United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

April 26, 2010

Colonel Alfred A. Pantano, Jr.
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Federal Activity Code:	41420-2008-FA-0425
Corps Application No:	SAJ-1997-5200 (IP-MJD)
Date Received:	July 13, 2009
Formal Consultation Initiation Date:	December 3, 2009
Project:	Sand Placement
Applicant:	Charlotte County Board of County Commissioners
County:	Charlotte

Dear Colonel Pantano:

The U.S. Fish and Wildlife Service (Service) has reviewed the July 9, 2009, request from the U.S. Army Corps of Engineers (Corps) to reinitiate formal consultation concerning the sand placement project on Manasota Key, and Knight and Don Pedro Islands, Charlotte County, Florida. In regard to the original project, the Corps in a letter dated March 6, 2002, determined the proposed action "may affect" nesting sea turtles. The Service concurred with the Corps' determination and on November 15, 2002, completed a Biological Opinion that provided an incidental take statement for the threatened loggerhead sea turtle (*Caretta caretta*), endangered green sea turtle (*Chelonia mydas*), endangered leatherback sea turtle (*Dermochelys coriacea*), endangered hawksbill sea turtle (*Eretmochelys imbricata*), and endangered Kemp's ridley sea turtle (*Lepidochelys kempii*). Because the November 15, 2002, Service Biological Opinion was written for a one-time sand placement event, reasonable and prudent measures have changed over the past 8 years, the Biological Opinion was amended on February 20, 2003, March 23, 2005, and March 29, 2006, and the sand fill template has been expanded, it was the Service's decision to develop a new biological opinion to encompass the current proposed sand placement event. This document is provided in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq*.).

In the March 6, 2002, letter, the Corps also determined the proposed action "is not likely to adversely affect" the West Indian manatee (*Trichechus manatus*). In order to protect the West Indian manatee, the Corps agreed to ensure specific construction safety precautions were implemented as outlined in the *Standard Manatee Conditions for In-Water Work* (Florida Fish and Wildlife Conservation Commission [FWC] 2009a). By letter dated October 2, 2002, the Service concurred with the Corps' determination for the West Indian manatee, and no further consultation on this species was necessary.

In the March 6, 2002, letter, the Corps also determined the proposed action "may affect" federally-listed shorebirds. Information provided by Charlotte County and by the Service's Geographic Information System database in 2002, did not indicate the presence of federally-listed shorebirds, or their critical habitat within the project area. Thus, in a letter dated October 2, 2002, the Service indicated federally-listed shorebirds were not known to use the project area, and therefore, consultation was not necessary. Nevertheless, nesting season listed species surveys conducted by Charlotte County Environmental and Extension Services from February 1 to August 31, 2008, recorded threatened roseate terns (*Sterna dougallii dougallii*) in and adjacent to the project area; however, no nesting was observed within the survey area including the project area. In addition, threatened piping plovers (*Charadrius melodus*) were observed feeding, flying, and resting in and adjacent to the project area. In view of the limited (non-nesting) use of the project area, and implementation of The Charlotte County Board of County Commissioners' (Applicant), FWC, and DEP approved Shorebird Monitoring Plan discussed further in this document, and the possibility the project may result in additional foraging and loafing habitat available to piping plovers and other shorebirds, the Service concurs with the Corps' determination of March 6, 2002, and therefore, further consultation of shorebirds is not warranted.

This biological opinion is based on information provided in the Corps' letter dated July 9, 2009, and correspondence with the Corps, National Marine Fisheries Service (NOAA Fisheries), Florida Department of Environmental Protection (DEP), FWC, and Coastal Technology Corporation (Consultant). A complete administrative record of this consultation is on file at the South Florida Ecological Services Office, Vero Beach, Florida.

FISH AND WILDLIFE RESOURCES

This section is provided in accordance with the Fish and Wildlife Coordination Act of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*) to address other fish and wildlife resources in the project area.

Black skimmer

The black skimmer (*Rhynchops niger*) is the only skimmer representative of the family Laridae in America. The bill of the black skimmer is what makes it distinctive from all other American birds. The large red and black bill consists of a lower mandible which is considerably longer than the upper. The black skimmer feeds by slicing the water's surface with the lower mandible, with the goal of catching small fishes. Black skimmers are of moderate size (16 to 20 inches) that inhabit primarily coastal sand beaches and lagoons. During the breeding season, the black skimmer occurs along the Atlantic coast from Massachusetts and New York southward to southern Mexico. It winters from North Carolina southward to South America. The black skimmer is listed as a State Species of Special Concern and is protected under the Migratory Bird Treaty Act (MBTA) (40 Stat. 755; 16 U.S.C. 701 *et seq.*). Black skimmers were observed in and adjacent to the project area during the nesting season listed species survey conducted by Charlotte County Environmental and Extension Services from February 1 to August 31, 2008. Nesting was observed within the survey area, which includes the project area.

American oystercatcher

The American oystercatcher (*Haematopus palliatus*) is a large shorebird with a distinctive long, knife-shaped orange bill which is specialized for prying open bivalve mollusks. Foraging occurs on oyster bars, intertidal mud flats, and sandbars. The American oystercatcher breeds from Massachusetts to Florida, nesting in coastal habitats with little vegetative cover such as sandy beaches, shell mounds, and spoil islands. The American oystercatcher is listed as a Species of Special Concern and is protected under the MBTA. American oystercatchers were observed in and adjacent to the project area during the nesting season listed species survey conducted by Charlotte County Environmental and Extension Services from February 1 to August 31, 2008. No nesting was observed within the survey area including the project area.

Wilson's plover

Wilson's plovers (*Charadrius wilsonia*) are small shorebirds that inhabit coastal areas including sandy beaches, tidal flats, and lagoons. During the breeding season, the Wilson's plover occurs in eastern and southern coastal areas of the United States. It winters from southern coastal Florida south to northern South America, usually along the Atlantic and Gulf coasts. Although not federally or state listed, it is protected under the MBTA. Wilson's plovers were observed in areas adjacent to the project area during the nesting season listed species survey conducted by Charlotte County Environmental and Extension Services from February 1 to August 31, 2008. Nesting of this species was observed within the survey area, which includes the project area.

Snowy plover

The snowy plover (*Charadrius alexandrinus*) is a small shorebird, about 6 inches long, with a thin dark bill, pale brown to gray upper parts, white or buff colored belly, dark patches on its shoulders and head, and a white forehead and supercilium (eyebrow line). Snowy plovers are listed as threatened by the state of Florida (Gruver 2009) and are protected under the MBTA. In Florida, snowy plovers nest in shallow open scrapes on large sandy beaches between April and July, where the beach and nearby estuarine and marine habitats provide insects, crustaceans, and other invertebrates as prey.

Snowy plovers were observed in areas adjacent to the project area during the nesting season listed species survey conducted by Charlotte County Environmental and Extension Services from February 1 to August 31, 2008. Nesting of this species was observed within the survey area, which includes the project area.

Least tern

Least terns (*Sterna antillarum*) are small, black-capped shorebirds that select nesting sites with a substrate composed of sand or gravel with fragments of shell. Least terns are listed as threatened by the state of Florida (Gruver 2009) and are protected under the MBTA. Least terns nest primarily along the coast in Florida, where beaches and gravel roofs provide nest sites, and where nearby estuarine and marine waters supply small fish as prey.

Least terns were observed in and adjacent to the project area during the nesting season listed species survey conducted by Charlotte County Environmental and Extension Services from February 1 to August 31, 2008. Nesting was observed within the survey area, which includes the project area.

Shorebird Protection Plan

Given that project construction and future sand placement maintenance activities may take place after the start of the shorebird nesting season (February 1), the Applicant has developed a shorebird management plan that establishes avoidance and minimization measures with regard to nesting, feeding, and roosting shorebirds. The following protocol will be implemented prior to and during construction activities:

1. A shorebird survey shall be conducted once a day by trained, dedicated individuals using accepted, appropriate ecological survey procedures as outlined below:

   a. Daily surveys shall begin two weeks prior to any construction activity, and continue throughout the construction period at the work sites for dredging the spit (south end of Manasota Key), fill placement on the north beach fill area of Knight Island, or creation of the Stump Pass Beach State Park Shorebird Habitat Mitigation Area.
   b. Daily summaries of shorebird abundance, location of the birds and their activity (*e.g.*, foraging, resting, nesting, courtship behavior), and summaries of nests observed including the number of eggs and fledglings, shall be provided on the next business day on the approved report form.
   c. The shorebird monitor shall communicate the results of their survey to the contractor daily.

2. Travel corridors shall be established within the action area. Such corridors should avoid known historical nesting sites to the maximum extent practicable, and be marked with signs clearly delineating the construction corridor from the nesting site. The shorebird monitor shall work closely with the Applicant and contractor to mark the appropriate corridors.

3. Buffer zones shall be established within the action area where shorebirds have been observed in courtship or nesting behavior, or around concentrations of resting birds or winter migrants. These buffer zones shall be established by the Applicant and shorebird monitors, and posted and maintained with clearly marked signs prior to or after commencement of construction as required below. The Applicant shall provide the stakes and signs. The contractor is responsible for no construction activities or stockpiling of equipment within the buffer zones. Heavy equipment may transit past the nesting areas in approved travel corridors outside the buffer zones; however, other activities such as stopping or turning, shall be restricted within the line-of-sight of the nesting site as follows.

   a. Tangential (longshore or parallel) movement of heavy equipment and other vehicles may occur no closer than 49 feet of an active colony site. Vehicles must move slowly (less than or equal to 5 mph) and may not stop, turn, or conduct other activities. If birds appear agitated or disturbed, the buffer zone shall be increased.

b. Other tangential vehicle activities may occur no closer than 164 feet of an active colony site. If birds appear agitated or disturbed, the buffer zone shall be increased.
c. Except for within travel corridors established pursuant to number three stated above, foot traffic may occur no closer than 164 feet of an active colony site. If birds appear agitated or disturbed, the buffer shall be increased.
d. Direct approach of vehicles and heavy equipment towards the colony should be restricted within 262 feet of an active colony site. If birds appear agitated or disturbed, the buffer zone shall be increased.
e. Site-specific buffer zones may be implemented upon approval by FWC, including around any new nests constructed after the establishment of the above referenced buffer zones or around resting sites or wintering migrants.

4. The Applicant will continue to monitor and report escarpments in accordance with the current DEP permit restrictions. Escarpment reports will be provided to both FWC and the Service whom will determine if any action is warranted.

5. Because the contractor is required to till the shoreline prior to demobilization, the Applicant will rope off any shorebird or sea turtle nests which will be avoided during tilling activities.

In addition, the Applicant will conduct monitoring as outlined above, on a weekly basis for the remainder of shorebird nesting season postconstruction. If shorebird nesting occurs within the action area, a bulletin board will be placed and maintained in the construction area with the location map of the construction site showing the bird nesting areas and a warning, clearly visible, stating "BIRD NESTING AREAS ARE PROTECTED BY THE FLORIDA THREATENED AND ENDANGERED SPECIES ACT AND THE FEDERAL MIGRATORY BIRD ACT."

The Applicant will also create approximately 4 acres of shorebird habitat with buffer zones (Figure 1) as mitigation for previous losses. The location for the created shorebird habitat is within the area where the former severed spit attached to Knight-Palm Island near DEP reference monument R-25, and is immediately adjacent to documented successful nesting areas from 2007 through 2009 on the spit. Future maintenance will include vegetation control via tilling or scraping as required by the approved Shorebird Protection Plan with the original permit. An approximate 50-foot buffer zone will be provided between the Gulf of Mexico and the shorebird habitat.

Hardbottom Reef Habitat and Seagrasses

On March 27, 2003, in concert with the initial permitted dredge event, underwater field surveys were conducted by DEP Aquatic Preserve staff and a consultant in the delineated project area to determine the presence or absence of submerged aquatic vegetation and, if present, to collect qualitative measurements on the located seagrass communities. The surveys identified no significant presence of seagrasses in the project area; however, seagrasses were present approximately 1,100 feet east of the borrow area. Seagrasses were documented in this area during previous surveys in conjunction with the last sand placement project completed in 2006. Pre and post 2006 construction seagrass surveys confirmed no adverse impacts to seagrasses.

The Applicant will continue to implement the Charlotte County Erosion Control Project seagrass and physical monitoring plans finalized in coordination with DEP on March 28, 2003. The seagrass monitoring plan will determine if changes in seagrass beds are natural or project related (*e.g.*, sedimentation, turbidity impacts), and if project related, a contingency mitigation plan will be developed. The physical monitoring plan will summarize the project construction and post construction history, shoreline position and volumetric changes, project performance compared to expected performance, and identification of any adverse impacts associated with the project.

Historical surveys of the Stump Pass inlet provided indications that no nearshore hardbottom was present. A survey for hardbottom reef habitat was conducted in the nearshore sand placement area in 1999 and 2000 as part of the Inlet Management Study in order to verify the historical information, which utilized diver observations and integrated video mapping. No hard bottom communities (*e.g.*, hard coral, rock outcropping, oysters) were observed within the area of the proposed dredge and fill activites, and pipeline/access corridors. Substrate within the project area is primarily composed of sand. Therefore, impacts to hardbottom reef habitat are not anticipated.

We recommend the Corps consult with the NOAA Fisheries concerning potential impacts to nearshore hardbottom reef habitat and seagrasses adjacent to the sand placement fill template and the shoreline downdrift and updrift areas.

CONSULTATION HISTORY

On July 13, 2009, the Service received the Corps' letter dated July 9, 2009, and supplemental documents.

On July 27, 2009, the Service emailed the Corps a request for additional information.

On August 26, 2009, the Service received a response to the request for additional information from the Consultant.

On September 29, 2009, the Service emailed the Corps a second request for additional information.

On October 26, 2009, the Service received a response to the second request for additional information from the Consultant.

On November 16, 2009, the Service emailed the Corps a third request for additional information.

On December 1, 2009, the Service received a response to the third request for additional information from the Consultant.

On December 3, 2009, the Service emailed the Corps that review of the project was complete, formal consultation initiated, and that the Service's biological opinion was scheduled to be completed by April 15, 2010.

On March 15, 2010, the Service received a letter from the Corps dated March 10, 2010, requesting that the northern limits of the sand placement fill template be extended approximately 1,000 feet from DEP reference monument R-18 to R-20.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Applicant proposes to place beach compatible sand on approximately 3.5 miles of shoreline along Manasota Key, and Knight and Don Pedro Islands, Charlotte County, Florida (Figure 2). The project area consists of the fill template which extends between DEP reference monuments R-14.4 and R-20, approximately 1,000 feet northeast of R-22 to R-23, and R-29 to R-39 (Figure 3). The proposed project involves the placement of approximately 332,400 cubic yards (cy) within the fill template. The proposed design berm template elevation for the north (inside Stump Pass on Knight Island) and south beach areas (Knight Island, Don Pedro Island) is +3.9 feet North American Veritical Datum (NAVD) with a 1:100 slope. The beach fill toe of slope is 1:15 with a dune crest width of 20 feet and slope of 1:5. The proposed design berm elevation for Manasota Key is +5.9 feet NAVD with a 1:100 slope. The beach fill toe of slope is 1:15 with a dune crest width of 20 feet and slope of 1:5. The proposed design berm template elevation between DEP reference monument R-18 and R-20 is reduced slightly to +5.0 feet NAVD with a slope of 1:100. The intent of the project is to renourish the shoreline, provide erosion control, maintain the navigational channel, and provide advanced shoreline mitigation adjacent to the Stump Pass Beach State Park (between DEP reference monument R-18 and R-20) required by DEP.

Using a hydraulic dredge, approximately 332,400 cy of beach compatible sand will be obtained from an authorized borrow area located within Stump Pass (Figure 3). The sand must be approved by DEP and meet all requirements as outlined in the Florida Administrative Code subsection 62B-41.007. The dredging template consists of the primary borrow area designated by Stations 0+00 through 42+00 and has a design dredge depth of -12.1 NAVD from stations 0+00 to 34+00 and -10.1 NAVD, between stations 35+00 to 42+00. Both regions have a 2-foot overdredge allowance. The dredge area will exclude all seagrass beds, as well as a minimum 200-foot buffer around all existing seagrass beds.

Dredge material will be hydraulically dredged and pumped through a submerged pipeline and discharged within the fill template. The maximum pumping distance will be approximately 12,000 feet and three pipeline corridors will be selected to avoid impacts to dune vegetation. Once discharged within the fill template, the sand will be graded to the permitted design fill template using a bulldozer.

There are three possible beach corridors, all of which have been previously used in either the 2003 or 2006 projects, or both. One corridor occurs within the boundaries of Stump Pass Beach State Park, through an existing unvegetated break in the dunes between DEP reference monuments R-15 and R-26. In addition, two lots previously used as beach corridors for the 2003 and 2006 projects between DEP reference monuments R-31 and R-32, and R-35 and R-36 are proposed for this project. Both of these corridors contain dune vegetation, and the contractor will be required to replant with native dune plants after construction is complete. All of these corridors currently exist and minimal impact to upland habitat is expected.

Dredging and sand placement are scheduled to commence as soon as all regulatory authorizations are in place. The Applicant anticipates that the project will commence in May 2010, and take approximately four months to complete. Dredging and sand placement activities will take place on a 24 hour per day, 7 days per week schedule. Depending on the project commencement date, dredging and sand placement activities may take place during sea turtle nesting season.

The action area is defined as all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action. The Service identifies the action area to include the nearshore borrow area (approximately 42.9 acres), the sand placement fill template (approximately 3.5 miles), all three beach access corridors, and the area of inlet influence defined as 9,900 feet north and 17,100 feet south of Stump Pass which correspond to DEP reference monuments R-12 to R-39. The project is located along the Gulf of Mexico and Stump Pass, Manasota Key, Knight Island, and Don Pedro Island, Charlotte County, Florida at latitude 26.8954 and longitude -82.3422.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

Loggerhead Sea Turtle

The loggerhead sea turtle, listed as a threatened species on July 28, 1978 (43 FR 32800), inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Loggerhead sea turtles nest within the continental United States (U.S.) from Louisiana to Virginia. Major nesting concentrations in the U.S. are found on the coastal islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf coasts of Florida (Hopkins and Richardson 1984).

No critical habitat has been designated for the loggerhead sea turtle.

Green Sea Turtle

The green sea turtle was federally listed on July 28, 1978 (43 FR 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. The green turtle has a worldwide distribution in tropical and subtropical waters. Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Suriname. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NOAA Fisheries and Service 1991a). Nesting has also been documented along the Gulf coast of Florida on Santa Rosa Island (Okaloosa and Escambia Counties) and from Pinellas County through Collier County. Green turtles have been known to nest in Georgia, but only on rare occasions, and sporadically in North Carolina and South Carolina. Unconfirmed nesting of green turtles in Alabama has also been reported.

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys (63 FR 46693).

Leatherback Sea Turtle

The leatherback sea turtle, listed as an endangered species on June 2, 1970 (35 FR 8491), nests on shores of the Atlantic, Pacific and Indian Oceans. Nonbreeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Nesting grounds are distributed worldwide, with the Pacific Coast of Mexico supporting the world's largest known concentration of nesting leatherbacks in the Pacific. The largest nesting colony in the wider Caribbean region is found in French Guiana, but nesting occurs frequently, although in lesser numbers, from Costa Rica to Columbia and in Guyana, Suriname, and Trinidad (National Research Council 1990; NOAA Fisheries and Service 1992).

The leatherback regularly nests in the U.S. in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia (NOAA Fisheries and Service 1992). Leatherback turtles have been known to nest in Georgia, South Carolina, and North Carolina, but only on rare occasions. Leatherback nesting has also been reported on the northwest coast of Florida (LeBuff 1990); a false crawl (nonnesting emergence) has been observed on Sanibel Island (LeBuff 1990).

Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands (44 FR 17710).

Hawksbill Sea Turtle

The hawksbill sea turtle was listed as an endangered species on June 2, 1970 (35 FR 8491). The hawksbill is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean. Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Miami-Dade Counties) and the Florida Keys (Monroe County) (Meylan 1992; Meylan et al. 1995). However, hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors. Therefore, surveys in Florida likely underestimate actual hawksbill nesting numbers (Meylan et al. 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NOAA Fisheries and Service 1993).

Critical habitat for the hawksbill sea turtle has been designated for selected beaches or waters of Mona, Monito, Culebrita, and Culebra Islands, Puerto Rico (63 FR 46693).

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was listed as endangered on December 2, 1970 (35 FR 18320). The range of the Kemp's ridley includes the Gulf of Mexico coasts of Mexico and the U.S., and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland. Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a very small number of Kemp's ridleys nest consistently along the Texas coast (Turtle Expert Working Group 1998). In addition, rare nesting events have been reported in Florida, Alabama, South Carolina, and North Carolina. Outside of nesting, adult Kemp's ridleys are believed to spend most of their time in the Gulf of Mexico, while juveniles and subadults also regularly occur along the eastern seaboard of the U.S. (Service and NOAA Fisheries 1992).

No critical habitat has been designated for the Kemp's ridley sea turtle.

Life history

Loggerhead Sea Turtle

Loggerheads are known to nest from one to seven times within a nesting season (Talbert et al. 1980; Lenarz et al. 1981; Richardson and Richardson 1982); the mean is approximately 4.1 (Murphy and Hopkins 1984). The interval between nesting events within a season varies around a mean of about 14 days (Dodd 1988). Mean clutch size varies from about 100 to 126 eggs along the southeastern U.S. coast (NOAA Fisheries and Service 1991b). Incubation ranges from about 45 to 95 days. Nesting migration intervals of 2 to 3 years are most common in loggerheads, but the number can vary from 1 to 7 years (Dodd 1988). Age at sexual maturity is believed to be about 20 to 30 years (Turtle Expert Working Group 1998).

Green Sea Turtle

Green turtles deposit from one to nine clutches within a nesting season, but the overall average is 3.3. The mean interval between nesting events within a season is 13 days (Hirth 1997). Mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Incubation ranges from about 45 to 75 days. Only occasionally do females produce clutches in successive years. Usually 2 or more years intervene between breeding seasons (NOAA Fisheries and Service 1991a). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Leatherback Sea Turtle

Leatherbacks nest five to seven times within a nesting season, with an observed maximum of 11 (NOAA Fisheries and Service 1992). The interval between nesting events within a season is about 10 days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Incubation ranges from about 55 to 75 days. Nesting migration intervals of 2 to 3 years were observed in leatherbacks nesting on Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in 6 to 10 years (Zug and Parham 1996).

Hawksbill Sea Turtle

Hawksbills nest on average four and one half times per season at intervals of approximately 14 days (Corliss et al. 1989). In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (NOAA Fisheries and Service 1993). Incubation lasts for about 60 days. On the basis of limited information, nesting migration intervals of 2 to 3 years appear to predominate. Hawksbills are recruited into the reef environment at about 14 inches in length and are believed to begin breeding about 30 years later. The time required to reach 14 inches in length however, is unknown, and growth rates vary geographically. As a result, actual age at sexual maturity is not known.

Kemp's Ridley Sea Turtle

Nesting occurs from April into July during which time the turtles appear off the Tamaulipas and Veracruz coasts of Mexico. Precipitated by strong winds, the females swarm to mass nesting emergences, known as *arribadas* or *arribazones*, to nest during daylight hours. Clutch size averages 100 eggs (Service and NOAA Fisheries 1992). The incubation period ranges from 45 to 70 days. Hatchlings, after leaving the nesting beach, are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 8 inches in length, at which size they enter coastal shallow water habitats (Ogren 1989). Some females breed annually and nest an average of one to four times in a season at intervals of 10 to 28 days. Age at sexual maturity is believed to be between 7 to 15 years (Turtle Expert Working Group 1998).

Population dynamics

Loggerhead Sea Turtle

The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. However, the majority of loggerhead nesting is at the western regions of the Atlantic and Indian Oceans. The most recent reviews show that only two loggerhead nesting beaches (South Florida [U.S.] and Masirah [Oman]) have greater than 10,000 females nesting per year (Baldwin et al. 2003; Ehrhart et al. 2003; Kamezaki et al. 2003; Limpus and Limpus 2003; Margaritoulis et al. 2003). Beaches with 1,000 to 9,999 females nesting each year are Georgia through North Carolina (U.S.), Quintana Roo and Yucatán (Mexico), Cape Verde Islands (Cape Verde, eastern Atlantic off Africa), and Western Australia (Australia). Smaller nesting aggregations with 100 to 999 nesting females annually occur in the Northern Gulf of Mexico (U.S.), Dry Tortugas (U.S.), Cay Sal Bank (Bahamas), Sergipe and Northern Bahia (Brazil), Southern Bahia to Rio de Janerio (Brazil), Tongaland (South Africa), Mozambique, Arabian Sea Coast (Oman), Halaniyat Islands (Oman), Cyprus, Peloponnesus (Greece), Island of Zakynthos (Greece), Turkey, Queensland (Australia), and Japan.

The loggerhead is commonly found throughout the North Atlantic including the Gulf of Mexico, the northern Caribbean, the Bahamas archipelago, and eastward to West Africa, the western Mediterranean, and the west coast of Europe.

The major nesting concentrations in the U.S. are found in South Florida; however, loggerheads nest from Texas to Virginia. Total estimated nesting in the U.S. has fluctuated between 47,000 and 90,000 nests per year over the last decade (FWC, unpublished data; Georgia and South Carolina Department of Natural Resources, unpublished data; North Carolina Wildlife Resources Commission, unpublished data). About 80 percent of loggerhead nesting in the southeast U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties). Adult loggerheads are known to make considerable migrations between foraging areas and nesting beaches (Schroeder et al. 2003; Foley et al. 2008). During nonnesting years, adult females from U.S. beaches are distributed in waters off the eastern U.S. and throughout the Gulf of Mexico, Bahamas, Greater Antilles, and Yucatán.

From a global perspective, the U.S. nesting aggregation is of paramount importance to the survival of the species as is the population that nests on islands in the Arabian Sea off Oman (Ross 1982; Ehrhart 1989). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interaction on foraging grounds and migration routes. The loggerhead nesting aggregations in Oman and the U.S. account for the majority of nesting worldwide.

Green Sea Turtle

About 150 to 2,750 females are estimated to nest on beaches in the continental U.S. annually. In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year (NOAA Fisheries and Service 1998a). Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting group in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season (Limpus et al. 1993). In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

A dramatic drop in nesting numbers has been recorded on major nesting beaches in the Pacific. Spotila et al. (2000) have highlighted the dramatic decline and possible extirpation of leatherbacks in the Pacific.

The East Pacific and Malaysia leatherback populations have collapsed. Spotila et al. (1996) estimated that only 34,500 females nested annually worldwide in 1995, which is a dramatic decline from the 115,000 estimated in 1980 (Pritchard 1982). In the eastern Pacific, the major nesting beaches occur in Costa Rica and Mexico. At Playa Grande, Costa Rica, considered the most important nesting beach in the eastern Pacific, numbers have dropped from 1,367 leatherbacks in 1988-1989 to an average of 188 females nesting between 2000-2001 and 2003-2004. In Pacific Mexico, 1982 aerial surveys of adult female leatherbacks indicated this area had become the most important leatherback nesting beach in the world. Tens of thousands of nests were laid on the beaches in the 1980s, but during the 2003-2004 seasons a total of 120 nests were recorded. In the western Pacific, the major nesting beaches lie in Papua New Guinea, Papua, Indonesia, and the Solomon Islands. These are some of the last remaining significant nesting assemblages in the Pacific. Compiled nesting data estimated approximately 5,000 to 9,200 nests annually with 75 percent of the nests being laid in Papua, Indonesia.

However, the most recent population size estimate for the North Atlantic alone is a range of 34,000 to 94,000 adult leatherbacks (Turtle Expert Working Group 2007). In Florida, an annual increase in number of leatherback nests at the core set of index beaches ranged from 27 to 498 between 1989 and 2008. Under the Core Index Nesting Beach Survey (INBS) program, 198.8 miles of nesting beach have been divided into zones, know as core index zones, averaging 0.5 mile in length. Annually, between 1989 and 2008, these core index zones were monitored daily during the 109-day sea turtle index nesting season (May 15 to August 31). On all index beaches, researchers recorded nests and nesting attempts by species, nest location, and date.

Nesting in the Southern Caribbean occurs in the Guianas (Guyana, Suriname, and French Guiana), Trinidad, Dominica, and Venezuela. The largest nesting populations at present occur in the western Atlantic in French Guiana with nesting varying between a low of 5,029 nests in 1967 to a high of 63,294 nests in 2005, which represents a 92 percent increase since 1967 (Turtle Expert Working Group 2007). Trinidad supports an estimated 6,000 nesting leatherbacks annually, which represents more than 80 percent of the nesting in the insular Caribbean Sea. Leatherback nesting along the Caribbean Central American coast takes place between Honduras and Colombia. In Atlantic Costa Rica, at Tortuguero, the number of nests laid annually between 1995 and 2006 was estimated to range from 199 to 1,623. Modeling of the Atlantic Costa Rica data indicated that the nesting population has decreased by 67.8 percent over this time period.

In Puerto Rico, the main nesting areas are at Fajardo on the main island of Puerto Rico and on the island of Culebra. Between 1978 and 2005, nesting increased in Puerto Rico with a minimum of 9 nests recorded in 1978 and a minimum of 469 to 882 nests recorded each year between 2000 and 2005. Recorded leatherback nesting on the Sandy Point National Wildlife Refuge on the island of St. Croix, U.S. Virgin Islands between 1990 and 2005, ranged from a low of 143 in 1990 to a high of 1,008 in 2001. In the British Virgin Islands, annual nest numbers have increased in Tortola from 0 to 6 nests per year in the late 1980s to 35 to 65 nests per year in the 2000s.

The most important nesting beach for leatherbacks in the eastern Atlantic lies in Gabon, Africa. It was estimated there were 30,000 nests along 60 miles of Mayumba Beach in southern Gabon during the 1999-2000 nesting season. Some nesting has been reported in Mauritania, Senegal, the Bijagos Archipelago of Guinea-Bissau, Turtle Islands and Sherbro Island of Sierra Leone, Liberia, Togo, Benin, Nigeria, Cameroon, Sao Tome and Principe, continental Equatorial Guinea, Islands of Corisco in the Gulf of Guinea and the Democratic Republic of the Congo, and Angola. In addition, a large nesting population is found on the island of Bioko (Equatorial Guinea).

Hawksbill Sea Turtle

About 15,000 females are estimated to nest each year throughout the world with the Caribbean accounting for 20 to 30 percent of the world's hawksbill population. Only five regional populations remain with more than 1,000 females nesting annually (Seychelles, Mexico, Indonesia, and two in Australia) (Meylan and Donnelly 1999). Mexico is now the most important region for hawksbills in the Caribbean with about 3,000 nests per year (Meylan 1999). Other significant but smaller populations in the Caribbean still occur in Martinique, Jamaica, Guatemala, Nicaragua, Grenada, Dominican Republic, Turks and Caicos Islands, Cuba, Puerto

Rico, and U.S. Virgin Islands. In the U.S. Caribbean, about 150 to 500 nests per year are laid on Mona Island, Puerto Rico and 70 to 130 nests per year are laid on Buck Island Reef National Monument, U.S. Virgin Islands. In the U.S. Pacific, hawksbills nest only on main island beaches in Hawaii, primarily along the east coast of the island of Hawaii. Hawksbill nesting has also been documented in American Samoa and Guam (NOAA Fisheries and Service 1998b).

Kemp's Ridley Sea Turtle

Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a small number of Kemp's ridleys nest consistently along the Texas coast (Turtle Expert Working Group 1998). In addition, rare nesting events have been reported in Alabama, Florida, Georgia, South Carolina, and North Carolina. Historical information indicates tens of thousands of Kemp's ridleys nested near Rancho Nuevo, Mexico, during the late 1940s (Hildebrand 1963). The Kemp's ridley population experienced a devastating decline between the late 1940s and the mid 1980s. The total number of nests per nesting season at Rancho Nuevo remained below 1,000 throughout the 1980s, but gradually began to increase in the 1990s. In 2007, 11,268 nests were documented along the 18.6 miles of coastline patrolled at Rancho Nuevo, and the total number of nests documented for all the monitored beaches in Mexico was 15,032 (Service 2007). During the 2007 nesting season, an arribada with an estimated 5,000 turtles was recorded at Rancho Nuevo from May 20 to May 23. In addition, 128 nests were recorded during 2007 in the U.S., primarily in Texas.

Status and distribution

Loggerhead Sea Turtle

Genetic research involving analysis of mitochondrial DNA has identified five different loggerhead subpopulations per nesting aggregations in the western North Atlantic: (1) the Northern Subpopulation occurring from North Carolina to around Cape Canaveral, Florida (about 29° N.); (2) South Florida Subpopulation occurring from about 29° N. on Florida's east coast to Sarasota on Florida's west coast; (3) Dry Tortugas, Florida, Subpopulation, (4) Northwest Florida Subpopulation occurring at Eglin Air Force Base and the beaches near Panama City; and (5) Yucatán Subpopulation occurring on the eastern Yucatán Peninsula, Mexico (Bowen et al. 1993; Bowen 1994, 1995; Encalada et al. 1998; Pearce 2001). These data indicate gene flow between the five regions is very low. If nesting females are extirpated from one of these regions, regional dispersal will not be sufficient to replenish the depleted nesting subpopulation. The Northern Subpopulation has declined substantially since the early 1970s. Recent estimates of loggerhead nesting trends from daily beach surveys showed a significant decline of 1.3 percent annually for the period 1989 to 2008 (NOAA Fisheries and Service 2008). Nest totals from aerial surveys conducted by the South Carolina Department of Natural Resources showed a 3.3 percent annual decline in nesting since 1980 (NOAA Fisheries and Service 2008). Overall, there is strong statistical evidence to suggest the Northern Subpopulation has sustained a long-term decline.

Data from all beaches where nesting activity has been recorded indicate the South Florida Subpopulation has shown significant increases over the last 25 years. However, an analysis of nesting data from the Florida INBS Program from 1989 to 2002, a period encompassing index surveys that are more consistent and more accurate than surveys in previous years, has shown no detectable trend and, more recently (1998 through 2008), has shown evidence of a declining trend. Given inherent annual fluctuations in nesting and the short time period over which the decline has been noted, caution is warranted in interpreting the decrease in terms of nesting trends.

A near complete census of the Florida Panhandle Subpopulation undertaken from 1989 to 2007, revealed a mean of 64,513 nests per year, which represents approximately 15,735 females nesting per year. This near complete census provides the best statewide estimate of total abundance, but because of viable survey effort, these numbers cannot be used to assess trends. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. An analysis of these data has shown a decline in nesting from 1989-2008 (Witherington et al. 2009).

A near complete census of the Dry Tortugas Subpopulation undertaken from 1995 to 2004 (excluding 2002), reveals a mean of 246 nests per year, which equates to about 60 females nesting per year. The nesting trend data for the Dry Tortugas Subpopulation are from beaches that were not part of the INBS program, but are part of the Statewide Nesting Beach Survey program. There are 9 continuous years (1995 to 2004) of data for this Subpopulation, but the time series is too short to detect a trend.

Nesting surveys in the Yucatán Subpopulations have been too irregular to date to allow for a meaningful trend analysis (Turtle Expert Working Group 1998, 2000).

Threats include incidental take from channel dredging and commercial trawling, longline, and gill net fisheries; loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and nonnative predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and disease. There is particular concern about the extensive incidental take of juvenile loggerheads in the eastern Atlantic by longline fishing vessels from several countries.

Green Sea Turtle

Total population estimates for the green turtle are unavailable, and trends based on nesting data are difficult to assess because of large annual fluctuations in numbers of nesting females. For instance, in Florida, where the majority of green turtle nesting in the southeastern U.S. occurs, estimates range from 150 to 2,750 females nesting annually. Populations in Suriname and Tortuguero, Costa Rica, may be stable, but there is insufficient data for other areas to confirm a trend.

A major factor contributing to the green turtle's decline worldwide is commercial harvest for eggs and food. Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor and has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die. Other threats include loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and nonnative predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and incidental take from channel dredging and commercial fishing operations.

Leatherback Sea Turtle

Declines in leatherback nesting have occurred over the last 2 decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (historically estimated to be 65 percent of the worldwide population), is now less than 1 percent of its estimated size in 1980. Spotila et al. (1996) estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200 and an upper limit of about 42,900. This is less than one third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. Presently, the largest population is in the western Atlantic. Using an age-based demographic model, Spotila et al. (1996) determined leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and even the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded leatherbacks are on the road to extinction and further population declines can be expected unless we take action to reduce adult mortality and increase survival of eggs and hatchlings.

The crash of the Pacific leatherback population is believed primarily to be the result of exploitation by humans for the eggs and meat, as well as incidental take in numerous commercial fisheries of the Pacific. Other factors threatening leatherbacks globally include loss or degradation of nesting habitat from coastal development; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and nonnative predators; degradation of foraging habitat; marine pollution and debris; and watercraft strikes.

Hawksbill Sea Turtle

The hawksbill sea turtle has experienced global population declines of 80 percent or more during the past century and continued declines are projected (Meylan and Donnelly 1999). Most populations are declining, depleted, or remnants of larger aggregations. Hawksbills were previously abundant, as evidenced by high-density nesting at a few remaining sites and by trade statistics. The decline of this species is primarily due to human exploitation for tortoiseshell. While the legal hawksbill shell trade ended when Japan agreed to stop importing shell in 1993, a significant illegal trade continues. It is believed individual hawksbill populations around the world will continue to disappear under the current regime of exploitation for eggs, meat, and tortoiseshell, loss of nesting and foraging habitat, incidental capture in fishing gear, ingestion of and entanglement in marine debris, oil pollution, and boat collisions. Hawksbills are closely associated with coral reefs, one of the most endangered marine ecosystems.

Kemp's Ridley Sea Turtle

The decline of this species was primarily due to human activities, including the direct harvest of adults and eggs and incidental capture in commercial fishing operations. Today, under strict protection, the population appears to be in the early stages of recovery. The recent nesting increase can be attributed to full protection of nesting females and their nests in Mexico resulting from a binational effort between Mexico and the U.S. to prevent the extinction of the Kemp's ridley, and the requirement to use turtle excluder devices in shrimp trawls in both nations.

The Mexican government also prohibits harvesting, and is working to increase the population through more intensive law enforcement, by fencing nest areas to reduce natural predation, and by relocating all nests into corrals to prevent poaching and predation. While relocation of nests into corrals is currently a necessary management measure, this relocation and concentration of eggs into a "safe" area is of concern since it makes the eggs more susceptible to reduced viability due to movement-induced mortality, disease vectors, catastrophic events like hurricanes, and marine predators once the predators learn where to concentrate their efforts.

Analysis of the species/critical habitat likely to be affected

The proposed action has the potential to adversely affect nesting sea turtles, their nests, and hatchlings within the action area. The effects of the proposed action on sea turtles will be considered further in the remaining sections of this biological opinion. Potential effects include destruction of nests deposited within the boundaries of the proposed project, harassment in the form of disturbing or interfering with female sea turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities, and behavior modification of nesting females due to escarpment formation within the action area during the nesting season that could result in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs. In addition, the quality of the placed sand could affect the ability of female sea turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest.

Critical habitat has not been designated for any sea turtle in the continental U.S.; therefore, the proposed action would not result in an adverse modification to critical habitat.

ENVIRONMENTAL BASELINE

Climate Change

According to the Intergovernmental Panel on Climate Change Report (IPCC 2007), warming of the earth's climate is unequivocal, as is now evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level. The IPCC Report (2007) describes changes in natural ecosystems with potential widespread effects on many organisms, including marine mammals, reptiles, and migratory birds. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the Department of the Interior requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2008).

Climate change at the global level drives alterations in weather at the regional level, although weather is also strongly affected by season and local effects (*e.g.*, elevation, topography, latitude, proximity to the ocean). Average temperature is predicted to rise from 36°F to 41°F for North America by the end of this century (IPCC 2007). Other processes to be affected by this projected warming include rainfall (amount, seasonal timing, and distribution), storms (frequency and intensity), and sea level rise. However, the exact magnitude, direction, and distribution of these changes at the regional level are not well understood or easy to predict. Seasonal change and local geography make prediction of the effects of climate change at any location variable. Climatic changes in south Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management (Pearlstine 2008).

Air Temperature

Current models predict changes in mean global temperature in the range of 4°F to 8°F by 2100. How this manifests at the regional and local scale is uncertain. A change of just a couple degrees can have profound effects, particularly at temperature extremes. For example, in Florida, winter frost, a 2-degree transition from 33°F to 31°F, greatly affects vegetation. While predicted changes in average annual temperature appear small, local and seasonal temperature variation may be greater. It is also important to consider that an increase in the temperature of the global atmosphere may manifest as an increase or a decrease in local means and extremes. We do not currently know either the direction or anticipated size of temperature change in Florida, but the following possibilities at the local level should be considered:

1. Changes (likely small) in mean annual temperature.
2. Greater extremes of temperature in summer (average highs) and winter (average lows).
3. More prolonged and seasonally extended frosts.
4. Shifts in the distribution of temperature regimes (*e.g.*, isotherms and growing zones).
5. Changes in the seasonal onset of temperature changes (*e.g.*, earlier spring).
6. Changes in the duration of temperature regimes (*e.g.*, longer and warmer summers).
7. Changes in both air and water (lake, river, ocean) temperature.

Most organisms have preferred ranges of temperature and lethal temperature limits they cannot survive. Many organisms require temperature signals or suitable temperature regimes to successfully complete life cycle activities such as nesting and winter dormancy. Some organisms are sensitive to temperature for incubation, sex determination (*e.g.*, sea turtles, alligators), or seed germination. The oxygen content of water (affecting fish) and the water content of vegetation (affecting fire combustion) are temperature-dependent. Some noxious or undesirable organisms may proliferate under different temperature regimes (*e.g.*, blue green algae in lakes and exotic species). Changes in temperature will likely affect fish and wildlife resources in many ways depending on the direction, amount, timing, and duration of the changes.

Rainfall

Ecosystems in Florida are sensitive to variation in rainfall. Well-drained soils, rapid runoff, and high plant transpiration quickly redistribute water available to organisms. Despite a high average rainfall, much of Florida experiences seasonal drought that profoundly affects fish and wildlife resources. Florida's rain depends on both global and regional climate factors (*e.g.*, jet stream, El Niño, frontal progression, storms and hurricanes) and local weather (*e.g.*, thunderstorms, sea breezes, lake effects and local circulation) that are likely affected by climate change. The following possibilities at the local level should be considered:

1. Changes in average annual rainfall (*e.g.*, higher or lower).
2. Changed seasonal distribution of rainfall (*e.g.*, when rain falls).
3. Changed regional distribution of rainfall (*e.g.*, where rain falls).
4. Changed intensity (*e.g.*, more severe storm rain, or dispersed "misty" rain).

Rainfall changes are affected by temperature. The affects of changes in rainfall will likely be mediated through responses by vegetation and the changed availability of surface water (*e.g.*, lakes, ponds, rivers, swamps, and wet prairies) on which many organisms depend. In the longer term, changes in deposition or recharge to surficial and deep aquifers may affect spring flow. Florida has an unusually large area of wetland habitats supporting wildlife. If climate change reduces rainfall, then desertification of much of Florida is possible and it may come to resemble "desert islands" such as much of the Bahamas that occur at the same latitude. Rainfall changes may have the most profound effects on Florida's fish and wildlife resources.

Storms

Another predicted effect of climate change is to increase the frequency and intensity of severe storms, particularly tropical cyclones (hurricanes). Higher sea temperatures and high atmosphere conditions generate energy and conditions suitable for storms. There is some controversy about whether this effect is already discernible against the background of natural variation and cycles of hurricane occurrence.

Hurricanes are generally considered detrimental to human interests and may directly cause wildlife mortality. However, their effect in natural systems is generally transient; plants and animals tend to rapidly recover. Hurricanes do have significant secondary effects, reshaping coastal habitat structure (barrier islands, beaches, salt/freshwater intrusion to marshes, and estuaries), replenishing water bodies and aquifers and renewing plant succession, which are not completely negative for wildlife. Hurricane effects will interact with rainfall and sea level changes, possibly exacerbating coastal flooding. Hurricanes also redistribute organisms, particularly plants, by spreading seeds and other propagules. The following possibilities at the local level should be considered:

1. Changes in storm intensity and frequency.
2. Changes in the possibility of more concentrated storm tracks leading to more frequent storm landfall.
3. Interaction of surge and sea level for more severe coastal and adjacent inland effects.
4. Distribution of invasive species.

Sea Level Rise

All current predictions suggest sea level will rise due to melting of continental and glacial ice and thermal expansion of the oceans. Florida, with its extensive coastline and low topography is highly vulnerable to sea level rise. The magnitude of the predicted rise is currently unknown and estimates vary from a few inches to yards. Modeled predictions using median consensus sea level rise estimates indicate that significant portions of Florida's coastline will be inundated and a major redistribution of coastal habitats is likely. However, to put this in context, Florida's coast currently experiences sea level fluctuations of 2 to 6 feet twice daily as tides and is exposed to storm surges of 10 to 16 feet in occasional hurricanes. Sea level changes will be superimposed on these normal, larger fluctuations. While these changes will likely be disastrous to human structures and activities, the effect on wildlife and its habitat may be less damaging. In essence, coastal habitats will migrate inland and Florida's flat coastal topography, a result of previous sea level changes, will mitigate the effect. Current coastal forests, dunes and beaches will migrate inland and be displaced by marsh, while current marsh will become sea grass, barrier islands will become sandbars and new barrier islands arise. The primary effect for wildlife will be redistribution, and possibly increase in some habitats at the expense of others.

More profound changes in the coastal and marine environment may be driven by the temperature and rainfall effects that may promote the distribution of mangroves and coral reefs into the expanded coastal zone. The main hazard to wildlife from sea level rise will arise from efforts to protect human structures from these changes by dikes, seawalls, dredging, beach nourishment and similar engineering responses. Changes in temperature regimes in the ocean may cause shifts in distribution of marine species, and profound but entirely unpredictable effects may be generated if climate changes causes large scale change in ocean circulation such as the Florida Current. The following possibilities at the local level should be considered:

1. Transient but damaging effects on vulnerable coastal species (*e.g.*, beach nesting shorebirds, and sea turtles).
2. Redistribution of coastal habitats with disruptions of productivity.
3. Sedimentation effects during the transition.
4. Interactive synergy with other climate effects (*e.g.*, temperature, and storm frequency) to generate unanticipated second order effects.
5. Disruption of coastal migration patterns, particularly "passive" migrations of larvae driven by local water movement effects.
6. Secondary effects of protection of human structures.
7. Migration zones and corridors available to allow changes in distribution.

To summarize, effects of climate change on wildlife in Florida are likely to be widespread and profound, and occur over a variety of dimensions and variables. As these effects cannot be prevented or delayed under current circumstances, a practical response will be to identify key areas and key species and habitats that are vulnerable to irreversible change and develop policy and planning to mitigate effects on these vulnerable entities.

Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. However, as it relates to nesting sea turtles, if predictions about global warming are realized, increased storms and rising sea levels could damage or destroy nests and nesting habitat, and temperature changes could skew sex ratios. In regard to piping plovers, increased storms and rising sea levels could damage, destroy, or otherwise alter foraging and roosting habitat. Consequently, the Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006).

Status of the species/critical habitat within the action area

Sea Turtles

The distribution of sea turtle nesting activity on Florida's Southwest Gulf Coast (Sarasota, Charlotte, Lee, and Collier Counties) is understood less than that of the East Coast epicenter of sea turtle nesting between Brevard and Palm Beach Counties (Addison et al. 2000). Ten to 12 percent of the total nesting activity on Florida's beaches occurs on Florida's Gulf Coast (Addison et al. 2000). During the 2009 nesting season, Charlotte County accounted for approximately 11 percent of the overall nesting in the Gulf coast region, and supported the third greatest number of nesting sea turtles on the Gulf coast of Florida. From 2005 to 2009, there was an average of 3 green, 542 loggerhead, and 0.2 Kemp's ridley sea turtle nests laid within the County (Table 1). The entire Charlotte County shoreline has been surveyed annually for sea turtle nesting activity over the last 20 years.

<u>Loggerhead Sea Turtle</u>

Of the counties along the Gulf coast of Florida, Charlotte County supported the third highest nesting of loggerhead sea turtles with 593 nests or 43 nests per mile in 2009 (FWC 2009b; Table 1). In 2009, loggerhead sea turtles laid 235 nests or 67 nests per mile in the project area (Table 2). In 2009, loggerhead sea turtles made 640 false crawls in Charlotte County (Table 1). In the project area, loggerhead turtles made 279 false crawls in 2009 (Table 2).

<u>Green Sea Turtle</u>

Of the counties along the Gulf coast of Florida, Charlotte County supported the fourth highest nesting of green sea turtles with 2 nests or 0.14 nest per mile in 2009 (FWC 2009b; Table 1). In 2009, no green sea turtle nests were laid in the project area (Table 2). In 2009, green sea turtles made 5 false crawls in Charlotte County (Table 1). In the project area, green sea turtles made 5 false crawls in 2009 (Table 2).

<u>Leatherback Sea Turtle</u>

Though leatherback sea turtles nest occasionally on Florida's Gulf coast, no occurrences of leatherback nesting have been documented in the project area or Charlotte County.

Hawksbill Sea Turtle

No occurrences of hawksbill nesting have been documented in the action area or Charlotte County. The majority of nesting surveys conducted in Florida occur during the morning hours and are based on interpretation of the tracks left by the turtles as they ascend and descend the beach; the turtles themselves are rarely observed. Because hawksbill turtle tracks are difficult to discern from loggerhead tracks, it is likely that nesting by hawksbill turtles is underreported (Meylan et al. 1995).

Kemp's Ridley Sea Turtle

One Kemp's ridley nest was reported in the project area in 2009 (Table 2). The majority of nesting surveys conducted in Florida occur during the morning hours and are based on interpretation of the tracks left by the turtles as they ascend and descend the beach; the turtles themselves are rarely observed. Because hawksbill and Kemp's ridley turtle tracks are difficult to discern from loggerhead tracks, it is likely that nesting by both species is underreported (Meylan et al. 1995).

Factors affecting the species habitat within the action area

As part of the 2003 Charlotte County Erosion Control Project, approximately 100,000 cy of sand was placed along Manasota Key between DEP reference monuments R-14.5 and R-17. In addition, approximately 196,300 cy and 628,700 cy of sand were placed on Knight Island (DEP reference monument R-22 to R-25.5) and Knight and Don Pedro Islands (DEP reference monument R-29 to R-40), respectively. Both the primary and supplemental borrow areas were utilized.

In 2005 and 2006 as part of the Stump Pass Experimental Stabilization Project, a groin system was constructed adjacent to Manasota Key to test the effectiveness of an experimental submerged groin system. The system consisted of a submerged groin field comprised of sand-filled, low-profile, geotextile tubes of various lengths positioned perpendicular to the shore and extending into the nearshore between DEP reference monument R-19 and R-20. From November 15, 2008 through December 31, 2008, the submerged groins were removed pursuant to a Consent Order issued by DEP. The contractor was required to return to the geotube project area three times between January 1, 2009 and March 31, 2009 to remove small remnants.

In 2006, as part of the Charlotte County Erosion Control Project maintenance event, approximately 148,800 cy of sand was placed along the shoreline of Manasota Key between DEP reference monument R-14.5 and R-18, approximately 6,260 cy of sand along Knight Island between DEP reference monument R-22 and R-23, and approximately 298,200 cy of sand along Knight and Don Pedro Islands between DEP reference monument R-30 and R-39.5.

Beach Maintenance And Pollution

Regular beach maintenance in the form of tractor tilling may disrupt or impact deposited nests and nesting sea turtles. Plastics, styrofoam, and fishing line are pollutants that may negatively impact nesting success and nearshore foraging.

Lighting

A primary anthropogenic threat to sea turtles along nesting shorelines includes hatchling disorientation as a result of artificial lighting along the beach. Typically, sea turtle hatchlings will emerge from the nest and orient themselves towards the brighter, open horizon of the ocean (Salmon et al. 1992). If artificial lights are visible from the beach, sea turtle hatchlings tend to travel toward the artificial lights instead of the ocean. Disorientation events often result in hatchling mortality as a result of dehydration, predation, and in some cases, motor vehicle strikes.

Charlotte County has a Land Development Code that includes measures to reduce impacts of coastal lighting on nesting sea turtles and hatchlings. The proposed project area is subject to this code.

Predation

Depredation of sea turtle eggs and hatchlings by natural and introduced species occurs on almost all nesting beaches. Depredation by a variety of predators can considerably decrease sea turtle nest hatching success. The most common predators in the southeastern U.S. are ghost crabs (*Ocypode quadrata*), raccoons (*Procyon lotor*), feral hogs (*Sus scrofa*), foxes (*Urocyon cinereoargenteus* and *Vulpes vulpes*), coyotes (*Canis latrans*), armadillos (*Dasypus novemcinctus*), cats (*Felis catus)*, dogs (*Canis lupus familiaris*), and fire ants (*Solenopsis* spp.) (Dodd 1988; Stancyk 1995; Indian River County 2008). Raccoons are particularly destructive on the Atlantic coast and may take up to 96 percent of all nests deposited on a beach (Davis and Whiting 1977; Hopkins and Murphy 1980; Stancyk et al. 1980; Talbert et al. 1980; Schroeder 1981; Labisky et al. 1986).

Shoreline Equilibration

As restored beaches equilibrate to a more natural profile, steep vertical escarpments often form along the seaward edge of the constructed beach berm and this presents a physical barrier to nesting turtles. Additionally, as beach profiles equilibrate, losses of nests laid in the seaward portions of the renourished beach due to erosion may be high. Steinitz et al. (1998) following long-term studies at Jupiter Island indicated that at 2 years postrenourishment, nesting success was considerably higher than prerenourishment levels and similar to densities found on nearby noneroded beaches. However, the nesting success declined as the renourished beach eroded and narrowed until the next renourishment event.

EFFECTS OF THE ACTION

The analysis of the direct and indirect effects of the proposed action on sea turtles and the interrelated and interdependent activities of those effects was based on beneficial and detrimental factors.

Factors to be considered

The proposed action has the potential to adversely affect nesting sea turtles and their nests, and hatchlings within the proposed action area during the construction activities associated with sand placement along Manasota Key, and Knight and Don Pedro Islands, Charlotte County, Florida.

The effects of the proposed action on sea turtles will be considered further in the remaining sections of this biological opinion.

Potential effects include destruction or damage to sea turtle nests, developing embryos, and hatchlings within the boundaries of the proposed project, harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities, behavior modification of nesting sea turtles that could result in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs, reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site, disorientation of female and hatchling sea turtles on beaches in and adjacent to the construction area as a result of project lighting that becomes visible on the wider beach, and the loss of nesting habitat.

Analyses for effects of the action

Beneficial effects

The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible *(e.g.,* grain size, shape, color) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may be more stable than the eroding one it replaces, thereby benefiting sea turtles.

Direct effects

<u>Artificial Lighting</u>

Visual cues are the primary sea-finding mechanism for hatchling sea turtles (Mrosovsky and Carr 1967; Mrosovsky and Shettleworth 1968; Dickerson and Nelson 1989; Witherington and Bjorndal 1991). When artificial lighting is present on or near the beach, it can misdirect hatchlings once they emerge from their nests and prevent them from reaching the ocean (Philibosian 1976; Mann 1977). In addition, a significant reduction in sea turtle nesting activity has been documented on beaches illuminated with artificial lights (Witherington 1992). Therefore, construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, misdirect females trying to return to the surf after a nesting event, and misdirect emergent hatchlings from adjacent nonproject beaches. Any source of bright lighting can profoundly affect the orientation of hatchlings, both during the crawl from the beach to the ocean and once they begin swimming offshore. Hatchlings attracted to light sources on dredging barges may not only suffer from interference in migration, but may also experience higher probabilities of predation to predatory fishes that are also attracted to the barge lights. This impact could be reduced by using the minimum amount of light necessary (may require shielding) or low pressure sodium lighting during project construction.

<u>Equipment</u>

The placement of construction materials, as well as the use of heavy machinery or equipment on the beach during a construction project, may have adverse effects on sea turtles. They can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure. The equipment can also create impediments to hatchling sea turtles as they crawl to the ocean.

Nest Relocation

Besides the risk of missing nests during a nest relocation program, there is a potential for eggs to be damaged by their movement, particularly if eggs are not relocated within 12 hours of deposition (Limpus et al. 1979). Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus et al. 1979; Ackerman 1980; Parmenter 1980; Spotila et al. 1983; McGehee 1990). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings.

Nest moisture content is known to influence the incubation environment of the embryos and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard et al. 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard et al. 1985), hatchling size (Packard et al. 1981; McGehee 1990), energy reserves in the yolk at hatching (Packard et al. 1988), and locomotory ability of hatchlings (Miller et al. 1987). In a 1994 Florida study comparing loggerhead hatching and emergence success of relocated nests with *in situ* nests, Moody (1998) found hatching success was lower in relocated nests at 9 of 12 beaches evaluated and emergence success was lower in relocated nests at 10 of 12 beaches surveyed in 1993 and 1994.

Missed Nests

Although a nesting survey and nest marking program would reduce the potential for sea turtle nests to be impacted by construction activities, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, or tides) or misidentified as false crawls during daily patrols. Even under the best of conditions, about 7 percent of the nests can be misidentified as false crawls by experienced sea turtle nest surveyors (Schroeder 1994).

Sand Placement

Placement of approximately 332,400 cy of sand along 3.5 miles of beach in and of itself may not provide suitable nesting habitat for sea turtles. Although placement of beach compatible material may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not incorporated during project construction. Sand placement during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of eggs and hatchlings and along with other mortality sources, may impact the long-term survival of the species. For example, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. Potential adverse effects during the project construction phase include disturbance of existing nests, which may have been missed, disturbance of females attempting to nest, and disorientation of emerging hatchlings. In addition, heavy equipment will be required to distribute the sand to the design fill template. This equipment will have to traverse the action area, which could result in harm to nesting sea turtles, their nests, and emerging hatchlings.

Indirect effects

Many of the direct effects of sand placement may persist over time and become indirect impacts. These indirect effects include increased susceptibility of relocated nests to catastrophic events during the construction period, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, the formation of escarpments, and erosion and sand migration due to nearshore dredging activities.

Increased susceptibility to catastrophic events

Relocation of sea turtle nests may concentrate eggs in an area making them more susceptible to catastrophic events. Hatchlings released from concentrated areas may also be subject to greater predation rates from both land and marine predators, because the predators learn where to concentrate their efforts (Glenn 1998; Wyneken et al. 1998).

Increased beachfront development

Pilkey and Dixon (1996) state that beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also notes that the very existence of a sand placement project can encourage more development in coastal areas. Following completion of a sand placement project in Miami during 1982, investment in new and updated facilities substantially increased tourism in the area (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as older buildings were replaced by much larger ones that accommodated more beach users. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development which leads to the need for more and larger protective measures. Increased shoreline development may adversely affect sea turtle nesting success. Greater development may support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas (National Research Council 1990), and can also result in greater adverse effects due to artificial lighting, as discussed above.

Changes in the physical environment

Sand placement activities may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings (Nelson and Dickerson 1987; Nelson 1988).

Beach compaction and unnatural beach profiles that may result from sand placement activities could negatively impact sea turtles regardless of project timing. Very fine sand or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson et al. 1987; Nelson and Dickerson 1988a). Significant reductions in nesting success (*e.g.,* increase in false crawls) have been documented on severely compacted nourished beaches (Fletemeyer 1980; Raymond 1984; Nelson and Dickerson 1987; Nelson et al. 1987), and increased false crawls may result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests and also cause increased physiological stress to the animals (Nelson and Dickerson 1988b). Nelson and Dickerson (1988c) concluded that, in general, beaches nourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

These impacts can be minimized by using suitable sand and tilling compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a nourished beach with a root rake may reduce the sand compaction to levels comparable to unnourished beaches. However, a pilot study by Nelson and Dickerson (1988b) showed that a tilled nourished beach will remain uncompacted for up to 1 year. Therefore, the Service requires multiyear beach compaction monitoring and, if necessary, tilling to ensure project impacts on sea turtles are minimized.

A change in sediment color on a beach could change the natural incubation temperatures of nests in an area, which, in turn, could alter natural sex ratios. To provide the most suitable sediment for nesting sea turtles, the color of the nourished sediments must resemble the natural beach sand in the area. Tilling, natural reworking of sediments, and bleaching from exposure to the sun would help to lighten dark nourishment sediments; however, the timeframe for sediment mixing and bleaching to occur could be critical to a successful sea turtle nesting season.

Escarpment formation

On nourished beaches, steep escarpments may develop along their waterline interface as they adjust from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984; Nelson et al. 1987). These escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998). Researchers have shown that female turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (*e.g.,* in front of escarpments, which often results in failure of nests due to prolonged tidal inundation). This impact can be minimized by leveling any escarpments prior to the nesting season.

Erosion and sand migration as a result of nearshore dredging activities

Future sand displacement from nesting beaches is a potential adverse effect of sand placement projects; where improper borrow area design removes sand from the active littoral transport zone near the beach fill. This has the potential to cause erosion of the newly created beach or other areas on the same adjacent beaches by creating a sand sink. The remainder of the system responds to this sand sink by providing sand from adjacent beaches in an attempt to reestablish equilibrium (National Research Council 1990).

The borrow area for the proposed project will avoid this problem because the sand will be dredged from the primary borrow area along the approximate historic channel alignment of Stump Pass and thus sand is not being removed from the active littoral zone of the beach fill segments in the nearshore. Natural sediment transport forms a spit on the southern end of

Manasota Key which historically grows southward, deflecting the channel and eroding the downdrift beach. The area of inlet influence expands in response to this process and the adjacent beaches have experienced significant shoreline recession and erosion. The dredging will therefore shift the channel alignment slightly to the north, to an earlier historic position, which will reduce the tendency for downdrift beach erosion to occur. To offset the erosion expected to occur on the updrift beach segment (DEP reference monument R-18 to R-20) immediately adjacent to the dredge cut, the project provides for advanced mitigation whereby an equivalent quantity of sand is placed within the permitted updrift beach segment adjacent to Stump Pass Beach State Park.

Species' response to a proposed action

Ernest and Martin (1999) conducted a comprehensive study to assess the effects of sand placement on loggerhead nesting and reproductive success. The following findings illustrate sea turtle responses to and recovery from a nourishment project. A significantly larger proportion of turtles emerging on nourished beaches abandoned their nesting attempts than turtles emerging on control or prenourished beaches. This reduction in nesting success was most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics associated with the nourishment project (*e.g.*, beach profile, sediment grain size, beach compaction, and frequency and extent of escarpments). During the first postconstruction year, the time required for turtles to excavate an egg chamber on the untilled, hard packed sands of one treatment area increased significantly relative to control and background conditions. However, in another treatment area, tilling was effective in reducing sediment compaction to levels that did not significantly prolong digging times. As natural processes reduced compaction levels on nourished beaches during the second postconstruction year, digging times returned to background levels.

During the first postconstruction year, nests on the nourished beaches were deposited significantly farther from both the dune toe and the tide line than nests on control beaches. Furthermore, nests were distributed throughout all available habitat and were not clustered near the dune toe as they were on the control beaches. As the width of nourished beaches decreased during the second year, among treatment differences in nest placement diminished. More nests were washed out on the wide, flat beaches of the nourished treatments than on the narrower steeply sloped beaches of the control beach. This phenomenon persisted through the second postconstruction year monitoring and resulted from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping, occurred as the beach equilibrated to a more natural contour.

As with other sand placement projects, Ernest and Martin (1999) found the principal effect of nourishment on sea turtle reproduction was a reduction in nesting success during the first year following project construction. Although most studies have attributed this phenomenon to an increase in beach compaction and escarpment formation, Ernest and Martin (1999) indicate changes in beach profile may be more important. Regardless, as a nourished beach is reworked by natural processes in subsequent years and adjusts from an unnatural construction profile to a more natural beach profile, beach compaction and the frequency of escarpment formation decline, and nesting and nesting success return to levels found on natural beaches.

Similar short-term effects to listed sea turtle species and their habitat are anticipated to occur as a result of sand placement activities related to the proposed project. Generally, these adverse effects are limited to the first year after construction. Nonetheless, an increase in sandy beach may not necessarily equate to an increase in suitable sea turtle nesting habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The Applicant intends to obtain authorization in the future to conduct periodic maintenance events within the project area, in order to address storm impacts and background erosion on Manasota Key, and Knight and Don Pedro Islands.

Another potential future action involves relocation of channel markers within Stump Pass as the navigational channel migrates. The purpose of this relocation is to facilitate safe navigation within the channel.

CONCLUSION

It is the Service's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles. This conclusion is based on the following:

1. The proposed sand placement event will directly impact 3.5 miles of shoreline. This represents 0.25 percent of the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern U.S.

2. Research has shown that the principal effect of sand placement on sea turtle reproduction is a reduction in nesting success, and this reduction is most often limited to the first year following the initial nourishment and subsequent renourishment events.

3. Research has shown that the impacts of a nourishment project on sea turtle nesting habitat are typically short-term because a nourished beach will be reworked by natural processes in subsequent years, and beach compaction and the frequency of escarpment formation will decline.

4. Take of sea turtles will be minimized by implementation of the Reasonable and Prudent Measures, and Terms and Conditions outline below. These measures have been shown to help minimize adverse impacts to sea turtles.

5. The Service's review of the current status of sea turtles, the environmental baseline for the action area, the effects of the proposed sand placement, and the cumulative effects.

6. No critical habitat has been designated for the loggerhead, green, leatherback, Kemp's Ridley, and hawksbill sea turtles in the continental U.S.; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be implemented by the Corps so they become binding conditions of any permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the Terms and Conditions or, (2) fails to adhere to the Terms and Conditions of the incidental take statement through enforceable terms that are added to the permit, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Sea Turtles

The Service anticipates approximately 3.5 miles of nesting beach habitat could be taken as a result of the proposed action; however, incidental take of sea turtles will be difficult to detect for the following reasons:

1. Turtles nest primarily at night and all nests are not located because
   a. Natural factors, such as rainfall, wind, and tides may obscure crawls; and
   b. Human-induced factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program.
2. The total number of hatchlings per undiscovered nest is unknown.
3. The reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown.
4. An unknown number of females may avoid the project beach and be forced to nest in a less than optimal area.
5. Lights may misdirect an unknown number of hatchlings and cause death.
6. Escarpments may form and obstruct an unknown number of females from accessing a suitable nesting site.

7. The number of nests lost due to erosion of the nourished beach template is unknown.

However, the level of take of these species can be anticipated by the disturbance and nourishment of suitable turtle nesting beach habitat because of the following:

1. Turtles nest within the project area.
2. Project construction may occur during a portion of the nesting season.
3. Sand placement will modify the incubation substrate, beach slope, and sand compaction.
4. Artificial lighting will deter or misdirect nesting females and hatchlings.

Take is expected to be in the form of:

1. Destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed project.
2. Destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project.
3. Reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site.
4. Harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities.
5. Behavior modification of nesting females due to escarpment formation, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs.
6. Destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.
7. Misdirection of nesting females or hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting and lights from beachfront development that reach the elevated berm postconstruction.

The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a one-time sand placement event along the 3.5 miles of beach identified for sand placement. This incidental take statement will expire on March 5, 2013, which will coincide with the expiration of the Corps permit. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

EFFECT OF THE TAKE

Sea Turtles

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the loggerhead, green, leatherback, hawksbill, or Kemp's ridley sea turtles. Critical habitat has not been designated in the project area; therefore, the project will not result in destruction or adverse modification of critical habitat for any of the sea turtle species.

Incidental take of nesting and hatchling sea turtles is anticipated to occur during project construction and during the life of the project. Take will occur on nesting habitat along 3.5 miles of beach within the project area.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles in the proposed action area.

1. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence must be used on the project site.
2. Immediately after completion of the project and prior to the next three nesting seasons,beach compaction must be monitored and tilling must be conducted as required by April 15 to reduce the likelihood of impacting sea turtle nesting and hatching activities.
3. Immediately after completion of the project and prior to the next three nesting seasons, starting April 15, monitoring must be conducted to determine if escarpments are present and escarpments must be leveled as required to reduce the likelihood of impacting sea turtle nesting and hatching activities.
4. If sand placement activities are conducted during the period from May 1 through October 31, surveys for nesting sea turtles must be conducted. If nests are constructed in the project area, the eggs must be relocated.
5. The Applicant must ensure that contractors performing the sand placement work fully understand the sea turtle protection measures detailed in this incidental take statement.
6. During the nesting season (May 1 through October 31) construction equipment and supplies must be stored in a manner that will minimize impacts to sea turtles to the maximum extent practicable.
7. During the nesting season (May 1 through October 31) lighting associated with the project must be minimized to reduce the possibility of disrupting and disorienting nesting or hatchling sea turtles.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of Section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above, and outline required reporting and monitoring requirements. These terms and conditions are nondiscretionary.

Protection of sea turtles

1. In accordance with the 2001 rule change under subsection 62B-41.007, Florida Administrative Code, all fill material placed on the beach must be analogous to that which naturally occurs within the project location or vicinity in quartz to carbonate ratio,

color, median grain size, and median sorting. Specifically, such material shall be predominately of carbonate, quartz, or similar material with a particle size distribution ranging between 0.062 mm and 4.76 mm (classified as sand by either the Unified Soil Classification System or the Wentworth classification). The material shall be similar in color, grain size distribution (sand grain frequency, mean and median grain size, and sorting coefficient) to the material in the existing coastal system at the nourishment site and shall not contain:

1a. Greater than 5 percent, by weight, silt, clay, or colloids passing the #230 sieve.
1b. Greater than 5 percent, by weight, fine gravel retained on the #4 sieve.
1c. Coarse gravel, cobbles, or other material retained on the 0.75-inch sieve in a percentage size greater than found on the native beach.
1d. Construction debris, toxic material or other foreign matter; and not result in contamination or cementation of the beach.

These standards must not be exceeded in any 10,000 square foot section, extending through the depth of the nourished beach. If the natural beach exceeds any of the limiting parameters listed, then the fill material must not exceed the naturally occurring level for that parameter.

2. Immediately after completion of sand placement and prior to April 15 for 3 consecutive years, sand compaction must be monitored in the area of sand placement. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of postconstruction compaction levels. In addition, out-year compaction monitoring and remediation are not required if the Applicant can demonstrate that placed sand no longer remains above mean high water (MHW). If required, the area must be tilled to a depth of 36 inches, and all tilling activity must be completed prior to April 15. Each pass of the tilling equipment must be overlapped to allow more thorough and even tilling. Compaction monitoring should at a minimum include:

2a. Compaction sampling stations must be located at 500-foot intervals along the project area. One station must be at the dune toe (when material is placed in this area), and one station must be midway between the dune toe and the high water line (normal wrack line).

At each station, the cone penetrometer will be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates will be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth will be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.

2b. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area must be tilled prior to April 15. If values exceeding 500 psi are distributed throughout the project area, but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

3. Visual surveys for escarpments along the project area must be made immediately after completion of the project and prior to April 15 for three consecutive years. All escarpments shall be leveled, or the beach profile shall be reconfigured, to minimize escarpment formation. In addition, weekly surveys of the project area shall be conducted during the three nesting seasons following completion of sand placement as follows:

3a. The number of escarpments and their location relative to DEP reference monumentsshall be recorded during each weekly survey and reported relative to the length ofthe beach survey (*e.g.,* 50 percent escarpments). Notations on the height of theseescarpments shall be included (0 to 2 feet, 2 to 4, and 4 feet or higher) as well as themaximum height of all escarpment; and

3b. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet must be leveled to the natural beach contour by April 15. An escarpment removal shall be reported relative to DEP reference monument locations. The Service and FWC must be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18inches in height for a distance of 100 feet occurs and persist for more than one week during the peak nesting and hatching season (May 1 to October 31) to determine the appropriate action to be taken. If it is determined escarpment leveling is required during the nesting season, the Service and FWC will provide written authorization that describes methods to be used to reduce the likelihood of impacting existing nests.

4. Daily early morning surveys for sea turtles will be required if any portion of the sand placement occurs during the period from May 1 through October 31. Nesting surveys must be initiated 65 days prior to construction activities, or by April 15, whichever is later. Nesting surveys must continue through the end of the project or through September 30, whichever is earlier. If nests are constructed in areas where they may be affected by sand placement, eggs must be relocated per the following requirements:

4a. Nesting surveys and egg relocations will only be conducted by personnel with prior experience and training in nesting survey and egg relocation procedures. Surveyors must have a valid FWC Permit. Nesting surveys must be conducted daily between sunrise and 9 a.m. The contractor must not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys must be performed in such a manner so as to ensure sand placement activities do not occur in any location prior to completion of the necessary sea turtle protection measures.

4b. Only those nests that may be affected by sand placement will be relocated. Nests requiring relocation must be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with sand placement must cease when these activities no longer threaten nests.

4c. Nests deposited within areas where construction activities have ceased or will not occur for 65 days must be marked and left in *in situ* unless other factors threaten the success of the nest. The sea turtle permit holder must install an on-beach marker at the nest site and a secondary marker at a point landward as possible to assure the future location of the nest will be possible should the on-beach marker be lost. A series of stakes and highly visible survey ribbon or string must be installed to establish a 10-foot radius around the nest. No activity will occur within this area nor will any activity occur which could result in impacts to the nest. Nest sites must be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the sand placement activity.

5. The Applicant must arrange a meeting between representatives of the contractor, the Service, the FWC, and the sea turtle permit holder responsible for egg relocation at least 30 days prior to the commencement of work on this project. At least 10 days advance notice must be provided prior to conducting this meeting. This will provide an opportunity for explanation or clarification of the sea turtle protection measures.

6. From May 1 through October 31, staging areas for construction equipment must be located off the beach to the maximum extent possible. Nighttime storage of construction equipment not in use must be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach must be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Temporary storage of pipes must be off the beach to the maximum extent possible. Temporary storage of pipes on the beach must be in such a manner so as to impact the least amount of nesting habitat and must likewise not compromise the integrity of the dune systems (placement of pipes perpendicular to the shoreline is recommended as the method of storage).

7. From May 1 through October 31, direct lighting of the beach and near shore waters must be limited to the immediate construction area and must comply with the safety requirements. Lighting on offshore or onshore equipment must be minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the waters surface and nesting beach while meeting all U.S. Coast Guard, EM 385-1-1, and Occupational Safety and Health Administration (OSHA) requirements. Shielded low pressure sodium vapor lights are recommended for lights on offshore equipment that cannot be eliminated, and for illumination of the nesting beach and nearshore waters. Construction light intensity must be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields must be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (Figure 4).

8. From May 1 through October 31, the contractor must not extend the beach fill more than 500 feet along the shoreline between dusk and the following day unless nighttime nesting surveys are conducted. If nighttime surveys are not conducted, no construction activities may proceed outside the 500 feet of shoreline outlined above, until completion of the morning sea turtle surveys and the necessary nest relocations have been completed.

9. No permanent exterior lighting will be installed in association with the construction project.

10. A preconstruction lighting survey shall be conducted followed by a lighting survey 30 days postconstruction to ensure no lights or light sources are visible from the project area. Additional lighting surveys shall be conducted annually prior to April 15 for 3 consecutive years.

11. Beach access to the construction site will be restricted to the wet sand below MHW,except where passage is impossible due to sections of narrow beach seaward of existing revetments or upland development (primarily at high tide).

12. In the event a sea turtle nest is excavated during construction activities, the sea turtle permit holder responsible for egg relocation for the project must be notified so the eggs can be moved to a designated relocation site.

Reporting

13. A report describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the FWC, Imperiled Species Management Section, Tallahassee office and the Service's South Florida Ecological Services Office, Vero Beach, Florida within 60 days postconstruction. This report will include the dates of actual construction activities, names and qualifications of personnel involved in nest surveys and relocation activities, descriptions and locations of self-release beach sites, nest survey and relocation results, hatching success of nests, preconstruction lighting survey results, postconstruction escarpment and sand compaction survey results, tilling activity, and both the presconstruction and 30-day postconstruction lighting survey results.

    Additionally, a monitoring report will be submitted for three consecutive nesting seasons postconstruction by December 31, that will include sand compaction survey or tilling activities, and escarpment survey results. Also, a report summarizing all lights visible, using standard survey techniques for such surveys, shall be submitted by April 15 documenting compliance with the Charlotte County beach lighting ordinance and enforcement action.

All reports will be submitted electronically to the Corps, FWC, and the Service on standard electronic media (*e.g.,* compact disc).

14. Upon locating a dead, injured, or sick endangered or threatened sea turtle specimen, initial notification must be made to the Service's Office of Law Enforcement (10426 NW 31st Terrace, Miami, Florida 33172; 305-526-2610). Additional notification must be made to FWC at 1-888-404-3922 and the Service's South Florida Ecological Services Office (1339 20th Street, Vero Beach, Florida 32960-3559; 772-562-3909). Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure evidence intrinsic to the specimen is not unnecessarily disturbed.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Surveys for nesting success of sea turtles should be continued for a minimum of 3 years following sand placement to determine whether sea turtle nesting and hatchling success has been adversely impacted.

2. To increase public awareness about sea turtles, informational signs should be placed at beach access points where appropriate. The signs should explain the importance of the beach to sea turtles and the life history of sea turtle species that nest in the area.

3. Appropriate native salt-resistant dune vegetation should be established on restored dunes. The DEP, Office of Beaches and Coastal Systems, can provide technical assistance on the specifications for design and implementation.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

1. The amount or extent of incidental take is exceeded.
2. New information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion.
3. The agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion.
4. A new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Should you have additional questions or require clarification, please contact Jeff Howe at 772-562-3909, extension 283.

Sincerely yours,

for Paul Souza
Field Supervisor
South Florida Ecological Services Office

cc: electronic only
Charlotte County Administration Center, Punta Gorda, Florida (Danny Quick)
Coastal Engineering Consultants, Naples, Florida (Michael Poff)
Coastal Technology Corporation, Vero Beach, Florida (Kim Colstad)
Corps, Fort Myers, Florida (Monika Dey)
DEP, Tallahassee, Florida (Lanie Edwards)
EPA, West Palm Beach, Florida (Richard Harvey)
FWC, Imperiled Species Management Section, Tallahassee, Florida (Robbin Trindell)
NOAA Fisheries, St. Petersburg, Florida (Mark Sramek)
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USGS, Florida Integrated Science Center, Gainesville, Florida (Susan Walls)

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Table 1. Summary of sea turtle nesting data along Charlotte County, Florida (13.7 miles survey length) from 2005 to 2009 (FWC 2009b).

Year	Loggerhead Nests	Loggerhead False Crawls	Green Nests	Green False Crawls	Kemp's Ridley Nests	Kemp's Ridley False Crawls
2005	494	776	5	6	0	0
2006	385	591	3	4	0	0
2007	519	889	1	5	0	0
2008	720	723	3	10	0	0
2009	593	640	2	5	1	0
Mean	**542**	**724**	**3**	**6**	**0.2**	**0**

Table 2. Summary of sea turtle nesting data from 2005 to 2009, which in part includes Manasota Key, Knight and Don Pedro Islands (DEP reference monument R-14.5 to R-39), Charlotte County, Florida. Total distance of shoreline surveyed is approximately 3.5 miles. Data provided by Charlotte County Natural Resources Division.

Year	Loggerhead Nests	Loggerhead False Crawls	Green Nests	Green False Crawls	Kemps' Ridley Nests	Kemp's Ridley False Crawls
2005	229	380	2	1	0	0
2006	128	248	2	4	0	0
2007	281	388	0	3	0	0
2008	382	547	2	8	0	0
2009	235	279	0	5	1	0
Mean	**251**	**368**	**1**	**4**	**0.2**	**0**

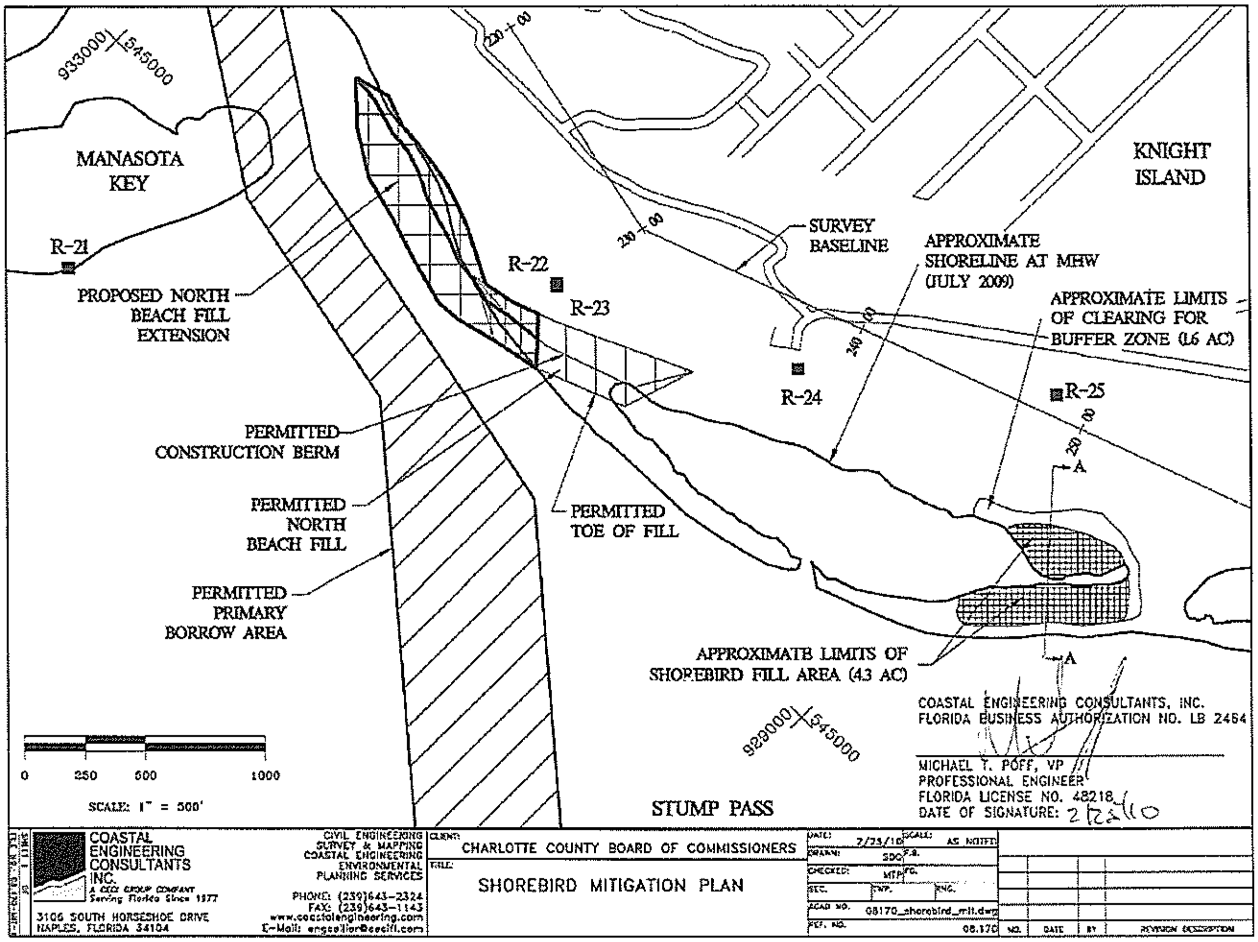

Figure 1. Proposed shorebird habitat mitigation area near DEP reference monument R-25.

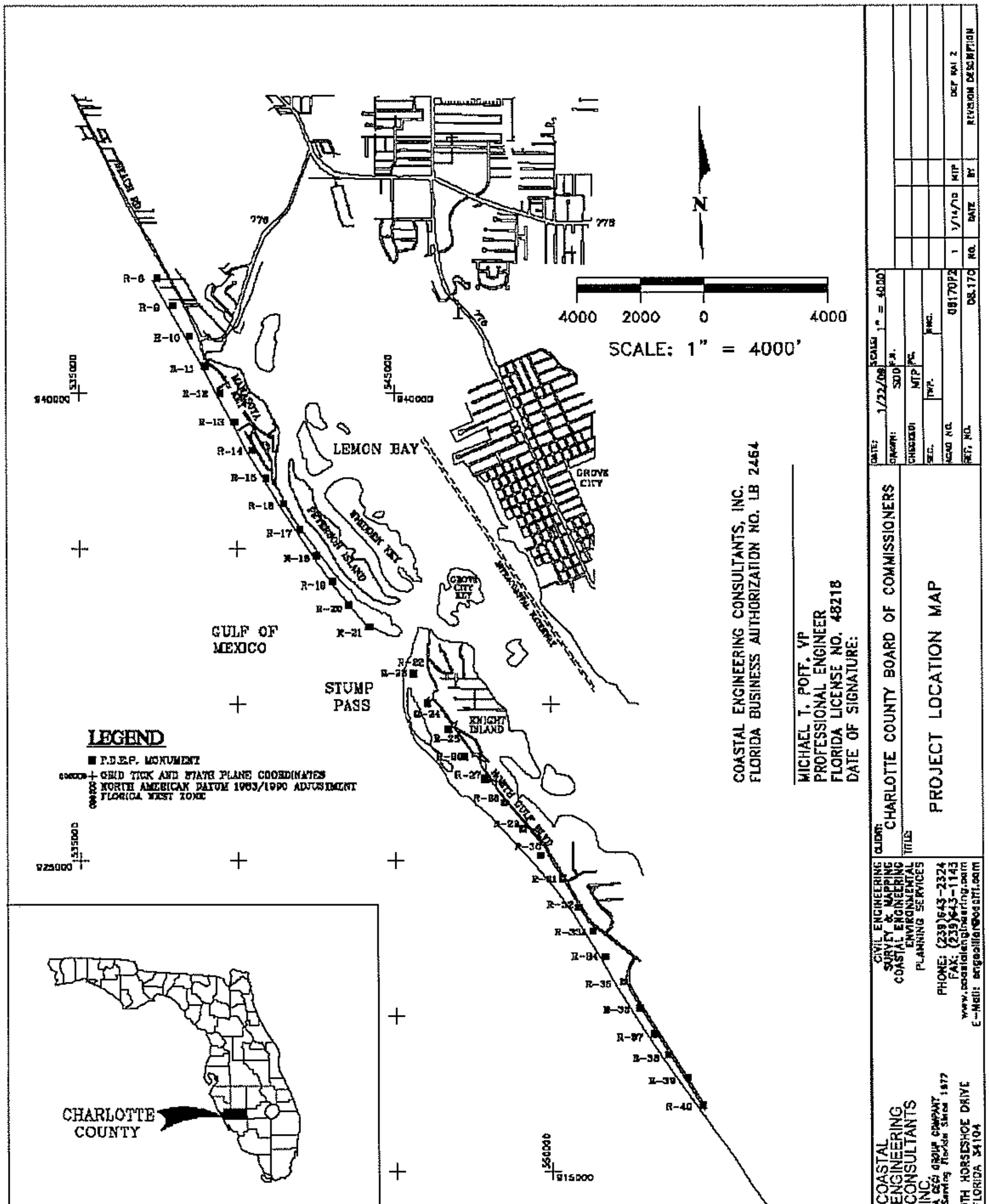

Figure 2. Location of the proposed sand placement project along 3.5 miles of shoreline in Charlotte County, Florida.

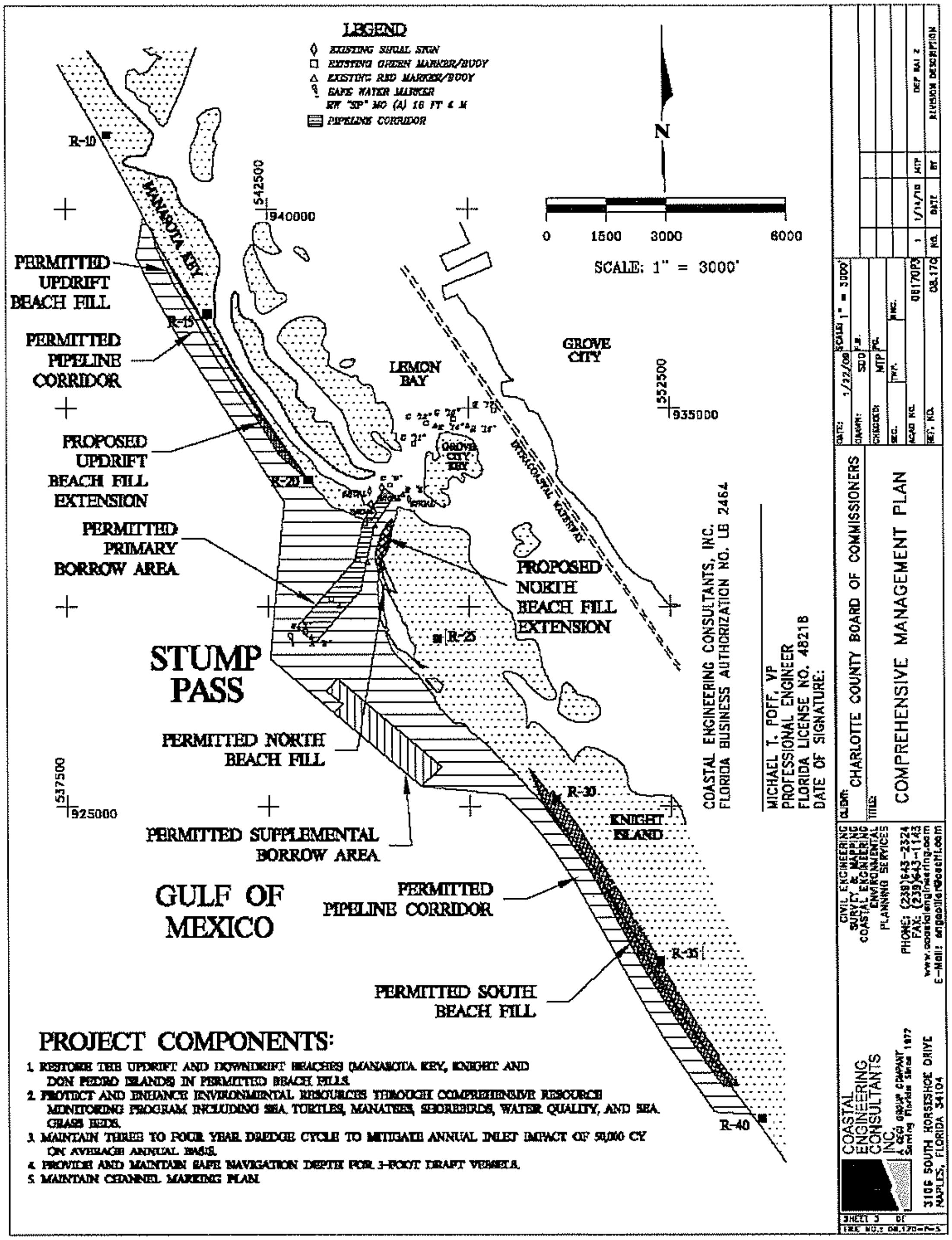

Figure 3. Location of the proposed fill template, pipeline corridors, and borrow areas in Charlotte County, Florida.

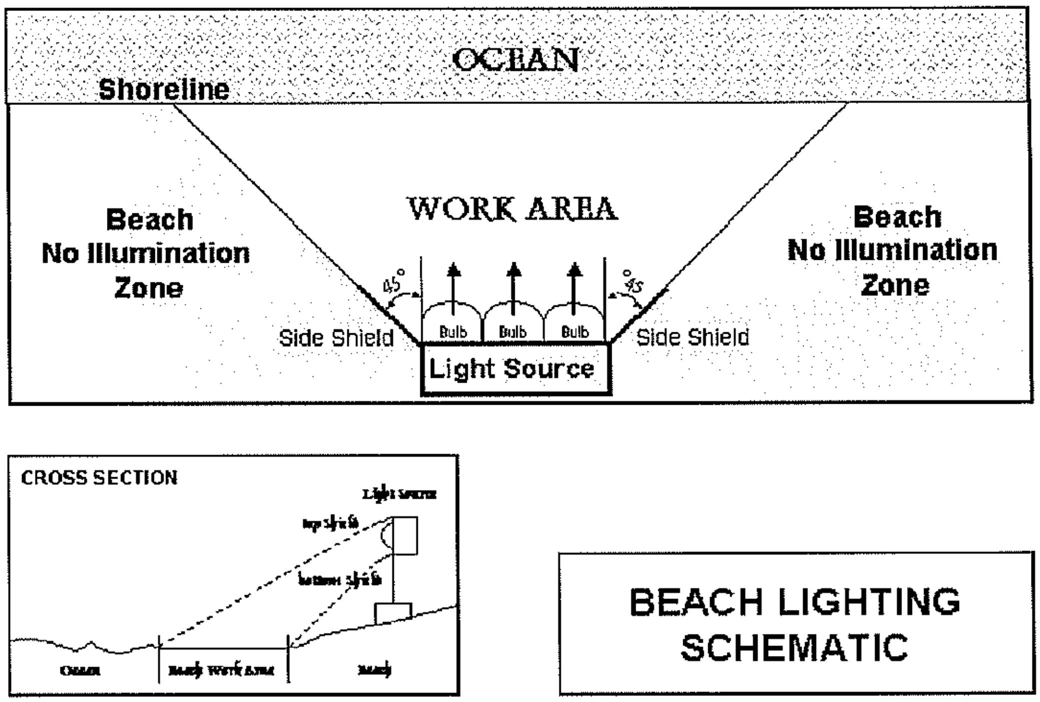

Figure 4. Beach lighting schematic.