United States Department of the Interior

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

May 25, 2007

Martin Altman
Federal Emergency Management Agency
Florida Long Term Recovery Office
36 Skyline Drive
Lake Mary, Florida 32746

Service Federal Activity Code: 41420-2007-FA-1001
Formal Consultation Initiation Date: May 25, 2007
Project: Emergency Dune Restoration
Applicant: Palm Beach County
County: Palm Beach

Dear Mr. Altman:

This document transmits the Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed emergency dune restoration project along Singer Island and South Palm Beach, Palm Beach County, Florida. The Federal Emergency Management Agency (FEMA) determined on May 25, 2007, that the proposed project may affect the threatened loggerhead sea turtle (*Caretta caretta*), the endangered leatherback sea turtle (*Dermochelys coriacea*), the endangered green sea turtle (*Chelonia mydas*), the endangered hawksbill sea turtle (*Eretmochelys imbricata*), and the endangered Kemp's ridley sea turtle (*Lepidochelys kempii*), and we concur with your determination. This biological opinion is provided in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*).

This biological opinion is based on information provided in telephone conversations, email correspondence, and site visits with FEMA, the Florida Department of Environmental Protection (DEP), the Florida Fish and Wildlife Conservation Commission (FWC), and Palm Beach County (County). A complete administrative record of this consultation is on file at the South Florida Ecological Services Office, Vero Beach, Florida.

CONSULTATION HISTORY

On December 10, 2004, FEMA requested emergency formal consultation with the Service concerning construction of Category B emergency berms due to damage from Hurricanes Charley, Frances, and Jeanne. FEMA Project Worksheets DR-1545, PW 1438 and DR-1545, PW 1439 were assigned to Singer Island and South Palm Beach, respectively.

On May 4, 2005, FEMA, under the Public Assistance Grant Program, funded Project Worksheets (PW) DR-1545, PW 1438 and PW 1439, in the amounts of $1,537,653 and $216,597, respectively.

On May 14 and 15, 2007, the Service met with State Senator Jeff Atwater, Congressman Ron Klein, County Commissioners, DEP, FWC, U.S. Army Corps of Engineers (Corps), County, and local representatives to discuss severe erosion caused by Subtropical Storm Andrea and identify possible solutions.

On May 15, 2007, DEP announced a Declaration of Shoreline Emergency resulting from the severe coastal shoreline erosion created by Subtropical Storm Andrea in early May 2007.

On May 22, 2007, the County requested via email, FEMA provide technical assistance because the County's projects occurred in the footprint of previously approved FEMA projects PW 1438 and PW 1439 and, thus, were directly related.

On May 22, 2007, the Service conducted a site visit with FEMA, County, and FWC to discuss project impacts and protective measures for nesting sea turtles.

On May 23, 2007, the County provided project specifications.

On May 25, 2007, the Service received a letter from FEMA stating the County's proposed dune restoration projects located within the footprint of open FEMA Project Worksheets DR-1545, PW 1439 and DR-1545, PW 1438, could affect the monitoring requirements as outlined in the Terms and Conditions in the Service's February 24, 2005, Biological Opinion. FEMA designated the County as its agent and requested consultation under section 7.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The County proposes to construct an emergency dune along approximately 6,135 feet of shoreline along South Palm Beach and Singer Island, Palm Beach County, Florida. The proposed action is necessary to restore the dune which experienced significant erosion due to Subtropical Storm Andrea in early May 2007. The 1,885 foot action area along South Palm Beach extends 385 feet south of DEP monument R-137 to approximately 500 feet north of DEP monument R-136 (Figure 1). The 4,250 foot action area along Singer Island extends 500 feet south of DEP monument R-60 to approximately 850 feet south of DEP monument R-65 (Figure 2). Approximately 10,000 cubic yards (cy) and 52,574 cy of beach compatible material will be used to restore the dunes along South Palm Beach and Singer Island, respectively.

DEP approved sand from the Stewart Mine in St. Lucie County will be transported to one of three access corridors on Singer Island. Two corridors have been established for use along the Singer Island action area. The northern corridor straddles the Water Glades and Sea Dunes condominium property and will service the north end of the action area to the north return wall of the Aquarius condominium. The central corridor is located on Eastpointe II property and will provide service from the south return wall of the Sea Dunes condominium to the north return wall of The Reaches condominium. A third corridor is currently under negotiation with either the Via Delfina condominium or the Condado that will service the south return wall of The

Reaches to the north return wall of the Condado. The Lantana Municipal Beach will provide the corridor for the South Palm Beach action area. The DEP-approved sand source for South Palm Beach will be the Ortona Mine in La Belle, Florida.

At each corridor, the fill material will be loaded into 25 cy off-road dump trucks using a front end loader. The dump trucks will transfer the material to the dune crest laterally along the beach to the area of placement. If access is granted at Condado, or Via Delfino, an electric conveyor system will be used to transport the material from the parking lot area to the crest of the restored dune. A D-5 bulldozer will be used to push the material in place. Attempts will be made to maintain a 1:4 slope in front of the dune.

Upon completion of both dune restoration projects, each restored dune will be planted with native salt-tolerant plants. Plants consisting of 90 percent sea oats (*Uniola paniculata*) will be planted within the Singer Island and South Palm Beach project areas. The remaining 10 percent will consist of several plant species including railroad vine (*Ipomoea pes-caprae*), beach bean (*Canavalia rosea*), salt meadow cordgrass (*Spartina patens*), and dune sunflower (*Helianthus debilis*). Any native vegetation such as seagrape (*Coccoloba uvifera*) not overwashed during the recent storm will be left in place.

Completion of the dune restoration project along South Palm Beach and Singer Island is expected to take approximately 1.5 and 4 weeks, respectively. These time frames could be extended due to possible delays based on equipment malfunctions and adverse weather. Both projects will only take place during daylight hours after surveys conducted by the marine turtle permit holder for each action area has been completed.

The County proposes to minimize the anticipated impacts to nesting sea turtles by removing foreign debris within each action area to the maximum extent possible. The material will be properly disposed of prior to material placement.

The action area is defined as all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action. The Service identifies the action area to include shoreline in the County between DEP monuments R-60 and R-65 (4,250 feet) and DEP monuments R-137 and R-136 (1,885 feet).

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 Federal Register [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 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 (NOAA Fisheries and Service 1991a). Nesting has also been documented along the Gulf coast of Florida on Santa Rosa Island (Okaloosa and Escambia Counties) and from Pinellas County through Collier County (FWC statewide nesting database). Green turtles have been known to nest in Georgia, but only on rare occasions (Georgia Department of Natural Resources statewide nesting database). The green turtle also nests sporadically in North Carolina and South Carolina (North Carolina Wildlife Resources Commission statewide nesting database; South Carolina Department of Natural Resources statewide nesting database). Unconfirmed nesting of green turtles in Alabama has also been reported (Bon Secour National Wildlife Refuge nesting reports).

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 (NOAA Fisheries and Service 1992, National Research Council 1990).

The leatherback regularly nests in the U.S. in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia (NOAA Fisheries and Service 1992). Leatherback turtles have been known to nest in Georgia, South Carolina, and North Carolina, but only on rare occasions (North Carolina Wildlife Resources Commission, South Carolina Department of Natural Resources, and Georgia Department of Natural Resources statewide nesting databases). Leatherback nesting has also been reported on the northwest coast of Florida

(LeBuff 1990, FWC statewide nesting database); 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 (NOAA Fisheries and 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.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was listed as endangered on December 2, 1970 (35 FR 18320). The range of the Kemp's ridley includes the Gulf coasts of Mexico and the U.S., and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland. Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a very small number of Kemp's ridleys nest consistently along the Texas coast (Turtle Expert Working Group 1998). In addition, rare nesting events have been reported in Florida, Alabama, South Carolina, and North Carolina. Hatchlings, after leaving the nesting beach, are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 8 inches in length, at which size they enter coastal shallow water habitats (Ogren 1989). Outside of nesting, adult Kemp's ridleys are believed to spend most of their time in the Gulf of Mexico, while juveniles and subadults also regularly occur along the eastern seaboard of the U.S. (Service and NOAA Fisheries 1992).

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

Life history

Loggerhead Sea Turtle

Loggerheads are known to nest from one to seven times within a nesting season (Talbert et al. 1980, Richardson and Richardson 1982, Lenarz et al. 1981); the mean is approximately 4.1 (Murphy

and Hopkins 1984). The interval between nesting events within a season varies around a mean of about 14 days (Dodd 1988). Mean clutch size varies from about 100 to 126 eggs along the southeastern United States coast (NOAA Fisheries and Service 1991b). Nesting migration intervals of years are most common in loggerheads, but the number can vary from 1 to 7 years (Dodd 1988). Age at sexual maturity is believed to be about 20 to 30 years (Turtle Expert Working Group 1998).

Green Sea Turtle

Green turtles deposit from one to nine clutches within a nesting season, but the overall average is 3.3. The mean interval between nesting events within a season is 13 days (Hirth 1997). Mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years. Usually 2, 3, 4, or more years intervene between breeding seasons (NOAA Fisheries and Service 1991a). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Leatherback Sea Turtle

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

Hawksbill Sea Turtle

Hawksbills nest on average 4.5 times per season at intervals of approximately 14 days (Corliss et al. 1989). In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (NOAA Fisheries and Service 1993). On the basis of limited information, nesting migration intervals of 2 to 3 years appear to predominate. Hawksbills are recruited into the reef environment at about 14 inches in length and are believed to begin breeding about 30 years later. However, the time required to reach 14 inches in length is unknown and growth rates vary geographically. As a result, actual age at sexual maturity is not known.

Kemp's Ridley Sea Turtle

Nesting occurs from April into July during which time the turtles appear off the Tamaulipas and Veracruz coasts of Mexico. Precipitated by strong winds, the females swarm to mass nesting emergences, known as *arribadas* or *arribazones*, to nest during daylight hours. Clutch size averages 100 eggs (Service and NOAA Fisheries 1992). Some females breed annually and nest an average of 1 to 4 times in a season at intervals of 10 to 28 days. Age at sexual maturity is believed to be between 7 to 15 years (Turtle Expert Working Group 1998).

Population dynamics

Loggerhead Sea Turtle

Total estimated nesting in the Southeast is approximately 50,000 to 90,000 nests per year (FWC statewide nesting database 2004, Georgia Department of Natural Resources statewide nesting database 2004, South Carolina Department of Natural Resources statewide nesting database 2004, North Carolina Wildlife Resources Commission statewide nesting database 2004). In 1998, 85,988 nests were documented in Florida alone. However, in 2001, 2002, 2003, and 2004, this number dropped to 69,657, 62,905, 56,852, and 47,173, respectively. An analysis of nesting data from the Florida Index Nesting Beach Survey (INBS) Program from 1989 to 2004, a period encompassing index surveys that are more consistent and more accurate than surveys in previous years, has shown no detectable trend but, more recently (1998 through 2004), has shown evidence of a declining trend (Blair Witherington, FWC, personal communication, 2005). Given inherent annual fluctuations in nesting and the short time period over which the decline has been noted, caution is warranted in interpreting the decrease in terms of nesting trends.

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, NOAA Fisheries and Service 1991b). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interactions on foraging grounds and migration routes (Earl Possardt, Service, personal communication, 2005). The loggerhead nesting aggregations in Oman, the southeastern U.S., and Australia have been estimated to account for about 88 percent of nesting worldwide (NOAA Fisheries and 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) (NOAA Fisheries and Service 1991b).

Green Sea Turtle

About 150 to 2,750 females are estimated to nest on beaches in the continental U.S. annually (FWC 2006). In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year (NOAA Fisheries and Service 1998a). Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting group in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season (Limpus et al. 1993). In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

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/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/year). In the United States, small nesting populations occur on the Florida east coast (100 females/year) (FWC 2006), Sandy Point, U.S. Virgin Islands (50 to 190 females/year) (Alexander et al. 2002), and Puerto Rico (30 to 90 females/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 nests per year (Meylan 1999). Other significant, but smaller populations in the Caribbean still occur in Martinique, Jamaica, Guatemala, Nicaragua, Grenada, Dominican Republic, Turks and Caicos Islands, Cuba, Puerto Rico, and U.S. Virgin Islands. In the U.S. Caribbean, about 150 to 500 nests per year are laid on Mona Island, Puerto Rico, and 70 to 130 nests per year on Buck Island Reef National Monument, U.S. Virgin Islands. In the U.S. Pacific, hawksbills nest only on main island beaches in Hawaii, primarily along the east coast of the island of Hawaii. Hawksbill nesting has also been documented in American Samoa and Guam (NOAA Fisheries and Service 1998b).

Kemp's Ridley Sea Turtle

The 40,000 nesting females estimated from a single mass nesting emergence in 1947 reflected a much larger total number of nesting turtles in that year than exists today (Carr 1963, Hildebrand 1963). However, nesting in Mexico has been steadily increasing in recent years - from 702 nests in 1985 to over 10,000 nests in 2005 (Service 2005). Despite protection for the nests, turtles have been and continue to be lost to incidental catch by shrimp trawls (Service and NOAA Fisheries 1992).

Status and distribution

Loggerhead Sea Turtle

Genetic research involving analysis of mitochondrial DNA has identified five different loggerhead subpopulations/nesting aggregations in the western North Atlantic: (1) the Northern Subpopulation occurring from North Carolina to around Cape Canaveral, Florida (about 29° N.); (2) South Florida Subpopulation occurring from about 29° N. on Florida's east coast to Sarasota on Florida's west coast; (3) Dry Tortugas, Florida, Subpopulation, (4) Northwest Florida Subpopulation occurring at Eglin Air Force Base and the beaches near Panama City; and

(5) Yucatán Subpopulation occurring on the eastern Yucatán Peninsula, Mexico (Bowen 1994, 1995, Bowen et al. 1993, Encalada et al. 1998, Pearce 2001). These data indicate 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 1970s. Recent estimates of loggerhead nesting trends from standardized daily beach surveys showed significant declines ranging from 1.5 to 2.0 percent annually (Mark Dodd, Georgia Department of Natural Resources, personal communication, 2005). Nest totals from aerial surveys conducted by the South Carolina Department of Natural Resources showed a 3.3 percent annual decline in nesting since 1980. Overall, there is strong statistical evidence to suggest the Northern Subpopulation has sustained a long-term decline.

Data from all beaches where nesting activity has been recorded indicate the South Florida Subpopulation has shown significant increases over the last 25 years. However, an analysis of nesting data from the Florida INBS Program from 1989 to 2002, a period encompassing index surveys that are more consistent and more accurate than surveys in previous years, has shown no detectable trend and, more recently (1998 through 2002), has shown evidence of a declining trend (Blair Witherington, FWC, personal communication, 2003). Given inherent annual fluctuations in nesting and the short time period over which the decline has been noted, caution is warranted in interpreting the decrease in terms of nesting trends.

A near census of the Florida Panhandle Subpopulation undertaken from 1989 to 2002 reveals a mean of 1,028 nests per year, which equates to about 251 females nesting per year (FWC 2006). Evaluation of long-term nesting trends for the Florida Panhandle Subpopulation is difficult because of changed and expanded beach coverage. Although there are now 8 years (1997 to 2004) of INBS data for the Florida Panhandle Subpopulation, the time series is too short to detect a trend (Blair Witherington, FWC, personal communication, 2005).

A near census of the Dry Tortugas Subpopulation undertaken from 1995 to 2001 reveals a mean of 213 nests per year, which equates to about 50 females nesting per year (FWC 2006). The trend data for the Dry Tortugas Subpopulation are from beaches that were not part of the State of Florida's INBS program prior to 2004, but have moderately good monitoring consistency. There are 7 continuous years (1995 to 2001) of data for this Subpopulation, but the time series is too short to detect a trend (Blair Witherington, FWC, personal communication, 2005).

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

Threats include incidental take from channel dredging and commercial trawling, longline, and gill net fisheries; loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and 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 150 to 2,750 females nesting annually (FWC 2006). 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 (historically estimated to be 65 percent of the worldwide population), is now less than 1 percent of its estimated size in 1980. Spotila et al. (1996) estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200 and an upper limit of about 42,900. This is less than one third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. The largest population is in the western Atlantic. Using an age-based demographic model, Spotila et al. (1996) determined leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and even the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded leatherbacks are on the road to extinction and further population declines can be expected unless we take action to reduce adult mortality and increase survival of eggs and hatchlings.

The crash of the Pacific leatherback population is believed primarily to be the result of exploitation by humans for the eggs and meat, as well as incidental take in numerous commercial fisheries of the Pacific. Other factors threatening leatherbacks globally include loss or degradation of nesting habitat from coastal development; disorientation of hatchlings by

beachfront lighting; excessive nest predation by native and 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 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.

Kemp's Ridley Sea Turtle

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

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

Analysis of the species/critical habitat likely to be affected

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project area. The effects of the proposed action on sea turtles will be considered further in the remaining sections of this Biological Opinion. Potential effects include destruction of nests deposited within the boundaries of the proposed project, harassment in the form of disturbing or interfering with female turtles attempting to nest within the restoration area or on adjacent beaches as a result of restoration activities, and behavior modification of nesting females due to escarpment formation within the project area during the nesting season resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit

eggs. The quality of the placed sand could affect the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchling to emerge from the nest.

Critical habitat has not been designated in the continental U.S.; therefore, the proposed action would not result in an adverse modification.

ENVIRONMENTAL BASELINE

The County is located within the most densely populated nesting range for three species of sea turtles: loggerhead, green, and leatherback regularly nest along the beaches of southeast Florida. Between 1998 and 2003, County beaches supported approximately 18 percent of the overall sea turtle nesting in Florida. Only one other Florida county, Brevard, supports a greater percentage of sea turtle nesting. In total, 13,327 and 12,745 sea turtle nests were recorded in 2005 and 2006, respectively, along the 42 miles of County beach included in the FWC's Florida Statewide Nesting Beach Survey (Table 1). The distribution of nests among species in 2005 included 10,791 loggerhead sea turtles, 2,252 green sea turtles, and 284 leatherback sea turtles; and in 2006 the distribution included 11,196 loggerhead sea turtles, 1,324 green sea turtles, and 225 leatherback sea turtles (Table 1). Only false crawls have been recorded for Kemp's Ridley sea turtles in the County (Meylan et al. 1995)

Status of the species/critical habitat within the action area

In 2006, a total of 12,745 sea turtle nests (a rate of approximately 303 nests per mile) were laid in the County (Table 1). In 2006, a total of 1,084 sea turtle nests, or 571 nests per mile were laid within the Singer Island action area (Table 2). Within the South Palm Beach action area, a total of 467 sea turtle nests, or 228 nests per mile were laid in 2006 (Table 3).

Pre-project surveys have documented a total of 16 unmarked sea turtle nests within the Singer Island action area.

Loggerhead Sea Turtle

The loggerhead sea turtle nesting and hatching season for the County extends from March 15 through November 30. Incubation ranges from about 45 to 95 days.

Along the Florida east coast between 1995 and 2005, the County had the second highest average nesting of loggerhead sea turtles, with approximately 13,000 nests laid (County 2006a). In 2006, a total of 11,196 loggerhead sea turtle nests, or 267 nests per mile, were laid in the County (Table 1). In 2006, a total of 857 loggerhead sea turtle nests, or 451 nests per mile were laid within the Singer Island action area (Table 2). Within the South County action area, a total of 445 loggerhead sea turtle nests, or 217 nests per mile were laid within the action area in 2006 (Table 3).

In 2006, loggerhead sea turtles made 13,329 false crawls in the County (Table 1). Within the Singer Island and South County action area, loggerhead turtles made 1,159 and 576 false crawls

in 2006, respectively (Tables 2 and 3). In both action areas, there were more false crawls than nests laid in 2006.

Green Sea Turtle

The green sea turtle nesting and hatching season for the County extends from May 1 through November 30. Incubation ranges from about 45 to 75 days.

Between 1995 and 2005, the County had the second highest average green sea turtle nesting along the Florida east coast; with a little more than 1,000 nests laid per year (County 2006b). In the County, a total of 1,324 green sea turtle nests were laid in 2006, for a nesting density of 32 nests per mile (Table 1). In 2006, a total of 217 and 18 green sea turtle nests, were laid within the Singer Island and South County action area, respectively (Tables 2 and 3). In 2006, the Singer Island nesting density (114 nests per mile) exceeded that of the County.

In the County, 1,351 green sea turtle false crawls were made in 2006 (Table 1). Within the Singer Island and South County action areas, there were 225 and 29 false crawls in 2006, respectively (Tables 2 and 3). In both action areas, there were more false crawls than nests laid in 2006.

Leatherback Sea Turtle

The leatherback sea turtle nesting and hatching season for the County extends from February 15 through November 30. Incubation ranges from about 55 to 75 days.
The County had the highest average leatherback sea turtle nesting along the Florida east coast from 1995 to 2005 (County 2006c). In 2006, the total number of leatherback sea turtle nests laid in the County was 225, which is a nesting density of 5 nests per mile (Table 1). In 2006, a total of 10 and 4 leatherback turtle nests, were laid within the Singer Island and South County action area, respectively (Tables 2 and 3). The Singer Island nesting density in 2006 (5 nests per mile) was similar to that of the County's.

In the County, 58 leatherback sea turtle false crawls were made in 2006 (Table 1). Within the Singer Island and South County action areas, there were 6 and 4 false crawls in 2006, respectively (Tables 2 and 3).

Hawksbill Sea Turtle

The hawksbill sea turtle nesting and hatching season for the County extends from June 1 through December 31. Incubation lasts about 60 days.

Nesting by this species has been documented five times in the County since 1985, with the most recent report in 2004 (Meylan et al. 1995, FWC 2006). No nesting has been reported from the proposed action area.

Kemp's Ridley Sea Turtle

Although no nesting has been reported in the County for Kemp's ridley turtles, four false crawls at Phipps Ocean Park were reported in 1989 (Meylan et al. 1995).

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

Factors affecting the species habitat within the action area

Since 2003, the County has completed three (December 2003, February 2005, and December 2005) dune restoration projects along South County and Lantana. These projects restored the eroded shoreline by filling the dune template to capacity with beach compatible material and planting the action area with native salt-tolerant vegetation. All three restoration projects served as a buffer against the hurricanes in 2004 and 2005. The dune restoration project completed in December 2005 was lost due to Subtropical Storm Andrea which impacted the area in early May 2007.

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

Lighting

A primary threat to sea turtles along nesting shorelines includes sea turtle hatchling disorientation as a result of artificial lighting along the beach. Typically, sea turtle hatchlings will emerge from the nest and orient themselves towards the brighter, open horizon of the ocean (Salmon et al. 1992). If artificial lights are visible from the beach, sea turtle hatchlings tend to travel toward the artificial lights instead of the ocean. Disorientation events often result in hatchling mortality as a result of dehydration, predation, and motor vehicle strikes. In addition, regular beach maintenance in the form of tractor tilling may disrupt or impact deposited nests and nesting females. Plastics, styrofoam, and fishing line are pollutants that may negatively impact nesting success and nearshore foraging.

Except for shoreline under public ownership, much of the remaining coast in the County is developed. The majority of development consists of multi-family residences, with smaller sections containing commercial and single-family residences. Because many beach-front

residences are not fully occupied during much of the nesting season, impacts to nesting sea turtles and hatchlings may be reduced.

The County has a Sea Turtle Protection Ordinance that includes measures to reduce impacts of coastal lighting on sea turtles. The proposed project area along Singer Island is subject to this ordinance. The Town of South Palm Beach has adopted and enforces a similar ordinance within the Town boundaries.

EFFECTS OF THE ACTION

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

Factors to be considered

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project areas through the placement of mined material.

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 (*e.g.*, 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 benefiting sea turtles.

Direct effects

Placement of up to 62,574 cy of sand along 6,135 feet of beach in and of itself may not provide suitable nesting habitat for sea turtles. Although placement of beach compatible material may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not incorporated during project construction. Placement of material during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of eggs and hatchlings and along with other mortality sources, may impact the long-term survival of the species. For example, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings.

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). In a 1994 Florida study comparing loggerhead hatching and emergence success of relocated nests with *in situ* nests, Moody (1998) found hatching success was lower in relocated nests at 9 of 12 beaches evaluated and emergence success was lower in relocated nests at 10 of 12 beaches surveyed in 1993 and 1994.

2. Missed nests

Although a nesting survey and nest marking program would reduce the potential for nests to be impacted by restoration 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 equipment and the use of heavy machinery on the beach during a dune restoration 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.

Indirect effects

Many of the direct effects of dune restoration may persist over time and become indirect impacts. These indirect effects include increased susceptibility of relocated nests to catastrophic events, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, 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 may also be subject to greater predation rates from both land and marine predators, because the predators learn where to concentrate their efforts (Glenn 1998, Wyneken et al. 1998).

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 in the area (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as older buildings were replaced by much larger ones that accommodated more beach users. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development which leads to the need for more and larger protective measures. Increased shoreline development may adversely affect sea turtle nesting success. Greater development may support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas (National Research Council 1990), and can also result in greater adverse effects due to artificial lighting.

3. Changes in the physical environment

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

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

These impacts can be minimized by using suitable sand and 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 (1988b) 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 project impacts on sea turtles are minimized.

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

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). 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.

Species' response to a 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 pre-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 area. As the width of nourished beaches decreased during the second year, among-treatment differences in nest placement diminished. More nests were washed out on the wide, flat beaches of the nourished treatments than on the narrower steeply sloped beaches of the control beach. This phenomenon persisted through the second 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 the principal effect of nourishment on sea turtle reproduction was a reduction in nesting success during the first year following project construction. Although most studies have attributed this phenomenon to an increase in beach compaction and escarpment formation, Ernest and Martin (1999) indicate changes in beach profile may be more important. Regardless, as a nourished beach is reworked by natural processes in subsequent years and adjusts from an unnatural construction profile to a more natural beach profile, beach compaction and the frequency of escarpment formation decline, and nesting and nesting success return to levels found on natural beaches.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The Service has considered potential cumulative effects of this project on sea turtles and, in this instance, there are no cumulative effects.

CONCLUSION

After reviewing the current status of the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles, the environmental baseline for the action area, the effects of the proposed dune restoration, and the cumulative effects, it is the Service's biological opinion that the dune restoration 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, Kemp's Ridley, and hawksbill sea turtles in the continental United States; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

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

of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by FEMA so that they become binding conditions of any grant or permit issued to the County, as appropriate, for the exemption in section 7(o)(2) to apply. FEMA has a continuing duty to regulate the activity covered by this incidental take statement. If FEMA (1) fails to assume and implement the terms and conditions or, (2) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, FEMA 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 about 6,135 feet of nesting beach habitat could be taken as a result of this proposed action. The take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited from March 1 through September 30 and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited from October 1 through February 28 (or 29 as applicable) when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) misdirection of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

Incidental take is anticipated for only the 6,135 feet of beach that has been identified for dune restoration. The Service anticipates incidental take of sea turtles will be difficult to detect for the following reasons: (1) the turtles nest primarily at night and all nests are not found because [a] natural factors, such as rainfall, wind, and tides may obscure crawls and [b] human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program; (2) the total number of hatchlings per undiscovered nest is unknown; (3) the reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown; (4) an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area; (5) lights may misdirect an unknown number of hatchlings and cause death; and (6) escarpments may form and cause an unknown number of females from accessing a suitable nesting site. However, the level of take of these species can be anticipated by the disturbance and restoration of suitable turtle nesting beach habitat because: (1) turtles nest within the project

site; (2) dune restoration will occur during a portion of the nesting season; and (3) the restoration project will modify the incubation substrate, beach slope, and sand compaction.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined 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 the threatened loggerhead sea turtle, and the endangered green, leatherback, hawksbill, and Kemp's ridley sea turtles.

1. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence must be used on the project site. In addition, prior to any sand placement, all exposed concrete and metal debris shall be removed from the beach when feasible. Debris removal activities shall proceed during daylight hours only and must not commence until completion of the marine turtle survey each day.

2. If dune restoration activities will be conducted during the period from March 1 through October 31, restoration activities must be conducted only during daylight hours to avoid encountering nesting and hatchling turtles. In addition, dune restoration activities for this project will be completed as soon as possible and not later than July 6, 2007.

3. If the dune restoration activities will be conducted during the period from March 1 through October 31, surveys for nesting sea turtles must be conducted. If nests are laid in the project area, the eggs must be relocated. Nest relocation must be done such that the potential for death of the developing embryos is minimized. Every attempt to relocate all marked and unmarked in situ nests deposited prior to project commencement will be made prior to being impacted by construction activities.

4. Immediately after completion of the project and prior to the next 3 nesting seasons, beach compaction must be monitored and tilling must be conducted to the extent practicable by March 1st to reduce the likelihood of impacting sea turtle nesting and hatching activities. The March 1st 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.

5. Immediately after completion of the project and prior to the next 3 nesting seasons, monitoring must be conducted to determine if escarpments are present and escarpments must be leveled to the extent practicable to reduce the likelihood of impacting sea turtle nesting and hatching activities.

6. The County must ensure that contractors performing the restoration work fully understand the sea turtle protection measures detailed in this incidental take statement.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, FEMA, and its designated agents, 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.

Any adverse effects to sea turtles due to the presence of a newly constructed dune are expected to occur throughout the life of the feature. Therefore, the terms and conditions of this incidental take statement will remain in effect for the life of the feature.

1. All fill material placed must be sand similar to a native beach in the vicinity of the site that has not been affected by prior nourishment activities. In addition, prior to any sand placement, all exposed concrete and metal debris shall be removed from the beach when feasible. Debris removal activities shall proceed during daylight hours only and must not commence until completion of the marine turtle survey each day. The fill material must be similar in both coloration and grain size distribution (sand grain frequency, mean and median grain size, and sorting coefficient) to the native beach and must not contain:

   1a. Greater than 5 percent, by weight, silt, clay, or colloids passing the #230 sieve;

   1b. Greater than 5 percent, by weight, fine gravel retained on the #4 sieve;

   1c. Coarse gravel, cobbles, or other material retained on the ¾-in sieve in a percentage or size greater than found on the native beach; and

   1d. Construction debris, toxic material, or other foreign matter; and not result in contamination or cementation of the beach.

2. If the dune restoration project will be conducted during the period from March 1 through October 31, restoration activities must be conducted during daylight hours only. In addition, dune restoration activities for this project will be completed as soon as possible and not later than July 6, 2007.

3. If the dune restoration project will be conducted during the period from March 1 through October 31, daily early morning surveys for sea turtle nests must be conducted until September 30 or completion of the project (whichever is earliest). Eggs in any nest within the project area must be relocated per the following requirements outlined below. No restoration activity may commence until completion of the sea turtle nesting survey and nest relocation or protection each day. In the event a sea turtle nest is excavated during restoration activities, all work shall cease in that area immediately and the

permitted person responsible for egg relocation for the project should be notified so the eggs can 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 perform under the supervision of a qualified professional with a valid FWC Marine Turtle Permit. Nesting surveys must be conducted daily between sunrise and 9 a.m. Surveys must be performed in such a manner so as to ensure that restoration 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 restoration activities will be relocated. New 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 restoration activities must cease when restoration activities no longer threaten nests. Nests deposited within areas where restoration 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; and

3c. Nests deposited within the project area that have been marked or located by probing prior to commencement of restoration activities, will be excavated and all eggs, pipped eggs, and hatchlings removed and either reburied in an adjacent beach outside the project area or kept on damp sand in the dark by a qualified professional with a valid FWC Marine Turtle Permit. Hatchlings that are ready for release (little yolk remaining and straightened carapace) shall be released that evening. Hatchlings that require additional rehabilitation shall be transported to the Marine Life Center of Juno Beach until ready for release.

4. Immediately after completion of the project 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 FWC, and the County. At a minimum, the protocol provided under 4a and 4b below must be followed. If required, the area must be tilled to a depth of 36 inches. 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-restoration compaction levels. Also, out-year compaction monitoring and remediation are not required if placed material no longer remains on the beach.).

4a. 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 lie 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.

4b. 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 1st. 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.

5. Visual surveys for escarpments along the project area must be made immediately after completion of the project and prior to March 1st for 3 subsequent years if placed sand still remains on the beach. All escarpments shall be leveled, or the beach profile shall be reconfigured, to minimize escarpment formation. In addition, weekly surveys of the project area shall be conducted during the 3 nesting seasons following completion of fill placement as follows:

5a. The number of escarpments and their location relative to DEP reference monuments shall be recorded during each weekly survey and reported relative to the length of the beach surveyed (*e.g.*, 50 percent escarpments). Notations on the height of these escarpments shall be included (0 to 2 feet, 2 to 4 feet, and 4 feet or higher) as well as the maximum height of all escarpments; and

5b. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet must be leveled to the natural beach contour by April 30th. Any escarpment removal shall be reported relative to R-monument locations. 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 (May 1 to October 31) to determine the appropriate action to be taken. If it is determined 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.).

6. Once dune restoration is completed, a night-time survey must be conducted within 30 days to determine if changes resulting from project construction have resulted in the visibility of lighting fixtures that are a potential source of sea turtle lighting disorientation. All visible lighting on the property on which the dune was restored must be brought into compliance with the local lighting ordinance within 30 days of the inspection.

7. A lighting survey shall be conducted by the County in areas under their jurisdiction prior to April 30th of the first nesting season following dune restoration activities and action taken to ensure no lights or light sources are visible from the newly elevated beach. A report summarizing all lights visible, using standard survey techniques for such surveys, shall be submitted to the Service by May 15th and documenting all compliance and enforcement action. Additional lighting surveys shall be conducted monthly through August and results reported by the 15th of each month of the first nesting season after project completion.

8. No additional permanent exterior lighting is authorized unless it is in compliance with the Palm Beach County Lighting Ordinance.

9. Annual reports on all nesting activity and sea turtle protection measures taken must be provided to the Service no later than February 15th of the following year for 3 years post-restoration. Monitoring of nesting activity will include daily surveys and any additional measures authorized by the FWC. The report will include daily survey sheets noting all activity, including nesting success rates. Nest location along the profile, including distance from the water line and distance from the landward structure, will also be noted. Nest and false crawl locations will be measured. The report will also describe any lighting that was out of compliance and steps taken to resolve and bring the lighting into compliance.

10. A report describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the FWC, Imperiled Species Management Section, Tequesta office and the Tallahassee office as well as the South Florida Ecological Services Office, Vero Beach, Florida 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 restoration 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.

11. Upon locating a dead, injured, or sick endangered or threatened sea turtle specimen, initial notification must be made to the FWC at 1-888-404-3922, and the South Florida Ecological Services Office biologist listed at the end of this Biological Opinion. Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead

animal, the finder has the responsibility to ensure evidence intrinsic to the specimen is not unnecessarily disturbed.

The Service believes incidental take will be limited to 6,135 feet of shoreline that has been identified for dune restoration. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes no more than the following types of incidental take will result from the proposed action: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the restoration area or on adjacent beaches as a result of restoration activities; (5) 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 (6) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than one dune restoration activity annually on the 6,135 feet of shoreline that has been identified for restoration. 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. FEMA or its designated agents must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

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

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

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

REINITIATION NOTICE

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

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

Sincerely yours,

Paul Souza
Field Supervisor
South Florida Ecological Services Office

cc:
DEP, Tallahassee, Florida (Stephanie Gudeman)
EPA, West Palm Beach, Florida
FWC, Tallahassee, Florida (Robbin Trindell)
NOAA Fisheries, West Palm Beach, Florida (Jocelyn Karazsia)
Palm Beach County, West Palm Beach (Dan Bates)
Service, Jacksonville, Florida (Sandy MacPherson)
Service, Atlanta, Georgia (Noreen Walsh) electronic copy
USGS, Florida Integrated Science Center, Gainesville, Florida (Susan Walls)

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Table 1. Summary of sea turtle nesting data for Palm Beach County, Florida from 2000 to 2006. Data accessed: http://www.floridamarine.org/features/view_article.asp?id=2377 on May 18, 2007.

Year	Loggerhead Nests	Loggerhead False Crawls	Green Nests	Green False Crawls	Leatherback Nests	Leatherback False Crawls
2000	14,187	16,124	1,942	1,931	160	33
2001	13,757	12,957	175	103	334	36
2002	13,032	12,841	2,339	2,824	250	47
2003	12,963	15,050	767	846	306	50
2004	10,759	15,822	968	1,283	166	25
2005	10,791	14,345	2,252	3,142	284	52
2006	11,196	13,329	1,324	1,351	225	58
Mean	**12,384**	**14,353**	**1,395**	**1,640**	**246**	**43**

Table 2. Summary of sea turtle nesting data along Singer Island, Palm Beach County, Florida from 2000 to 2006 (FWC).

Year	Loggerhead Nests	Loggerhead False Crawls	Green Nests	Green False Crawls	Leatherback Nests	Leatherback False Crawls
2000	1,001	1,243	192	147	21	8
2001	693	638	20	15	35	4
2002	825	1,249	103	78	13	0
2003	876	713	80	48	17	0
2004	744	651	69	34	6	1
2005	1,083	1,270	383	404	26	5
2006	857	1,159	217	225	10	6
Mean	**868**	**989**	**152**	**136**	**18**	**3**

Table 3. Summary of sea turtle nesting data along South Palm Beach, Palm Beach County, Florida from 2001 to 2006 (FWC).

Year	Loggerhead Nests	Loggerhead False Crawls	Green Nests	Green False Crawls	Leatherback Nests	Leatherback False Crawls
2001	413	415	1	0	9	2
2002	421	339	24	5	8	2
2003	408	480	18	13	15	2
2004	387	539	5	2	5	0
2005	395	458	37	26	11	2
2006	445	576	18	29	4	4
Mean	**412**	**468**	**17**	**13**	**9**	**2**

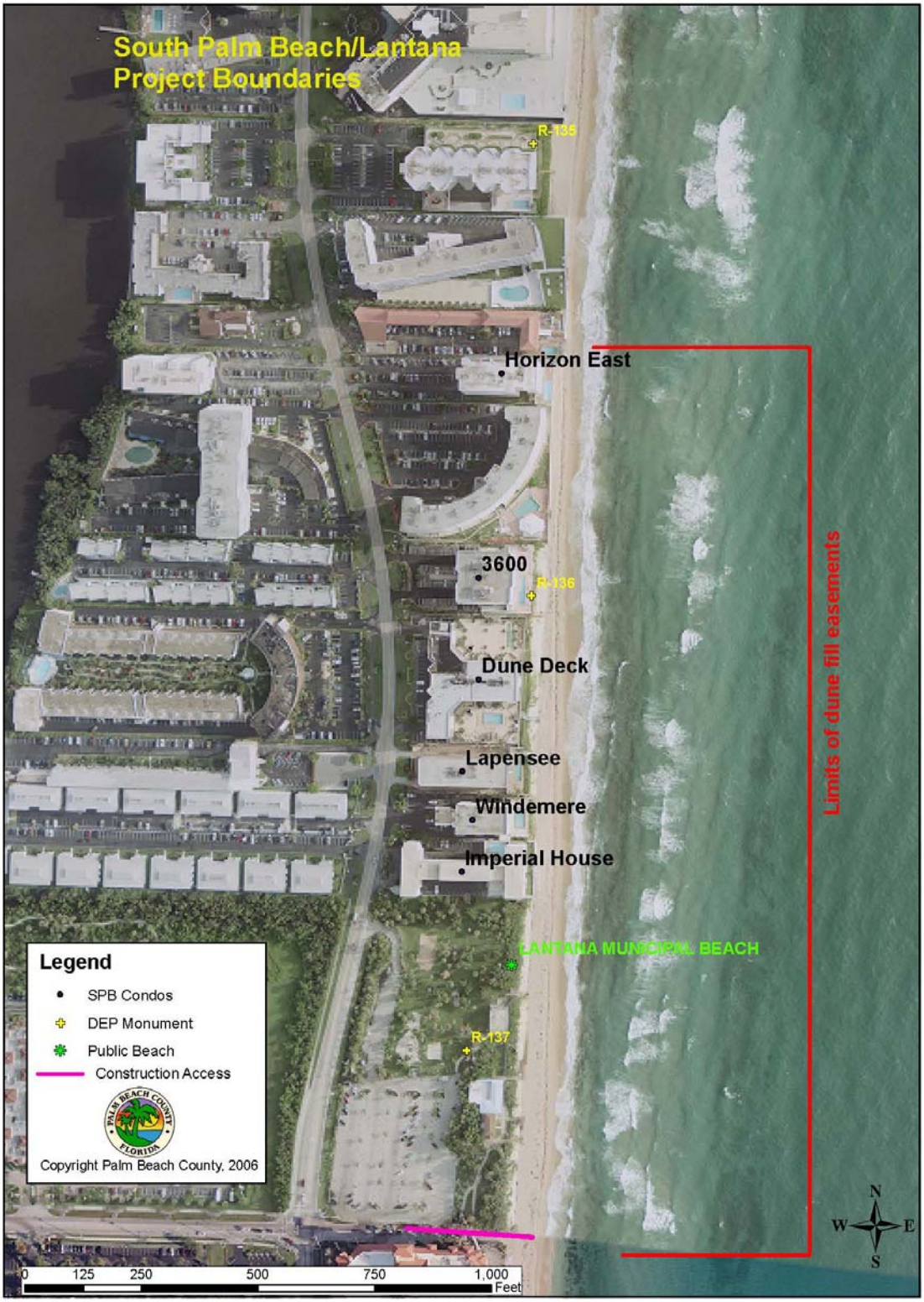

Figure 1. Location of the proposed dune restoration project along South Palm Beach, Palm Beach County, Florida.

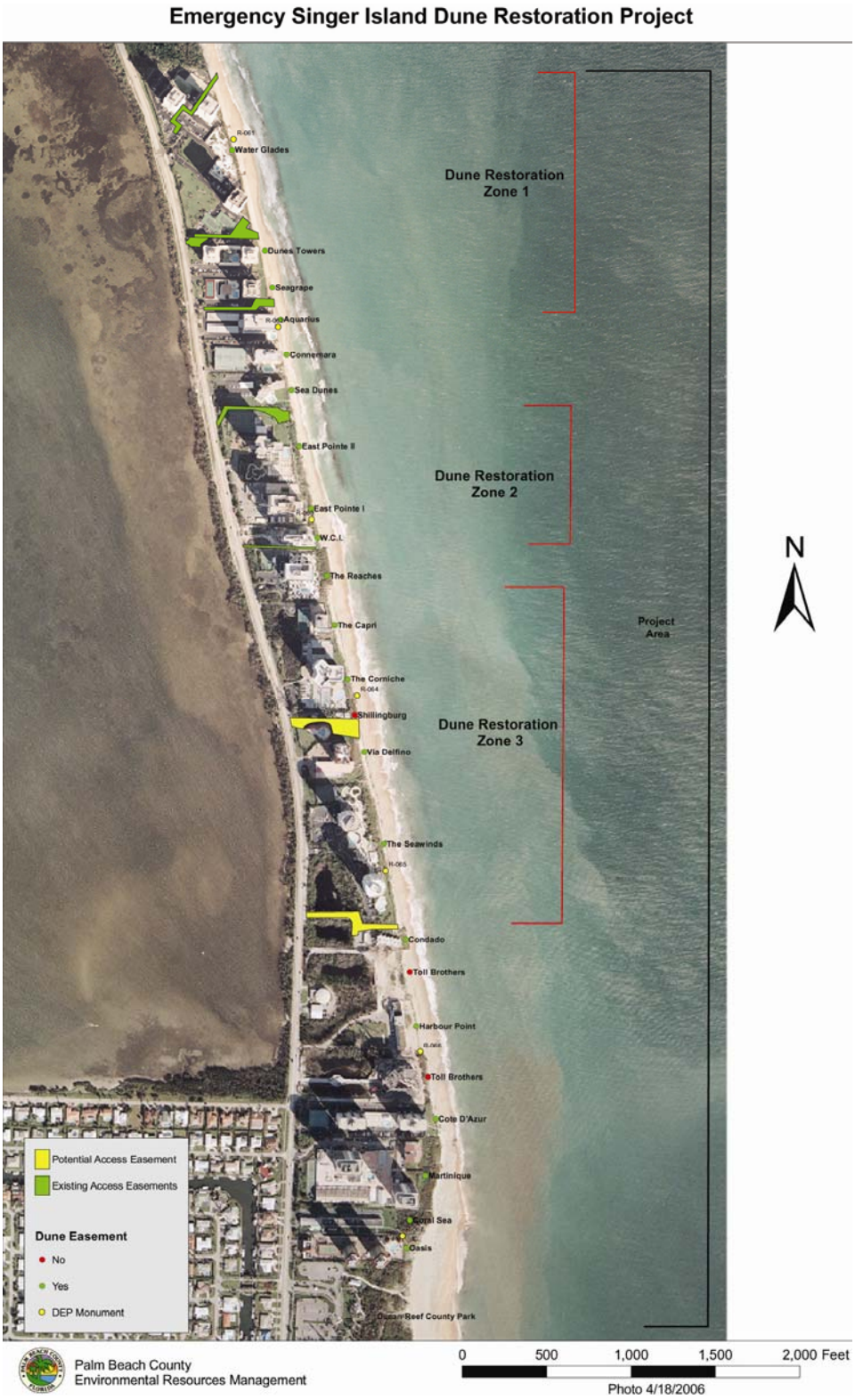

Figure 2. Location of the proposed dune restoration project along Singer Island, Palm Beach County, Florida.