United States Department of the Interior

FISH AND WILDLIFE SERVICE
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June 19, 2003

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Jacksonville, Florida 32207-8175

Service Log No.: 4-1-03-F-1867
Project: Fort Pierce Shoreline Protection General Reevaluation Report
Sponsor: St. Lucie County Board of County Commissioners
County: St. Lucie County

Dear Colonel May:

This document transmits the Fish and Wildlife Service's (Service) biological opinion based on our review of the General Reevaluation Report for the federally authorized Fort Pierce Shoreline Protection Project located in Fort Pierce, St. Lucie County, Florida. It describes the effects of the action on the federally listed 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 West Indian manatee (*Trichechus manatus*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (87 Stat. 884;16 U.S.C. 1531 *et seq*.).

This Biological Opinion is based on information provided in the Draft Environmental Impact Statement (EIS) for the Fort Pierce Shore Protection Project Design Document Report for Future Dredging of Capron Shoal, September 2002; Fort Pierce Shore Protection Project Design Documentation Report, Taylor Engineering, Incorporated, 2001; field investigations, meetings, email correspondence, agency websites, and telephone conversations with the U.S. Army Corps of Engineers (Corps), Taylor Engineering, Incorporated, Ecological Associates, Incorporated, Florida Department of Environmental Protection (DEP), and Florida Fish and Wildlife Conservation Commission (FWC), as well as, other sources of information. A complete administrative record of this consultation is on file in the South Florida Ecological Services Office.

CONSULTATION HISTORY

Project History

The Fort Pierce Shore Protection Project was first authorized by the River and Harbor Act of 1965 (79 Stat.1089, 1092). This authorization provided for the placement of dredged material along 1.3 miles of shoreline south of the Fort Pierce Inlet and for periodic nourishment as needed for a period of 10 years following the initial construction of the project. In 1976, the authorization was extended to 50 years under the Water Resources Development Act (WRDA) of 1976.

Since 1971, the project area has been periodically nourished with material obtained from offshore borrow areas and maintenance dredging activities within the Fort Pierce Inlet, which is a Federal channel. Significant renourishment events have occurred in 1980, 1995, 1999, and April 2003. Despite periodic renourishment, geotextile tube placement, and jetty alterations, the shoreline within the project area has continued to erode.

In an effort to improve project performance and meet the designed renourishment interval, the Corps initiated a Design Documentation Report (DDR), completed in May 2002, which evaluated engineering and cost alternatives to address the excessive erosion in the northern portion of the project (Taylor Engineering, Incorporated 2002). The report found that the most suitable design alternative was to incorporate six T-head groins and a nearshore breakwater between DEP monuments R-33.8 to R-36, in addition to sand placement.

Service Involvement

On October 30, 1990, the Service provided a biological opinion to address the possible adverse affects of the placement of fill material in an area between 1,000 and 3,000 feet south of the Fort Pierce Inlet on nesting sea turtles.

On March 16, 1992, the Service provided the Corps with a planning aid letter, which addressed the possible adverse affects of the continued authorization of the Federal project on fish and wildlife resources.

On February 10, 1994, the Service provided a comment letter to the Corps regarding the Service's review of the Corps' Reevaluation Report Section 934 Study and the Corps' Environmental Assessment (EA).

On July 7, 1997, the Corps reinitiated formal consultation regarding the possible adverse affects to nesting sea turtles as a result of renourishment within the authorized 1.3-mile project footprint and the proposed extension of the project by 1 mile as identified in the Fort Pierce Shore Protection Project, Draft General Re-Evaluation Report (GRR) and Environmental Assessment.

In October 1997, the Service provided a Final Fish and Wildlife Coordination Act (FWCA) Report to the Corps regarding the Fort Pierce Shore Protection Project GRR and EA.

On October 9, 1997, the Service provided a biological opinion for sea turtles, Service Log Number 4-1-91-F-212, to the Corps regarding the Fort Pierce Shore Protection Project GRR and EA. However after the 1999 renourishment and the passage of two tropical weather systems, most of material placed south of the Fort Pierce Inlet migrated south and into the proposed 1-mile expansion area. As a result, the berm width in this area has remained stable and nourishment in this area has not been necessary.

In September 2002, the Corps released the Draft EIS for Future Dredging of Capron Shoal for the Fort Pierce Shore Protection Project, which addressed the affects of dredging on bryozoans in Capron Shoal. This assessment was provided in accordance with the settlement agreement related to the 1999 lawsuit, Judith Winston, *et al.*, versus Lieutenant General Joseph Ballard, Docket No. CA 99-0533.

In October 2002, the United States Department of Interior, Office of Environmental Policy and Compliance, provided comments to the Corps regarding the Draft EIS for Future Dredging of Capron Shoal for the Fort Pierce Shore Protection Project.

On October 8, 2002, the Service received a proposed Scope of Work from the Corps regarding the preparation of a FWCA report for the proposed modification of the authorized project to include the construction of erosion control structures, as proposed in the Fort Pierce Shoreline Protection Project GRR currently in preparation by the Corps.

In addition, the Corps requested concurrence on a "may affect" determination for the manatee and initiation of formal consultation for the proposed action. In addition, the Corps determined that construction of the proposed structures "may affect" the federally listed threatened loggerhead sea turtle, endangered green sea turtle endangered hawksbill sea turtle, and endangered leatherback sea turtle.

On February 21, 2003, the Service provided a letter to the Corps requesting additional information and consideration of design modifications regarding the proposed erosion control structures.

On April 1, 2003, the Corps and Taylor Engineering, Incorporated, met with the Service to discuss our concerns, as identified in the February 21, 2003, letter. Specifically, the Service requested that the following modifications be considered to reduce possible adverse affects to nesting and hatchling sea turtles: (1) a reduction in the number of structures, (2) submersion of the emergent and shore-parallel portion of the T-head, and (3) inclusion of a weir or notch at the stem and head intersection to minimize hatchling entrapment behind the T-head at that point.

The Corps stated that a reduction in the number of structures and submersion of the T-heads were not feasible, based on the result of the DDR. However, Taylor Engineering stated that the weir may be possible and an analysis would be conducted to determine if the modification would result in a reduction of project performance or significantly increase project costs.

In addition, the Service expressed concern regarding the potential downdrift affects of the structures on adjacent sea turtle nesting beaches since the extent of the potential erosional affects downdrift and outside of the project boundaries were not evaluated in the DDR. The Corps stated that post-project monitoring will include an element to identify areas of increased erosion within the authorized project boundaries.

On May 1, 2003, the Service concurred with the Corps' determination of "may affect" for the manatee and provided our biological opinion. In addition, the Service concurred with the Corps' "may affect" determination for the sea turtles identified above and the Service stated that we would provide a separate biological opinion to address the possible adverse affects of the action on nesting and hatchling sea turtles.

BIOLOGICAL OPINION

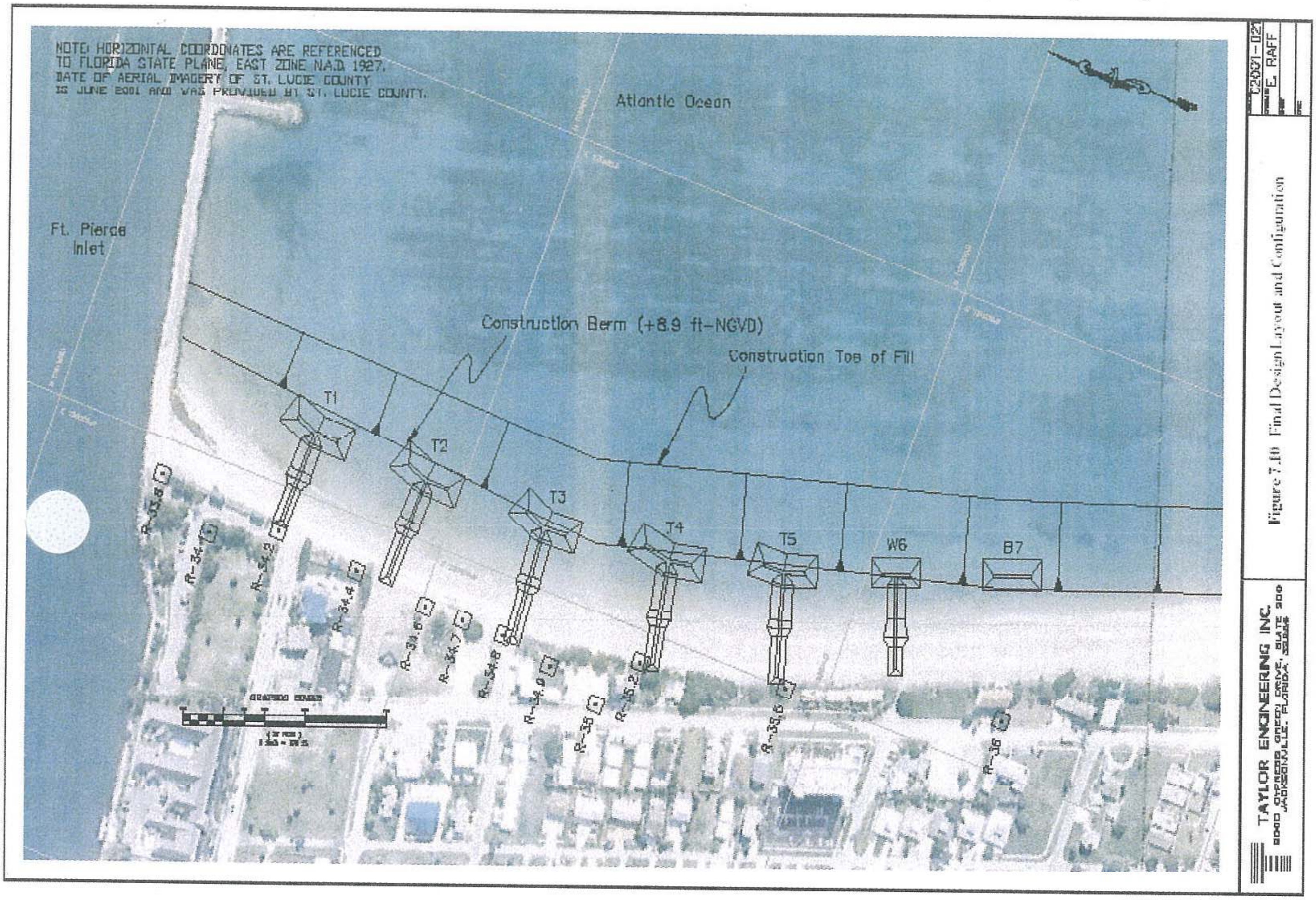
DESCRIPTION OF THE PROPOSED ACTION

The Corps proposes to place approximately 1,250,000 cubic yards (cy) of material along 1.3 miles of Hutchinson Island shoreline located immediately south of the Fort Pierce Inlet. The proposed design includes a 50 to 120-foot berm extension between DEP monuments R-33.8 to T-41 terminating at Surfside Park. This translates to an average post-nourishment sandy beach width of approximately 200 feet. The design template provides for a berm elevation of +10 feet mean low water (MLW). Post-construction profiles are to be 1V:10H from the berm crest out to MLW, and then 1V:20H out to the intersection with the existing bottom profile. The material will be obtained by a hopper dredge from the Capron Shoal borrow area located approximately 3 miles southeast of the project site (Attachment A). Geotechnical investigations of the Capron Shoal borrow area indicate that the mean grain size is 0.485 millimeters (mm) with a silt and clay content ranging from 1.16 to 3.48 percent. The mean grain size of the existing beach is 0.11 mm with a silt content ranging from 0 to 18 percent, with a mean value of 5 percent (Corps 2002). A 4-year renourishment interval is anticipated.

In addition to nourishment, the Corps proposes to construct six T-head groins and one nearshore breakwater on the northern 2,200 feet of the project area between DEP monuments R-33.8 and R-36 to address the erosional hot spot located immediately south of the Fort Pierce Inlet. The sequence of construction includes the advance placement of 600,000 cy of material followed by excavation and installation of the erosion control structures the following year. Groin stem length is proposed to range from 225 feet to 269 feet. T-head length is proposed to range from 78 feet to 130 feet. The T-heads of the groins will be parallel to the shoreline and maintain a crest elevation of +2 National Geodetic Vertical Datum (NGVD) above mean highwater (MHW).

Likewise, the 100 foot-long breakwater will be oriented parallel to the shoreline and remain emergent at high tide (Figure 1). All structures will include an armor stone layer of granite stones weighing between 4.5 and 7.5 tons, marine mattress bedding, a sheet pile core, and filter fabric.

Figure 1. Erosion control structure configuration and design layout (Taylor Engineering 2002).



The footprints of each of the seven erosion control structures will lie landward of the proposed beach equilibrium toe-of-fill. Specifically, the structures are designed to be entirely buried by sand during each renourishment event. However, as material moves downdrift of the project area, the erosion control structures will become exposed over-time. By year 2 of the 4-year renourishment cycle, the T-groin stem and shore-parallel portions of the erosion control structures will likely become completely exposed (Figure 2).

Figure 2. Final erosion control structure design and post project structure induced MHW (Taylor Engineering 2002).

Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. The Service has determined that the action area for this project includes the shoreline from R-33.8 to R-41.

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

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

Leatherback Sea Turtle

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

The leatherback regularly nests in the U.S. in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic Coast of Florida as far north as Georgia (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). Leatherback turtles have been known to nest in Georgia, South Carolina, and North Carolina, but only on rare occasions (Murphy 1996, Winn 1996, Boettcher 1998). Leatherback nesting also has been reported on the northwest coast of Florida (LeBuff 1990; Florida Department of Environmental Protection, unpublished data); a false crawl (non-nesting 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.

Hawksbill Sea Turtle

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

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

Life history

Loggerhead Sea Turtle

Loggerheads are known to nest from one to seven times within a nesting season (Talbert *et al.* 1980, Richardson and Richardson 1982, Lenarz *et al.* 1981, among others); 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 along the southeastern U.S. coast (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). 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 about 3.3. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997). Mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years. Usually 2, 3, 4, or more years intervene between breeding seasons (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Leatherback Sea Turtle

Leatherbacks nest an average of 5 to 7 times within a nesting season, with an observed maximum of 11 (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). The interval between nesting events within a season is about 9 to 10 days. Clutch size averages 101 eggs on Hutchinson Island, Florida (Martin 1992). Nesting migration intervals of 2 to 3 years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in 6 to 10 years (Zug and Parham 1996).

Hawksbill Sea Turtle

Hawksbills nest on average about 4.5 times per season at intervals of approximately 14 days. In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1993). On the basis of limited information, nesting migration intervals of 2 to 3 years appear to predominate. Hawksbills are recruited into the reef environment at about 14 inches in length and are believed to begin breeding about 30 years later. However, the time required to reach 14 inches in length is unknown and growth rates vary geographically. As a result, actual age at sexual maturity is not known.

Population dynamics

Loggerhead Sea Turtle

Total estimated nesting in the Southeast is approximately 50,000 to 70,000 nests per year (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). In 1998, there were over 80,000 nests in Florida alone. From a global perspective, the southeastern U.S. nesting aggregation is of paramount importance to the survival of the species and is second in size only to that which nests on islands in the Arabian Sea off Oman (Ross 1982, Ehrhart 1989, National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). The status of the Oman colony has not been evaluated recently, but its location in a part of the world that is vulnerable to disruptive events (*e.g.*, political upheavals, wars, catastrophic oil spills) is cause for considerable concern (Meylan *et al.* 1995). The loggerhead nesting aggregations in Oman, the southeastern U.S., and Australia account for about 88 percent of nesting worldwide (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). About 80 percent of loggerhead nesting in the southeastern U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties) (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b).

Green Sea Turtle

About 200 to 1,100 females are estimated to nest on beaches in the continental U.S. 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. Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting aggregation in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season. In the Indian Ocean, major nesting beaches occur in Oman where 6,000 to 20,000 females are reported to nest annually.

Leatherback Sea Turtle

Recent estimates of global nesting populations indicate 26,000 to 43,000 nesting females annually (Spotila *et al.* 1996). The largest nesting populations at present occur in the western Atlantic in French Guiana (4,500 to 7,500 females nesting per year) and Colombia (estimated several thousand nests annually), and in the western Pacific in West Papua (formerly Irian Jaya) and Indonesia (about 600 to 650 females nesting per year). In the U.S., small nesting populations occur on the Florida east coast (35 females per year), Sandy Point, U.S. Virgin Islands (50 to 100 females per year), and Puerto Rico (30 to 90 females per year).

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). Mexico is now the most important region for hawksbills in the Caribbean with 3,000 to 4,500 nests per year. 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 100 to 350 nests per year are laid on Mona Island, Puerto Rico, and 60 to 120 nests per year 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.

Status and distribution

Loggerhead Sea Turtle

Genetic research involving analysis of mitochondrial DNA has identified five different loggerhead nesting subpopulations in the western North Atlantic: (1) 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 1994, 1995; Bowen *et al.* 1993; Encalada *et al.* 1998). These data indicate that gene flow between these 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 1970's, but most of that decline occurred prior to 1979. No significant trend has been detected in recent years (Turtle Expert Working Group 1998, 2000). Adult loggerheads of the South Florida Subpopulation have shown significant increases over the last 25 years, indicating that the population is recovering, although a trend could not be detected from the State of Florida's Index Nesting Beach Survey program from 1989 to 1998. Nesting surveys in the Dry Tortugas, Northwest Florida, and Yucatán Subpopulations have been too irregular to date to allow for a meaningful trend analysis (National Marine Fisheries Service Southeast Fisheries Science Center 2001, 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 non-native 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 200 to 1,100 females nesting annually. Populations in Surinam, 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 non-native 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 two decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (65 percent of worldwide population), is now less than 1 percent of its estimated size in 1980. Spotila *et al.* (1996) recently estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200 and an upper limit of about 42,900. This is less than one-third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. The largest population is in the western Atlantic. Using an age-based demographic model, Spotila *et al.* (1996) determined that leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and that even the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded that leatherbacks are on the road to extinction and further population declines can be expected unless 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 non-native 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 that 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 of all marine ecosystem types.

Analysis of the species/critical habitat likely to be affected

Suitable habitat is present for the loggerhead, green, leatherback, and hawksbill sea turtle species, which are known to occur within and adjacent to the proposed project location. FWC's statewide sea turtle nesting data indicate that the loggerhead, green, leatherback, and hawksbill sea turtles nest in St. Lucie County, but the loggerhead, green sea, and leatherback turtles are the most common. Though the Kemp's ridley (*Lepidochelys kempii*) may occur Florida waters, only seven nests have been documented in the State of Florida from 1979 through 1999 (FWC, Statewide Nesting, unpublished data). The nests were found in Volusia, Pinellas, Sarasota, and Lee counties in the months of May and June. While it is likely that Kemp's ridleys utilize the nearshore Atlantic waters of St. Lucie County, there have been no documented nests in St. Lucie County (Meylan *et al.* 1995, FWC, Statewide Nesting, unpublished data). Critical habitat has not been designated in the continental U.S. for sea turtles; therefore, the proposed action would not result in an adverse modification.

ENVIRONMENTAL BASELINE

Status of the species/critical habitat within the action area

The sea turtle nesting activity on Florida's southeast Atlantic Coast (Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, and Miami-Dade counties) is considered the epicenter of sea turtle nesting (Addison *et al.* 2000). Approximately 90 percent of the total nesting activity on Florida's beaches occurs on the southeast coast (Addison *et al.* 2000). The St. Lucie County shoreline supports the third greatest number of nesting turtles in southeast Florida (FWC, Statewide Nesting, unpublished data).

Sea turtle survey data collected from 1999 to 2001 indicate that sea turtles have not nested within approximately 900 feet south of Fort Pierce Inlet between R-33.8 and 34.9. During the 2002 nesting season, only two nests were deposited between R-35 and R-36, which includes the proposed erosion control structure field. Nesting density generally increases south of R-36 (Martin, personal communication 2003). However, there is a general decline in the nesting success and density after the 1999 renourishment event throughout the project area, which may be attributed to the high rate of erosion in the area.

Table1: Sea Turtle Nesting Summary from 1999 to 2001, south of Fort Pierce Inlet to R-41, St. Lucie County (Ernest and Martin 2001).

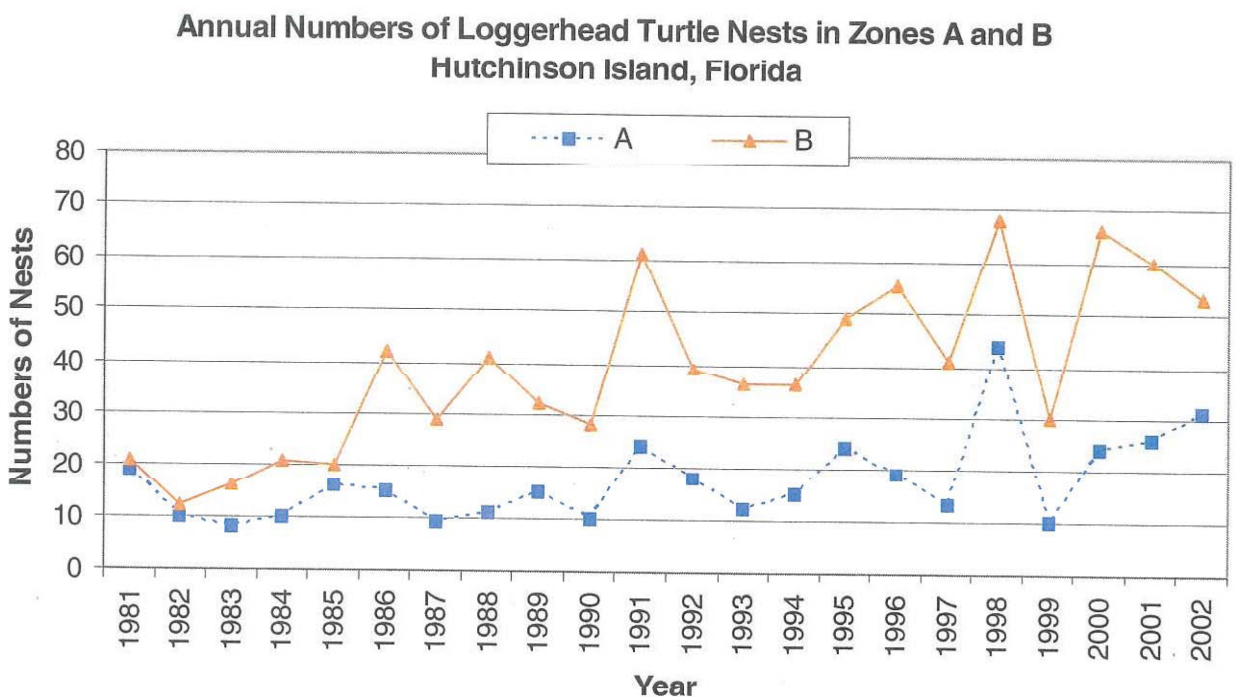
Year	Loggerhead nests	Loggerhead False-crawls	Nests lost to erosion	Green nests	Green False-crawls	Nest lost to erosion	Leatherback nests	Leather-back false-crawls	Nests lost to erosion
2001	98	142	20	0	3	**0**	1	1	**0**
2000	98	95	14	1	3	**0**	0	0	**0**
1999	50	78	12	0	0	**0**	2	1	**1**
Total	**246**	**315**	**46**	**1**	**6**	**0**	**3**	**2**	**1**
Total Emergence	**561**		**n/a**	**7**		**n/a**	**5**		**n/a**

Table 2: Sea turtle nesting success of marked nests from 1999 to 2001 within the project area from Fort Pierce Inlet south to R-41 (Ernest and Martin 2001).

Year	Loggerhead Sea Turtles				Green Sea Turtles				Leatherback Sea Turtles			
	Total Emergence	No. Nests Marked	No. Hatch	Nest success %	Total Emergence	No. Nest Marked	No. Hatch	Nest Success %	Total Emergence	No. Nests	No. Hatch	Nest Success %
2001	192	50	26	26.4	3	0	0	0	2	1	1	50
2000	193	98	79	50.3	4	1	0	25	0	0	0	0
1999	176	98	76	55.7	0	0	0	0	3	2	1	66.7
Total	561	246	181	44%	7	1	0	25%	5	3	2	58%

Loggerhead Sea Turtle

The loggerhead sea turtle nesting and hatching season for southern Florida Atlantic beaches (includes Brevard through Dade counties) extends from March 15 through November 30. Incubation ranges from about 45 to 95 days. Since 1981, the shoreline located south of Fort Pierce Inlet has been surveyed annually for sea turtle nesting activity, as shown in the graph below. These data provided by Ecological Associates, Incorporated, indicate that loggerhead nesting density is significantly lower in the northern portion of the survey area (near the Fort Pierce Inlet) as compared to beaches located in the southern and less developed portions of the county (Ernest and Martin 2001). Zone A includes the shoreline of the northern survey area, which includes the project footprint. Zone B includes the shoreline in southern St. Lucie County.



The loggerhead sea turtle is the most abundant sea turtle species nesting in St. Lucie County. The mean number of loggerhead sea turtles that nested in the 1.3 miles in the project area from 1999-2001 was 82 and ranged from 50 to 98 (Table 1). Loggerhead sea turtle nesting success during the same period averaged 44 percent (Table 2).

A daily sea turtle activity survey was conducted during 1999 to 2001 along 1.3 miles of the project area between R-33.8 and R-41 by the Ecological Associates, Incorporated (2002). Loggerhead sea turtle nests numbered from 50 to 98 and averaged 82 nests per year while false crawls numbered from 78 to 142 and averaged 105 per year (Table 1).

For the year 2001, 240 emergences of adult turtles (98 total nests, 142 false crawls) and a nesting success of 26 percent were documented for survey area within the project area. As a result of storm erosion, 20 of the nests marked were lost entirely (Tables 1 and 2).

Green Sea Turtle

The green sea turtle nesting and hatching season for southern Florida Atlantic beaches (includes Brevard through Dade counties) extends from May 1 through November 30. Incubation ranges from about 45 to 75 days.

A daily sea turtle activity survey was conducted during 1999 to 2001 along 1.3 miles of the project area between R-33.8 and R-41 by the Ecological Associates, Incorporated (2002). Green sea turtle nests numbered from 0 to 1 and averaged 0.3 nest per year while false crawls numbered from 0 to 3 and averaged 1 per year (Table 1).

For the year 2001, seven emergences of adult turtles (1 total nests, 6 false crawls) and a nesting success of 25 percent was calculated based on the number of crawls above the high tide line that resulted in nests within the project area (Tables 1 and 2).

Leatherback Sea Turtle

The leatherback sea turtle nesting and hatching season for southern Florida Atlantic beaches (includes Brevard through Miami-Dade counties) extends from February 15 through November 15. Incubation ranges from about 55 to 75 days.

A daily sea turtle activity survey was conducted during 1999 to 2001 along 1.3 miles of the project area between R-33.8 and R-41 by the Ecological Associates, Incorporated (2002). Leatherback sea turtle nests numbered from 0 to 3 and averaged one nest per year while false crawls numbered from 0 to 1 and averaged 0.3 per year (Table 1).

For the year 2001, five emergences of adult turtles (3 total nests, 2 false crawls) and a nesting success of 50 percent was calculated based on the number of crawls above the high tide line that resulted in nests within the project area (Tables 1 and 2).

Hawksbill Sea Turtle

The hawksbill sea turtle nesting and hatching season for southern Florida Atlantic beaches (includes Brevard through Miami-Dade counties) extends from June 1 through December 31. Incubation lasts about 60 days.

Although hawksbill nests have not been documented in St. Lucie County, the turtles may be found inhabiting the reefs and ledges in nearshore waters. Hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by monitoring personnel. Therefore, nesting surveys in Florida likely underestimate the actual number of hawksbill nests deposited each year (Meylan *et al.* 1995). Between the years of 1979 and 1992, only 11 hawksbill nests were reported in the State of Florida. These nests were documented in Broward, Miami-Dade, Martin, Monroe, Palm Beach, and Volusia counties (Meylan *et al.* 1995).

Nine hawksbill nests were counted in Florida from 1993 to 1999. All were in Broward, Miami-Dade, Monroe and Palm Beach counties and deposited between June and December (FWC, Statewide Nesting, unpublished data).

Factors affecting the species environment within the action area

As is the case with inlets, in general, along the east coast of Florida, the Fort Pierce Inlet interrupts the lateral nearshore transport of sand from north to south, resulting in sand deprivation south of the inlet. Shoreline change data from 1972 to 1991 indicate that materials in the 1.3-mile authorized project have been eroding at approximately 5.4 feet per year, in the south portion of the project, to approximately 9 feet per year in the northern portion of the project, immediately south of the inlet. Fort Pierce Inlet is one of the few east coast inlets that has not developed an inlet management plan to initiate annual sand by-passing to the sand starved beaches south of the inlet.

In total, approximately 1,568,483 cy of dredged material has been placed within the project area since 1970. The project area has been periodically nourished since 1971 with a total of approximately 1,184,000 cy of material from various offshore borrow areas, as well as, approximately 384,483 cy of material from maintenance dredging of the Fort Pierce Inlet. Major nourishment events occurred in 1971, 1980, 1995, 1999, and in April 2003. Sand has also been trucked in from upland sources to protect structures immediately south of the inlet, in an area of excessive erosion. Shoreline change data from 1972 to 1991 indicate that materials in the 1.3-mile authorized project have been eroding at approximately 5.4 feet per year, in the south portion of the project, to approximately 9 feet per year in the northern portion of the project, immediately south of the inlet. Geotextile fabric tubes were placed in this area in 1994 to curtail erosion, but with limited success. A spur jetty was constructed on, and perpendicular to the south jetty in 1997, to curtail erosion in this area, but with limited success.

In 2000, fall season storms caused severe erosion along a 1,000-foot beach segment immediately south of the south jetty, threatening public and private structures. As a result, the design beach was lost in less than 2 years following the 1999 nourishment. In October 2000, St. Lucie County installed rock rubble along the beach face, which was later removed and replaced with shore-parallel sand-filled geotextile fabric tubes. The State of Florida has mandated that these tubes be removed by March 15, 2005.

In addition to erosion and subsequent nest loss, beach front lighting within the project area cause hatchling disorientation, particularly in the northern portion of the project area. In August 2000, lighting surveys were conducted during the day and night to evaluate the existing lighting associated with coastal development along an approximately 2-mile portion of the beach south of the Fort Pierce Inlet (Ernest and Martin 2000). Numerous beach front lights from commercial business, private and multi-family homes, as well as, public street and parking lot lights, were found to be non-compliant with the Fort Pierce lighting ordinance, particularly in between R-34 and R-35, north of St. Lucie Boulevard. Efforts have been made to correct these problems in the past 2 years.

EFFECTS OF THE ACTION

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

Factors to be considered

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project area during the renourishment activities (short-term effects) and through the establishment of erosion control structures (long term effects).

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project area during the initial construction activities associated with the sand placement and erosion control structure construction activities. The effects of the proposed action on sea turtles will be considered further in the remaining sections of this biological opinion. Potential effects include destruction of nests deposited within the boundaries of the proposed project, harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities, disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting, behavior modification of nesting females due to encounters with exposed erosion control structures during nesting season, which may result in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs, and entrapment of hatchling sea turtles behind the exposed erosion control structures after hatching.

Analyses for effects of the action

Beneficial Effects

The placement of sand on a beach with reduced dry fore-dune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (*i.e.*, grain size, shape, color, etc.) 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, benefitting sea turtles.

Erosion control structures constructed in appropriate high erosional areas or to mitigate the effects of shoreline armoring, may benefit sea turtles in specific areas by reestablishing nesting habitat where none currently exists or is unstable. However, caution should be exercised not to automatically assume that the reestablishment of nesting habitat will wholly benefit sea turtle populations without determining the extent that emergent and shore-parallel erosion control structures may affect hatchling behavior.

Direct Effects

Placement of sand on a beach alone may not provide suitable nesting habitat for sea turtles. Although beach nourishment may increase the potential nesting area, significant negative effects to sea turtles may result if protective measures are not incorporated during project construction. Nourishment and/or erosion control structure construction 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 significantly impact the long-term survival of the species. For instance, 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. While a nest monitoring and egg relocation program or a nest mark and avoidance program would reduce these impacts, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, and/or tides) or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. 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).

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. Heavy equipment will be required to install the T-groins and breakwater structures, and this equipment will have to traverse the sandy beach to the project site, which could result in harm to nesting females, nests, and emerging hatchlings. Since a large trench will be excavated on the beach and be present during the night for some portion of the construction, a potential threat to nesting females and emerging hatchlings will exist.

Following construction, the presence of erosion control structures has the potential to adversely affect sea turtles. For instance, they may interfere with the egress and ingress of adult females at nesting sites; alter downdrift beach profiles through erosion, escarpment formation, and loss of sandy berms; trap and/or obstruct hatchlings during a critical life-history stage; increase hatchling and adult female energy expenditure in attempts to overcome the structures; and attract additional predatory fish or concentrate existing predatory fish, thereby increasing the potential of hatchling predation.

However, the seven erosion control structures are designed to be entirely buried by sand during renourishment. The Corps anticipates that the structures will become exposed over-time as sand moves downdrift of the project area. By year 2 of the 4-year renourishment cycle, the shore-parallel portion of the T-groins and breakwater will likely become completely exposed. Therefore, the potential to entrap or alter the behavior of hatchlings and nesting sea turtles is greatest during the period in which the T-groins and breakwater are exposed.

1. Nest relocation

Besides the potential for 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. Water availability 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).

Comparisons of hatching success between relocated and *in situ* nests have noted significant variation ranging from a 21 percent decrease to a 9 percent increase for relocated nests (FWC Statewide Nesting, unpublished data). Comparisons of emergence success between relocated and *in situ* nests have also noted significant variation ranging from a 23 percent decrease to a 5 percent increase for relocated nests (FWC, Statewide Nesting, unpublished data). A 1994 FWC study of hatching and emergence success of *in situ* and relocated nests at seven sites in Florida found that hatching success was lower for relocated nests in five of seven cases with an average decrease for all seven sites of 5.01 percent (range = 7.19 percent increase to 16.31 percent decrease). Emergence success was lower for relocated nests in all seven cases by an average of 11.67 percent (range = 3.6 to 23.36 percent) (Meylan 1995).

2. Missed nests

Although a nesting survey and nest marking program would reduce the potential for nests to be impacted by construction activities, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, and/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).

3. Equipment

The placement of pipelines and erosion control structure construction materials, as well as the use of heavy machinery or equipment on the beach during a construction project, may also 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.

4. Artificial lighting

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

(Philbosian 1976; Mann 1977; (FWC Coastal Lighting, unpublished data)). 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 non-project 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.

5. Entrapment/physical obstruction

The erosion control structures proposed for Fort Pierce Beach Island include the construction of six T-groins and a nearshore breakwater that are designed to remain emergent at MHW and oriented parallel to the shoreline when exposed. As such, these structures have the potential to interfere with the egress and/or ingress of adult females at nesting sites where they may proceed around the structures successfully, abort nesting for that night, or move to another section of beach to nest. This may cause an increase in energy expenditure, and, if the body of the T-groin is exposed, may act as a barrier between beach segments and also prevent nesting on the T-groin alignment.

T-groins constructed in Palm Beach County, Florida, were observed to serve as impediments to the offshore migration by hatchlings. Howard and Davis (1999) found that 13 percent of hatchlings emerging from nests laid near T-head groins encountered the groins on their trek to the ocean. However in this case, the project design for sand placement around the T-groins was not properly followed. The project was designed to have a narrower fill section in the vicinity of the groins so the shore parallel T-heads would be seaward of the high water line and hatchlings would be able to swim over them. However, the groin section received more fill than expected which caused the high water line to be further seaward than expected. As a result, hatchlings were trapped in the corner of the structure at the head and body joint intersection. This was attributed to the exposure of the T-head and body above the high water line and the presence of artificial lighting in the vicinity of the groins which caused them to disorient in the direction of the T-groins.

Typically, sea turtles emerge from the nest at night when lower sand temperatures elicit an increase in hatchling activity (Witherington *et al.* 1990). After emergence, approximately 20-120 hatchlings crawl *en masse* immediately to the surf using predominately visual cues to orient themselves (Witherington and Salmon 1992, Lohmann *et al.* 1997). Upon reaching the water, loggerhead and green turtle hatchlings orient themselves into the waves and begin a period of hyperactive swimming activity, or swim frenzy, which lasts for approximately 24 hours (Witherington 1991, Wyneken *et al.* 1990, Salmon and Wyneken 1987). The swim frenzy effectively moves the hatchling quickly away from shallow, predator rich, nearshore waters to the relative safety of deeper water (Wyneken *et al.* 2000, Gyuris 1994).

The first hour of a hatchling's life is precarious and predation is high, but threats decrease as hatchlings distance themselves from the natal beach (Stancyk 1995, Pilcher *et al.* 2000). Delays in hatchling migration (both on the beach and in the water) can cause added expenditures of energy and an increase of time spent in predator rich nearshore water.

On rare occasions hatchlings will encounter natural nearshore features that are similar to the emergent shore-parallel structures proposed for this project. However, observations of hatchling behavior during an encounter with a sand bar at low tide, a natural shore-parallel barrier, showed the hatchlings maintained their shore-perpendicular path seaward, by crawling over the sand bar versus deviating from this path to swim parallel around the sand bar through the trough, an easier alternative (Witherington, personal communication 2001). Therefore, the T-groins and breakwater may adversely effect sea turtle hatchlings by serving as a barrier or obstruction to sea turtle hatchlings delaying offshore migration; depleting or increasing expenditure of the "swim frenzy" energy critical to reach the relative safety of offshore development areas; and possibly entrapping hatchlings within the crevices of the structures or within eddies or other associated currents.

6. Predator concentration

The presence of T-groins and breakwaters has the potential to attract and concentrate predatory fishes and provide perching spots for predatory birds, resulting in higher probabilities of hatchling predation as hatchlings enter the ocean and attempt to reach offshore developmental habitat. In addition, colonization of the structures by epibenthic macroalgae, invertebrates, and other organisms will change over time and will likely result in changes of fish assemblages as the structures mature and may continue to concentrate predators in the future.

It is known that hatchling predation in nearshore waters is high (Stancyk 1995, Wyneken and Salmon 1996, Gyuris 1994). There are many documented occurrences of nearshore predators captured with hatchlings found in their digestive tracts. During hatchling predation studies in Broward County, Florida, it was documented that predatory fish species, such as tarpon and snappers (*Lutjanus sp.*), targeted sea turtle hatchlings and "learned" where to concentrate foraging efforts (Wyneken *et al.*1998). Therefore, a delay in the offshore migration can cause increased predation of sea turtle hatchlings (Glenn 1998, Gyuris 1994, Witherington and Salmon 1992).

Indirect Effects

Many of the direct effects of beach nourishment may persist over time and become indirect impacts. These indirect effects include increased susceptibility of relocated nests to catastrophic events, the formation of escarpments, and future sand migration.

1. Increased susceptibility to catastrophic events

Nest relocation may concentrate eggs in an area making them more susceptible to catastrophic events. Hatchlings released from concentrated areas also may 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).

2. 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 beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (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 1990a), and can also result in greater adverse effects due to artificial lighting, as discussed above. Any new development or redevelopment should be reviewed for opportunities to reduce artificial light affects to the nesting beaches.

3. Changes in the physical environment

Beach nourishment may result in changes in sand density or compaction, beach shear resistance or 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 beach nourishment activities could negatively impact sea turtles regardless of the timing of projects. Very fine sand and/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 (*i.e.*, false crawls occurred more frequently) 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 1988c). Nelson and Dickerson (1988b) 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 by 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 (1988c) showed that a tilled nourished beach will remain uncompacted for up to 1 year. Therefore, the Service requires multi-year beach compaction monitoring and, if necessary, tilling to ensure that 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. Natural reworking of sediments and bleaching from exposure to the sun would help to lighten dark nourishment sediments; however, the time-frame for sediment mixing and bleaching to occur could be critical to a successful sea turtle nesting season.

The Corps states that the beach fill material to be excavated from the proposed borrow area is expected to maintain the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system.

4. Escarpment formation

On nourished beaches, steep escarpments may develop along their water line interface as they adjust from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984, Nelson *et al.* 1987). In addition, escarpments may develop on the crenulate beaches located between groins as the beaches equilibrate to their final positions. 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 the 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.

5. Downdrift erosion related to erosion control structures

Erosion control structures (*e.g.*, terminal groins,T-head groins, and breakwaters), in conjunction with beach nourishment, can help stabilize U.S. East Coast barrier island beaches (Leonard *et al.* 1990). However, groins and breakwaters often result in accelerated beach erosion downdrift of the structures (Komar 1983, National Research Council 1990b) and corresponding degradation of suitable sea turtle nesting habitat (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a, 1991b, 1992). Impacts first are noted and greatest changes are observed close to the structures, but effects eventually may extend great distances along the coast (Komar 1983). Beach nourishment only partly alleviates impacts of groin construction on downdrift beaches (Komar 1983).

Terminal groins operate by blocking the natural littoral drift of sand (Kaufman and Pilkey 1979, Komar 1983). Once sand fills the updrift groin area, some littoral drift and sand deposition on adjacent downdrift beaches occurs due to spillover. But, groins often force the river of sand into deeper offshore water, and sand that previously would have been deposited on downdrift beaches is lost from the system (Kaufman and Pilkey 1979). Conventional terminal rubble mound groins control erosion by trapping sand and dissipating some wave energy. In general, terminal groins are not considered a favorable erosion control alternative because they usually impart stability to the updrift beach and transfer erosion to the downdrift side of the structure. Additionally, they deflect longshore currents offshore, and excess sand built up on the updrift side of the structure may be carried offshore by those currents. This aggravates downdrift erosion and erosion escarpments are common on the downdrift side of terminal groins (Humiston 2001).

Likewise, conventional T-groins function in a manner similar to a regular conventional groin, except that the shore parallel section adds a breakwater-like feature which dissipates more wave energy than a shore-perpendicular groin. A conventional T-groin consists of a terminal groin with a shore parallel section connected to the seaward end. However, the conventional T-head groin may also act as a barrier to littoral transport and result in adverse downdrift impacts (Humiston 2001).

Breakwaters are designed to attenuate wave energy which reduces the primary cause of erosion. Additionally, breakwaters modify wave patterns through diffraction. The combination of these factors on wave energy modifies the local littoral transport rates and may result in the accumulation of sand and minimization of erosion along the shoreline behind the breakwater. When properly designed, the shoreline forms a salient (sand accumulating prominently behind, but does not connect to the breakwater) which achieves a state of equilibrium, and once equilibrium is achieved, sand transport past the structure resumes thereby minimizing the potential of adverse downdrift effects. (Humiston 2001). The segmentation of the proposed segmented breakwater is designed to minimize this effect.

However, breakwaters may adversely affect the adjacent shoreline if they are not properly designed. They may form a tombolo, which is defined as prominent sand accumulation behind and connected to the breakwater. This creates a situation where the breakwater acts as a headland (a prominent land feature) rather than an offshore feature. The breakwater functions as a barrier to the longshore transport of material in a manner similar to a conventional terminal groin, resulting in offshore sand movement and downdrift erosion. Therefore, erosion may increase downdrift of the structure thus compromising suitable sea turtle nesting habitat.

6. Erosion control structure breakdown

If the structures fail and break apart, debris may spread upon the beach, which may further impede nesting females from accessing suitable nesting sites (resulting in a higher incidence of false crawls) and trap hatchlings and nesting turtles (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a, 1991b).

Species' response to the proposed action

Ernest and Martin (1999) conducted a comprehensive study to assess the effects of beach nourishment on loggerhead sea turtle 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 non-nourished) 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, frequency and extent of escarpments). During the first post-construction 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 post-construction year, digging times returned to background levels.

During the first post-construction year, nests on the nourished beaches were deposited significantly farther from both the toe of the dune and the tide line than nests on control beaches. Furthermore, nests were distributed throughout all available habitat and were not clustered near the dune as they were in the control. As the width of nourished beaches decreased in successive years, among-treatment differences in nest placement also decreased. 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 post-construction 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 beach nourishment projects, Ernest and Martin (1999) found that 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 indicate that 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 construction activities related to the proposed project. Generally, these adverse effects are limited to the first year after construction. However, the Service believes there is a potential for long-term adverse effects on sea turtles, particularly hatchlings, as a result of the introduction of the permanent shore-parallel, erosion control structures. However, the Service acknowledges the potential benefits of the erosion control structures since they may minimize the effects of erosion on sea turtle nesting habitat and extend the renourishment interval. 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 ESA.

CONCLUSION

After reviewing the current status of the loggerhead, green, leatherback, and hawksbill sea turtles, the environmental baseline for the action area, the effects of the proposed beach nourishment, and the cumulative effects, it is the Service's biological opinion that the beach nourishment project, as proposed, is not likely to jeopardize the continued existence of these sea turtles. No critical habitat has been designated for the loggerhead, green, leatherback, and hawksbill sea turtles in the continental U.S.; therefore, none will be affected.

The proposed project will affect1.3 miles during sand placement and erosion control structure construction of the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern U.S. Research has shown that the principal effect of beach nourishment on sea turtle reproduction is a reduction in nesting success, and this reduction is most often limited to the first year following the initial sand placement and subsequent renourishment events. Research has also 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. However, long-term adverse effects to adult and hatchling sea turtles are anticipated as a result of the erosion control structures. The principle long-term effects of the permanent placement of the structures are expected to affect hatchling success within the 2,200 feet of the erosion control structure field for the duration of the structures' existence. Although a variety of factors, including some that cannot be controlled, can influence how a beach renourishment and/or erosion control structure construction project will perform from an engineering perspective, measures can be implemented to minimize adverse impacts to sea turtles.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA 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 ESA 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 that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The 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 require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the 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

The Service anticipates that 1.3 miles during sand placement and 2,200 feet during erosion control structure construction of nesting beach habitat could be taken as a result of the proposed action. The take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and marking program within the boundaries of the proposed project; (2) destruction of all nests deposited during the period when a nest survey and marking 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 and/or erosion control structure presence; (5) behavior modification of nesting females or hatchlings due to the presence of the erosion control structures, which may act as barriers to movement; (6) behavior modification of nesting females if they dig into shallowly buried T-groins, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; (7) misdirection of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (8) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (9) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

Incidental take is anticipated for the 1.3 miles and/or 2,200 feet of beach that has been identified for sand placement and/or erosion control structure construction. The Service anticipates incidental take of sea turtles will be difficult to detect for the following reasons: (1) the turtles nest primarily at night and all nests are not found because [a] natural factors, such as rainfall, wind, and tides may obscure crawls and [b] human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program; (2) the total number of hatchlings per undiscovered nest is unknown; (3) the reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown; (4) an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area; (5) lights may misdirect an unknown number of hatchlings and cause death; (6) escarpments may form and cause an unknown number of females from accessing a suitable nesting site; (7) erosion control structures may obstruct or entrap an unknown number of adult and hatchling sea turtles during ingress or egress at nesting sites; and (8) an unknown number of hatchlings may be predated as a result of obstruction and/or increased predators at erosion control structures. However, the level of take of these species can be anticipated by the disturbance of project construction on suitable turtle nesting beach habitat because: (1) turtles nest within the project site; (2) project construction will likely occur during a portion of the nesting season; (3) erosion control structures will modify beach profile and width and may increase the presence of escarpments; (4) beach renourishment will modify the incubation substrate, beach slope, and sand compaction; and (5) artificial lighting will deter and/or misdirect nesting females and hatchlings.

The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more the placement of sand more than once on the 1.3 miles of beach proposed for construction. 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

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species. Critical habitat has not been designated in the project area; therefore, the project will not result in destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerhead, green, leatherback, and hawksbill sea turtles.

1. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence must be used on the project site.

2. Beach nourishment and/or erosion control structure construction activities must not occur from May 1 through October 31, the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial, crushing of eggs, and nest excavation.

3. If the beach nourishment and/or erosion control structure construction will be conducted during the period from March 1 through April 30, surveys for early nesting sea turtles must be conducted. If nests are constructed in the area of beach nourishment, the eggs must be relocated.

4. If the beach nourishment project or erosion control structure construction will be conducted during the period from November 1 through November 30, surveys for late nesting sea turtles must be conducted. If nests are constructed in the area of beach nourishment, the eggs must be relocated.

5. Immediately after completion of the beach nourishment and/or erosion control structure construction and prior to the next three nesting seasons, beach compaction must be monitored and tilling must be conducted as required by March 1 to reduce the likelihood of impacting sea turtle nesting and hatching activities. The March 1 deadline is required to reduce impacts to leatherbacks that nest in greater frequency along the south Atlantic Coast of Florida than elsewhere in the continental United States.

6. Immediately after completion of the beach nourishment and/or erosion control structure construction project and prior to the next three nesting seasons, 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.

7. The applicant must ensure that contractors doing the beach nourishment work fully understand the sea turtle protection measures detailed in this incidental take statement.

8. During the early and late portions of the nesting season, construction equipment and pipes must be stored in a manner that will minimize impacts to sea turtles to the maximum extent practicable.

9. During the early and late portions of the nesting season, lighting associated with the project must be minimized to reduce the possibility of disrupting and misdirecting nesting and/or hatchling sea turtles.

10. During the sea turtle nesting season from March 1 to April 30, groin construction activities must not be conducted at night.

11. Include observations of hatchling disorientation and hatchling entrapment as a parameter during the post-project sea turtle nesting survey.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. In accordance with the 2001 rule change under subsection 62B-41.007, Florida Administrative Code of the Florida Statutes, 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 and grain size distribution (sand grain frequency, mean and median grain size, and sorting coefficient) to the material in the existing coastal system at the disposal site and shall not contain:

a. greater than 5 percent, by weight, silt, clay, or colloids passing the #230 sieve;
b. greater than 5 percent, by weight, fine gravel retained on the #4 sieve;
c. coarse gravel, cobbles, or material retained on the 3/4 inch sieve in a percentage or size greater than found on the native beach;
d. construction debris, toxic material, or other foreign matter; and
e. material that results in cementation of the beach.

These standards must not be exceeded in any 1000 square foot section, extending through the depth of the renourished beach. If the natural beach exceeds any of the limiting parameters listed above, then the fill material must not exceed the naturally occurring level for that parameter.

2. Beach nourishment and/or erosion control structure construction must be started after October 31 and be completed before May 1. During the May 1 through October 31 period, no construction equipment or pipes will be stored on the beach.

3. If the beach nourishment and/or erosion control structure construction will be conducted during the period from March 1 through April 30, daily early morning surveys for sea turtle nests must be conducted from March 1 through April 30 or until completion of the project (whichever is earliest), and eggs must be relocated per the following requirements.

3a. 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. Surveys must be performed in such a manner as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

3b. Only those nests that may be affected by construction activities will be relocated. Nests requiring relocation must be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with construction activities must cease when construction activities no longer threaten nests. Nests deposited within areas where construction activities have ceased or will not occur for 65 days must be marked and left in place unless other factors threaten the success of the nest. Any nests left in the active construction zone must be clearly marked, and all mechanical equipment must avoid nests by at least 10 feet.

4. If the beach nourishment and/or erosion control structure construction will be conducted during the period from November 1 through November 30, daily early morning sea turtle nesting surveys must be conducted 65 days prior to project initiation and continue through September 30, and eggs must be relocated per the preceding requirements.

5. Immediately after completion of the beach nourishment and/or erosion control structure construction and prior to March 1 for 3 subsequent years, sand compaction must be monitored in the area of restoration in accordance with a protocol agreed to by the Service, the State regulatory agency, and the applicant. At a minimum, the protocol provided under 5a and 5b below must be followed. If required, the area must be tilled to a depth of 36 inches. All tilling activity must be completed prior to March 1. An annual summary of compaction surveys and the actions taken must be submitted to the Service. (NOTE: The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post-construction compaction levels. Also, out-year compaction monitoring and remediation are not required if placed material no longer remains on the beach.)

5a. Compaction sampling stations must be located at 500-foot intervals along the project area. One station must be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station must be midway between the dune line and the high water line (normal wrack line).

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 lay over less compact layers. Replicates will be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth 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 6 averaged compaction values.

5b. 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 March 1. 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.

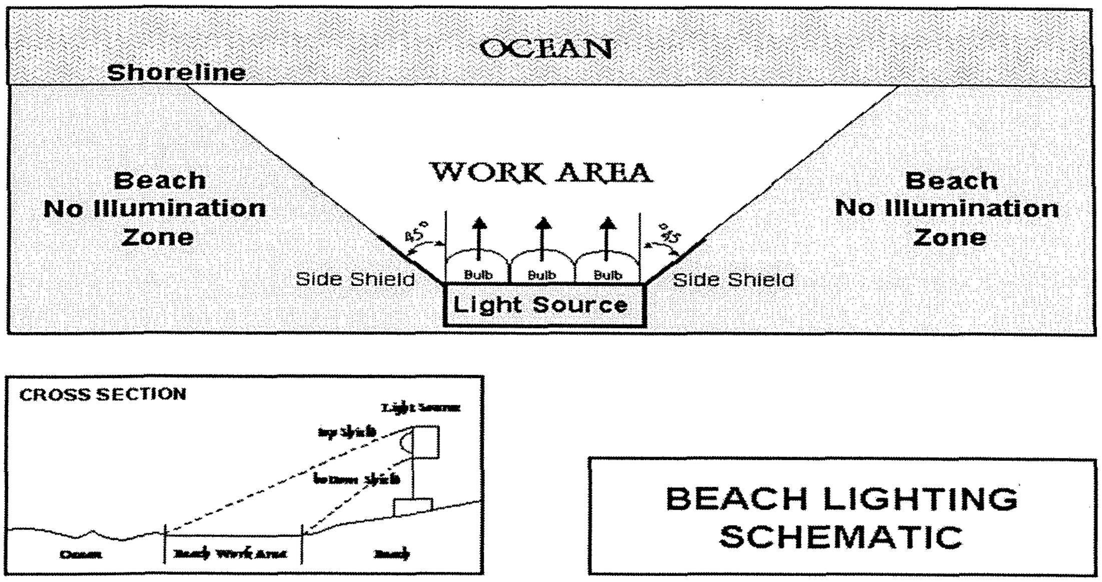
6. Visual surveys for escarpments along the project area must be made immediately after completion of the beach nourishment and/or erosion control structure construction and prior to March 1 for three subsequent years. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet must be leveled to the natural beach contour by March 1. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The Service must be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the Service will provide a brief written authorization that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken must be submitted to the Service. (NOTE: Out-year escarpment monitoring and remediation are not required if placed material no longer remains on the dry beach.)

7. The applicant must arrange a meeting between representatives of the contractor, the Service, the FWC, and the permitted person 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 and/or clarification of the sea turtle protection measures.

8. From March 1 through April 30 and November 1 through November 30, staging areas for construction equipment must be located off the beach to the maximum extent practicable. 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 that are 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 or erosion control structure materials must be off the beach to the maximum extent possible. Temporary storage of pipes or construction materials 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).

9. During beach nourishment and/or erosion control structure construction, from March 1 through April 30 and November 1 through November 30, direct lighting of the beach and near shore waters must be limited to the immediate construction area and must comply with safety requirements. Lighting on offshore or onshore equipment must be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the waters surface and nesting beach while meeting all Coast Guard, EM 385-1-1, and OSHA requirements. Light intensity of lighting plants must be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields must be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (see figure below).



BEACH LIGHTING SCHEMATIC

10. During erosion control structure construction, no temporary lighting of the groin construction area is authorized at anytime during the sea turtle nesting season from March 1 through April 30 and November 1 through November 30 with the following exception. Lighting will be allowed if safety lighting is required at any excavated trenches that must remain on the beach at night. This lighting must be limited to the immediate construction area only and must be the minimal lighting necessary to comply with safety requirements.

11. No permanent exterior lighting will be installed in association with this construction project.

12. A report describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the South Florida Ecological Services Office within 60 days of completion of the proposed work for each year when the activity has occurred. 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, and hatching success of nests.

13. In the event a sea turtle nest is excavated during construction activities, the permitted person responsible for egg relocation for the project must be notified so the eggs can be moved to a suitable relocation site.

14. Upon locating a sea turtle adult, hatchling, or egg harmed or destroyed as a direct or indirect result of the project, notification must be made to the FWC Commission, Bureau of Marine Enforcement (formerly the Florida Marine Patrol) at 800-342-5367 and South Florida Ecological Services Office at 772-562-3909. Care should be taken in handling injured turtles or eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

CONSERVATION RECOMMENDATIONS

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

1. Appropriate native salt-resistant dune vegetation should be established on the proposed dune feature. The DEP, Bureau of Wetland Resources, can provide technical assistance on the specifications for design and implementation.

2. Surveys for nesting success of sea turtles should be continued for a minimum of 3 years following project construction to determine the extent of the potential adverse impacts to sea turtle nesting and hatchling success. Include observations of hatchling disorientation and entrapment within the T-groin field as survey parameters to assess the long term effects of erosion control structures on the migration of hatchlings from the nest to the ocean.

3. Evaluate compliance with the Fort Pierce County Lighting Ordinance pre- and post-construction in the project area, particularly within the vicinity of the erosion control structures.

4. Educational signs should be placed where appropriate at beach access points explaining the importance of the area to sea turtles and/or the life history of sea turtle species that nest in the area.

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

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank your for your cooperation and effort in protecting fish and wildlife resources. Should you have any questions regarding the findings and recommendations contained in this report, please contact Trish Adams at 772-562-3909, extension 232.

Sincerely yours,

James J. Slack
Field Supervisor
South Florida Ecological Services Office

cc.
Service, Jacksonville, Florida (Sandy MacPherson)
FWC, Bureau of Protected Species Management, Tallahassee, Florida (Robbin Trindell)
NMFS, Protected Species Division, St. Petersburg, Florida (Shelly Norton)
NMFS, Habitat Conservation Division, Jacksonville, Florida (George Getsinger)
DEP, Office of Beaches and Coastal Systems, Tallahassee, Florida (Vladimir Kosmynin)
St. Lucie County Board of County Commissioners, Fort Pierce, Florida

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