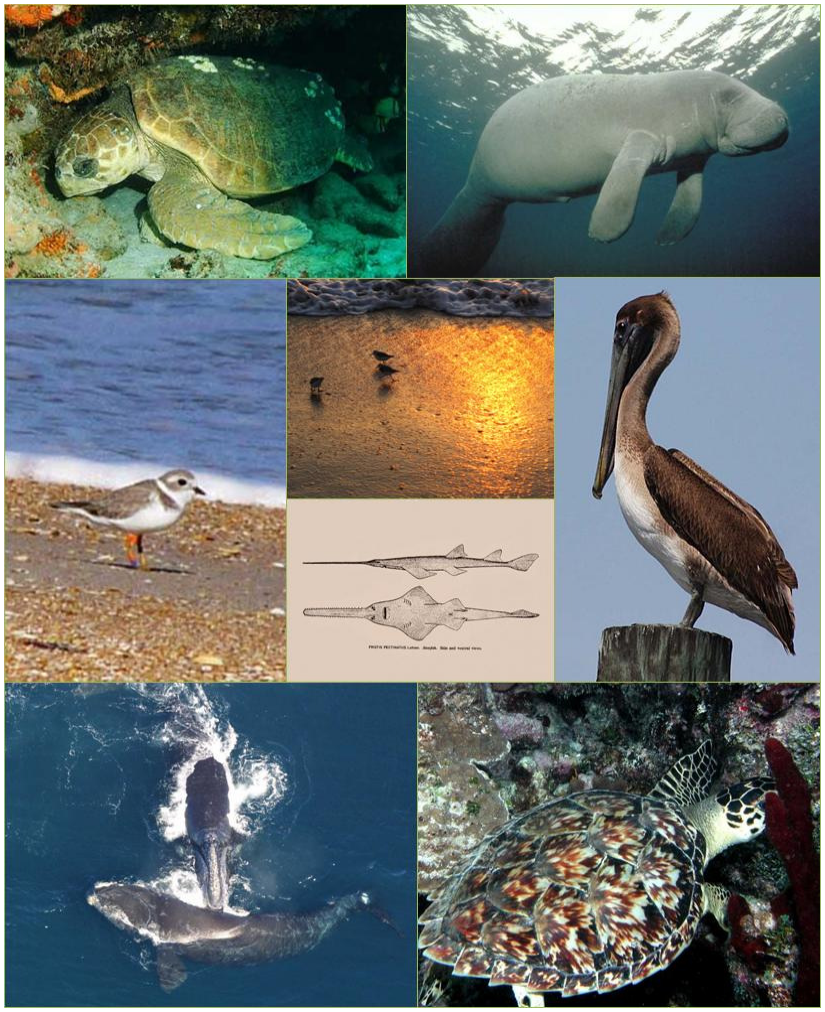
APPENDIX L

BIOLOGICAL ASSESSMENT

October 2011
(Revised January 2012)

The St. Lucie County South Beach and Dune Restoration Project, St. Lucie County, Florida

Biological Assessment



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1. DESCRIPTION OF THE ACTION AND PROJECT AREA

St. Lucie County, Florida proposed placement of approximately 610,000 yd^3 of sand over about 3.8 mi of shoreline in St. Lucie County, Florida in a Joint Coastal Permit Application, (SAJ-2009-03448) submitted to the United States Army Corps of Engineers (Corps) Jacksonville District Regulatory Division. The Corps, in reviewing the permit application for the proposed project, determined that the project required a Biological Assessment (BA) as part of an Environmental Impact Statement (EIS) for the proposed project. A BA comprises information prepared by, or prepared under the direction of, a federal agency to determine whether a proposed action is likely to: 1) adversely affect listed species or designated critical habitat; 2) jeopardize the continued existence of species proposed for listing; or 3) adversely modify proposed critical habitat. Biological assessments must be prepared for "major construction activities." The outcome of this biological assessment determines whether formal consultation or a conference is necessary (50 CFR §402.02, 50 CFR §402.12).

For this EIS, the Corps serves as the lead federal agency for Endangered Species Act (ESA) Section 7 and the EFH consultations. Under the Outer Continental Shelf (OCS) Lands Act, the Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEM) has jurisdiction over mineral resources on the OCS. As a federal agency, BOEM is also subject to the requirements of the ESA and Magnuson Stevens Fishery and Conservation Management Act. While the current Applicant's proposed action considers activity only in State waters, the permit application also indicates plans to mine locations under BOEM jurisdiction as part of another, future project on the site. In addition, the Corps is currently developing a Feasibility Study for a federal project on part or all of the proposed project area and for OCS sand borrow sources. The EIS with which this EFH evaluation is associated may become part of the Corps Feasibility Study documentation. Therefore, BOEM is serving as a cooperating federal agency for the Corps in the EIS and related federal consultations for this project.

The St. Lucie County South Beach and Dune Restoration Project (Project), as submitted to the USACE in a permit application, includes beach and dune restoration along the South St. Lucie County beaches, extending from Florida Department of Environmental Protection (FDEP) Reference Monuments R-87.5 to R-90.3 and R-98 to R-115 at the St. Lucie County/Martin County border (**Figure 1**). On January 5, 2012, after substantial completion of the Biological Assessment, the applicant provided a letter to the USACE deleting the northern project segment (R-87.5 to R-90.3). This change significantly reduces the amount of hardbottom habitat impact of the applicant's preferred plan to 0.57 acre. The revised plan would require 596, 000 cy of sand. Other project components remain the same, and the analysis below does not change with the applicant's revised preferred plan. Changes to this BA includes revision here only to reflect the recently changed project area, volume, and impact acreage.

The purpose of the project includes protection of upland infrastructure and development adjacent to the project beach. The proposed sand source for the project is an offshore borrow area located in a sand ridge 3 to 6 mi offshore of Reference Monuments R-88 to

R-115 in water depths of approximately 36 to 43 ft. The offshore borrow area contains approximately 1.5 million yd^3 of beach compatible material. Fill material from the borrow area will be excavated and transferred to the beach by a hopper dredge with pump-out capabilities. Beach construction will proceed as sand pumped from the hopper dredge via pipelines on the ocean bottom and discharged along the project area beach and shaped into a permitted template.

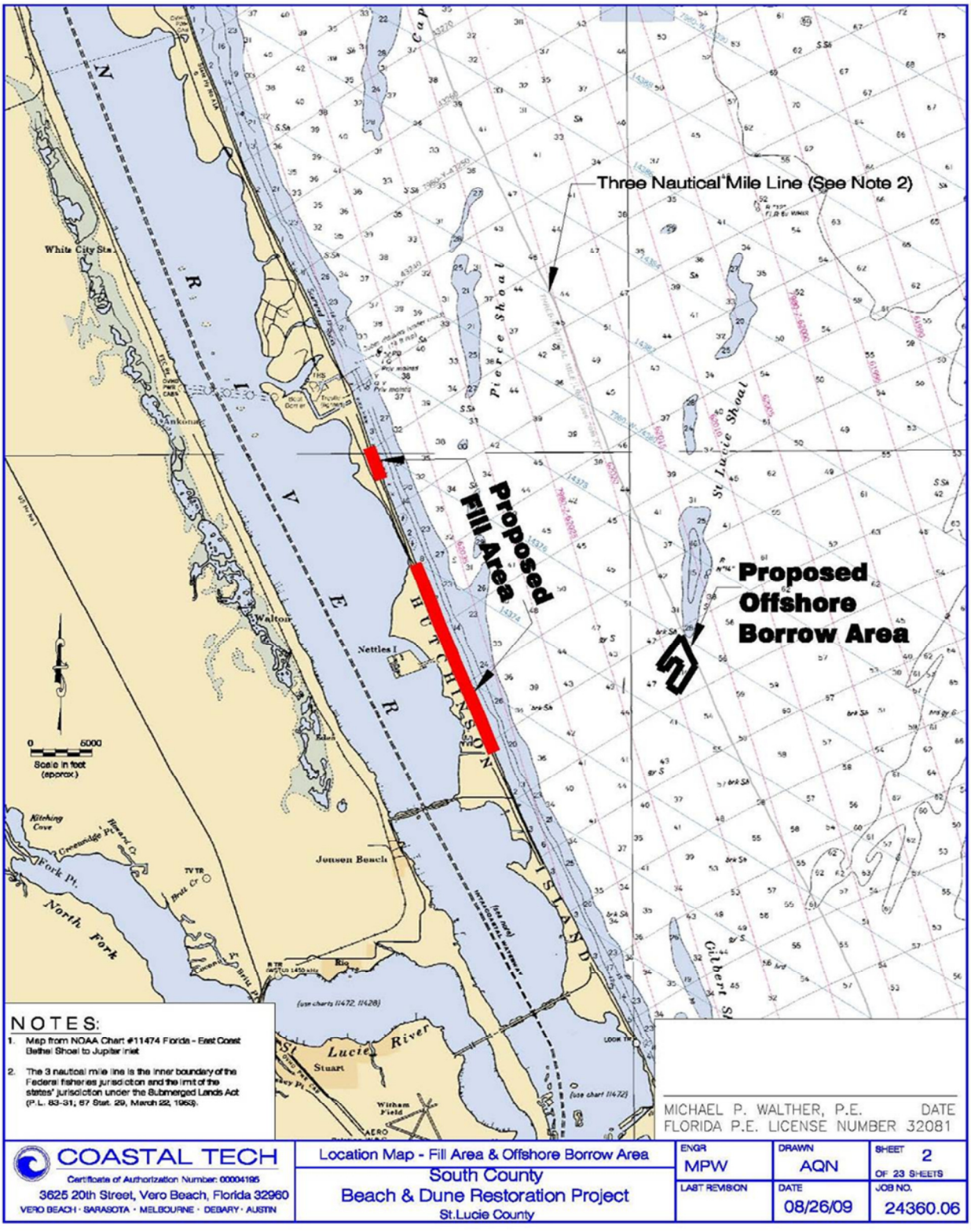

Figure 1. Beach and Dune Restoration Areas for the St. Lucie County South Beach and Dune Restoration Project

Assuming the use of an offshore sand source, project construction includes three activity phases: dredging, conveyance and pumping of dredged material from the hopper dredge to the beach, and fill grading on the beach. If upland mines provide the sand, truck transport of sand to the beach fill site replaces the dredging and conveyance phase of the offshore sand source alternative.

A hopper dredge comprises a self-propelled floating plant capable of dredging material from the ocean bottom, storing it on board, transporting it to a disposal point, and dumping or pumping it. Ocean-going hopper dredges are typically large vessels (>200 ft in length) capable of storing 2,000 cubic yards or more of sediment in their holds. These vessels typically operate on a 24-hr/day 7-day/week schedule with a crew of several dozen or more. Workboats (likely two or more 35-ft or larger inboard vessels) will transport workers and required materials and supplies to and from the hopper dredge. Periodically the hopper dredge may return to port for supplies.

During dredging operations, hopper dredges travel at a ground speed of 2 to 3 mph. They can dredge in depths up to about 80 ft and are equipped with twin propellers and twin rudders as well as bow and stern thrusters to provide the required maneuverability. Precise vessel location and elevation typically provided by a Real-time Kinematic (RTK) Global Positioning System (GPS) hardware/software system ensures proper elevation and location control of the dredging activity.

For the Applicant's proposed action, the hopper dredge will dredge sand by dragging two suctions heads across the approved borrow area. As the material discharges within the ship hold (hopper), sand material falls out of suspension; excess seawater is decanted and discharged overboard. When full, the hopper dredge will move to a location offshore of the beach disposal area and pump the stored sand onto the beach through a submerged pipeline (sub-line) lying on the nearshore ocean bottom and emerging on the beach. The hopper dredge will always locate outside the nearshore hardbottom areas to avoid any impacts to that habitat. At least one and potentially two hopper dredges may work the project to provide continuous sand supply to the beach. The dredger will deploy a sufficient number of vessels to keep the operation running continuously (24 hr/day, 7 days/week).

On the beach, bulldozers will grade the discharged sand to the permitted cross section templates. Two bulldozers typically provide the necessary grading equipment. When necessary, a front-end loader with a rake bucket or similar attachment will attach additional sections of pipeline to allow construction to progress down the beach. In addition to this equipment, a few off-road, all-terrain vehicles and one or two pickup trucks provide the typical equipment set associated with a beach construction crew. The site will also typically include a construction shed on a skid, a porta-potty, and a double-walled fuel tank approved for use in this environment. The contractor may choose to work two locations (two crews) simultaneously as a cost-effective means of operating the project. Lights placed on the beach will allow nighttime work. State and federal permits will specify conditions, including text and drawings defining the required lighting arrangements to avoid and minimize impacts to nesting turtles. An off-beach location provides space for the beach work crew to park and store some materials.

As necessary, the contractor will extend the discharge pipe along the beach and/or move the location of the sub-line running from the shore to the hopper dredge to pump sand efficiently. Typically, contractors do not employ booster pumps to extend the beach pipeline beyond the capacity of the hopper dredge to pump the sand. For a project as long as this (3.4 mi) with several "no-impact" access points through the nearshore hardbottom zone, the contractor may likely choose to move the location of the sub-line several times. This method allows the contractor to reduce the required total length of shore-parallel discharge pipeline, providing lower equipment costs and easier pumping of the sediments. To construct the sub-line connecting the hopper dredge to the shoreline discharge pipeline, the contractor will connect multiple sections of fabricated pipe at an off-site location. When the sub-line stretches to the desired length, the pipe ends are sealed and the pipe is pressurized to test for leaks. When the pipe passes this test, the contractor floats the pipe into place and sinks it. The final location of the sub-line may be verified with divers or a magnetometer survey. The contractor may deploy up to two sub-lines at locations previously identified and approved by the FDEP and Corps for that purpose. Dredge pipeline running along the beach will extend about half of the way between pipeline corridors to the north and south, a maximum of about 3,000 ft, based on proposed and biologically surveyed corridors.

On the beach, the contractor will create a long shore-parallel dike (several hundred feet long) to provide a settling basin for the sand to fall from suspension within the sand-water slurry created to pump the material from the hopper dredge to the beach. Bulldozers continually maintain these dikes and move sand from the settling area into the beach template to maintain the settling basin while shaping the material into the beach template. Maintaining the settling area helps maintain water quality (measured as turbidity) within permitted limits.

If sand from upland mines provides the beach nourishment material, no in-water activity will occur and no pipelines will be required along the beach. Trucks filled at the sand mine will traverse the beach and deposit sand at the necessary location where bulldozers shape the sand to fill the template. The same set of equipment remains necessary to shape the sand to the desired template whether it is discharged through a pipeline or transported with a dump truck.

St. Lucie County proposes to perform the project dredge and fill activities outside turtle nesting season in late fall 2011 – Winter/Spring 2012. Construction will require two to three months. The area of potential project influence will extend from about St. Lucie County Reference Monument R-96 to Martin County Reference Monument R-4 due to the proposed mixing zone (850 m from the point of sand discharge) and potential downdrift (southerly) transport of sand in the nearshore area.

The Corps Jacksonville District Planning Division is preparing a Feasibility Study for consideration of a federal project at the St. Lucie County Project site. The Feasibility Study assesses the proposed project for congressional authorization as a Civil Works project. Coordination between the Corps Jacksonville District Planning and Regulatory

Divisions concerning the Applicant's proposed action and the feasibility study includes this BA.

2. BACKGROUND AND HISTORY

2.1. BACKGROUND

According to a report by the FDEP titled "Critically Eroded Beaches in Florida", updated in June 2010 (FDEP 2010), 9.4 mi of critically eroded beaches where development interests are threatened have been identified in St. Lucie County. The Applicant's proposed project area is located within these areas designated as "critically eroded". In the absence of beach and dune restoration, erosion will continue to narrow the beach, resulting in impacts to development interests, habitat for marine life and shore birds, and recreational uses. Continued erosion and narrowing of the beach will eventually result in increased threats to oceanfront properties, providing less protection from storm damages and potential loss of property. Without the proposed restoration of the beach and shoreline, a proliferation of emergency shoreline armoring structures and other stopgap measures are likely to be installed, further impacting the shoreline and narrowing the beach. As an additional result of beach narrowing, sea turtle hatching success would decrease dramatically due to inundation and nest washout, and nesting habitat will continue to degrade until it is lost. Eroded beaches and shorelines will also reduce the amount of habitat available for shore birds. Narrowed beaches do not support, and may preclude, public recreational use of the beach.

The Applicant has stated that the county requires the proposed project to offset critical eroded beach in South St. Lucie County. The project would provide storm protection to upland properties and restore coastal habitat and recreational beach. The proposed project has developed because of previous studies and events as described in **Section 2.2**.

2.2. PROJECT HISTORY

In November 2002, the Corps completed a Section 905(b) analysis for the St. Lucie County, Florida – Hurricane and Storm Damage Reduction Study for the South St. Lucie County Beaches from Reference Monument R-77 to the Martin County border (project area). In 2004, the Corps initiated a federal Feasibility Study of the project area, but, due to limited funding, it only partially advanced. The Corps conducted historic and cultural resources surveys of potential borrow areas for the Applicant's proposed action and developed an inventory of existing buildings and structures fronting the shoreline in the project area. Because the Corps does not expect to undertake a federal project before 2012, St. Lucie County has initiated this effort to develop an initial non-federal project to address the deteriorated shoreline and emergency conditions as soon as possible. The Corps is developing a federal shore protection project to provide for additional, future beach renourishment within the project area.

In April 2007, St. Lucie County published a Conditions Assessment Report (CTC 2007). The Conditions Assessment, conducted within the area extending from a point north of the Florida Power and Light power plant to the St. Lucie County/Martin County border, evaluated the historical beach and dune conditions between 1972 and 2006, including

shoreline and volumetric changes, to begin the process of identifying design alternatives.

Pre-application meetings with both state and federal agencies in May 2007 led to the preparation of an assessment of fisheries and the collection of additional hardbottom mapping data and aerial photography of the project area. In June 2008, a formal request to the FDEP was also made to designate the entire project area as "critically eroded" as needed to justify state funding and provide a basis to identify a project area. The FDEP denied the request in a formal letter dated 5 December 2008, citing "…the available engineering data do not indicate erosion to such a degree that upland development, recreational interests, wildlife habitat or important cultural resources are threatened or lost". Based on the response from the FDEP and the Corps criteria for storm damage reduction," the project area was delineated as the developed area — limited to that shoreline from Reference Monuments R-87.7 to R-90.3 (surrounding Sand Dollar Shores) and R-98 (just north of Regency Island Dunes) to the St. Lucie County/Martin County line (R-115+1,000 ft).

St. Lucie County prepared a Conditions Assessment Addendum in December 2008 (CTC 2008) to assess in detail historical shoreline and volumetric change from 2006 to 2008. Information provided in the addendum, along with other project-related documentation, helped continue the process of identifying the design alternatives.

As the prospective local sponsor for a federal project on the proposed site, St. Lucie County also desired to provide information appropriate for use in a federal project. The county determined to assess a substantive fill project to ascertain whether the project would prove cost-effective as the National Economic Development (NED) project. The assessment prompted the evaluation of additional alternatives.

The beach fill design alternatives assessed by the county are based on the information gathered during the processes described above, including but not limited to information found in the Conditions Assessment and Addendums, related environmental documents, agency consultations, and public input. The beach fill alternatives considered in detail included:

- No action (status quo)
- Beach fill to restore the 1972 dune with a 35-ft berm (the Applicant's Proposed Action)
- Beach fill with no impact to existing hardbottom
- Beach fill to restore the 1972 beach and dune (1972 design)
- Beach fill to restore the 1972 dune with a 70-ft berm
- South Segment Beach and Dune Restoration; North Segment Dune Restoration Only
- Beach and Dune Restoration with T-head Groins

On January 5, 2012, after substantial completion of the Biological Assessment, the applicant provided a letter to the USACE deleting the northern project segment (R-87.5 to R-90.3). The revised plan reduces hardbottom habitat impacts from 2.73 acres to

0.57 acres. The impact acreage has been changed throughout the document. Other project components remain the same as described elsewhere in this document.

3. LISTED SPECIES AND CRITICAL HABITAT IN THE PROJECT AREA

3.1. SEA TURTLES

Five sea turtle species occur on the eastern Florida inner shelf (shoreline to the 20-m isobath). In order of abundance based on results of sea turtle monitoring conducted within the project area (Ecological Associates, Inc. [EAI] 2006, 2007, 2008, 2009a), they are the loggerhead, green, hawksbill, Kemp's ridley, and leatherback sea turtles (**Table 1**).

Table 1. Sea turtle species potentially occurring on the eastern Florida inner shelf (Adapted from: NMFS and USFWS 1991a, b, 1992a, b, 1993)

Common and Scientific Names	Status[1]	Life Stages Present	Abundance Within the Project Area	Seasonal Presence	Nesting Season
Loggerhead sea turtle (*Caretta caretta*)	T	Adults, subadults, juveniles, and hatchlings	Abundant	Year-round (most abundant during spring and fall migrations)	April to September
Green sea turtle (*Chelonia mydas*)	T/E[2]	Adults, subadults, juveniles, and hatchlings	Common	Year-round	July to August
Hawksbill sea turtle (*Eretmochelys imbricata*)	E	Adults, subadults, juveniles, and hatchlings	Rare	Year-round	June to September
Kemp's ridley sea turtle (*Lepidochelys kempi*)	E	Juveniles and subadults	Rare	Year-round (most abundant during spring and fall migrations)	No nesting in area
Leatherback sea turtle (*Dermochelys coriacea*)	E	Adults, subadults, juveniles, and hatchlings	Rare	March to October	March to July

Species are listed in order of relative abundance (Adapted from: EAI 2006, 2007, 2008, 2009a).
[1] Status: E = endangered; T = threatened under the Endangered Species Act of 1973.
[2] Green sea turtles are listed as threatened except in Florida, where breeding populations are listed as endangered. Due to inability to distinguish between the two populations away from the nesting beach, green sea turtles are considered endangered wherever they occur in U.S. waters.

All sea turtles in U.S. territorial waters are protected under the Endangered Species Act of 1973. Currently, hawksbills, Kemp's ridleys, and leatherbacks are listed as endangered species; loggerheads are listed as a threatened species. Green sea turtles also are listed as a threatened species, except for the Florida breeding population, which is listed as endangered. Due to the inability to distinguish between the breeding and non-breeding populations away from the nesting beach, green sea turtles are considered an endangered species wherever they occur in U.S. waters (National Marine Fisheries Service [NMFS] and U.S. Fish and Wildlife Service [USFWS] 1991a,b).

3.1.1. LOGGERHEAD SEA TURTLE

The loggerhead sea turtle (*Caretta caretta*), named for its characteristic broad and massive skull, is a relatively large sea turtle. This species occurs throughout tropical, subtropical, and temperate waters of the Atlantic, Pacific, and Indian Oceans (Dodd 1988). In the western Atlantic, it is found in estuarine, coastal, and shelf waters from South America to Newfoundland. It is the most abundant sea turtle within nearshore waters of the project area.

Four genetically distinct loggerhead nesting subpopulations have been identified in the western North Atlantic (Marine Turtle Expert Working Group 2000). These are 1) the Northern Nesting Subpopulation, extending from North Carolina to northeastern Florida, at approximately 29° N; 2) the South Florida Nesting Subpopulation, extending from 29° N on the Florida east coast to Sarasota on its west coast; 3) the Florida Panhandle Nesting Subpopulation; and 4) the Yucatan Nesting Subpopulation. Loggerhead turtles within the project area belong to the South Florida Nesting Subpopulation.

In general, the eastern coast of Florida appears to be an important year-round habitat for juvenile and adult loggerhead and green sea turtles along both the inner shelf (0 to 20 m) and middle shelf (20 to 40 m) depths. Subadult and adult loggerheads primarily feed on bottom-dwelling invertebrates (e.g., crabs, mollusks, and shrimp) and macroalgae.

3.1.2. GREEN SEA TURTLE

The green sea turtle (*Chelonia mydas*), named for the greenish color of its body fat, has a circumglobal distribution in tropical and subtropical waters. The species is made up of several distinct populations. In the U.S., green turtles occur in Caribbean waters around the U.S. Virgin Islands and Puerto Rico and along the mainland coast from Texas to Massachusetts. Adult green turtles are typically found in shallow tropical and subtropical waters, particularly in association with seagrass beds (NMFS and USFWS 1991a).

The major feeding grounds for green turtles in U.S. waters are located in Florida, where the turtles forage mainly on macroalgae and the seagrass *Thalassia testudinum* (Burke et al. 1992). Although no seagrass habitats occur within nearshore waters of the project area, macroalgae is common on nearshore hardbottom outcrops (CSA International, Inc. 2010).

Subadult green turtle habitats on the east coast of Florida include shallow estuarine environments such as the Indian River Lagoon (Bresette et al. 2000; Ehrhart et al. 1996; Provancha et al. 1998); deeper coral and limestone reefs in south Florida (Wershoven and Wershoven 1992; Makowski et al. 2002; Makowski 2004); and shallow nearshore habitats in Brevard, Indian River, and St. Lucie Counties (Bresette et al. 1998; Ehrhart et al. 2001; Holloway-Adkins et al. 2002).

3.1.3. HAWKSBILL SEA TURTLE

Hawksbill sea turtles (*Eretmochelys imbricata)* occur in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. In the western Atlantic, hawksbill turtles generally occur in clear tropical waters near coral reefs, including the southeast Florida coast, the Florida Keys, Bahamas, Caribbean Sea, and southwestern Gulf of Mexico (NMFS and USFWS 1993).

Hatchling hawksbills are pelagic, drifting with *Sargassum* rafts. Available data suggest they are herbivorous during this period, but become more omnivorous as they age (Ernst et al. 1994). Juveniles shift to a benthic foraging existence in shallow waters, progressively moving to deeper waters as they grow and become capable of deeper dives for sponges (Meylan 1988; Ernst et al. 1994). Adult hawksbills typically are associated with coral reefs and similar hardbottom areas where they forage on invertebrates, primarily sponges.

3.1.4. KEMP'S RIDLEY SEA TURTLE

The Kemp's ridley (*Lepidochelys kempi*) is the smallest and most endangered of the sea turtles. Its distribution includes the Gulf of Mexico and southeast U.S. coast, although some individuals have been found as far north along the eastern seaboard as Nova Scotia and Newfoundland (Marine Turtle Expert Working Group 1996a). Adult Kemp's ridley turtles occur almost exclusively in the Gulf of Mexico, primarily on the inner shelf (Byles 1988).

Nesting of Kemp's ridley turtles occurs almost entirely at Rancho Nuevo Beach, Tamaulipas, Mexico, where 95% of the nests are laid along 60 km of beach (NMFS and USFWS 1992a; Weber 1995; Marine Turtle Expert Working Group 2000). In the U.S., nesting occurs infrequently on Padre and Mustang Islands in south Texas and in a few other Gulf of Mexico locations (Marine Turtle Expert Working Group 2000). Kemp's ridleys, therefore, are not expected within the project area. After emerging, Kemp's ridley hatchlings swim offshore to inhabit *Sargassum* mats and drift lines associated with convergences, eddies, and rings. Hatchlings feed at the surface and are dispersed widely by Gulf and Atlantic surface currents. After reaching a size of about 20 to 60 cm carapace length, juveniles enter shallow coastal waters and become benthic carnivores (Marine Turtle Expert Working Group 2000).

Post-pelagic (i.e., juvenile, subadult, and adult) Kemp's ridleys feed primarily on portunid crabs, but also occasionally eat mollusks, shrimp, dead fishes, and vegetation (Mortimer 1982; Lutcavage and Musick 1985; Shaver 1991; NMFS and USFWS 1992a; Burke et al. 1993; Werner and Landry 1994).

3.1.5. LEATHERBACK SEA TURTLE

The leatherback sea turtle (*Dermochelys coriacea*), named for its unique, flexible carapace, is a circumglobal species that is currently subdivided into two subspecies. The Atlantic subspecies, *D. c. coriacea,* inhabits waters of the western Atlantic from Newfoundland to northern Argentina. The leatherback is the largest living turtle

(Eckert 1995). With its unique deep-diving abilities (Eckert et al. 1986) and wide-ranging migrations, the leatherback is considered the most pelagic of the sea turtles (Marquez 1990).

Leatherbacks nest on coarse-grained, high-energy beaches in tropical latitudes (Eckert 1995). Florida is the only location in the continental U.S. where significant leatherback nesting occurs. No data on the feeding habits of hatchling and juvenile leatherbacks are available. Adult leatherbacks feed in the water column, primarily on cnidarians (medusa and siphonophores) and tunicates (salps and pyrosomas) (Eckert 1995). The turtles are sometimes observed in association with jellyfishes, but actual feeding behavior has only occasionally been documented (Grant et al. 1996). Foraging has been observed at the surface, but considering their well-developed deep-diving capabilities, these turtles are also likely to occur at depth (Eckert 1995).

3.2. COASTAL AND MARINE BIRDS

Birds that may be affected by the Applicant's proposed action primarily include shorebird and seabird species that use outer beach and primary dune habitats within the project area for roosting, feeding, and/or nesting activities. **Table 2** presents bird species listed by the USFWS or the Florida Fish and Wildlife Conservation Commission (FWC) as endangered or threatened species or as species of special concern under the Endangered Species Act of 1973. Species listed in **Table 2** may occur within the project area. **Section 4.2** provides details of resident or the migrant status (including season of presence) of these birds.

Table 2. Bird species that may occur within the project area currently listed by Federal and State agencies as endangered, threatened, or as species of concern (From: Florida Fish and Wildlife Commission, Fish and Wildlife Institute 2008)

Common Name	Scientific Name	Listing	
		Federal (USFWS)	State of Florida (FWC)
Piping Plover	*Charadrius melodus*	Threatened	Threatened
Snowy Plover	*Charadrius alexandrinus*	Threatened	Threatened
Brown Pelican	*Pelecanus occidentalis*	n/a	SSC (1)*
Red Knot	*Calidris canutus rufa*	C	n/a
American Oystercatcher	*Haematopus palliates*	n/a	SSC (1,2)*
Black Skimmer	*Rynchops niger*	n/a	SSC (1)*
Least Tern	*Sterna antillarum*	n/a	Threatened

* Species of Special Concern (SSC) are indicated by the number in parentheses under the following criteria:
(1) Has a significant vulnerability to habitat modification, environmental alteration, human disturbance, or human exploitation that in the foreseeable future may result in its becoming a threatened species unless appropriate protective or management techniques are initiated or maintained; and
(2) May already meet certain criteria for designation as a threatened species, but for which conclusive data are limited or lacking.
C = Candidate for listing.

3.2.1. PIPING PLOVERS

The Piping Plover (*Charadrius melodus*) and Snowy Plover (*C. alexandrinus*), listed as threatened by the USFWS and FWC, are migrant shorebirds that overwinter along the southeastern U.S. and Gulf of Mexico coasts. Piping Plovers and Snowy Plovers inhabit coastal sandy beaches and mudflats. These species are currently in decline in the State of Florida (Ehrlich et al. 1992; Scott 2004).

3.2.2. BROWN PELICAN

The brown pelican (*Pelecanus occidentalis*), listed as a species of special concern by the FWC, is a large, heavy water bird with a massive bill and huge throat pouch and grayish-brown wings and body. Mainly coastal birds, they are rarely seen inland or far out at sea. The Brown Pelican feeds mostly in shallow estuarine waters, but has also been observed up to 40 mi from shore and may use the nearshore waters of the project area. This species uses sand spits, offshore sand bars, and islets for nocturnal roosting and daily loafing.

3.2.3. AMERICAN OYSTERCATCHER

The American Oystercatcher (*Haematopus palliatus*), listed as a species of special concern by the FWC, is a large shorebird that inhabits rocky and sandy shores and islands. It nests on the ground in open sites on high parts of sandy beaches, among rocks, on islands, and occasionally in salt marshes.

3.2.4. BLACK SKIMMER

The black Skimmer (*Rynchops niger*), listed as a species of special concern by the FWC, is a slim waterbird with a red, black-tipped bill and red legs that inhabits primarily coastal waters, including bays, estuaries, lagoons, and mudflats. It nests primarily near the coast on sandy beaches, shell banks, coastal and estuary islands, or on wrack and drift of salt marshes.

3.2.5. LEAST TERN

The Least Tern (*Sternula antillarum*), listed as threatened by the FWC, is a shorebird that inhabits coastal sandy beaches, bays, and estuaries and nests well above the high tide mark.

3.3. FISH SPECIES

The smalltooth sawfish (*Pristis pectinata*) is currently listed as endangered by NMFS, rarely occurs within the project area (**Figure 1**). This species has become rare along the southeastern Atlantic and northern Gulf of Mexico coasts of the U.S. 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 this former range.

The smalltooth sawfish is distributed in tropical and subtropical waters worldwide. It normally inhabits shallow waters (10 m or less), often near river mouths or in estuarine lagoons over sandy or muddy substrates, but may also occur in deeper waters (20 m) of the continental shelf. Shallow water less than 1 m deep apparently provides an important nursery area for young smalltooth sawfish. Maintenance and protection of habitat is an important component of the smalltooth sawfish recovery plan (NMFS 2006). Recent studies indicate that key habitat features (particularly for immature individuals) nominally consist of shallow water, proximity to mangroves, and estuarine conditions. Smalltooth sawfish grow slowly and mature at about 10 years of age. Females bear live young, and the litters reportedly range from 15 to 20 embryos requiring a year of gestation (NMFS 2006). Their diet consists of macroinvertebrates and fishes such as herrings and mullets. The saw is reportedly used to rake surficial sediments in search of crustaceans and benthic fishes or to slash through schools of herrings and mullets (NMFS 2006).

3.4. MAMMALS

Four listed mammal species (three species of marine mammals and one species of rodent) are known to occur within or inhabit habitats within the project area. A brief discussion of each species follows.

3.4.1. FLORIDA MANATEE

The Florida manatee (*Trichechus manatus latirostris*) has been designated as an endangered species by the federal government (USFWS) and the State of Florida (FWC). It has also been designated as the State Marine Mammal of Florida. Florida manatees are large, air-breathing aquatic mammals that inhabit both fresh and saltwater areas, including coastal areas, estuaries, rivers, canals, and dredged channels, particularly where seagrass beds or freshwater vegetation are present (Jefferson et al. 2008). Adult manatees primarily feed on aquatic and floating plants (USFWS 2001).

The Florida manatee is a migratory species that prefers warm water. During winter months, it is concentrated in Florida. During warm weather, it can occur as far west as Texas and as far north as Massachusetts, but more common summer sightings occur in Alabama, Georgia, and South Carolina.

Manatee hearing is reasonably good within a relatively narrow low-frequency band. Observations and studies have revealed that manatees emit sounds to communicate with one another, with these vocalizations often between a cow and its calf. Evidence suggests that despite their relatively good hearing, manatees have difficulty in localizing the source and direction of sound (EAI 2002).

Manatees are relatively long-lived, with estimates of maximum life expectancy at about 60 years. The reproductive rate for manatees is low. Females enter their reproductive cycle at 3 to 4 years of age, and the mean age when they first give birth is 5 years. Males mature at approximately 7 years of age. It is believed that cows give birth every

2 to 5 years, and twins are rare. The gestation period is about a year, and a calf remains dependent on its mother for approximately 1 to 2 years.

Critical habitat for the manatee, designated in 1976, includes inner shelf waters along the coast of Florida and the entire Indian River.

3.4.2. NORTH ATLANTIC RIGHT WHALE

The North Atlantic right whale (*Eubalaena glacialis*) is in a group of whales known as Mysticetus, or baleen whales. Instead of teeth, these whales have baleen, which is composed of keratin and is the same material that forms hair, fingernails, and horns. A series of plates that hang from both sides of the whale's upper jaw comprise the baleen, with over 200 plates on each side. Each plate can extend up to 10 ft in length, and a long, silky fringe lines the inner edge of the baleen. The fringe acts like a strainer that allows the whale to filter its food from the seawater. Baleen whales require this type of feeding mechanism because they are seasonal feeders and carnivores that filter feed tiny crustaceans, plankton, and small fish (zooplankton) from the water. When right whales find a dense patch of zooplankton, they swim through the patch with their huge mouths wide open and the zooplankton enter their mouth with the seawater. The zooplankton are then trapped against the baleen fringe, while the water passes through. A single right whale can consume more than a ton of the tiny creatures in a single day.

North Atlantic right whales feed in coastal habitats off New England and Canada, and their calving grounds lie in the shallow waters off the southeastern U.S. Approximately 350 right whales are thought to exist today, according to the number of whales recently photographed and individually identified. Right whales give birth to calves off the coast of Florida and Georgia during the winter months, and a few tens of other whales congregate in Cape Cod Bay at that time and migrate into the Great South Channel east of Cape Cod in the early spring. The rest of the population disappears from human observation during the winter, and the wintering ground for most of the population is still unknown.

By mid-summer and into the fall months, large numbers of right whales migrate to Canadian waters where they are frequently observed in the Bay of Fundy and sometimes on the western Scotian Shelf. Although most of the population (about two thirds) can be found in Canadian waters during the summer and early fall months, where the remainder of the population goes at that time is not known.

Critical habitat for the North Atlantic right whale consists of a relatively narrow strip of near-coastal waters extending from southern Georgia to the Sebastian Inlet, Florida. The habitat boundary widens near the Georgia-Florida State boundary, within an area where researchers have found the highest concentrations of individual whales during their winter calving season. Whales typically occur within this area from December through March, with peak calving in December and January. The area is frequented primarily by mothers, newborn calves, and some juveniles as well as the occasional adult males and non-calving adult females (http://www.neaq.org).

3.4.3. HUMPBACK WHALE

The humpback whale (*Megaptera novaeangliae*) is a large baleen whale with a maximum length of about 52 ft (16 m) and is mostly black or gray with very long (up to one-third of body length) flippers. The rear edge of the flippers and fluke are scalloped. As with all baleen whales, humpback whales are seasonal feeders and carnivores that filter feed tiny crustaceans, plankton, and small fish (zooplankton) from the water. They are gulpers (not skimmers) or filter feeders that alternatively swim then gulp a mouthful of plankton or fish. During the feeding season (about 120 days) in cold waters, an average-sized humpback whale will eat twice a day and consume 2,000 to 2,500 kg (4,400 to 5,500 lbs) of plankton; krill; and small, schooling fish.

Humpback whales occur in all the world's oceans. Most populations of these whales follow a regular migration route. They spend summers feeding in temperate and polar waters and winters in tropical waters mating and calving. They live at the surface of the open ocean and coastal waters, sometimes including inshore areas such as bays. When they are not migrating, they prefer shallow waters. Though rarely sighted within the vicinity of St. Lucie County, humpback whales occur in Florida waters during annual migrations between their summer and winter ranges.

Humpback whales are active, acrobatic whales that emit complex "songs" that typically last from 10 to 20 minutes. The "songs" these whales emit are the same within each population of whales (e.g., all the whales in the North American Atlantic population sing the same "song," and the North American Pacific population emits a different "song").

3.4.4. SOUTHEASTERN BEACH MOUSE

The southeastern beach mouse (*Peromyscus polionotus niveiventris*) is a small, buff-colored rodent that may inhabit the beach/dune zone within the project area. Historically, the southeastern beach mouse occurred from New Smyrna Beach to possibly as far south as Miami Beach; however, it is currently known to occur only in a few isolated locations from southern Volusia County to Martin County (USFWS 1999). Regional sighting reports include those from "scattered locations in Indian River and St. Lucie Counties" (http://www.fws.gov/verobeach/images/pdflibrary/sbmo.pdf).

USFWS (1999) documented populations of the southeastern beach mouse within St. Lucie County at Pepper Beach State Park and Fort Pierce Inlet State Recreation Area. These areas are located in the northern part of the county on North Hutchinson Island and outside of the project area. It is possible that this species is extirpated in the southern part of the county.

The general loss of preferred habitat associated with the urbanization of coastal areas and predation by house cats may represent primary causes of the southeastern beach mouse population decline (USFWS 1999). The 5-yr review of the species' status (USFWS 2008) stated that "Coastal development has already caused the extirpation of SEBM from St. Lucie, Martin, Palm Beach, and Broward Counties."

Adult beach mice average approximately 136 mm (5.4 in.) in length, with a tail that is approximately 53 mm (2.1 in.) long. The average weight is approximately 14.5 g (0.5 oz). Beach mice live in burrows that consist of three parts, an entrance tunnel, escape tunnel, and a nest chamber. Southeastern beach mice typically live and forage in the sea oats (*Uniola paniculata*) zone of the primary coastal dune. Beach mouse habitat also typically includes dune panic grass (*Panicum amarum*), railroad vine (*Ipomaea pes-caprae*), beach morning glory (*Ipomaea stolonifera*), salt-meadow cordgrass (*Spartina patens*), lambs' quarters (*Chenopdium album*), saltgrass (*Distichlis spicata*), and camphor weed (*Heterotheca subaxillaris*) (USFWS 1999). No critical habitat has been designated for the southeastern beach mouse.

4. ENVIRONMENTAL BASELINE CONDITIONS

4.1. SEA TURTLES

In general, the eastern coast of Florida apparently serves as an important year-round habitat for juvenile and adult loggerhead and green sea turtles on both inner shelf (0 to 20 m) and middle shelf (20 to 40 m) depths. In St. Lucie County, inner shelf (nearshore) hardbottom habitats including wormrock, coquina, and limestone outcroppings are important developmental habitat for juvenile green turtles (Dynamac Corporation 2005). Hawksbill, Kemp's ridley, and leatherback sea turtles occur year-round along the east coast of Florida. However, in contrast with loggerhead and green turtles, hawksbills and Kemp's ridleys primarily use the middle shelf areas and leatherbacks use outer shelf and continental slope areas (Teas 1993).

The state of Florida, through the FWC's Fish and Wildlife Research Institute, coordinates two sea turtle monitoring programs: the Statewide Nesting Beach Survey (SNBS) and the Index Nesting Beach Survey (INBS).

The SNBS program documents the total distribution, seasonality, and abundance of sea turtle nesting in Florida for sections of beach. The project area lies within two SNBS zones: North Hutchison Island (24.5 km) in St. Lucie County and South Hutchison Island (12 km) in Martin County. Between 1993 and 2007, 68,602 loggerhead turtles (an average of 4,573 per nesting season), 2,478 green sea turtles (an average of 165 per nesting season), and 964 leatherback turtles (an average of 64 per nesting season) nested on the beaches of the northern Hutchinson Island in St. Lucie County. Between 1993 and 2007, a total of 26,152 loggerhead turtles (an average of 1,743 per nesting season), 812 green sea turtles (an average of 54 per nesting season), and 898 leatherback turtles (an average of 60 per nesting season) nested on the beaches of south Hutchinson Island, Martin County (FWC, Fish and Wildlife Research Institute 2008).

The INBS coordinates a detailed monitoring program in conjunction with SNBS. This program, established to measure seasonal productivity, allows comparisons between beaches and between years. For this program, the beach areas are divided in 1-km zones, each with a separate letter designation. The project renourishment area includes INBS Zones Q through Y. INBS Zones P and Z comprise areas associated with potential construction effects.

Turtle nesting occurs in South St. Lucie County within the project area. Between 2000 and 2009, approximately 91.2% of the total sea turtle nests in the project area were loggerheads, followed by 7% green sea turtle nests, and 1.8% leatherbacks sea turtle nests (EAI 2007, 2008, 2009a; Jonathan Gorham, Inwater Research Group, Inc. May 6, 2010 and Beth Brost, Florida Fish and Wildlife Commission July 1, 2010, personal communication). In addition, green turtles have been consistently observed offshore adjacent to the southern portion of the project area during all seasons, with the greatest number of observations occurring in June (EAI 2009b, c, d, e, f, g). The next sections

briefly characterize the five species of turtles that occur in the project area and provide historical data nest data for the three species documented to have nested on the project area between 2000 and 2009.

Historically, hardbottom areas offshore St. Lucie County served as important developmental habitat for juvenile sea turtles (Quantum Resources Inc. 1998). Between March of 1976 (when the St. Lucie Nuclear Power Plant began operation) and April 1998, 5,727 sea turtles were captured and released at the plant's intake canal. This total included 3,357 loggerhead, 2,297 green, 34 Kemp's ridley, 20 leatherback, and 19 hawksbill turtles (Quantum Resources Inc. 1998). The power plant cooling water intake draws water from the nearshore just north of the project beach. That location includes the same reef system as the project area. Quantum Resources Inc. (1998) documented foraging by juvenile green turtles in this reef system.

4.1.1. LOGGERHEAD SEA TURTLE

Loggerhead turtles are present year-round in Florida waters, with peak abundance during spring and fall migrations. Data suggest that nesting adult females are short-term residents that migrate into east Florida waters on 2- and 3-year intervals and reside elsewhere during non-nesting years (Henwood 1987; Schroeder and Thompson 1987). 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). Subadult loggerheads forage opportunistically along the Atlantic seaboard, although evidence suggests that a resident population of subadults overwinter in the Canaveral area each year (Henwood 1987). In Brevard, Indian River, and St. Lucie Counties, juvenile and subadult loggerheads are found throughout the year in estuarine habitats (Ehrhart 1983, 1992; Henwood 1987; Ehrhart and Redfoot 1996; Bresette et al. 2000; Ehrhart et al. 2001; Holloway-Adkins 2005; Provancha et al. 2005). In the project area, loggerheads represented greater than 70% of the turtle species nests during nest surveys performed on both the restored beach and natural beach areas (EAI 2007, 2008, 2009a).

Approximately 90% of loggerhead nesting in the U.S. occurs in South Florida (Shoop et al. 1985). Their nesting season in southeast Florida (including St. Lucie County) is reported to extend from late April through September. Juveniles, thought to overwinter in the area, depart and adult males that migrate into the area to mate (Ryder et al. 1994) take their place. The adult loggerhead population increases in Florida waters during the nesting season (Magnuson et al. 1990). The nearshore rock resources in these areas appear to represent a travel corridor (to nesting sites) and not a main foraging or developmental habitat.

The southeast Florida region supports the largest loggerhead nesting aggregation in the western hemisphere (Schroeder and Thompson 1987). Annual numbers of nests observed in southeast Florida during 1989 to 1998 ranged from 46,295 (1989) to 74,988 (1998), with a mean of 61,731 nests annually (Marine Turtle Expert Working Group 2000).

Hatchling turtles normally emerge during the night on project beaches between July and September. They swim offshore and begin a pelagic existence within *Sargassum* rafts, drifting in current gyres and convergence zones for several years (Carr 1987; Marine Turtle Expert Working Group 1996b; Witherington 2002). Post-hatchlings from the Florida coast eventually enter currents of the North Atlantic Gyre. At a carapace length of approximately 40 to 60 cm, they leave the pelagic environment and move into nearshore habitats (Carr 1987; Bowen et al. 1993).

Table 3 summarizes the loggerhead sea turtle nests documented by INBS zone/FDEP Reference Monument between 2000 and 2009. Nesting totals for INBS Zones T through Z (**Table 3**) are seasonal (not yearly) totals, as the data provided by the FWC only include nests recorded between 15 May and 31 August of each year. In the project area, loggerhead nests varied between approximately 1,812 nests in 2007 and 3,411 nests in 2000, with a 10-year average of 2,367 nests.

Table 3. Loggerhead sea turtle nests by Index Nesting Beach Survey (INBS) zone in the project area between 2000 and 2009

LOGGERHEAD (Caretta caretta)

INBS Zone	R - Monument	Nests									
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
P	R-84 - R-87.5	267	232	184	155	138	178	116	185	154	122
Q	R-87.5 - R-91	371	270	216	200	218	337	213	212	240	193
R	R-91 - R-94.5	288	190	212	196	205	259	123	150	171	157
S	R-94.5 - R-98	470	390	351	289	241	408	168	162	320	255
T	R-98 - R-101	342	356	287	248	214	270	245	261	356	360
U	R-101 - R-104	344	346	371	292	249	184	155	162	243	215
V	R-104 - R-108	344	376	301	273	193	197	230	146	236	267
W	R-108 - R-111	274	217	246	212	197	68	213	195	259	185
X	R-111 - R-114.5	274	196	169	188	136	65	172	149	140	143
Y	R-114.5 - R-3.5	253	213	217	177	95	162	116	112	139	132
Z	R-3.5 - R-7	184	89	136	111	79	107	93	78	129	80
	Totals	**3411**	**2875**	**2690**	**2341**	**1965**	**2235**	**1844**	**1812**	**2387**	**2109**

Data Sources: INSB Zones P – S: personal communication, Jonathan Gorham, Inwater Research Group, Inc. May 6, 2010. INSB Zones T – Z Beth Brost, Florida Fish and Wildlife Commission Index Nesting Beach Survey Database July 1, 2010. Note: Zones P – S are year totals, while Zones T – Z include data between May 15 and August 31.

4.1.2. GREEN SEA TURTLE

The green turtle is considered common within nearshore waters of the project area. All life stages of green turtles occur during different times of the year in and around the project area and have been consistently observed offshore adjacent to the southern portion of the project area during all seasons, with the most observations occurring in June (EAI 2009b,c,d,e,f,g). Immature turtles also occur on the inner shelf along the entire east coast of Florida (Schmid 1995; Hirth 1997).

The major feeding grounds for green turtles in U.S. waters are located in Florida, where the turtles forage mainly on algae and the seagrass *Thalassia testudinum* (Burke et al. 1992). However, no seagrass habitats are located within nearshore waters of the project area (CSA International, Inc. 2009).

Primary green turtle nesting sites in U.S. Atlantic waters occur along high-energy beaches of Florida's east coast, primarily during July and August, with additional sites in the U.S. Virgin Islands and Puerto Rico (NMFS and USFWS 1991a; Hirth 1997). Green

turtle nests observed during nest surveys performed on both the restored beach and natural beach areas of the southern portion of the project area and comprised 6% to almost 20% of all nests located during the 2006, 2007, and 2008 nesting seasons. The nest densities reported ranged from 13.5 to 46.3 nests/km for the restored beach and 9.5 to 38.1 nests/km for the natural beach (EAI 2007, 2008, 2009a).

Subadult green turtle habitats on the east coast of Florida include shallow estuarine environments such as the Indian River Lagoon (Ehrhart et al. 1996; Provancha et al. 1998; Bresette et al. 2000), deeper coral and limestone reefs in south Florida (Wershoven and Wershoven 1992; Makowski et al. 2002; Makowski 2004), and shallow nearshore habitats in Brevard, Indian River, and St. Lucie Counties (Bresette et al. 1998; Ehrhart et al. 2001; Holloway-Adkins et al. 2002). They also have been found in man-made habitats such as shipping channels and turning basins (Henwood 1987; Redfoot 1997).

Juvenile green turtles over nearshore hardbottom habitats in the project area were found to primarily forage on various red algae species (Ehrhart et al. 1996; Holloway-Adkins 2001; Holloway-Adkins 2005). The most frequently consumed species included *Gelidium* spp., *Bryothamnion seaforthii*, *Hypnea* spp., *Gracilaria* spp., *Laurencia* spp., and *Bryocladia cuspidata*. Samples of juvenile stomachs also included a variety of small invertebrates. Occasionally, a large portion of jellyfish was discovered in the samples. However, the overall results indicate green turtles in the nearshore hardbottom habitat feed as herbivores (Holloway-Adkins 2001; Gilbert 2005; Holloway-Adkins and Provancha 2005). Sand, pieces of rock, and shell debris found in foraging samples indicate green turtles forage close to the substrate and either incidentally or selectively ingest these non-nutritional items. Stranding events and foraging studies indicate that sea turtles at all life stages are susceptible to ingesting anthropogenic debris (Balazs 1985; Carr 1987; Witherington 2002).

Table 4 summarizes the green sea turtle nests documented by INBS Zone/FDEP Reference Monument between 2000 and 2009. Nesting totals for INBS Zones T through Z are not year totals, as the data provided by the FWC only include nests recorded between 15 May and 31 August of each year. In the project area, green turtle nests varied between approximately 16 nests in 2001 and 340 nests in 2007, with a 10-year average of 181 nests.

Table 4. Green sea turtle nests by Index Nesting Beach Survey (INBS) zone in the project area between 2000 and 2009

GREEN TURTLE (Chelonia mydas)

INBS Zone	R - Monument	Nests									
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
P	R-84 - R-87.5	20	0	4	8	8	18	3	8	9	1
Q	R-87.5 - R-91	15	0	5	10	1	21	9	12	7	11
R	R-91 - R-94.5	16	1	13	8	5	38	11	26	14	8
S	R-94.5 - R-98	25	0	45	8	6	74	29	44	14	13
T	R-98 - R-101	52	2	42	8	13	40	31	89	74	40
U	R-101 - R-104	62	10	86	13	10	51	18	51	32	16
V	R-104 - R-108	23	1	47	4	15	15	7	24	15	10
W	R-108 - R-111	17	1	31	11	4	11	3	49	14	8
X	R-111 - R-114.5	22	0	18	3	3	3	6	19	4	7
Y	R-114.5 - R-3.5	20	1	10	2	4	11	2	12	6	0
Z	R-3.5 - R-7	11	0	6	0	1	5	2	6	3	3
Totals		**283**	**16**	**307**	**75**	**70**	**287**	**121**	**340**	**192**	**117**

Data Sources: INSB Zones P – S: personal communication, Jonathan Gorham, Inwater Research Group, Inc. May 6, 2010. INSB Zones T – Z Beth Brost, Florida Fish and Wildlife Commission Index Nesting Beach Survey Database July 1, 2010. Note: Zones P – S are year totals, while Zones T – Z include data between May 15 and August 31.

Between December 2008 and August 2009, EAI conducted six boat-based surveys for marine turtles in the nearshore waters of Hutchinson Island, Florida (EAI 2009b,c,d,e,f) in support of the Applicant's proposed action. EAI established the survey transects over areas of hardbottom.

Surveys reported sighting a total of 61 green turtles: 3 in December 2008, 2 in March 2009, 3 in May 2009, 37 in June 2009, 5 in July 2009, and 11 in August 2009. The majority of the turtles (48) were observed while submerged (EAI 2009b,c,d,e,f).

4.1.3. HAWKSBILL SEA TURTLE

Nesting areas for hawksbills in the Atlantic are found in south Florida, Puerto Rico, and the U.S. Virgin Islands. Within the continental U.S., nesting beaches are restricted to the southeastern coast of Florida (i.e., Palm Beach, Broward, and Dade Counties), Florida Keys, and southwestern coast of Florida as noted by Meylan (1992) and the NMFS and USFWS (1993). Hawksbill nesting along the eastern coast of Florida occurs between June and September (B. Brost, 2002, pers. comm.).

Hatchling hawksbills are pelagic, drifting with *Sargassum* rafts. Available data suggest they are herbivorous during this period, but become more omnivorous as they age (Ernst et al. 1994). Juveniles shift to a benthic foraging existence in shallow waters, progressively moving to deeper waters as they grow and become capable of deeper dives for sponges (Meylan 1988; Ernst et al. 1994). Adult hawksbills typically are associated with coral reefs and similar hardbottom areas where they forage on invertebrates, primarily sponges.

No hawksbill nests or animals have been observed in the project area during any nesting or boat survey performed during 2006, 2007, and 2008 (EAI 2007, 2008, 2009a,b,c,d,e,f,g).

4.1.4. KEMP'S RIDLEY SEA TURTLE

The Kemp's ridley is considered very rare in nearshore waters of the project area. No Kemp's ridley nests or animals have been observed in the project area during any nesting or boat survey performed during 2006, 2007, and 2008 (EAI 2007, 2008, 2009 a,b,c,d,e,f,g).

4.1.5. LEATHERBACK SEA TURTLE

Adult leatherback turtles reportedly occur in east Florida waters primarily during summer, although some were sighted during aerial survey programs conducted off northeast Florida from October through April as well (Schroeder and Thompson 1987; Knowlton and Weigle 1989; Continental Shelf Associates, Inc. 2002). During these surveys, leatherbacks were sighted on the middle shelf and inner shelf, but not usually in nearshore waters (Continental Shelf Associates, Inc. 2002). However, historical data suggest that leatherbacks also may utilize inner shelf waters during periods of local thermal fronts that concentrate food resources (Thompson and Huang 1993). Because of the cryptic behavior of hatchling and/or juvenile leatherback turtles, very little is known of their pelagic distribution. Leatherbacks rarely occur in nearshore waters of the project area.

Nesting along the eastern coast of Florida occurs late February through early September (Meylan et al. 1995). Leatherbacks nest on coarse-grained, high-energy beaches in tropical latitudes (Eckert 1995). Florida is the only location in the continental U.S. where significant leatherback nesting occurs. Nests in St. Lucie County are relatively few in number when compared with Florida beaches farther south, especially Martin and Palm Beach Counties (NMFS and USFWS 1992b).

Table 5 summarizes the leatherback sea turtle nests documented by INBS Zone/FDEP Reference Monument between 2000 and 2009. Nesting totals for INBS Zones T through Z are not year totals, as the data provided by the FWC only include nests recorded between May 15 and August 31 of each year. In the project area, leatherback nests varied between approximately 13 nests in 2000 and 100 nests in 2009, with a 10-year average of 45 nests.

Table 5. Leatherback sea turtle nests by Index Nesting Beach Survey (INBS) zone in the project area between 2000 and 2009

LEATHERBACK (Dermochelys coriacea)

INBS Zone	R - Monument	Nests									
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
P	R-84 - R-87.5	2	1	1	1	0	2	0	3	0	0
Q	R-87.5 - R-91	2	0	2	2	1	1	0	4	1	2
R	R-91 - R-94.5	1	5	1	5	3	3	2	3	2	16
S	R-94.5 - R-98	5	13	10	15	10	19	4	16	7	32
T	R-98 - R-101	1	3	2	0	1	2	4	3	3	8
U	R-101 - R-104	0	3	6	3	2	2	1	7	9	3
V	R-104 - R-108	0	5	0	4	4	0	0	0	2	5
W	R-108 - R-111	0	5	3	5	4	1	3	6	6	7
X	R-111 - R-114.5	0	0	2	3	0	0	1	14	4	8
Y	R-114.5 - R-3.5	1	8	3	4	2	6	4	8	4	6
Z	R-3.5 - R-7	1	2	2	2	0	8	3	16	7	13
Totals		**13**	**45**	**32**	**44**	**27**	**44**	**22**	**80**	**45**	**100**

Data Sources: INSB Zones P – S: personal communication, Jonathan Gorham, Inwater Research Group, Inc. May 6, 2010. INSB Zones T – Z Beth Brost, Florida Fish and Wildlife Commission Index Nesting Beach Survey Database July 1, 2010. Note: Zones P – S are year totals, while Zones T – Z include data between May 15 and August 31.

4.2. COASTAL AND MARINE BIRDS

A search of the Florida Natural Area Inventory (FNAI 2010) database indicates that several of the threatened and endangered species and species of special concern identified in **Table 2** as potentially present in the project area have been observed within St. Lucie County. Each species observed within the county that could occupy the project area is described below. Surveys conducted between November 2007 and February 2008 in the project area and in the vicinity of the St. Lucie County power plant counted numerous shorebirds. However, with the exception of the Brown Pelican, a species of special concern in Florida, no other individuals with listed species status were reported (Jonathan Gorham, pers. comm., Inwater Research Group, Inc., 17 May 2010).

4.2.1. PIPING PLOVERS

The Piping Plover and Snowy Plover inhabit coastal sandy beaches and mudflats. No occurrences of these species, including nesting or foraging, were noted in recent site visits to the project area (CTC 2007). Critical habitat for Piping Plovers includes no areas in St. Lucie County.

4.2.2. BROWN PELICAN

The Brown Pelican, a common year-round resident of the project area, occur in coastal shoreline habitats and nearshore waters. Bird surveys conducted between November 2007 and February 2008 in the project area (**Table 6**) showed this species used the project area (Jonathan Gorham, pers. comm., Inwater Research Group, Inc., 17 May 2010). **Table 6** breaks down the sightings (2,031 individuals) by date.

Table 6. Brown Pelican counts between November 2007 and February 2008 in the vicinity of the St. Lucie County nuclear power plant (Adapted from: Jonathan Gorham, pers. comm., Inwater Research Group, Inc., 17 May 2010)

Location	Date	Abundance
St Lucie Nuclear Power Plant Turbine 3&4	11/30/2007	413
	12/14/2007	121
	12/27/2007	110
	12/31/2007	120
	1/1/2008	124
	1/2/2008	65
	1/11/2008	81
	1/25/2008	125
	2/8/2008	113
	2/22/2008	30
St Lucie Nuclear Power Plant Turbine 5	11/30/2007	217
	12/14/2007	81
	12/27/2007	21
	12/31/2007	73
	1/1/2008	41
	1/2/2008	41
ST 112	1/11/2008	77
ST-II	1/25/2008	102
	2/8/2008	31
	2/22/2008	45

4.2.3. AMERICAN OYSTERCATCHER

The American Oystercatcher, a year-round resident of coastal Florida, breeds in sparsely vegetated, sandy areas along the east coast north of Palm beach County, and in the Indian River Lagoon system (FNAI 2010). The American Oystercatcher will also use beach wrack and marsh grass for breeding. Recent surveys conducted in the project area reported non sightings of this species (Jonathan Gorham, pers. comm., Inwater Research Group, Inc., 17 May 2010).

4.2.4. BLACK SKIMMER

The Black Skimmer, a year-round resident of coastal Florida, inhabits coastal waters, including beaches, bays, estuaries, sandbars, tidal creeks (foraging), and inland waters of large lakes, phosphate pits, and flooded agricultural fields. Recent surveys conducted in the project area did not record this species (Jonathan Gorham, pers. comm., Inwater Research Group, Inc., 17 May 2010).

4.2.5. LEAST TERN

The Least Tern, a migratory species, enters central and south Florida and for breeding and nesting in mid-April. They migrate elsewhere in November and do not return until

at least mid-February (FNAI 2010). Least terns inhabit coastal sandy beaches, bays, and estuaries and nests well above the high tide mark. Recent surveys conducted in the project area did not record this species (Jonathan Gorham, pers. comm., Inwater Research Group, Inc., 17 May 2010).

4.3. FISH SPECIES

4.3.1. SMALLTOOTH SAWFISH

The St. Lucie County South Beach and Dune Restoration Project area lacks freshwater input and mangrove shoreline habitats the smalltooth sawfish prefers. The National Sawfish Encounter database, managed by Florida Museum of Natural History, University of Florida, indicates that three confirmed sightings of the smalltooth sawfish in St. Lucie County (**Table 7**) (Mote Marine Laboratory 2006). None was located in the project area, although the St. Lucie power plant lies just north of the project area

Table 7. Smalltooth sawfish sightings in St. Lucie County
(From: Mote Marine Laboratory 2006)

Date	Number Observed	Location	Latitude	Longitude
25 June 2003	1	Offshore St. Lucie Inlet	27.27933	-80.111
16 May 2005	1	St. Lucie power plant, intake pond	27.34671	-80.2475
October 2001	1	St. Lucie Jensen Beach power plant, south side cove	27.4284	-80.2911

Although no individuals were present within the project area, coastal areas including the project area are important for recovery of smalltooth sawfish and the project area will likely support adult and subadult individuals.

4.4. MAMMALS

4.4.1. FLORIDA MANATEE

Within St. Lucie County, manatees are most frequently observed in the Indian River Lagoon and other inland waters. However, they have also been observed along the coast in the shallow, nearshore waters, though only rarely. They may graze on the algae present on the intermittent nearshore exposed hardbottom present in the project area.

4.4.2. NORTH ATLANTIC RIGHT WHALE

Sightings of North Atlantic right whales within waters off Florida are limited to late fall to early spring months. Sightings are concentrated near northeastern Florida and southeastern Georgia; however, sightings of individual whales have been reported as far south as Palm Beach County, Florida.

4.4.3. HUMPBACK WHALE

The humpback whale is rarely sighted within the vicinity of St. Lucie County during its spring/fall migration.

4.4.4. SOUTHEASTERN BEACH MOUSE

Populations of the southeastern beach mouse within St. Lucie County have been documented at Pepper Beach State Park and Fort Pierce Inlet State Recreation Area (USFWS 1999), located in the northern part of the county on North Hutchinson Island, and outside of the project area. The healthiest populations of the southeastern beach mouse are now documented primarily in protected areas (e.g., Canaveral National Seashore). Recent surveys in St. Lucie County located no mice in South St. Lucie Atlantic shoreline and USFWS (2008) concluded that the mouse had been extirpated in St. Lucie County.

5. POTENTIAL EFFECTS ON LISTED SPECIES

Impact-producing factors (IPFs) from the implementation of the Applicant's proposed action include the following:

- Turbidity from dredging and seawater discharge
- Turbidity from sand placement
- Noise and vibration
- Vessel traffic
- Disturbance of and activities on the beach within the dredge fill placement area
- Loss of intertidal and subtidal benthic macroinfaunal invertebrates
- Loss of exposed hardbottom habitats within the dredge fill placement area
- Hopper dredge operations

Table 8 provides a summary of the listed species and whether the identified IPFs will affect them. An "X" in a particular table cell indicates that an IPF could affect a certain listed species, and a dash (--) indicates no impact or negligible impact.

5.1. SEA TURTLES

Section 3.1 lists sea turtles that may occur within the project area. All sea turtle species are currently listed as endangered or threatened species by the USFWS and FWC (**Table 1**).

The project area is not identified or labeled as critical habitat for sea turtles. Beaches within the project do, however, provide nesting habitat for loggerhead, green, and leatherback turtles (Meylan et al. 1995). Erosion rates on beaches in many coastal areas are increased by inlets, jetties, and groins, which disrupt normal long shore patterns of sand transport (Pilkey 1991; Finkl 1993). This sand loss poses a threat to nesting sea turtles, with most nesting beaches in Florida now seriously affected by erosion (NMFS and USFWS 1991a,b). Beach nourishment projects help restore sea turtle nesting beaches (Crain et al. 1995; Greene 2002).

IPFs to sea turtles associated with beach nourishment activities to sea turtles include:

- Construction-related reduction in beach access to female turtles
- Disturbance of nesting female turtles by beach nourishment activities
- Damage to or burial of existing nests during nourishment activities
- Effects to nesting females, eggs, and hatchlings from changes in the physical and chemical characteristics of the nourished beach
- Alteration (burial) of nearshore exposed hard substrate during and subsequent to nourishment activities
- Entrainment by hopper dredge drag heads
- Underwater and construction noise

Table 8. Summary of listed species and impact-producing factors (IPFs)

Listed Species	IPF							
	Turbidity from Dredging	Turbidity from Sand Placement	Noise	Vessel Traffic	Disturbance of Beach within the Dredge Fill Placement Area	Loss of Macroinfauna	Loss of Exposed Hardbottom Habitats Within the Dredge Fill Placement Area	Hopper Dredge Operation
Loggerhead sea turtle	X	--	X	--	X	--	X	X
Green sea turtle	X	--	X	--	X	--	X	X
Hawksbill sea turtle	X	--	X	--	X	--	X	X
Kemp's ridley sea turtle	X	--	X	--	X	--	--	X
Leatherback sea turtle	X	--	X	--	X	--	--	X
Piping plover and snowy plover	--	--	X	--	X	X	--	
Brown pelican	--	--	X	--	--	X	--	
American oystercatcher	--	--	X	--	X	X	--	
Black Skimmer	--	--	X	--	X	X	--	
Least tern	--	--	X	--	X	X	--	
Smalltooth sawfish	--	X	X	--	--	--	--	
Florida manatee	X	X	X	X	--	--	--	X
North Atlantic right whale	X	--	X	--	--	--	--	X
Humpback whale	X	--	X	--	--	--	--	X

X = An IPF could affect the species.
-- = No impact or negligible impact.

Nourishment projects conducted during the nesting season can cause decreased nesting success (Crain et al. 1995; Brock et al. 2008). Gravid female turtles may avoid or be deterred from suitable nesting sites by the presence of equipment used during nourishment activities (e.g., trucks, bulldozers, dredge pipelines, etc.), noise from these operations, and human activity (National Research Council 1995). Existing nests can be covered with excess sand fill during nourishment activities. The compaction of this fill may crush eggs or inhibit hatchling emergence by physically impeding their upward crawl through the upper sand layer, though most studies find no adverse effect of nourishment on hatchling emergence (Crain et al. 1995).

Physical and chemical changes induced by nourishment activities can have detrimental effects on the nesting success of gravid female turtles the survival and future reproductive contribution of developing embryos, and emerging hatchlings. Steep sand scarps may form on nourished beaches when an abrupt transition occurs between the steep fill slope and a flatter, natural offshore slope (Nelson and Dickerson 1989). Scarping may occur following nourishment while the beach readjusts to a more natural profile. A scarp can prevent female turtles from reaching preferred nesting sites, increasing the numbers of false crawls on the nourished beach (Nelson et al. 1987; Steinitz et al. 1998; Herren 1999; Rumbold et al. 2001). Nesting turtle's responses to a beach scarp varies considerably (Nelson et al. 1987). The turtle may dig through the scarp or resort to digging the nest closer to the water where the eggs may be swept away by tides (Steinitz et al. 1998). Brock et al. (2008) observed reduced nesting success in loggerhead and green turtles on artificially nourished beaches. That study attributed decrease in nesting success to the altered beach profile, which subsequently improved in later as the beach equilibrated to a more natural slope. Nourished beaches are often harder (increased shear resistance. Nourished beaches are often harder (have increased shear resistance) and more compact (have increased sand density) than natural beaches, primarily from the use of angular, finer grain sand dredged from stable offshore borrow sites (Nelson and Dickerson 1989). This physical change can cause female turtles to abandon attempts at digging nests, leaving behind unsuccessful nest cavities (false digs) and may prevent nesting females from concealing the nest with a disguising mound of sand, therefore, leading to increased nest predation by predators such as raccoons (Ryder 1991). According to Steinitz et al. (1998), a nourished beach may not provide suitable habitat for turtle nesting in the middle beach zone until 2 to 3 years after project completion, by which time the beach surface has become more penetrable. Other studies have documented times of up to 7 years for the beach sand to return to its normal density from erosion and accretion from weather and waves (Moulding and Nelson 1988; Nelson and Dickerson 1989).

Sea turtles assess potential nesting beaches prior to emerging to nest (Crain et al. 1995). However, nesting habitat qualities such as its sand grain size, density, shear resistance, color, gas diffusion rates, organic composition, and moisture content, are not important factors in a turtle's choice of nesting beach. Nevertheless, these characteristics may significantly affect nesting and hatching success.

Sediments of finer grain size or those with a high clay or silt content may affect nesting success because of beach compaction or concretion from the drying of newly placed

sediments. Compaction may also occur from the use of construction equipment on the beach. Increased compaction has been found to decrease the proportion of crawls resulting in nests, alter nest chamber geometry, and alter nest concealment (Byrd 2004). Compacted sediments on nourished beaches may also affect gas diffusion and available moisture to sea turtle eggs and have a tremendous impact on egg survival (Crain et al. 1995; Herren 1999).

When nourished sand is taken from offshore borrow sites, it may have a very dark gray color that could affect ambient sand temperature (darker sands absorb more radiation than lighter colored sands). Byrd (2004) found nourished beach temperatures on Hunting Island, South Carolina to be significantly higher than temperatures on a control beach. In sea turtles, nest temperatures during the second trimester of egg incubation determine sex. High incubation temperatures during this period produce primarily females, and low temperatures produce males (Mrosovsky and Yntema 1980). Abnormal sex ratios are likely, therefore, if the sand fill on a nourished beach differs from the natural beach in thermal parameters.

Although nourishment activities would occur outside of the nesting season, (see **Section 1.1**) impacts to sea turtles may result from a number of factors, including sand color and other physical characteristics, chemical characteristics, and compaction. The project activities may affect, and will likely adversely affect, sea turtles in the project area at least in the short term. The period of adverse impacts depends on how well the chemical and physical parameters of the borrow site sand match the existing beach material.

Juvenile sea turtles of three species (green, hawksbill, and loggerhead) commonly associate with shallow hard substrate features off east Florida where they find habitat for feeding (macroalgae) and structure for shelter (CSA International, Inc. 2009). Beach nourishment activities can result in the loss (burial) of areas of nearshore hard substrate. Studies have suggested that observed reductions in local turtle abundance following nourishment activities are correlated with a temporary reduction in available macroalgal food resources and shelter (Makowski and Kruempel 2007; Prekel et al. 2007).

Sea turtles can be injured killed by entrainment within hopper dredge dragheads, particularly within areas of soft sediment in ship channels where turtles are known to rest by partial burial (National Research Council Committee on Sea Turtle Conservation 1990). Numerous methods have been implemented to reduce the number of turtle takes during hopper dredge operations, including special turtle deflecting hopper dredge dragheads, relocation trawling, dredging windows, and the implementation of trained protected species observers during dredging operations (http://el.erdc.usace.army.mil/tessp/pdfs/1997SADBO.pdf).

The proposed offshore borrow area is unlikely to serve as a refuge for sea turtles as it comprises an area of bare sand positioned along the inner continental shelf, away from a ship channel and proximal to numerous areas of emergent hard substrate that would provide shelter. The hopper dredge will be equipped with a sea turtle deflecting

draghead deflector and will be manned by NMFS-approved protected species observers within the proposed borrow site (http://el.erdc.usace.army.mil/seaturtles/docs/observercriteria.pdf) during all dredging operations With these measures in place, there a chance for incidental take(s) of sea turtles during dredging operations remains. The Corps has received the 1997 NMFS SADRBO for swimming sea turtles that stated hopper dredging activities will not jeopardize the continued existence of swimming sea turtles and that no further consultation is required for hopper dredging activities. However, the project does propose burial of nearshore hardbottom, which does provide foraging for juvenile green sea turtles. The Corps has determined that the effects associated with the burial of suitable foraging habitat may affect green sea turtles and will initiate formal consultation with NMFS. Furthermore, during construction activities, the Corps will require the implementation of the smalltooth sawfish and swimming sea turtle construction conditions to reduce adverse effects to swimming sea turtles.

5.2. COASTAL AND MARINE BIRDS

Section 3.2 lists bird species currently identified by the USFWS and FWC as endangered or threatened species that may occur within the project area. The project area is not identified or labeled as critical habitat for listed birds. Critical habitat is defined by the USFWS as "specific geographic areas, whether occupied by a listed species or not, that are essential for its conservation and that have been formally designated by rule published in the Federal Register." Further, no reports indicate nesting of listed bird species within the project area (CTC 2007).

IPFs associated with the applicant's proposed action to listed birds include the following:

- Disturbance from ongoing dredge material pumpout and grading activities
- The loss of benthic macroinfaunal invertebrates used as a food source for certain species of listed birds within the dredge fill placement area

Disturbance from ongoing activities may cause listed species that may visit the project area during the project construction period to leave temporarily or abandon the project area for a longer period. The expected temporary impacts associated with the Applicant's proposed action may affect but are unlikely to adversely affect the Wood Stork and Piping Plover or to jeopardize the existence of any listed bird species.

The assemblage(s) of benthic macroinfaunal invertebrates buried during beach nourishment activities will remain unavailable to listed birds as a source of food until recolonization of the habitat. A study on the effects of beach nourishment on waterbirds and shorebirds in Brunswick County, North Carolina found no significant effect from replenishment on mean bird abundances. Conversely, study data suggested that habitat use by these birds might have actually increased at replenished beaches. Waterbird feeding activity, however, declined significantly after replenishment but, overall, no strong evidence indicates that replenishment alters either shorebird or waterbird feeding activity (Grippo et al. 2007). A study of the effects of beach nourishment activities on the intertidal zone at Bogue Banks, North Carolina (Reilly and Bellis 1983) found that intertidal and subtidal benthic faunal density and community

structure were affected both during and after nourishment activities. Species densities on the nourished beach became zero at the onset of nourishment activities, and recovery largely depended on recruitment from pelagic larval stocks. High turbidities in adjacent nearshore waters associated with these activities may prevent or slow this recruitment.

The recovery of beach benthic fauna within renourished beach habitats occurs through mechanisms such as the vertical migration of existing beach fauna through the sediment overburden and recruitment of pelagic larvae, juveniles, and adult organisms to the target beach from adjacent areas (Greene 2002). Historic data suggest that recovery of these areas should occur within one to two seasons following the project, assuming the nourishment material is compatible with the natural beach sediments.

5.3. FISH SPECIES

5.3.1. SMALLTOOTH SAWFISH

IPFs associated with the Applicant's proposed action to smalltooth sawfish include noise and turbidity generated by the construction activities. These activities may affect, but are not likely to adversely affect, smalltooth sawfish individuals in the project area.

Disturbance from ongoing activities is likely to displace smalltooth sawfish that may visit the project area during the construction period. These disturbances may result in temporary movement or avoidance of the area. During construction activities, the Corps will require the implementation of the smalltooth sawfish and swimming sea turtle construction conditions to avoid adverse effects to smalltooth sawfish.

5.4. MAMMALS

5.4.1. FLORIDA MANATEE

IPFs associated with the Applicant's proposed action to the Florida manatee include noise, turbidity, and vessel traffic generated by the construction activities. According to the Florida Manatee Recovery Plan, death or injury from collisions with the hulls and/or propellers of boats and ships represents the most significant problem manatees face in Florida (USFWS 2001). Construction activities would involve a minimal amount of vessel traffic. The project would employ standard manatee protection mitigation measures to minimize the chance of any project vessel striking manatees, other marine mammals, or sea turtles. Taking into account the mitigation measures and the low likelihood of killing or injuring a manatee, these activities may affect but are unlikely to adversely affect manatee individuals in the project area.

5.4.2. NORTH ATLANTIC RIGHT WHALE

IPFs associated with the Applicant's proposed action to the North Atlantic right whale include noise and turbidity generated by the construction activities. Marine mammals rely heavily on the use of underwater sounds to communicate and gain information about their environment. The reactions of marine mammals to noise can vary and

depend on the species involved, time of year, and the activity of the animal at the time of exposure to noise.

Even in the absence of man-made sounds, the sea is usually noisy. Background ambient noise often interferes with or masks the ability of an animal to detect a sound signal even when that signal is above its absolute hearing threshold. Although masking is a natural phenomenon to which marine mammals must be adapted, introduction of strong sounds into the sea at frequencies important to marine mammals will inevitably increase the severity and the frequency of masking.

Potential effects of the elevated background noise levels caused by man-made noise include the following:

- Limiting the detection by the mammals of natural sounds
- Disturbing their normal behavior, resulting in possible displacement from areas
- Causing temporary or permanent reductions in hearing sensitivity

The potential effects depend on the type of marine mammal involved because different marine mammals have different hearing frequencies. The levels and types of ambient noise also strongly influence the potential area or zone of influence of a man-made sound. An animal's sensitivity to different sounds varies with frequency, and its response to a sound likely depends strongly on the presence and levels of sound in the frequency band or range of frequencies to which it is sensitive (Ports Corporation of Queensland 2005).

The project area is used by the North Atlantic right whale as part of the species' migratory route and as potential calving grounds during the winter months; however, these whales are rare to the project area (see **Section 4.4.2**). Whales would likely avoid areas where the dredge is operating. The project area is an extremely small area when compared to the overall waters used for migration and calving; therefore, the dredging activities may affect, but are not likely to adversely affect, North Atlantic right whale individuals in the project area. The Corps has received prior concurrence in the NMFS 1997 Regional Biological Opinion on Hopper Dredging along the South Atlantic coast (1997 SADRBO) for the effects of hopper dredging on right whales, and no further consultation is required.

5.4.3. HUMPBACK WHALE

As discussed above, the IPFs associated with the Applicant's proposed action to the humpback whale include noise and turbidity generated by the construction activities. Marine mammals rely heavily on the use of underwater sounds to communicate and gain information about their environment. The reactions of marine mammals to noise can vary and depend on the species involved, time of year, and the activity of the animal at the time of exposure to noise.

The humpback whale is rarely present within the vicinity of St. Lucie County during its spring/fall migration (see **Section 4.4.3**). Whales would likely avoid areas where the dredge is operating. The project area is an extremely small area when compared to the overall waters used for migration and calving; therefore, the dredging activities may affect, but are not likely to adversely affect, humpback whale individuals in the project area. The Corps has received prior concurrence from the NMFS for this determination in the NMFS 1997 Regional Biological Opinion on Hopper Dredging along the South Atlantic Coast (1997 SADRBO) for the effects of hopper dredging on humpback whales, and no further consultation is required.

5.4.4. SOUTHEASTERN BEACH MOUSE

According to the Draft Standard Local Operating Procedures for Endangered Species (SLOPES) Manual for the southeastern beach mouse, if the project is located outside of Indian River County or northern St. Lucie County, then the action agency can determine that the action will have “no affect” on the beach mouse (USFWS South Florida Ecological Services Office 2003).

The IPFs associated with the Applicant’s proposed action to the southeastern beach mouse (assuming their presence in southern St. Lucie County) include covering of their burrows that may be located in the beach/dune zone and temporary loss of habitat due to the construction activities. The beach mouse is known to occur only in a few isolated locations from northern Volusia County to Martin County, Florida and most likely is not present in the project area (see **Section 4.4.4**). However, before the start of renourishment activities, a beach mouse survey will be performed to ensure that no burrows would be buried. Since the beach mouse is not likely present in the project area and pre-construction surveys are proposed, beach renourishment activities may affect, but are not likely to adversely affect, beach mouse individuals in the project area.

6. CUMULATIVE AND INDIRECT IMPACTS

According to U.S. Environmental Protection Agency, the following are factors that may be considered in evaluating the potential for cumulative impacts:

- Whether the resource is especially vulnerable to incremental effects
- Whether the Applicant's proposed action is one of several similar actions in the same geographic area
- Whether other activities in the area have similar effects on the resource
- Whether these effects have been historically significant for this resource
- Whether other analyses in the area have identified a cumulative effects concern

This section considers each type of "impact factor" that may affect listed species. The potential for significant cumulative impacts is evaluated by considering the project-specific impacts in combination with those of past, present, and reasonably foreseeable future projects. These projects include:

- Past and future renourishment projects for the USACE Fort Pierce Shore Protection Project north of the project area
- Bathtub Beach renourishment in Martin County, Florida
- Future renourishment activities of the same project area
- Past and future renourishment projects for the USACE Martin County Shoreline Protection Project
- M-5 Dredged Material Management Area (DMMA) Offloading and Crossroads Channel Maintenance Dredging Project
- Additional dredging of the borrow area for future sand needs
- Dredging of shoals located north of the proposed borrow area

The Applicant's proposed action, as well as past projects and any future actions, primarily impacts the beach, including turtle nesting and assemblage(s) of benthic macroinfaunal invertebrates, noise, and turbidity nearshore and at the borrow area(s) with respect to listed species. Local, short-term impacts of turbidity and sedimentation will occur adjacent to the beach fill sites and offshore borrow area during project construction. Potential long-term effects of sedimentation and turbidity are unknown (U.S. Army Corps of Engineers 2003). The project benefits would include continuance of the beach as an area suitable for shoreline protection, recreation, and wildlife habitat.

6.1. BEACH HABITAT

As discussed in **Section 5.0**, future renourishment activities in the same project area or at other beaches within St. Lucie or Martin Counties would result in similar impacts, primarily short-term and temporary. Sea turtles typically return to the same beach for nesting; therefore, cumulative impacts from other renourishment projects would not be expected. However, turtle nesting activities could be impacted, depending on how well the chemical and physical parameters of the borrow sand match the existing beach

material. Long-term impacts to the turtle nesting activities could include abnormal sex ratios if the sand fill differs from the natural beach in thermal characteristics. If the borrow materials used for beach renourishment projects closely matches the existing beach material as planned for all renourishment projects, the potential for significant cumulative impacts is low.

6.2. BENTHIC MACROFAUNA

The assemblage(s) of benthic macroinfaunal invertebrates buried during beach nourishment activities will remain unavailable to listed birds as a source of food until recolonization of the habitat; however, the recovery of these areas should occur within one to two seasons following the project, assuming the nourishment material is compatible with the natural beach sediments. Future renourishment activities in the same project area or at other beaches within St. Lucie or Martin Counties would result in additional areas with the short-term, temporary impact of unavailable food source; therefore, cumulative impacts would occur. However, the project area along with the planned Martin County Beach Restoration project is relatively small in comparison to the entire beach habitat within St. Lucie and Martin Counties, and the shorebirds can easily move to a different area in search of this food source. Therefore, potential for significant cumulative impacts is low.

6.3. NOISE

Noise from the Applicant's proposed action will create short term and temporary impacts to the beach area and the borrow site. As discussed above, most listed species will merely avoid the project area during construction. If future projects in southern St. Lucie and northern Martin Counties are conducted concurrently, the range of influence from noise, vessel traffic, turbidity, etc. could overlap; therefore, the potential for significant cumulative impacts would be greater, but still discountable, if the projects are constructed as designed.

6.4. TURBIDITY

Turbidity impacts from the Applicant's proposed action will be short term and temporary for both the nearshore area and the borrow site. As discussed above, most listed species will merely avoid the project area during construction due to noise. Because other identified projects likely will not occur simultaneously with the St. Lucie County South Beach and Dune Restoration Project, the potential for cumulative impacts is low. Should the St. Lucie South Beach and Dune Restoration Project occur simultaneously with the Martin County Shoreline Protection Project, construction would occur on a relatively long (eight mile) section of Hutchinson Island beach. In that case, the potential for significant cumulative impacts would be greater, Careful compliance with approved turbidity monitoring and management plans, and design of construction to minimize confluence of turbidity plumes could help maintain the otherwise low risk of significant cumulative impacts from turbidity.

6.5. NEARSHORE HARDBOTTOM HABITAT LOSS

Impacts to juvenile sea turtle species from the Applicant's proposed action due to the loss of developmental nearshore habitat will depend on the size and longevity of buried

nearshore hardbottom within the project area. It is expected that juvenile turtles will be displaced (i.e., prevented from utilizing these impacted areas) as long as macroalgae and seafloor structures are covered. If future projects in southern St. Lucie and northern Martin Counties were conducted concurrently, local habitat loss due to burial of hardbottom areas would increase if that adjacent project also included burial impacts.

To offset lost ecological functions from the burial of nearshore hardbottom, the County proposes to construct artificial reef(s) in comparable locations to those of the impacts. As described in the proposed Mitigation Plan (RAI #2 Attachment K St. Lucie County South County Beach & Dune Restoration Project Draft Mitigation Plan submitted to FDEP July 8, 2010), mitigation reef(s) will be constructed before 31 December 2016 and will be low to medium relief to mimic the structure of the impacted hardbottom community types.

7. CONCLUSIONS

The Applicant's proposed action, entitled the St. Lucie County South Beach and Dune Restoration Project, St. Lucie County, Florida, entails placement of approximately 550,000 yd^3 of sand over about 3.4 mi of shoreline in St. Lucie County in an effort to partially restore local beach and dune habitats. The sand source for the project is the nearshore end of an offshore ridge of beach-compatible sand, 3 to 6 mi offshore in water depths of approximately 36 to 43 ft. Sand from the borrow area will be excavated and transferred to the beach by a hopper dredge with pump-out capabilities. Beach construction will proceed as fill is offloaded from the dredge onto project area beaches.

Within the project area, 16 listed species or species of concern, comprising four mammals, seven birds, and five reptiles are likely to occur. Potential IPFs from Applicant's proposed action to these species include temporary increases of nearshore turbidity, coastal and underwater noise, increases in vessel traffic, disturbance of and activities on sandy beaches within the dredge fill placement area, the temporary loss of intertidal and subtidal benthic macroinfaunal invertebrates within the dredge placement area, the permanent loss of exposed nearshore hardbottom habitats within the dredge fill placement area, and hopper dredge operation. Anticipated impacts to listed species within the project area resulting from the Applicant's proposed action are generally expected to be temporary and of relatively short duration and will result in the temporary avoidance or displacement of these species.

Nearshore hardbottom habitats adjacent to the project area provide developmental habitat for juvenile sea turtles, particularly green, hawksbill, and loggerhead turtles. The anticipated permanent loss of approximately 0.57 acres of nearshore hardbottom habitat offshore the project area (beach) will reduce the local area of this habitat to these species. The Applicant's proposed action will result in the temporary commitment of nearshore hardbottom areas as locations for placement of beach sand, which is a temporary loss of habitat use during project construction. Burial of nearshore hardbottom would result in a local reduction of macroalgae and invertebrates that could significantly change the nearshore food web. Loss of macroalgae would be more severe in summer due to the presence of annual species. Re-exposure of hardbottom is possible due to the high-energy dynamics of the area and equilibration of beach fill. Recolonization of re-exposed hard substrate by worm rock and turf and macroalgae is likely as these organisms have high recruitment capabilities. Potential impacts by burial are considered minor.

In addition to the direct impacts on epibiota, burial of nearshore hardbottom areas will result in an incremental loss of Essential Fish Habitat for reef-associated fishes as well as developmental habitat for juvenile sea turtles. These animals will be prevented from using the buried hardbottom habitat as long as macroalgae and seafloor structures are covered. However, the area to be buried is a small percentage of the total habitat area available for use and, therefore, the impact is considered minor; while it may affect the species using this habitat this impact is not likely to adversely affect them or the habitat.

Due to the configuration of nearshore hardbottom habitat in the area, some level of impact to these areas is unavoidable for a beach nourishment project. The project design intends to maintain the requisite level of shore protection while avoiding and minimizing impacts to the hardbottom habitat to the extent practicable. Construction of artificial reef habitat will mitigate for unavoidable impacts to hardbottom habitat.

To offset lost ecological functions from the burial of nearshore hardbottom, the county proposes to construct artificial reef(s) in comparable locations. As described in the proposed Mitigation Plan (RAI #2 Attachment K St. Lucie County South County Beach & Dune Restoration Project Draft Mitigation Plan submitted to FDEP July 8, 2010), mitigation reef(s) construction will occur before 31 December 2016 and will comprise low to medium relief hard substrate to mimic the structure of the impacted hardbottom community types.

Overall, potential impacts from the Applicant's proposed action may affect but are not likely to adversely affect the status of listed species likely to occur within the project area. These impacts will result in temporary avoidance behavior and displacement of individuals within the project area. Added sand on project beaches may increase available sea turtle nesting habitat if added fill is suitable in terms of sand grain size and color. Permanent nearshore hardbottom habitat loss, however, will remove the availability part of this important developmental habitat to local sea turtles. Proposed mitigation, if successful, will replace the impacted habitat.

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