is not sufficient quantitative information regarding the value of this habitat type to green sea turtle recovery from which we can determine with a high degree of confidence what long-term impact will occur from

the loss of this habitat. However, the fact that it is a habitat type that is limited in availability and has been proven to be a highly-preferred habitat providing both foraging and refuge for juvenile green turtles, indicates that impacts to this habitat type must be monitored closely, and minimized as much as is feasible, as the importance of the habitat to green turtle recovery is being investigated.

However, at this time, if we consider the findings of Ehrhart et al. (2007) coupled with our conclusion that the impact from the potential lethal take of up to four juvenile green turtles and the non-lethal take of 44 juvenile green turtles over ten years would not cause a change in the increasing trajectories of the nesting populations whose juveniles utilize Florida's nearshore foraging habitats, we conclude that the proposed action is not likely to interfere with the attainment of the recovery criterion. Thus, the effects of the proposed action would not cause an appreciable reduction in the likelihood of green sea turtle recovery in the wild.

7.2 Loggerhead Sea Turtles

This section analyzes the effects of the action on the likelihood of survival of loggerhead sea turtles in the wild. In this context, the survival of a species considers its current risk of extinction and how that may be increased by the proposed action. In the following analysis, we demonstrate that potentially killing two sea turtles by hopper dredge (possibly both loggerheads) and two sea turtles by relocation trawling (possibly both loggerheads) and potentially non-injuriously taking 116 loggerhead turtles (by relocation trawling) during two dredging/renourishment events conducted over a 10-year period will not appreciably reduce the species' likelihood of survival in the wild.

Reduction in Numbers and Reproduction
NMFS believes that the effects of the proposed action resulting in the lethal take of up to four loggerhead turtles over ten years (by a combination of hopper dredging and relocation trawling) is not likely to appreciably reduce the survival of this species in the wild. In order to support this conclusion, we must first determine if a particular age class is more likely to be affected by the proposed action. Based on the Brevard County SPP data discussed in Section 5 of this opinion, of the five reported sea turtle takes by hopper dredge (all were loggerheads) from 2001-2003 and 2005, three were adults, one was a subadult, and the other was unknown. Based on the Brevard County SPP data, NMFS expects all loggerheads that may be taken over ten years to be adults or subadults. For the purpose of our analysis, we will assume a reasonable worst-case scenario in which all four of the loggerhead turtles that may be lethally taken are adult females. The non-lethal loggerhead sea turtle takes from the proposed action are not expected to have any measurable impact on the numbers, reproduction, or distribution of loggerhead sea turtles. Therefore, we will focus this part of our analysis on the potential effects from the loss of four adult female loggerheads over a 10-year period and evaluate whether this reduction in numbers would cause an appreciable reduction in the likelihood of survival of loggerhead sea turtles.

The lethal take of up to four adult female loggerheads over a 10-year period is a reduction in numbers. These lethal takes would also result in a reduction in reproduction as a result of lost reproductive potential, as we are assuming that all of the individuals that may be taken are adult

females and we are assuming that these individuals would have survived other threats and reproduced in the future, thus eliminating each individual's contribution to future generations. For example, an adult female loggerhead sea turtle can lay 3 or 4 clutches of eggs every 2 to 4 years, with 100 to 130 eggs per clutch. The potential loss of four adult female sea turtles could preclude the production of thousands of eggs and hatchlings of which only a small percentage would be expected to survive to sexual maturity. Whether or not the reduction in loggerhead sea turtle numbers and reproduction attributed to the proposed action would appreciably reduce the likelihood of survival depends on what effect this reduction in numbers and reproduction would have on the overall population sizes and trends (i.e., whether the estimated reduction, when viewed within the context of the environmental baseline and status of the species, is to such an extent that adverse effects on population dynamics are appreciable). In Section 3.2.1, we reviewed the status of the species in terms of nesting and female population trends and several recent assessments based on population modeling (i.e., Conant et al. 2009 and NMFS SEFSC 2009a). Below, we synthesize what that information means in general terms and also in the more specific context of the proposed action.

Loggerhead sea turtles are slow growing, long-lived species. Because of their longevity, loggerhead turtles require high survival rates throughout their life to maintain a population. In other words, long-lived species cannot tolerate much anthropogenic mortality without going into decline. Conant et al. (2009) concluded loggerhead natural growth rates are small; natural survival needs to be high; and even low to moderate mortality can drive the population into decline. Because recruitment to the adult population is slow, population modeling studies suggest even small increased mortality rates in adults and subadults could impact substantially on population numbers and viability (Crouse et al. 1987, Crowder et al. 1994, Heppell et al. 1999, Chaloupka and Musick 1997).

The best available information indicates the Northwest Atlantic population of loggerheads is still large, but is experiencing more mortality than it can withstand. All of the results of recent population models in both NMFS SEFSC (2009a) and Conant et al. (2009) indicated Northwest Atlantic loggerheads are likely to continue to decline in the future unless action is taken to reduce anthropogenic mortality.

In our discussion, we will assume that all four of the loggerheads that may be lethally taken by the proposed action are adult females (i.e., a reasonable, worst-case scenario). Focusing on the more reproductively important females appropriately simplifies our analysis. In addition, adult females are the population segment with the most precise and accurate population estimates, based on nest counts. We will also focus solely on lethal takes, as we believe the non-lethal takes from the proposed action would not affect numbers, reproduction, or distribution of the species.

NMFS SEFSC (2009a) estimated the minimum adult female population size for the Northwest Atlantic subpopulation in the 2004-2008 time frame to likely be between 20,000 to 40,000 (median 30,050) female individuals, with a low likelihood of being as many as 70,000 individuals. Estimates were based on the following equation: Adult females = (nests/(nests per female)) x remigration interval. The estimate of Northwest Atlantic adult loggerhead females was considered conservative for several reasons. The number of nests used for the Northwest Atlantic was based

primarily on U.S. nesting beaches. Thus, the results are a slight underestimate of total nests because of the inability to collect complete nest counts for many non-U.S. nesting beaches. In estimating the current population size for adult nesting female loggerhead sea turtles, NMFS SEFSC (2009a) simplified the number of assumptions and reduced uncertainty by using the minimum total annual nest count over the last five years (i.e., 48,252 nests). This was a particularly conservative assumption considering how the number of nests and nesting females can vary widely from year to year, (cf., 2008's nest count of 69,668 nests, which would have increased the adult female estimate proportionately, to between 30,000 and 60,000). Also, minimal assumptions were made about the distribution of remigration intervals and nests per female parameters, which are fairly robust and well known parameters.

If we use the NMFS SEFSC (2009a) estimate of the minimum adult female population size for the western North Atlantic subpopulation in the 2004-2008 time frame (minimum of 20,000 individuals), the anticipated long-term deaths resulting from the proposed action (i.e., 4 females over a 10-year period) represent the removal of approximately 0.02 percent of the estimated current adult female loggerhead population. The potential take described above will result in a small reduction in numbers and reproduction, but will not have any detectable influence on the population and nesting trends noted above, in other words, this take will not exacerbate the observed declining trends. This is because the loss of these adult females during a 10-year period will not have a measurable, discernible, or appreciable impact on total recruitment of new sea turtles to the population, given the potential reproductive output of 4 females compared to a minimum of 20,000 adult females. Thus, this small reduction in reproduction and numbers is not expected to appreciably reduce the species' likelihood of survival in the wild.

Reduction in distribution

A reduction in the distribution of loggerhead sea turtles is not expected from lethal or non-lethal takes attributed to the proposed action. Loggerhead sea turtles are highly migratory, and individuals may range throughout the Gulf of Mexico, Atlantic Ocean, Mediterranean Sea, Indian Ocean, and Pacific Ocean. We believe the potential loss of four loggerhead sea turtles over a 10-year period is not significant in terms of local, regional, or global distribution. Therefore, we believe the anticipated impacts will not affect the species' distribution.

In summary, the action is not expected to affect distribution; however, it is expected to affect the species' numbers and reproduction. Based on our analysis, this reduction in numbers and reproduction is not expected to measurably affect the species' status or trends. Therefore, the anticipated impacts are not expected to appreciably reduce the species' likelihood of survival in the wild.

In the above analysis on the effects of the action, we concluded the potential lethal take of four adult female loggerhead turtles (by hopper dredging and relocation trawling) and the non-lethal take of 116 loggerhead turtles (by relocation trawling) over ten years would not be expected to appreciably reduce the likelihood of this species' survival in the wild. The following analysis considers the effects of the take on the likelihood of recovery in the wild. We consider the recovery objectives in the recovery plan prepared for the U.S. population of Atlantic green sea turtles that may be affected by the predicted reduction in numbers of juvenile green turtles.

NMFS' and USFWS' (2008) Recovery Plan for the Northwest Atlantic population of the loggerhead turtle provides a recovery goal and objectives for this population. Most pertinent to the proposed action is Recovery Objective No. 1:

> *Ensure that the number of nests in each recovery unit is increasing and that this increase corresponds to an increase in the number of nesting females.*

The Recovery Plan anticipates that, with implementation of the Plan, the western North Atlantic population will recover within 50 to 150 years, but notes that reaching recovery in only 50 years would require a rapid reversal of the current declining trends of the Northern, Peninsular Florida, and Northern Gulf of Mexico Recovery Units.

The multiple recent reviews and assessments of loggerheads (e.g., NMFS and USFWS 2007, Merrick and Haas 2008,Witherington et al. 2009, TEWG 2009, Conant et al. 2009, and NMFS SEFSC 2009a) have all concluded that loggerhead nesting and adult female populations in the western North Atlantic are in decline and likely to continue to decline. As discussed in Section 3 and TEWG (2009), there is conflicting information of increases of abundance in some juvenile age classes, which makes an assessment of overall population trends more difficult. The population is clearly not at a stable age distribution, given past population perturbations; and it is possible that observed declines may be transitory effects, which will be compensated for by a wave of recruitment. However, the most comprehensive demographic model to date (NMFS SEFSC 2009a) also predicts that a continued decline in the total population is likely, given our present knowledge of loggerhead life history parameters. Therefore, we believe a conservative assessment of the western North Atlantic population is that the population is in overall decline. Nesting in Florida has declined by 43-44 percent from 1998 to 2007 (Witherington et al. 2009), but this is a decline from the maximum nesting level recorded for this population in 1998.

As discussed above, the anticipated long-term deaths resulting from this action represent the removal of approximately 0.02 percent of the estimated adult female loggerhead population in the Northwest Atlantic Ocean. This removal is very small and contributes only minimally to the overall mortality on the population. Because this contribution to mortality is a tiny part of our range of uncertainty across what total mortality might be, we do not believe that the small effect posed by the lethal takes from the proposed action will be detectable or appreciable on trends in abundance of nests or nesting females. Recovery Objective No. 1, "Ensure that the number of nests in each recovery unit is increasing…," is the Plan's overarching objective and has associated demographic criteria. Currently, none of the Plan's criteria are being met, but the plan acknowledges that it will take 50-150 years to do so. Further reduction of multiple threats throughout the North Atlantic, Gulf of Mexico, and Greater Caribbean will be needed for strong, positive population growth, following implementation of more of the plan's actions. Although any continuing mortality in an already declining population can affect the potential for population growth, we believe the size of the effect posed by the incidental take and mortality of loggerhead turtles resulting from the proposed action is so small that it is not an appreciable reduction in the likelihood of a recovery that is not anticipated for 50-150 years.

We believe that the incidental take and resulting mortality of loggerhead turtles associated with the proposed action are not reasonably expected to cause an appreciable reduction in the likelihood of survival of the western North Atlantic population of loggerhead turtles. The proposed action is expected to result in the removal of approximately 0.02 percent of the estimated adult female loggerhead population in the western North Atlantic. We believe the currently still large population is likely to continue to decline until large mortality reductions in all commercial fisheries and other sources of mortality (including impacts outside U.S. jurisdiction) are achieved. However, over at least the next several decades, we expect the western North Atlantic population to remain large (tens or hundreds of thousands of individuals) and to retain the potential for recovery. The effects of the proposed action may have a small effect on the overall size of the population (due to the potential removal of four adult females over ten years), which we believe will remain sufficiently large for several decades to come, and the action will not cause the population to lose genetic heterogeneity, broad demographic representation, or successful reproduction, nor affect loggerheads' ability to meet their lifecycle requirements, including reproduction, sustenance, and shelter.

Therefore, we believe that the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival and recovery of the western North Atlantic population of loggerhead turtles.

7.3 Kemp's Ridley Sea Turtles

The proposed action may result in up to four lethal Kemp's ridley sea turtle takes (by combined hopper dredging and relocation trawling) over a 10-year period. This is a reasonable, worst-case scenario that presumes all of the takes are lethal.

The non-lethal take of two Kemp's ridley sea turtles over a 10-year period is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. The individuals are expected to fully recover such that no reductions in reproduction or numbers of this species are anticipated.

The lethal take of up to four Kemp's ridley sea turtles over a 10-year period would reduce the species' population compared to the number that would have been present in the absence of the proposed action, assuming all other variables remained the same. These four lethal takes could also result in a potential reduction in future reproduction, assuming at least some of these individuals would be female and would have survived to reproduce in the future. The annual loss of adult female sea turtles, on average, could preclude the production of thousands of eggs and hatchlings, of which a fractional percentage is expected to survive to sexual maturity. Thus, the death of any females would eliminate their contribution to future generations, and result in a reduction in sea turtle reproduction. The anticipated takes are expected to occur anywhere in the action area and sea turtles generally have large ranges in which they disperse; thus, no reduction in the distribution of Kemp's ridley sea turtles is expected from the take of these individuals.

Whether the reductions in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction

would have relative to current population sizes and trends.

The total population of Kemp's ridley sea turtles is not known, but nesting has been increasing significantly in the past several years (9 to 13 percent per year) with official estimates for 2009 of almost 22,000 nests (E. Hawk, NMFS SERO, pers. comm., March 25, 2010). Kemp's ridleys mature and nest at an age of 7-15 years, which is earlier than other chelonids. A younger age at maturity may be a factor in the response of this species to recovery actions. A period of steady increase in benthic immature ridleys has been occurring since 1990 and appears to be due to increased hatchling production and an apparent increase in survival rates of immature sea turtles. The increased survivorship of immature sea turtles is largely attributable to the introduction of turtle excluder devices (TEDs) in the United States and Mexican shrimping fleets and Mexican beach protection efforts. The TEWG (2000) projected that Kemp's ridleys could reach the Recovery Plan's intermediate recovery goal of 10,000 nesters by the year 2015.

NMFS' and USFWS' (1991b) Recovery Plan for the Kemp's Ridley Sea Turtle discusses recovery objectives. Most pertinent to the proposed action is Recovery Objective No. 224:

Monitor and reduce impacts from dredging activities.

NMFS and the COE have taken steps to reduce impacts to sea turtles from dredging activities. These measures include requiring protected species' monitors onboard hopper dredges as well as requiring the COE to use draghead deflectors and inflow screens on hopper dredges to reduce sea turtle take. Relocation trawling prior to dredging can also reduce sea turtle take by temporarily relocating sea turtles away from dredging activities. These measures have been successful in reducing the amount of incidental take from dredging activities.

The Reasonable and Prudent Measures (RPMs) and the Terms and Conditions of this opinion require the aforementioned measures to reduce the amount of incidental sea turtle take from the proposed action. NMFS believes that the potential lethal take of four Kemp's ridley sea turtles over a 10-year period is not likely to reduce population numbers over time due to current population sizes and expected recruitment. Thus, we believe the proposed action is in concert with the recovery objective above and will not result in an appreciable reduction in the likelihood of Kemp's ridley sea turtles' survival or recovery in the wild.

8.0 CONCLUSION

8.1 Opinion for Globally-Listed Species. We have analyzed the best available data, the current status of the species, environmental baseline, effects of the proposed action, and cumulative effects to determine whether the proposed action is likely to jeopardize the continued existence of green, loggerhead, and Kemp's ridley sea turtles. We have concluded that the proposed action will not appreciably reduce the likelihood of survival and recovery of populations of these species that will be affected by the proposed action in the Northwest Atlantic Ocean; therefore, it is also our biological opinion that the proposed action is not likely to jeopardize the continued existence of green, loggerhead, and Kemp's ridley sea turtles as presently listed.

8.2 Conference Opinion for Northwest Atlantic DPS of loggerhead sea turtles. In our judgment, the above conclusion that the proposed action is not likely to jeopardize loggerhead sea turtles would be valid as applied to the Northwest Atlantic DPS of loggerhead sea turtles, proposed to be listed as endangered. The takes anticipated will all be of turtles that are part of this proposed DPS, and the population trends and estimates discussed in the jeopardy section are for the population of turtles that represents this proposed DPS. Thus, our conclusions about the impacts of the proposed action on the likelihood of survival and recovery of loggerhead sea turtles discussed in section 7.2 above would be the same for the Northwest Atlantic DPS of loggerhead sea turtles.

9.0 INCIDENTAL TAKE STATEMENT (ITS)

Section 9 of the ESA and protective regulations issued pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the Reasonable and Prudent Measures and Terms and Conditions of the ITS. The ITS in this opinion is for loggerhead sea turtles as currently listed under the ESA. If NMFS and the USFWS decide to list the Northwest Atlantic DPS separately, then the ITS in this opinion would also apply to the Northwest Atlantic DPS for loggerhead sea turtles.

Section 7(b)(4)(c) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under section 101(a)(5) of the Marine Mammal Protection Act (MMPA). Since no incidental take of listed marine mammals is expected or has been authorized under section 101(a)(5) of the MMPA, no statement on incidental take of endangered whales is provided, and no take is authorized. Nevertheless, the Air Force must immediately notify (within 24 hours, if communication is possible) NMFS' Office of Protected Resources should a take of a listed marine mammal occur, and must reinitiate consultation.

9.1 Anticipated Amount or Extent of Incidental Take

NMFS estimates that the proposed action can be expected to result in the lethal take of two sea turtles by hopper dredge (any combination of loggerhead, green, or Kemp's ridley) in two dredging/renourishment events conducted over a 10-year period. In addition, we believe the proposed action will result in non-lethal take (by relocation trawling) of 116 loggerhead, 44 green, and two Kemp's ridley sea turtles over a 10-year period. Of the estimated take by relocation trawling, NMFS believes that two of these individuals (any combination of loggerhead, green, or Kemp's ridley) may be taken lethally over a 10-year period. Exceeding any take estimate will require reinitiation of consultation with NMFS.

9.2 Effect of the Take

NMFS has determined the anticipated level of incidental take specified in Section 9.1 is not likely to jeopardize the continued existence of green, loggerhead, and Kemp's ridley sea turtles.

9.3 Reasonable and Prudent Measures

RPMs and implementing Terms and Conditions have been identified by NMFS as necessary and appropriate to minimize impacts of incidental take of green, loggerhead, and Kemp's ridley sea turtles from the proposed beach renourishment project and to validate the conclusion that no take of other species protected by the ESA and under NMFS' purview will result from the proposed action.

1. The Air Force and COE shall have measures in place to monitor and report all interactions with any protected species (ESA or MMPA) resulting from the proposed action. Reports shall be sent to the Assistant Regional Administrator (Mr. David Bernhart) for NMFS' Protected Resources Division, Southeast Regional Office, 263 13th Avenue South, St. Petersburg, Florida 33701-5505. Please provide a copy of the incident report to Audra Livergood (Audra.Livergood@noaa.gov).

2. The Air Force and COE (in the COE permit) will require NMFS-approved observers to monitor dredged material inflow and overflow screening baskets on the hopper dredge.

3. The Air Force and COE (in the COE permit) will require relocation trawling prior to the start of dredging and will implement relocation trawling during dredging should a take(s) occur.

4. The Air Force and COE (in the COE permit) will require the hopper dredge's draghead deflector to be inspected. In addition, the Air Force and COE shall ensure that all contracted personnel involved in operating hopper dredges receive thorough training on measures of dredge operation that will minimize sea turtle takes.

5. The Air Force and COE (in the COE permit) will ensure that important sea turtle foraging habitat (e.g., hardbottom/hardground) is not adversely impacted by the proposed action. The Air Force will continue to monitor the effects of beach renourishment projects carried out at PAFB to ensure that these activities are not adversely impacting sea turtle foraging habitat.

9.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Air Force must comply with the following terms and conditions, which implement the RPMs described above and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary. The COE shall condition the permit to require the following terms and conditions to minimize the effects of take on loggerhead, green, and Kemp's ridley sea turtles:

1. A project report summarizing the results of the dredging and the sea turtle take (if any) must be submitted to the COE and NMFS within 30 working days of completion. Reports shall contain information on project location, start-up and completion dates, cubic yards of material dredged, problems encountered, incidental takings (include photographs, if available) and sightings of protected species, mitigative actions taken (if relocation trawling, the number and species of turtles relocated), screening type (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the Air Force deems relevant. This report must be provided to NMFS' Protected Resources Division at the address provided in RPM 1 above and notification of take shall be provided to NMFS at the following e-mail address within 24 hours: takereport.NMFSser@noaa.gov. The Air Force shall provide NMFS' Southeast Regional Office (address provided in RPM 1 above) with an end-of-project (each of the two dredging/renourishment events) relocation trawling report within 30 days of completion of relocation trawling. This report may be included within the project report (RPM 1).

2. The Air Force project manager shall notify the Sea Turtle Stranding and Salvage Network (STSSN) state representative (contact information available at http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp) of the start-up and completion of hopper dredging operations and ask to be notified of any sea turtle strandings in the project area that, in the estimation of the STSSN personnel, bear signs of potential draghead impingement or entrainment. Information on any such strandings shall be reported in writing within 30 days of project end to NMFS' Southeast Regional Office (address provided in RPM 1 above), or included in the project report (Term and Condition #1). Because of different possible explanations for, and subjectivity in the interpretation of potential causes of strandings, these strandings will not normally be counted against the Air Force's take limit (in this biological opinion); however, if compelling STSSN observer reports and evidence convinces NMFS that a turtle was killed by a hopper dredge, that take will be deducted from the Incidental Take Statement's anticipated take level for the project (RPM 1)

3. The Air Force shall arrange for NMFS-approved protected species observers to be aboard the hopper dredge to monitor the hopper bin, screening, and dragheads for sea turtles and their remains. For the proposed action, 100 percent observer monitoring is required year round (RPM 2).

4. Beach observers cannot be used in place of shipboard observers for hopper dredging of borrow areas (RPM 2).

5. Pre-dredge relocation trawling shall commence not earlier than 72 hours prior to the start of dredging (RPM 3).

6. Relocation trawling shall also be implemented simultaneous with hopper dredging if

two or more turtles are taken in a 24-hour period during dredging (RPM 3).

7. Relocation trawl tow-time duration shall not exceed 42 minutes (doors in – doors out) and trawl speeds shall not exceed 3.5 knots (RPM 3).

8. Sea turtles captured during relocation trawling shall be handled in a manner designed to ensure their safety and viability, and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position (i.e., not rotating). Resuscitation guidelines are attached (Appendix I) (RPM 3).

    a. Captured Turtle Holding Conditions: Captured turtles shall be kept moist, and shaded whenever possible, until they are released.

    b. Weight and Size Measurements: When safely possible, all turtles shall be measured (standard carapace measurements including body depth), tagged, weighed, and tissue sampled prior to release. Any external tags shall be noted and data recorded into the observer's log. Only NMFS-approved observers or observer candidates in training under the direct supervision of a NMFS-approved observer shall conduct the tagging/measuring/weighing/tissue sampling operations.

    c. Take and Release Time During Trawling: Turtles shall be kept no longer than 12 hours prior to release and shall be released not less than three nmi from the dredge site. If two or more released turtles are later recaptured, subsequent turtle captures shall be released not less than five nmi away. If it can be done safely without injuring the turtles, turtles may be transferred onto another vessel for transport to the release area to enable the relocation trawler to keep sweeping the dredge site without interruption.

9. Injured sea turtles shall be immediately transported to the nearest sea turtle rehabilitation facility. The Air Force is responsible for funding and arranging transportation and care of threatened or endangered species injured during the course of dredging or relocation trawling. Turtle parts of turtles killed during relocation trawling or dredging may be retained for educational purposes, with written permission from NMFS Southeast Regional Office Protected Resources Division (RPM 3).

10. Flipper Tagging: All sea turtles captured by relocation trawling shall be flipper-tagged prior to release with external tags which shall be obtained prior to the project from the University of Florida's Archie Carr Center for Sea Turtle Research. This opinion serves as the permitting authority for any NMFS-approved endangered species observer aboard these relocation trawlers to flipper-tag with external tags (e.g., Inconel tags) captured sea turtles. Columbus crabs or other organisms living on external sea turtle surfaces may also be sampled and removed under this

authority. PIT tagging is authorized by trained observers (see Term and Condition #16) (RPM 3).

11. PIT-Tag Scanning: All sea turtles captured by relocation trawling (or dredges) shall be thoroughly scanned for the presence of PIT tags prior to release using a multi-frequency scanner powerful enough to read multiple frequencies (including 125-, 128-, 134-, and 400-kHz tags) and read tags deeply embedded in muscle tissue (e.g., manufactured by Trovan, Biomark, or Avid). Turtles whose scans show have been previously PIT tagged shall nevertheless be externally flipper tagged. The data collected (PIT tag scan data and external tagging data) shall be submitted to NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 days of project completion to Lisa.Belskis@noaa.gov and Sheryan.Epperly@noaa.gov. Sea turtle external flipper tag and PIT tag data generated and collected by relocation trawlers shall also be submitted to the Cooperative Marine Turtle Tagging Program (CMTTP), on the appropriate CMTTP form, at the University of Florida's Archie Carr Center for Sea Turtle Research (RPM 3).

12. Tissue Sampling: All live or dead sea turtles captured by relocation trawling or dredging shall be tissue-sampled prior to release, according to the protocols described in Appendix II or Appendix III of this opinion. Tissue samples shall be sent within 60 days of capture to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov. This Opinion serves as the permitting authority for any NMFS-approved endangered species observers aboard relocation trawlers or hopper dredges to tissue-sample live- or dead-captured sea turtles, without the need for a section 10 permit (RPM 3).

13. PIT Tagging: PIT tagging is authorized but shall not be conducted by Endangered Species Observers (ESO) who do not have prior training or experience in said activity. PIT tagging must be performed in accordance with the protocol detailed at NMFS SEFSC's webpage: http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp (See Appendix C on the SEFSC's "Fisheries Observers" webpage). PIT tags used must be sterile, individually wrapped tags to prevent disease transmission. PIT tags should be 125 kHz, glass-encapsulated tags - the smallest ones made. Note: If scanning reveals a PIT tag and it was not difficult to find, then do not insert another PIT tag; simply record the tag number and location, and frequency, if known. If for some reason the tag is difficult to detect (e.g., tag is embedded deep in muscle, or is a 400 mHz tag), then insert one in the other shoulder (RPM 3).

14. Other Sampling Procedures: All other tagging and external or internal sampling procedures (e.g., blood letting, laparoscopies, anal and gastric lavages, mounting

satellite or radio transmitters, etc.) performed on live sea turtles are not permitted under this opinion unless the observer holds a valid sea turtle research permit (obtained pursuant to section 10 of the ESA, from NMFS' Office of Protected Resources, Permits Division) authorizing the activity, either as the permit holder, or as designated agent of the permit holder (RPM 3).

15. Handling Fibropapillomatose Turtles: NMFS-approved ESOs are not required to handle or sample viral fibropapilloma tumors if they believe there is a health hazard to themselves and choose not to. When handling sea turtles infected with fibropapilloma tumors, ESOs must either: 1) clean all equipment that comes in contact with the turtle (tagging equipment, tape measures, etc.) with mild bleach solution, between the processing of each turtle, or 2) maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors or lesions. Sea turtle tissue samples shall be taken in accordance with NMFS' SEFSC's procedures for sea turtle genetic analyses (Appendix II of this opinion). The Air Force shall ensure that tissue samples taken during a dredging project are collected and stored properly and mailed within 60 days of the completion of the dredging project to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. This opinion serves as the permitting authority for all NMFS-approved ESOs aboard a relocation trawler or hopper dredge to tissue-sample fibropapilloma-infected sea turtles without the need for a section 10 permit (RPM 3).

16. For the proposed action, 100 percent shipboard observer monitoring is required year round. If conditions disallow 100 percent inflow screening, inflow screening can be reduced gradually, but 100 percent overflow screening is required, and an explanation must be included in the project report:

    The hopper's inflow screens should have 4-inch by 4-inch screening. If the Air Force, in consultation with observers and the draghead operator, determines that the draghead is clogging and reducing production substantially, the screens may be modified sequentially: mesh size may be increased to 6-inch by 6-inch, then 9-inch by 9-inch, then 12-inch by 12-inch openings. Clogging should be greatly reduced with these flexible options; however, further clogging may compel removal of the screening altogether, in which case effective 100 percent overflow screening is mandatory. The Air Force shall notify NMFS beforehand if inflow screening is going to be reduced or eliminated, and provide details of how effective overflow screening will be achieved. NMFS believes that this flexible, graduated-screen option is necessary since the need to constantly clear the inflow screens will increase the time it takes to complete the project; therefore, it will increase the exposure of sea turtles to the risk of impingement or entrainment. Additionally, there are increased risks to sea turtles in the water column when the inflow screen is halted to clear screens since this results in clogged intake pipes, which may have to be lifted from the bottom to discharge the dredged material by applying suction (RPM 4).

17. Training Personnel on Hopper Dredges: The Air Force and COE must ensure that all contracted personnel involved in operating hopper dredges receive thorough training on measures of dredge operation that will minimize takes of sea turtles:

    a. All inspectors, operators, and vessel captains shall be advised about the prohibitions on taking, harming, or harassing sea turtles and whales.
    b. The captain of the dredge shall be instructed to avoid any sea turtles and whales encountered in transit and to immediately contact the Air Force if sea turtles or whales are seen in the vicinity (any sightings should be included in the protected species report).
    c. Notify NMFS immediately by phone (727/824-5312), fax (727/824-5309), or e-mail (takereport.nmfsser@noaa.gov) if a sea turtle or any other ESA-listed species is taken by the dredge.

    It shall be the goal of each hopper dredging operation to establish operating procedures that are consistent with those that have been used successfully during hopper dredging in other regions of the coastal United States, and which have proven effective in reducing turtle/dredge interactions. Therefore, COE Engineering Research and Development Center experts or other persons with expertise in this matter shall be involved both in dredge operation training, and installation, adjustment, and monitoring of the rigid deflector draghead assembly (RPM 4).

18. The sea turtle deflecting draghead is required for all hopper dredging, unless a waiver is granted by the COE South Atlantic District, in consultation with NMFS (RPM 5). The draghead deflector engineer that assisted with the design should inspect the rigid draghead deflector annually to insure that the deflector has been tailored appropriately to each draghead. Additionally, the inspector should assess whether the dredge operator appears to be familiar with the operation of the draghead deflector and provide necessary training where appropriate (RPM 4).

19. To prevent impingement or entrainment of sea turtles within the water column, standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads are not firmly on the bottom (RPM 4).

20. Dredge Lighting: From March 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within three nmi of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or OSHA requirements. All non-essential lighting on the dredge and pumpout barge shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the water to reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natal beaches (RPM 4).

21. Hardground Buffer Zones: All dredging in borrow areas will be designed to ensure that dredging will not occur within a minimum of 400 feet from any significant hardground areas or bottom structures that serve as attractants to sea turtles for foraging or shelter. NMFS considers (for the purposes of this opinion) a significant hardground in a project area to be one that, over a horizontal distance of 150 feet, has an average elevation above the sand of 1.5 feet or greater, and has algae growing on it. The Air Force shall ensure that the borrow area is adequately mapped to enable the dredge to stay at least 400 feet from these areas. If the COE or Air Force is uncertain as to what constitutes significance, it shall consult with NMFS' Habitat Conservation Division (727/824-5317) and NMFS' Protected Resources Division (727/824-5312) for clarification and guidance (RPM 5).

10.0 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authority to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat to help implement recovery plans or to develop information. For the PAFB project, NMFS provides the following conservation recommendations:

1. NMFS recommends that the Air Force explore the implications of nourishment material grain size, shape, and composition as it relates to potential long-term chronic turbidity. Current assessments of adequacy may not fully account for differences in sediment behavior resulting from the full suite of sediment characteristics (Wanless and Maier 2007).

2. In previous biological opinions for beach (re)nourishment projects in southeast and east-central Florida (NMFS 2008a; NMFS 2008b), NMFS has recommended that the COE prepare an Environmental Impact Statement (EIS) to consider the direct, indirect, and cumulative impacts of proposed and ongoing beach nourishment projects that are located along the Atlantic coast of Florida in areas where nearshore hardbottom habitat is present (Brevard County south to Miami-Dade County). The EIS is necessary to evaluate cumulative effects on listed species (e.g., sea turtles) and their foraging and resting habitats (e.g., nearshore hardbottom in southeast and east-central Florida) from the projects. As part of this effort, NMFS recommends that the Air Force work cooperatively with the COE to provide information on the nearshore hardbottom monitoring in association with beach renourishment activities at PAFB.

3. NMFS, based on recommendations of Griffen (1974), has recommended water column sediment load deposition rates of no more than 200 $mg/cm^2/day$, averaged over a 7-day period to protect hardbottom communities, rather than use of only state standards.

4. The Air Force should consider devising and implementing some method of significant economic incentives to hopper dredge operators such as financial reimbursement based on their satisfactory completion of dredging operations, or X number of cubic yards of material moved, or hours of dredging performed, without taking turtles. This may encourage dredging companies to research and develop "turtle friendly" dredging methods; more effective deflector dragheads; pre-deflectors; top-located water ports on dragarms, etc.

11.0 REINITIATION OF CONSULTATION

This concludes formal consultation on the proposed permit issuance for the construction of the PAFB beach renourishment and dune restoration project in Brevard County, Florida. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of taking specified in the incidental take statement is exceeded; (2) new information reveals effects of the action may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

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APPENDIX C

Consultation with U.S. Fish and Wildlife Service, Biological Opinion, PAFB Shoreline Restoration Project, FL

United States Department of the Interior

U. S. FISH AND WILDLIFE SERVICE

7915 BAYMEADOWS WAY, SUITE 200
JACKSONVILLE, FLORIDA 32256-7517

IN REPLY REFER TO:
FWS Log Number: 41910-2009-F-0336

June 2, 2009

Brigadier General Edward L. Bolton Jr.
Commander, 45th Space Wing, 45 CES/CEVP
1224 Edward H. White II Street, MS-7100
Patrick AFB, Florida 32925-3299
(ATTN: Robin Sutherland)

Dear General Bolton:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (BO) based on our review of the proposed nourishment project located along the shoreline of Patrick Air Force Base (PAFB) in Brevard County, Florida, and its effects on the Florida manatee (*Trichechus manatus*), loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*) sea turtles in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your April 7, 2009, request for formal consultation was received on April 10, 2009.

This BO is for dune restoration along the shoreline of PAFB in Brevard County, Florida. Information is provided in the April 7, 2009, coordination letter. Additional information was provided via email on May 5, 2009 and May 13, 2009, telephone conversations, and other sources of information. A complete administrative record of this consultation is on file at Jacksonville Field Office.

The Air Force determined that this project may affect the loggerhead, green, leatherback, and hawksbill and Kemp's Ridley sea turtles. In addition, the Air Force made a determination that the project may affect but is not likely to adversely affect the Florida manatee. The Service concurred with these determinations.

Florida manatee

The Air Force determined that the proposed project may affect but is not likely to adversely affect the Florida manatee. The Service concurs that, if the Standard Manatee Construction Conditions are implemented, then these activities are not likely to adversely affect the Florida manatee. We also conclude that these activities will not adversely modify its critical habitat. These findings fulfill section 7 requirements of the Act in regard to manatees. In addition, because no incidental take of manatees is anticipated, no such authorization under the Marine Mammal Protection Act (MMPA) is needed.

Consultation History

On November 15, 2004, the Service issued a BO for a beach nourishment project along the shoreline of PAFB (FWS Log number: 05-258). The nourishment occurred along 11,482 linear feet of beach beginning at the South Beach North (Pineda Crossing) north to the Main Gate. The borrow site for this project was from the Space Coast Shoal (Borrow Area II) and an access channel into Borrow Area 1. On October 20, 2006, the Service issued a modified BO for an upland borrow source immediately north of Canaveral Harbor Inlet (41910-2009-F-0037). The upland borrow source was designated to be used as sand placement on the shoreline of PAFB. On February 15, 2008, the Service issued a BO for an emergency dune restoration project to rebuild the PAFB central and south beach dune profile. The dune restoration extended from the Florida Department of Environmental Protection (FDEP) R-Monument 65 to R-Monument 70. This action did not occur.

On April 7, 2009, the Air Force submitted a letter requesting formal consultation for the proposed dune restoration project. On May 5, 2009, the Air Force sent via email an addendum to the letter with a determination for the Florida manatee. The Air Force sent another email on May 22, 2009, with additional information on the proposed dune profile.

The Service had sufficient information to issue a BO for the proposed project. Information for this BO was obtained by email correspondence, meetings, site visits, telephone conversations and other sources of information. A complete administrative record of this consultation is on file at the Service's Jacksonville Field Office.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Brevard County is located on Florida's central Atlantic coast and includes about 72 miles of sandy, ocean shoreline. Of this, 32 miles are mostly undeveloped federal coastline north of Canaveral Harbor Entrance. The other forty miles feature a diverse mix of public, private, and federal oceanfront development. The Service has described the action area to include dune restoration for 8,500 linear feet of beach, from the north of the Tides Club to the PAFB South Beach boundary (FDEP R-Monument 65 to FDEP R-Monument 75) and beach restoration including the entire beach profile from FDEP R-Monument 53 to FDEP R-Monument 65 for 11,580 linear feet of beach.

The proposed dune restoration will involve mechanical placement (truck hauling) of approximately 80,000 cubic yards of beach compatible sand fill above the mean high water line along approximately 8,500 linear feet of PAFB beach with slopes and elevations consistent with prior dune restoration engineering specifications (2001 & 2005). Along the project area, tapering of sand will be applied to the north and south boundaries to allow for a more natural transition. The sand will be obtained from an upland borrow source just north of Canaveral Harbor Inlet. Sand placement activities will also occur along 11,580 linear feet of beach (FDEP R-Monument 53 to R-Monument 65) which includes an entire beach profile. The sand placement for this activity consists of 350,000 cubic yards of beach compatible sand from dredging activities along the offshore Canaveral Shoals Borrow Area. Sand will be hydraulically pumped onto the North beach and distributed per profiling specifications. A stockpile area will be constructed at FDEP R0Monument 61 to FDEP R-Monument 65 to allow truck hauling of sand for dune restoration along the Central and South beaches of PAFB.

Conservation Measures

Sea Turtles

1. The Air Force will place material on the beach between November 1 and April 30 to avoid the majority of sea turtle nesting activities.

2. The Air Force currently conducts sea turtle monitoring and will continue for a minimum of two additional nesting seasons after the nourishment event if placed-sand remains.

STATUS OF THE SPECIES/CRITICAL HABITAT

The Service has responsibility for implementing recovery of sea turtles when they come ashore to nest. This BO addresses nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) has jurisdiction over sea turtles in the marine environment.

Species/critical habitat description

Loggerhead Sea Turtle

The loggerhead sea turtle was listed as a threatened species on July 28, 1978 (43 FR 32800). The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans.

Within the continental U.S., loggerheads nest from Texas to Virginia with major nesting concentrations found in South Florida. Additional nesting concentrations occur on coastal

islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf coasts of Florida (NMFS and Service 1991b). Within the western Atlantic, loggerheads also nest in Mexico and the Caribbean.

The loggerhead sea turtle grows to an average weight of about 200 pounds and is characterized by a large head with blunt jaws. Adults and subadults have a reddish-brown carapace. Scales on the top of the head and top of the flippers are also reddish-brown with yellow on the borders. Hatchlings are a dull brown color (NMFS 2002a). The loggerhead feeds on mollusks, crustaceans, fish, and other marine animals.

The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. However, the majority of loggerhead nesting is at the western rims of the Atlantic and Indian Oceans. It may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas. Nesting occurs mainly on open beaches or along narrow bays having suitable sand, and often in association with other species of sea turtles.

No critical habitat has been designated for the loggerhead sea turtle.

Green Sea Turtle

The green sea turtle was federally listed as a protected species on July 28, 1978 (43 FR 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. The green sea turtle has a worldwide distribution in tropical and subtropical waters. Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NMFS and Service 1991a). Nesting also has been documented along the Gulf coast of Florida from Escambia County through Franklin County in northwest Florida and from Pinellas County through Collier County in southwest Florida (FWC Statewide Nesting Beach Survey database). Green turtles have been known to nest in Georgia, but only on rare occasions (Georgia Department of Natural Resources statewide nesting database). The green turtle also nests sporadically in North Carolina and South Carolina (North Carolina Wildlife Resources Commission statewide nesting database; South Carolina Department of Natural Resources statewide nesting database). Unconfirmed nesting of green turtles in Alabama has also been reported (Bon Secour National Wildlife Refuge nesting reports).

Green sea turtles are generally found in fairly shallow waters (except when migrating) inside reefs, bays, and inlets. The green turtle is attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting.

The green sea turtle grows to a maximum size of about 4 feet and a weight of 440 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. The carapace is smooth and colored gray, green, brown and black. Hatchlings are black on top and white on the bottom (NMFS 2002b). Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrasses and marine algae.

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys.

Leatherback Sea Turtle

The leatherback sea turtle, listed as an endangered species on June 2, 1970 (35 FR 8491), nests on shores of the Atlantic, Pacific and Indian Oceans. Leatherbacks have the widest distribution of the sea turtles with nesting on beaches in the tropics and sub-tropics and foraging excursions into higher-latitude sub-polar waters. They have evolved physiological and anatomical adaptations (Frair et al. 1972, Greer et al. 1973) that allow them to exploit waters far colder than any other sea turtle species would be capable of surviving. Non-breeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Nesting grounds are distributed worldwide, with the Pacific Coast of Mexico historically supporting the world's largest known concentration of nesting leatherbacks. The largest nesting colony in the wider Caribbean region is found in French Guiana, but nesting occurs frequently, although in lesser numbers, from Costa Rica to Columbia and in Guyana, Surinam, and Trinidad (NMFS and Service 1992; National Research Council 1990a).

The leatherback regularly nests in the U.S., in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia (NMFS and Service 1992). Leatherback turtles have been known to nest in Georgia, South Carolina, and North Carolina, but only on rare
occasions (North Carolina Wildlife Resources Commission; South Carolina Department of Natural Resources; and Georgia Department of Natural Resources statewide nesting databases). Leatherback nesting has also been reported on the northwest coast of Florida (LeBuff 1990; FWC Statewide Nesting Beach Survey database); and in southwest Florida a false crawl (non-nesting emergence) has been observed on Sanibel Island (LeBuff 1990).

This is the largest, deepest diving of all sea turtle species. The adult leatherback can reach 4 to 8 feet in length and weigh 500 to 2,000 pounds. The carapace is distinguished by a rubber-like texture, about 1.6 inches thick, made primarily of tough, oil-saturated connective tissue. Hatchlings are dorsally mostly black and are covered with tiny scales; the flippers are edged in white, and rows of white scales appear as stripes along the length of the back (NMFS 2002c). Jellyfish are the main staple of its diet, but it is also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed.

Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands (50 CFR 17.95).

Hawksbill Sea Turtle

The hawksbill sea turtle was listed as an endangered species on June 2, 1970 (35 FR 8491). The hawksbill is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean. Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Dade Counties) and the Florida Keys (Monroe County) (Meylan 1992; Meylan et al. 1995). However, hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors. Therefore, surveys in Florida likely underestimate actual hawksbill nesting numbers (Meylan et al. 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NMFS and Service 1993).

Hawksbills typically weigh around 176 pounds or less in the wider Caribbean; hatchlings average about 1.6 inches straight length and range in weight from 0.5 to 0.7 ounces. The carapace is heart shaped in young turtles, and becomes more elongated or egg-shaped with maturity. The top scutes are often richly patterned with irregularly radiating streaks of brown or black on an amber background. The head is elongated and tapers sharply to a point. The lower jaw is V-shaped (NMFS 2002d).

Critical habitat for the hawksbill sea turtle has been designated for selected beaches and/or waters of Mona, Monito, Culebrita, and Culebra Islands, Puerto Rico.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was listed as endangered on December 2, 1970 (35 FR 18320). The Kemp's ridley, along with the flatback sea turtle (*Natator depressus*), has the most geographically restricted distribution of any sea turtle species. The range of the Kemp's ridley includes the Gulf coasts of Mexico and the U.S., and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland. The majority of nesting for the entire species occurs on the primary nesting beach at Rancho Nuevo (Marquez-M. 1994).

Outside of nesting, adult Kemp's ridleys are believed to spend most of their time in the Gulf of Mexico, while juveniles and subadults also regularly occur along the eastern seaboard of the U.S. (Service and NMFS 1992). There have been rare instances when immature ridleys have been documented making transatlantic movements (Service and NMFS 1992). It was originally speculated that ridleys that make it out of the Gulf of Mexico might be lost to the breeding population (Hendrickson 1980), but data indicate that many of these turtles are capable of moving back into the Gulf of Mexico (Henwood and Ogren 1987). In fact, there are documented cases of ridleys captured in the Atlantic that migrated back to the nesting beach at Rancho Nuevo (Schmid and Witzell 1997, Schmid 1998, Witzell 1998).

Hatchlings, after leaving the nesting beach, are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 7.9 inches in length, at which size they enter coastal shallow water habitats (Ogren 1989).

No critical habitat has been designated for the Kemp's ridley sea turtle.

Life history

Loggerhead Sea Turtle

Loggerheads are long-lived, slow-growing animals that use multiple habitats across entire ocean
basins throughout their life history. This complex life history encompasses terrestrial, nearshore, and open ocean habitats. The three basic ecosystems in which loggerheads live are the:

1. Terrestrial zone (supralittoral) - the nesting beach where both oviposition (egg laying) and embryonic development and hatching occur.

2. Neritic zone - the inshore marine environment (from the surface to the sea floor) where water depths do not exceed 656 feet (200 meters). The neritic zone generally includes the continental shelf, but in areas where the continental shelf is very narrow or nonexistent, the neritic zone conventionally extends to areas where water depths are less than 656 feet (200 meters).

3. Oceanic zone - the vast open ocean environment (from the surface to the sea floor) where water depths are greater than 656 feet (200 meters).

Maximum intrinsic growth rates of sea turtles are limited by the extremely long duration of the juvenile stage and fecundity. Loggerheads require high survival rates in the juvenile and adult stages, common constraints critical to maintaining long-lived, slow-growing species, to achieve positive or stable long-term population growth (Congdon et al. 1993; Heppell 1998; Crouse 1999; Heppell et al. 1999, 2003; Musick 1999).

Life History Trait	Data
Clutch size (mean)	100-126 eggs[1]
Incubation duration (varies depending on time of year and latitude)	Range = 42-75 days[2,3]
Juvenile (<87 cm CCL) sex ratio	65-70% female[4]
Pivotal temperature (incubation temperature that produces an equal number of males and females)	29.0°C[5]
Nest productivity (emerged hatchlings/total eggs) x 100 (varies depending on site specific factors)	Range = 45-70%[2,6]
Clutch frequency (number of nests/female/season)	3-4 nests[7]
Internesting interval (number of days between successive nests within a season)	12-15 days[8]
Remigration interval (number of years between successive nesting migrations)	2.5-3.7 years[9]
Nesting season	late April-early September
Hatching season	late June-early November
Age at sexual maturity	32-35 years[10]
Life span	>57 years[11]

1 Dodd 1988.
2 Dodd and Mackinnon (1999, 2000, 2001, 2002, 2003, 2004).
3 B. Witherington, FWC, pers. comm. 2006 (information based on nests monitored throughout Florida beaches in 2005, n=865).
4 National Marine Fisheries Service (2001); A. Foley, FWC, pers. comm. 2005.
5 Mrosovsky (1988); Marcovaldi et al. (1997).
6 B. Witherington, FWC, pers. comm. 2006 (information based on nests monitored throughout Florida beaches in 2005, n=1,680).
7 Murphy and Hopkins (1984); Frazer and Richardson (1985); Ehrhart, unpublished data.
8 Caldwell (1962), Dodd (1988).
9 Richardson et al. (1978); Bjorndal et al. (1983); Ehrhart, unpublished data.
10 M. Snover, NMFS, pers. comm. 2005.
11 Dahlen et al. (2000).

Green Sea Turtle

Green turtles deposit from one to nine clutches within a nesting season, but the overall average is about 3.3 nests. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997). Mean clutch size varies widely among

populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years. Usually two, three, four or more years intervene between breeding seasons (NMFS and Service 1991a). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Leatherback Sea Turtle

Leatherbacks nest an average of five to seven times within a nesting season, with an observed maximum of 11 nests (NMFS and Service 1992). The interval between nesting events within a season is about 9 to 10 days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Nesting migration intervals of 2 to 3 years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in 6 to 10 years (Zug and Parham 1996).

Hawksbill Sea Turtle

Hawksbills nest on average about 4.5 times per season at intervals of approximately 14 days (Corliss et al. 1989). In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (NMFS and Service 1993). On the basis of limited information, nesting migration intervals of 2 to 3 years appear to predominate. Hawksbills are recruited into the reef environment at about 14 inches in length and are believed to begin breeding about 30 years later. However, the time required to reach 14 inches in length is unknown and growth rates vary geographically. As a result, actual age at sexual maturity is unknown.

Kemp's Ridley Sea Turtle

Nesting occurs from April into July during which time the turtles appear off the Tamaulipas and Veracruz coasts of Mexico. Precipitated by strong winds, the females swarm to mass nesting emergences, known as *arribadas* or *arribazones*, to nest during daylight hours. The period between Kemp's ridley arribadas averages approximately 25 days (Rostal et al. 1997), but the precise timing of the arribadas is highly variable and unpredictable (Bernardo and Plotkin 2007). Clutch size averages 100 eggs and eggs typically take 45 to 58 days to hatch depending on temperatures (Marquez-M. 1994, Rostal 2007).
Some females breed annually and nest an average of 1 to 4 times in a season at intervals of 10 to 28 days. Analysis by Rostal (2007) suggested that ridley females lay approximately 3.075 nests per nesting. Interannual remigration rate for female ridleys is estimated to be approximately 1.8 (Rostal 2007) to 2.0 years (Marquez Millan et al. 1989, TEWG 2000). Age at sexual maturity is believed to be between 10 to 17 years (Snover et al. (2007).

Population dynamics

Loggerhead Sea Turtle

The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. However, the majority of loggerhead nesting is at the western rims of the Atlantic and Indian Oceans. The most recent reviews show that only two loggerhead nesting beaches have greater than 10,000 females nesting per year (Baldwin et al. 2003, Ehrhart et al. 2003, Kamezaki et al. 2003, Limpus and Limpus 2003, Margaritoulis et al. 2003): South Florida (U.S.) and Masirah (Oman). Those beaches with 1,000 to 9,999 females nesting each year are Georgia through North Carolina (U.S.), Quintana Roo and Yucatán (Mexico), Cape Verde Islands (Cape Verde, eastern Atlantic off Africa), and Western Australia (Australia). Smaller nesting aggregations with 100 to 999 nesting females annually occur in the Northern Gulf of Mexico (U.S.), Dry Tortugas (U.S.), Cay Sal Bank (Bahamas), Sergipe and Northern Bahia (Brazil), Southern Bahia to Rio de Janerio (Brazil), Tongaland (South Africa), Mozambique, Arabian Sea Coast (Oman), Halaniyat Islands (Oman), Cyprus, Peloponnesus (Greece), Island of Zakynthos (Greece), Turkey, Queensland (Australia), and Japan.

The loggerhead is commonly found throughout the North Atlantic including the Gulf of Mexico, the northern Caribbean, the Bahamas archipelago, and eastward to West Africa, the western Mediterranean, and the west coast of Europe.

The major nesting concentrations in the U.S. are found in South Florida. However, loggerheads nest from Texas to Virginia. Total estimated nesting in the U.S. has fluctuated between 47,000 and 90,000 nests per year over the last decade (FWC, unpublished data; GDNR, unpublished data; SCDNR, unpublished data; NCWRC, unpublished data). About 80% of loggerhead nesting in the southeast U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties). Adult loggerheads are known to make considerable migrations between foraging areas and nesting beaches (Schroeder et al. 2003, Foley et al. in press). During non-nesting years, adult females from U.S. beaches are distributed in waters off the eastern U.S. and throughout the Gulf of Mexico, Bahamas, Greater Antilles, and Yucatán.

From a global perspective, the U.S. nesting aggregation is of paramount importance to the survival of the species and is second in size only to that which nests on islands in the Arabian Sea off Oman (Ross 1982, Ehrhart 1989). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interaction on foraging grounds and migration routes (E. Possardt, Service, personal communication 2005). The loggerhead nesting aggregations in Oman, the U.S., and Australia account for about 88% of nesting worldwide (NMFS and Service 1991b).

Green Sea Turtle

About 150 to 3,000 females are estimated to nest on beaches in the continental U.S. annually (FWC 2005). In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year (NMFS and Service 1998a). Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting aggregation in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season (Limpus et al. 1993). In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

A dramatic drop in nesting numbers has been recorded on major nesting beaches in the Pacific. Spotila et al. (2000) have highlighted the dramatic and possible extirpation of leatherbacks in the Pacific.

The East Pacific and Malaysia leatherback populations have collapsed. Spotila et al. (1996) estimated that only 34,500 females nested annually worldwide in 1995, which is a dramatic decline from the 115,000 estimated in 1980 (Pritchard 1982). In the eastern Pacific, the major nesting beaches occur in Costa Rica and Mexico. At Playa Grande, Costa Rica, considered the most important nesting beach in the eastern Pacific, numbers have dropped from 1,367 leatherbacks in 1988-1989 to an average of 188 females nesting between 2000-2001 and 2003-2004. In Pacific Mexico, in 1982 through aerial surveys of adult female leatherbacks this area became the most important leatherback nesting beach in the world. Tens of thousands of nests were laid on the beaches in 1980s but during the 2003-2004 seasons a total of 120 nests were recorded. In the western Pacific, the major nesting beaches lie in Papua New Guinea, Papua, Indonesia, and the Solomon Islands. These are some of the last remaining significant nesting assemblages in the Pacific. Compiled nesting data estimated approximately 5,000-9,200 nests annually with 75% of the nests being laid in Papua, Indonesia.

However, the most recent population size estimate for the North Atlantic alone is a range of 34,000-94,000 adult leatherbacks (Turtle Expert Working Group 2007). In Florida, an increase in leatherback nesting numbers from 98 nests in 1989 to between 800 and 900 nests in the early 2000s has been documented.

Nesting in the Southern Caribbean occurs in the Guianas (Guyana, Suriname, and French Guiana), Trinidad, Dominica, and Venezuela. The largest nesting populations at present occur in the western Atlantic in French Guiana with nesting varying between approximately 5,029 and 63,294 nests between 1967 and 2005 (Turtle Expert Working Group 2007). Trinidad supports an estimated 6,000 leatherbacks nesting annually, which represents more than 80% of the nesting in the insular Caribbean Sea. Leatherback nesting along the

Caribbean Central American coast takes place between the Honduras and Colombia. In Atlantic Costa Rica, at Tortuguero the number of nests laid annually between 1995 and 2006 was estimated to range from 199-1,623; modeling of these data indicated that the nesting population has decreased by 67.8% over this time period.

In Puerto Rico, the main nesting areas are at Fajardo on the main island of Puerto Rico and on the island of Culebra. Between 1978 and 2005, nesting increased in Puerto Rico with a minimum of 9 nests recorded in 1978 and a minimum of 469-882 nests recorded each year between 2000 and 2005. Recorded leatherback nesting on the Sandy Point National Wildlife Refuge on the island of St. Croix, U.S. Virgin Islands between 1990 and 2005, ranged from a low of 143 in 1990 to a high of 1,008 in 2001. In the British Virgin Islands, annual nest numbers have increased in Tortola from 0-6 nests per year in the late 1980s to 35-65 nests per year in the 2000s.

The most important nesting beach for leatherbacks in the eastern Atlantic lies in Gabon, Africa. It was estimated there were 30,000 nests along 60 miles (96.5 km) of Mayumba Beach in southern Gabon during the 1999 - 2000 nesting season. Some nesting has been reported in Mauritania, Senegal, and the Bijagos Archipelago of Guinea-Bissau, Turtle Islands and Sherbro Island of Sierra Leone, Liberia, Togo, Benin, Nigeria, Cameroon, Sao Tome and Principe, continental Equatorial Guinea, Islands of Corisco in the Gulf of Guinea and the Democratic Republic of the Congo, and Angola. A larger nesting population is found on the island of Bioko (Equatorial Guinea).

Hawksbill Sea Turtle

About 15,000 females are estimated to nest each year throughout the world with the Caribbean accounting for 20 to 30 percent of the world's hawksbill population. Only five regional populations remain with more than 1,000 females nesting annually (Seychelles, Mexico, Indonesia, and two in Australia) (Meylan and Donnelly 1999). Mexico is now the most important region for hawksbills in the Caribbean with about 3,000 nests/year (Meylan 1999). Other significant but smaller populations in the Caribbean still occur in Martinique, Jamaica, Guatemala, Nicaragua, Grenada, Dominican Republic, Turks and Caicos Islands, Cuba, Puerto Rico, and U.S. Virgin Islands. In the U.S. Caribbean, about 150 to 500 nests per year are laid on Mona Island, Puerto Rico and 70 to 130 nests/year are laid on Buck Island Reef National Monument, U.S. Virgin Islands. In the U.S. Pacific, hawksbills nest only on main island beaches in Hawaii, primarily along the east coast of the island of Hawaii. Hawksbill nesting has also been documented in American Samoa and Guam (NMFS and Service 1998b).

Kemp's Ridley Sea Turtle

Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a small number of Kemp's ridleys nest consistently along the Texas coast (Turtle Expert Working Group 1998). In addition, rare nesting events have been reported in Alabama, Florida, Georgia, South Carolina, and North Carolina. Historic

information indicates that tens of thousands of ridleys nested near Rancho Nuevo, Mexico, during the late 1940s (Hildebrand 1963). The Kemp's ridley population experienced a devastating decline between the late 1940s and the mid 1980s. The total number of nests per nesting season at Rancho Nuevo remained below 1,000 throughout the 1980s, but gradually began to increase in the 1990s. In 2007, 11,268 nests were documented along the 18.6 miles (30 km) of coastline patrolled at Rancho Nuevo, and the total number of nests documented for all the monitored beaches in Mexico was 15,032 (Service 2007c). During the 2007 nesting season, an arribada with an estimated 5,000 turtles was recorded at Rancho Nuevo from May 20 to May 23. In addition, 128 nests were recorded during 2007 in the U.S., primarily in Texas.

Status and Distribution

Loggerhead Sea turtle

A combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries, in addition to genetic differences, were used to reassess the designation of subpopulations within the U.S. to identify recovery units for the Northwest Atlantic population of the loggerhead (NMFS and Service 2008). Five units were designated; the first four recovery units represent nesting assemblages in the southeast U.S. The fifth recovery unit includes all other nesting assemblages within the Northwest Atlantic.

(1) The Northern Recovery Unit is defined as loggerheads originating from nesting beaches from the Florida-Georgia border through southern Virginia (the northern extent of the nesting range). Annual nest totals for this recovery unit averaged 5,215 nests from 1989-2008. The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3% annually since 1983. Nest totals from aerial surveys conducted by SCDNR showed a 1.9% annual decline in nesting in South Carolina since 1980. Overall, there is strong statistical evidence to suggest the Northern Recovery Unit has experienced a long-term decline;

(2) Peninsula Florida Recovery Unit is defined as loggerheads originating from nesting beaches from the Florida-Georgia border through Pinellas County on the west coast of Florida, excluding the islands west of Key West, Florida. Annual nest totals for this recovery unit averaged 64,513 nests from 1989-2007. An analysis of index nesting beach survey data has shown a decline in nesting. Results of the analysis indicated that there has been a decrease of 26% over the 20-year period from 1989-2008 and a 41% decline since 1998. The mean annual rate of decline for the 20-year period was 1.6%;

(3) Dry Tortugas Recovery Unit is defined as loggerheads originating from nesting beaches throughout the islands located west of Key West, Florida. Annual nest totals for this recovery unit averaged 246 nests from 1995-2004 (surveys not conducted in 2002). The nesting trend data for the Dry Tortugas Recovery Unit are from beaches that are not part of the Florida index nesting beach survey program but are part of the statewide nesting beach

survey program. There are 9 years of data for this recovery unit. A simple linear regression accounting for temporal autocorrelation revealed no trend in nesting numbers. Because of the annual variability in nest totals, a longer time series is needed to detect a trend;

(4) Northern Gulf of Mexico Recovery Unit is defined as loggerheads originating from nesting beaches from Franklin County on the northwest Gulf coast of Florida through Texas. Annual nest totals for this recovery unit averaged 906 nests from 1995-2007. Evaluation of long-term nesting trends for the Northern Gulf of Mexico Recovery Unit is difficult because of changed and expanded beach coverage. However, there are 12 years of Florida index nesting beach survey data for the Northern Gulf of Mexico Recovery Unit. A log-linear regression showed a significant declining trend of 4.7% annually; and

(5) Greater Caribbean Recovery Unit is composed of loggerheads originating from all other nesting assemblages within the Greater Caribbean (Mexico through French Guiana, The Bahamas, Lesser Antilles, and Greater Antilles. Statistically valid analyses of long-term nesting trends for the entire Greater Caribbean Recovery Unit are not available because there are few long-term standardized nesting surveys representative of the region. Additionally, changing survey effort at monitored beaches and scattered and low-level nesting by loggerheads at many locations currently precludes comprehensive analyses. The most complete data are from Quintana Roo, Yucatán, Mexico, where an increasing trend was reported over a 15-year period from 1987-2001. However, nesting since 2001 has declined and the previously reported increasing trend appears not to have been sustained. Other smaller nesting populations have experienced declines over the past few decades.

Recovery Criteria

1. Number of Nests and Number of Nesting Females

a. Northern Recovery Unit

(i) The annual rate of increase over a generation time of 50 years is 2% or greater.

(ii) This increase in number of nests must be a result of corresponding increases in number of nesting females.

b. Peninsular Florida Recovery Unit

(i) The annual rate of increase over a generation time of 50 years is statistically detectable (1%) resulting in a total annual number of nests of 106,100 or greater.

(ii) This increase in number of nests must be a result of corresponding increases in number of nesting females.

c. Dry Tortugas Recovery Unit

(i) The annual rate of increase over a generation time of 50 years is 3% or greater.

(ii) This increase in number of nests must be a result of corresponding increases in number of nesting females.

d. Northern Gulf of Mexico Recovery Unit

(i) There is statistical confidence (95%) that the annual rate of increase over a generation time of 50 years is 3% or greater resulting in a total annual number of nests of 4,000 or greater.

(ii) This increase in number of nests must be a result of corresponding increases in number of nesting females.

e. Greater Caribbean Recovery Unit

(i) The total annual number of nests at a minimum of three nesting assemblages, averaging greater than 100 nests annually (e.g., Yucatán, Mexico; Cay Sal Bank, The Bahamas) has increased over a generation time of 50 years.

(ii) This increase in number of nests must be a result of corresponding increases in number of nesting females.

2. Trends in Abundance on Foraging Grounds

A network of in-water sites, oceanic and neritic, distributed across the foraging range is established and monitoring is implemented to measure abundance. There is statistical confidence (95%) that a composite estimate of relative abundance from these sites is increasing for at least one generation.

3. Trends in Neritic Strandings Relative to In-water Abundance

Stranding trends are not increasing at a rate greater than the trends in in-water relative abundance for similar age classes for at least one generation.

Green Turtle

Nesting data collected as part of the Florida SNBS program (2000-2006) show that a mean of approximately 5,600 nests are laid each year in Florida. Nesting occurs in 26 counties with a peak along the east coast, from Volusia through Broward Counties. The green turtle nesting population of Florida appears to be increasing based on 19 years (1989-2007) of INBS data from throughout the state. The increase in nesting in Florida is likely a result of several factors, including: (1) a Florida statute enacted in the early 1970s that prohibited the killing of green turtles in Florida; (2) the species listing under the ESA in 1973, affording complete protection to eggs, juveniles, and adults in all U.S. waters; (3) the passage of Florida's constitutional net ban amendment in 1994 and its subsequent enactment, making it illegal to use any gillnets or other entangling nets in state waters; (4) the likelihood that the majority of Florida adult green turtles reside within Florida waters where they are fully protected; (5) the protections afforded Florida green turtles while they inhabit the waters of other nations that have enacted strong sea turtle conservation measures (e.g., Bermuda); and

(6) the listing of the species on Appendix I of CITES, which stopped international trade and reduced incentives for illegal trade from the U.S.

Recovery Criteria

The U.S. Atlantic population of green sea turtles can be considered for delisting when, over a period of 25 years the following conditions are met:

1. The level of nesting in Florida has increased to an average of 5,000 nests per year for at least six years. Nesting data shall be based on standardized surveys.

2. At least 25 percent (65 miles) of all available nesting beaches (260 miles) are in public ownership and encompass at least 50 percent of the nesting activity.

3. A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The current "Recovery Plan for the U.S. Population of Atlantic Green Turtle (*Chelonia mydas*)" was completed in 1991, the Recovery Plan for U.S. Pacific Populations of the Green Turtle (*Chelonia mydas*)" was completed in 1998, and the "Recovery Plan for U.S. Pacific Populations of the East Pacific Green Turtle (*Chelonia mydas*)" was completed in 1998. The recovery criteria contained in the plans, while not strictly adhering to all elements of the Recovery Planning Guidelines (Service and NOAA), are a viable measure of the species status.

Leatherback Sea Turtle

Declines in leatherback nesting have occurred over the last two decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (historically estimated to be 65 percent of worldwide population), is now less than one percent of its estimated size in 1980. Spotila et al. (1996) estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200 and an upper limit of about 42,900. This is less than one third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. The largest population is in the western Atlantic. Using an age-based demographic model, Spotila et al. (1996) determined that leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and that even the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded that leatherbacks are on the road to extinction and further population declines can

be expected unless action is taken to reduce adult mortality and increase survival of eggs and hatchlings.

In the U.S., nesting populations occur in Florida, Puerto Rico, and the U.S. Virgin Islands. In Florida, the SNBS program has documented an increase in leatherback nesting numbers from 98 nests in 1988 to between 800 and 900 nests per season in the early 2000s (FWC SNBS; Stewart and Johnson 2006). Although the SNBS program provides information on distribution and total abundance statewide, it cannot be used to assess trends because of variable survey effort. Therefore, leatherback nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time (1989-2007). An analysis of the INBS data has shown a substantial increase in leatherback nesting in Florida since 1989 (FWC INBS; Turtle Expert Working Group 2007).

Recovery Criteria

The U.S. Atlantic population of leatherbacks can be considered for delisting when the following conditions are met:

1. The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, U.S. Virgin Island, and along the east coast of Florida.

2. Nesting habitat encompassing at least 75 percent of nesting activity in U.S. Virgin Islands, Puerto Rico, and Florida is in public ownership.

3. All priority one tasks identified in the recovery plan have been successfully implemented.

The current "Recovery Plan for the Leatherback Turtles (*Dermochelys coriacea*)" in the U.S. Caribbean, Atlantic, and Gulf of Mexico" was signed in 1992 and the "Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (*Dermochelys coriacea*)" was signed in 1998. The recovery criteria contained in the plans, while not strictly adhering to all elements of the Recovery Planning Guidelines (Service and NOAA), are a viable measure of the species status.

Hawksbill Sea Turtle

The hawksbill sea turtle has experienced global population declines of 80 percent or more during the past century and continued declines are projected (Meylan and Donnelly 1999). Most populations are declining, depleted, or remnants of larger aggregations. Hawksbills were previously abundant, as evidenced by high-density nesting at a few remaining sites and by trade statistics.

Recovery Criteria

The U.S. Atlantic population of hawksbills can be considered for delisting when the following conditions are met:

1. The adult female population is increasing, as evidenced by a statistically significant trend in the annual numbers of nests on at least five index beaches, including Mona Island and Buck Island Reef National Monument (BIRNM).

2. Habitat for at least 50 percent of the nesting activity that occurs in the U.S. Virgin Islands (USVI) and Puerto Rico is protected in perpetuity.

3. Numbers of adults, subadults, and juveniles are increasing, as evidenced by a statistically significant trend on at least five key foraging areas within Puerto Rico, USVI, and Florida.

4. All priority one tasks identified in the recovery plan have been successfully implemented.

Kemp's Ridley Sea Turtle

Today, under strict protection, the population appears to be in the early stages of recovery. The recent nesting increase can be attributed to full protection of nesting females and their nests in Mexico resulting from a bi-national effort between Mexico and the U.S. to prevent the extinction of the Kemp's ridley, and the requirement to use Turtle Excluder Devices (TEDs) in shrimp trawls both in the United States and Mexico.

The Mexico government also prohibits harvesting and is working to increase the population through more intensive law enforcement, by fencing nest areas to diminish natural predation, and by relocating most nests into corrals to prevent poaching and predation. While relocation of nests into corrals is currently a necessary management measure, this relocation and concentration of eggs into a "safe" area is of concern since it makes the eggs more susceptible to reduced viability.

Recovery Criteria

The goal of the recovery plan is for the species to be reduced from endangered to threatened status. The Recovery Team members feel that the criteria for a complete removal of this species from the endangered species list need not be considered now, but rather left for future revisions of the plan. Complete removal from the federal list would certainly necessitate that some other instrument of protection, similar to the Marine Mammal Protection Act, be in place and be international in scope. Kemp's ridley can be considered for reclassification to threatened status when the following four criteria are met:

1. Protection of the known nesting habitat and the water adjacent to the nesting beach (concentrating on the Rancho Nuevo area) and continuation of the bi-national project.

2. Elimination of the mortality from incidental catch from commercial shrimping in the U.S. and Mexico through the use of TEDs and full compliance with the regulations requiring TED use.

3. Attainment of a population of at least 10,000 females nesting in a season.

4. All priority one recovery tasks in the recovery plan are successfully implemented.

The current Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) was signed in 1992. Significant new information on the biology and population status of Kemp's ridley has become available since 1992. Consequently, a full revision of the recovery plan has been undertaken by the Service and NMFS and is nearing completion. The revised plan will provide updated species biology and population status information, objective and measurable recovery criteria, and updated and prioritized recovery actions. The Service and NMFS completed a five-year status review of the Kemp's ridley sea turtle in August 2007 (NMFS and Service 2007d). Recommendations provided in the five-year review focused on the protection of the species both in the water (enforcement of TED use) and on land (nesting habitat).

Common threats to sea turtles in Florida

Anthropogenic (human) factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion, armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs, and an increased presence of native species (*e.g.*, raccoons, armadillos, and opossums), which raid and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the western North Atlantic coast, other areas along these coasts have limited or no protection.

Anthropogenic threats in the marine environment include oil and gas exploration and transportation; marine pollution; underwater explosions; hopper dredging, offshore artificial lighting; power plant entrainment and/or impingement; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; poaching and fishery interactions.

Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor, particularly for green

turtles. This disease has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die.

Climate change is evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level, according to the Intergovernmental Panel on Climate Change Report (IPCC 2007). The IPCC Report (2007) describes changes in natural ecosystems with potential wide-spread effects on many organisms, including marine mammals and migratory birds. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the Department of the Interior (DOI) requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2007).

Temperatures are predicted to rise from 2°C to 5°C for North America by the end of this century (IPCC 2007a,b). Other processes to be affected by this projected warming include rainfall (amount, seasonal timing and distribution), storms (frequency and intensity), and sea level rise.

Climatic changes in Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management. Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006). As the level of information increases concerning the effects of global climate change on sea turtles, the Service will have a better basis to address the nature and magnitude of this potential threat and will more effectively evaluate these effects to the range-wide status of sea turtles.

Analysis of the species/critical habitat likely to be affected

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project area. The effects of the proposed action on sea turtles will be considered further in the remaining sections of this biological opinion. Potential effects include destruction of nests deposited within the boundaries of the proposed project, harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities, disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting, behavior modification of nesting females due to escarpment formation within the project area during a nesting season resulting in false crawls or situations where they choose

marginal or unsuitable nesting areas to deposit eggs. The quality of the placed sand could affect the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest.

Critical habitat has not been designated in the continental United States; therefore, the proposed action would not result in an adverse modification.

ENVIRONMENTAL BASELINE

Status of the species within the action area

Loggerhead Sea Turtle

The loggerhead sea turtle nesting and hatching season for Southern Florida Atlantic beaches extends from March 15 through November 30. Incubation ranges from about 45 to 95 days.

The PAFB project area has a significant number of loggerhead nests. Between 889 and 1,457 loggerhead nests were deposited annually on PAFB beach from 2003 through 2008.

Green Sea Turtle

The green sea turtle nesting and hatching season for Southern Florida Atlantic extends from May 1 through November 30. Incubation ranges from about 45 to 75 days.

The PAFB project area has a significant number of green turtle nests. Between 4 and 39 green turtle nests were deposited annually on PAFB beach from 2003 through 2008.

Leatherback Sea Turtle

The leatherback sea turtle nesting and hatching season for Southern Florida Atlantic beaches extends from February 15 through November 15. Incubation ranges from about 55 to 75 days.

The PAFB project area has had an increasing number of leatherback nests over the years. Between 0 and 3 leatherback turtle nests were deposited annually on PAFB beach from 2003 through 2008.

Hawksbill Sea Turtle

The hawksbill sea turtle nesting and hatching season for Southern Florida Atlantic beaches extends from June 1 through December 31. Incubation lasts about 60 days.

Hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Dade Counties) and the Florida Keys (Monroe County) (Meylan 1992, Meylan *et al.* 1995). However, hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors. Therefore, surveys in Florida likely

underestimate actual hawksbill nesting numbers (Meylan *et al.* 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1993).

Factors affecting the species environment within the action area

Hurricanes

Hurricanes were probably responsible for maintaining coastal beach habitat upon which sea turtles depend through repeated cycles of destruction, alteration, and recovery of beach and dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain and can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes and other storms can result in the direct or indirect loss of sea turtle nests, either by erosion or washing away of the nests by wave action or inundation or "drowning" of the eggs or hatchlings developing within the nest or indirectly by loss of nesting habitat. Depending on their frequency, storms can affect sea turtles on either a short-term basis (nests lost for one season and/or temporary loss of nesting habitat) or long term, if frequent (habitat unable to recover). How hurricanes affect sea turtle nesting also depends on its characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining nesting habitat, frequent or successive severe weather events could threaten the ability of certain sea turtle populations to survive and recover. Sea turtles evolved under natural coastal environmental events such as hurricanes. The extensive amount of pre-development coastal beach and dune habitat allowed sea turtles to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to sea turtle survival and recovery. On developed beaches, typically little space remains for sandy beaches to become re-established after periodic storms. While the beach itself moves landward during such

storms, reconstruction or persistence of structures at their pre-storm locations can result in a major loss of nesting habitat.

Erosion

The designation of a Critically Eroded Beach is a planning requirement of the State's Beach Erosion Control Funding Assistance Program. A segment of beach shall first be designated as critically eroded in order to be eligible for State funding. A critically eroded area is a segment of the shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critically eroded areas may also include peripheral segments or gaps between identified critically eroded areas because their inclusion is necessary for continuity

of management of the coastal system or for the design integrity of adjacent beach management projects (FDEP 2005). It is important to note, that for an erosion problem area to be critical, there shall exist a threat to or loss of one of four specific interests – upland development, recreation, wildlife habitat, or important cultural resources. The total of critically eroded beaches statewide in Florida for 2007 is 388 miles of 497 miles of shoreline. Seventy-eight (78) percent of the State's shoreline is considered to be critically eroded.

Beachfront Lighting

Artificial beachfront lighting may cause disorientation (loss of bearings) and misorientation (incorrect orientation) of sea turtle hatchlings. Visual signs are the primary sea-finding mechanism for hatchlings (Mrosovsky and Carr 1967; Mrosovsky and Shettleworth 1968; Dickerson and Nelson 1989; Witherington and Bjorndal 1991). Artificial beachfront lighting is a documented cause of hatchling disorientation and misorientation on nesting beaches (Philibosian 1976; Mann 1977; FWC 2006). The emergence from the nest and crawl to the sea is one of the most critical periods of a sea turtle's life. Hatchlings that do not make it to the sea quickly are eaten by ghost crabs, birds, and other predators or become dehydrated and die before reaching the ocean. Some types of beachfront lighting attract hatchlings away from the sea while some lights cause adult turtles to avoid stretches of brightly illuminated beach. Research has documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992). During the 2007 sea turtle nesting season in Florida, over 64,000 turtle hatchlings were documented as being disoriented (**Table 1**) (FWC/FWRI 2007, http://www.myfwc.com/seaturtle/Lighting/Light_Disorient.htm). Exterior and interior lighting associated with condominiums had the greatest impact causing approximately 42 percent of documented hatchling disorientation/misorientation. Other causes included urban sky glow and street lights (http://www.myfwc.com/seaturtle/Lighting/Light_Disorient.htm).

Table 1. Documented Disorientations along the Florida coast.

Year	Total Number of Hatchling Disorientation Events	Total Number of Hatchlings Involved in Disorientation Events	Total Number of Adult Disorientation Events
2001	743	28,674	19
2002	896	43,226	37
2003	1,446	79,357	18
2004	888	46,487	24
2005	976	41,521	50
2006	1,521	71,798	40
2007	1,410	64,433	25
2008	1192	49,623	62

Predation

Depredation of sea turtle eggs and hatchlings by natural and introduced species occurs on almost all nesting beaches. Depredation by a variety of predators can considerably decrease sea turtle nest hatching success. The most common predators in the southeastern United States are ghost crabs (*Ocypode quadrata*), raccoons (*Procyon lotor*), feral hogs (*Sus scrofa*), foxes (*Urocyon cinereoargenteus* and *Vulpes vulpes*), coyotes (*Canis latrans*), armadillos (*Dasypus novemcinctus*), cats (*Felis catus)*, and fire ants (*Solenopsis* spp.) (Dodd 1988, Stancyk 1995). Raccoons are particularly destructive on the Atlantic coast and may take up to 96 percent of all nests deposited on a beach (Davis and Whiting 1977, Hopkins and Murphy 1980, Stancyk et al. 1980, Talbert et al. 1980, Schroeder 1981, Labisky et al. 1986). As nesting habitat dwindles, it is essential that nest production be naturally maximized so the turtles may continue to exist in the wild.

In response to increasing depredation of sea turtle nests by coyote, fox, hog, and raccoon, multi-agency cooperative efforts have been initiated and are ongoing throughout Florida, particularly on public lands.

Climate Change

Based on the present level of available information concerning the effects of global climate change on the status of sea turtles, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting sea turtles or its designated critical habitat. Nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The Service is not aware of any cumulative effects in the project area.

CONCLUSION

After reviewing the current status of the loggerhead, green, hawksbill, and leatherback turtle, the environmental baseline for the action area, the effects of the proposed beach nourishment, and the cumulative effects, it is the Service's biological opinion that the beach nourishment project, as proposed, is not likely to jeopardize the continued existence of the loggerhead, green, hawksbill, and leatherback turtle, and is not likely to destroy or adversely modify designated critical habitat. No critical habitat has been designated for the loggerhead, green, hawksbill, and leatherback turtle, in the continental United States; therefore, none will be affected.

The proposed project will affect only 8,500 linear feet for dune restoration and 11,235 linear feet for beach renourishment for the entire beach profile of the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern U.S. Although a variety of controllable and uncontrollable factors can influence the performance of a nourishment project from an engineering perspective, measures can be implemented to minimize impacts to sea turtles.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the Air Force so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Air Force has a continuing duty to regulate the activity covered by this incidental take statement. If the Air Force (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Air Force must report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF ANTICIPATED TAKE

The Service anticipates 8,500 linear feet for dune restoration and 11,235 linear feet for beach renourishment for the entire beach profile of nesting beach habitat could be taken as a result of this proposed action. The take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited from March 1 through April 30 and from September 1 through September 30 and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited from October 1 through February 28 (or 29 as applicable) when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse

conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) misdirection of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

Incidental take is anticipated for only the 8,500 linear feet for dune restoration and 11,235 linear feet for beach renourishment for the entire beach profile of beach that has been identified for sand placement. The Service anticipates incidental take of sea turtles will be difficult to detect for the following reasons: (1) the turtles nest primarily at night and all nests are not found because [a] natural factors, such as rainfall, wind, and tides may obscure crawls and [b] human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program; (2) the total number of hatchlings per undiscovered nest is unknown; (3) the reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown; (4) an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area; (5) lights may misdirect an unknown number of hatchlings and cause death; and (6) escarpments may form and cause an unknown number of females from accessing a suitable nesting site. However, the level of take of these species can be anticipated by the disturbance and renourishment of suitable turtle nesting beach habitat because: (1) turtles nest within the project site; (2) beach renourishment will likely occur during a portion of the nesting season; (3) the renourishment project will modify the incubation substrate, beach slope, and sand compaction; and (4) artificial lighting will deter and/or misdirect nesting females and hatchlings.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species. Critical habitat has not been designated in the project area; therefore, the project will not result in destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerhead, green, hawksbill, and leatherback sea turtles.

1. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence must be used on the project site.

2. Beach nourishment activities must not occur from May 1 through October 31, the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial or crushing of eggs.

3. If the beach nourishment project will be conducted during the period from March 1 through April 30, surveys for early nesting sea turtles must be conducted. If nests are constructed in the area of beach nourishment, the eggs must be relocated.

4. If the beach nourishment project will be conducted during the period from November 1 through November 30, surveys for late nesting sea turtles must be conducted. If nests are constructed in the area of beach nourishment, the eggs must be relocated.

5. All derelict concrete, metal, coastal armoring geotextile material or other debris must be removed from the beach prior to any sand placement.

6. Any new light sources visible from the beach as a result of the raised beach elevation must be addressed under the Lighting BO (41910-2009-F-0087) dated November 2008.

7. A meeting between representatives of the Air Force, the contractor, the Service, and the permitted sea turtle surveyor, must be held prior to the commencement of work on this project.

8. Beach compaction must be monitored and tilling (non-vegetated areas) must be conducted if needed immediately after completion of the sand placement project and prior to the next three nesting seasons to reduce the likelihood of impacting sea turtle nesting and hatching activities. (NOTE: Out-year beach compaction monitoring and tilling are not required if placed material no longer remains on the dry beach.)

9. Escarpment formation must be monitored and leveling must be conducted if needed immediately after completion of the sand placement project and prior to the next three nesting seasons to reduce the likelihood of impacting nesting and hatchling sea turtles.

10. Construction equipment and materials must be stored in a manner that will minimize impacts to nesting and hatchling sea turtles to the maximum extent practicable.

11. Lighting associated with the project construction must be minimized to reduce the possibility of disrupting and disorienting nesting and/or hatchling sea turtles.

12. A report describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the Service by March 1 of the year following completion of the proposed work for each year when the activity has occurred.

13. The Service and the FWC must be notified if a sea turtle adult, hatchling, or egg is harmed or destroyed as a direct or indirect result of the project.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Air Force must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. Beach compatible fill must be placed on the beach or in any associated dune system. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Such material must be predominately of carbonate, quartz or similar material with a particle size distribution ranging between 0.062mm and 4.76mm (classified as sand by either the Unified Soils or the Wentworth classification), must be similar in color and grain size distribution (sand grain frequency, mean and median grain size and sorting coefficient) to the material in the historic beach sediment at the disposal site, and must not contain:

   1a. Greater than 5 percent, by weight, silt, clay or colloids passing the #230 sieve;

   1b. Greater than 5 percent, by weight, fine gravel retained on the #4 sieve (- 2.25φ);

   1c. Coarse gravel, cobbles or material retained on the 3/4 inch sieve in a percentage or size greater than found on the native beach;

   1d. Construction debris, toxic material or other foreign matter; and

   1e. Material that will result in cementation of the beach.

If rocks or other non-specified materials appear on the surface of the filled beach in excess of 50 percent of background in any 10,000 square foot area, then surface rock should be removed from those areas. These areas must also be tested for subsurface rock percentage and remediated as required. If the natural beach exceeds any of the limiting parameters listed above, then the fill material must not exceed the naturally occurring level for that parameter on nearby native beaches.

Pursuant to subsection 62B-41.005(15), Florida Administrative Code (F.A.C.), sandy sediment derived from the maintenance of coastal navigation channels must be deemed suitable for beach placement with up to 10 percent fine material passing the #230 sieve, provided that it meets the criteria contained in 2b to 2e above and water quality standards. If this material contains between 10 percent and 20 percent fine material passing the #230 sieve by weight, and it meets all other sediment and water quality standards, it must be considered suitable for placement in the nearshore portion of the beach.

These standards must not be exceeded in any 10,000 square foot section extending through the depth of the nourished beach. If the native beach exceeds any of the

limiting parameters listed above, then the fill material must not exceed the naturally occurring level for that parameter on nearby native beaches.

2. Beach nourishment must be started after October 31 and be completed before May 1. During the May 1 through October 31 period, no construction equipment or pipes will be stored on the beach.

3. For sand placement projects that occur during the period from March 1 through April 30, daily early morning surveys must be conducted for sea turtle nests from March 1 through April 30 or until completion of the project (whichever is earliest), and eggs must be relocated per the following requirements. For sand placement projects that occur during the period from November 1 through November 30, daily early morning sea turtle nesting surveys must be conducted 65 days prior to project initiation and continue through September 30, and eggs must be relocated per the following requirements.

   3a. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to F.A.C 68E-1. Please contact FWC's Marine Turtle Management Program in Tequesta at (561) 575-5408 for information on the permit holder in the project area. Nesting surveys must be conducted daily between sunrise and 9 a.m. (this is for all time zones).

   3b. Only those nests that may be affected by sand placement activities will be relocated. Nests requiring relocation must be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests must not be placed in organized groupings; relocated nests must be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, or subject to artificial lighting. Nest relocations in association with construction activities must cease when construction activities no longer threaten nests.

   3c. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the nourished berm prior to tilling must be marked and left in situ unless other factors threaten the success of the nest. The turtle permit holder must install an on-beach marker at the nest site and/or a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity will occur within this area nor will any activities occur which could result in impacts to the nest. Nest sites must be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

4. If the beach nourishment project will be conducted during the period from November 1 through November 30, surveys for late nesting sea turtles must be conducted. If nests are constructed in the area of beach nourishment, the eggs must be relocated.

5. All derelict concrete, metal, and coastal armoring geotextile material and other debris must be removed from the beach prior to any sand placement to the maximum extent practicable. If debris removal activities will take place during the sea turtle nesting season (March 1 through October 31), the work must be conducted during daylight hours only and must not commence until completion of the sea turtle survey each day.

6. Any new light sources visible from the beach as a result of the raised beach elevation must be addressed under the Lighting BO (41910-2009-F-0087) dated November 2008.

7. A meeting between representatives of the Air Force, the contractor, the Service, and the permitted sea turtle surveyor, must be held prior to the commencement of work on this project. At least 10-business days advance notice must be provided prior to conducting this meeting.

8. Sand compaction must be monitored in the area of sand placement immediately after completion of the project and prior to March 1 for 3 subsequent years in accordance with a protocol agreed to by the Service, FWC, and the applicant or local sponsor. At a minimum, the protocol provided under 8a and 8b below must be followed. If tilling is needed, the area must be tilled to a depth of 36 inches. Each pass of the tilling equipment must be overlapped to allow more thorough and even tilling. All tilling activity must be completed at least once prior to nesting season. A report on the results of the compaction monitoring must be submitted to the Service's field office prior to any tilling actions being taken. (NOTE: The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post-construction compaction levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.)

   8a. Compaction sampling stations must be located at 500-foot intervals along the project area. One station must be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station must be midway between the dune line and the high water line (normal wrack line).

   8b. At each station, the cone penetrometer must be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates must be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth must be averaged to produce final values for each depth at

each station. Reports will include all 18 values for each transect line, and the final 6 averaged compaction values.

8c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area must be tilled immediately prior to the dates listed above.

8d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

8e. Tilling must occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

9. Visual surveys for escarpments along the project area must be made immediately after completion of the beach nourishment project or dredged channel material placement and during 30 days prior to March 1 for 3 subsequent years if sand still remains on the beach. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet must be leveled and the beach profile must be reconfigured to minimize scarp formation by March 1. Any escarpment removal must be reported by location. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. Surveys for escarpments must be conducted weekly during the three nesting seasons following completion of the project. The Service must be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the Service or FWC will provide a brief written authorization that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken must be submitted to the Service's Field Office. (NOTE: Out-year escarpment monitoring and remediation are not required if placed material no longer remains on the dry beach).

10. Staging areas for construction equipment must be located off the beach from March 1 through April 30 and November 1 through November 30, if off-beach staging areas are available. Nighttime storage of construction equipment not in use must be off the beach to minimize disturbance to sea turtle nesting and hatching activities.

11. Direct lighting of the beach and nearshore waters must be limited to the immediate construction area from March 1 through April 30 and November 1 through November 30, and must comply with safety requirements. Lighting on offshore or onshore equipment must be minimized through reduction, shielding, lowering, and appropriate

placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, EM 385-1-1, and OSHA requirements. Light intensity of lighting plants must be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields must be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (see **Figure 1**).

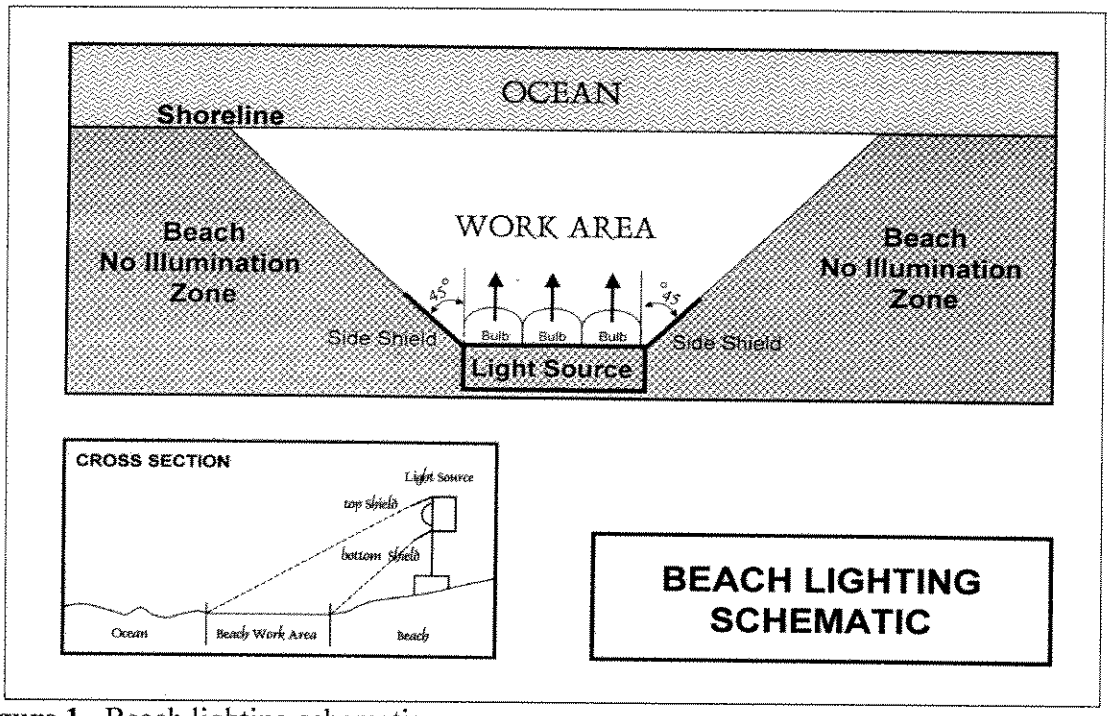

Figure 1. Beach lighting schematic.

12. A report describing the projects conducted during the year and actions taken to implement the reasonable and prudent measures and terms and conditions of this incidental take statement shall be submitted to the Service by March 1 of the following year of completing the proposed work for each year when the activity has occurred. This report will include project location (FDEP R-Monuments), dates of construction, descriptions and locations of self-release beach sites.

13. In the event a sea turtle nest is excavated during construction activities, the permitted person responsible for egg relocation for the project must be notified so the eggs can be moved to a suitable relocation site.

    Upon locating a dead or injured sea turtle adult, hatchling, or egg that may have been harmed or destroyed as a direct or indirect result of the project, the Air Force must be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922) and the Service Office.

Care must be taken in handling injured or dead turtles or eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

The Service believes that incidental take will be limited to the 8,500 linear feet for dune restoration and 11,235 linear feet for beach renourishment for the entire beach profile of beach that have been identified for sand placement. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that no more than the following types of incidental take will result from the proposed action: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service. The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a one-time placement of sand to the 8,500 linear feet for dune restoration and 11,235 linear feet for beach renourishment for the entire beach profile of beach that have been identified for sand placement. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Air Force must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Appropriate native salt-resistant dune vegetation should be established on the restored dunes. The Florida Department of Environmental Protection, Bureau of Beaches and Wetland Resources, can provide technical assistance on the specifications for design and implementation.

2. Surveys for nesting success of sea turtles should be continued for a minimum of 3 years following beach nourishment to determine whether sea turtle nesting success has been adversely impacted.

3. Educational signs should be placed where appropriate at beach access points explaining the importance of the area to sea turtles and/or the life history of sea turtle species that nest in the area.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions regarding this BO, please contact Ann Marie Lauritsen of this office at (904) 525-0661.

Sincerely,

for David L. Hankla
Field Supervisor

cc:

Robbin Trindell- FWC
Ken Graham- Service/Atlanta

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APPENDIX D

Consultation with U.S. National Marine Fisheries Service, Habitat Conservation Division, Essential Fish Habitat Conservation Recommendations and Correspondence, PAFB Shoreline Restoration Project, FL

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
(727) 824-5317; FAX (727) 824-5300
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July 29, 2009 F/SER4:GG/pw

(Sent via Electronic Mail)

Colonel Paul Grosskruger
District Engineer, Jacksonville District
Regulatory Division, North Permits Branch
Department of the Army, Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Attention: Stephen Brooker

Dear Colonel Grosskruger:

NOAA's National Marine Fisheries Service (NMFS) reviewed public notice SAJ-1996-3789 (SP-TSB), dated June 9, 2009; the comment period for this notice was extended by your staff until July 10, 2009. The 45th Space Wing (45SW) Patrick Air Force Base (PAFB) proposes to place up to 310,000 cubic yards of beach compatible sand along the northern 3.1 miles of shoreline between FDEP reference monuments R53 and R70, in Brevard County, Florida. The sources of the sand would be a combination of offshore borrow areas (referred to as Canaveral Shoals I and Canaveral Shoals II) and an upland area at the Cape Canaveral Air Force Station (CCAFS). The Jacksonville District has not made a determination on whether the project would adversely affect essential fish habitat (EFH) or federally managed fishery species; however the District notes that 45SW believes impacts to EFH would be minimal. As the nation's federal trustee for the conservation and management of marine, estuarine, and anadromous fishery resources, the following comments and recommendations are provided pursuant to authorities of the Fish and Wildlife Coordination Act, the Water Resources Development Act, and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

Project Description
The proposed project dimensions and construction methods are similar to those used for shore protection projects at PAFB during 2000-2001 and 2005 and permitted under the same project number as the current public notice. The proposed beach fill area is approximately 65 acres. To reduce impacts to worm rock and other live/hardbottom along the fill area, placement of fill along the southern mile (Reach 2), approximately between FDEP monuments R65 and R70, would be done by truck haul and the width of the fill would be reduced. North of this area (Reach 1), between FDEP monuments R53 and R65, material would be placed either by truck haul or by a hopper dredge with pump-out capability.

The source of the sand is significantly different between the proposed beach nourishment and the nourishment that previously occurred at PAFB. Previous beach nourishment used sand from the Canaveral Shoals II borrow area, which is within federal waters. The proposed beach nourishment will use a combination of three sources based on project conditions determined at the time of construction. If

only the offshore borrow areas will be used for sand, the truck haul for Reach 2 will be accomplished by creating a temporary stockpile within the southern 4000 feet of Reach 1 (i.e., between FDEP monuments R61 and R65). Use of the upland borrow area at CCAFS is reviewed in an Environmental Assessment and Finding of No Significant Impact completed by the USAF during September 2007. PAFB is in the process of securing approval from the US Minerals Management Service for further use of the Canaveral Shoals II borrow area.

Essential Fish Habitat within the Project Area
The South Atlantic Fishery Management Council (SAFMC) designates habitats in the vicinity of the project as EFH, including live/hardbottoms, worm rock reef, and the sandy shoals off Cape Canaveral. Live/hardbottom and worm rock are EFH for juvenile and adult gag and yellowedge grouper, gray and mutton snapper, and spiny lobster. In addition, the SAFMC also designates live/hardbottom and worm rock as Habitat Areas of Particular Concern (HAPC) for the snapper/grouper complex or highly migratory pelagic species. The shoals off of Cape Canaveral are part of a cross-shelf current system that SAFMC designates as an HAPC for shrimp. HAPCs are subsets of EFH that are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. Detailed information on these species and their EFH is provided in the 1998 comprehensive amendment to the fishery management plans prepared by the SAFMC.

Nearshore live/hardbottom habitats are the primary natural reef structures at depths of 0 to 4 m offshore of southeast and central Florida. Diverse, ichthyofauna dominated by early life stages utilize this habitat. The structural complexity of this habitat is enhanced by colonies of tube-building polychaete worms (forming worm rock) and by other invertebrates and macroalgae. Over 325 species of invertebrates and plants from nearshore live/hardbottom habitats have been recorded at Sebastian Inlet and over 118 species from nearshore live/hardbottom in Palm Beach County. Early life stages from over 20 managed fish species occur in these hardbottom habitats. Hardbottom habitats often occur between mid-shelf reefs to the east and estuarine habitats to the west, and this central location allows the habitats to serve as settlement areas for immigrating larvae or as nursery areas for emigrating juveniles. The central location coupled with being the only natural hard structure in the areas makes nearshore live/hardbottom an important EFH resource[1].

Canaveral Shoals I occurs in depth of 10 to 20 feet MLLW and Canaveral Shoals II occurs in depths of 20 to 40 feet MLLW. These offshore sand shoals are known to support a diverse faunal assemblage, although comparatively little research has been conducted. Studies from the Capron Shoal area off Fort Pierce Inlet show over 188 species of invertebrates within benthic samples, a study from Indian River County collected 194 species of fish from open shelf sand habitats, including flatfish, searobins, cusk eels, baitfish, skates[2].

Impacts to Essential Fish Habitat
Nearshore hardbottom and worm rock: NMFS agrees the project design represents considerable effort to avoid and minimize impacts to live/hardbottom and worm rock. Surveys of nearshore live/hardbottom

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[1] Nelson, W.G., and L. Demetraides. 1992. Peracarids associates with sabellarid worm rock (*Phragmatopoma lapidosa* Kinberg) at Sebastian Inlet, Florida, U.S.A. Journal of Crustacean Biology 12(4): 647-654
Lindeman, K.C., and D.B. Snyder. 1999. Nearshore hardbottom fishes of southeast Florida and effects of habitat burial by dredging. Fishery Bulletin 97(4): 508-525
Vare, C.N. 1991. A survey, analysis, and evaluation of the nearshore reefs situated off Palm Beach County, Florida. M.S. Thesis, Florida Atlantic University, Boca Raton, FL. 165 pp.
[2] Johnson, R.O. 1982. The effects of dredging on offshore benthic macrofauna south of the inlet at Fort Pierce, Florida. MS thesis, Florida Institute of Technology Melbourne, Florida. 137 pp.
Gilmore, R.G. and D.J. Herrema. 1981. Fishes of the Indian River Lagoon and adjacent waters, Florida. Harbor Branch Foundation, Inc. Tech. Rep. 41. 64 pp.

habitat are inherently difficult leading to low precision results. Monitoring of the beach profile since 2005 generally shows the beach fill has not encroached onto the worm rock or other live/hardbottom, however some burial of this important habitat has occurred while other live/hardbottom appears to have become emergent. While this result is encouraging, results must be viewed cautiously because the methods used are not able to discern whether indirect impacts from elevated sedimentation or turbidity have occurred to live/hardbottom. Consistent with recommendations NMFS has provided for other beach nourishment projects, a biological monitoring program is needed to complement the physical monitoring. This program should focus primarily on quantifying the amount of live worm rock and secondarily on documenting utilization of this habitat by macroinvertebrates and fish. The monitoring also should include suitable reference areas, and it may be more efficient for 45SW, the Jacksonville District, and Brevard County to examine the feasibility of coordinating this monitoring with that needed for the Brevard County shore protection projects.

Canaveral Shoals I and II Borrow Areas: NMFS is concerned that systematic dredging of shoals, such as those off Cape Canaveral, may result in unanticipated changes in habitat quality. Sandy shoals provide feeding, resting, and staging habitat for a variety of commercially, recreationally, or ecologically important fish species. Although, opportunistic invertebrate communities may repopulate these areas after the dredging, benthic populations may not recover to pre-project levels. Dredging will also re-suspend any fine material in the borrow area which can result in clogged gills in young, less mobile fish and invertebrates and thereby increase their mortality rate. The extent of negative effect is dependent on the life history stages of the species present and the duration of the event. We note that Canaveral Shoals is reconfigured on a regular basis by natural process. However, reconfiguring on tidal, seasonal, and annual scales does not diminish its habitat value. Canaveral Shoals is a long-established seascape feature that provides valuable habitat for fishery resources that utilize estuaries and offshore waters as a part of their life cycle. Avoiding mining sand from Canaveral Shoals would ensure that these important areas would not be altered to the point that they no longer provide valuable habitat. NMFS recommends the upland borrow area at CCAFS be used to the maximum extent practicable for nourishing the beach at PAFB.

To fully evaluate the proposed mining of the shoals for sand, NMFS requires additional information regarding the rates at which borrow areas are expected to fill and measures 45SW may take to limit dredging to portions of the shoal expected to fill in most rapidly. For example, limiting the dredging to the prevailing downdrift flanks of the shoals and limiting the depths of the dredge cuts to 3 to 6 feet may be good practices. NMFS also recommends monitoring of the shoal's infauna communicates be required to quantify whether the actual impacts to EFH are within acceptable limits. As with the monitoring for the live/hardbottom, it may be more efficient for 45SW, the Jacksonville District, and Brevard County to examine the feasibility of coordinating this monitoring with that needed for the Brevard County shore protection projects.

EFH Conservation Recommendations
NMFS finds the proposed project would adversely impact EFH. Section 305(b)(4)(A) of the Magnuson-Stevens Act requires NMFS to provide EFH conservation recommendations when an activity is expected to adversely impact EFH. Accordingly, NMFS provides the following:

EFH Conservation Recommendations

- Dredging within offshore borrow areas (Canaveral Shoals I and II) shall be limited to the portions of the shoal expected to fill in most quickly once dredging has stopped. 45SW shall provide NMFS a plan for accomplishing this objective before a permit is issued.
- A physical monitoring plan for the offshore borrow areas shall be provided to NMFS for review and approval before a permit is issued. The objectives of the monitoring shall be to document the rate at

which the offshore borrow areas fill and grain-size distribution of the material that fills the dredge hole(s).

- An integrated biological and physical monitoring plan for the worm rock and nearshore live/hardbottom offshore of the fill area shall be provided to NMFS for review and approval before a permit is issued. The primary objective of the monitoring shall be to quantify the amount of live worm rock and secondarily on documenting utilization of this habitat by macroinvertebrates and fish.

Section 305(b)(4)(B) of the Magnuson-Stevens Act and its implementing regulation at 50 CFR Section 600.920(k) require your office to provide a written response to this letter within 30 days of its receipt. If it is not possible to provide a substantive response within 30 days, in accordance with our "findings" with your Regulatory Functions Branch, an interim response should be provided to NMFS. A detailed response then must be provided prior to final approval of the action. Your detailed response must include a description of measures proposed by your agency to avoid, mitigate, or offset the adverse impacts of the activity. If your response is inconsistent with our EFH Conservation Recommendation, you must provide a substantive discussion justifying the reasons for not following the recommendation.

In closing, NMFS notes the importance of understanding the long-term sand budget deficits in the area of Port Canaveral. While sand by-pass has begun, this constructed and maintained inlet has blocked littoral sand flows for over forty years, which has prompted 45SW and Brevard County to request large-scale beach nourishment projects. New approaches are needed to balance shoreline protection and stewardship of fishery resources. NMFS recommends a comprehensive examination of the area to include all areas affected by the navigation projects at Port Canaveral.

We appreciate the opportunity to provide these comments. Please direct related questions to Mr. George Getsinger at our Northeast Florida Office. He may be reached at 9741 Ocean Shore Drive, St. Augustine, Florida 32080, by telephone at (904) 461-8674, or by email at George.Getsinger@noaa.gov.

Sincerely,

Pace Wilber

/ for

Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

cc:

COE, Stephen.Brooker@usace.army.mil
EPA, Eric.H.Hughes@usace.army.mil
FWS, John_Milio@fws.gov
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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
(727) 824-5317; FAX (727) 824-5300
http://sero.nmfs.noaa.gov/

December 10, 2010 F/SER4:GG/pw

(Sent via Electronic Mail)

Mr. Patrick S. Giniewski
Chief, Asset Management
45 CES/CEVP
1224 Jupiter St. MS 9125
Patrick AFB, Florida 32925-3343

Attention: Ms Keitha Dattilo-Bain

Dear Mr. Sutherland:

NOAA's National Marine Fisheries Service (NMFS) reviewed your memorandum dated September 16, 2010, designed to address the Essential Fish Habitat (EFH) conservation recommendations that we provided to the U.S. Army Corps of Engineers Jacksonville District (Jacksonville District) by letter dated July 29, 2009, regarding the proposed beach nourishment at Patrick Air Force Base (PAFB) by the 45th Space Wing (45 SW), Brevard County, Florida, SAJ-1996-3789 (SP-TSB). Our letter to the Jacksonville District included the following recommendations to conserve and protect EFH:

- Dredging within offshore borrow areas (Canaveral Shoals I and II) shall be limited to the portions of the shoal expected to fill in most quickly once dredging has stopped. 45SW shall provide NMFS a plan for accomplishing this objective before a permit is issued.
- A physical monitoring plan for the offshore borrow areas shall be provided to NMFS for review and approval before a permit is issued. The objectives of the monitoring shall be to document the rate at which the offshore borrow areas fill and grain-size distribution of the material that fills the dredge hole(s).
- An integrated biological and physical monitoring plan for the worm rock and nearshore live/hardbottom offshore of the fill area shall be provided to NMFS for review and approval before a permit is issued. The primary objective of the monitoring shall be to quantify the amount of live worm rock and secondarily on documenting utilization of this habitat by macroinvertebrates and fish.

In response to our first EFH conservation recommendation, the 45 SW indicates that it cannot specify that the contractor limit dredging to the portion of the proposed borrow area expected to infill most quickly because methods used by each qualified contractors can differ greatly. However, your memorandum indicates that the 45 SW will recommend that the contractor

submit a dredging plan that identifies the areas within Canaveral Shoals II (CS-II) that prior monitoring shows will infill most rapidly and that the contractor limit dredging activities to those areas to the extent practicable. If Canaveral Shoals I (CS-I), which has not been previously dredged, is to be used as a borrow area, accreting areas will be identified through pre-construction surveys, and similar excavation recommendations will be made. In regard to this EFH conservation recommendation NMFS will request that the Jacksonville District stipulate in the permit conditions that the portions of the designated borrow shoal expected to fill in most quickly be identified prior to dredging and that dredging be limited to areas.

In response to our second EFH conservation recommendation, the 45 SW indicates that previous federal permits for use of offshore sand borrow areas include a requirement for physical surveys of the borrow area at pre-, post- and 3-years post-construction. These surveys have been designed to document the rate and extent of borrow area recovery relative to the dredging activity. These surveys and attendant analyses have been conducted by both the Air Force and Brevard County for dredging activities at the CS-II borrow area in 2000-2003, 2005, and most recently in 2010. No recovery surveys have been done for CS-I borrow area since it has not been previously dredged.

The 45 SW states previous survey reports provided to the Florida Department of Environmental Protection (FDEP), Jacksonville District, and Bureau of Ocean Energy Management, Regulation and Enforcement (formerly Mineral Management Service) have assessed infill grain size distribution at CS-II through sediment samples of the dredged material placed upon the beach. The monitoring protocol consists of two samples collections at 1000-foot intervals. Samples are analyzed for grain size. Results from the sampling done during the 2003, 2005, and 2010 dredging events (which included sediment from areas previously dredged in 2000-2001 and 2002) indicate no change in the grain size distribution relative to pre-dredge core samples. These studies suggest that the material dredged from the borrow area during each construction event has been granulometrically identical to that which was sampled originally and in the prior dredging event. An analysis that couples this sediment sampling with in filling rates should provide an assessment of how quickly the dredge site will recover and a description of the grain-size distribution of the material that can be expected to fill the dredge hole(s). NMFS will review these monitoring reports and if changes in the planned monitoring protocol are deemed necessary, NMFS will provide additional recommendations to the Jacksonville District in our subsequent project review.

In response to our third EFH conservation recommendation, the 45 SW states that a physical monitoring plan designed to document changes in the abundance of the nearshore hardbottom has been implemented annually since 2004/2005, in accordance with previous EFH conservation recommendations. This plan was originally proposed by 45 SW in a letter to NMFS dated January 21, 2005, and was accepted by NMFS in a response letter to the 45 SW dated January 27, 2005. The physical monitoring plan assesses the extent of hardbottom exposure and seabed fluctuations, relative to pre-renourishment baseline conditions, through annual, physical transect-surveys at FDEP reference monuments from R70 through R77 (the latter being 2000 feet south of the project area). As noted in our letter of July 29, 2009, for the current iteration of the project, data from these annual surveys generally show that the beach fill has not permanently covered hardbottom within the project area. These surveys indicate no trends of shoreline

accretion or net decrease in rock exposure when compared to the 2004 baseline. The most recent available survey, July 2009, shows the exposed hardbottom along the monitored survey transects was 1.5 times greater than the initial project construction (January 2001).

For this iteration of the project, the 45 SW states it will expand the scope of physical monitoring to the entire project area and include a biological monitoring component designed to quantify the worm rock and associated utilization by macroinvertebrates and fish. Surveys will be conducted at pre- and post-project conditions and annually for not less than 5 years after project construction. Pre-construction surveys will provide baseline conditions. Biological monitoring protocol will be the same as that proposed for the Brevard County Mid-Reach beach nourishment project; this monitoring is summarized in the memorandum and includes documenting the presence and abundance of species of fishes, macroalgae, as well as mobile and sessile macroinvertebrates (e.g., reef-building sabellariid worms, tunicates, bryozoans). The goal of biological surveys will be to determine whether project construction has resulted in adverse impacts of nearshore rock or its utilization by macroinvertebrates and fish. If adverse impacts can be demonstrated, mitigation and/or modification of future project designs will be considered. The results of the integrated biological and physical monitoring will be submitted to NMFS for review.

In regard to the additional recommendations that the impacts from and means to mitigate the littoral impacts of Canaveral Harbor be re-examined, it is the opinion of the 45 SW, that these impacts have already been mitigated through the Brevard County Federal Shore Protection Project and the Canaveral Harbor Federal Sand Bypass Project. The goal of these projects has been to address Canaveral Harbor sand budget impacts, which the 2002 Independent Coastal Expert (ICE) study concluded, directly effects the area 10 to 15 miles south of the inlet. Dredge and fill shore protection projects, sand-tightened of the inlet jetties and bypassing of more than 3.4 million cubic yards of sand across the Port Canaveral Entrance through four construction events may address outstanding historical sand losses and meet sediment transfer targets identified in the ICE study, but NMFS does not concur that these approaches emulate natural southerly littoral transport across the inlet.

These large-scale bypassing and nourishment events do not occur without burial impacts to benthic infaunal communities utilizing the deposition area and disruption to fisheries species which feed on the resident benthic infauna. Secondary effects of downstream sedimentation and turbidity are also known to occur. The effectiveness and longevity of these activities has also been questioned since a large portion of the sand placed in these events is not assimilated into the littoral system and is “lost” either offshore or back into Canaveral’s Entrance. Given that the littoral drift system dynamics operate in a geological time-frame and over a coastal continuum, cumulative blockage at Canaveral may have, over 50 years, had an effect county-wide. Further, on-shore assimilation and movement through the littoral system of the recently deposited sediments, estimated to equal the 50-year deficit, will take time.

To address future sediment budget and erosional issues, NMFS still recommends that the FDEP, the Jacksonville District, Brevard County, and the 45 SW jointly investigate new approaches that balance shoreline protection and stewardship of fishery resources. NMFS has in the past recommended that an approach which incorporates periodic smaller–scale nourishment of

erosional hotspots coupled with a continual sand bypass system, a method which minimizes environmental impacts at the deposition area and more closely mimics natural annual littoral drift dynamics, be evaluated for its effectiveness in addressing sand budget and littoral drift equilibrium north and south of the Port Canaveral Entrance. This approach may be less costly both economically and environmentally, and could be adaptively managed to compensate for annual longshore fluctuations.

NMFS appreciates the 45 SW's interim response memorandum to our conservation recommendations which were developed to implement the EFH provisions of the Magnuson-Stevens Fishery Conservation and Management Act. We will continue to coordinate this project application with the Jacksonville District and the 45 SW until NMFS and the Jacksonville District agree that the consultation procedures outlined in 50 CFR Section 600.920 of the regulation to implement the EFH provisions of the Magnuson-Stevens Act are satisfied. Mr. George Getsinger, at our Marineland Office, is available if further assistance is needed. He may be reached at 9741 Ocean Shore Blvd, St. Augustine, Florida 32080, (904) 471-8674, or by email at George.Getsinger@noaa.gov.

Sincerely,

Pace Willer

/ for

Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

cc:

Keitha.Dattilo-Bain@patrick.af.mil
COE, Stephen.Brooker@usace.army.mil
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DEPARTMENT OF THE AIR FORCE
45TH SPACE WING (AFSPC)

JAN 20 2011

MEMORANDUM FOR NATIONAL MARINE FISHERIES SERVICE
HABITAT CONSERVATION DIVISION
263 13TH AVENUE SOUTH
ST PETERSBURG, FL 33701-5505
ATTENTION: MR. MILES CROOM

FROM: 45 CES/CEA
1224 Jupiter Street, MS 9125
Patrick AFB FL 32925-3343

SUBJECT: Response to National Marine Fisheries Service's (NMFS) Clarification of Essential Fish Habitat Conservation Recommendations for Proposed Beach Restoration at Patrick Air Force Base (PAFB), Florida

1. The 45th Space Wing (45 SW) received your letter dated 10 Dec 10 which replied to our 16 Sept 10 memorandum that outlined the 45 SW actions to conserve and protect Essential Fish Habitat (EFH) with regard to the dredging and subsequent placement of beach-compatible sand along the approximate 4.2-mile shoreline of PAFB. The three Conservation Recommendations (CRs) for EFH defined by the NMFS in its letter, dated 29 Jul 09, to the U.S. Army Corps of Engineers (ACOE), Jacksonville District, have been at the core of our correspondence for the PAFB project.

2. The three CRs, in summary, include:

a) A plan by which dredging within offshore borrow areas (Canaveral Shoals I and II) will be limited to the portions of the shoal expected to infill most quickly.

b) A physical monitoring plan for the offshore borrow areas that seeks to document the rate and grain-size distribution of sediment that infills the dredge locations within the borrow areas.

c) An integrated biological and physical monitoring plan for the nearshore hardbottom offshore of the fill area that primarily quantifies the amount of live worm rock, and secondarily documents utilization of this habitat by macroinvertebrates and fish.

3. The 45 SW will execute each of the plans and actions to address the CRs for EFH, indicated above, as described in our memorandum dated 16 Sept 10, and shall submit the results to NMFS for review. Your letter dated 10 Dec 10 indicated that the NMFS accepts the 45 SW actions planned for each CR with notation that additional recommendations may be made if impacts are assessed or changes to borrow area monitoring plans are deemed necessary. It is our understanding that jurisdiction in the borrow areas falls under the Bureau of Ocean Energy Management and the ACOE, so further recommendations would also need to be coordinated with them. In regard to the third CR listed above, the 45 SW re-iterates that it shall conduct integrated physical and biological monitoring, as described in our memorandum, to document the baseline condition of the nearshore hardbottom at pre-construction conditions, and shall conduct post-construction biological surveys if the results of the post-construction physical monitoring indicate that the project activity may have resulted in adverse impact of nearshore rock (e.g., burial or changes in rock exposure beyond that expected through natural variation).

4. In reply to an additional NMFS recommendation to re-examine the impacts of Canaveral Harbor and sand bypassing which serves as the means to mitigate littoral impacts of the Harbor, the 45 SW presented a detailed technical response that documented the successful record of shoreline restoration and inlet sand bypassing that has been accomplished through proactive inlet sand management at Canaveral Harbor since the early 1990's. In response, your letter indicated that NMFS does not concur that these actions emulate natural southerly littoral transport across the inlet and recommends that the Florida Department of Environmental Protection (FDEP), ACOE, Brevard County and the 45 SW jointly investigate new approaches that balance shoreline protection and stewardship of fishery resources. The 45 SW acknowledges your comments in this regard, but notes that actions to modify and/or mitigate inlet sand management for the Canaveral Harbor Federal Navigation Project are the responsibility of the ACOE, and not the 45 SW. Therefore, we have copied the appropriate ACOE individual, Mr. Jerry Scarborough, Acting Deputy District Engineer for Programs and Project Management, and will forward prior correspondence (29 Jul 09) so his branch is aware of these specific NMFS concerns.

5. The 45 SW has no authority to modify inlet or shoreline management beyond the boundaries of its U.S. Air Force properties. As such, the 45 SW can only execute actions to address the CRs for EFH presented by the NMFS, as outlined above. Nonetheless, it is noted that the 45 SW has, and will continue to, cooperate with FDEP, ACOE, Brevard County and the Canaveral Port Authority, within its federal authority, to facilitate inlet sand management and shoreline restoration. This partnering should continue to encourage all parties to seek improved inlet and shoreline management practices that optimize stewardship of all the diverse environmental resources associated with the Brevard County coastline including, but not limited to, EFH.

6. In summary, the 45 SW has provided plans and actions that address the NMFS EFH CRs for the proposed PAFB project activity, as acknowledged by NMFS, and the 45 SW has further addressed additional recommendations presented by NMFS beyond the CRs. Pursuant to the EFH provisions of the Magnuson-Stevens Act and 50 CFR Section 600.920, the 45 SW has fully responded to the recommendations of the NMFS in regard to the proposed project activity.

7. Please direct comments and questions concerning this letter to Ms. Keitha Dattilo-Bain at (321) 494-5286 or E-mail keitha.dattilo-bain@patrick.af.mil.

PATRICK S. GINIEWSKI, GS-14
Chief, Asset Management

cc:
George Getsinger, NMFS/HCD
Geoffrey Wiekel, Bureau of Ocean Energy Management, Regulation and Enforcement
Steve Brooker, U.S. Army Corps of Engineers, Regulatory Division
Jerry Scarborough, U.S. Army Corps of Engineers, Programs and Project Management
Kevin Bodge, PhD, PE, Olsen Associates, Inc.

APPENDIX E

Nearshore Rock Exposure Data Analysis Memorandum from Olsen Associates, Inc., to the 45 SW, Air Force, PAFB Shoreline Restoration Project, FL

APPENDIX E

MEMORANDUM

To: Keitha Dattilo-Bain (45 SW)

From: Kevin Bodge, PhD., P.E., Olsen Associates Inc.

Re: Patrick AFB Beach Renourishment Project Nearshore Rock Exposure – PAFB Monitoring Area

Date: 4 March 2010

Summary Tabulation of Rock Exposure. The following is a summary tabulation of nearshore rock exposure along the southern end of Patrick AFB. It uses prior available baseline data (2001 & 2004) and those data collected for the annual monitoring effort pursuant to consultation with NMFS in January 2005. The monitoring program is intended to assess changes in the beach profile and rock exposure along this southern mile of the Base shoreline and continuing into the northern end of the Mid Reach (viz., R70-R77). The summary includes the data from the most recent survey, in July 2009. The next survey is anticipated in July 2010. Table 1 summarizes the lineal amount of exposed rock occurrence along each monitoring transect (R70-R77) from the available data.

- The January 2001 data represent approximate pre-initial project conditions (when only a portion of the initial PAFB project had been constructed, north of the survey area).
- The June 2004 data represent pre-renourishment conditions (prior to the 2004 hurricane impacts and the 2005 project renourishment).
- The February 2005 data represent post-hurricane, pre-renourishment conditions.
- The July 2006 through July 2009 data represent post-renourishment, equilibrated conditions.

Note that the values from 2001 and 2004 were developed from “digital” slices through aerial photography mapping. All other values were measured directly by ground-truth survey transects.

Table 1: Estimated Total Hardbottom Exposure (feet)

R-Mon	Jan 2001	June 2004	Feb 2005	July 2006	July 2007	July 2008	July 2009
R-70	137	133	100	233	92	111	214
R-71	156	136	236	152	80	143	209
R-72	92	7	180	128	142	196	158
R-73	101	231	260	170	202	135	238
R-74	116	220	261	95	170	371	321
R-75	232	210	126	35	177	217	205
R-76	244	217	231	73	134	204	294
R-77	148	100	252	28	211	231	281
Sum R70-R77	1,226	1,254	1,646	914	1,208	1,608	1,920

Per the annual surveys, the amount of exposed nearshore rock in the most recent, July 2009, survey is the greatest observed since quantitative data are available (i.e., beginning in 2001 and 2004). By transect line measure, there was 55% more exposed rock in 2009 than in both 2001 and 2004. Likewise, there was 30% more exposed rock in 2008 than in both 2001 and 2004. In each year since project renourishment in 2005, the total rock exposure has been greater than in the baseline (2004) conditions – with the exception of 2006, during which large sand bars were migrating ashore, across the rock terrace, along most of Brevard County. And even in 2006, rock exposure increased or remained the same nearest the fill project activity (i.e., at R70-R73), where one would have otherwise expected rock

exposure to have decreased the most if there was significant alongshore diffusion of sand from the prior beach renourishment activity. Survey data from December 2008, depicted in the permit drawings, indicate the greatest amount of rock exposure that has been measured to-date. These data, collected at only monuments R70-R75 and outside of the normal annual monitoring cycle, indicate 1901 lineal ft of exposed rock at transect lines R70 through R75. This is over 2.0 times greater than that indicated in the 2001 and 2004 pre-project surveys at these same transects, and it is 63% greater than in February 2005. Overall, then, the permit drawings – with annotation of the December 2008 transect results -- can be viewed as presenting a conservative depiction of the extent of exposed rock outcrops, where it is recognized that the actual extent and limits of rock exposure changes significantly over very short time periods due to natural variations in the beach. These observations are consistent with the findings from the detailed annual surveys and reports. The data present no trends or other indication that there is shoreline or seabed accretion that has resulted in coverage of the nearshore hardbottom beyond natural temporal fluctuations.

APPENDIX F

Consultation with Department of Historic Resources/ State Historic Preservation Office, PAFB Shoreline Restoration Project, FL

RECEIVED

APR 22 2009

BUREAU OF BEACHES
AND COASTAL SYSTEMS

FLORIDA DEPARTMENT OF STATE
Kurt S. Browning
Secretary of State
DIVISION OF HISTORICAL RESOURCES

Ms. Merrie Beth Neely
Florida Department of Environmental Protection
Bureau of Beaches and Coastal Systems
3900 Commonwealth Blvd., M.S. 300
Tallahassee, Florida 32399-3000

April 14, 2009

Re: DHR No.: 2009-01738/ Received by DHR: March 13, 2009
Application No.: 0294526-001-JCJC
Applicant: Patrick Air Force Base
Project: Patrick Air Force Base Shore Protection
County: Brevard

Dear Ms. Neely

Our office received and reviewed the referenced project in accordance with Chapters 267 and 373, *Florida Statutes*, Florida's Coastal Management Program, and implementing state regulations, for possible impact to historic properties listed, or eligible for listing, in the *National Register of Historic Places* (NRHP), or otherwise of historical, architectural or archaeological value. The State Historic Preservation Officer is to advise and assist state and federal agencies when identifying historic properties, assessing effects upon them, and considering alternatives to avoid or minimize adverse effects.

Our review of the Florida Master Site File indicates that no significant archaeological or historical resources are recorded within the project area. However, the project area contains environmental conditions consistent with those found at other archaeological sites in Brevard County and has not been subjected to systematic professional archaeological or historical investigation. Therefore, it is the opinion of this agency that, in addition to the standard permitting condition, this permit, if issued, should include the following special condition regarding unexpected discoveries during ground disturbing activities on the property:

If prehistoric or historic artifacts, such as pottery or ceramics, stone tools or metal implements, dugout canoe remains, or any other physical remains that could be associated with Native American cultures, or early colonial or American settlement are encountered at any time within the project area, the permitted project should cease all activities involving subsurface disturbance in the immediate vicinity of such discoveries. The permittee, or other designee, should contact the Florida Department of State, Division of Historical Resources, Review and Compliance Section at (850) 245-6333 or (800) 847-7278, as well as the appropriate permitting agency office. Project activities should not resume without verbal and/or written authorization from the Division of Historical Resources. In the event that unmarked human remains are encountered during permitted activities, all work shall stop immediately and the proper authorities notified in accordance with Section 872.05, *Florida Statutes*.

For any questions concerning our comments, please contact Michael Hart, Historic Sites Specialist, by phone at (850) 245-6333, or by electronic mail at mrhart@dos.state.fl.us. We appreciate your continued interest in protecting Florida's historic properties.

Sincerely,

Frederick P. Gaske

Frederick P. Gaske, Director, and
State Historic Preservation Officer

FLORIDA DEPARTMENT OF STATE
Kurt S. Browning
Secretary of State
DIVISION OF HISTORICAL RESOURCES

Ms. Keitha Dattilo-Bain
Department of the Air Force
45 CES/CEAO
1224 Jupiter Street, MS 9125
Patrick Air Force Base, Florida 32925-3343

December 1, 2011

RE: DHR Project File Number: 2011-5295
Draft Final Environmental Assessment for Beach Shoreline Protection
Patrick Air Force Base, Brevard County

Dear Ms. Dattilo-Bain:

This office reviewed the referenced project for possible impact to historic properties listed, or eligible for listing, on the *National Register of Historic Places.* The review was conducted in accordance with Section 106 of the *National Historic Preservation Act of 1966*, as amended, *36 CFR Part 800: Protection of Historic Properties* and the *National Environmental Policy Act of 1969,* as amended.

We reviewed Sections 3.4 and 4.4, which deal with Cultural Resources of the above referenced environmental assessment. Based on the information provided, it is the opinion of this office that the Department of the Air Force has adequately addressed cultural resources.

If you have any questions concerning our comments, please contact Scott Edwards, Historic Preservationist, by electronic mail *scott.edwards@dos.myflorida.com*, or at 850.245.6333 or 800.847.7278.

Sincerely,

Laura A. Kammerer

Laura A. Kammerer
Deputy State Historic Preservation Officer
For Review and Compliance

PC: Thomas E. Penders, PAFB