Essential Fish Habitat Assessment
Port Canaveral Navigation Improvements
Port Canaveral FL

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TABLE OF CONTENTS

Page

LIST OF FIGURES III

LIST OF TABLES III

1.0 INTRODUCTION 1

1.1 Project Purpose 1

1.2 Study Area Location 1

1.3 Project Alternatives 4

1.3.1 Recommended Plan 4

2.0 ESSENTIAL FISH HABITAT DESIGNATION 7

2.1 Assessment 7

2.2 Managed Species 9

2.2.1 Crustacea 11

2.2.1.1 Life Histories 11

2.2.1.1.1 Brown Shrimp 11

2.2.1.1.2 Pink Shrimp 11

2.2.1.1.3 White Shrimp 12

2.2.1.1.4 Spiny Lobster 12

2.2.1.2 Summary of Impacts to Shrimps and Spiny Lobsters 13

2.2.2 Habitat Areas of Particular Concern 14

2.2.2.1 Unvegetated Bottom Habitat 14

2.2.2.2 Summary of Impacts to Unvegetated Bottom Habitat 14

2.2.3 South Atlantic Snapper-Grouper Complex 14

2.2.3.1 Life History 15

2.2.3.1.1 Balistidae 15

2.2.3.1.2 Carangidae 15

2.2.3.1.3 Ephippidae 16

2.2.3.1.4 Haemulidae 17

2.2.3.1.5 Labridae 17

2.2.3.1.6 Lutjanidae 18

2.2.3.1.7 Serranidae 18

2.2.3.1.8 Sparidae 19

2.2.3.2 Summary of the Impacts to the Snapper-Grouper Complex Fishes 19

2.2.4 Coastal Migratory Pelagics Complex 20

2.2.4.1 Life History 20
2.2.4.1.1 Coryphaenidae 20
2.2.4.1.2 Rachycentridae 21
2.2.4.1.3 Scombridae 21
2.2.5 Summary of Impacts to the Coastal Migratory Pelagics Complex Fishes 22
2.3 Associated Species 22
2.3.1 Invertebrates 22
2.3.2 Fishes 23
2.3.3 Summary of Impacts to Associated Species 24
3.0 CONCLUSIONS 24
4.0 REFERENCES 25

LIST OF FIGURES

Page
Figure 1 Location Map 2
Figure 2 Study Area 3

LIST OF TABLES

Page
Table 1 Managed Species Identified by the South Atlantic Fishery Management Council That Are Known to Occur in Brevard County, Florida 9

1.0 INTRODUCTION

1.1 Project Purpose

The Canaveral Port Authority (CPA) is currently conducting a feasibility study of potential navigation improvements under the authority granted under Section 203 of the Water Resources Development Act (WRDA), 1986. The study is in response to problems and issues identified by the CPA and Canaveral Pilots Association with regard to ship maneuvering and delays caused by within the existing federal project. The three major problems at Port Canaveral are:

1. Congestion at cargo berths reduces the effectiveness and efficiency of cargo vessels and landside facilities. Given the rapid growth in commodity movements at Port Canaveral, in the very near future a significant proportion of cargo vessels calling at Port Canaveral will have to wait offshore for a berth to become available. Some of these vessels may divert to an alternative port and incur increased transportation costs, if channels are not improved. In addition, landside facilities will stand temporarily idle as vessels wait offshore for an available berth or safe passage through the Federal channel.

2. The size of cargo vessels calling at Port Canaveral is constrained by existing channel dimensions and configurations. Larger, more efficient vessels could be used for bulk items such as petroleum products, aggregates and cement if channels were improved.

3. The size of cruise ships calling at Port Canaveral is constrained by channel and turning basin dimensions. Increasingly larger cruise ships are calling at Port Canaveral and are beginning to exceed the dimensions for safe use of the existing west turning basin. Passage of large cruise ships through the narrow ship channel leading to the turning basin and cruise ship piers also causes surges at cargo piers that line the channel, which results in cargo vessels having to stop loading and unloading activities while the cruise ships pass. The potential for future cruise ship terminal expansion also cannot be fully exploited under existing channel and turning basin dimensions and configurations.

1.2 Study Area Location

Port Canaveral is located in Brevard County on the east coast of Florida, just north of Cape Canaveral and approximately nine miles north of Cocoa Beach (Figure 1). The main port is orientated in an east – west direction, extending from the Atlantic coast to the Banana River. The port is bounded to the north by the Cape Canaveral Air Force Station (CCAFS) and the Banana River, and bounded to the south by the City of Cape Canaveral. The harbor consists of three turning basins (Figure 2). Starting from the east they are: the Trident Turning Basin (TTB), the Middle Turning Basin (MTB), and the West Turning Basin (WTB). The basins are connected by a channel (East Access Channel and West Access Channel) that forms the south

Titusville
Port St. John
Port Canaveral
Cape Canaveral
Cocoa
Cocoa West
Merritt Island
Cocoa Beach
Rockledge
John F Kennedy Space Center
Patrick Air Force Base
Jane Green Swamp
Nasa
Kennedy
Cape
Kings
Ranch
Banyan
Fay
Gissom
Cities
Hartville
Sharpes
Satellite
Indian River
Eyster
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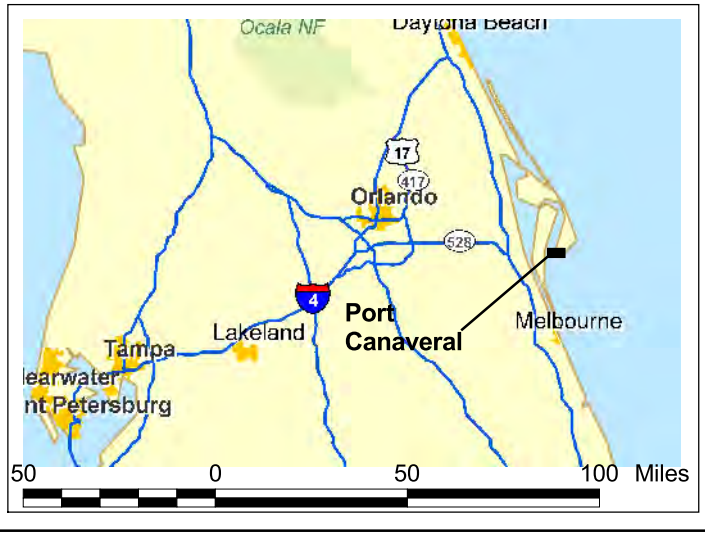

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Port Canaveral EFH Assessment

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	Figure 2

boundary of each basin. Within this channel, a Federally maintained Barge Canal extends from the south side of the MTB, through the Banana River, across Merritt Island, and connects with the Intracoastal Waterway (ICWW) system in the Indian River. Where the Barge Canal enters the Banana River, a 600-foot long Corps of Engineers' lock (Canaveral Lock) separates the tidal harbor from the almost non-tidal river.

1.3 Project Alternatives

The primary objective of the Section 203 Study was to identify and evaluate alternatives that would:

1. Reduce future congestion at Port Canaveral;
2. Accommodate anticipated future growth in number and size of vessel transiting the Port;
3. Improve the efficiency of operations for cargo vessels and cruise ships within the Port complex;
4. Allow for use of the Port by larger, more efficient, cargo vessels and cruise ships;
5. Allow for development of additional terminals/berths without encroaching on the West Turning Basin.

Three alternatives will be evaluated during the NEPA process and include a no action alternative, one alternative that includes operational changes only, and one structural alternative that is the project Recommended Plan. The no action alternative and the operational alternative would have little or no direct effect on essential fish habitat, so the evaluation presented in this report will focus on the Recommended Plan.

1.3.1 Recommended Plan

The following narrative describes the Recommended Plan project features relative to existing conditions and progressing from the Atlantic Ocean entrance channel to the West Basin. Canaveral Harbor channels are comprised of the outer, middle, and inner reaches, the middle turning basin and west access channels, and the west turning basin. The outer reach is oriented on roughly a northwest-southeast alignment. The remainder of the channels is oriented on a generally east-west alignment. Various cut(s) comprise the outer, middle, and inner reaches as described below.

- Outer Reach, Cut 1A: Existing dimensions are 44-ft project depth by 400 ft wide by 11,000 ft long. New dimensions would increase the project depth to 47 ft. Current USACE quarterly condition surveys indicate that the existing water depth at the end of the project and up to 200 ft beyond the end of the project is 47 ft.

- Outer Reach, Cut1B: Existing dimensions are 44-ft project depth by 400 ft wide by 5,500 ft long. New dimensions would increase the project depth to 47 ft.

- Outer Reach, Cut 1: Existing dimensions are 44-ft project depth by 400 ft wide by 12,500 ft long. New dimensions would increase the project depth to 47 ft only for the 5,300-ft long portion of Cut 1 that is seaward of buoys 7/8 (Station 0+00 to Station 53+00). Project depth for the remaining 7,200-ft of Cut 1, from buoys 7/8 to the apex of the channel turn, would increase to 46 ft.

- US Navy Turn Widener: Existing dimensions are 44-ft project depth by 7.7 acres (triangular shaped area) bounded by outer and middle reaches to the north and northeast and the civil turn widener to the southwest. New dimensions would increase the project depth to 46 ft.

- Civil Turn Widener: Existing dimensions are 41-ft project depth by 15.6 acres (irregular shaped area) bounded to the north and northeast by the middle reach and the US Navy turn widener. New dimensions would increase the project depth to 46 ft.

- New 203 Turn Widener: New dimensions are 46-ft project depth by 23.1 acres (irregular shaped area) bounded to the north and northeast by the civil turn widener and Cut 1 of the outer reach.

- Middle Reach: The middle reach extends from the apex of the channel turn westward to the western boundary of the Trident access channel. Existing dimensions are 44-ft project depth by 400 ft wide by 5,658 ft long. New dimensions would increase the project depth to 46 ft and the project width from 400 ft to 500 ft, providing a 100-ft widener of 2,282 ft in length along the north side of the channel for the portion of the middle reach that is inside of the north jetty. The eastern terminus of the 100-ft widener transitions from the existing to the new northern channel boundary over a plan distance of 500 ft. This portion of the project requires that the western "Surge Warning" notification sign structure be relocated northward 100 ft.

- Trident Access Channel and Trident Basin: With exclusive use by US Navy, the Trident Access channel connects the middle reach to the trident basin. Existing dimensions are 44- and 41-ft project depth by irregular shaped areas for the access channel and the basin, respectively. Existing dimensions to remain except as affected by the new 100-ft north side channel widener at the entrance to the Trident access channel.

- Inner Reach, Cut 2 and Cut 3: Existing dimensions are 40-ft project depth by 400 ft wide by 3,344 ft long. New dimensions would increase the project depth to 44 ft and the project width from 400 to 500 ft, providing a 100-ft widener along the entire length of the reach on the north side of the channel. The rip-rap protected shoreline and berm between the middle and trident basins will be relocated northward to accommodate the 100-ft northside channel widener.

- Middle Turning Basin: The middle turning basin has shared use by commercial and military activities. The federal project area encompasses 92.4 acres with project depths of 35 ft in the north and east portions of the basin used exclusively by the military and 39 ft in the remainder of the basin supporting commercial vessel traffic. Because of the somewhat limited room afforded by the present 39-ft federal project boundaries toward the northwest portion of the basin, CPA maintains an irregular shaped central portion of the basin to 39 ft. This provides additional area for maneuvering cargo vessels to and from the North Cargo Pier 1 and ro-ro ramp and enlarges the available area for turning displacement vessels on arrival or departure. The existing 39-ft federal project provides a turning circle diameter of 1200 ft. The new project dimensions for commercial purposes encompass 68.9 acres with a project depth of 43 ft yielding a turning circle diameter on the order of 1422 ft. Approximately 1.9 acres of the new 43-ft project area completes the western end of the north side channel widener in the area adjacent to the inner reach and the US Navy's Poseidon Wharf. As in the inner reach, the rip-rap protected north side shoreline will be relocated northward to accommodate the north side channel widening. The US Navy's mooring dolphin, located east of Poseidon Wharf and no longer used, sits within 25 ft of the new channel boundary and will be removed to eliminate a potential hazard to navigation.

- West Access Channel (east of Station 260+00): Existing dimensions are 39-ft project depth by 400 ft wide by 1,840 ft long. New dimensions would increase the project depth to 43 ft and increase the project width from 400 to 500 ft, providing 100 ft of widening along the entire length of the channel by redefining the northern channel boundary 12 ft north of the existing northern boundary, and widening the channel by 88 ft along the south side and into the barge canal.

- West Turning Basin and West Access Channel, Cut A (west of Station 260+00): The West turning basin has exclusive use by commercial activities and the Coast Guard. The Existing federal basin and Cut A of the west access channel take up 78.6 acres with a project depth of 31 ft as federally maintained and 35 ft as maintained by the CPA. The CPA has also maintained a triangular shaped 35-ft project area adjacent to the northeast shoreline at the entrance to the west turning basin and at the request of the pilots, performed new work dredging beyond present project limits at this location since 2003 to facilitate cruise vessel access to and from the basin and cruise berths. The Existing federal project basin provides a turning circle diameter of 1400 ft. The preferred alternative, comprising 141 acres, will expand the federal project limits in the northern and western portions as needed to support cruise ship access to present and planned terminals and will enlarge the entrance to the west basin providing a new turning circle diameter of 1725 ft. The turning circle and entrance widening will be created by dredging beyond the present federal and CPA project boundaries to the northeast and to the south within the barge canal. Approximately 18.5 acres of existing bank, shoreline, and uplands adjacent to the CPA 35-ft project boundary and 6.9 acres within the existing barge canal will be dredged to the new project depth of 35 ft.

The Recommended Plan will result in dredging or excavation of 4,271,000 million cubic yards of sand, silts, and clays of which all but 455,000 cubic yards is identified for uplands or offshore disposal. The 455,000 cubic yards designated as upland excavation and will be disposed upland for beneficial reuse. The upland excavated material comes from the West Turning Basin corner cut-off and the northside widener from existing grade down to elevation -13 MLLW. The geotechnical investigations show that sands suitable for reuse are generally located at and above elevation -13 feet (MLLW). Although these sands do not appear to be suitable for direct placement on the beach, they can be stockpiled on land for beneficial reuse as construction fill material. Excavated material below -13 feet MLLW is generally not suitable for reuse and would be disposed in the offshore disposal site. In the event that suitable material is found below -13 feet MLLW, it would be placed in the Nearshore Disposal Area.

2.0 ESSENTIAL FISH HABITAT DESIGNATION

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act of 1976 and the 1996 Sustainable Fisheries Act, an Essential Fish Habitat (EFH) assessment is necessary for this project. An EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." *Waters* include aquatic areas and their associated physical, chemical, and biological properties that are use by fishes and may include areas historically used by fishes. *Substrate* includes sediment, hardbottom, structures underlying the waters, and any associated biological communities. *Necessary* means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem. *Spawning, breeding, feeding, or growth to maturity* covers all habitat types used by a species throughout its life cycle. Only species managed under a federal fishery management plan (FMP) are covered (50 C.F.R. 600). The act requires federal agencies to consult on activities that may adversely influence EFH designated in the FMPs. The activities may have direct (e.g., physical disruption) or indirect (e.g., loss of prey species) effects on EFH and may be site-specific or habitat-wide. The adverse result(s) must be evaluated individually and cumulatively.

2.1 Assessment

The most obvious direct impact of the Recommended Plan on managed species in all habitats is the potential for mortality and/or injury of individuals through the dredging and/or rock removal processes. Species in any and all of the project area's habitats are susceptible. Fishes and invertebrates are at risk at any life-history stage; eggs, larvae, juveniles, and even adults may be inadvertently killed, disabled, or undergo physiological stress, which may adversely affect behavior or health. Forms that are less motile, such as juvenile shrimp, are particularly vulnerable (they would be sucked into the dredge apparatus, or otherwise directly removed from their habitat).

Although dredge operations are likely to directly impact individuals of managed species in observable lethal and sublethal ways, dredging and rock removal may have more subtle effects. These subtle effects act on individuals, but may be perceived only at the population level. For example, dredging activities, particularly in linear corridors (such as Port Canaveral channel) may interfere with migration patterns of species that require utilization of both inshore and offshore habitats through ontogeny. This is a particular concern for species that travel along shorelines and bulkheads. Therefore dredging berths and littoral zone habitats is anticipated to have greater effects. These impacts may result in displacement of individuals or disjuncture in the life-cycles of managed species.

Water Column. Impacts to the water column can have widespread effects on marine and estuarine species. Hence, it is recognized as EFH. The water column is a habitat used for foraging, spawning, and migration by both managed species and organisms consumed by managed species. Water quality concerns are of particular importance in the maintenance of this important habitat. During dredging in substrates comprising coarser materials and rock, water quality impacts are expected to be minimal. However, where silt and/or silty sand are to be dredged, water quality impacts are expected to be significant, and take several weeks/months after cessation of dredging activities to return to background levels. Re-suspended materials will interfere with the diversity and concentration of phytoplankton and zooplankton, and therefore affect foraging success and patterns of schooling fishes and other grazers that comprise prey for managed species. Recent efforts to quantify areal impacts of dredging incorporate only the waters directly above dredged substrates. However, due to the physical properties of water and the complex hydraulics operating within the harbor and channels, these efforts greatly underestimate the extent of negative effects of dredging.

Unvegetated Softbottom Habitat. Impacts to populations of managed species will occur due to dredging softbottom habitats, including those that lack seagrasses. Dredging will remove benthic organisms used as prey by managed species and as a result may temporarily impact certain species, such as red drum, that forage largely on such taxa. Dredged habitats are anticipated to recover, in terms of benthic biodiversity and population density, within two years (Taylor et. al 1973, Culter and Mahadevan, 1982; Saloman et. al, 1982).

Sargassum. Sargassum is pelagic brown algae that occurs in large, floating mats on the continental shelf and in the Gulf Stream including the waters off of Cape Canaveral. Sargassum provides valuable habitat for marine species including juvenile sea turtles, sea birds, and a variety of fish species. In the nearshore areas off Port Canaveral, sargassum only occurs in small clumps in the upper portion of ocean waters, and would not likely be adversely affected by dredging or disposal activities.

Live or Hardbottoms. Live or hardbottom habitats are associated with deviations in ocean floor relief and support invertebrate and algal communities with substantial fish assemblages. In the waters off southeast Florida, live bottom is particularly evident at the shelf break, a zone from about 35 to 100 fathoms where the Continental Shelf adjoins the deeper ocean basin. These habitats are not known to occur in the vicinity of Port Canaveral or the Canaveral ODMDS. However, some manmade areas of riprap occur adjacent to the main channel within Port

Canaveral that support algal growth and foraging for juvenile sea turtles (Redfoot 1997; Dial Cordy 2006). A portion of this habitat between the Trident Turning Basin and the Middle Turning Basin would be temporarily displaced during channel widening. The riprap would be replaced and likely recolonized after construction is completed. Additional foraging habitat occurs within the Trident Turning Basin, which is also used for foraging by juvenile sea turtles (Redfoot 1997). Therefore, this habitat would be adversely affected by the project, but effects would only be temporary in nature.

The aquatic communities associated with these different bottom types and the water column have been identified as EFH in accordance with the amendment to the Fishery Management Plans of the South Atlantic Region (SAFMC, 1998). Impacts associated with widening and deepening of the harbor are unavoidable. However, implementing strict management practices to reduce turbidity will minimize the temporary disruption of the water column and sand bottom areas that may provide habitat or contribute to aquatic food chains. These practices along with the construction of new seagrass and hardbottom habitat should mitigate for any direct impacts.

2.2 Managed Species

Thirty-seven of these fish species are listed under the Affected Fishery Management Plans and Fish Stocks of the Comprehensive EFH Amendment (SAFMC, 1998). Consequently, the project area has been designated as EFH for theses fishes, brown shrimp, white shrimp, pink shrimp, and spiny lobster (Table 1). Six coastal migratory pelagic fish species have been included owing to their distribution patterns along the Florida coast (SAFMC, 1998).

The species addressed in this section consist of fishes and invertebrates of both recreational and commercial importance that are managed under the Magnuson-Stevens Fishery Conservation and Management Act (PL94-265).

Table 1 Managed Species Identified by the South Atlantic Fishery Management Council That Are Known to Occur in Brevard County, Florida

Common Name	Taxa
Balistidae	
Gray Triggerfish	*Balistes capriscus*
Queen Triggerfish	*Balistes vetula*
Ocean Triggerfish	*Canthidermis sufflamen*
Carangidae	
Yellow Jack	*Caranx bartholomaei*
Blue Runner	*Caranx crysos*
Crevalle Jack	*Caranx hippos*
Bar Jack	*Caranx rubber*
Greater Amberjack	*Seriola dumerili*
Coryphaenidae	
Dolphin [1]	*Coryphaena hippurus*

Common Name	Taxa
Ephippidae	
Spadefish	*Chaetodipterus faber*
Haemulidae	
Black Margate	*Anisotremus surinamensis*
Porkfish	*Anisotremus virginicus*
Margate	*Haemulon album*
Tomtate	*Haemulon aurolineatum*
Smallmouth Grunt	*Haemulon chrysargyreum*
French Grunt	*Haemulon flavolineatum*
Spanish Grunt	*Haemulon macrostomum*
Cottonwick	*Haemulon melanurum*
Sailors Choice	*Haemulon parra*
White Grunt	*Haemulon plumieri*
Blue Stripe Grunt	*Haemulon sciurus*
Labridae	
Puddingwife	*Halichoeres radiatus*
Hogfish	*Lachnolaimus maximus*
Lutjanidae	
Mutton Snapper	*Lutjanus analis*
Schoolmaster	*Lutjanus apodus*
Gray Snapper	*Lutjanus griseus*
Dog Snapper	*Lutjanus jocu*
Mahogany Snapper	*Lutjanus mahogoni*
Lane Snapper	*Lutjanus synagris*
Yellowtail Snapper	*Ocyurus chrysurus*
Rachycentridae	
Cobia [1]	*Rachycentron canadum*
Scombridae	
Little Tunny [1]	*Euthynnus alletteratus*
King Mackerel [1]	*Scomberomorus cavalla*
Spanish Mackerel [1]	*Scomberomorus maculates*
Cero [1]	*Scomberomorus regalis*
Serranidae	
Black Sea Bass	*Centropristis striata*
Rock Hind	*Epinephelus adscensionis*
Goliath Grouper	*Epinephelus itajara*
Red Grouper	*Epinephelus morio*
Black Grouper	*Mycteroperca bonaci*
Gag	*Mycteroperca microlepis*
Sparidae	
Sheepshead	*Archosargus probatocephalus*
Jolthead Porgy	*Calamus arctifrons*
Invertebrates	
Brown Shrimp	*Farfantepenaeus aztecus*
Pink Shrimp	*Farfantepenaeus duorarum*
White Shrimp	*Litopenaeus setiferus*
Spiny Lobster	*Panulirus argus*

[1] Coastal Migratory Pelagic Fish Species

2.2.1 Crustacea

2.2.1.1 Life Histories

2.2.1.1.1 Brown Shrimp

Brown shrimp larvae occur offshore and migrate from offshore as post-larvae from January through November with peak migration from February through April. Post-larvae move into the estuaries primarily at night on incoming tides. Once in the estuaries, post-larvae seek out the soft silty/muddy substrate common to both vegetated and non-vegetated, shallow estuarine environments. This environment yields an abundance of detritus, algae, and microorganisms that comprise their diet at this developmental stage. Post-larvae have been collected in salinities ranging from zero to 69 ppt with maximum growth reported between 18° and 25°C, peaking at 32°C (Lassuy, 1983). Maximum growth, survival, and efficiency of food utilization has been reported at 26°C (Lassuy, 1983). The density of post-larvae and juveniles is highest among emergent marsh and submerged aquatic vegetation (Howe et al., 1999; Howe and Wallace, 2000), followed by tidal creeks, inner marsh, shallow non-vegetated water, and oyster reefs. The diet of juveniles consists primarily of detritus, algae, polychaetes, amphipods, nematodes, ostracods, chironomid larvae, and mysids (Lassuy, 1983). Although some of their potential prey will initially be lost during dredging activities, recovery will be rapid (Culter and Mahadevan, 1982; Saloman et al., 1982) and they can forage in adjacent areas that have not been impacted as they emigrate offshore. Emigration of sub-adults from the shallow estuarine areas to deeper, open water takes place between May through August, with June and July reported as peak months. The stimulus behind emigration appears to be a combination of increased tidal height and water velocities associated with new and full moons. After exiting the estuaries, adults seek out deeper (18 m), offshore waters in search of silt, muddy sand, and sandy substrates. Adults reach maturity in offshore waters within the first year of life.

2.2.1.1.2 Pink Shrimp

Of the three penaeid shrimp species, pink shrimp is the most prevalent in Florida waters. Consequently, the pink shrimp fishery is the most economically important of all fisheries in Florida. Spawning of pink shrimp occurs in oceanic waters at depths of 4 to 48 m and possibly deeper (Bielsa et al., 1983) where adult females lay demersal eggs. Spawning takes place year round in some areas (e.g., Tortugas Shelf), but peak spawning activity appears to coincide with maximum bottom water temperatures (Bielsa et al., 1983). Recruitment of planktonic post-larvae into estuarine and coastal bay nursery areas occurs in the spring and late fall during flood tides. Post-larvae become benthic at approximately 10 mm TL and prefer areas with a soft sand or mud substrate mixture containing sea grasses and turtle grass (Bielsa et al., 1983;

Howe et al., 1999; Howe and Wallace, 2000). Pink shrimp spend from 2 to 6 months in the nursery ground prior to emigration. During this time there is a dietary shift from nauplii and microplankton to polychaetes, ostracods, caridean shrimps, nematodes, algae, diatoms, amphipods, mollusks, and mysids, regarding post-larvae and juveniles, respectively (Bielsa et al., 1983). Although some of their potential prey will initially be lost during dredging activities, recovery will be rapid (Culter and Mahadevan, 1982; Saloman et al., 1982) and they can forage in adjacent areas that have not been impacted as they emigrate offshore. Emigration from the nursery grounds to offshore occurs year round with a peak during the fall and a smaller peak during the spring. The greatest concentrations of adults have been reported between 9 and 44 m, although some have been found as deep as 110 m in Florida waters. Although detailed dietary studies concerning adults are non-existent, Williams (1955) reported foraminiferans, gastropod shells, squid, annelids, crustaceans, small fishes, plant material, and debris in the stomachs of adults collected in North Carolina estuaries.

2.2.1.1.3 White Shrimp

White shrimp spawn along the South Atlantic coast from March to November, with May and June reported as peak months along the offshore waters of northeast Florida. Spawning takes place in water ≥ 9 m deep and within 9 km from the shore where they prefer salinities of ≥ 27 ppt (Muncy, 1984). The increase in bottom water temperature in the spring is thought to trigger spawning. After the demersal eggs hatch, the planktonic post-larvae live offshore for approximately 15-20 days. During the second post-larval stage, they enter Florida estuaries in April through early May by way of tidal currents and flood tides and become benthic. During this larval stage, the diet consists of zooplankton and phytoplankton. It has been documented that juvenile white shrimp tend to migrate further upstream than do juvenile pink or brown shrimp; as far as 210 km in northeast Florida (Pérez-Fartante, 1969). Juveniles prefer to inhabit shallow estuarine areas with a muddy substrate with loose peat and sandy mud and moderate salinity. Juvenile white shrimp are benthic omnivores (e.g., fecal pellets, detritus, chitin, bryozoans, sponges, corals, algae, annelids) and feed primarily at night. White shrimp usually become sexually mature at age I during the calender year after they hatched. The emigration of sexually mature adults to offshore waters is influenced primarily by body size, age, and environmental conditions. Studies have shown that a decrease in water temperature in estuaries triggers emigration in the south Atlantic (Muncy, 1984). The life span of white shrimp usually does not extend beyond one year.

2.2.1.1.4 Spiny Lobster

The spiny lobster inhabits the coastal waters from North Carolina to Rio de Janeiro, Brazil, including Bermuda and the Gulf of Mexico. The Florida spiny lobster is a valuable species both commercially and recreationally, and supports Florida's second most valuable shellfishery. During its life cycle, the spiny lobster occupies three different habitats (Marx and Herrnkind, 1986). The phyllosoma larvae are planktonic and inhabit the epipelagic zone of the Caribbean,

Gulf of Mexico, and the Straits of Florida. The duration of the phyllosome stage is approximately 6 to 12 months. A brief (several weeks) non-feeding, oceanic phase follows, where the larva metamorphoses into a puerulus offshore. The pueruli migrate to shore by night using specialized abdominal pleopods. Large concentrations of pueruli have been recorded along the southeast Florida coast and the southern shores of the Florida Keys year round, with a peak in the spring and a lesser peak in the fall. In addition, these large concentrations are usually associated with the new and first quarter lunar phases. When suitable inshore substrate is encountered by pueruli, they rapidly settle out of the water column and within days molt into the first juvenile stage. The specific factors that stimulate post-larval settlement is not well understood. Known nursery areas of young benthic larvae and juveniles consist of macroalgae beds along rocky shorelines interspersed with seagrasses where they live a solitary existence (Marx and Herrnkind, 1986). Juveniles larger than 20 mm CL tend to aggregate in biotic (e.g., sponges, small coral heads, sea urchins) and abiotic (ledges) structures in protected bays, including estuaries with high salinity. As adults, spiny lobsters inhabit coral reef crevices, rocky outcroppings, and ledges. Refuge availability plays an important role regarding population distribution because spiny lobsters do not have the ability to construct dens. However, in a study where additional artificial structures were placed in Biscayne Bay, FL, the population was re-distributed, but the number of spiny lobsters in the Bay did not increase (Marx and Herrnkind, 1986). Consequently, the south Florida population may be limited by recruitment, emigration, food, and other factors.

2.2.1.2 Summary of Impacts to Shrimps and Spiny Lobsters

As outlined by SAFMC (1998), EFH-HAPCs for penaeid shrimps include coastal inlets and both state identified overwintering areas and nursery habitats. Seagrass beds common to the bays of Florida are particularly important areas. Essential fish habitats for spiny lobster are varied including nearshore shelf/oceanic waters, shallow, benthic subtidal areas, seagrass beds, soft sediment and both live and hardbottom, sponges, algal communities, mangroves, and the Gulf Stream which it uses for dispersion (SAFMC, 1998).

The project area includes sand bottom and water column that may be used by all three penaeid species and spiny lobster as post-larvae, juvenile, and adults. The project would impact a relatively small area of the sand and the impacts would be minor. The project will cause localized turbidity during construction; however, turbidity would be minimized using the best management practices so that any impacts would be minor and temporary. Penaeid shrimp and spiny lobster would not be affected.

2.2.2 Habitat Areas of Particular Concern

2.2.2.1 Unvegetated Bottom Habitat

Unvegetated bottoms predominate the substrates within the Port Canaveral area. These habitats are important for both migration routes and foraging of managed species. These habitats serve as important foraging areas for species such as red drum.

2.2.2.2 Summary of Impacts to Unvegetated Bottom Habitat

Unvegetated softbottom habitats comprise a significant proportion or the total area proposed for dredging. As long as the areas remained as viable aquatic habitat following dredging, benthic infaunal populations in these areas would re-colonize. Whether the substrate remains viable for benthos may depend on the degree to which light attenuates with the additional depth. Increased depth may not promote the growth of macroalgae and epipsammic algae.

Impacts to benthic infaunal and epifaunal communities would be considered as relatively minimal when examined on a spatial scale. Infaunal communities in particular have very high reproductive potential and recruitment. Adjacent areas that have not been impacted would most likely be the primary source of recruitment to the impacted areas. Previous studies have shown a relatively short recovery time for infaunal communities following dredging (Taylor et. al 1973, Culter and Mahadevan, 1982; Saloman et. al, 1982). Succession of infaunal communities post dredging should begin within days following construction. This initial settlement usually consists of pelagic larval recruits settling within the impact area. Later succession from adjacent non-impacted areas will be more gradual, and involve less opportunistic species. Saloman et. al (1982) stated that communities would be close to pre-dredge conditions within one year and potentially as quickly as 8-9 months. Culter and Mahadevan (1982) found similar results and no long-term effects to benthic communities resulting from dredging activities. Based on these previous studies infaunal communities will most likely be re-established within 1-2 years post dredging.

2.2.3 South Atlantic Snapper-Grouper Complex

Brevard County, Florida is designated as EFH for 37 species of reef fishes (Table 1) that are listed under the Affected Fishery Management Plans and Fish Stocks of the Comprehensive EFH Amendment (SAFMC, 1998). Collectively, these 37 species, representing eight different families, are all members of the 73 species Snapper-Grouper Complex as outlined by SAFMC (1998). A discussion of how these fishes utilize the different inshore habitats follows.

2.2.3.1 Life History

2.2.3.1.1 Balistidae

Brevard County is designated as EFH for three species of triggerfishes (Table 1). Collectively, these triggerfishes inhabit shallow inshore areas (e.g., bays, harbors, lagoons, sandy areas, grassy areas, rubble rock, artificial reefs, or dropoffs adjacent to offshore reefs) to offshore waters as deep as 275 m. These triggerfishes, especially the gray and queen triggerfish are an important component of the reef assemblage of both natural and artificial reefs (Vose and Nelson, 1994). Information regarding balistid reproduction is limited and varied (Thresher, 1984). The basic balistid (e.g., gray triggerfish) spawning behavior involves the production of dermersal, adhesive eggs that are thought to stick to corals and algae near or on the bottom. On the other hand, spawning of both the ocean and queen triggerfish takes place well off the bottom over relatively deep water where pelagic eggs are released. Unfortunately, egg and larval development is poorly understood regarding most species; however, a long (≥ 1 yr) planktonic stage appears common for many species. As juveniles, it has been suggested that they are planktonic, taking refuge among floating masses of *Sargassum* (Johnson and Saloman, 1984). During this stage of development, the diet consists of primarily zooplankton associated with the *Sargassum* or drifting in the water column. The exact timing or the environmental cues that trigger settlement is not well understood. However, juvenile gray triggerfish as small as 16 - 17 cm SL have been reported to colonize hardbottom habitats (Thresher, 1984). After juveniles take on a benthic existence, their diet shifts to benthic fauna including algae, hydroids, barnacles, and polychaetes. All triggerfish feed diurnally and are well adapted to prey upon hard-shell invertebrates, especially adults. The diet of adult ocean triggerfish includes large zooplankton and possibly drifting seagrasses, algae, mollusks, and echinoderms. Adult gray and queen triggerfish feed primarily on sea urchins, but in their absence, will shift to other benthic invertebrates such as crabs, chiton, and sand dollars (Frazer et al., 1991; Vose and Nelson, 1994). All three triggerfishes are commercially important (especially the queen triggerfish) in the aquarium trade and to some extent as a gamefish.

2.2.3.1.2 Carangidae

Brevard County is designated as EFH for five carangids (Table 1) because they utilize the offshore and possibly inshore areas adjacent to the study area. Spawning of the bar jack, yellow jack, blue runner, and the crevalle jack takes place in offshore waters associated with a major current system such as the Gulf Stream from February through September (Berry, 1959). Consequently, these four species have an offshore larval existence. Data indicates that peak spawning months for blue runners is May through July (Shaw and Drullinger, 1990). Although spawning data regarding the greater amberjack doesn't exist, it is assumed that it is similar to the other four species. As young juveniles, crevalle jack migrate into inshore waters at about 20 mm SL whereas blue runners don't migrate into inshore areas until their late juvenile stage (Berry, 1959). Young bar jacks have a tendency to remain offshore and yellow jacks occur

inshore only occasionally as juveniles (Berry, 1959). Based on collections of juveniles regarding these four species, there is some indication that there is a mobile, northward population of developing young in the Gulf Stream that developed from spawning that occurred in more southern waters (Berry, 1959).

As juveniles and sub-adults, blue runners occur singly or in schools while juveniles have a high affinity for *Sargassum* and other floating objects in the Gulf Stream off southeast Florida (Goodwin and Finucane, 1985). Blue runners are a fast growing, long-lived species which attains 75% of its maximum size in its first 3 - 4 years of life (Goodwin and Johnson, 1986). The greater amberjack is a far ranging species that inhabits inlets, shallow reefs, rock outcrops, and wrecks with reef fishes such as snappers, sea bass, grunts, and porgies (Manooch and Potts, 1997a). They are generally restricted to the continental shelf to depths as great as 350 m (Manooch and Haimovici, 1983). Small individuals (< 1 m SL) are usually found in water < 10 m deep while larger individuals frequent waters 18 - 72 m deep (Manooch and Potts, 1997b). Greater amberjack are a fast growing species and are recruited to the headboat fishery in the Gulf by age 4 and fully recruited to the fishery by age 8 (Manooch and Potts, 1997a; Manooch and Potts, 1997b).

All five carangids are popular sport fishes among recreational fishers, but not as popular commercially where they are harvested using handlines, bottom longlines, and in some cases traps and trawls. Some Florida fishers feel that amberjack are being exposed to too much fishing pressure, especially owing to their attraction to reefs which make them an easy target for overfishing (Manooch and Potts, 1997a). However, as of 1997 there is no evidence of overfishing in both the Gulf of Mexico and southeast Florida (Manooch and Potts, 1997b).

2.2.3.1.3 Ephippidae

Brevard County is designated as EFH for the spadefish because as juveniles it inhabits shallow sandy beaches, estuaries, jetties, wharves, and other inshore areas, as well as deeper offshore habitats as adults. Spawning which takes place from May to September involves an offshore migration as far as 64.4 km (Chapman, 1978; Thresher, 1984). Although no data exists regarding egg and larvae development in nature, small individuals (~ 1-2 cm TL) appear inshore in early summer (Walker, 1991). These small juveniles are commonly observed drifting motionless along side vegetation (e.g., *Sargassum*). It has been suggested that they mimic floating debris and vegetation to escape predation. As spadefish mature they move further offshore where large schools will take residence around wrecks, oil and gas platforms, reefs, and occasionally open water. Spadefish are opportunistic feeders, preying upon a variety of items including small crustaceans, worms, hydroids, sponges, sea cucumbers, salps, anemones, and jellyfish. In certain areas, the spadefish is an important game fish.

2.2.3.1.4 Haemulidae

Brevard County is designated as EFH for eleven species of grunts (Table 1). Collectively, these grunts inhabit shallow inshore areas (e.g., estuaries, jetties, piers, seagrass beds), rock outcrops, and offshore waters as deep as 110 m. Although most of the life history data concerning grunts (Cummings et al., 1966; Manooch and Barans, 1982; Darcy, 1983; McFarland et al., 1985; Sedberry, 1985) are from studies of tomtate, white grunt, French grunt, blue stripe grunt, and the margate, the general information can probably be applied to the other species as well. As a reef-dwelling species, grunts are probably similar to other roving benthic predators such as snappers and groupers that migrate to select spawning sites along the outer reef and participate in group spawning at dusk. Some data suggests that spawning takes place over much of the year, while other suggests spawning peaks in later winter and spring (Manooch and Barans, 1982; Darcy, 1983). The eggs are pelagic as well as the planktonic larvae. After this pelagic larval stage that may last several weeks, they settle to the bottom as benthic predators (Darcy, 1983). The juveniles are commonly found in seagrass beds, near mangroves, and other inshore, shallow areas. Studies in the Caribbean regarding French grunt, suggested that fertilization and settlement was associated with the lunar cycle (quarter moon, rather than the full or new moon) and daily tidal cycles (rising and falling tides), respectively (McFarland et al., 1985). Juveniles are diurnal planktivores that tend to feed higher in the water column than adults on amphipods, copepods, decapods, and small fishes (Darcy, 1983; Sedberry, 1985). The transformation to adult involves a change in feeding strategy from diurnal planktivore to nocturnal benthic foraging. Most grunts take refuge near the reef in schools, but at dusk they disperse and forage over the reef, along sandy flats, and grass beds for crustaceans, fishes, mollusks, polychaetes, and ophiuroids. Because of these nocturnal foraging migrations, grunts are a major source of food for higher tropic level, piscivorous fishes. In addition, they are very important to hardbottom reef-related fisheries regarding the energy transfer from sandy expanses to these reefs (Darcy, 1983). Several species of grunt such as the tomtate and white grunt have some commercial and recreational importance. Tomtate are commonly caught by sport fishers from shore, bridges, jetties, and inshore waters by boat. In the southeastern United States, the hook and line fishery is the most important method of commercial harvest regarding tomtate (Darcy, 1983). In addition, tomtate are collected using traps, trawls, and seines off southeast Florida. Commercially, tomtate are usually discarded or cut up and used as bait for the grouper or snapper fishery. Similarly, white grunt are commercially harvested by hook and line along the southeast United States and is also a common sport species.

2.2.3.1.5 Labridae

Brevard County is designated as EFH for two species of wrasse (Table 1). The EFH for both species ranges from shallow reef and patch reefs, areas of hard sand and rock, and/or along areas inshore or offshore of the main reef. The puddingwife appears to be depth restricted as it is rare to find this species in waters deeper than 13.3 m, while the hogfish inhabits areas as

shallow as 3.3 m deep (Thresher, 1980). Reproduction in wrasses involves a complex reproductive system based on protogynous hermaphroditism which features a complex socio-sexual system involving sex reversal, alternate spawning systems and variable color patterns (Thresher, 1980). Both species participate in group (the dominant or terminal male with a harem of females) broadcast spawning that occurs along the outer edge of a patch reef or on an extensive reef complex along the outer shelf during the summer months (Thresher, 1984). Hogfish spawn during the late afternoon or early evening hours, while puddingwife spawning is synchronized with strong tidal or shoreline currents. Although the exact duration of both the planktonic egg and larval stage is unknown, some records suggest that the latter may be as short as one month before the larvae settle out. Newly settled hogfish and puddingwifes use common areas around grass flats and the shallow reef, respectively. The smallest juveniles on record collected on reefs is approximately 10 mm SL. Other data suggests that puddingwife as small as 30 mm SL may be sexually active. As a benthic predator, the diet of adult hogfish consists of mollusks, echinoderms, and small crustaceans (primarily crabs). Owing to their large size, hogfish are popular with sport fishers.

2.2.3.1.6 Lutjanidae

Brevard County is designated as EFH for seven species of snapper (Table 1). Collectively, the EFH of these snappers ranges from shallow estuarine areas (e.g., vegetated sand bottom, mangroves, jetties, pilings, bays, channels, mud bottom) to offshore areas (e.g., hard and live bottom, rocky bottom) as deep as 400 m (Allen, 1985; Bortone and Williams, 1986). Like most snappers, these seven species participate in group spawning, which indicates either an offshore migration or a tendency for larger, mature individuals to take residency in deeper, offshore waters. Data suggests that adults tend to remain in one area. Both the eggs and larvae of these snappers are pelagic (Richards et al., 1994). After an unspecified period of time in the water column, the planktivorous larvae move inshore and become demersal juveniles. The diet of these newly settled juveniles consists of benthic crustaceans and fishes. Juveniles inhabit a variety of shallow, estuarine areas including vegetated sand bottom, bays and seagrass beds. As adults, most are common to deeper offshore areas such as live and hardbottoms and rock rubble. However, adult mutton, gray, and lane snapper also inhabit vegetated sand bottoms with gray snapper less frequently occurring in estuaries and mangroves (Bortone and Williams, 1986). The diet of adult snappers includes a variety fishes, shrimps, crabs, gastropods, cephalopods, worms, and plankton. All seven species are of commercial and/or recreational importance In particular, the mutton, gray, lane, and yellowtail snapper comprise the major portion of Florida's snapper fishery (Bortone and Williams, 1986).

2.2.3.1.7 Serranidae

Brevard County is designated as EFH for six species of sea bass (Table 1). Collectively, the EFH of these sea bass ranges from shallow estuarine areas (e.g., seagrass beds, jetties, mangrove swamps) to offshore waters as deep as 300 m (Heemstra and Randall, 1993; Jory and Iverson, 1989; Mercer, 1989). Like all other serranids, these six species are protogynous

hermaphrodites; functioning initially as females only to undergo a sexual transformation at a later time to become functional males. In addition, like all other serrranids, these six species produce offshore planktonic eggs, moving into shallow, inshore water during their post-larval benthic stage. Juveniles inhabit estuarine, shallow areas such as seagrass beds, bays, harbors, jetties, piers, shell bottom, mangrove swamps, and inshore reefs. Juveniles feed on estuarine dependent prey such as invertebrates, primarily crustaceans, that comprise the majority of their diet at this developmental stage. As sub-adults and adults, they migrate further offshore taking refuge along rocky, hard, or live bottom, on artificial reefs, in crevices, ledges, or caverns associated with rocky reefs. During this stage in their lives, the bulk of their diet consists of fishes, supplemented with crustaceans, crabs, shrimps, and cephalopods. Except for the Goliath grouper, the other species discussed in this section have some importance to commercial and/or recreational fisheries.

2.2.3.1.8 Sparidae

Brevard County is designated as EFH for two species of porgy (Table 1). The EFH regarding both species ranges from shallow inshore waters (e.g., vegetated areas, jetties, piers, hard and rock bottoms), to deeper offshore waters with natural or artificial reefs, offshore gas and oil platforms, or live bottom habitat (Darcy, 1986). Although nothing is known regarding the sexuality of the jolthead porgy, it is most likely a hermaphroditic species which is widely documented in sparids (Thresher, 1984). On the other hand, the sheepshead has been determined to be a protogynous hermaphrodite through histological investigations (Render and Wilson, 1992). Information regarding tropical sparids is limited, but in general, it suggests long spawning seasons. Little is known about spawning behavior, but it is presumed that both the sheepshead and the jolthead porgy produce pelagic eggs some distance off the bottom. Whether or not spawning takes place in pairs or in spawning aggregations has not been documented. Settlement of sheepshead larvae to the bottom occurs at about 25 mm TL (Thresher, 1984). Based on their dentition, both species are well suited for benthic feeding of sessile and motile invertebrates (e.g., copepods, amphipods, mysids, shrimp, bivalves, gastropds) which are bitten off from hard substrates and vegetation. Neither sparid is considered a schooling species, although they will form small groups composed of several individuals occasionally. There is no direct commercial or sport fishery associated with either sparid; however, both are fished in coastal waters. Both species are an important constituent of grassbed communities in shallow water and live bottom communities in deeper water (Darcy, 1986).

2.2.3.2 Summary of the Impacts to the Snapper-Grouper Complex Fishes

The project area includes sand bottom and water column that may be used by these managed fishes and their prey. The project would impact a relatively small area of the sand and rock habitat and the impacts would be minor and short-term. Some possible refuge and related prey may be lost in regards to the impact to the riprap and sand areas; however, this refuge would be re-created by the construction of the riprap. The project will cause localized turbidity during

construction; however, turbidity would be minimized using the best management practices so that any impacts would be minor and temporary. These fishes and possible prey would be temporarily displaced, but should quickly return to the project area.

2.2.4 Coastal Migratory Pelagics Complex

Brevard County, Florida is designated as EFH for six species of coastal migratory pelagic fishes that are listed under the Affected Fishery Management Plans and Fish Stocks of the Comprehensive EFH Amendment (SAFMC, 1998). Collectively, these six species, representing three different families, are all members of the Coastal Migratory Pelagics Fish Species as outlined by SAFMC (1998). The association of these fishes or their prey with hardbottom structure, or inshore waters during some period of their life cycle and their contribution to a reef fishery ecosystem is why they are included in this complex. A discussion of how these fishes utilize the different inshore habitats and the hardbottom and reef communities follows.

2.2.4.1 Life History

2.2.4.1.1 Coryphaenidae

The dolphin is oceanic and distributed worldwide in both tropical and subtropical waters. Data suggest that this species may be involved in northward migrations during the spring and summer with some occasional movements and migrations being controlled by drifting objects in open waters. Spawning which is poorly documented, it thought to take place in oceanic waters where pairing of the sexes occurs (Ditty et al., 1994). Based on the occurrence of young dolphin in the Florida Current, spawning may be almost year round (November - July) with peak activity in January through March (Palko et al., 1982). Owing to the oceanic distribution of this species, its not surprising that both the egg and larval stages are pelagic. Upon hatching, this species experiences rapid growth throughout its life with both sexes reaching sexually maturity within the first year (Palko et al., 1982). In the Straits of Florida, female dolphin begin to mature at 350 mm FL and become fully mature at 550 mm FL. On the other hand, the smallest, mature male on record is 427 mm FL. The maximum life span of dolphin is estimated at 4 years. The diet of dolphin alters throughout its life cycle (Palko et al, 1982). As larvae, they feed primarily on crustaceans, with copepods as the primary prey item. Adult dolphin are opportunistic, top-level predators. They feed upon a variety of fishes (e.g., flyingfish) and crustaceans, especially those species commonly associated with drifting flotsam and *Sargassum* in the Florida Current. As a prized food, dolphin are sought by both commercial and sport fishers. They are most commonly taken using hook and line around the edges of the continental shelf. In southern Florida, based on recreational catches, they appear most frequently March through August and then again September through February (Palko et al., 1982).

2.2.4.1.2 Rachycentridae

Cobia are distributed worldwide in tropical, subtropical, and warm temperate waters where they inhabit estuarine and shelf waters depending of their life stage. They appear to associate with structures such as pilings, wrecks and other forms of vertical relief (e.g. oil and gas platforms) and favor the shade from these structures (Mills, 2000). Cobia spawn offshore where external fertilization takes place in large spawning aggregations; however, the pelagic eggs have been collected at both inshore and offshore stations. Based on past collections of gravid females, spawning takes place from mid May, extending through the end of August off South Carolina (Shaffer and Nakamura, 1989). Consequently, spawning may start slightly early off the southeast coast of Florida. Eggs have been collected in the lower Chesapeake Bay inlets, North Carolina estuaries, in coastal waters 20 - 49 m deep, and near the edge of the Florida Current and the Gulf Stream (Ditty and Shaw, 1992). Ditty and Shaw (1992) suggested that cobia spawn during the day since all the embryos they examined were at similar stages of development. Cobia exhibit rapid growth and may attain a length of 2 m FL and are known to live 10 years (Shaffer and Nakamura, 1989). Although females grow faster than males, they attain sexual maturity later in life. Sexual maturity is attained by males at approximately 52 cm FL during the second year and at approximately 70 cm FL for females during their third year (Shaffer and Nakamura, 1989). They are adaptable to their environment and can utilize a variety of habitats and prey. Cobia are voracious predators that forage primarily near the bottom, but on occasion do take some prey near the surface. Their favorite benthic prey are crabs, and to a much less extent other benthic invertebrates and fishes. No predator studies have been conducted, but dolphin fish have been known to feed on small cobia. Adults may be found solitary or in small groups and are known to associate with rays, sharks, and other larger fishes. Cobia is fished both commercially and recreationally; however, the commercial harvest is mostly incidental in both the hook and line and net fisheries. The recreational harvest is primarily through charter boats, party boats and fishers fishing from piers and jetties. Tagging studies have documented a north-south, spring-fall migration along the southeast United States and an inshore-offshore, spring-fall migration off South Carolina (Ditty and Shaw, 1992).

2.2.4.1.3 Scombridae

Brevard County is designated as EFH for six scombrid species (Table 1). Collectively, the EFH of these epipelagic scombrids ranges from clear waters around coral reefs, and inshore and continental shelf waters (Collette and Nauen, 1983). Spawning of king and Spanish mackerel takes place May through September with peaks in July and August. The cero is thought to spawn year round with peaks in April through October, whereas little tunny spawn from April to November. Batch spawning takes place in tropical and subtropical waters, frequently inshore. The eggs are pelagic and hatch into planktonic larvae. Both king and Spanish mackerel are involved in migrations along the western Atlantic coast. With increasing water temperatures, Spanish mackerel move northward from Florida to Rhode Island between late February and July, and back in the fall (Collette and Nauen, 1983). King mackerel have

been reported to migrate along the western Atlantic coast in large schools; however, there appears to be a resident population in south Florida as this species is available to sport fishers year round (Collette and Nauen, 1983). Although the little tunny is epipelagic, it typically inhabits inshore waters in schools of similar size fish and/or with other scombrids (Collette and Nauen, 1983). The diet of these scombrids consists of primarily fishes and to a lesser extent penaeid shrimp and cephalopods. The fishes that make up the bulk of their diet are small schooling clupeids (e.g., menhaden, alewives, thread herring, anchovies), atherinids, and to a lesser extent jack mackerels, snappers, grunts, and half beaks (Collette and Nauen, 1983). The king and Spanish mackerel are important both commercially and recreationally. The king mackerel is a valued sport fish year round in Florida while the sport fisheries for Spanish mackerel in southern Florida is concentrated in the winter months. The cero is a valued sport fish that is taken primarily by trolling. The little tunny is not of commercial or recreational interest.

2.2.5 Summary of Impacts to the Coastal Migratory Pelagics Complex Fishes

The project area includes sand bottom and water column, that may be, but is rarley used by these managed fishes and their prey. Some possible refuge for related prey may be lost in regards to the impact to the rip-rap and sand areas. The project will cause localized turbidity during construction; however, turbidity would be minimized using the best management practices so that any impacts would be minor and temporary. Possible prey may be temporarily displaced, but should quickly return to the project area and there should be no effect on these pelagic species from the project.

2.3 Associated Species

Associated species consists of living resources that occur in conjunction with the managed species discussed earlier. These living resources would include the primary prey species and other fauna that occupy similar habitats.

2.3.1 Invertebrates

Dredging and removal and replacement of rock associated with widening and deepening would result in direct adverse effects on invertebrate species in the area. Initially this will result in a significant, but localized reduction in the abundance, diversity, and biomass of the immediate fauna. Species affected most are those that have limited capabilities or are incapable in avoiding the dredging activities. The fauna most affected would include predominantly invertebrates such as crustaceans, echinoderms, mollusks, and annelids. However, due to the relatively small area that will be impacted as viewed on a spatial scale, impacts to the benthic community will be minimal due to the relatively short period of recovery regarding infaunal communities following dredging activities (Culter and Mahadevan, 1982; Saloman et al.,

1982). Adjacent areas not impacted would most likely be the primary source of recruitment to the impacted area.

Zooplankton are primarily filter feeders and suspended inorganic particles can foul the fine structures associated with the feeding appendages. Zooplankton that feed by ciliary action (e.g., echinoderm larvae) would also be susceptible to mechanical affects of suspended particles (Sullivan and Hancock, 1977). Zooplankton mortality is assumed from the physical trauma associated with dredging activities (Reine and Clark, 1998). The overall impact on the zooplankton community should be minimal due to the limited extent and transient nature of the sediment plume.

2.3.2 Fishes

The larvae of the managed fish species discussed in this document are hatched from planktonic eggs (excluding the gray triggerfish) and the larvae are also planktonic. The primary source of larval food is microzooplankton with a dietary overlap in many species and specialization (Sale, 1991). Algae is most likely food for only the youngest larval stages of certain species or for those larvae that are very small after hatching, and then only for a short time. The algae-eating larvae eventually switch to animal food while they are still small. At this time, varying life history stages of copepods become the dominant food and to a lesser extent cladocerans, tunicate and gastropod larvae, isopods, amphipods, and other crustacea.

Larval feeding efficiency depends on many factors such as light intensity, temperature, prey evasiveness, food density, larva experience, and olfaction to mention a few (Gerking, 1994). Larval fishes are visual feeders that depend on adequate light levels in the water column which reduces the reaction distance between larval fish and prey. Suspended sediment and dispersion due to dredging activities will increase turbidity levels in the project area temporarily. This will reduce light levels within the water column which may have a short term negative effect regarding feeding efficiency. In addition, turbidity can affect light scattering which will impede fish predation (Benfield and Minello, 1996). However, because the sediment plumes are transient and temporary, and the area to be impacted is relatively small when examined on a spatial scale, the overall impact to the larval fish population and consequently, the adult population should be minimal (Sale, 1991). The majority of larval fish mortality will be attributed to the physical trauma associated with the dredging activities.

Similar to larval fishes, both juvenile and adult fishes are primarily visual feeders. Consequently, the visual effects of turbidity as outlined above will apply. Also, suspended sediment can impair feeding ability by clogging the interraker space of the gill raker or the mucous layer of filter feeding species (Gerking, 1994). However, because these fishes have the ability to migrate away from the dredging activities, the impact of the sediment plumes which are transient and temporary should be minimal. Although few adult fishes have been entrained by dredging operations (McGraw and Armstrong, 1988; Reine and Clark, 1998), most juvenile and adult fishes again have the ability to migrate away from the dredging activities. Consequently, dredging operations would have minimal effects on juvenile and adult fishes in

the area. In addition, the reduction of benthic epifaunal and infaunal prey, and pelagic prey in the immediate area would have little affect on juvenile and adult fishes because they can migrate to adjacent areas that have not been impacted to feed.

In addition to the managed fish species discussed in this document, many other inshore and pelagic fishes in various stages of life occur in the project area (Gilmore, 1977; Vare, 1991; Lindeman and Snyder, 1999). A total of 192 species have been recorded in association with nearshore hardbottom habitats in southeast Florida (Lindeman and Snyder, 1999). In the study conducted by Lindeman and Snyder (1999), 80% of the fishes collected at all sites were early life stages. In addition, eight of the top ten fish species were consistently represented by early life stages, and the use of hardbottom habitats was recorded for newly settled stages of more than 20 species of fishes. This provided evidence that suggested that these nearshore hardbottom habitats along the mainland coast of east Florida may serve as nursery grounds for a wide diversity of juvenile reef fishes. Lindeman and Snyder (1999) estimated that 34 species of fishes used nearshore hardbottom habitats as a nursery. These nearshore hardbottom habitats may actually serve several nursery-related roles such as, 1) a centrally located refuge for incoming early life stages that would exhibit considerably greater mortality if shelter were not available, 2) habitat for juvenile fishes (e.g., gray snapper, blue stripe grunt) that emigrate out of inlets to offshore waters, and 3) an area to promote growth because of the greater availability of prey at these hardbottom habitats.

2.3.3 Summary of Impacts to Associated Species

Many of the fishes associated with nearshore hardbottom habitats as observed in past studies (Gilmore, 1977; Vare, 1991; Lindeman and Snyder, 1999), would be common along Brevard County. The majority of juvenile and adult fishes would be displaced to adjacent habitat during dredging operations, consequently, mortality of these fishes should be minimal. Only those species that produce demersal eggs and that comprise the demersal ichthyofauna could potentially be impacted more heavily than their pelagic counterparts. Mortality of demersal eggs and larvae would be expected from the physical trauma associated with dredging operations and riprap placment. Suspended sediments produced by these operations can affect the feeding activity of pelagics as outlined earlier; however, the impact to these fishes should be minimal due to the limited extent and transient nature of the sediment plume.

3.0 CONCLUSIONS

The proposed Project will impact unvegetated sand bottom, water column, and manmade hardbottom riprap. Significant adverse impacts to those species associated with EFH within the Project area are not expected.

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Section 7 Consultation Documents

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF
Planning Division
Environmental Branch

OCT 22 2007

Mr. David Hankla
U.S. Fish and Wildlife Service
6620 Southpoint Drive, Suite 310
Jacksonville, Florida 32216-0912

Dear Mr. Hankla:

The U.S. Army Corps of Engineers (Corps), Jacksonville District, would like to initiate consultation with your office on the Port Canaveral Improvements Section 203 Feasibility Study. The study is being conducted by the Canaveral Port Authority under authority granted by Section 203 of the Water Resources Development Act of 1986.

In summary, the proposed alternative navigation improvements at Port Canaveral include making no further improvements to the project (no action alternative); deepening ocean access and interior channels to accommodate larger vessels; deepening the turning circles in the west and middle turning basins to accommodate larger vessels; increasing the diameter of the west turning basin to accommodate new larger cruise ships; deepening the widener to accommodate larger cruise ships; and widening interior channels to accommodate larger cruise ships. Dredged material would be taken to the designated Ocean Dredged Material Disposal Site.

The West Indian manatee is known to occur in the vicinity of Port Canaveral. Therefore, the standard manatee protection measures would be implemented for the duration of the project. Widening of the channel would require the modification of an upland area immediately adjacent to the channel, and while unlikely, the eastern indigo snake may be present. An indigo snake protection and education plan would be implemented as a precautionary measure. Based on this information, the Corps has determined that the proposed work may affect but is not likely to adversely affect the manatee or the indigo snake. Please find attached a biological assessment which provides more detailed information on the project. We request your concurrence in this matter pursuant to Section 7 of the Endangered Species Act.

If you require additional information, please contact Mr. Paul Stodola at (904)-232-3271.

Sincerely,

Marie G. Burns
Acting Chief, Planning Division

Enclosure

Copy Furnished:
Mr. Lee Swain, Dial Cordy and Associates Inc., 490 Osceola Avenue, Jacksonville Beach, FLorida 32250

BIOLOGICAL ASSESSMENT
PORT CANAVERAL
NAVIGATION IMPROVEMENTS PROJECT
BREVARD COUNTY, FLORIDA

Submitted to the

U.S. FISH AND WILDLIFE SERVICE

September 2007

(Revised December 2007)

Prepared for:
Canaveral Port Authority
200 George J. King Boulevard
Cape Canaveral, Florida 32920

Prepared by:
Dial Cordy and Associates Inc.
490 Osceola Avenue
Jacksonville Beach, FL 32250

TABLE OF CONTENTS

Page

1.0 DESCRIPTION OF THE PROPOSED ACTION 1

2.0 ACTION AREA 3

3.0 PROTECTED SPECIES INCLUDED IN THIS ASSESSMENT 9

3.1 West Indian Manatee 10

3.2 Eastern Indigo Snake 13

4.0 EFFECT DETERMINATION 13

5.0 LITERATURE CITED 14

Appendix A Standard Manatee Protection Measures

LIST OF FIGURES

Page

Figure 1 Location Map 4

Figure 2 Study Area 5

Figure 3 Project Footprint - West 6

Figure 4 Project Footprint - East 7

Figure 5 Dredged Material Disposal Areas 8

LIST OF TABLES

Table 1 Protective Status of Listed Wildlife Species That May Occur Within the Port Canaveral Expansion Study Area, Brevard County, Florida. 9

Table 2 Canaveral Lock Manatee Sightings, 1997-2006 12

1.0 DESCRIPTION OF THE PROPOSED ACTION

The Canaveral Port Authority (CPA) is currently conducting a feasibility study of potential navigation improvements under the authority granted under Section 203 of the Water Resources Development Act (WRDA), 1986. The study is in response to problems and issues identified by the CPA and Canaveral Pilots Association with regard to ship maneuvering and delays caused by within the existing federal project. The three major problems at Port Canaveral are:

1. Congestion at cargo berths reduces the effectiveness and efficiency of cargo vessels and landside facilities. Given the rapid growth in commodity movements at Port Canaveral, in the very near future a significant proportion of cargo vessels calling at Port Canaveral will have to wait offshore for a berth to become available. Some of these vessels may divert to an alternative port and incur increased transportation costs, if channels are not improved. In addition, landside facilities will stand temporarily idle as vessels wait offshore for an available berth or safe passage through the Federal channel.

2. The size of cargo vessels calling at Port Canaveral is constrained by existing channel dimensions and configurations. Larger, more efficient vessels could be used for bulk items such as petroleum products, aggregates and cement if channels were improved.

3. The size of cruise ships calling at Port Canaveral is constrained by channel and turning basin dimensions. Increasingly larger cruise ships are calling at Port Canaveral and are beginning to exceed the dimensions for safe use of the existing west turning basin. Passage of large cruise ships through the narrow ship channel leading to the turning basin and cruise ship piers also causes surges at cargo piers that line the channel, which results in cargo vessels having to stop loading and unloading activities while the cruise ships pass. The potential for future cruise ship terminal expansion also cannot be fully exploited under existing channel and turning basin dimensions and configurations.

The primary objective of the Section 203 Study was to identify and evaluate alternatives that would:

1. Reduce future congestion at Port Canaveral;
2. Accommodate anticipated future growth in number and size of vessel transiting the Port;
3. Improve the efficiency of operations for cargo vessels and cruise ships within the Port complex;
4. Allow for use of the Port by larger, more efficient, cargo vessels and cruise ships;
5. Allow for development of additional terminals/berths without encroaching on the West Turning Basin.

Three alternatives will be evaluated during the NEPA process and include a no action alternative, one alternative that includes operational changes only, and one structural alternative that is the project Recommended Plan.

The Recommended Plan can generally be described as widening and deepening the Port Canaveral ocean channel, the interior harbor channel and the West Turning Basin. The design depth of the project is -41 MLW. More specifically, proceeding east to west, the project can be broken down into five components as follows:

- Ocean Channel Widening
- North Side Inner Reach Widening
- South Side West Access Channel Widening
- Existing West Access Channel Deepening
- West Turning Basin Expansion (Corner Cut-Off) and Deepening

Ocean Channel Widening. The ocean channel widening is approximately 8,350 feet long and is located entirely on the south side of the channel centered on the bend before entering the harbor. This portion is essentially a widening of the interior angle of the bend. The widening is variable in width to a maximum of 350 feet wide and tapers on both ends. The dredging area is approximately 34 acres. The existing grade is approximately -30 MLW. Dredging to -41 MLW results in approximately 600,000 cy of dredging.

North Side Inner Reach Widening. The north side inner reach widening is an approximate 6,700 feet long strip along the north side of the harbor channel between the Trident Turning Basin and the Middle Turning Basin. This portion of the project basically effects a widening of the channel from 400 feet to 500 feet along a natural, rock revetment shoreline. The dredging area is approximately 110 feet wide with tapered ends. The dredging area is approximately 16 acres. The existing grade slopes from Elevation -40 MLW to +10 MLW. Dredging this strip to -41 MLW results in a dredging volume of approximately 620,000 cy.

South Side West Access Channel Widening. The south side west access channel widening is approximately 4,620 feet long and lies along the south side of the harbor channel along the predominantly commercial and retail business portion of the port. This area is presently the east end of the Barge Canal and is not included in the Corps of Engineers or Canaveral Port Authority dredging programs. The area appears as a “notch” in the harbor channel and the proposed project will widen the channel from 400 feet to 500 feet through to the WTB. The area is two end-to-end rectangular areas 90 feet and 175 feet wide each, summing to approximately 13 acres. The area slopes from an average low elevation of -16 MLW to an average high elevation of -34 MLW. Dredging the area to Elevation -41 results in approximately 190,000 cy of dredging.

Existing West Access Channel Deepening. The existing west access channel deepening is at the west end of the channel and the limit for cruise and cargo shipping. The area is approximately 2,810 feet long and 400 feet wide (the current channel width) and approximately 26 acres in size. This area is maintained by the Canaveral Port Authority to Elevation -35 MLW. Dredging to the -41 MLW elevation results in a dredging volume of approximately 250,000 cy.

West Turning Basin Expansion (Corner Cut-Off) and Deepening. The west turning basin expansion (corner cut-off) and deepening encompasses the entire basin in two parts defined by required depth. The lower (southerly) approximate one-half of the basin is proposed to be maintained at -41 MLW to accommodate cargo vessels. This area is approximately 52 acres. Approximately 7 acres of this area is not submerged land. The basin is expanded to the east by superimposing a 1,750-foot turning diameter across the entrance of the WTB, which is required for new, larger cruise ships proposed to utilize the WTB. The expansion is into an undeveloped upland area with a natural shoreline. Dredging this area from -35 MLW to -41 MLW, including cutting into the uplands, results in a volume of approximately 1,090,000 cy. Approximately 510,000 cy of this amount is dredging (excavation) of the upland area.

The remaining northerly part of the WTB is approximately 57 acres in size with borders defined as 100 feet offset from any berthing pier and 200 feet offset from a industry and does not require greater than a -35 MLW elevation at this time. The Canaveral Port Authority currently maintains this area at Elevation -35 MLW. This area does not represent new project dredging and is simply proposed to shift to federal maintenance at the same -35 MLW elevation.

Dredging associated with deepening and widening of the channel will likely be performed by clamshell dredge. All dredged material will be placed in the authorized Canaveral Offshore Dredged Material Disposal Site (ODMDS) and is centered 4.5 miles offshore of Cocoa Beach or three authorized upland disposal sites located just north of the project area. If any beach quality sand is identified during the dredging process, it may be placed in the authorized nearshore disposal area. Since 1974, approximately 22.6 million cy of dredged material from the entrance channel and various basins within the harbor has been disposed in the ODMDS (USEPA and USACE 2001).

2.0 ACTION AREA

Port Canaveral is located in Brevard County on the east coast of Florida, just north of Cape Canaveral and approximately nine miles north of Cocoa Beach (Figure 1). The main port is orientated in an east–west direction, extending from the Atlantic coast to the Banana River. The port is bounded to the north by the Cape Canaveral Air Force Station (CCAFS) and the Banana River, and bounded to the south by the City of Cape Canaveral. The harbor consists of three turning basins (Figure 2). Starting from the east they are: the Trident Turning Basin (TTB), the Middle Turning Basin (MTB), and the West Turning Basin (WTB). The basins are connected by a channel (East Access Channel and West Access Channel) that forms the south boundary of each basin. Within this channel, a Federally maintained Barge Canal extends from the south side of the MTB, through the Banana River, across Merritt Island, and connects with the Intracoastal Waterway (ICWW) system in the Indian River. Where the Barge Canal enters the Banana River, a 600-foot long Corps of Engineers' lock (Canaveral Lock) separates the tidal harbor from the almost non-tidal river. The project footprint is displayed in Figures 3 and 4. The ODMDS, upland, and nearshore dredged material disposal areas are shown in Figure 5.

Titusville
Port St. John
Port Canaveral
Cape Canaveral
Cocoa
Cocoa West
Merritt Island
Cocoa Beach
Rockledge
John F Kennedy Space Center
Patrick Air Force Base
Jane Green Swamp
Nasa
Kennedy
Cape
Gissom
Kings
Ranch
Banyan
Fay
Citrus
Hartville
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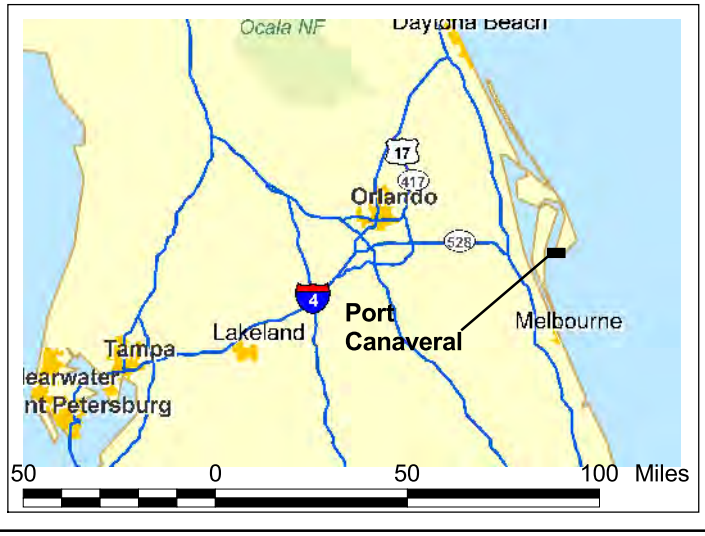

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Port Canaveral Biological Assessment

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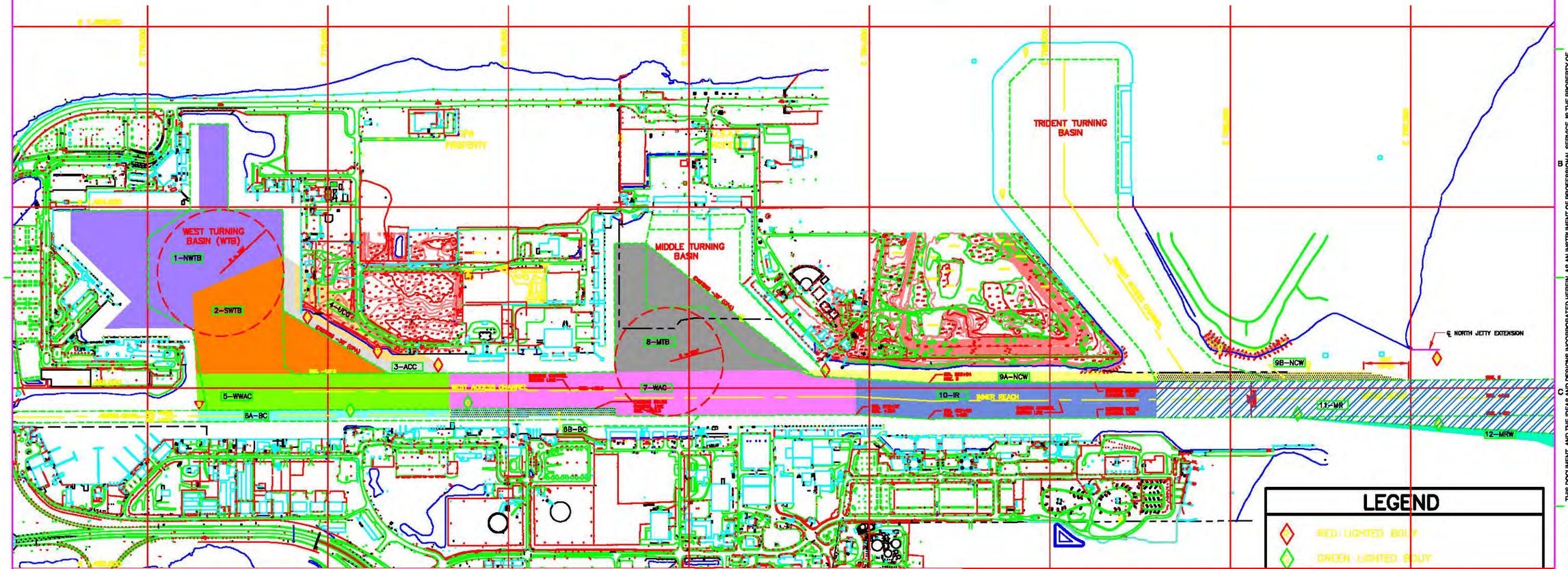
	Figure 2

LEGEND

- 1–NWTB MAINTAINED (M) = −35' MLLW, INCR. = 0
- 2–SWTB MAINTAINED (M) = −35' MLLW, INCR. −35' TO −43'
- 3–ACC MAINTAINED (M) = N/A, INCR. −13'/−35' TO −43' (1st INCR. −13'/−35' TO −35')
- 4–UCC MAINTAINED (M) = +10.5' MLLW, INCR. +10.5' TO −43' (1st INCR. +10.5' TO −13') (2nd INCR. −13' TO −35')
- 5–WWAC MAINTAINED (M) = −35' MLLW, INCR. −35 TO −43'
- 6A–BC MAINTAINED (M) = N/A, INCR. ACTUAL TO −35', −35' TO −43'
- 6B–BC MAINTAINED (M) = N/A, INCR. ACTUAL TO −35', −35' TO −44'
- 7–WAC MAINTAINED (M) = −39' MLLW, INCR. −39' TO −44'
- 8–MTB MAINTAINED (M) = −39' MLLW, INCR. −39' TO −44'
- 9A–NCW MAINTAINED (M) = N/A, INCR. ? TO −44', (1st INCR. ? TO −40')
- 9B–NCW MAINTAINED (M) = N/A, INCR. ? TO −46', (1st INCR. ? TO −40')
- 10–IR MAINTAINED (M) = −40' MLLW, INCR. −40' TO −44'
- 11–MR MAINTAINED (M) = −44' MLLW, INCR. −44' TO −46' (EXTENDS EAST TO STA. 53+00)
- 12–MRW MAINTAINED (M) = N/A (APPROX. −30' COE SURVEY) INCR. ?(−30') TO −46', (1st INCR. ?(−30') TO −44')
- 13–OR MAINTAINED (M) = −44' MLLW, INCR. −44' TO −48'



NOTES:

1. FLORIDA STATE PLANE COORDINATE GRID SHOWN, EAST ZONE, BASED ON NORTH AMERICAN DATUM 1983 (NAD83).
2. STATIONS AND RANGES REFER TO THE CANAVERAL HARBOR GRID SYSTEM.
3. TOPOGRAPHIC VERTICAL CONTROL IS BASED ON FEET, PORT CANAVERAL MEAN LOW WATER (MLW). HYDROGRAPHIC VERTICAL CONTROL IS BASED ON FEET, MEAN LOWER LOW WATER (MLLW).
4. MORGAN AND EKLUND, INC. COMPILED HYDROGRAPHIC AND TOPOGRAPHIC DATA FROM VARIOUS SOURCES INCLUDING THE USACE, CPA CONNESSENCE SURVEYS, AND MORGAN AND EKLUND, INC. SURVEYS.
5. TOPO SURVEY SHOWN ON THE UPLANDS EAST OF WEST TURNING BASIN AND EAST OF THE MIDDLE TURNING BASIN IS OBTAINED FROM THE 2003 AERIAL TOPOGRAPHY CONNESSENCE BY CPA.
6. TOPO SURVEY SHOWN ALONG THE ROCK ENBANKMENT ON BOTH SIDES OF THE TRIDENT BASIN IS FROM THE SURVEY FOR CHANNEL IMPROVEMENTS BY ALLEN ENGINEERING, INC. DATED MARCH 4, 2003.

DREDGING INCREMENTS PLAN AREAS

GRAPHIC SCALE

LEGEND

- RED LIGHTED BOUY
- GREEN LIGHTED BOUY
- LIGHTED BEACON
- EXISTING RANGE STRUCTURE
- SIGNAGE STRUCTURE
- RED DAYBEACON
- PROPOSED OUTBOUND RANGE STRUCTURE
- PROPOSED 500' CHANNEL

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PRELIMINARY

NOT FOR CONSTRUCTION

DSGN X
DR X
CHK X
APVD X

NO.	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
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LB 0002934 AA C000856

PORT CANAVERAL

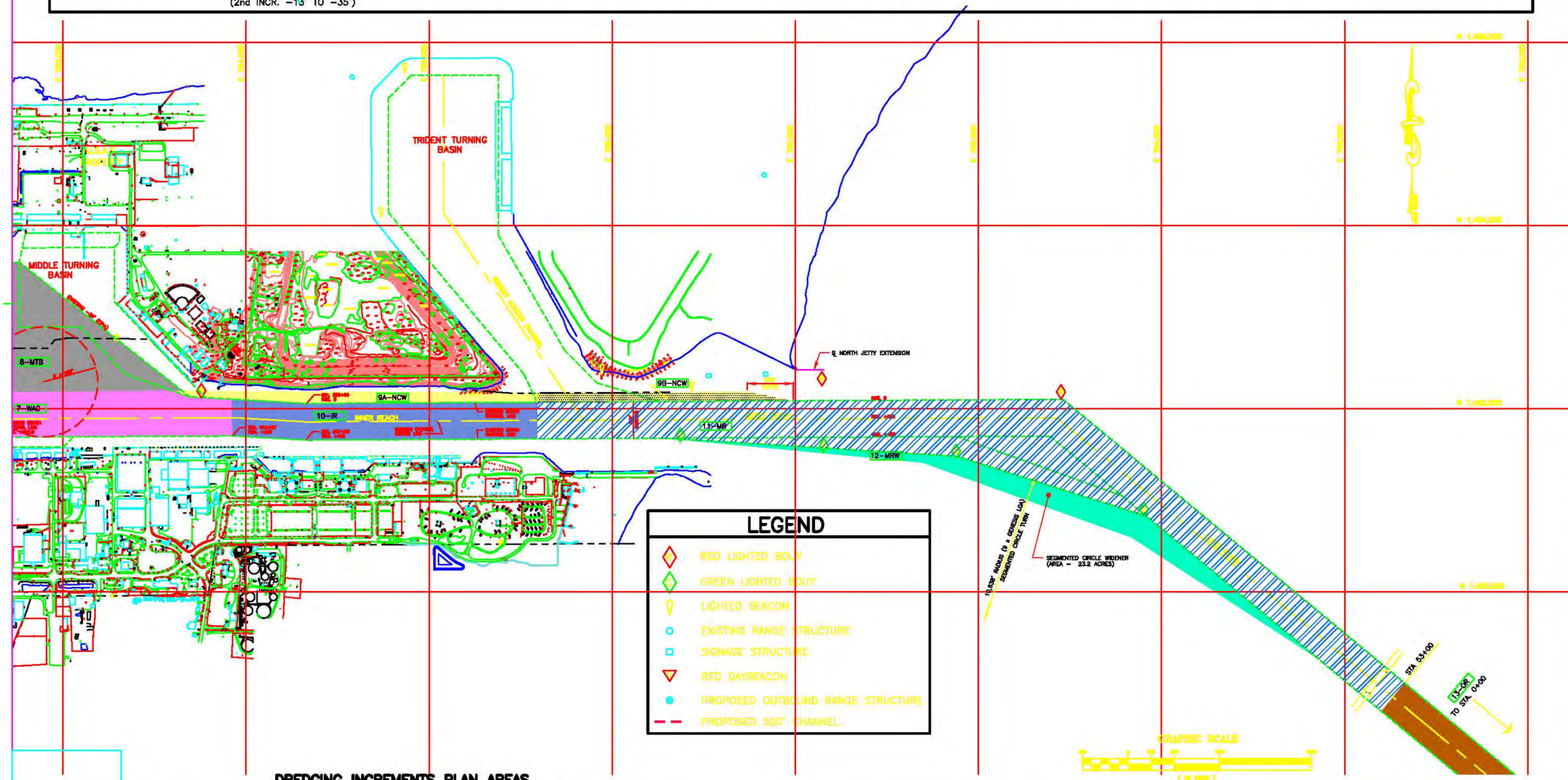
Proposed Project Footprint
Port Canaveral Biological Assessment
Figure 3

DATE AUGUST 2007
PROJ J05-0850

port_dredging_increments_edit

LEGEND

- 1–NWTB MAINTAINED (M) = –35' MLLW, INCR. = 0
- 2–SWTB MAINTAINED (M) = –35' MLLW, INCR. –35' TO –43'
- 3–ACC MAINTAINED (M) = N/A, INCR. –13'/–35' TO –43' (1st INCR. –13'/–35' TO –35')
- 4–UCC MAINTAINED (M) = +10.5' MLLW, INCR. +10.5' TO –43' (1st INCR. +10.5' TO –13') (2nd INCR. –13' TO –35')
- 5–WWAC MAINTAINED (M) = –35' MLLW, INCR. –35 TO –43'
- 6A–BC MAINTAINED (M) = N/A, INCR. ACTUAL TO –35', –35' TO –43'
- 6B–BC MAINTAINED (M) = N/A, INCR. ACTUAL TO –35', –35' TO –44'
- 7–WAC MAINTAINED (M) = –39' MLLW, INCR. –39' TO –44'
- 8–MTB MAINTAINED (M) = –39' MLLW, INCR. –39' TO –44'
- 9A–NCW MAINTAINED (M) = N/A, INCR. ? TO –44', (1st INCR. ? TO –40')
- 9B–NCW MAINTAINED (M) = N/A, INCR. ? TO –46', (1st INCR. ? TO –40')
- 10–IR MAINTAINED (M) = –40' MLLW, INCR. –40' TO –44'
- 11–MR MAINTAINED (M) = –44' MLLW, INCR. –44' TO –46' (EXTENDS EAST TO STA. 53+00)
- 12–MRW MAINTAINED (M) = N/A (APPROX. –30' COE SURVEY) INCR. ?(–30') TO –46', (1st INCR. ?(–30') TO –44')
- 13–OR MAINTAINED (M) = –44' MLLW, INCR. –44' TO –48'



LEGEND

- RED LIGHTED BOUY
- GREEN LIGHTED BOUY
- LIGHTED BEACON
- EXISTING RANGE STRUCTURE
- SIGNAGE STRUCTURE
- RED DAYBEACON
- PROPOSED OUTBOUND RANGE STRUCTURE
- PROPOSED 500' CHANNEL

DREDGING INCREMENTS PLAN AREAS

PRELIMINARY

NOT FOR CONSTRUCTION

DSGN	X
DR	X
CHK	X
APVD	X

NO.	DATE	REVISION	BY	APVD

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PORT CANAVERAL

Proposed Project Footprint
Port Canaveral Biological Assessment
Figure 4

DATE AUGUST 2007

PROJ J05-0850

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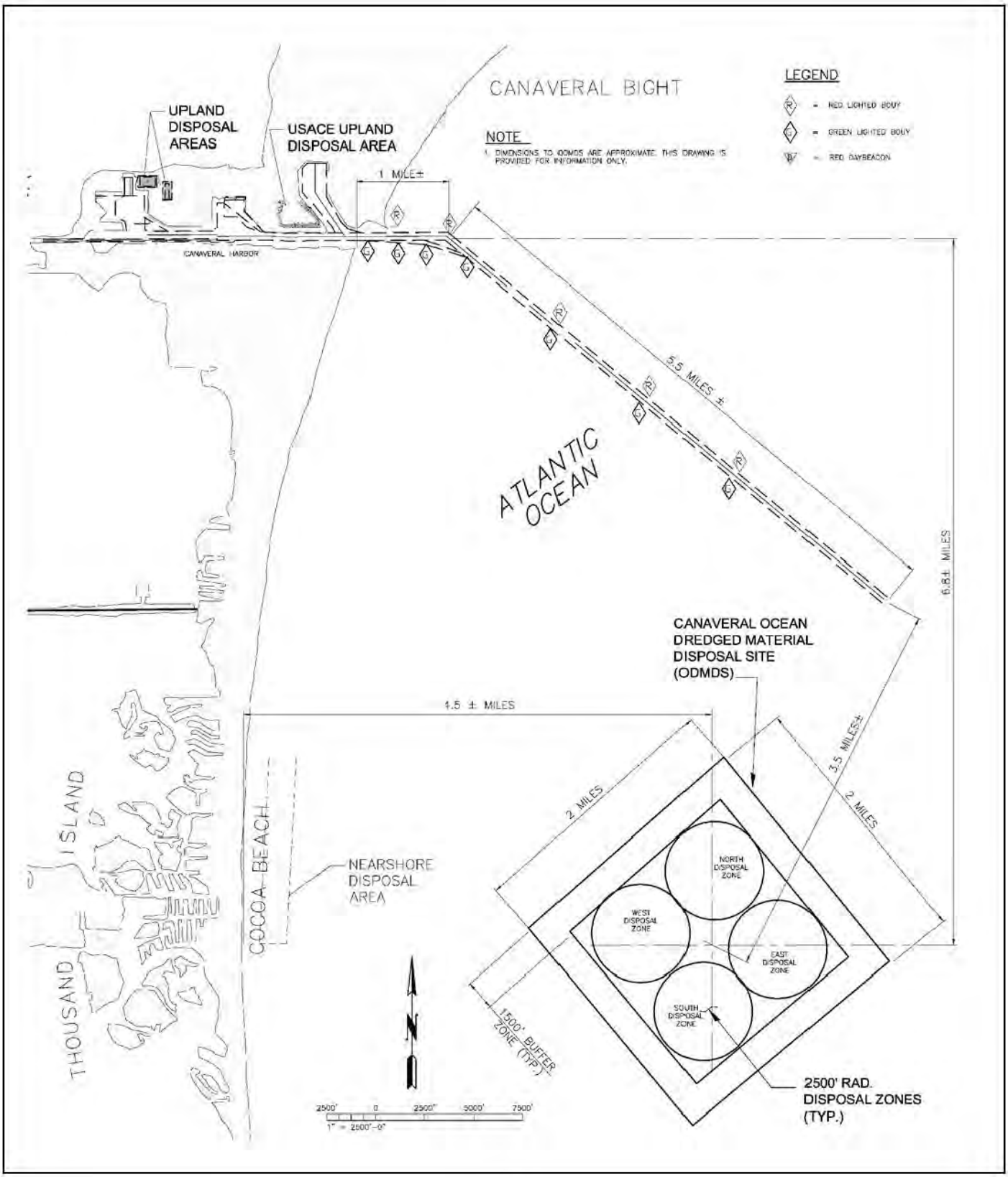

Dredged Material Disposal Sites	
Port Canaveral Section 203 Study	
Scale: as shown	Drawn By: MR
Date: December 2007	Approved By: LS
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J05-850
	Figure 5

3.0 PROTECTED SPECIES INCLUDED IN THIS ASSESSMENT

A Florida Natural Areas Inventory (FNAI) Species Summary for Brevard County was obtained to review the listed fauna that could potentially occur within this geographic region. In addition to the FNAI, existing reports from Cape Canaveral Air Force Station (CCAFS) and Port Canaveral (Port) were reviewed for potential protected species that may occur within the action area. Five terrestrial species were identified that could potentially occur within the action area. These species include the gopher tortoise (*Gopherus polyphemus*), Florida scrub jay (*Aphelocoma coerulescens*), eastern indigo snake (*Drymarchon corais couperi*), bald eagle (*Haliaeetus leucocephalus*), and the southeastern beach mouse (*Peromyscus polionotus niviventris*). In addition to the terrestrial species, seven marine species were identified as potentially utilizing terrestrial beach habitats and nearshore waters within the action area. These species include the loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempii*), and green sea turtles (*Chelonia mydas*). The protected species and their listing status are provided in Table 1.

Table 1 Protective Status of Listed Wildlife Species That May Occur Within the Port Canaveral Expansion Study Area, Brevard County, Florida.

Species	***State Listing****	***Federal Listing***
West Indian Manatee	LE	LE
Green Sea Turtle	LE, LT	LE
Loggerhead Sea Turtle	LT	LT
Leatherback Sea Turtle	LE	LE
Kemp's Ridley Sea Turtle	LE	LE
Atlantic Right Whale	LE	LE
Gopher Tortoise	SSC	None
Florida Scrub Jay	T	T
Southeastern Beach Mouse	T	T
Eastern Indigo Snake	T	T
Bald Eagle	T	T

Source: Florida's Endangered Species, Threatened Species and Species of Special Concern, Official Lists. FGFWFC 1997.
* E=Endangered, SSC=Species of Special Concern, and T=Threatened

The sea turtles also utilize the rock outcrops within the harbor for foraging. A separate study is being conducted to determine the extent of this utilization. The West Indian manatee (*Trichechus manatus latirostris*) is also known to occur in waters of Brevard County including Port Canaveral and to utilize the Port waters for passage from the Atlantic Ocean to the Banana River.

The North Atlantic right whale (*Eubalaena glacialis*) also may occur within the action area and the Port has initiated consultation with the National Marine Fisheries Service under a separate Biological Assessment concerning the effects of the proposed action on this species as well as effects on swimming sea turtles.

3.1 West Indian Manatee

Of the listed and protected species under USFWS jurisdiction occurring in the project area, the Port believes that the West Indian manatee (*Trichecus manatus*) may be affected by the implementation of the proposed project. The waters along the coast of Brevard County are designated critical habitat for the Florida manatee, and the project area is located within this designated habitat (50 CFR 17.95).

The Federal government has recognized the threats to the continued existence of the Florida manatee for more than 30 years. The West Indian manatee was first listed as an endangered species in 1967 under the Endangered Species Preservation Act of 1966 (16 U.S.C. 668aa(c)) (32 FR 48:4001). The Endangered Species Conservation Act of 1969 (16 U.S.C. 668aa(c)) continued to recognize the West Indian manatee as an endangered species (35 FR 16047), and the West Indian manatee was also among the original species listed as endangered pursuant to the Endangered Species Act of 1973. Critical habitat was designated for the manatee in 1976. The justification for listing as endangered included impacts to the population from harvesting for flesh, oil, and skins as well as for sport, loss of coastal feeding grounds from siltation, and the volume of injuries and deaths resulting from collisions with the keels and propellers of powerboats. Manatees are also protected under the provisions of the Marine Mammal Protection Act of 1972, as amended (16 U.S.C. 1361 *et seq*.) and have been protected by Florida law since 1892. Florida provided further protection in 1978 by passing the Florida Marine Sanctuary Act designating the state as a manatee sanctuary and providing signage and speed zones in Florida's waterways.

The manatee occurs throughout the southeastern United States. The only year-round populations of manatees occur throughout the coastal and inland waterways of peninsular Florida and Georgia (Hartman 1974). During the summer months, manatees may range as far north along the East Coast of the U.S. as Rhode Island, west to Texas, and, rarely, east to the Bahamas, (FWS 1996, Lefebvre *et al.* 1989). There are reports of occasional manatee sightings from Louisiana, southeastern Texas, and the Rio Grande River mouth (Gunter 1941, Lowery 1974).

In Florida, manatees are commonly found from the Georgia/Florida border south to Biscayne Bay on the east coast and from Wakulla River south to Cape Sable on the west coast (Hartman 1974, Powell and Rathbun 1984). Manatees are also found throughout the waterways in the Everglades and in the Florida Keys. Although temperatures are suitable for manatees in the Florida Keys, the low number of manatees has been attributed to the lack of fresh water (Beeler and O'Shea 1988). Manatees also occur in Lake Okeechobee.

In warmer months (April to November), the distribution of manatees along the east coast of Florida tends to be greater around the St. Johns River, the Banana and Indian rivers to Jupiter Inlet, and Biscayne Bay. On the west coast of Florida, larger numbers of manatees are found at the Suwannee, Crystal and Homosassa rivers, Tampa Bay, Charlotte Harbor/Matlacha Pass/San Carlos Bay area, the Caloosahatchee River and Estero Bay area, the Ten Thousand

Islands, and the inland waterways of the Everglades. On the west coast, manatees winter at Crystal River, Homosassa Springs, and other warm mineral springs (Powell and Rathbun 1984, Rathbun *et al.*1990). In the winter, higher numbers of manatees are seen on the east coast at the natural warm waters of Blue Spring and near man-made warm water sources on or near the Indian River Lagoon, at Titusville, Vero Beach, Ft. Pierce, Riviera Beach, Port Everglades, Ft. Lauderdale, and throughout Biscayne Bay and nearby rivers and canals (FWS 1996, FWS 2001). They also aggregate near industrial warm water outflows in Tampa Bay, the warmer waters of the Caloosahatchee and Orange rivers (from the Ft. Myers power plant), and in inland waters of the Everglades and Ten Thousand Islands.

The Florida manatees inhabit rivers, bays, canals, estuaries, and coastal areas rich in seagrass and other vegetation. They can live in fresh, saline (salt), and brackish water. They move freely between salinity extremes. Manatees may be found in any waterway over 3.25 ft. (1 m) deep and connected to the coast. They prefer water above 70 degrees F (21 degrees C). Manatees rarely venture into deep ocean waters. However, there are reports of manatees in locations as far offshore as the Dry Tortugas Islands, approximately 50 mi. (81 km) west of Key West, Florida. The patchy distribution of manatees throughout all their ranges is due to the distribution of suitable habitat: plentiful aquatic plants and a freshwater source.

Manatees are herbivores that feed opportunistically on a wide variety of submerged, floating, and emergent vegetation. Shallow grass beds with ready access to deep channels are the preferred feeding areas in coastal and riverine habitats. Bengtson (1983) estimated the annual mean consumption rate for manatees feeding in the upper St. Johns River at 4% to 9% of their body weight per day depending on season.

Brevard County is one of the most utilized areas in Florida by manatees due to the presence of a warm water refuge and abundant foraging opportunities. Within Brevard County, manatees frequently use waters within or near the study area including the Banana River and Intracoastal Waterway, especially during the spring and fall.

Brevard County also has one of the highest manatee mortality rates in the state, due to the high concentration of manatees combined with the popularity of recreational boating along the eastern coast of Florida. In 2006, the FWC reported 87 manatee deaths in Brevard County (the State total was 417), with 22 caused by watercraft injury. In 2005, the FWC reported 57 manatee deaths in Brevard County (the State total was 396), with 6 caused by watercraft injury.

The Corps operates a lock facility at the western end of Canaveral Harbor that allows vessel traffic to access the Banana River through the Port. Corps manatee sighting data within the lock facility since 1997 (Table 2), shows that the facility is heavily used by manatees, with lulls during the cold winter months of December, January, and February (USACE, unpublished data).

Table 2 Canaveral Lock Manatee Sightings, 1997-2006

	Year									
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
January	0	78	84	16	5	8	1	24	10	42
February	0	8	234	19	36	126	15	54	10	143
March	0	108	168	428	143	84	277	57	39	315
April	0	256	650	655	385	369	500	308	331	597
May	0	128	741	560	426	232	571	616	598	920
June	0	222	702	392	424	349	411	658	388	1031
July	0	108	805	464	539	355	544	657	446	844
August	0	106	663	557	618	304	626	578	596	0
September	0	118	555	319	299	222	452	188	544	0
October	424	52	623	654	299	290	610	414	0	687
November	167	73	338	426	46	335	324	177	0	320
December	190	189	115	100	72	59	101	79	0	405

The Brevard County Manatee Protection Plan (BCMPP) was adopted by the Brevard County Commission in 2003. The plan includes recommendations, regulations, and enforcement measures to protect the manatee and its habitat within the County. The plan also includes the establishment of a Port Canaveral special planning area, which provides special protection measures for the Port (excluding the Federal facilities within the Port) due to its unique features, function, and location. The plan provides for specifications regarding bulkhead and dock facilities, fender and standoff requirements, stormwater outfall specifications, education and awareness guidelines, and coordination with private industry regarding normal operations.

Potential impacts to the manatee resulting from the proposed project would occur from dredging and in-water construction activities and through vessel interaction with facility operations. As has been the case with previous Port operations, the Port will adopt standard manatee protection measures in the project design to eliminate or reduce potential. Adopted measures will include:

Construction-related measures

The Port will stop all in-water construction-related activities if a manatee is observed within 50 feet of the activity. The activity will not resume until the manatee has departed the activity area of its own volition. Standard manatee protection measures (Appendix A) will be incorporated into the construction requirements.

Project Design

The Port will design and place any outfall from stormwater treatment ponds to minimize adverse impacts to manatees. The outfalls would also be grated to prevent manatees from entering.

Operational measures

Any vessel moored to, or otherwise contiguous with, the wharf will observe a minimum 4-foot standoff distance from the wharf to prevent manatee crushing.

Conclusion.

The Port has determined that the proposed project is likely to affect, but not likely to adversely affect, the manatee within the project area. The Port believes that the manatee protection measures incorporated into project construction, design, and operations discussed in this assessment will diminish the effect of the project on protected species within the project area.

3.2 Eastern Indigo Snake

The eastern indigo snake occurs in most of Florida and much of southern Georgia. It may be found in habitats ranging from mangrove swamps and wet prairies to xeric pinelands and scrub (Moler 1992). The indigo snake may be found wintering in gopher tortoise burrows and will prey on small vertebrates including fish, frogs, toads, lizards, snakes, small turtles, birds, and small mammals. The species prefers to search for prey along the edges of wetlands where much of its prey tends to congregate. The main threat to the indigo snake is loss and fragmentation of habitat. As regulations for protecting wetlands have become stricter and more costly, the pressure of increased population in Florida has led to increased development of upland areas, including habitat for the indigo snake. The indigo snake was not identified as being present within the project area including the CCAFS area, although gopher tortoise habitat is currently present on the CCAFS site. A survey conducted in 2006 yielded active gopher tortoise burrows; however, no indigo snakes were sighted during the survey. Therefore, it is not likely that the indigo snake would be adversely affected by the proposed project. However, as standard procedure, precautions will be taken during construction. Instructions on identifying the species, steps to avoid the animal if encountered, and information regarding penalties for intentional harm will be included in construction documents.

4.0 EFFECT DETERMINATION

The Port has determined that the proposed navigations improvements is not likely to adversely affect listed species within the action area and requests concurrence from FWS.

5.0 LITERATURE CITED

Beeler, I.E. and T.J. O' Shea. 1988. Distribution and mortality of the West Indian manatee *(Trichechus manatu*s) in the southeastern United States: a compilation and review of recent information. Report prepared by the U.S. Fish and Wildlife Service for the U.S. Army Corps of Engineers. PB 88-207 980/AS. National Technical Information Service; Springfield, Virginia.

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APPENDIX A

STANDARD MANATEE PROTECTION MEASURES

STANDARD MANATEE CONDITIONS
FOR USE DURING CONSTRUCTION OF A PROJECT

The permittee shall ensure that:

1. The contractor instructs all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees.

2. All construction personnel will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, and the Florida Manatee Sanctuary Act of 1978. The permittee and/or contractor may be held responsible for any manatee harmed, harassed, or killed as a result of construction activities.

3. Siltation barriers will be made of material in which manatees cannot become entangled, are properly secured, and are regularly monitored to avoid manatee entrapment. Barriers must not block manatee entry to or exit from essential habitat.

4. All vessels associated with the project will operate at "no wake/idle" speeds at all times while in water where the draft of the vessel provides less than four feet clearance from the bottom and that vessels will follow routes of deep water whenever possible.

5. If manatees are seen within 100 yards of the dredging area, all appropriate precautions shall be implemented to ensure protection of the manatees. These precautions shall include operating all equipment in such a manner that moving equipment does not come any closer than 50 feet of any manatee. Operation of any equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment.

6. Any collision with and/or injury to a manatee will be reported immediately to the "Manatee Hotline" (1-800-DIAL FMP) and to the U.S. Fish and Wildlife Service, Jacksonville Field Office (904-791-2580) for north Florida and to the Vero Beach Field Office (407-562-3909) for south Florida.

7. A minimum of ___ 3 feet by 4 feet temporary manatee awareness construction signs labeled "Manatee Habitat – Idle Speed in Construction Area" shall be installed and maintained at prominent locations within the construction area/docking facility prior to initiation of construction. One temporary sign will be located prominently adjacent to the construction permit and, if required, a second temporary construction sign will be installed in a location prominently visible to water related construction crews. A temporary construction sign criteria sheet is enclosed. Temporary signs will be removed by the permittee upon completion of construction.

8. The contractor will maintain a log detailing sightings, collisions, or injuries to manatees should they occur during the contract period. Following project completion, a report summarizing incidents and sightings will be submitted to the Florida Department of Natural Resources (DNR) Marine Mammal Section, 100 Eighth Avenue, Southeast, St. Petersburg, Florida 33701-5095; the U.S. Fish and Wildlife Service, Jacksonville Field Office, 3100 University Boulevard, South, Suite 120, Jacksonville, Florida 32216 for north Florida; and the U.S. Fish and Wildlife Service Office, P.O. Box 2676, Vero Beach, Florida 39230 for south Florida.

STANDARD MANATEE CONDITIONS
FOR MANATEE AWARENESS SIGNS

The permittee shall ensure that:

1. Permanent manatee awareness signs (___) will be installed and maintained at docking and launching facilities within 1-year of issuance of the permit. The location of the "Caution Manatee Area" sign and "Information Display" signs will be noted on the attached permit drawings.

   The permanent "Caution Manatee Area" signs will be 3 feet by 4 feet, 125 gauge 61TS aluminum, covered with white, engineer grade, reflective sheeting; black painted lettering; black screened design; and orange, engineer grade, reflective tape border. These 3 feet wide by 4 feet long signs shall conform to the Florida Uniform Waterway Marking System in accordance with F.S. 327.40-1. The installation of the signs shall be made in accordance with DNR specification for such signs. Sign criteria are attached to this permit.

2. A notarized verification letter stating that permanent signs have been installed at designated locations shall be forwarded to the Corps of Engineers, Jacksonville District Office as soon as they are installed. Signs and pilings remain the responsibility of the owner(s) and are to be maintained for the life of the docking and launching facility in a manner acceptable to the Corps of Engineers.

3. A permanent "Information Display" (consisting of two signs, "Manatee Basics for Boaters: and West Indian Manatee Fact Sheet") will be installed prior to mooring occupancy at a prominent location to increase the awareness of boaters using the facility of the presence of manatees and of the need to minimize the threat of boats to these animals. The number of Information Displays required will depend on the docking facility design. One Information Display is required at each boat ramp (if applicable). Information Display locations will be as shown on the attached drawings. Information displays remain the responsibility of the owner(s) and are to be maintained for the life of the docking facility in a manner acceptable to the Corps of Engineers.

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

OCT 23 2007

Planning Division
Environmental Branch

Mr. David M. Bernhart
Chief, Protected Species Management Branch
National Marine Fisheries Service
263 13th Avenue South
Saint Petersburg, Florida 33701

Dear Mr. Bernhart:

The U.S. Army Corps of Engineers (Corps), Jacksonville District, would like to initiate consultation with your office on the Port Canaveral Improvements Section 203 Feasibility Study. The study is being conducted by the Canaveral Port Authority under authority granted by Section 203 of the Water Resources Development Act of 1986.

In summary, the proposed alternative navigation improvements at Port Canaveral include making no further improvements to the project (no action alternative); deepening ocean access and interior channels to accommodate larger vessels; deepening the turning circles in the west and middle turning basins to accommodate larger vessels; increasing the diameter of the west turning basin to accommodate new larger cruise ships; deepening the widener to accommodate larger cruise ships; and widening interior channels to accommodate larger cruise ships. Dredged material would be taken to the designated Ocean Dredged Material Disposal Site (ODMDS).

There are several species of sea turtles that are known to occur in the project area. Per the National Marine Fisheries Service Regional Biological Opinion, a hopper dredge would not be used to perform any of the work at Port Canaveral. Several species of whales, including the northern right whale, may be encountered in the vicinity of the ODMDS. Appropriate measures will be taken to protect these species. Based on this information, the Corps has determined that the proposed work may affect but is not likely to adversely affect sea turtles and whales, or any species under the jurisdiction of the National Marine Fisheries Service. Please find attached a biological assessment which provides more detailed information on the project. We request your concurrence in this matter pursuant to Section 7 of the Endangered Species Act.

If you require additional information, please contact Mr. Paul Stodola at (904) 232-3271.

Sincerely,

Marie G. Burns
Acting Chief, Planning Division

Enclosure

Copy Furnished:
Mr. Lee Swain, Dial Cordy and Associates, Inc., 490 Osceola Avenue, Jacksonville Beach, Florida 32250

BIOLOGICAL ASSESSMENT
PORT CANAVERAL
NAVIGATION IMPROVEMENTS PROJECT
BREVARD COUNTY, FLORIDA

Submitted to the

NATIONAL MARINE FISHERIES SERVICE

September 2007

(Revised December 2007)

Prepared for:
Canaveral Port Authority
200 George J. King Boulevard
Cape Canaveral, Florida 32920

Prepared by:
Dial Cordy and Associates Inc.
490 Osceola Avenue
Jacksonville Beach, FL 32250

TABLE OF CONTENTS

Page

1.0 DESCRIPTION OF THE PROPOSED ACTION 1

2.0 ACTION AREA 3

3.0 PROTECTED SPECIES INCLUDED IN THIS ASSESSMENT 9

3.2 Sea Turtles 10

3.2.1 Green Sea Turtle (*Chelonia mydas*) 10

3.2.2 Loggerhead Turtle (*Caretta caretta*) 12

3.2.3 Kemp's Ridley Turtle (*Lepidochelys kempii*) 18

3.2.4 Leatherback Turtle (*Dermochelys coriacea*) 21

3.2.5 Site Specific Sea Turtle Information 23

3.3 Right Whale (*Eubalaena glacialis)* 25

4.0 EFFECT DETERMINATION 26

5.0 LITERATURE CITED 27

LIST OF FIGURES

Page

Figure 1 Location Map 4
Figure 2 Study Area 5
Figure 3 Project Footprint - West 6
Figure 4 Project Footprint – East 7
Figure 5 Dredged Material Disposal Areas 8

LIST OF TABLES

Page

Table 1 Protective Status of Listed Wildlife Species That May Occur Within the Port Canaveral Expansion Study Area, Brevard County, Florida. 9
Table 2 Green Sea Turtle Nesting Data for Brevard County, 1988-2005 11
Table 3 Loggerhead Sea Turtle Nesting Data for Brevard County, 1988-2005 13
Table 4 Leatherback Sea Turtle Nesting Data for Brevard County, 1988-2005 22

1.0 DESCRIPTION OF THE PROPOSED ACTION

The Canaveral Port Authority (CPA) is currently conducting a feasibility study of potential navigation improvements under the authority granted under Section 203 of the Water Resources Development Act (WRDA), 1986. The study is in response to problems and issues identified by the CPA and Canaveral Pilots Association with regard to ship maneuvering and delays caused by within the existing federal project. The three major problems at Port Canaveral are:

1. Congestion at cargo berths reduces the effectiveness and efficiency of cargo vessels and landside facilities. Given the rapid growth in commodity movements at Port Canaveral, in the very near future a significant proportion of cargo vessels calling at Port Canaveral will have to wait offshore for a berth to become available. Some of these vessels may divert to an alternative port and incur increased transportation costs, if channels are not improved. In addition, landside facilities will stand temporarily idle as vessels wait offshore for an available berth or safe passage through the Federal channel.
2. The size of cargo vessels calling at Port Canaveral is constrained by existing channel dimensions and configurations. Larger, more efficient vessels could be used for bulk items such as petroleum products, aggregates and cement if channels were improved.
3. The size of cruise ships calling at Port Canaveral is constrained by channel and turning basin dimensions. Increasingly larger cruise ships are calling at Port Canaveral and are beginning to exceed the dimensions for safe use of the existing west turning basin. Passage of large cruise ships through the narrow ship channel leading to the turning basin and cruise ship piers also causes surges at cargo piers that line the channel, which results in cargo vessels having to stop loading and unloading activities while the cruise ships pass. The potential for future cruise ship terminal expansion also cannot be fully exploited under existing channel and turning basin dimensions and configurations.

The primary objective of the Section 203 Study was to identify and evaluate alternatives that would:

1. Reduce future congestion at Port Canaveral;
2. Accommodate anticipated future growth in number and size of vessel transiting the Port;
3. Improve the efficiency of operations for cargo vessels and cruise ships within the Port complex;
4. Allow for use of the Port by larger, more efficient, cargo vessels and cruise ships;
5. Allow for development of additional terminals/berths without encroaching on the West Turning Basin.

Three alternatives will be evaluated during the NEPA process and include a no action alternative, one alternative that includes operational changes only, and one structural alternative that is the project Recommended Plan. The evaluation presented in this report will focus on the Recommended Plan.

The Recommended Plan can generally be described as widening and deepening the Port Canaveral ocean channel, the interior harbor channel and the West Turning Basin. The design depth of the project is -41 MLW. More specifically, proceeding east to west, the project can be broken down into five components as follows:

- Ocean Channel Widening
- North Side Inner Reach Widening
- South Side West Access Channel Widening
- Existing West Access Channel Deepening
- West Turning Basin Expansion (Corner Cut-Off) and Deepening

Ocean Channel Widening. The ocean channel widening is approximately 8,350 feet long and is located entirely on the south side of the channel centered on the bend before entering the harbor. This portion is essentially a widening of the interior angle of the bend. The widening is variable in width to a maximum of 350 feet wide and tapers on both ends. The dredging area is approximately 34 acres. The existing grade is approximately -30 MLW. Dredging to -41 MLW results in approximately 600,000 cy of dredging.

North Side Inner Reach Widening. The north side inner reach widening is an approximate 6,700 feet long strip along the north side of the harbor channel between the Trident Turning Basin and the Middle Turning Basin. This portion of the project basically effects a widening of the channel from 400 feet to 500 feet along a natural, rock revetment shoreline. The dredging area is approximately 110 feet wide with tapered ends. The dredging area is approximately 16 acres. The existing grade slopes from Elevation -40 MLW to +10 MLW. Dredging this strip to -41 MLW results in a dredging volume of approximately 620,000 cy.

South Side West Access Channel Widening. The south side west access channel widening is approximately 4,620 feet long and lies along the south side of the harbor channel along the predominantly commercial and retail business portion of the port. This area is presently the east end of the Barge Canal and is not included in the Corps of Engineers or Canaveral Port Authority dredging programs. The area appears as a “notch” in the harbor channel and the proposed project will widen the channel from 400 feet to 500 feet through to the WTB. The area is two end-to-end rectangular areas 90 feet and 175 feet wide each, summing to approximately 13 acres. The area slopes from an average low elevation of -16 MLW to an average high elevation of -34 MLW. Dredging the area to Elevation -41 results in approximately 190,000 cy of dredging.

Existing West Access Channel Deepening. The existing west access channel deepening is at the west end of the channel and the limit for cruise and cargo shipping. The area is approximately 2,810 feet long and 400 feet wide (the current channel width) and approximately 26 acres in size. This area is maintained by the Canaveral Port Authority to Elevation -35 MLW. Dredging to the -41 MLW elevation results in a dredging volume of approximately 250,000 cy.

West Turning Basin Expansion (Corner Cut-Off) and Deepening. The west turning basin expansion (corner cut-off) and deepening encompasses the entire basin in two parts defined by required depth. The lower (southerly) approximate one-half of the basin is proposed to be maintained at -41 MLW to accommodate cargo vessels. This area is approximately 52 acres. Approximately 7 acres of this area is not submerged land. The basin is expanded to the east by superimposing a 1,750-foot turning diameter across the entrance of the WTB, which is required for new, larger cruise ships proposed to utilize the WTB. The expansion is into an undeveloped upland area with a natural shoreline. Dredging this area from -35 MLW to -41 MLW, including cutting into the uplands, results in a volume of approximately 1,090,000 cy. Approximately 510,000 cy of this amount is dredging (excavation) of the upland area.

The remaining northerly part of the WTB is approximately 57 acres in size with its borders defined as 100 feet offset from any berthing pier and 200 feet offset from a industry and does not require greater than a -35 MLW Elevation at this time. The Canaveral Port Authority currently maintains this area at Elevation -35 MLW. This area does not represent new project dredging and is simply proposed to shift to federal maintenance at the same -35 MLW elevation.

Dredging associated with deepening and widening of the channel will likely be performed by clamshell dredge. All dredged material will be placed in the authorized Canaveral Offshore Dredged Material Disposal Site (ODMDS) and is centered 4.5 miles offshore of Cocoa Beach or three authorized upland disposal sites located just north of the project area. If any beach quality sand is identified during the dredging process, it may be placed in the authorized nearshore disposal area. Since 1974, approximately 22.6 million cy of dredged material from the entrance channel and various basins within the harbor has been disposed in the ODMDS (USEPA and USACE 2001).

2.0 ACTION AREA

Port Canaveral is located in Brevard County on the east coast of Florida, just north of Cape Canaveral and approximately nine miles north of Cocoa Beach (Figure 1). The main port is orientated in an east – west direction, extending from the Atlantic coast to the Banana River. The port is bounded to the north by the Cape Canaveral Air Force Station (CCAFS) and the Banana River, and bounded to the south by the City of Cape Canaveral. The harbor consists of three turning basins (Figure 2). Starting from the east they are: the Trident Turning Basin (TTB), the Middle Turning Basin (MTB), and the West Turning Basin (WTB). The basins are connected by a channel (East Access Channel and West Access Channel) that forms the south boundary of each basin. Within this channel, a Federally maintained Barge Canal extends from the south side of the MTB, through the Banana River, across Merritt Island, and connects with the Intracoastal Waterway (ICWW) system in the Indian River. Where the Barge Canal enters the Banana River, a 600-foot long Corps of Engineers' lock (Canaveral Lock) separates the tidal harbor from the almost non-tidal river. The footprint of the recommended plan is graphically displayed in Figures 3 and 4. The ODMDS, upland, and nearshore dredged material disposal areas are shown in Figure 5.

Titusville
Port St. John
Port Canaveral
Cape Canaveral
Cocoa
Cocoa West
Merritt Island
Cocoa Beach
Rockledge
John F Kennedy Space Center
Patrick Air Force Base
Jane Green Swamp
Nasa
Kennedy
Cape
Gissom
Kings
Ranch
Banyan
Fay
Citrus
Hartville
Sharpes
Satellite
Indian River
Eyster
Barnes
Stadium
Courtenay
Tropical
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401
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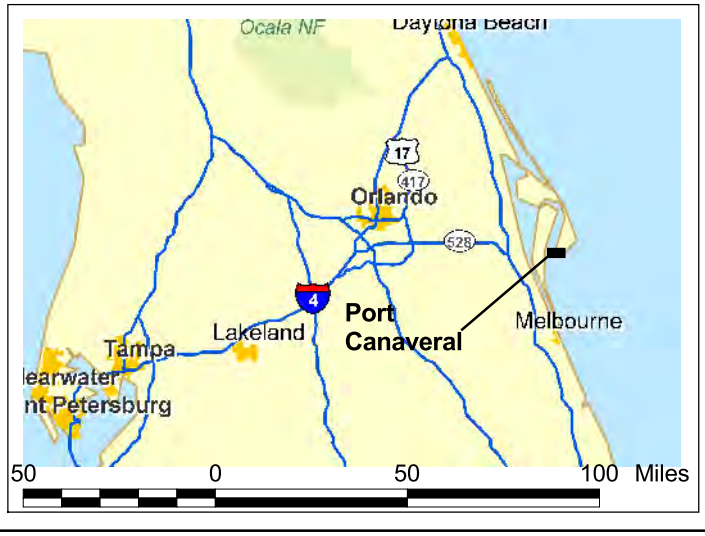

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tud re

Port Canaveral Biological Assessment

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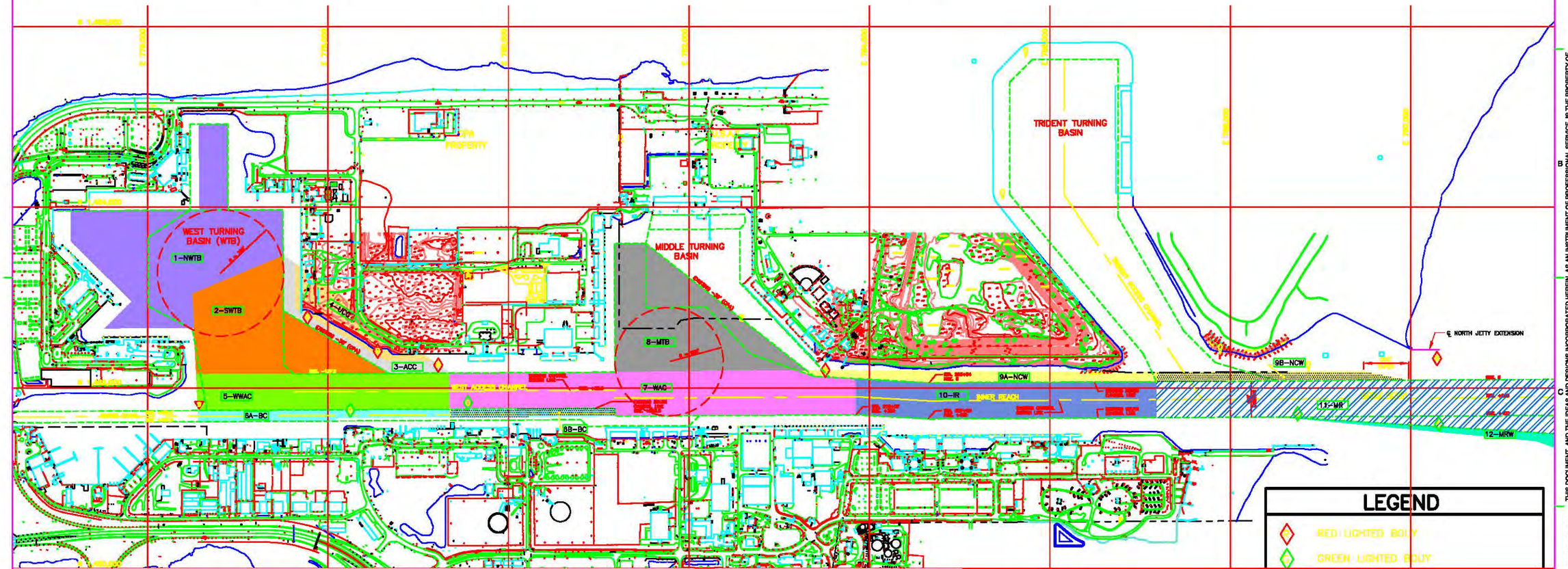
Da r 2007	ro S
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J 0
	Figure 2

LEGEND

- 1–NWTB MAINTAINED (M) = −35' MLLW, INCR. = 0
- 2–SWTB MAINTAINED (M) = −35' MLLW, INCR. −35' TO −43'
- 3–ACC MAINTAINED (M) = N/A, INCR. −13'/−35' TO −43' (1st INCR. −13'/−35' TO −35')
- 4–UCC MAINTAINED (M) = +10.5' MLLW, INCR. +10.5' TO −43' (1st INCR. +10.5' TO −13') (2nd INCR. −13' TO −35')
- 5–WWAC MAINTAINED (M) = −35' MLLW, INCR. −35 TO −43'
- 6A–BC MAINTAINED (M) = N/A, INCR. ACTUAL TO −35', −35' TO −43'
- 6B–BC MAINTAINED (M) = N/A, INCR. ACTUAL TO −35', −35' TO −44'
- 7–WAC MAINTAINED (M) = −39' MLLW, INCR. −39' TO −44'
- 8–MTB MAINTAINED (M) = −39' MLLW, INCR. −39' TO −44'
- 9A–NCW MAINTAINED (M) = N/A, INCR. ? TO −44', (1st INCR. ? TO −40')
- 9B–NCW MAINTAINED (M) = N/A, INCR. ? TO −46', (1st INCR. ? TO −40')
- 10–IR MAINTAINED (M) = −40' MLLW, INCR. −40' TO −44'
- 11–MR MAINTAINED (M) = −44' MLLW, INCR. −44' TO −46' (EXTENDS EAST TO STA. 53+00)
- 12–MRW MAINTAINED (M) = N/A (APPROX. −30' COE SURVEY) INCR. ?(−30') TO −46', (1st INCR. ?(−30') TO −44')
- 13–OR MAINTAINED (M) = −44' MLLW, INCR. −44' TO −48'



NOTES:

1. FLORIDA STATE PLANE COORDINATE GRID SHOWN, EAST ZONE, BASED ON NORTH AMERICAN DATUM 1983 (NAD83).
2. STATIONS AND RANGES REFER TO THE CANAVERAL HARBOR GRID SYSTEM.
3. TOPOGRAPHIC VERTICAL CONTROL IS BASED ON FEET, PORT CANAVERAL MEAN LOW WATER (MLW). HYDROGRAPHIC VERTICAL CONTROL IS BASED ON FEET, MEAN LOWER LOW WATER (MLLW).
4. MORGAN AND EKLUND, INC. COMPILED HYDROGRAPHIC AND TOPOGRAPHIC DATA FROM VARIOUS SOURCES INCLUDING THE USACE, CPA CONNESSENCE SURVEYS, AND MORGAN AND EKLUND, INC. SURVEYS.
5. TOPO SURVEY SHOWN ON THE UPLANDS EAST OF WEST TURNING BASIN AND EAST OF THE MIDDLE TURNING BASIN IS OBTAINED FROM THE 2003 AERIAL TOPOGRAPHY CONNESSENCE BY CPA.
6. TOPO SURVEY SHOWN ALONG THE ROCK ENBANKMENT ON BOTH SIDES OF THE TRIDENT BASIN IS FROM THE SURVEY FOR CHANNEL IMPROVEMENTS BY ALLEN ENGINEERING, INC. DATED MARCH 4, 2003.

DREDGING INCREMENTS PLAN AREAS

GRAPHIC SCALE

LEGEND

- RED LIGHTED BOUY
- GREEN LIGHTED BOUY
- LIGHTED BEACON
- EXISTING RANGE STRUCTURE
- SIGNAGE STRUCTURE
- RED DAYBEACON
- PROPOSED OUTBOUND RANGE STRUCTURE
- PROPOSED 500' CHANNEL

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PRELIMINARY

NOT FOR CONSTRUCTION

DSGN X
DR X
CHK X
APVD X

NO.	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

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LB 0002934 AA C000856

PORT CANAVERAL

Proposed Project Footprint
Port Canaveral Biological Assessment
Figure 3

DATE AUGUST 2007
PROJ J05-0850

port_dredging_increments_edit

LEGEND

- 1–NWTB MAINTAINED (M) = –35' MLLW, INCR. = 0
- 2–SWTB MAINTAINED (M) = –35' MLLW, INCR. –35' TO –43'
- 3–ACC MAINTAINED (M) = N/A, INCR. –13'/–35' TO –43' (1st INCR. –13'/–35' TO –35')
- 4–UCC MAINTAINED (M) = +10.5' MLLW, INCR. +10.5' TO –43' (1st INCR. +10.5' TO –13') (2nd INCR. –13' TO –35')
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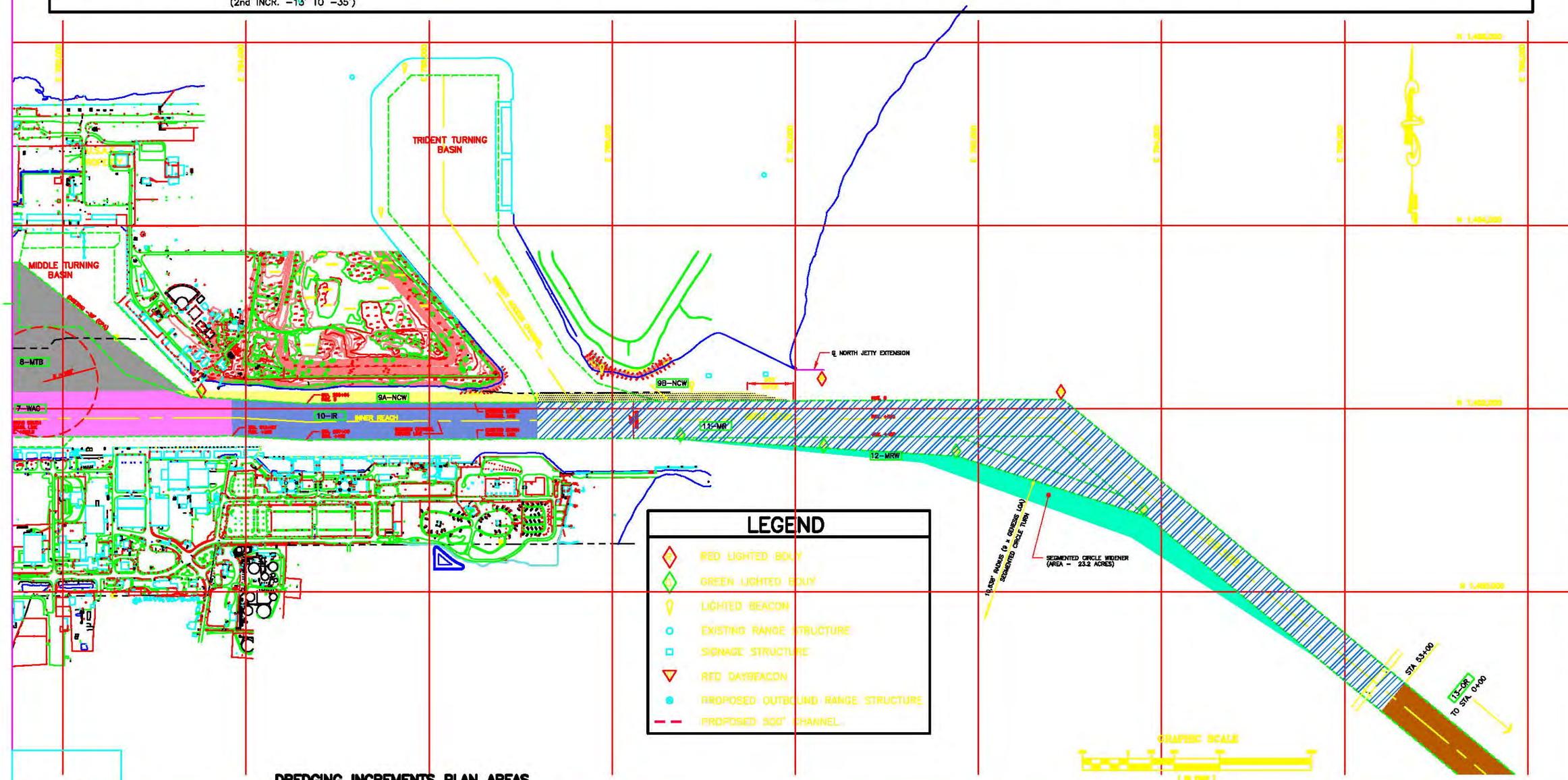
- 7–WAC MAINTAINED (M) = –39' MLLW, INCR. –39' TO –44'
- 8–MTB MAINTAINED (M) = –39' MLLW, INCR. –39' TO –44'
- 9A–NCW MAINTAINED (M) = N/A, INCR. ? TO –44', (1st INCR. ? TO –40')
- 9B–NCW MAINTAINED (M) = N/A, INCR. ? TO –46', (1st INCR. ? TO –40')
- 10–IR MAINTAINED (M) = –40' MLLW, INCR. –40' TO –44'
- 11–MR MAINTAINED (M) = –44' MLLW, INCR. –44' TO –46' (EXTENDS EAST TO STA. 53+00)
- 12–MRW MAINTAINED (M) = N/A (APPROX. –30' COE SURVEY) INCR. ?(–30') TO –46', (1st INCR. ?(–30') TO –44')
- 13–OR MAINTAINED (M) = –44' MLLW, INCR. –44' TO –48'



LEGEND

- RED LIGHTED BOUY
- GREEN LIGHTED BOUY
- LIGHTED BEACON
- EXISTING RANGE STRUCTURE
- SIGNAGE STRUCTURE
- RED DAYBEACON
- PROPOSED OUTBOUND RANGE STRUCTURE
- PROPOSED 500' CHANNEL

DREDGING INCREMENTS PLAN AREAS

PRELIMINARY

NOT FOR CONSTRUCTION

DSGN	X
DR	X
CHK	X
APVD	X

NO.	DATE	REVISION	BY	APVD

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

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CAPE CANAVERAL, FLORIDA 32920
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PORT CANAVERAL

Proposed Project Footprint
Port Canaveral Biological Assessment
Figure 4

DATE AUGUST 2007

PROJ J05-0850

port_dredging_increments_edit

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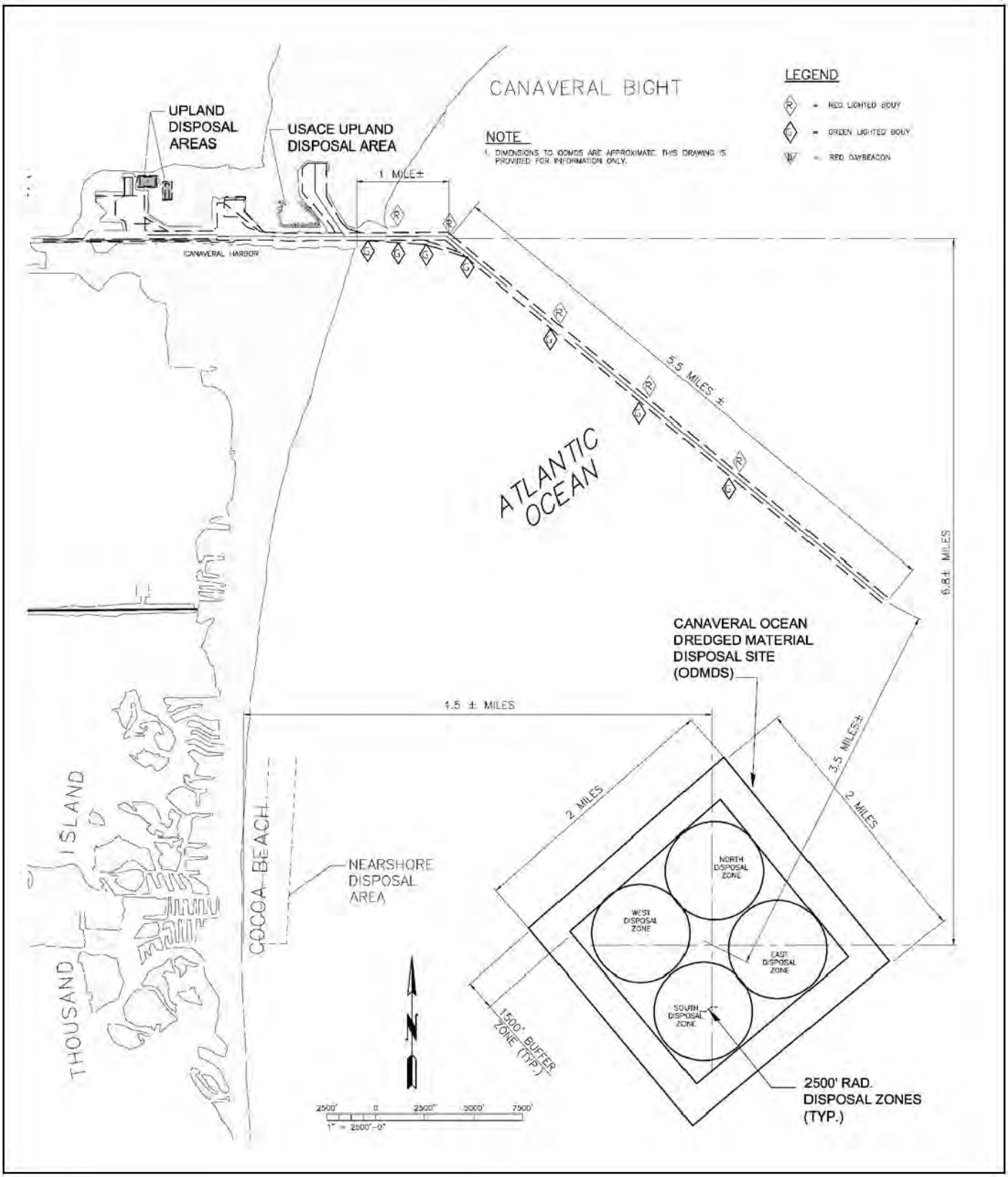

Dredged Material Disposal Sites	
Port Canaveral Section 203 Study	
Scale: as shown	Drawn By: MR
Date: December 2007	Approved By: LS
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J05-850
	Figure 5

3.0 PROTECTED SPECIES INCLUDED IN THIS ASSESSMENT

A Florida Natural Areas Inventory (FNAI) Species Summary for Brevard County was obtained to review the listed fauna that could potentially occur within this geographic region. In addition to the FNAI, existing reports from Cape Canaveral Air Force Station (CCAFS) and Port Canaveral (Port) were reviewed for potential protected species that may occur within the action area. Five terrestrial species were identified that could potentially occur within the action area. These species include the gopher tortoise (*Gopherus polyphemus*), Florida scrub jay (*Aphelocoma coerulescens*), eastern indigo snake (*Drymarchon corais couperi*), bald eagle (*Haliaeetus leucocephalus*), and the southeastern beach mouse (*Peromyscus polionotus niviventris*). The West Indian manatee (*Trichechus manatus latirostris*) is also known to occur in waters of Brevard County including Port Canaveral and to utilize the Port waters for passage from the Atlantic Ocean to the Banana River. A separate Biological Assessment was prepared addressing these species and was submitted under separate cover to the U.S. Fish and Wildlife Service.

Six species were identified as potentially utilizing marine habitats and nearshore waters within the action area. These species include the loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempii*), and green sea turtles (*Chelonia mydas*). The sea turtles also utilize the rock outcrops within the harbor for foraging. The North Atlantic right whale (*Eubalaena glacialis*) is also present in the nearshore waters. The protected species and their listing status are provided in Table 1.

Table 1 Protective Status of Listed Wildlife Species That May Occur Within the Port Canaveral Expansion Study Area, Brevard County, Florida.

Species	***State Listing****	***Federal Listing***
West Indian Manatee	LE	LE
Green Sea Turtle	LE, LT	LE
Loggerhead Sea Turtle	LT	LT
Leatherback Sea Turtle	LE	LE
Kemp's Ridley Sea Turtle	LE	LE
Atlantic Right Whale	LE	LE
Gopher Tortoise	SSC	None
Florida Scrub Jay	T	T
Southeastern Beach Mouse	T	T
Eastern Indigo Snake	T	T
Bald Eagle	T	T

Source: Florida's Endangered Species, Threatened Species and Species of Special Concern, Official Lists. FGFWFC 1997.
* E=Endangered, SSC=Species of Special Concern, and T=Threatened

3.2 Sea Turtles

3.2.1 Green Sea Turtle (*Chelonia mydas*)

Distribution. Green turtles are distributed circumglobally. In the western Atlantic they range from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean, but are considered rare north of Cape Hatteras (Wynne and Schwartz, 1999). Several major nesting assemblages have been identified and studied in the western Atlantic (Peters 1954; Carr and Ogren, 1960; Carr *et al.*, 1978). Most green turtle nesting in the continental United States occurs on the Atlantic Coast of Florida (Ehrhart 1979). Green turtles are the largest of the hard-shelled sea turtles. Adult male green turtles are smaller than adult females whose lengths range from 92 to 110 cm (36 to 43 in.) and weights range from 119 to 182 kg (200 to 300 lbs). Their heads are small compared to other sea turtles and the biting edge of their lower jaws is serrated.

Green turtles have a more tropical distribution than loggerhead turtles; they are generally found in waters between the northern and southern 20°C isotherms (Hirth 1971). Green turtles, like most other sea turtles, are distributed more widely in the summer when warmer water temperatures allow them to migrate north along the Atlantic coast of North America. In the summer, green turtles are found around the U.S. Virgin Islands, Puerto Rico, and continental North America from Texas to Massachusetts. Immature greens can be distributed in estuarine and coastal waters from Long Island Sound, Chesapeake Bay, and the North Carolina sounds south throughout the tropics (Musick and Limpus, 1997). In the United States, green turtles nest primarily along the Atlantic Coast of Florida, the U.S. Virgin Islands, and Puerto Rico. In the winter, as water temperatures decline, green turtles that are found north of Florida begin to migrate south into subtropical and tropical water.

Status and Population Trends. The green turtle was protected under the ESA in 1978; breeding populations off the coast of Florida and the Pacific coast of Mexico are listed as endangered, all other populations are listed as threatened. Recent population estimates for the western Atlantic area are not available. However, there is evidence that green turtle nesting has been on the increase during the past decade. Recently, green turtle nesting occurred on Bald Head Island, North Carolina just east of the mouth of the Cape Fear River, on Onslow Island, and on Cape Hatteras National Seashore. Increased nesting has also been observed along the Atlantic Coast of Florida, on beaches where only loggerhead nesting was observed in the past (Pritchard 1997). Certain Florida nesting beaches where most green turtle nesting activity occurs have been designated index beaches. Index beaches were established to standardize data collection methods and effort on key nesting beaches. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the six years of regular monitoring since establishment of the index beaches in 1989. A nesting summary for Brevard County in which the proposed project resides is found in Table 2. The majority of sea turtle nesting activity occurred during the summer months of June, July and August, with nesting activity occurring as early as March and as late as September.

Table 2 Green Sea Turtle Nesting Data for Brevard County, 1988-2005

Year	Beach Length (km)	Green Turtle Nests
1988	77.9	134
1989	97.4	246
1990	98.3	841
1991	98.5	214
1992	101.0	1232
1993	100.1	116
1994	102.8	1720
1995	103.4	171
1996	105.2	1351
1997	110.0	259
1998	108.0	2764
1999	108.0	125
2000	108.0	3907
2001	115.2	193
2002	115.2	4316
2003	115.2	705
2004	103.2	1494
2005	115.2	4878

Natural History. While nesting activity is obviously important in determining population distributions, the remaining portion of the green turtle's life is spent on the foraging grounds. Some of the principal feeding pastures in the western Atlantic Ocean include the upper west coast of Florida, the northwestern coast of the Yucatan Peninsula, the south coast of Cuba, the Mosquito Coast of Nicaragua, the Caribbean Coast of Panama, and scattered areas along Colombia and Brazil (Hirth 1971). Juvenile green sea turtles occupy pelagic habitats after leaving the nesting beach. Pelagic juveniles are assumed to be omnivorous, but with a strong tendency toward carnivory during early life stages. At approximately 20 to 25 cm carapace length, juveniles leave pelagic habitats and enter benthic foraging areas, shifting to a chiefly herbivorous diet (Bjorndal 1997). Post-pelagic green turtles feed primarily on sea grasses and benthic algae but also consume jellyfish, salps, and sponges. In the western Atlantic region, the summer developmental habitat encompasses estuarine and coastal waters as far north as Long Island Sound, Chesapeake Bay, and North Carolina sounds, and south throughout the tropics (Musick and Limpus, 1997). Like loggerheads and Kemp's ridleys, green sea turtles that use northern waters during the summer must return to southern waters in autumn, or face the risk of cold stunning.

Threats. The greatest threat to this species is the loss of its nesting habitat. Throughout the tropical and subtropical distribution of this species, beaches are eroded, armored, renourished, or converted for residential or commercial purposes. Green turtles are also threatened by

fibropapilloma disease; incidental takes in commercial or recreational fishing gear; and poaching (although poaching is infrequent in the United States). Green turtles are harvested in some nations for food, leather, and jewelry. Green turtles are also threatened by natural causes including hurricanes; predation by fire ants, raccoons, and opossums; and poaching of eggs and nesting females.

Anthropogenic impacts to the green turtle population are similar to those for other sea turtle species. Sea sampling coverage in the pelagic driftnet, pelagic longline, scallop dredge, southeast shrimp trawl, and summer flounder bottom trawl fisheries has recorded takes of green turtles. In addition, the NMFS/Northeast Fisheries Science Center (NEFSC) is conducting a review of bycatch levels and patterns in all fisheries in the western Atlantic for which observer data is available. Bycatch estimates will be made for all fisheries for which sample sizes are sufficiently large to permit reasonable statistical analysis. This will be compiled into an assessment report. Until that analysis is completed, the only information on the magnitude of takes available for fisheries in the action area are unextrapolated numbers of observed takes from the sea sampling data. Preliminary sea sampling data summary (1994-1998) shows the following total take of green turtles: one (anchored gillnet), two (pelagic driftnet), and two (pelagic longline). Stranding reports indicate that between 200-300 green turtles strand annually from a variety of causes (Sea Turtle Stranding and Salvage Network, unpublished data). As with the other species, fishery mortality accounts for a large proportion of annual human-caused mortality outside the nesting beaches, while other activities like dredging, pollution, and habitat destruction account for an unknown level of other mortality.

Critical Habitat. In 1998, NMFS designated the waters surrounding the islands of Culebra, Puerto Rico as critical habitat for the green turtle. This area supports major seagrass beds and reefs that provide forage and shelter habitat. The action area does not comprise critical habitat for green turtles.

3.2.2 Loggerhead Turtle (*Caretta caretta*)

Distribution. Loggerhead turtles occur throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans and are the most abundant species of sea turtle occurring in U.S. waters. Loggerheads concentrate their nesting in the north and south temperate zones and subtropics, but generally avoid nesting in tropical areas of Central America, northern South America, and the Old World (NRC 1990). The largest known nesting aggregation of loggerhead turtles occurs on Masirah and Kuria Muria Islands in Oman (Ross and Barwani, 1982). In the western Atlantic, most loggerhead turtles nest from North Carolina to Florida and along the gulf coast of Florida. The best scientific and commercial data available on the genetics of loggerhead turtles suggests there are four major subpopulations of loggerheads in the northwest Atlantic: (1) a northern nesting subpopulation that occurs from North Carolina to northeast Florida, about 29° N (approximately 7,500 nests in 1998); (2) a south Florida nesting subpopulation, occurring from 29° N on the east coast to Sarasota on the west coast (approximately 83,400 nests in 1998); (3) a Florida panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida (approximately 1,200 nests in 1998); and (4) a Yucatán nesting subpopulation, occurring on the eastern

Yucatán Peninsula, Mexico (Márquez 1990) (approximately 1,000 nests in 1998, according to TEWG, 2000). This biological opinion will focus on the northwest Atlantic subpopulations of loggerhead turtles, which occur in the action area. A nesting summary for Brevard County in which the action is proposed is included in Table 3. The majority of sea turtle nesting activity occurred during the summer months of June, July and August, with nesting activity occurring as early as March and as late as September. Between 1988 and 2005, County-wide loggerhead nesting ranged from a low of 13,181 in 1988 to a high of 34,596 in 1998 (Table 3). There were 19,339 documented loggerhead nests in 2005.

Table 3 Loggerhead Sea Turtle Nesting Data for Brevard County, 1988-2005

Year	Beach Length (km)	Loggerhead Turtle Nests
1988	77.9	13181
1989	97.4	19589
1990	98.3	27673
1991	98.5	28279
1992	101.0	25555
1993	100.1	20600
1994	102.8	28029
1995	103.4	31653
1996	105.2	28742
1997	110.0	25221
1998	108.0	34596
1999	108.0	34134
2000	108.0	32910
2001	115.2	26198
2002	115.2	23492
2003	115.2	22994
2004	103.2	15678
2005	115.2	19339

Although NMFS and FWS have not completed the administrative processes necessary to formally recognize populations or subpopulations of loggerhead turtles, these sea turtles are generally grouped by nesting locations. Based on the most recent reviews of the best scientific and commercial data on the population genetics of loggerhead sea turtles and analyses of their population trends (TEWG, 1998; TEWG 2000), NMFS and FWS treat these loggerhead turtle nesting aggregations as distinct subpopulations whose survival and recovery is critical to the survival and recovery of the species. Further, any action that appreciably reduced the likelihood that one or more of these nesting aggregations would survive and recover would appreciably reduce the species' likelihood of survival and recovery in the wild. Consequently, this biological opinion will focus on the four nesting aggregations of loggerhead turtles identified in the preceding paragraph (which occur in the action area) and treat them as subpopulations for the purposes of this analysis. Natal homing to the nesting

beach provides the genetic barrier between these subpopulations, preventing recolonization from turtles from other nesting beaches. The importance of maintaining these subpopulations in the wild is shown by the many examples of extirpated nesting assemblages in the world. In addition, recent fine-scale analysis of mtDNA work from Florida rookeries indicate that population separations begin to appear between nesting beaches separated by more than 50-100 km of coastline that does not host nesting (Francisco *et al.* 2000) and tagging studies are consistent with this result (Richardson 1982, Ehrhart 1979, LeBuff 1990, CMTTP: in NMFS SEFSC 2001). Nest site relocations greater than 100 km occur, but generally are rare (Ehrhart 1979; LeBuff 1974, 1990; CMTTP; Bjorndal *et al.* 1983: *in* NMFS SEFSC 2001).

The loggerhead turtles in the action area are likely to represent differing proportions of the four western Atlantic subpopulations. Although the northern nesting subpopulation produces about 9% of the loggerhead nests, they comprise more of the loggerhead sea turtles found in foraging areas from the northeastern U.S. to Georgia: between 25 and 59 percent of the loggerhead turtles in this area are from the northern subpopulation (NMFS SEFSC 2001; Bass *et al*., 1998; Norrgard, 1995; Rankin-Baransky, 1997; Sears 1994, Sears *et al.*, 1995). In the Carolinas, the northern subpopulation is estimated to make up from 25% to 28% of the loggerheads (NMFS SEFSC 2001; Bass *et al.* 1998, 1999). About ten percent of the loggerhead turtles in foraging areas off the Atlantic coast of central Florida are from the northern subpopulation (Witzell *et al*., in prep). In the Gulf of Mexico, most of the loggerhead turtles in foraging areas will be from the South Florida subpopulation, although the northern subpopulation may represent about 10% of the loggerhead sea turtles in the Gulf (Bass pers. comm). In the Mediterranean Sea, about 45 - 47 percent of the pelagic loggerheads are from the South Florida subpopulation and about two percent are from the northern subpopulation, while only about 51% originated from Mediterranean nesting beaches (Laurent *et al.*, 1998). In the vicinity of the Azores and Madiera Archipelagoes, about 19% of the pelagic loggerheads are from the northern subpopulation, about 71% are from the South Florida subpopulation, and about 11% are from the Yucatán subpopulation (Bolten *et al*., 1998).

Natural History. Loggerhead turtles originating from the western Atlantic nesting aggregations are believed to lead a pelagic existence in the North Atlantic Gyre for as long as 7-12 years. Turtles in this life history stage are called “pelagic immatures” and are best known from the eastern Atlantic near the Azores and Madeira and have been reported from the Mediterranean as well as the eastern Caribbean (Bjorndal *et al*., in press). Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm SCL they recruit to coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic and Gulf of Mexico.

Benthic immatures have been found from Cape Cod, Massachusetts, to southern Texas, and occasionally strand on beaches in northeastern Mexico. Large benthic immature loggerheads (70-91 cm) represent a larger proportion of the strandings and in-water captures (Schroeder *et al.*, 1998) along the south and western coasts of Florida as compared with the rest of the coast, but it is not known whether the larger animals actually are more abundant in these areas or just more abundant within the area relative to the smaller turtles. Benthic immature loggerheads foraging in northeastern U.S. waters are known to migrate southward in the fall

as water temperatures cool (Epperly *et al.*, 1995; Keinath, 1993; Morreale and Standora, 1999; Shoop and Kenney, 1992), and migrate northward in spring. Given an estimated age at maturity of 21-35 years (Frazer and Ehrhart, 1985; Frazer and Limpus, 1998), the benthic immature stage must be at least 10-25 years long. NMFS SEFSC 2001 analyses conclude that juvenile stages have the highest elasticity and maintaining or decreasing current sources of mortality in those stages will have the greatest impact on maintaining or increasing population growth rates.

Like other sea turtles, the movements of loggerheads are influenced by water temperature. Since they are limited by water temperatures, sea turtles do not usually appear on the summer foraging grounds until June, but are found in Virginia as early as April. The large majority leaves the Gulf of Maine by mid-September but may remain in these areas until as late as November and December. Loggerhead sea turtles are primarily benthic feeders, opportunistically foraging on crustaceans and mollusks (Wynne and Schwartz, 1999). Under certain conditions they may also scavenge fish, particularly if they are easy to catch (e.g., caught in nets) (NMFS and USFWS, 1991).

Adult female loggerheads in the western Atlantic come ashore to nest primarily from North Carolina southward to Florida. Additional nesting assemblages occur in the Florida Panhandle and on the Yucatán Peninsula. Non-nesting, adult female loggerheads are reported throughout the U.S. and Caribbean Sea; however, little is known about the distribution of adult males who are seasonally abundant near nesting beaches during the nesting season. Aerial surveys suggest that loggerheads (benthic immatures and adults) in U.S. waters are distributed in the following proportions: 54% in the southeast U.S. Atlantic, 29% in the northeast U.S. Atlantic, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico (TEWG 1998).

Threats. Loggerhead sea turtles face a number of human-related threats in the marine environment, including oil and gas exploration, development, and transportation; marine pollution; trawl, purse seine, hook and line, gill net, pound net, longline, and trap fisheries (see below); underwater explosions; dredging, offshore artificial lighting; power plant entrapment; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; and poaching.

Although loggerhead turtles are most vulnerable to pelagic longlines during their pelagic, immature life history stage, there is some evidence that benthic immatures may also be captured, injured, or killed by pelagic fishery operations. Recent studies have suggested that not all loggerhead turtles follow the model of circumnavigating the North Atlantic Gyre as pelagic immatures, followed by permanent settlement into benthic environments. Some may not totally circumnavigate the North Atlantic. In addition, some of these turtles may either remain in the pelagic habitat in the North Atlantic longer than hypothesized or they may move back and forth between pelagic and coastal habitats (Witzell in prep.). Any loggerhead turtles that follow this developmental model would be adversely affected by shark gill nets and shark bottom longlines set in coastal waters, in addition to pelagic longlines.

On their nesting beaches in the U.S., loggerhead turtles are threatened with beach erosion, armoring, and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; exotic dune and beach vegetation; predation by fire ants, raccoons, armadillos, opossums; and poaching. Elimination/control of these threats are especially important because, from a global perspective, the southeastern U.S. nesting aggregation is critical to the survival of this species: it is second in size only to the nesting aggregations in the Arabian Sea off Oman and represents about 35 and 40 percent of the nests of this species. The status of the Oman nesting beaches has not been evaluated recently, but they are located in a part of the world that is vulnerable to extremely disruptive events (e.g. political upheavals, wars, and catastrophic oil spills), the resulting risk facing this nesting aggregation and these nesting beaches is cause for considerable concern (Meylan *et al*., 1995).

Loggerhead turtles also face numerous threats from weather and coastal processes. For example, there is a significant overlap between hurricane seasons in the Caribbean Sea and northwest Atlantic Ocean (June to November) and loggerhead turtle nesting season (March to November); hurricanes can have potentially disastrous effects on the survival of eggs in sea turtle nests. In 1992, Hurricane Andrew affected turtle nests over a 90-mile length of coastal Florida; all of the eggs were destroyed by storm surges on beaches that were closest to the eye of this hurricane (Milton *et al*., 1992). On Fisher Island near Miami, Florida, 69% of the eggs did not hatch after Hurricane Andrew, probably because they were drowned by the storm surge. Nests from the northern subpopulation were destroyed by hurricanes, which made landfall in North Carolina in the mid to late 1990's. Sand accretion and rainfall that result from these storms can appreciably reduce hatchling success. These natural phenomena probably have significant, adverse effects on the size of specific year classes; particularly given the increasing frequency and intensity of hurricanes in the Caribbean Sea and northwest Atlantic Ocean.

Status and Population Trends. The loggerhead turtle was listed as threatened under the ESA on July 28, 1978. The most recent work updating what is known regarding status and trends of loggerhead sea turtles is contained in NMFS SEFSC 2001. The recovery plan for this species (NMFS and USFWS 1991) state that southeastern U.S. loggerheads can be considered for delisting if, over a period of 25 years, adult female populations in Florida are increasing and there is a return to pre-listing annual nest numbers totaling 12,800 for North Carolina, South Carolina, and Georgia combined. This equates to approximately 3,100 nesting females per year at 4.1 nests per female per season. NMFS SEFSC 2001 concludes, "…nesting trends indicate that the numbers of females associated with the South Florida subpopulation are increasing. Likewise, nesting trend analyses indicate potentially increasing nest numbers in the northern subpopulation" (TEWG 2000). However, NMFS SEFSC 2001 also cautions that given the uncertainties in survival rates (of the different life stages, particularly the pelagic immature stage), and the stochastic nature of populations, population trajectories should not be used now to quantitatively assess when the northern subpopulation may achieve 3,100 nesting females.

Several published reports have presented the problems facing long-lived species that delay sexual maturity in a world replete with threats from a modern, human population (Crouse *et al.*, 1987, Crowder *et al.*, 1994, Crouse 1999). In general, these reports concluded that animals that delay sexual maturity and reproduction must have high, annual survival as juveniles through adults to ensure that enough juveniles survive to reproductive maturity and then reproduce enough times to maintain stable population sizes. This general tenet of population ecology originated in studies of sea turtles (Crouse *et al.*, 1987, Crowder *et al.*, 1994, Crouse 1999). Heppell *et al.* (in prep.) specifically showed that the growth of the loggerhead sea turtle population was particularly sensitive to changes in the annual survival of both juvenile and adult sea turtles and that the adverse effects of the pelagic longline fishery on loggerheads from the pelagic immature phase appeared critical to the survival and recovery of the species. Crouse (1999) concluded that relatively small changes in annual survival rates of both juvenile and adult loggerhead sea turtles would adversely affect large segments of the total loggerhead sea turtle population.

The four major subpopulations of loggerhead sea turtles in the northwest Atlantic, northern, south Florida, Florida panhandle, and Yucatán are all subject to fluctuations in the number of young produced annually because of natural phenomena like hurricanes as well as human-related activities. Although sea turtle nesting beaches are protected along large expanses of the northwest Atlantic coast (in areas like Merrit Island, Archie Carr, and Hobe Sound National Wildlife Refuges), other areas along these coasts have limited or no protection and probably cause fluctuations in sea turtle nesting success. Sea turtles nesting in the southern and central counties of Florida can be affected by beach armoring, beach renourishment, beach cleaning, artificial lighting, predation, and poaching (NMFS & FWS 1991).

As discussed previously, the survival of juvenile loggerhead sea turtles is threatened by a completely different set of threats from human activity once they migrate to the ocean. Pelagic immature loggerhead sea turtles from these four subpopulations circumnavigate the North Atlantic over several years (Carr 1987, Bjorndal 1994). During that period, they are exposed to a series of long-line fisheries that include an Azorean long-line fleet, a Spanish long-line fleet, and various fleets in the Mediterranean Sea (Aguilar *et al*., 1995, Bolten *et al.*, 1994, Crouse 1999). Based on their proportional distribution, the capture of immature loggerhead sea turtles in long-line fleets in the Azores and Madiera Archipelagoes and the Mediterranean Sea will have a significant, adverse effect on the annual survival rates of juvenile loggerhead sea turtles from the western Atlantic subpopulations, with a disproportionately large effect on the northern subpopulation that may be significant at the population level.

In waters off coastal U.S., a suite of fisheries in Federal and State waters threatens the survival of juvenile loggerhead sea turtles. Loggerhead turtles are captured, injured, or killed in shrimp fisheries off the Atlantic coast; along the southeastern Atlantic coast, loggerhead turtle populations are declining where shrimp fishing is intense off the nesting beaches (NRC 1990). Conversely these nesting populations do not appear to be declining where nearshore shrimping effort is low or absent. The management of shrimp harvest in the Gulf of Mexico demonstrates the correlation between shrimp trawling and impacts to sea turtles. Waters out to 200nm are closed to shrimp fishing off of Texas each year for approximately a three-month

period (mid- May through mid-July) to allow shrimp to migrate out of estuarine waters; sea turtle strandings decline dramatically during this period (NMFS, STSSN unpublished data). Loggerhead sea turtles are captured in fixed pound-net gear in the Long Island Sound, in pound-net gear and trawls in summer flounder and other finfish fisheries in the mid-Atlantic and Chesapeake Bay, in gill net fisheries in the mid-Atlantic and elsewhere, in fisheries for monkfish and for spiny dogfish, and in northeast sink gillnet fisheries. Witzell (1999) compiled data on capture rates of loggerhead and leatherback turtles in U.S. longline fisheries in the Caribbean and northwest Atlantic; the cumulative takes of these fisheries approach those of the U.S. shrimp fishing fleet (Crouse 1999, NRC 1990).

Based on the data available, it is not possible to estimate the size of the loggerhead population in the U.S. or its territorial waters. There is, however, general agreement that the number of nesting females provides a useful index of the species' population size and stability at this life stage. Nesting data collected on index nesting beaches in the U.S. from 1989-1998 represent the best dataset available to index the population size of loggerhead turtles. However, an important caveat for population trends analysis based on nesting beach data is that this may reflect trends in adult nesting females, but it may not reflect overall population growth rates. Given this, between 1989 and 1998, the total number of nests laid along the U.S. Atlantic and Gulf coasts ranged from 53,016-89,034 annually, representing, on average, an adult female population of 44,780 [(nests/4.1) * 2.5]. On average, 90.7% of the nests were from the South Florida subpopulation, 8.5% were from the northern subpopulation, and 0.8% were from the Florida Panhandle subpopulation. There is limited nesting throughout the Gulf of Mexico west of Florida, but it is not known to what subpopulation they belong. Based on the above, there are only an estimated 3,800 nesting females in the northern loggerhead subpopulation. The status of this population, based on number of loggerhead nests, has been classified as stable or declining (TEWG 2000). Another consideration adding to the vulnerability of the northern subpopulation is that NMFS scientists estimate, using genetics data from Texas, South Carolina, and North Carolina in combination with juvenile sex ratios from those states, that the northern subpopulation produces 65% males, while the Florida subpopulation is estimated to produce 80% females (NMFS SEFSC 2001, Part I).

Critical Habitat. No critical habitat has been designated for loggerhead turtles.

3.2.3 Kemp's Ridley Turtle (*Lepidochelys kempii*)

Status and Population Trends. Of the seven extant species of sea turtles of the world, the Kemp's ridley has declined to the lowest population level. The Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempi*) (USFWS and NMFS 1992) contains a description of the natural history, taxonomy, and distribution of the Kemp's ridley turtle. Kemp's ridleys nest in daytime aggregations known as *arribadas*. The primary arribada in the Gulf of Mexico is at Rancho Nuevo, a stretch of beach in Mexico. Most of the population of adult females nest in this single locality (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the early 1970's, the world population estimate of mature female Kemp's ridleys had been reduced to 2,500-5,000 individuals. The population

declined further through the mid-1980s. Recent observations of increased nesting suggest that the decline in the ridley population has stopped and there is cautious optimism that the population is now increasing.

After unprecedented numbers of Kemp's ridley carcasses were reported from Texas and Louisiana beaches during periods of high levels of shrimping effort, NMFS established a team of population biologists, sea turtle scientists, and managers, known as the Turtle Expert Working Group (TEWG) to conduct a status assessment of sea turtle populations. Analyses conducted by the group have indicated that the Kemp's ridley population is in the early stages of recovery; however, strandings in some years have increased at rates higher than the rate of increase in the Kemp's population (TEWG 1998).

The TEWG (1998) developed a population model to evaluate trends in the Kemp's ridley population through the application of empirical data and life history parameter estimates chosen by the TEWG. Model results identified three trends in benthic immature Kemp's ridleys. Benthic immatures are those turtles that are not yet reproductively mature but have recruited to feed in the nearshore benthic environment where they are available to nearshore mortality sources that often result in strandings. Benthic immature ridleys are estimated to be 2-9 years of age and 20-60 cm in length. Increased production of hatchlings from the nesting beach beginning in 1966 resulted in an increase in benthic ridleys that leveled off in the late 1970s. A second period of increase followed by leveling occurred between 1978 and 1989 as hatchling production was further enhanced by the cooperative program between the U.S. Fish and Wildlife Service (FWS) and Mexico's Instituto Nacional de Pesca to increase the nest protection and relocation program in 1978. A third period of steady increase, which has not leveled off to date, has occurred since 1990 and appears to be due to the greatly increased hatchling production and an apparent increase in survival rates of immature turtles beginning in 1990 due, in part, to the introduction of turtle excluder devices (TEDs). Adult ridley numbers have now grown from a low of approximately 1,050 adults producing 702 nests in 1985, to greater than 3,000 adults producing 1,940 nests in 1995 and about 3,400 nests in 1999.

The TEWG (1998) was unable to estimate the total population size and current mortality rates for the Kemp's ridley population. However, the TEWG listed a number of preliminary conclusions. The TEWG indicated that the Kemp's ridley population appears to be in the early stage of exponential expansion. Over the period 1987 to 1995, the rate of increase in the annual number of nests accelerated in a trend that would continue with enhanced hatchling production and the use of TEDs. Nesting data indicated that the number of adults declined from a population that produced 6,000 nests in 1966 to a population that produced 924 nests in 1978 and a low of 702 nests in 1985. This trajectory of adult abundance tracks with trends in nest abundance from an estimate of 9,600 in 1966 to 1,050 in 1985. The TEWG estimated that in 1995 there were 3,000 adult ridleys. The increased recruitment of new adults is illustrated in the proportion of neophyte, or first time nesters, which has increased from 6% to 28% from 1981 to 1989 and from 23% to 41% from 1990 to 1994. The population model in the TEWG projected that Kemp's ridleys could reach the intermediate recovery goal identified in the Recovery Plan of 10,000 nesters by the year 2020 if the assumptions of age to sexual maturity and age specific survivorship rates plugged into their model are correct. It

determined that the data reviewed suggested that adult Kemp's ridley turtles were restricted somewhat to the Gulf of Mexico in shallow near shore waters, and benthic immature turtles of 20-60 cm straight line carapace length are found in nearshore coastal waters including estuaries of the Gulf of Mexico and the Atlantic.

The TEWG (1998) identified an average Kemp's ridley population growth rate of 13% per year between 1991 and 1995. Total nest numbers have continued to increase. However, the 1996 and 1997 nest numbers reflected a slower rate of growth, while the increase in the 1998 nesting level has been much higher and decreased in 1999. The population growth rate does not appear as steady as originally forecasted by the TEWG, but annual fluctuations, due in part to irregular inter-nesting periods, are normal for other sea turtle populations. Also, as populations increase and expand, nesting activity would be expected to be more variable.

The area surveyed for ridley nests in Mexico was expanded in 1990 due to destruction of the primary nesting beach by Hurricane Gilbert. The TEWG (1998) assumed that the increased nesting observed particularly since 1990 was a true increase, rather than the result of expanded beach coverage. Because systematic surveys of the adjacent beaches were not conducted prior to 1990, there is no way to determine what proportion of the nesting increase documented since that time is due to the increased survey effort rather than an expanding ridley nesting range. As noted by TEWG, trends in Kemp's ridley nesting even on the Rancho Nuevo beaches alone suggest that recovery of this population has begun but continued caution is necessary to ensure recovery and to meet the goals identified in the Kemp's Ridley Recovery Plan.

Natural History. Juvenile Kemp's ridleys use northeastern and mid-Atlantic coastal waters of the U.S. Atlantic coastline as primary developmental habitat during summer months, with shallow coastal embayments serving as important foraging grounds. Post-pelagic ridleys feed primarily on crabs, consuming a variety of species, including *Callinectes* sp., *Ovalipes* sp., *Libinia* sp., and *Cancer* sp. Mollusks, shrimp, and fish are consumed less frequently (Bjorndal, 1997). Juvenile ridleys migrate south as water temperatures cool in fall, and are predominantly found in shallow coastal embayments along the Gulf Coast during fall and winter months.

Ridleys found in mid-Atlantic waters are primarily post-pelagic juveniles averaging 40 centimeters in carapace length, and weighing less than 20 kilograms (Klinger and Musick 1995). Next to loggerheads, they are the second most abundant sea turtle in Virginia and Maryland waters, arriving in these areas during May and June, and migrating to more southerly waters from September to November (Keinath *et al.*, 1987; Musick and Limpus, 1997). In the Chesapeake Bay, ridleys frequently forage in shallow embayments, particularly in areas supporting submerged aquatic vegetation (Lutcavage and Musick, 1985; Bellmund *et al.*, 1987; Keinath *et al.*, 1987; Musick and Limpus, 1997). The juvenile population in Chesapeake Bay is estimated to be 211 to 1,083 turtles (Musick and Limpus, 1997).

Research being conducted by Texas A&M University has resulted in the intentional live-capture of hundreds of Kemp's ridleys at Sabine Pass and the entrance to Galveston Bay. Between 1989 and 1993, Galveston NMFS Laboratory staff tracked 50 of these turtles using

satellite and radio telemetry. The tracking study was designed to characterize sea turtle habitat and to identify small and large-scale migration patterns. Preliminary analysis of the data collected during these studies suggests that subadult Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud, NMFS Galveston Laboratory, pers. comm.).

Threats. Observations in the northeast otter trawl fishery, pelagic longline fishery, and southeast shrimp and summer flounder bottom trawl fisheries have recorded takes of Kemp's ridley turtles. As with loggerheads, a large number of Kemp's ridleys are taken in the southeast shrimp fishery each year. Kemp's ridleys were also affected by the apparent large-mesh gillnet interaction that occurred in spring off of North Carolina. A total of five Kemp's ridley carcasses were recovered from the same North Carolina beaches where 277 loggerhead carcasses were found. This is expected to be a minimum count of the number of Kemp's ridleys that were killed or seriously injured as a result of the fishery interaction since it is unlikely that all carcasses washed ashore. Stranding events illustrate the vulnerability of Kemp's ridley and loggerhead turtles to the impacts of human activities in nearshore Gulf of Mexico waters as well (TEWG 1998). While many of the stranded turtles observed in recent years in Texas and Louisiana have been incidentally taken in the shrimp fishery, other sources of mortality, such as those observed in the northeastern and southeastern Atlantic zones, exist in these waters.

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

3.2.4 Leatherback Turtle (*Dermochelys coriacea*)

Species Description and Distribution. The leatherback is the largest living turtle. Leatherback sea turtles are widely distributed throughout the oceans of the world, and are found throughout waters of the Atlantic, Pacific, Caribbean, and the Gulf of Mexico.

Leatherback turtles undertake the longest migrations of any other sea turtle and exhibit the broadest thermal tolerances (NMFS and USFWS 1998). Leatherback turtles are able to inhabit intensely cold waters for a prolonged period of time because leatherbacks are able to maintain body temperatures several degrees above ambient temperatures. Leatherback turtles are typically associated with continental shelf habitats and pelagic environments, and are sighted regularly in offshore waters (>328 ft). Leatherback turtles regularly occur in deep waters (>328 ft), and an aerial survey study in the north Atlantic Ocean sighted leatherback turtles in water depths ranging from 3 to 13,618 ft, with a median sighting depth of 131.6 ft (CeTAP 1982). This same study found leatherbacks in waters ranging from 7 to 27.2°C. Leatherback nesting data for Brevard County is included in Table 4.

Table 4 Leatherback Sea Turtle Nesting Data for Brevard County, 1988-2005

Year	Beach Length (km)	Leatherback Turtle Nests
1988	77.9	0
1989	97.4	1
1990	98.3	0
1991	98.5	3
1992	101.0	2
1993	100.1	1
1994	102.8	5
1995	103.4	4
1996	105.2	16
1997	110.0	11
1998	108.0	30
1999	108.0	43
2000	108.0	22
2001	115.2	61
2002	115.2	18
2003	115.2	68
2004	103.2	25
2005	115.2	68

Life History Information. Although leatherbacks are a long lived species (> 30 years), they are somewhat faster to mature than loggerheads, with an estimated age at sexual maturity reported as about13-14 years for females, and an estimated minimum age at sexual maturity of 5-6 years, with 9 years reported as a likely minimum (Zug and Parham 1996).

Leatherback sea turtles are predominantly distributed pelagically where they feed on jellyfish such as *Stomolophus*, *Chryaora*, and *Aurelia*. Leatherbacks are deep divers, with recorded dives to depths in excess of 1000 m, but they may come into shallow waters if there is an abundance of jellyfish nearshore. They also occur annually in places such as Cape Cod and Narragansett bays during certain times of the year, particularly the fall.

Listing status. The leatherback was listed as endangered on June 2, 1970 and a recovery plan was issued in 1998. Leatherback turtles are included in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, which effectively bans trade.

Population status and trends. Globally, leatherback turtle populations have been decimated worldwide. The global leatherback turtle population was estimated to number approximately 115,000 adult females in 1980 (Pritchard 1982), but only 34,500 in 1995 (Spotila *et al*. 1996). The decline can be attributed to many factors including fisheries as well as intense

exploitation of the eggs (Ross 1979). On some beaches nearly 100% of the eggs laid have been harvested. Spotila *et al*. (1996) record that adult mortality has also increased significantly, particularly as a result of driftnet and longline fisheries.

The status of the Atlantic population is not clear. In 1996, it was reported to be stable, at best (Spotila 1996), but numbers in the Western Atlantic at that writing were reported to be on the order of 18,800 nesting females. According to Spotila, the Western Atlantic population currently numbers about 15,000 nesting females, whereas current estimates for the Caribbean (4,000) and the Eastern Atlantic (i.e. off Africa, numbering ~ 4,700) have remained consistent with numbers reported by Spotila *et al*. in 1996. Between 1989 and 1995, marked leatherback returns to the nesting beach at St. Croix averaged only 48.5%, but that the overall nesting population grew (McDonald, et. al 1993). This is in contrast to a Pacific nesting beach at Playa Grande, Costa Rica, where only 11.9% of turtles tagged in 1993-94 and 19.0% of turtles tagged in 1994-95 returned to nest over the next five years. Characterizations of this population suggest that it has a very low likelihood of survival and recovery in the wild under current conditions.

Spotila *et al*. (1996) describe a hypothetical life table model based on estimated ages of sexual maturity at both ends of the species= natural range (5 and 15 years). The model concluded that leatherbacks maturing in 5 years would exhibit much greater population fluctuations in response to external factors than would turtles that mature in 15 years. Furthermore, the simulations indicated that leatherbacks could maintain a stable population only if both juvenile and adult survivorship remained high, and that if other life history stages (i.e. egg, hatchling, and juvenile) remained static, stable leatherback populations could not withstand an increase in adult mortality above natural background levels without decreasing.

Threats. The primary threats to leatherback turtles are entanglement in fishing gear (e.g., gillnets, longlines, lobster pots, weirs), boat collisions, and ingestion of marine debris (NMFS and USFWS 1997). The foremost threat is the number of leatherback turtles killed or injured in fisheries. Spotila, *et al.* (2000) states that a conservative estimate of annual leatherback fishery-related mortality (from longlines, trawls and gillnets) in the Pacific during the 1990s is 1,500 animals. He estimates that this represented about a 23% mortality rate (or 33% if most mortality was focused on the East Pacific population). As noted above, leatherbacks normally live at least 30 years, usually maturing at about 12-13 years. Such long-lived species cannot withstand such high rates of anthropogenic mortality.

3.2.5 Site Specific Sea Turtle Information

Sea turtles use the habitats offshore of Brevard County to different degrees during different stages of their life cycle. During the summer months hatchlings utilize this habitat as a corridor to deeper waters farther off the coast. Juvenile and sub-adult turtles use the nearshore and offshore habitats as a foraging area, while adult turtles are present year round with seasonally high abundances during the breeding season.

Green turtles are found in a variety of habitats in the waters in and adjacent to Brevard County depending on their developmental stage (Redfoot 1997). After hatching, they utilize the pelagic habitat where they spend the next two to three years of their lives (Frazer and Ehrhart 1985; Carr 1987) and subsequently take up residence as juveniles and subadults in coastal lagoons, estuaries, and near-shore reefs (Redfoot 1997). They eventually migrate to foraging habitats and migrate to nesting beaches to reproduce.

Juvenile green sea turtles have been documented to forage in the Port since the early 1990s where the algal communities associated with granite riprap boulders serve as one of their primary sources of food and is likely what attracts them into the Port (Dial Cordy 2007). In particular, waters within the Trident Turning Basin were previously identified as foraging areas for juvenile sea turtles (Ehrhart and Redfoot 1994; Ehrhart and Redfoot 1997; Redfoot 1997; Redfoot and Ehrhart 2002; Ehrhart and Redfoot 2005; Ehrhart and Redfoot 2006; Dial Cordy 2007). In addition to the Trident Turning Basin, many areas within Port Canaveral (including the riprap area that may be affected by the proposed project) are rocky riprap areas similar to those found in the Trident Turning Basin, and have potential as foraging habitat for juvenile green turtles.

Surveys of turtle presence along the riprap areas within the Port were conducted in August 2005, February 2006 and June 2006 (Dial Cordy 2007). During the surveys in August 2005 and February 2006 the majority of juvenile sea turtles were observed along the riprap between the Main Turning Basin and Trident Turning Basin , it has been previously shown that significant numbers of sea turtles also use the Trident basin for foraging, and this area was not available for observation during these surveys. While there is likely to be some exchange between this assemblage and other developmental habitats, we are not aware of any extensive areas of suitable habitat immediately adjacent to Port Canaveral, and turtles may remain resident in the Port for considerable lengths of time. Some turtles in previous studies have been caught over 20 times over a period of up to 12 years (Dial Cordy 2007). Based on these past and present observations it should be assumed that many of the turtles observed utilizing the riprap areas along the main Port channel also use the riprap foraging areas in the adjacent Trident Turning Basin. This additional foraging habitat is available to support juvenile turtle populations in the Port during the time between removal of the existing riprap and the time that the new riprap would be recolonized by algal species (Dial Cordy 2007).

Re-colonization of the riprap by the algal communities should begin quickly after re-placement of new riprap along the shoreline. Previous studies have shown rapid colonization (<2 weeks) of marine algal species on bare rock substrates (Littler et. al 1987). These early successional species will allow more mature successional species to colonize these rock riprap areas. Adjacent algal communities will play a role in helping to recolonize the now bare rock substrates and these habitats should start rebounding quickly following placement of riprap. Therefore, it is not likely that the proposed project would have a significant impact on foraging juvenile sea turtles.

Dredging is not expected to have a direct affect on sea turtles. Hydraulic dredging is not known to take turtles, so no dredging blackout period would be required (NMFS and USACE 2003). No blackout date would likely be in effect for clamshell dredging, as well. Hopper

dredging is not permitted for use in the project area. The majority of the dredged material would be placed in the authorized Canaveral ODMDS, although some of the material suitable for construction or other beneficial use will be temporarily stockpiled on three authorized upland disposal areas located north of the project area. If any beach quality sand is encountered during the dredging process, it may be placed in the authorized nearshore disposal area contingent on approval from the appropriate agencies.

Potential Impacts. The potential for the proposed project to adversely affect juvenile sea turtles is due to the loss of foraging habitat within Canaveral Harbor. However, there is a substantial amount of additional foraging habitat within the harbor, and the proposed action would only temporarily remove a section of the habitat. Therefore, the proposed action is likely to affect but not likely to adversely affect sea turtles.

3.3 Right Whale (*Eubalaena glacialis)*

Geographic Range. The North Atlantic right whale has been listed as endangered under the Endangered Species Act (ESA) since 1972. The western stock of the North Atlantic right whale population ranges from wintering and calving grounds in the coastal waters of the southeastern United States to summer feeding and nursery grounds in New England waters and northward to the Bay of Fundy and the Scotian Shelf. Offshore surveys flown off the coast of Florida and southeastern Georgia from 1996 to 2001 had three sightings in 1996, one in 1997, 13 in 1998, six in 1999, 11 in 2000, and six in 2001. The western North Atlantic population size was estimated to be 291 individuals in 1998 (NMFS 2005).

Habitat/Behavior. The North Atlantic right whale primarily occurs in coastal or shelf waters. Five areas of "high use" were identified in the Recovery Plan and include coastal Florida and Georgia, from the Sebastian Inlet, Florida to the Altamaha River, Georgia, and this area was designated as critical habitat in 1994. Known wintering occurs along the southeastern U.S. coast, where calving occurs from December through March. Gestation lasts from 357 to 396 days in southern right whales (NMFS 2005), and weaning has been reported to last 8 to 17 months. Calf production over the past 20 years has averaged around 11 individuals per year (NMFS 2005). The calving interval for right whales is between 2 and 7 years, with a mean period of 3.12 to 3.67 years. The 2005-2006 calving season resulted in the birth of 19 calves, five of which were to new mothers (Georgia Environmental Policy Institute 2006).

Threats. Ship collisions and fishing gear entanglements are the most common anthropogenic causes of mortality in the western North Atlantic right whale. Other potential threats include habitat degradation, noise, contamination, underwater bombing activities, climate and ecosystem change, and commercial exploitation (NMFS 2005).

The greatest known current cause of right whale mortality in the western North Atlantic is collision with ships (NMFS 2005). Of the 45 confirmed deaths of right whales between 1970 and 1999, 16 are known to have been caused by ship strikes and two additional collisions were determined to be possibly fatal (Knowlton and Kraus 2001). In the period between 1999 and 2003, 18 verified right whale mortalities occurred, of which five were due to ship strikes

(Cole, *et al* 2005). None of the incidents occurred in the area near Port Canaveral. Only one of the incidents occurred in the Jacksonville area (January 2003) and the death was most likely caused by gear ingestion. Recently, however, there have been two documented right whale deaths in the Jacksonville region. One calf died as a result of lacerations from a large propeller (first reported off Jacksonville on January 10, 2006), and a second calf died from entanglement in line and gillnet gear (reported off Jacksonville Beach on January 21, 2006). A severed fluke was recovered east of Jacksonville, leading authorities to believe that a third right whale calf died, but no carcass has been recovered (Georgia Environmental Policy Institute 2006). Genetic sampling is currently underway to determine the lineage of the probable fatality. Additional non-fatal incidents recently occurred off Amelia Island (January 10, 2006) and Cumberland Island, GA (March 11, 2006).

The entanglement death prompted NMFS to issue a temporary ruling prohibiting gillnet fishing in southeast waters from Savannah to Sebastian Inlet between February 15 and March 31, 2006. It is unknown whether or not this ban will be extending during future years.

Potential Impacts. The potential for the proposed project to adversely affect the North Atlantic right whale would occur from cargo and cruise ship traffic associated with the Port. However, the current and projected ship traffic would not increase in response to the proposed action. In fact, it is likely that the amount of time ships spend in the designated critical habitat area in the nearshore area would decrease as a result of more efficient operations.

4.0 EFFECT DETERMINATION

The Port has determined that the proposed navigations improvements is not likely to adversely affect listed species within the action area and requests concurrence from NMFS.

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Port Canaveral Sea Turtle Foraging Report
Brevard County, Florida

August 2007

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DC&A Project No. 05-850

TABLE OF CONTENTS

Page

LIST OF FIGURES III

LIST OF TABLES III

1.0 INTRODUCTION 1

1.1 Study Purpose 1

1.2 Study Area Location 1

1.3 Background 1

2.0. METHODOLOGY 4

2.1 Algal Community Study 4

2.2 Sea Turtle Survey 4

3.0 RESULTS 6

3.1 Algal Community 6

3.2 Sea Turtle Distribution 9

4.0 SUMMARY 10

5.0 LITERATURE CITED 11

Appendix A Algal List

Appendix B Inwater Research Group Reports

LIST OF FIGURES

Page

Figure 1 Location Map 2
Figure 2 Study Area 3
Figure 3 Algal Survey Locations 5
Figure 4 Survey Transects 8

LIST OF TABLES

Page

Table 1 Algae Families Collected From Port Canaveral Rip-Rap Habitat Summer 2005 and Winter 2006. 7
Table 2 Observation Data for Port Canaveral Sea Turtle Census, August 2005 and September 2006 9

1.0 INTRODUCTION

1.1 Study Purpose

The Canaveral Port Authority (CPA) is currently conducting a feasibility study of potential navigation improvements under the authority granted under Section 203 of the Water Resources Development Act (WRDA), 1986. The study is in response to problems and issues identified by the CPA and Canaveral Pilots Association with regard to ship maneuvering within the existing federal project. Dial Cordy and Associates Inc. (DC&A) was contracted by the CPA to conduct a study to determine the potential impact to the juvenile sea turtle population within the study area from the proposed port improvements identified in the current Section 203 Study.

1.2 Study Area Location

Port Canaveral is located in Brevard County on the east coast of Florida, approximately nine miles north of Cocoa Beach (Figure 1). The main port is orientated in an east – west direction, extending from the Atlantic coast to the Banana River. The port is bounded to the north by the Cape Canaveral Air Force Station (CCAFS) and the Banana River, and bounded to the south by the City of Cape Canaveral. The harbor consists of three turning basins (Figure 2). Starting from the east they are: the Trident Turning Basin (TTB), the Middle Turning Basin (MTB), and the West Turning Basin (WTB). The basins are connected by a channel (East Access Channel and West Access Channel) that forms the south boundary of each basin. Within this channel, a Federally maintained Barge Canal extends from the south side of the MTB, through the Banana River, across Merritt Island, and connects with the Intracoastal Waterway (ICWW) system in the Indian River. Where the Barge Canal enters the Banana River, a 600-foot long Corps of Engineers' lock (Canaveral Lock) separates the tidal harbor from the almost non-tidal river.

1.3 Background

The Atlantic and Gulf of Mexico coastal waters of the United States are utilized by five species of marine turtles during parts of their life histories. All five are protected under the Endangered Species Act of 1973. Of these, the green turtle (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempi*), Leatherback, (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*) are classified as endangered in Florida waters; and the loggerhead (*Caretta caretta*) is classified as threatened (Dial Cordy 2006; Redfoot 1997). Sea turtles use the habitats offshore of Brevard County to different degrees during different stages of their life cycle. During the summer months hatchlings utilize this habitat as a corridor to deeper waters farther off the coast. Juvenile and sub-adult turtles use the inshore and offshore habitats as a foraging areas, while adult turtles are present year round with seasonally high abundances during the breeding season.

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Port Canaveral
Cape Canaveral
Cocoa
Cocoa West
Merritt Island
Cocoa Beach
Rockledge
John F Kennedy Space Center
Patrick Air Force Base
Jane Green Swamp
Nasa
Kennedy
Cape
Gissom
Kings
Ranch
Banyan
Fay
Citrus
Hartville
Sharpes
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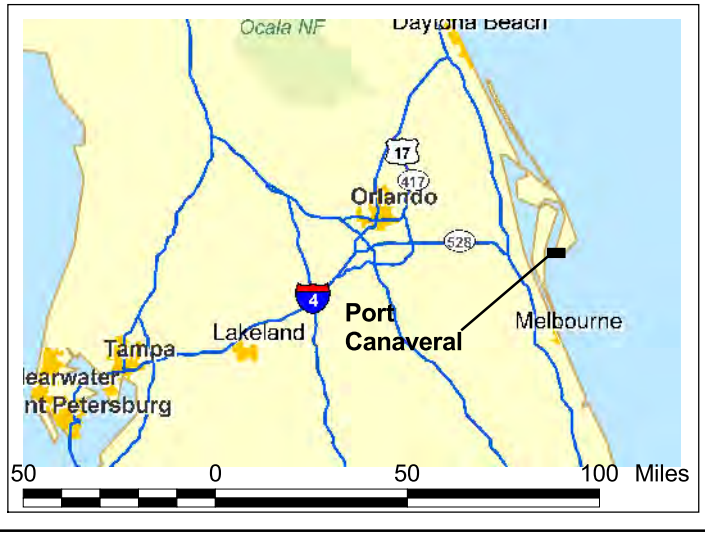

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	Figure 2

Green turtles are found in a variety of habitats in the waters in and adjacent to Brevard County depending on their developmental stage (Redfoot 1997). After hatching, they utilize the pelagic habitat where they spend the next two to three years of their lives (Frazer and Ehrhart 1985; Carr 1987) and subsequently take up residence as juveniles and subadults in coastal lagoons, estuaries, and near-shore reefs (Redfoot 1997). They eventually migrate to foraging habitats and migrate to nesting beaches to reproduce.

The waters within Port Canaveral, particualry the Trident Turning Basin, were previously identified as foraging areas for juvenile sea turtles, particularly green turtles (Redfoot 1997). Algae, which grows on the rocky riprap areas in the basin, is the major component of the green turtles diet within the Trident Turning Basin. Many areas within Port Canaveral (including the riprap area that may be affected by the proposed project) are rocky riprap areas similar to those found in the Trident Turning Basin, and have potential as foraging habitat for juvenile green turtles. This study was conducted to specifically determine the extent of habitat and utilization by the species.

2.0. METHODOLOGY

2.1 Algal Community Study

Algal community surveys and sample collections were conducted in August 2005 and February 2006. Five survey locations were randomly established along the approximately 2,500-foot area of rip rap adjacent to the U. S. Air Force property on the northern shore of the main channel (Figure 3). The position of each survey location was marked with a Differential Geographical Positioning System (DGPS) with accuracy of less than 1 meter.

At each survey location, a diver established a transect from the waters edge to the seaward edge of the rip rap. Along each transect, algal abundance and distribution was documented by photographing 0.25 m^2 quadrats along the depth gradient (shallow [approximately 1 meter from waters edge], mid depth, and deep [approximately 1 m from deep edge of rock]).

Additionally, along each transect, a 10cm x 10cm area at each depth station (i.e. shallow, mid, and deep) a scraping was collected and samples sent to a lab for analysis. The analysis determined the species of algae and other marine species present and identified them to the lowest practical identification level. In total, 15 samples were collected for each of the two surveys (i.e. 5 transects x 3 depth stations).

2.2 Sea Turtle Survey

Sea turtle surveys were conducted by the Inwater Research Group Inc. (IRG) August 27-29, 2005 and February 11-13, 2006 using methodology developed by IRG and accepted by the

Survey Location

300 0 300 600 Feet

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	Figur 3

Florida Department of Environmental Protection (FDEP) and the National Marine Fisheries Service (NMFS). The methodology entailed subjecting each survey site to repetitive censusing, using observers in an elevated tower on a small boat. This technique allows for the calculation of observations per transect kilometer (an index of turtle abundance which can be used to directly compare different sites within a single area or sites over time). Data recorded for each siting included turtle species and size, whether the turtle was observed on the surface or underwater, proximity to the transect line, and activity (i.e., foraging, swimming, etc.) Locations of the turtles were recorded using GPS.

Five specific sites of probable sea turtle utilization within the Port were surveyed (Figure 4). Site 1 was the 988 meter riprap rock habitat along the north side of the entrance channel between the middle and east turning basins. Site 2 was the 266-meter riprap area on the south side of the channel at Jetty Park. Site 3 was the 98-meter stretch of riprap on the south side of the channel in the vicinity of marker 19. Site 4 was the 258-meter riprap shoreline on the north side of the channel just west of the west turning basin. Site 5 consisted of a 3,490 meter transect down the middle of the main channel.

An additional survey was conducted on June 6 and 7, 2007 to identify additional areas within Canaveral Harbor that had the potential to support juvenile sea turtle foraging. The survey crew examined additional rocky habitat for algal growth and the presence of juvenile sea turtles.

3.0 RESULTS

3.1 Algal Community

Algae were present along the entire length and depth of the rip-rap within the surveyed portion of the basin. In fact, algae maintained 100 percent cover on the majority of the area. Algae collected along the 988 m north side of the channel entrance was identified only to the family level due to the large amount of material and high complexity (Table 1). Redfoot's analysis of algal species in the adjacent Trident submarine basin (1997) yielded a number of species that most likely are also represented at the current survey site including *Gelidium americanum, Hypnea cervicornis, Polysiphonia subtilissima, Solieria filiformis, Ulva lactuca, Centroceras clavulatum, Cladophora catenata, Amphiroa rigida var. antillana,* and *Enteromorpha compressa.*

There were only minor variations in algal community between summer and winter. Algal species of the families Rhodomeleaceae and Ulvaceae were present on the winter that were not present during the summer sampling event. During the June 2007 survey, an additional total of 1952 meters of riprap rock shoreline were examined in areas not previously examined in prior surveys. Similar algal species were present along this riprap area, although no algal samples were obtained for identification. Sea turtles were also observed foraging along these additional areas.

Table 1 Algae Families Collected From Port Canaveral Rip-Rap Habitat Summer 2005 and Winter 2006.

Station	Shallow	Mid-Depth	Deep
August 2005			
1	None	Hypneaceae	Caulerpaceae Hypneaceae
2	Corallinaceaea Ceramiaceae Cladophoraceae Hypneaceae	Ceramiaceae Gelidiaceae Hypneaceae	Hypneaceae
3	Corallinaceaea Ceramiaceae Hypneaceae	Caulerpaceae Gelidiaceae Hypneaceae	Hypneaceae
4	Hypneaceae	Caulerpaceae Gelidiaceae Corallinaceaea Ceramiaceae Hypneaceae	Cladophoraceae Hypneaceae
5	Caulerpaceae Hypneaceae Corallinaceaea	Ceramiaceae Hypneaceae Corallinaceaea	Hypneaceae
February 2006			
1	Caulerpaceae Cladophoraceae Ceramiaceae Hypneaceae Rhodomelaceae	Hypneaceae Rhodomelaceae	Ceramiaceae Corallinaceaea Hypneaceae Rhodomelaceae
2	Corallinaceaea Hypneaceae Rhodomelaceae	Ceramiaceae Cladophoraceae Corallinaceaea Hypneaceae Rhodomelaceae	Ceramiaceae Cladophoraceae Hypneaceae Rhodomelaceae
3	Cladophoraceae Corallinaceaea Hypneaceae Rhodomelaceae	Cladophoraceae Ceramiaceae Hypneaceae Rhodomelaceae Ulvaceae	Cladophoraceae Ceramiaceae Hypneaceae Rhodomelaceae Ulvaceae
4	Cladophoraceae Hypneaceae Rhodomelaceae	Ceramiaceae Corallinaceaea Hypneaceae Rhodomelaceae	Cladophoraceae Corallinaceaea Rhodomelaceae Ulvaceae
5	Caulerpaceae Cladophoraceae Ceramiaceae Hypneaceae Rhodomelaceae	Cladophoraceae Ceramiaceae Corallinaceaea Hypneaceae Rhodomelaceae	Cladophoraceae Hypneaceae Rhodomelaceae Ulvaceae

Survey Transect

2000 0 2000 4000 Feet

Turtle urv Transects	
Port Cana ral Turtle Foraging stud	
Scale 1 inch = ,0 fe t	rawn MR
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	Figure 4

3.2 Sea Turtle Distribution

Sea turtles were mainly observed along transect 1, which paralleled the riprap shoreline between the MTB and TTB. In the fall 2005, 200 individuals were observed along the 980 m transect on 30 repetitions and yielded an average of 6.8 turtles/kilometer (Table 2). Nine individuals were observed along transect 2 on the southside of the channel on 27 repetitions. Five turtles were observed along transect 3 (31 repetitions), and 3 turtles were observed along transect 5 (3 repetitions). Respectively transects 2, 3, and 5 had averages of 1.25 turtles/kilometer, 1.64 turtles/kilometer and 0.29 turtles/kilometer. No turtles were observed during 31 repetitions along transect 4.

In the spring 2006, 111 turtles were observed along transect 1 (36 repetitions) for an average of 3.21 turtles/kilometer, and six turtles were observed along transect 2 (38 repetitions) or 0.593 turtles/kilometer (Table 2). No other turtles were observed.

During the June 2007 survey, turtles were observed along both the North Jetty and the South Jetty, with eight turtles being observed along the North Jetty and 25 turtles observed along the South Jetty or 0.39 turtles/kilometer and 1.18 turtles/kilometer respectively (Table 2).

Table 2 Observation Data for Port Canaveral Sea Turtle Census, August 2005 and September 2006

Transect	Length (meters)	No. of Repetitions	Total Turtles Observed	Turtles (observations) per kilometer
August 2005				
1	980	30	200	6.80
2	266	27	9	1.25
3	98	31	5	1.64
4	258	31	0	0
5	3490	3	3	0.29
February 2006				
1	980	36	111	3.21
2	266	38	6	0.593
3	98	18	0	0
4	258	23	0	0
5	3490	4	0	0
June 2007				
North Jetty	740	28	8	0.39
South Jetty	590	36	25	1.18

4.0 SUMMARY

Green turtles are found in a variety of habitats in the waters in and adjacent to Brevard County depending on their developmental stage (Witherington and Ehrhart 1989; Ehrhart et al., 1996; Redfoot 1997). After hatching, they utilize the pelagic habitat where they spend the next two to three years of their lives (Frazer and Ehrhart 1985; Carr 1987) and subsequently take up residence as juveniles and subadults in coastal lagoons, estuaries, and near-shore reefs (Ehrhart et al., 1996; Redfoot 1997). They eventually migrate to foraging habitats and to nesting beaches to reproduce.

Research on juvenile green sea turtles that began in the 1990s has documented that algal communities on riprap areas within Port Canaveral are important foraging grounds for these turtles (Ehrhart and Redfoot 1994; Ehrhart and Redfoot 1997; Redfoot 1997; Redfoot and Ehrhart 2002; Ehrhart and Redfoot 2005; Ehrhart and Redfoot 2006). Most of the previous studies have centered on the extensive riprap areas present within the Trident Turning Basin. This study shows that the area directly adjacent to the Trident Turning Basin has similar algal cover and is also heavily utilized by these juvenile turtles within the Port. During the surveys in August 2005 and February 2006 the majority of juvenile sea turtles were observed along the riprap between the Main Turning Basin and Trident Turning Basin , it has been previously shown that significant numbers of sea turtles also use the Trident basin for foraging, and this area was not available for observation during these surveys (Redfoot 1997; Redfoot and Ehrhart 2000; Ehrhart and Redfoot 2006). While there is likely to be some exchange between this assemblage and other developmental habitats, we are not aware of any extensive areas of suitable habitat immediately adjacent to Port Canaveral, and turtles may remain resident in the Port for considerable lengths of time. Some turtles in previous studies have been caught over 20 times over a period of up to 12 years (pers. communication Bagley). Based on these past and present observations it should be assumed that many of the turtles observed utilizing the riprap areas along the main Port channel also use the riprap foraging areas in the adjacent Trident Turning Basin. This additional foraging habitat is available to support juvenile turtle populations in the Port during the time between removal of the existing riprap and the time that the new riprap would be recolonized by algal species.

Re-colonization of the riprap by the algal communities should begin quickly after re-placement of new riprap along the shoreline. Previous studies have shown rapid colonization (<2 weeks) of marine algal species on bare rock substrates (Littler et. al 1987). These early successional species will allow more mature successional species to colonize these rock riprap areas. Adjacent algal communities will play a role in helping to recolonize the now bare rock substrates and these habitats should start rebounding quickly following placement of riprap.

Therefore, it is not likely that the proposed project would have a significant impact on foraging juvenile sea turtles.

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APPENDICES

APPENDIX A

Algal List

August 2005

Station	Date	Taxa
MPC1	Aug-05	Hypneaceae (LPIL)
MPC2	Aug-05	Hypneaceae (LPIL)
MPC2	Aug-05	Ceramiaceae (LPIL)
MPC2	Aug-05	Gelidiaceae (LPIL)
MPC3	Aug-05	Hypneaceae (LPIL)
MPC3	Aug-05	Caulerpaceae (LPIL)
MPC3	Aug-05	Gelidiaceae (LPIL)
MPC4	Aug-05	Caulerpaceae (LPIL)
MPC4	Aug-05	Corallinaceae (LPIL)
MPC4	Aug-05	Hypneaceae (LPIL)
MPC4	Aug-05	Ceramiaceae (LPIL)
MPC4	Aug-05	Gelidiaceae (LPIL)
MPC5	Aug-05	Hypneaceae (LPIL)
MPC5	Aug-05	Corallinaceae (LPIL)
MPC5	Aug-05	Ceramiaceae (LPIL)
DPC1	Aug-05	Caulerpaceae (LPIL)
DPC1	Aug-05	Hypneaceae (LPIL)
DPC2	Aug-05	Hypneaceae (LPIL)
DPC3	Aug-05	Hypneaceae (LPIL)
DPC4	Aug-05	Hypneaceae (LPIL)
DPC4	Aug-05	Cladophoraceae (LPIL)
DPC5	Aug-05	Hypneaceae (LPIL)
SPC1	Aug-05	**No live Algae***
SPC2	Aug-05	Corallinaceae (LPIL)
SPC2	Aug-05	Ceramiaceae (LPIL)
SPC2	Aug-05	Cladophoraceae (LPIL)
SPC2	Aug-05	Hypneaceae (LPIL)
SPC3	Aug-05	Corallinaceae (LPIL)
SPC3	Aug-05	Hypneaceae (LPIL)
SPC3	Aug-05	Ceramiaceae (LPIL)
SPC4	Aug-05	Hypneaceae (LPIL)
SPC5	Aug-05	Hypneaceae (LPIL)
SPC5	Aug-05	Caulerpaceae (LPIL)
SPC5	Aug-05	Corallinaceae (LPIL)

February 2006

Station	Date	Taxa
PC1-S	Feb-06	Caulerpaceae (LPIL)
PC1-S	Feb-06	Hypneaceae (LPIL)
PC1-S	Feb-06	Rhodomelaceae (LPIL)
PC1-S	Feb-06	Ceramiaceae (LPIL)
PC1-S	Feb-06	Cladophoraceae (LPIL)
PC1-Mid	Feb-06	Rhodomelaceae (LPIL)
PC1-Mid	Feb-06	Hypneaceae (LPIL)
PC1-Deep	Feb-06	Ceramiaceae (LPIL)
PC1-Deep	Feb-06	Hypneaceae (LPIL)
PC1-Deep	Feb-06	Rhodomelaceae (LPIL)
PC1-Deep	Feb-06	Corallinaceae (LPIL)
PC2-S	Feb-06	Corallinaceae (LPIL)
PC2-S	Feb-06	Rhodomelaceae (LPIL)
PC2-S	Feb-06	Hypneaceae (LPIL)
PC2-Mid	Feb-06	Corallinaceae (LPIL)
PC2-Mid	Feb-06	Hypneaceae (LPIL)
PC2-Mid	Feb-06	Ceramiaceae (LPIL)
PC2-Mid	Feb-06	Cladophoraceae (LPIL)
PC2-Mid	Feb-06	Rhodomelaceae (LPIL)
PC2-Deep	Feb-06	Rhodomelaceae (LPIL)
PC2-Deep	Feb-06	Ceramiaceae (LPIL)
PC2-Deep	Feb-06	Hypneaceae (LPIL)
PC2-Deep	Feb-06	Cladophoraceae (LPIL)
PC3-S	Feb-06	Cladophoraceae (LPIL)
PC3-S	Feb-06	Rhodomelaceae (LPIL)
PC3-S	Feb-06	Corallinaceae (LPIL)
PC3-S	Feb-06	Hypneaceae (LPIL)
PC3-Mid	Feb-06	Ceramiaceae (LPIL)
PC3-Mid	Feb-06	Rhodomelaceae (LPIL)
PC3-Mid	Feb-06	Ulvaceae (LPIL)
PC3-Mid	Feb-06	Cladophoraceae (LPIL)
PC3-Mid	Feb-06	Hypneaceae (LPIL)
PC3-Deep	Feb-06	Hypneaceae (LPIL)

Station	Date	Taxa
PC3-Deep	Feb-06	Hypneaceae (LPIL)
PC3-Deep	Feb-06	Cladophoraceae (LPIL)
PC3-Deep	Feb-06	Rhodomelaceae (LPIL)
PC3-Deep	Feb-06	Ceramiaceae (LPIL)
PC3-Deep	Feb-06	Ulvaceae (LPIL)
PC4-S	Feb-06	Cladophoraceae (LPIL)
PC4-S	Feb-06	Hypneaceae (LPIL)
PC4-S	Feb-06	Rhodomelaceae (LPIL)
PC4-Mid	Feb-06	Corallinaceae (LPIL)
PC4-Mid	Feb-06	Hypneaceae (LPIL)
PC4-Mid	Feb-06	Rhodomelaceae (LPIL)
PC4-Mid	Feb-06	Ceramiaceae (LPIL)
PC4-Deep	Feb-06	Cladophoraceae (LPIL)
PC4-Deep	Feb-06	Rhodomelaceae (LPIL)
PC4-Deep	Feb-06	Ulvaceae (LPIL)
PC4-Deep	Feb-06	Corallinaceae (LPIL)
PC5-S	Feb-06	Corallinaceae (LPIL)
PC5-S	Feb-06	Hypneaceae (LPIL)
PC5-S	Feb-06	Ceramiaceae (LPIL)
PC5-S	Feb-06	Rhodomelaceae (LPIL)
PC5-S	Feb-06	Cladophoraceae (LPIL)
PC5-Mid	Feb-06	Rhodomelaceae (LPIL)
PC5-Mid	Feb-06	Corallinaceae (LPIL)
PC5-Mid	Feb-06	Cladophoraceae (LPIL)
PC5-Mid	Feb-06	Ceramiaceae (LPIL)
PC5-Deep	Feb-06	Rhodomelaceae (LPIL)
PC5-Deep	Feb-06	Ulvaceae (LPIL)
PC5-Deep	Feb-06	Hypneaceae (LPIL)
PC5-Deep	Feb-06	Cladophoraceae (LPIL)

APPENDIX B

Inwater Research Group Reports

IRG
A NON-PROFIT CORPORATION
INWATER RESEARCH GROUP INC.

September 5, 2005

Dial Cordy and Associates, Inc.
490 Osceola Avenue
Jacksonville Beach, FL 32250
Attn: Mr. R. Steve Dial

SUBJECT: CANAVERAL SECTION 203 PROJECT SEA TURTLE CENSUS

Dear Mr. Dial:

This letter and enclosures transmits Inwater Research Group's (IRG) Results of initial censusing of sea turtle populations in Port Canaveral. This work was undertaken in support of the Section 203 study for the Canaveral channel widening project. The work was performed on August 27-29, 2005.

IRG identified five sites inside Port Canaveral for sea turtle censusing. Site #1 was the main area of interest – the riprap rock habitat along the north side of the entrance channel between the middle and east turning basins. This is the shoreline segment that would have to be disturbed to construct the project. The other sites were chosen to provide information on comparative turtle abundance in other areas of similar habitat, and in the main channel itself. Site #2 is a riprap area 266 meters long on the south side of the channel at Jetty Park. Site #3 is a short (98 meter) stretch of riprap on the south side of the channel in the vicinity of marker 19. Site #4 is a 258 meter long riprap shoreline on the north side of the channel just west of the west turning basin. Site #5 consisted of a transect run down the mainline of the channel for a stretch of 3490 meters. The site locations are graphically presented in the attachments.

IRG subjected all these sites to repetitive visual censusing, using observers in an elevated tower on a small boat. This technique allows for the calculation of an index of turtle abundance, observations per transect kilometer, which can be used to directly compare the different sites in the Port with each other, or a single site over time. Because the index results from the mean of a large number of observations, statistical significance testing will be possible from the data. A synopsis of the data is presented in the table below.

Site #	Transect length	# Of repetitions	Total turtles observed	Obs. per kilometer
1	980 m	30	200	6.80
2	266 m	27	9	1.25
3	98 m	31	5	1.64
4	258 m	31	0	0
5	3490 m	3	3	0.29

Data recorded for each turtle observation included the species and size class of the turtle, whether the turtle was observed on the surface or underwater, how far off the transect line the turtle was observed, and if the turtle was actively feeding when observed. GPS coordinates were also recorded for each sighting. A spreadsheet containing the full data set for all observations is included in the attachments.

It is evident from the results that turtles were considerably more abundant at Site #1 than at the other riprap habitat sites adjacent to the main channel in the Port. The habitat at sites 1,2, and 3 appeared quite similar, with algae covered rock sloping steeply into water over 2 meters deep. Site 4 had a much narrower band of submerged riprap and the adjacent water was considerably shallower, less than 1 meter.

Our discussions with the University of Central Florida (UCF) sea turtle research program indicate that UCF has conducted some capture operations at our Site #1. We hope that a careful examination of their records may allow us to correlate our abundance data with their capture data. This would allow us to provide estimates of abundance for additional areas within the Trident basin, if desired.

IRG appreciates the opportunity to work with Dial Cordy on this project. Please do not hesitate to contact the Principal Investigator for this project, Dr. Jonathan Gorham, at (321) 243-2211 with any questions or if you require additional information.

Sincerely,

Michael Bressete
President

Enclosures

CANAVERAL SEA TURTLE CENSUS DATA
TRANSECT LOCATION 1 - NORTH SIDE OF CHANNEL BETWEEN MIDDLE AND EAST BASINS
TRANSECT LENGTH 960 METERS

RUN #	DATE	SPECIES	JUVENILE/ ADULT	INSHORE OR OFFSHORE SIDE	DISTANCE	SURFACE OR UNDERWATER	FEEDING?	WAYPOINT #	LAT/LON
1	8/27/2005	CM	JUVENILE	INSHORE	10'	UNDERWATER	NO	840	N28.41062 W80.59358
1	8/27/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	841	N28.41051 W80.59408
1	8/27/2005	CM	JUVENILE	INSHORE	15'	UNDERWATER	NO	842	N28.41056 W80.59658
1	8/27/2005	CM	JUVENILE	INSHORE	15'	UNDERWATER	NO	843	N28.41056 W80.59667
1	8/27/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	NO	844	N28.41057 W80.59743
1	8/27/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	845	N28.41056 W80.59773
1	8/27/2005	CM	JUVENILE	INSHORE	2'	SURFACE	NO	846	N28.41057 W80.59888
1	8/27/2005	CM	JUVENILE	INSHORE	20'	UNDERWATER	NO	847	N28.41054 W80.59945
1	8/27/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	848	N28.41053 W80.59951
1	8/27/2005	CM	JUVENILE	INSHORE	40'	SURFACE	NO	849	N28.41047 W80.60054
1	8/27/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	850	N28.41050 W80.60089
1	8/27/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	YES	851	N28.41059 W80.60212
2	8/27/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	853	N28.41061 W80.59348
2	8/27/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	854	N28.41049 W80.59413
2	8/27/2005	CM	JUVENILE	INSHORE	15'	UNDERWATER	NO	855	N28.41054 W80.59604
2	8/27/2005	CM	JUVENILE	INSHORE	20'	UNDERWATER	NO	856	N28.41052 W80.59666
2	8/27/2005	CM	JUVENILE	INSHORE	15'	SURFACE	NO	857	N28.41058 W80.59764
2	8/27/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	NO	858	N28.41054 W80.59858
2	8/27/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	859	N28.41052 W80.59930
2	8/27/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	860	N28.41051 W80.59950
2	8/27/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	861	N28.41050 W80.59959
2	8/27/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	862	N28.41056 W80.60175
3	8/27/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	863	N28.41063 W80.59359
3	8/27/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	NO	864	N28.41055 W80.59599
3	8/27/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	865	N28.41056 W80.59837
3	8/27/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	866	N28.41050 W80.59955
3	8/27/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	867	N28.41049 W80.60080
3	8/27/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	868	N28.41050 W80.60104
3	8/27/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	NO	869	N28.41058 W80.60223
3	8/27/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	870	N28.41062 W80.60273
4	8/27/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	872	N28.41054 W80.59388
4	8/27/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	873	N28.41050 W80.59501
4	8/27/2005	CM	JUVENILE	INSHORE	20'	UNDERWATER	NO	874	N28.41057 W80.59621
5	8/27/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	875	N28.41059 W80.60197
5	8/27/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	876	N28.41054 W80.60147
5	8/27/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	NO	877	N28.41053 W80.59949
5	8/27/2005	CM	JUVENILE	INSHORE	15'	SURFACE	NO	878	N28.41054 W80.59711
5	8/27/2005	CM	JUVENILE	INSHORE	10'	SURFACE	NO	879	N28.41056 W80.59572
5	8/27/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	880	N28.41045 W80.59511

5	8/27/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	NO	881	N28.41049 W80.59448
6	8/27/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	NO	882	N28.41049 W80.60150
6	8/27/2005	CM	JUVENILE	INSHORE	15'	UNDERWATER	NO	883	N28.41057 W80.59697
6	8/27/2005	CM	JUVENILE	INSHORE	10'	SURFACE	NO	884	N28.41058 W80.59674
6	8/27/2005	CM	JUVENILE	INSHORE	40'	SURFACE	NO	885	N28.41049 W80.59575
6	8/27/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	886	N28.41050 W80.59424
6	8/27/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	887	N28.41059 W80.59384
7	8/28/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	892	N28.41054 W80.59726
7	8/28/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	893	N28.41052 W80.59402
8	8/28/2005	CM	JUVENILE	INSHORE	18'	UNDERWATER	NO	894	N28.41056 W80.59371
8	8/28/2005	CM	JUVENILE	INSHORE	12'	SURFACE	NO	895	N28.41055 W80.59704
8	8/28/2005	CM	JUVENILE	INSHORE	12'	SURFACE	NO	896	N28.41056 W80.59719
8	8/28/2005	CM	JUVENILE	INSHORE	12'	SURFACE	NO	897	N28.41057 W80.59729
8	8/28/2005	CM	JUVENILE	INSHORE	12'	SURFACE	NO	898	N28.41058 W80.59745
8	8/28/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	899	N28.41057 W80.59853
9	8/28/2005	CM	JUVENILE	INSHORE	40'	UNDERWATER	NO	902	N28.41056 W80.59372
9	8/28/2005	CM	JUVENILE	INSHORE	40'	SURFACE	YES	903	N28.41050 W80.59393
9	8/28/2005	CM	JUVENILE	INSHORE	45'	SURFACE	NO	904	N28.41042 W80.59487
9	8/28/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	905	N28.41046 W80.59522
9	8/28/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	NO	906	NO DATA
9	8/28/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	907	N28.41052 W80.59549
9	8/28/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	908	N28.41054 W80.59630
9	8/28/2005	CM	JUVENILE	INSHORE	15'	SURFACE	NO	909	N28.41052 W80.59692
9	8/28/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	910	N28.41055 W80.59744
9	8/28/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	911	N28.41054 W80.59751
10	8/28/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	912	N28.41052 W80.60036
10	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	913	N28.41057 W80.59780
10	8/28/2005	CM	JUVENILE	INSHORE	20'	UNDERWATER	YES	914	N28.41059 W80.59609
10	8/28/2005	CM	JUVENILE	INSHORE	20'	UNDERWATER	YES	915	N28.41059 W80.59603
10	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	916	N28.41058 W80.59568
10	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	917	N28.41056 W80.59562
10	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	918	N28.41050 W80.59417
11	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	919	N28.41053 W80.59381
11	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	920	N28.41052 W80.59385
11	8/28/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	921	N28.41056 W80.59645
11	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	922	N28.41056 W80.59768
11	8/28/2005	CM	JUVENILE	INSHORE	40'	SURFACE	NO	923	N28.41057 W80.59804
12	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	924	N28.41062 W80.60226
12	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	925	N28.41056 W80.59926
12	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	926	N28.41059 W80.59908
12	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	927	N28.41061 W80.59901
12	8/28/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	YES	928	N28.41060 W80.59719
12	8/28/2005	CM	JUVENILE	INSHORE	10'	UNDERWATER	NO	929	N28.41062 W80.59703
12	8/28/2005	CM	JUVENILE	INSHORE	5'	UNDERWATER	NO	930	NO DATA
12	8/28/2005	CM	JUVENILE	INSHORE	20'	UNDERWATER	NO	931	N28.41061 W80.59679

12	8/28/2005	CM	JUVENILE	INSHORE	5'	UNDERWATER	NO	932	N28.41061 W80.59670
12	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	933	N28.41059 W80.59621
12	8/28/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	YES	934	N28.41056 W80.59590
12	8/28/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	935	N28.41071 W80.59349
13	8/28/2005	CM	JUVENILE	INSHORE	20'	UNDERWATER	YES	937	N28.41059 W80.59614
13	8/28/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	NO	938	N28.41057 W80.59689
13	8/28/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	YES	939	N28.41057 W80.59700
13	8/28/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	YES	940	N28.41058 W80.59784
13	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	941	N28.41058 W80.59895
13	8/28/2005	CM	JUVENILE	INSHORE	40'	SURFACE	NO	942	N28.41046 W80.60073
13	8/28/2005	CM	JUVENILE	INSHORE	40'	UNDERWATER	YES	943	N28.41053 W80.60148
13	8/28/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	944	N28.41059 W80.60194
14	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	945	N28.41058 W80.60174
14	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	946	N28.41053 W80.59944
14	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	947	N28.41056 W80.59896
14	8/28/2005	CM	JUVENILE	INSHORE	40'	UNDERWATER	NO	948	N28.41055 W80.59798
14	8/28/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	949	N28.41055 W80.59655
14	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	950	N28.41054 W80.59569
15	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	951	N28.41078 W80.59340
15	8/28/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	952	N28.41073 W80.59350
15	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	953	N28.41043 W80.59532
15	8/28/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	954	N28.41055 W80.59694
15	8/28/2005	CM	JUVENILE	INSHORE	45'	UNDERWATER	YES	955	N28.41052 W80.59866
15	8/28/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	956	N28.41052 W80.59955
15	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	957	N28.41053 W80.60133
15	8/28/2005	CM	JUVENILE	INSHORE	40'	UNDERWATER	YES	958	N28.41055 W80.60174
15	8/28/2005	CM	JUVENILE	INSHORE	45'	UNDERWATER	NO	959	N28.41062 W80.60263
16	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	960	N28.41050 W80.59965
16	8/28/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	NO	961	N28.41056 W80.59861
16	8/28/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	962	N28.41058 W80.59795
16	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	963	N28.41057 W80.59723
16	8/28/2005	CM	JUVENILE	INSHORE	40'	UNDERWATER	NO	964	N28.41042 W80.59492
16	8/28/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	965	N28.41069 W80.59355
16	8/28/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	966	N28.41073 W80.59352
16	8/28/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	967	N28.41080 W80.59347
17	8/28/2005	CM	JUVENILE	INSHORE	25'	SURFACE	YES	973	N28.41069 W80.60261
17	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	974	N28.41047 W80.59983
17	8/28/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	975	N28.41060 W80.59885
17	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	976	N28.41058 W80.59787
17	8/28/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	NO	977	N28.41057 W80.59583
17	8/28/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	978	N28.41055 W80.59388
17	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	979	N28.41058 W80.59375
17	8/28/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	NO	980	N28.41071 W80.59356
18	8/28/2005	CM	JUVENILE	INSHORE	50'	SURFACE	NO	982	N28.41067 W80.59343
18	8/28/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	983	N28.41054 W80.59423

18	8/28/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	984	N28.41048 W80.59525
18	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	986	N28.41049 W80.59934
19	8/28/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	NO	987	N28.41063 W80.60287
19	8/28/2005	CM	JUVENILE	INSHORE	15'	UNDERWATER	NO	988	N28.41060 W80.59818
19	8/28/2005	CM	JUVENILE	INSHORE	20'	UNDERWATER	NO	989	N28.41060 W80.59806
19	8/28/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	990	N28.41059 W80.59586
19	8/28/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	NO	991	N28.41061 W80.59572
19	8/28/2005	CM	JUVENILE	INSHORE	40'	UNDERWATER	YES	992	N28.41061 W80.59567
19	8/28/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	993	N28.41054 W80.59531
19	8/28/2005	CM	JUVENILE	INSHORE	5'	SURFACE	NO	994	N28.41057 W80.59423
19	8/28/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	995	N28.41059 W80.59399
19	8/28/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	996	N28.41068 W80.59367
20	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	997	N28.41073 W80.59344
20	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	998	N28.41072 W80.59351
20	8/28/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	NO	999	N28.41069 W80.59368
20	8/28/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	NO	1000	N28.41064 W80.59389
20	8/28/2005	CM	JUVENILE	INSHORE	40'	SURFACE	YES	1001	N28.41060 W80.59568
20	8/28/2005	CM	JUVENILE	INSHORE	40'	SURFACE	YES	1002	N28.41060 W80.59575
20	8/28/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	1003	N28.41060 W80.59644
20	8/28/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1004	N28.41060 W80.59748
20	8/28/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1005	N28.41059 W80.59776
20	8/28/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1006	N28.41061 W80.59786
20	8/28/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	YES	1007	N28.41063 W80.59823
20	8/28/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	1008	N28.41060 W80.60133
21	8/29/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	YES	1011	N28.41049 W80.60073
21	8/29/2005	CM	JUVENILE	INSHORE	15'	UNDERWATER	NO	1012	N28.41054 W80.59811
21	8/29/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1013	N28.41053 W80.59737
21	8/29/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1014	N28.41042 W80.59416
22	8/29/2005	CM	JUVENILE	INSHORE	10'	SURFACE	NO	1015	N28.41050 W80.59969
22	8/29/2005	CM	JUVENILE	INSHORE	5'	UNDERWATER	NO	1016	N28.41050 W80.59985
23	8/29/2005	CM	JUVENILE	INSHORE	40'	SURFACE	NO	1017	N28.41057 W80.60319
23	8/29/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	1018	N28.41049 W80.60072
23	8/29/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	YES	1019	N28.41049 W80.60035
23	8/29/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	1020	N28.41053 W80.59950
23	8/29/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	1021	N28.41058 W80.59776
23	8/29/2005	CM	JUVENILE	INSHORE	45'	SURFACE	NO	1022	N28.41058 W80.59608
23	8/29/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1023	N28.41064 W80.59356
23	8/29/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1024	N28.41071 W80.59346
23	8/29/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1025	N28.41078 W80.59339
24	8/29/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	1033	N28.41058 W80.59679
24	8/29/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	1034	N28.41053 W80.59935
24	8/29/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	1035	N28.41052 W80.59943
24	8/29/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	NO	1036	N28.41047 W80.59980
24	8/29/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	YES	1037	N28.41052 W80.60071
24	8/29/2005	CM	JUVENILE	INSHORE	5'	SURFACE	NO	1038	N28.41052 W80.60100

24	8/29/2005	CM	JUVENILE	INSHORE	50'	SURFACE	NO	1039	N28.41052 W80.60124
25	8/29/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	YES	1041	N28.41062 W80.60201
25	8/29/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1042	N28.41048 W80.60044
25	8/29/2005	CM	JUVENILE	INSHORE	25'	SURFACE	NO	1043	N28.41051 W80.59826
25	8/29/2005	CM	JUVENILE	INSHORE	40'	UNDERWATER	YES	1044	N28.41054 W80.59775
25	8/29/2005	CM	JUVENILE	INSHORE	45'	UNDERWATER	NO	1045	N28.41051 W80.59698
25	8/29/2005	CM	JUVENILE	INSHORE	40'	SURFACE	NO	1047	N28.41051 W80.59574
26	8/29/2005	CM	JUVENILE	INSHORE	40'	SURFACE	NO	1048	N28.41049 W80.59552
26	8/29/2005	CM	JUVENILE	INSHORE	40'	UNDERWATER	NO	1049	N28.41075 W80.59332
26	8/29/2005	CM	JUVENILE	INSHORE	40'	SURFACE	NO	1050	N28.41048 W80.59404
26	8/29/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	1051	N28.41055 W80.59876
26	8/29/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	NO	1052	N28.41053 W80.59921
26	8/29/2005	CM	JUVENILE	INSHORE	25'	UNDERWATER	NO	1053	N28.41049 W80.59953
26	8/29/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1054	N28.41049 W80.59960
27	8/29/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	1055	N28.41046 W80.60006
27	8/29/2005	CM	JUVENILE	INSHORE	45'	SURFACE	NO	1056	N28.41053 W80.59926
28	8/29/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	NO	1057	N28.41056 W80.59864
28	8/29/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	1058	N28.41056 W80.59403
28	8/29/2005	CM	JUVENILE	INSHORE	40'	UNDERWATER	NO	1059	N28.41054 W80.59701
28	8/29/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	1060	N28.41055 W80.59730
29	8/29/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1061	N28.41050 W80.60037
29	8/29/2005	CM	JUVENILE	INSHORE	40'	UNDERWATER	NO	1062	N28.41047 W80.60037
29	8/29/2005	CM	JUVENILE	INSHORE	5'	SURFACE	NO	1063	N28.41053 W80.59932
30	8/29/2005	CM	JUVENILE	INSHORE	30'	SURFACE	NO	1064	N28.41059 W80.59720
30	8/29/2005	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1065	N28.41076 W80.59344
30	8/29/2005	CM	JUVENILE	INSHORE	30'	UNDERWATER	NO	1066	N28.41047 W80.59511

CANAVERAL SEA TURTLE CENSUS DATA
TRANSECT LOCATION 2 - SOUTH SIDE OF CHANNEL AT JETTY PARK
TRANSECT LENGTH 266 METERS

RUN #	DATE	SPECIES	JUVENILE/ ADULT	INSHORE OR OFFSHORE SIDE	DISTANCE	SURFACE OR UNDERWATER	FEEDING?	WAYPOINT #	LAT/LON
1	8/27/2005	CM	JUVENILE	INSHORE	20'	SURFACE	NO	852	N28.40900 W80.59253
2	8/27/2005								
3	8/27/2005	CM	JUVENILE	OFFSHORE	300'	SURFACE	NO	871	N28.40876 W80.59204
4	8/27/2005								
5	8/27/2005								
6	8/28/2005	CM	JUVENILE	INSHORE	40'	SURFACE	NO	900	N28.40896 W80.59252
7	8/28/2005	CM	JUVENILE	INSHORE	5'	UNDERWATER	YES	901	N28.40886 W80.59273
8	8/28/2005								
9	8/28/2005	CM	JUVENILE	INSHORE	45'	SURFACE	NO	936	NO DATA
10	8/28/2005								
11	8/28/2005								
12	8/28/2005								
13	8/28/2005								
14	8/28/2005								
15	8/28/2005								
16	8/28/2005								
17	8/28/2005								
18	8/29/2005	CM	JUVENILE	INSHORE	40'	SURFACE	NO	1046	N28.41051 W80.59574
18	8/29/2005	CM	JUVENILE	INSHORE	40'	SURFACE	NO	1047	N28.41049 W80.59552
19	8/29/2005	CM	JUVENILE	INSHORE	45'	UNDERWATER	NO	1031	N28.40896 W80.59341
19	8/29/2005	CM	JUVENILE	INSHORE	45'	UNDERWATER	NO	1032	N28.40896 W80.59349
20	8/29/2005								
21	8/29/2005								
22	8/29/2005								
23	8/29/2005								
24	8/29/2005								
25	8/29/2005								
27	8/29/2005								

CANAVERAL SEA TURTLE CENSUS DATA
TRANSECT LOCATION 3 - SOUTH SIDE OF CHANNEL NEAR MARKER 19
TRANSECT LENGTH 98 METERS

RUN #	DATE	SPECIES	JUVENILE/ADULT	INSHORE OR OFFSHORE SIDE	DISTANCE	SURFACE OR UNDERWATER	FEEDING?	WAYPOINT #	LAT/LON
1	8/27/2005								
2	8/27/2005								
3	8/27/2005								
4	8/27/2005								
5	8/27/2005								
6	8/27/2005								
7	8/28/2005								
8	8/28/2005								
9	8/28/2005								
10	8/28/2005								
11	8/28/2005								
12	8/28/2005								
13	8/28/2005								
14	8/28/2005								
15	8/28/2005								
16	8/28/2005								
17	8/28/2005								
18	8/29/2005								
19	8/29/2005	CM	JUVENILE	OFFSHORE	20'	UNDERWATER	NO	1009	N28.40907 W80.62006
20	8/29/2005								
21	8/29/2005								
22	8/29/2005								
23	8/29/2005	CM	JUVENILE	INSHORE	35'	UNDERWATER	NO	1010	N28.40910 W80.61977
24	8/29/2005	CM	JUVENILE	INSHORE	40'	SURFACE	NO	1028	N28.40884 W80.59450
24	8/29/2005	CM	JUVENILE	INSHORE	40'	UNDERWATER	NO	1029	N28.40887 W80.59443
24	8/29/2005	CM	JUVENILE	INSHORE	40'	UNDERWATER	NO	1030	N28.40895 W80.59398
25	8/29/2005								
26	8/29/2005								
27	8/29/2005								
28	8/29/2005								
29	8/29/2005								
30	8/29/2005								
31	8/29/2005								

CANAVERAL SEA TURTLE CENSUS DATA
TRANSECT LOCATION 4 - NORTH SIDE OF CHANNEL WEST OF WEST TURNING BASIN
TRANSECT LENGTH 258 METERS

RUN #	DATE	SPECIES	JUVENILE/ ADULT	INSHORE OR OFFSHORE SIDE	DISTANCE	SURFACE OR UNDERWATER	FEEDING?	WAYPOINT #	LAT/LON
1	8/27/2005								
2	8/27/2005								
3	8/27/2005								
4	8/27/2005								
5	8/27/2005								
6	8/27/2005								
7	8/27/2005								
8	8/28/2005								
9	8/28/2005								
10	8/28/2005								
11	8/28/2005								
12	8/28/2005								
13	8/28/2005								
14	8/28/2005								
15	8/28/2005								
16	8/28/2005								
17	8/28/2005								
18	8/28/2005								
19	8/29/2005								
20	8/29/2005								
21	8/29/2005								
22	8/29/2005								
23	8/29/2005								
24	8/29/2005								
25	8/29/2005								
26	8/29/2005								
27	8/29/2005								
28	8/29/2005								
29	8/29/2005								
30	8/29/2005								
31	8/29/2005								

CANAVERAL SEA TURTLE CENSUS DATA
TRANSECT LOCATION 5 - CENTERLINE OF CHANNEL
TRANSECT LENGTH 3490 METERS

RUN #	DATE	SPECIES	JUVENILE /ADULT	INSHORE OR OFFSHORE SIDE	DISTANCE	SURFACE OR UNDERWATER	FEEDING?	WAYPOINT #	LAT/LON
1	8/27/2005	CM	JUVENILE	NORTH SIDE	300'	SURFACE	NO	889	N28.41016 W80.60247
1	8/27/2005	CM	JUVENILE	NORTH SIDE	200"	SURFACE	NO	890	N28.41003 W80.61365
2	8/28/2005								
3	8/29/2005	CC	JUVENILE	SOUTH SIDE	50'	SURFACE	NO	1057	N28.41056 W80.59403

IRG
A NON-PROFIT CORPORATION
INWATER RESEARCH GROUP INC.

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APR 3 2006
DIAL CORDY AND ASSOCIATES INC

March 18, 2006

Dial Cordy and Associates, Inc.
490 Osceola Avenue
Jacksonville Beach, FL 32250
Attn: Mr. R. Steve Dial

SUBJECT: CANAVERAL SECTION 203 PROJECT SEA TURTLE CENSUS – WINTER 2006

Dear Mr. Dial:

This letter and enclosures transmits Inwater Research Group's (IRG) Results of censusing of sea turtle populations in Port Canaveral for the winter 2006 period. This work was undertaken in support of the Section 203 study for the Canaveral channel widening project. The work was performed on February 11-13 2006.

IRG has identified five sites inside Port Canaveral for sea turtle censusing. Site #1 is the main area of interest – the riprap rock habitat along the north side of the entrance channel between the middle and east turning basins. This is the shoreline segment that would have to be disturbed to construct the project. The other sites were chosen to provide information on comparative turtle abundance in other areas of similar habitat, and in the main channel itself. Site #2 is a riprap area 266 meters long on the south side of the channel at Jetty Park. Site #3 is a short (98 meter) stretch of riprap on the south side of the channel in the vicinity of marker 19. Site #4 is a 258 meter long riprap shoreline on the north side of the channel just west of the west turning basin. Site #5 comprises a transect run down the mainline of the channel for a stretch of 3490 meters. The site locations are graphically presented in the attachments.

IRG subjected all these sites to repetitive visual censusing, using observers in an elevated tower on a small boat. This technique allows for the calculation of an index of turtle abundance; observations per transect kilometer, which can be used to directly compare the different sites in the Port with each other, or a single site over time. Because the index results from the mean of a large number of observations, statistical significance testing will be possible from the data. A synopsis of the data is presented in the table below.

Site #	Transect length	# Of repetitions	Total turtles observed	Turtles per kilometer
1	980 m	36	111	3.21
2	266 m	38	6	0.593
3	98 m	18	0	0
4	258 m	23	0	0
5	3490 m	4	0	0

A spreadsheet containing the full data set for all observations and a graphical presentation of turtle observations are included as attachments.

It is evident from the results that turtles were considerably more abundant at Site #1 than at the other riprap habitat sites adjacent to the main channel in the Port. The habitat at sites 1,2, and 3 appeared quite similar, with algae covered rock sloping steeply into water over 2 meters deep. Site 4 had a much narrower band of submerged riprap and the adjacent water was considerably shallower, less than 1 meter.

Results of the winter 2006 sampling were consistent with the results of summer 2005 sampling in the relative abundance of turtles between sites, with site #1 showing considerably greater abundance. The number of turtles sighted per kilometer of transect at all sites was considerably less than the summer 2006 sampling. Some of this difference may be attributable to the somewhat rougher and more turbid conditions encountered in the winter sampling effort. Underwater visibility and surface chop primarily affects the ability of observers to spot turtles below the surface. A considerably smaller proportion of the total turtles observed in this winter were observed underwater as compared to summer sampling. If only turtles observed on the surface for both winter and summer sampling are considered, there is still a significantly lesser abundance in the winter sample.

IRG appreciates the opportunity to work with Dial Cordy on this project. Please do not hesitate to contact the principal Investigator for this project, Dr. Jonathan Gorham, at (321) 243-2211 with any questions or if you require additional information.

Sincerely,

Michael Bresette
President

Enclosures

CANAVERAL SEA TURTLE CENSUS DATA
TRANSECT LOCATION 1 - NORTH SIDE OF CHANNEL BETWEEN MIDDLE AND EAST BASINS
TRANSECT LENGTH 960 METERS

RUN #	DATE	SPECIES	JUVENILE/ADULT	INSHORE OR OFFSHORE SIDE	DISTANCE	SURFACE OR UNDERWATER	FEEDING?	WAYPOINT #	LAT/LONG
1	2/11/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1338	N28.41060 W80.59673
1	2/11/2006	CM	JUVENILE	INSHORE	15	UNDERWATER	NO	1339	N28.41053 W80.59945
1	2/11/2006	CM	JUVENILE	INSHORE	25	SURFACE	NO	1340	N28.41051 W80.60088
2	2/11/2006	CM	JUVENILE	INSHORE	30	SURFACE	NO	1341	N28.41060 W80.60283
2	2/11/2006	CM	JUVENILE	INSHORE	10	SURFACE	NO	1342	N28.41052 W80.59950
2	2/11/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1343	N28.41058 W80.59924
2	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1344	N28.41057 W80.59685
2	2/11/2006	CM	JUVENILE	INSHORE	45	SURFACE	NO	1345	N28.41087 W80.59341
3	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1346	N28.41056 W80.59674
4	2/11/2006								
5	2/11/2006	CM	JUVENILE	INSHORE	10	SURFACE	NO	1347	N28.41064 W80.59374
5	2/11/2006	CM	JUVENILE	INSHORE	10	SURFACE	NO	1348	N28.41052 W80.59960
5	2/11/2006	CM	JUVENILE	INSHORE	12	UNDERWATER	NO	1349	N28.41052 W80.60099
5	2/11/2006	CM	JUVENILE	INSHORE	10	UNDERWATER	NO	1350	N28.41058 W80.60150
5	2/11/2006	CM	JUVENILE	INSHORE	10	SURFACE	NO	1351	N28.41063 W80.60264
6	2/11/2006	CM	JUVENILE	INSHORE	15'	SURFACE	NO	1352	N28.41050 W80.60076
6	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1353	N28.41050 W80.60060
6	2/11/2006	CM	JUVENILE	INSHORE	10	SURFACE	NO	1354	N28.41057 W80.59915
6	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1355	N28.41058 W80.59699
6	2/11/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1356	N28.41050 W80.59530
6	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1357	N28.41078 W80.59352
7	2/11/2006	CM	JUVENILE	INSHORE	25	SURFACE	NO	1359	N28.41054 W80.59792
7	2/11/2006	CM	JUVENILE	INSHORE	30	SURFACE	NO	1360	N28.41058 W80.60328
8	2/11/2006	CM	JUVENILE	INSHORE	25	UNDERWATER	YES	1361	N28.41059 W80.60188
8	2/11/2006	CM	JUVENILE	INSHORE	0	SURFACE	NO	1362	N28.41057 W80.60149
8	2/11/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1363	N28.41057 W80.59798
9	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1365	N28.41051 W80.59977
9	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1366	N28.41059 W80.59824
9	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1367	N28.41059 W80.59775
10	2/11/2006	CM	JUVENILE	INSHORE	25	SURFACE	NO	1369	N28.41061 W80.59670
10	2/11/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1370	N28.41059 W80.59906
10	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1371	N28.41057 W80.59940
10	2/11/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1372	N28.41052 W80.60038
10	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1373	N28.41067 W80.60267
11	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1374	N28.41057 W80.60154
11	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1375	N28.41052 W80.60063
11	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1376	N28.41059 W80.59781
11	2/11/2006	CM	JUVENILE	INSHORE	15'	SURFACE	YES	1377	N28.41060 W80.59670
12	2/11/2006	CM	JUVENILE	INSHORE	10'	SURFACE	NO	1379	N28.41059 W80.59569
12	2/11/2006	CM	JUVENILE	INSHORE	3	SURFACE	NO	1380	N28.41061 W80.59846
12	2/11/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1381	N28.41059 W80.59912
12	2/11/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1382	N28.41050 W80.60028
13	2/11/2006	CM	JUVENILE	INSHORE	15'	SURFACE	NO	1383	N28.41053 W80.60051
13	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1384	N28.41054 W80.59974

13	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1385	N28.41058 W80.59722
14	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1386	N28.41058 W80.59576
14	2/11/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1387	N28.41059 W80.59666
14	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1388	N28.41061 W80.59772
14	2/11/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1389	N28.41058 W80.59857
15	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1390	N28.41058 W80.60144
15	2/11/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1391	N28.41050 W80.60027
15	2/11/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1392	N28.41059 W80.59817
15	2/11/2006	CM	JUVENILE	INSHORE	30	SURFACE	NO	1393	N28.41057 W80.59658
16	2/12/2006	CM	JUVENILE	INSHORE	30	SURFACE	NO	1395	N28.41058 W80.59570
16	2/12/2006	CM	JUVENILE	INSHORE	30	SURFACE	NO	1396	N28.41054 W80.59942
17	2/12/2006	CM	JUVENILE	INSHORE	30	SURFACE	NO	1397	N28.41057 W80.59947
17	2/12/2006	CM	JUVENILE	INSHORE	25	SURFACE	NO	1398	N28.41061 W80.59855
17	2/12/2006	CM	JUVENILE	INSHORE	50	SURFACE	NO	1399	N28.41060 W80.59666
17	2/12/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1400	N28.41091 W80.59351
18	2/12/2006	CM	JUVENILE	INSHORE	20	UNDERWATER	NO	1401	N28.41062 W80.59891
18	2/12/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1402	N28.41066 W80.60233
18	2/12/2006	CM	JUVENILE	INSHORE	25	SURFACE	NO	1403	N28.41066 W80.60262
19	2/12/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1404	N28.41059 W80.60139
19	2/12/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1405	N28.41057 W80.60105
19	2/12/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1406	N28.41059 W80.59814
19	2/12/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1407	N28.41056 W80.59692
19	2/12/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1408	N28.41050 W80.59512
19	2/12/2006	CM	JUVENILE	INSHORE	20'	SURFACE	YES	1409	N28.41081 W80.59345
20	2/12/2006	CM	JUVENILE	INSHORE	15	SURFACE	YES	1410	N28.41053 W80.59976
21	2/12/2006	CM	JUVENILE	INSHORE	12	SURFACE	NO	1411	N28.41053 W80.60084
21	2/12/2006	CM	JUVENILE	INSHORE	25	UNDERWATER	NO	1412	N28.41054 W80.59707
22	2/12/2006	CM	JUVENILE	INSHORE	30	SURFACE	NO	1413	N28.41054 W80.59697
23	2/12/2006	CM	JUVENILE	INSHORE	25	SURFACE	NO	1414	N28.41061 W80.59669
23	2/12/2006	CM	JUVENILE	INSHORE	20'	SURFACE	NO	1415	N28.41062 W80.59875
23	2/12/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1416	N28.41062 W80.59881
23	2/12/2006	CM	JUVENILE	INSHORE	20	UNDERWATER	YES	1417	N28.41062 W80.59907
23	2/12/2006	CM	JUVENILE	INSHORE	30	SURFACE	NO	1418	N28.41059 W80.60334
24	2/12/2006	CM	JUVENILE	INSHORE	20'	SURFACE	NO	1419	N28.41057 W80.60108
24	2/12/2006	CM	JUVENILE	INSHORE	20	UNDERWATER	NO	1420	N28.41049 W80.59528
24	2/12/2006	CM	JUVENILE	INSHORE	12	SURFACE	NO	1421	N28.41055 W80.59403
24	2/12/2006	CM	JUVENILE	INSHORE	12	SURFACE	NO	1422	N28.41056 W80.59398
25	2/12/2006	CM	JUVENILE	INSHORE	25	SURFACE	NO	1423	N28.41067 W80.60276
26	2/12/2006	CM	JUVENILE	INSHORE	25	SURFACE	NO	1424	N28.41059 W80.60288
26	2/12/2006	CM	JUVENILE	INSHORE	25	SURFACE	NO	1425	N28.41052 W80.60156
26	2/12/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1426	N28.41052 W80.59625
27	2/12/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1428	N28.41060 W80.60211
27	2/12/2006	CM	JUVENILE	INSHORE	5	SURFACE	NO	1429	N28.41055 W80.60155
28	2/12/2006	CM	JUVENILE	INSHORE	25	SURFACE	NO	1430	N28.41047 W80.59969
28	2/12/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1431	N28.41048 W80.59414
29	2/12/2006	CM	JUVENILE	INSHORE	5	SURFACE	NO	1433	N28.41058 W80.59721
29	2/12/2006	CM	JUVENILE	INSHORE	0	SURFACE	NO	1434	N28.41058 W80.59758
29	2/12/2006	CM	JUVENILE	INSHORE	35'	SURFACE	NO	1435	N28.41049 W80.60004
30	2/13/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1436	N28.41056 W80.59552

30	2/13/2006	CM	JUVENILE	INSHORE	15	SURFACE	YES	1437	N28.41056 W80.59892
30	2/13/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1438	N28.41056 W80.59908
30	2/13/2006	CM	JUVENILE	INSHORE	30	SURFACE	NO	1439	N28.41052 W80.59953
30	2/13/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1440	N28.41051 W80.60080
31	2/13/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1441	N28.41060 W80.59671
31	2/13/2006	CM	JUVENILE	INSHORE	5	SURFACE	NO	1442	N28.41053 W80.59409
32	2/13/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1443	N28.41075 W80.59359
32	2/13/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1444	N28.41058 W80.59683
32	2/13/2006	CM	JUVENILE	INSHORE	5	SURFACE	NO	1445	N28.41060 W80.59893
33	2/13/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1446	N28.41049 W80.60021
33	2/13/2006	CM	JUVENILE	INSHORE	0	SURFACE	NO	1447	N28.41055 W80.59948
33	2/13/2006	CM	JUVENILE	INSHORE	10	SURFACE	NO	1448	N28.41049 W80.59463
34	2/13/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1449	N28.41055 W80.60100
34	2/13/2006	CM	JUVENILE	INSHORE	20	UNDERWATER	NO	1450	N28.41055 W80.60127
35	2/13/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1451	N28.41057 W80.59904
36	2/13/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1452	N28.41053 W80.59452
36	2/13/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1453	N28.41052 W80.59460
36	2/13/2006	CM	JUVENILE	INSHORE	20	SURFACE	NO	1454	N28.41049 W80.59496
36	2/13/2006	CM	JUVENILE	INSHORE	15	SURFACE	NO	1455	N28.41058 W80.59849

CANAVERAL SEA TURTLE CENSUS DATA
TRANSECT LOCATION 2 - SOUTH SIDE OF CHANNEL ALONG JETTY PARK
TRANSECT LENGTH 266 METERS

RUN #	DATE	SPECIES	JUVENILE/ADULT	INSHORE OR OFFSHORE SIDE	DISTANCE	SURFACE OR UNDERWATER	FEEDING?	WAYPOINT #	LAT/LONG
1	2/11/2006								
2	2/11/2006								
3	2/11/2006								
4	2/11/2006								
5	2/11/2006								
6	2/11/2006	CM	JUVENILE	INSHORE	25	SURFACE	NO	1358	N28.40883 W80.59454
7	2/11/2006								
8	2/11/2006								
9	2/11/2006	CM	JUVENILE	INSHORE	20	UNDERWATER	NO	1364	N28.40875 W80.59459
10	2/11/2006	CM	JUVENILE	INSHORE	10	SURFACE	NO	1368	N28.40885 W80.59302
11	2/11/2006								
12	2/11/2006	CM	JUVENILE	INSHORE	5	SURFACE	NO	1378	N28.40885 W80.59386
13	2/11/2006								
14	2/11/2006								
15	2/11/2006								
16	2/11/2006	CM	JUVENILE	OFFSHORE	5	UNDERWATER	NO	1394	N28.40886 W80.59246
17	2/11/2006								
18	2/12/2006								
19	2/12/2006								
21	2/12/2006								
22	2/12/2006								
23	2/12/2006								
24	2/12/2006								
25	2/12/2006								
26	2/12/2006								
27	2/12/2006	CM	JUVENILE	INSHORE	30	SURFACE	NO	1432	N28.40873 W80.59470
28	2/12/2006								
29	2/12/2006								
30	2/12/2006								
31	2/13/2006								
32	2/13/2006								
33	2/13/2006								
34	2/13/2006								
35	2/13/2006								
36	2/13/2006								
37	2/13/2006								
38	2/13/2006								

CANAVERAL SEA TURTLE CENSUS DATA
TRANSECT LOCATION 3 - SOUTH SIDE OF CHANNEL BY MARKER 19
TRANSECT LENGTH 98 METERS

RUN #	DATE	SPECIES	JUVENILE/ADULT	INSHORE OR OFFSHORE SIDE	DISTANCE	SURFACE OR UNDERWATER	FEEDING?	WAYPOINT #	LAT/LONG
1	2/11/2006								
2	2/11/2006								
3	2/11/2006								
4	2/11/2006								
5	2/11/2006								
6	2/12/2006								
7	2/12/2006								
8	2/12/2006								
9	2/13/2006								
10	2/13/2006								
11	2/13/2006								
12	2/13/2006								
13	2/13/2006								
14	2/13/2006								
15	2/13/2006								
16	2/13/2006								
17	2/13/2006								
18	2/13/2006								

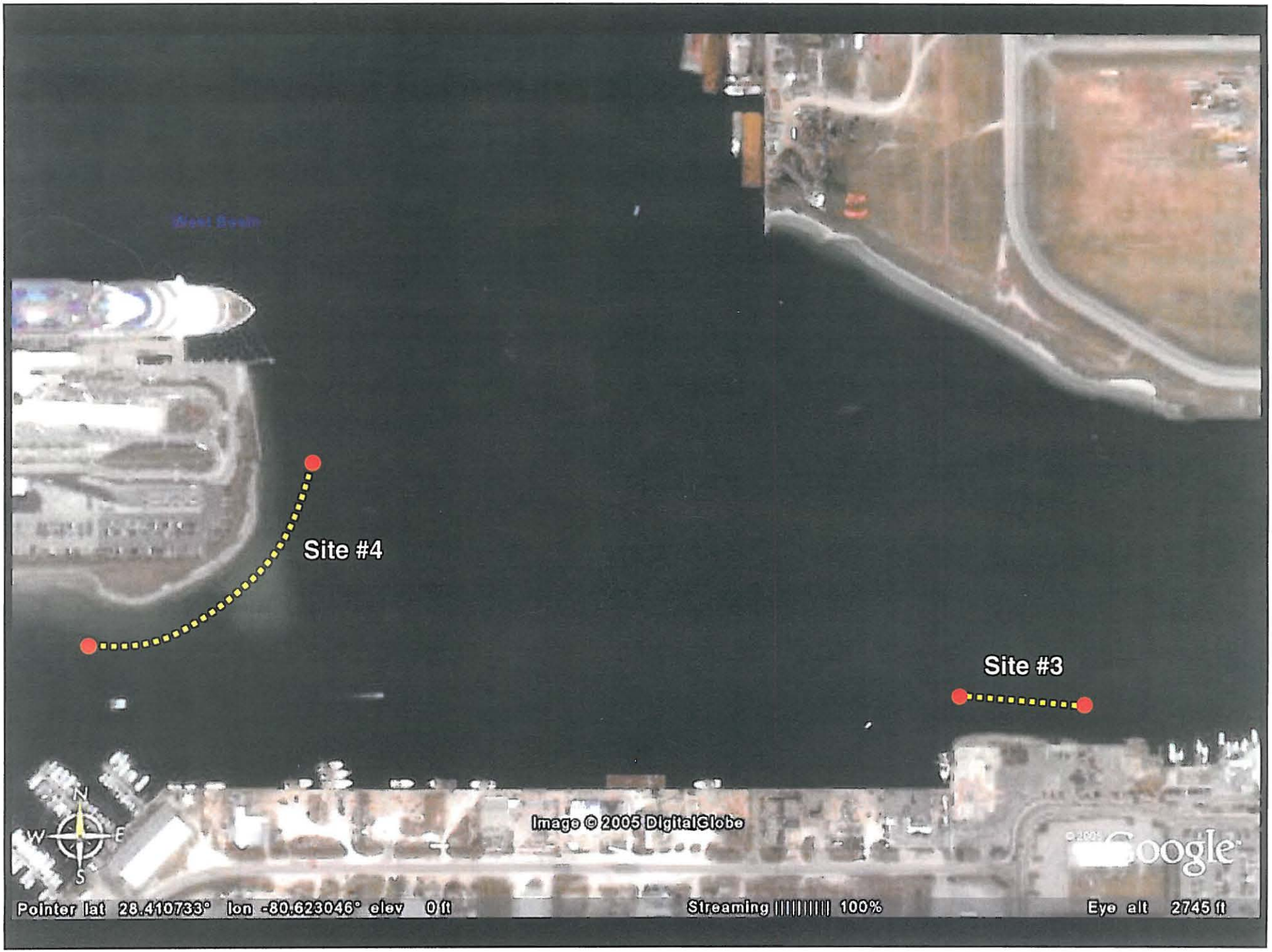
CANAVERAL SEA TURTLE CENSUS DATA
TRANSECT LOCATION 4 - NORTH SIDE OF CHANNEL JUST WEST OF WEST BASIN
TRANSECT LENGTH 258 METERS

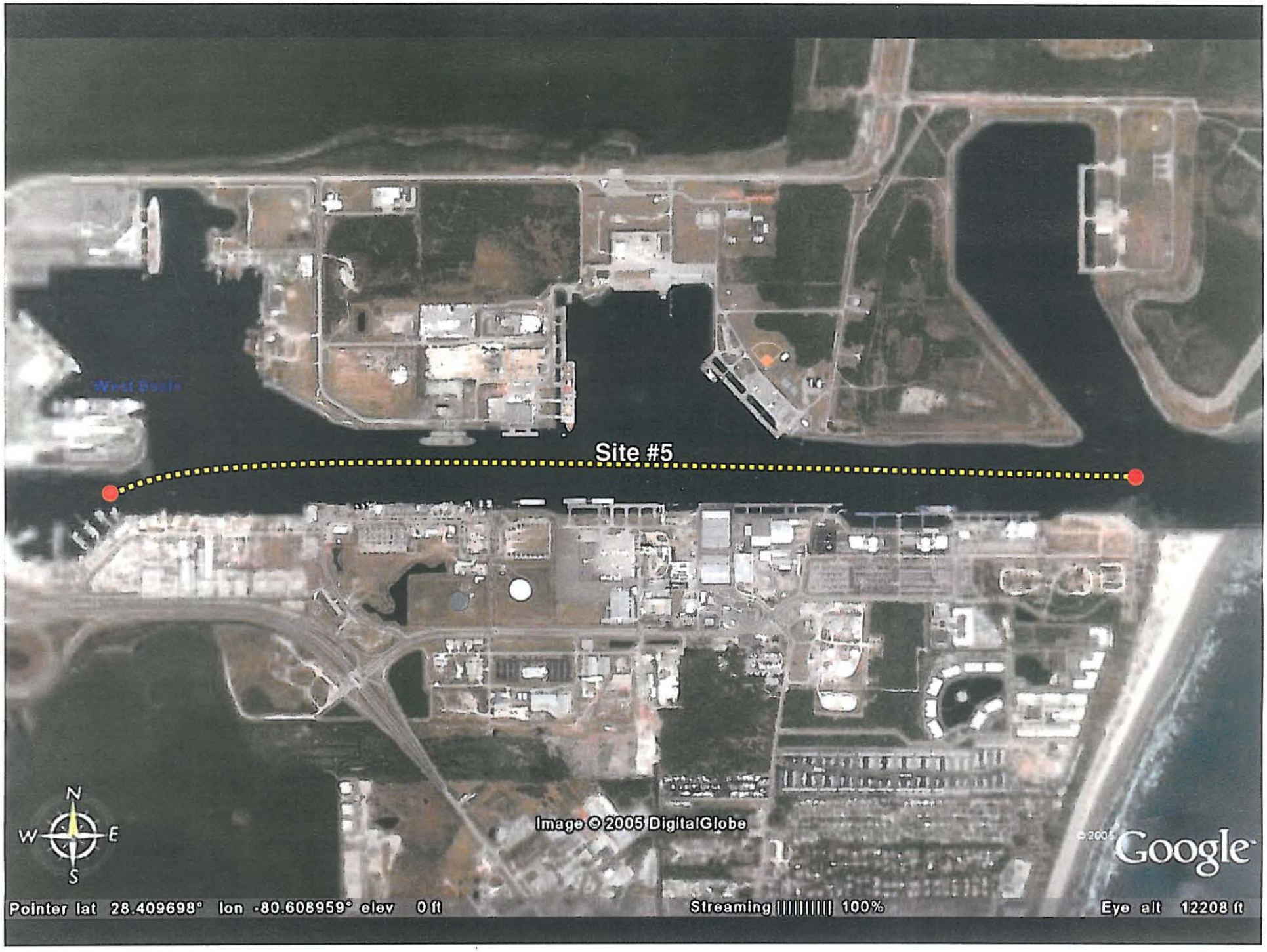
RUN #	DATE	SPECIES	JUVENILE/ADULT	INSHORE OR OFFSHORE SIDE	DISTANCE	SURFACE OR UNDERWATER	FEEDING?	WAYPOINT #	LAT/LONG
1	2/11/2006								
2	2/11/2006								
3	2/11/2006								
4	2/11/2006								
5	2/11/2006								
6	2/11/2006								
7	2/11/2006								
8	2/11/2006								
9	2/11/2006								
10	2/11/2006								
11	2/11/2006								
12	2/12/2006								
13	2/12/2006								
14	2/12/2006								
15	2/12/2006								
16	2/12/2006								
17	2/12/2006								
18	2/13/2006								
19	2/13/2006								
20	2/13/2006								
21	2/13/2006								
22	2/13/2006								
23	2/13/2006								

CANAVERAL SEA TURTLE CENSUS DATA
TRANSECT LOCATION 5 - CENTERLINE OF CHANNEL
TRANSECT LENGTH 3490 METERS

RUN #	DATE	SPECIES	JUVENILE/ADULT	INSHORE OR OFFSHORE SIDE	DISTANCE	SURFACE OR UNDERWATER	FEEDING?	WAYPOINT #	LAT/LONG
1	2/11/2006								
2	2/11/2006								
3	2/12/2006								
4	2/13/2006								

Site #1
Site #2
Image © 2005 DigitalGlobe
© 2005 Google
N
W
E
S
Pointer lat 28.411757° lon -80.596884° elev 0 ft
Streaming 100%
Eye alt 3896 ft


Site #4
Site #3
Image © 2005 DigitalGlobe
Google
Pointer lat 28.410733° lon -80.623046° elev 0 ft
Streaming 100%
Eye alt 2745 ft


West Basin
Site #5
N
W
E
S
Image © 2005 DigitalGlobe
© 2005 Google
Pointer lat 28.409698° lon -80.608959° elev 0 ft
Streaming 100%
Eye alt 12208 ft

RECEIVED

AUG - 9 2007

DIAL CORDY AND ASSOCIATES INC

June 30, 2007

Dial Cordy and Associates, Inc.
490 Osceola Avenue
Jacksonville Beach, FL 32250
Attn: Mr. Lee Swain

SUBJECT: CANAVERAL SECTION 203 PROJECT SEA TURTLE CENSUS
2007 SUPPLEMENTAL SURVEYS

Dear Mr. Swain:

This letter and enclosures transmits Inwater Research Group's (IRG) results of June 2007 censusing of sea turtle populations in Port Canaveral. This work was undertaken in support of the Section 203 study for the Canaveral channel widening project. The work was performed on June 6 and 7, 2007.

IRG had previously identified five sites inside Port Canaveral for sea turtle censusing. Site #1 was the main area of interest – the riprap rock habitat along the north side of the entrance channel between the middle and east turning basins. This is the shoreline segment that would have to be disturbed to construct the project. The other sites were chosen to provide information on comparative turtle abundance in other areas of similar habitat, and in the main channel itself. These results were transmitted in prior reports, and indicated that sea turtles, primarily juvenile green sea turtles, were considerably more abundant at Site #1 than at the other rock riprap habitats within the Port.

The objective of the June 2007 census effort was to look for any other areas of rock substrate habitat in the vicinity that had not been examined in prior efforts, and to determine the abundance of sea turtles on those habitats. Abundance was assessed using the same methodology used for the earlier work, so the data would be directly comparable.

Two new sites were identified and censused. The North Jetty Site consisted of a rock riprap shoreline along the north side of the entrance channel 740 meters in length. The South Jetty Site was a similar segment 590 meters in length on the south side of the entrance channel.

IRG subjected these sites to repetitive visual censusing, using observers in an elevated tower on a small boat. This technique allows for the calculation of an index of turtle abundance, observations per transect kilometer, which can be used to directly compare

the different sites in the Port with each other, or a single site over time. Because the index results from the mean of a large number of observations, statistical significance testing will be possible from the data. A synopsis of the data is presented in the table below.

Site #	Transect length	# Of repetitions	Total turtles observed	Turtles per kilometer
North Jetty	740 m	28	8	0.39
South Jetty	590 m	36	25	1.18

A spreadsheet containing the full data set for all observations and a graphical presentation of turtle observation locations are included as attachments.

Compared to the summer 2005 observation of 6.80 turtles per transect kilometer at Site #1 (the shoreline segment proposed for relocation), both the North Jetty and South Jetty sites showed a relatively low abundance. The habitat at the North Jetty and South Jetty sites appeared quite similar to the habitat at Site #1, with algae covered rock sloping steeply into water over 2 meters deep.

With the addition of the North and South Jetty Sites, we have examined a total of 1952 meters of riprap rock shoreline in the Port that is suitable turtle habitat (as evidenced by the presence of turtles and suitable forage), in addition to the 980 meter long Site #1. If the habitat provided by Site #1 were temporarily removed in the process of channel relocation, these other shoreline segments would be available as refugia. There is also a large extent of similar habitat available within the Trident Basin, where researchers from the University of Central Florida have been working for many years and have documented a high abundance of juvenile green turtles.

IRG appreciates the opportunity to work with Dial Cordy on this project. Please do not hesitate to contact the Principal Investigator for this project, Dr. Jonathan Gorham, at (321) 243-2211 with any questions or if you require additional information.

Sincerely,

Michael Bresette
President

Enclosures

North Jetty Transect
© 2007 Navteq
Image NASA
Google
Pointer lat 28.410841° lon -80.587416°
Streaming 100%
Eye alt 3090 ft

CANAVERAL SEA TURTLE CENSUS DATA - 2007
NORTH JETTY TRANSECT LOCATION - NORTH SIDE OF ENTRANCE CHANNEL
TRANSECT LENGTH 740 METERS

RUN #	DATE	SPECIES	JUVENILE/ ADULT	INSHORE OR OFFSHORE SIDE	DISTANCE	SURFACE OR UNDERWATER	FEEDING ?	WAYPOINT #	LATITUDE/LONGITUDE
1	6/6/2007								
2	6/6/2007								
3	6/6/2007								
4	6/6/2007	CM	JUV	IN	40FT	SURFACE	NO	4095	N28 24.662 W80 35.040
5	6/6/2007								
6	6/6/2007								
7	6/6/2007								
8	6/6/2007								
9	6/6/2007	CC	SUBADULT	OFF	5FT	UNDERWATER	NO	4100	N28 24.700 W80 35.220
10	6/6/2007								
11	6/6/2007	CM	JUV	IN	6FT	SURFACE	NO	4102	N28 24.704 W80 35.217
12	6/6/2007	CC	SUBADULT	OFF	40FT	SURFACE	NO	4103	N28 24.713 W80 35.162
13	6/6/2007								
14	6/6/2007								
15	6/6/2007								
16	6/6/2007								
17	6/6/2007								
18	6/6/2007								
19	6/6/2007								
20	6/6/2007								
21	6/6/2007	CM	JUV	IN	25FT	SURFACE	NO	4119	N28 24.661 W80 35.032
22	6/7/2007	CM	JUV	IN	20FT	SURFACE	NO	4120	N28 24.652 W80 34.980
23	6/7/2007	CM	JUV	IN	30FT	SURFACE	NO	4122	N28 24.709 W80 35.147
24	6/7/2007	CM	JUV	IN	15 FT	SURFACE	NO	4123	N28 24.657 W80 35.005
25	6/7/2007								
26	6/7/2007								
27	6/7/2007								
28	6/7/2007								

South Jetty Transect
© 2007 Navteq
Image NASA
©2005 Google
Pointer lat 28.410364° lon -80.591465°
Streaming 100%
Eye alt 2588 ft

CANAVERAL SEA TURTLE CENSUS DATA - 2007
SOUTH JETTY TRANSECT LOCATION - SOUTH SIDE OF ENTRANCE CHANNEL
TRANSECT LENGTH 590 METERS

RUN #	DATE	SPECIES	JUVENILE /ADULT	INSHORE OR OFFSHORE SIDE	DISTANCE	SURFACE OR UNDERWATER	FEEDING?	WAYPOINT #	LATITUDE/LONGITUDE
1	6/6/2007								
2	6/6/2007								
3	6/6/2007	CM	JUV	IN	10FT	SURFACE	NO	4096	N28 24.531 W80 35.542
4	6/6/2007	CM	JUV	IN	5FT	SURFACE	NO	4093	N28 24.522 W80 35.523
5	6/6/2007	CM	JUV	IN	10FT	SURFACE	NO	4091	N28 24.529 W80 35.535
5	6/6/2007	CM	JUV	IN	10FT	SURFACE	NO	4092	N28 24.527 W80 35.531
6	6/6/2007	CM	JUV	IN	15FT	SURFACE	NO	4097	N28 24.501 W80 35.495
6	6/6/2007	CM	JUV	IN	25FT	SURFACE	NO	4098	N28 24.499 W80 35.479
6	6/6/2007	CM	JUV	IN	10FT	SURFACE	NO	4099	N28 24.501 W80 35.352
7	6/6/2007								
8	6/6/2007								
9	6/6/2007								
10	6/6/2007	CM	JUV	IN	5FT	SURFACE	NO	4101	N28 24.499 W80 35.371
11	6/6/2007								
12	6/6/2007								
13	6/6/2007								
14	6/6/2007								
15	6/6/2007								
16	6/6/2007								
17	6/6/2007								
18	6/6/2007	CM	JUV	IN	5FT	SURFACE	NO	4104	N28 24.534 W80 35.580
19	6/7/2007	CM	JUV	IN	5FT	SURFACE	NO	4108	N28 24.531 W80 35.586
20	6/7/2007								
21	6/7/2007	CM	JUV	IN	5FT	SURFACE	NO	4109	N28 24.532 W80 35.605
21	6/7/2007	CM	JUV	IN	10FT	SURFACE	NO	4110	N28 24.534 W80 35.523
22	6/7/2007								
23	6/7/2007								
24	6/7/2007	CM	JUV	IN	15FT	SURFACE	NO	4111	N28 24.534 W80 35.558

25	6/7/2007	CM	JUV	IN	5FT	SURFACE	NO	4112	N28 24.499 W80 35.328
26	6/7/2007	CC	SUBADULT	IN	5FT	SURFACE	NO	4113	N28 24.533 W80 35.553
26	6/7/2007	CM	JUV	OFF	5FT	SURFACE	NO	4114	N28 24.500 W80 35.480
27	6/7/2007	CM	JUV	IN	10FT	SURFACE	NO	4115	N28 24.531 W80 35.649
28	6/7/2007	CC	SUBADULT	IN	15FT	SURFACE	NO	4116	N28 24.515 W80 35.495
29	6/7/2007	CM	JUV	IN	20FT	SURFACE	NO	4117	N28 24.535 W80 35.593
29	6/7/2007	CM	JUV	IN	20FT	SURFACE	NO	4118	N28 24.504 W80 35.374
30	6/7/2007								
31	6/7/2007	CC	SUBADULT	IN	20FT	UNDERWATER	YES	4121	N28 24.534 W80 35.547
32	6/7/2007	CM	JUV	IN	20FT	SURFACE	NO	4124	N28 24.501 W80 35.353
33	6/7/2007	CM	JUV	IN	25FT	SURFACE	NO	4125	N28 24.505 W80 35.341
34	6/7/2007	CM	JUV	IN	20FT	SURFACE	NO	4126	N28 24.535 W80 35.554
35	6/7/2007								
36	6/7/2007	CM	JUV	IN	20FT	SURFACE	NO	4127	N28 24.510 W80 35.495

Cultural Resource Reports and Correspndence

TECHNICAL MEMORANDUM

A Cultural Resources Assessment of Proposed Navigation Improvements Canal Port Authority of Port Canaveral Brevard County, Florida

Lee Terzis, Senior Project Archaeologist
June 28, 2006
(Revised and updated December 5, 2007)

PBS&J Project Number: 091845.00
Project Location: Township 24 South, Range 37 East, Sections 10 and 11 in Port Canaveral, Florida
Project Description: The Canal Port Authority proposes to enlarge the Canaveral Barge Canal to a width of 500 feet in selected locations, and to remove land composed of dredge spoil to expand the West Turning Basin.

Introduction and Project Setting

PBS&J, on behalf of Dial Cordy and Associates, Inc. and the Canal Port Authority of Port Canaveral, conducted a reconnaissance-level cultural resources assessment of properties adjacent to the Canaveral Barge Canal on March 30 and 31, 2006. The tracts are located in Township 24 South, Range 37 East, Sections 10 and 11 in Port Canaveral, on the 7.5 minute Cape Canaveral, Florida Quadrangle (Figure 1). The Canal Port Authority proposes to enlarge the Canaveral Barge Canal to a width of 500 feet in selected locations, and to remove land composed of dredge spoil to expand the West Turning Basin. Lee Terzis served as field archaeologist and principal investigator for the project.

The purpose of a reconnaissance-level assessment is to define the probability that cultural resources may be present and preliminarily document any resources encountered in accordance with the provisions contained in 36 CFR 60.4 ("Criteria for Evaluation"). The assessment and evaluation consisted of a review of related source materials, photo documentation of the subject tracts, and a visual examination of the project area.

The project was designed to comply with 36 CFR. Part 800 ("Protection of Historic Properties") of the National Historic Preservation Act of 1966, as amended, applicable local ordinances, Section 267.061, *Florida Statutes*, Chapter 1A-46, *Florida Administrative Code* and reporting standards outlined in the Florida Division of

Historical Resources (FDHR) *Cultural Resources Management Standards & Operational Manual* (2003).

The Area of Potential Effect (APE) for the purposes of this assessment includes the Canaveral Barge Canal and lands bordering it to the north and south (Figure 2). Submerged areas potentially impacted by the proposed canal dredging east of the historic Atlantic shoreline were not specifically evaluated during this investigation.

Previous Investigations

A review of Florida Department of Environmental Protection (FDEP) data, including the original 1859 government survey plat map and modern aerial photographs, clearly demonstrate that the construction of the port facilities and canal in the early 1960s and subsequent filling-in of the Banana River with dredge spoil have significantly altered the project area over time (Figure 3).

An initial review of pertinent Florida Master Site File (FMSF) data revealed that CCAFS is listed as a National Historic Landmark (NHL) for its vital contribution to the nation's space program. Specifically, the significant structures on the base included in the NHL designation consist of the launch complexes (5, 6, 13, 14, 19, 26 and 34) and the Mission Control Center. However, these structures are located well to the north of the APE and will not be affected by the proposed canal improvements.

Initial FMSF research also showed that one archaeological site was previously recorded adjacent to the project area. Site 8BR1641 is located on a relict sandy ridge paralleling the old Banana River shoreline. The site was originally discovered in January, 1992, when Mobile Corps of Engineers archaeologists noted the presence of gray midden soils containing shell and ceramics. Surface collections and limited shovel testing produced shell, bone, possible grinding tool fragments, and ceramics dating to the Orange Period (4,000 to 2,500 BP) (Seckinger and Nielsen n.d. in Cantley et al 1993:212). Late in 1992, archeologists conducted shovel testing and surface collection. This effort produced coquina shell, chert flakes and ceramics from the Malabar II Period (1,200 to 500 BP) (Cantley et al 1993). Additional excavations completed in 1999 by Archaeological Consultants, Inc., and in 2006 by PBS&J, confirmed that the site boundary was circa 100 meters north of the canal shoreline (Deming and Horvath 1999:124; Stickler 2006) (Figure 4).

Results of Fieldwork

A pedestrian inspection was conducted along the northern edge of the Canaveral Barge Canal on CCAFS land west of the Trident Submarine Turning Basin (see Figure 2). This

area has been heavily impacted by development, beginning with the construction of the old A1A corridor that once extended north-south through what is now CCAFS land (Figure 5). Subsequent disturbances included the original dredging of the canal in the 1960s, the erection of a fence and riprap, and the placement of a Trident submarine conning tower as a marker (Figure 6). Across the canal to the south is a commercial docking complex for cruise ships and other vessels (Figure 7).

The only substantial land parcel within the APE is a restricted USCG facility adjacent to the West Turning Basin (see Figure 2). The land that comprises this parcel is composed entirely of dredge spoil removed to create the Canaveral Barge Canal in the 1960s. Therefore, this parcel has no potential to contain significant cultural resources. Physical access to the parcel was not permitted due to security reasons, although a photograph of the tract was taken from a distance (Figure 8).

Summary and Recommendations

PBS&J, on behalf of Dial Cordy and Associates, Inc. and the Canal Port Authority of Port Canaveral, conducted a reconnaissance-level cultural resources assessment of lands adjacent to the Canaveral Barge Canal on March 30 and 31, 2006. The Canal Port Authority plans to dredge the canal and to make other safety and navigation improvements (Figure 4).

It is our opinion that dredging of the canal as currently proposed will not impact any significant cultural resources on the subject tracts included in this assessment, and that the project will have no adverse effect on archaeological or historical properties listed or eligible for listing in the National Register of Historic Places, or otherwise of historical or archaeological value.

References

Cantley, Charles E., Joe Joseph, and Leslie Raymer
1993 *Historic Properties Survey of Cape Canaveral Air Force Station, Florida.* U.S. Army Corps of Engineers, Mobile, Alabama.

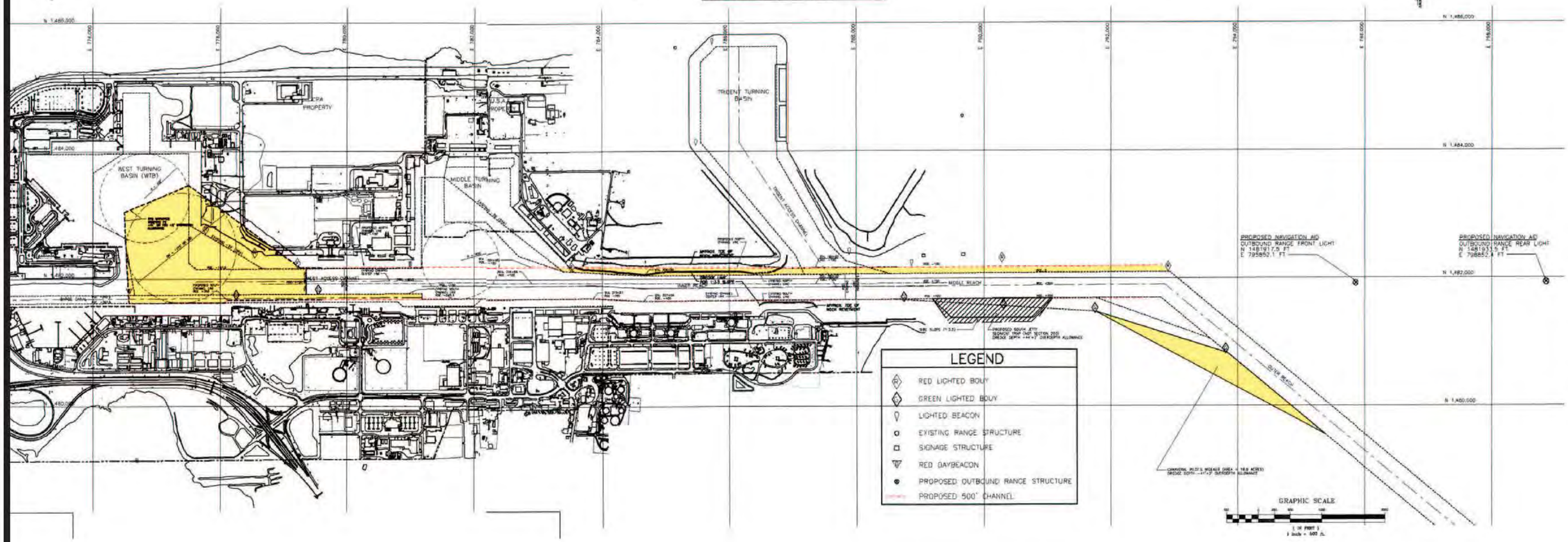
Deming, Joan and Elizabeth A. Horvath
1999 *Phase II Test Excavation Report: Sixteen Archaeological Sites, Cape Canaveral Air Station, Brevard County.* Submitted to 45th Space Wing, Patrick Air Force Base, Florida by Archaeological Consultants, Inc., Sarasota, Florida.

Levy, R. S., D. F. Barton, and T. B. Riordan
1984 *An Archaeological Survey of Cape Canaveral Air Force Station, Brevard County, Florida*. Submitted to the Southeast Regional Office, National Park Service, Atlanta, Georgia by Resource Analysts, Bloomington, Indiana.

Stickler, Justin
2006 *A Phase 1 Archaeological Assessment of the NOTU Site, 8BR1641, Brevard County, Florida.* Prepared for the Economic Development Commission of Florida's Space Coast and submitted to 45th Space Wing CES/CEVP, Patrick Air Force Base, Florida.

Figure 1 **Project Location Map**

PBSJ



LEGEND

Project Area

Figure 2 **CH2MHill Site Plan**

PBSJ

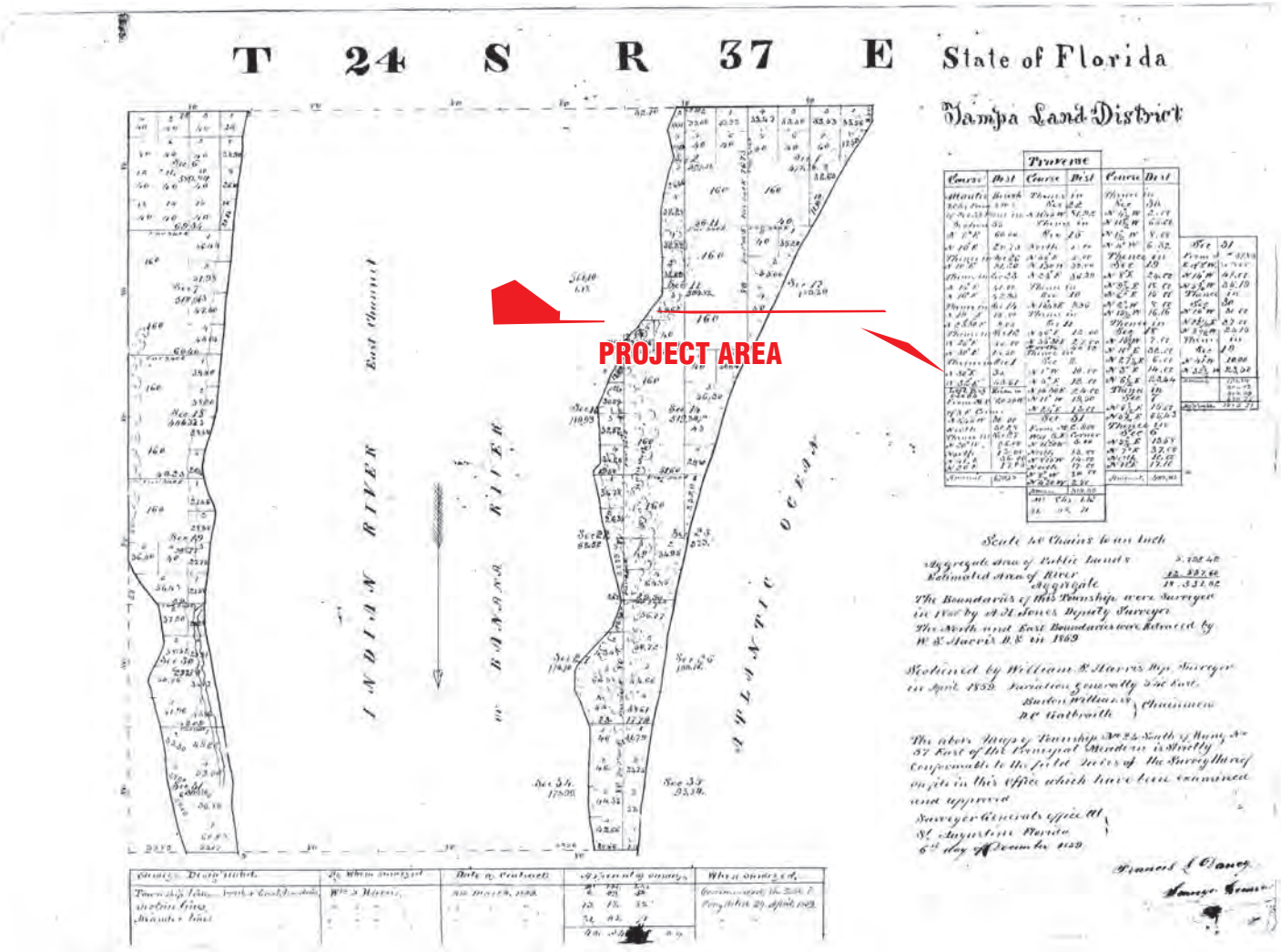


Figure 3 **Historic Plat Map**

PBSJ

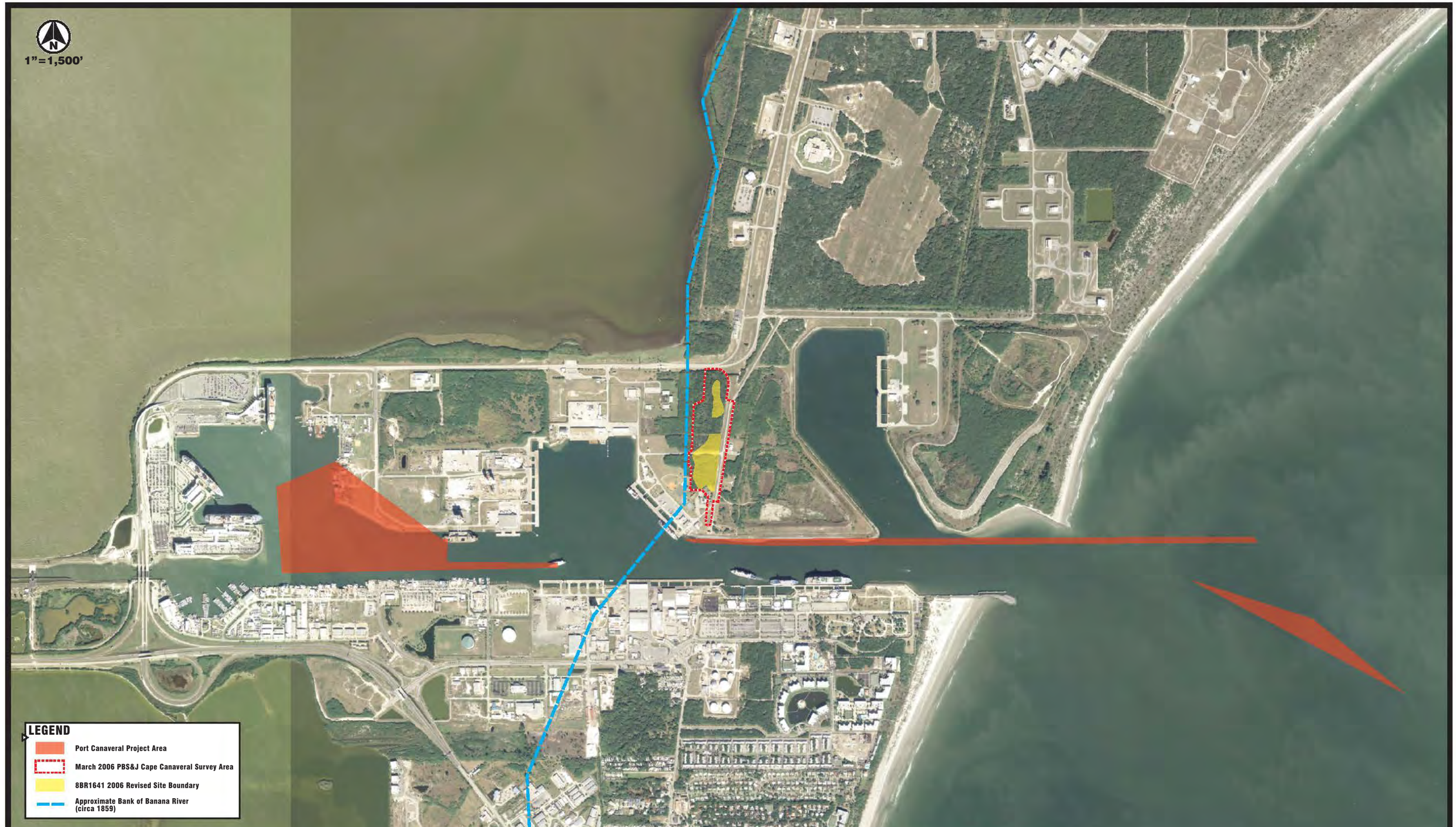


Figure 4 **Port Canaveral Project Area**

PBSJ

Figure 5. CCAFS land, view south to the canal.

Figure 6. CCAFS land, view to the northwest.

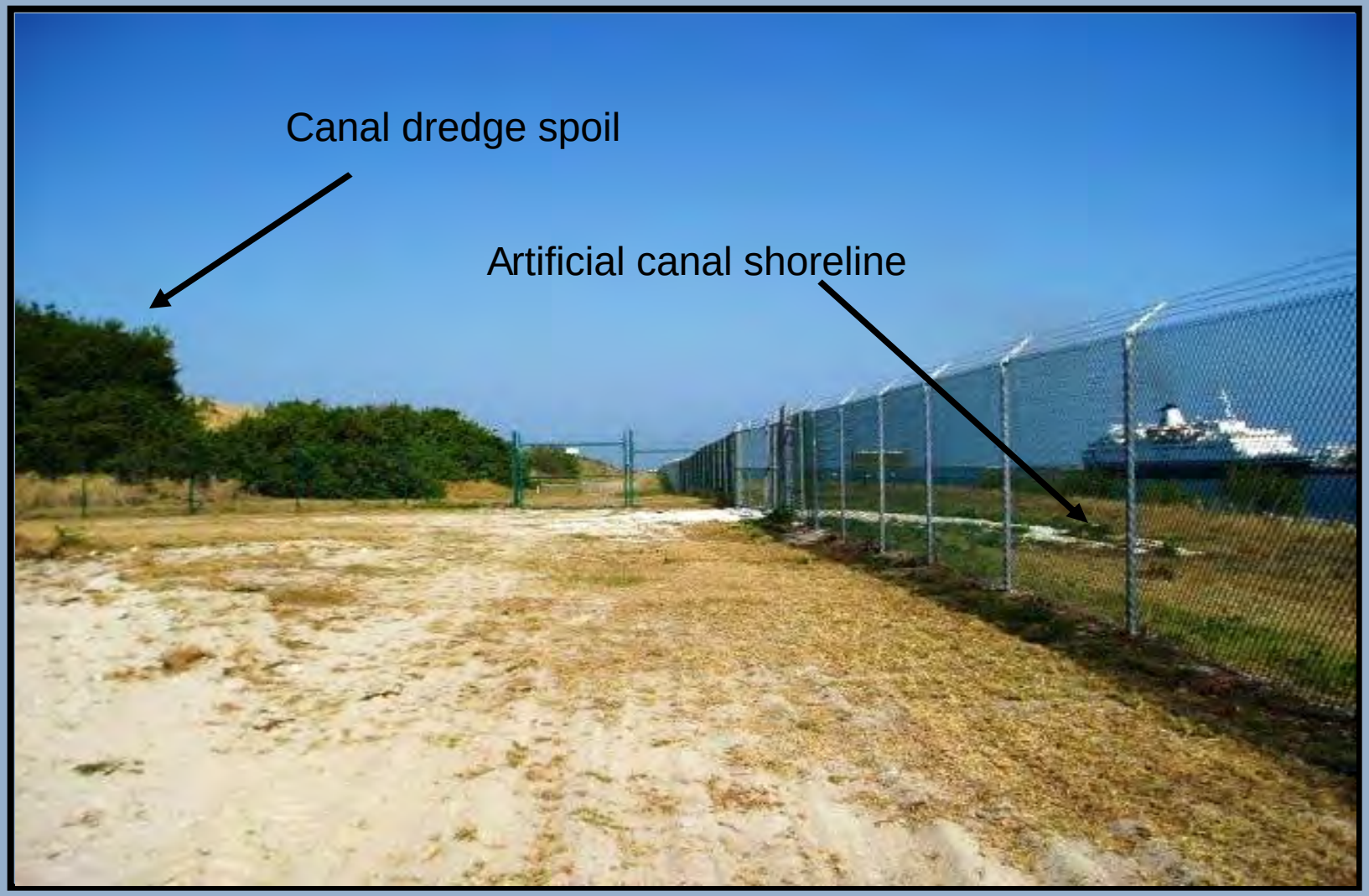


Figure 7. CCAFS land, view to the east.

Figure 8. USCG property, view to the southwest.

PBS&J

An employee-owned company

December 5, 2007

Mr. Fred Gaske
Director and State Historic Preservation Officer
Florida Division of Historical Resources
R.A. Gray Building
Tallahassee, Florida 32399-0250

Attention: Ms. Laura Kammerer

Subject: Technical Memorandum: A Cultural Resources Assessment of Proposed Navigation Improvements, Canal Port Authority of Port Canaveral, Brevard County, Florida

PBS&J Project Number: 091845.00
County: Brevard
Project Description: The Canal Port Authority proposes to enlarge the Canaveral Barge Canal to a width of 500 feet in selected locations, and to remove land composed of dredge spoil to expand the West Turning Basin.

Dear Mr. Gaske:

In accordance with the provisions contained in Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, 36 CFR, Part 800, PBS&J on behalf of Dial Cordy and Associates, Inc. and the Canal Port Authority of Port Canaveral, is seeking your concurrence that the subject project will have no effect on any archaeological or historical sites or properties listed, or eligible for listing, in the *National Register of Historic Places*, or otherwise of historical or archaeological value.

This office has performed a cultural resources assessment of the subject tract. Based upon our assessment, we are of the opinion that this area does not contain any sites that are eligible for listing in the *National Register of Historic Places*, or otherwise of historical or archaeological value.

Lee Terzis served as the principal investigator for this assessment. Ms. Terzis' technical memorandum, entitled *A Cultural Resources Assessment of Proposed Navigation*

Improvements, Canal Port Authority of Port Canaveral, Brevard County, Florida, is attached for your review and consideration.

This report applies strictly to this project as defined herein, and does not apply if any of the parameters should change. Any future projects within this area would be subject to any and all pertinent federal and state laws, rules and regulations. If you have any questions about the subject project, please do not hesitate to contact Ms. Terzis or me.

Sincerely,

POST, BUCKLEY, SCHUH & JERNIGAN, INC.

Daniel T. Penton
Senior Program Archaeologist

Attachment

xc: Steve Dial, Dial Cordy and Associates, Inc.
Lee Swain, Dial Cordy and Associates, Inc.

RECEIVED
DEC 18 2007
PBS & J TALLAHASSEE

FLORIDA DEPARTMENT OF STATE
Kurt S. Browning
Secretary of State
DIVISION OF HISTORICAL RESOURCES

Mr. Daniel Penton
Post, Buckley, Schuh, and Jernigan, Inc.
1901 Commonwealth Lane
Tallahassee, Florida 32303

December 14, 2007

Re: DHR No.: 2007-8692
Technical Memorandum: A Cultural Resources Assessment of Proposed Navigation Improvements, Canal Port Authority of Port Canaveral, Brevard County, Florida

Dear Mr. Penton:

Our office reviewed the referenced investigations report in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, its implementing regulations (36 CFR Part 800), and Chapters 267, *Florida Statutes*. The State Historic Preservation Officer is to advise and assist federal agencies when identifying historic properties, listed, or eligible for listing, in the National Register of Historic Pla*ces*, assessing the project's effects, and considering alternatives to avoid or reduce adverse effects.

In June 2006, Post, Buckley, Schuh, and Jernigan conducted a cultural resources assessment reconnaissance level survey of the barge canal navigation improvements project area on behalf of Dial Cordy and Associates, Inc. for the Port Canaveral Canal Port Authority. No cultural resources were identified within the project area of potential effect during the investigation.

Based on the information provided, in is the opinion of this office that there are no historic properties located within the project area of potential effect. Because of the nature of the proposed improvements, it is unlikely that such properties would be affected. The technical memorandum is consistent with the requirements of 1A-46, *Florida Administrative Code.*

If you have any questions concerning our comments, please contact Laura Kammerer, Deputy State Historic Preservation Officer for Review and Compliance, at 850-245-6333 or lkammerer@dos.state.fl.us. Thank you for your interest in protecting Florida's historic properties.

Sincerely,

Frederick P. Gaske

Frederick P. Gaske, Director, and
State Historic Preservation Officer

500 S. Bronough Street • Tallahassee, FL 32399-0250 • http://www.flheritage.com

☐ **Director's Office** (850) 245-6300 • FAX: 245-6436
☐ **Archaeological Research** (850) 245-6444 • FAX: 245-6452
☒ **Historic Preservation** (850) 245-6333 • FAX: 245-6437
☐ **Historical Museums** (850) 245-6400 • FAX: 245-6433

☐ **South Regional Preservation Office** (561) 416-2115 • FAX: 416-2149
☐ **North Regional Preservation Office** (850) 245-6445 • FAX: 245-6435
☐ **Central Regional Preservation Office** (813) 272-3843 • FAX: 272-2340

Mid-Atlantic Technology
and Environmental Research, Inc.

13 February 2008

Lee Swain
Vice President
Dial Cordy Associates, Inc.
490 Osceola Avenue
Jacksonville Beach, FL 32250

Re: **Management Summary**: Submerged Cultural Resource Survey of Entrance Channel Widener and Channel Improvement, Port Canaveral, Florida

Dear Mr. Swain:

Mid-Atlantic Technology (M-AT) has completed the field investigations portion of the above referenced project. The remote sensing portion of the investigations was conducted on 11 December 2008. Two remote sensing devices were used: a Geometrics 881 cesium marine magnetometer, and Marine Sonic 600-kHz side-scan sonar. Each instrument was interfaced with a Starlink Differential Global Positioning System. HYPACK MAX™ navigation software also was interfaced with the DGPS system, being used to develop the survey lines and maintain vessel track during data collection.

Data was collected along parallel lines spaced at 50-foot (15-meter) intervals. Magnetic data, along with corresponding positioning data, was recorded at ½-second sample intervals (or approximately every 4 feet along a track line at 5 knots) using HYPACK data acquisition software. Acoustic data was recorded with Sea Scan PC acoustic data acquisition software using an onboard PC computer system.

The primary investigations concentrated on the proposed turn widener at the south side of the entrance channel. We also conducted side scan sonar investigations along each side of the harbor west past the large turning basin.

Magnetic data was contoured at 1-nanotesla intervals and reduced to pole. The contour map was then overlaid on either the sonar mosaic for comparison analysis or geo-referenced color aerial photographs (or sonar mosaic) taken in 2000.

Nine survey lines space at 50-foot intervals were conducted across the turn widener. Several small magnetic and acoustic anomalies were identified within the proposed turn widener. However, all the targets directly within the footprint of the widener appear to be associated with modern debris, and have little or no potential to be associated with a significant submerged cultural resource.

441 Blossom Ferry Road, Castle Hayne, North Carolina 28429 USA | tel. 910 675 8270 | fax 910 675 8284 | www.midatlantictechnology.net

Just to the south of the widener two targets were identified that initially had characteristics that had the potential to be associated with significant submerged cultural resources. These are located at the following Florida East State Plane Coordinates:

Cape1a: 791547 E 1491271 N

Cape1b: 791467 E 1481234 N

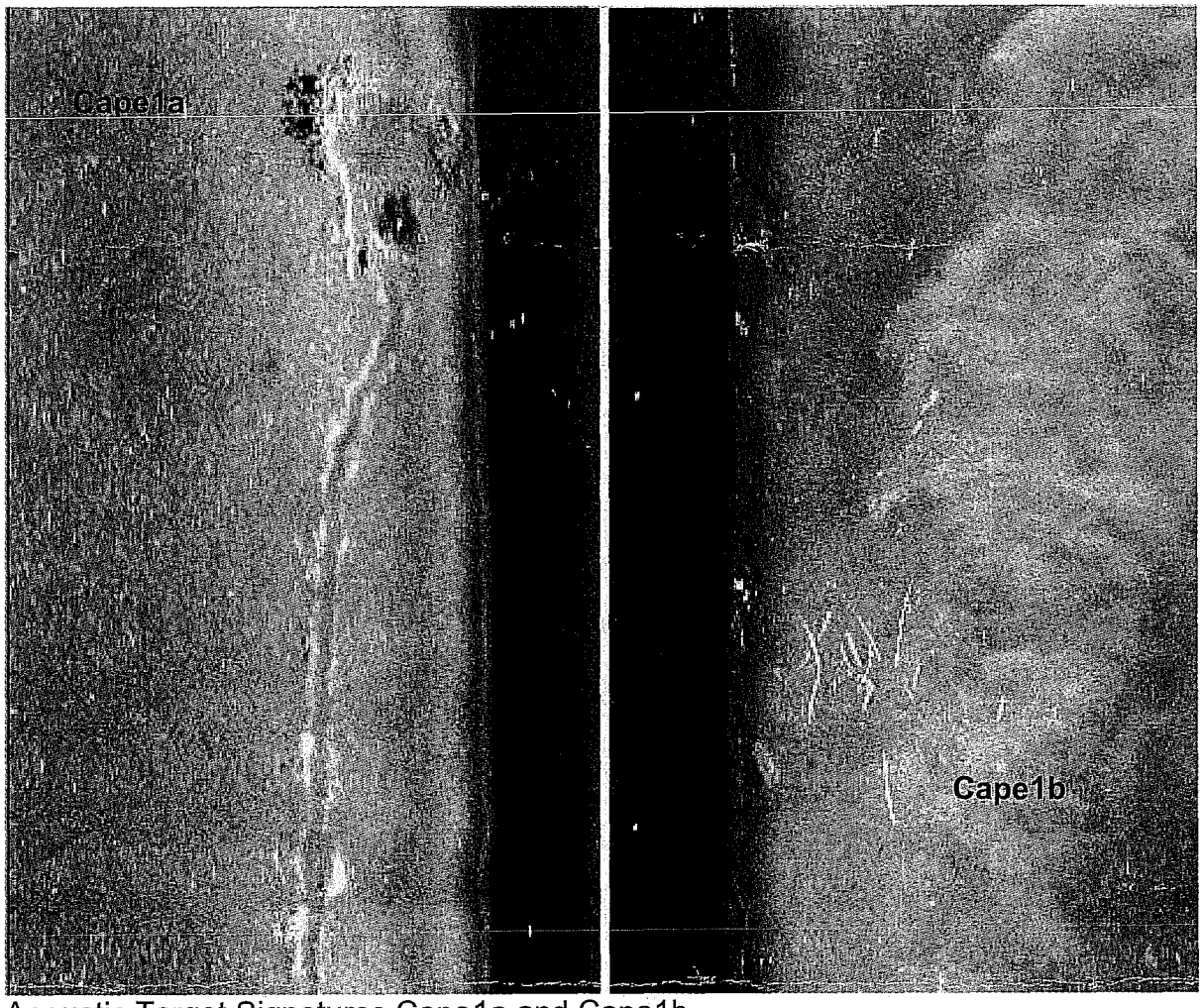
On 28 January 2008 M-AT conducted underwater investigations to identify the nature of the materials creating the acoustic and magnetic anomalies at **Cape1a** and **Cape1b** along the south side of the turn widener.

Both Cape1a and Cape1b were identified as modern construction debris including sections of 2½ -inch wire rope and 3-inch angle iron.

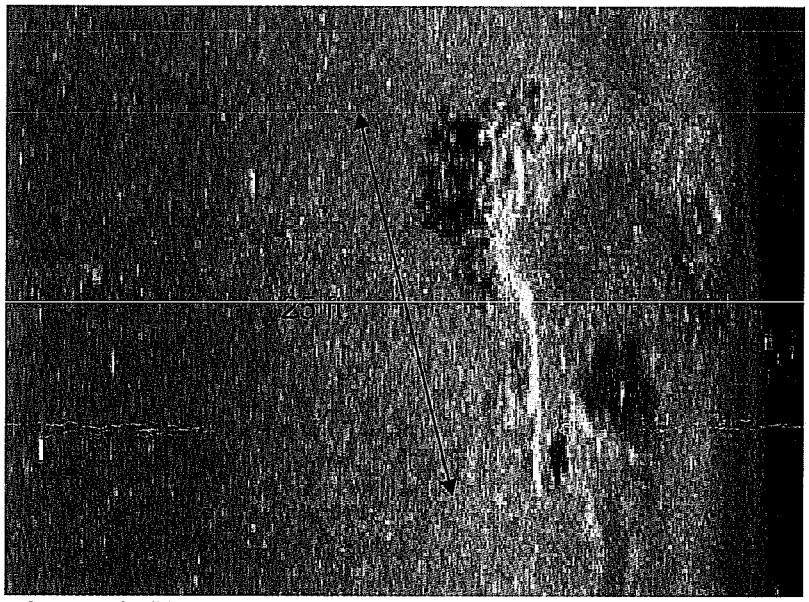
No additional archaeological investigations or mitigation are recommended for the proposed navigation channel improvement at Port Canaveral.

Sincerely,

Wes Hall
President
Enclosure

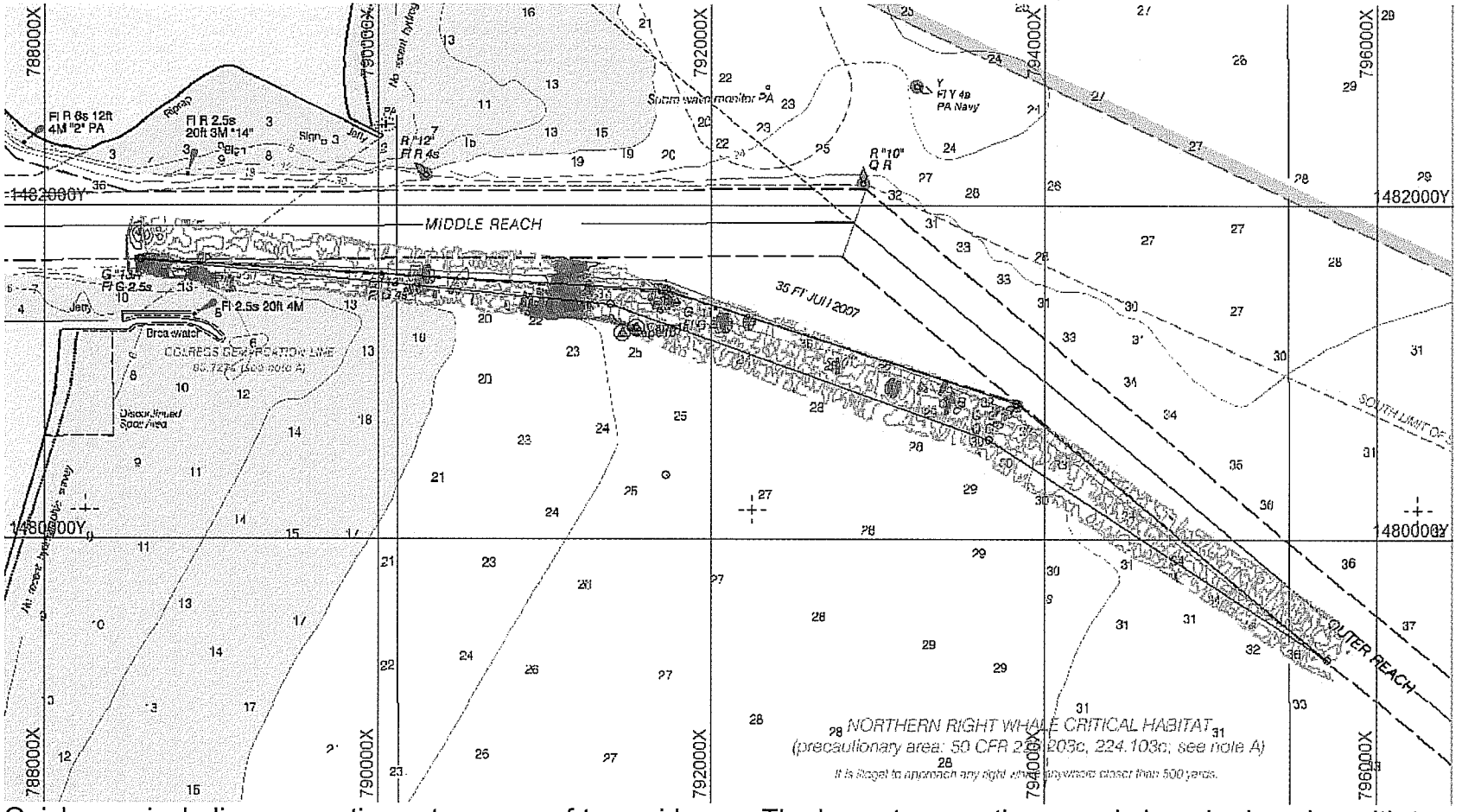


Acoustic Target Signatures Cape1a and Cape1b.



Acoustic Target Cape1a.

Acoustic Target Cape1b.



Quick map including magnetic contour map of turn widener. The largest magnetic anomaly is a dredge pipe with two anchors and mooring buoys.

Port Canaveral Improvements
Section 203 Feasibility Study
Draft Fish and Wildlife Coordination Act Report

U. S. Fish & Wildlife Service
North Florida Field Office
6620 Southpoint Drive South, Suite 310
Jacksonville, FL 32216-0958

17 September 2007

TABLE OF CONTENTS

Page

LIST OF FIGURES IV

LIST OF TABLES V

1.0 INTRODUCTION 1

2.0 AUTHORIZATION 1

3.0 PROJECT HISTORY AND SERVICE INVOLVEMENT 1

4.0 DESCRIPTION OF RECOMMENDED PLAN 1

5.0 AFFECTED ENVIRONMENT AND FISH & WILDLIFE RESOUCES 9

5.1 Biotic Communities 9

5.1.1 Uplands 9

5.1.2 Wetlands 9

5.1.3 Beaches and Dunes 11

5.1.4 Nearshore Hardgrounds 11

5.1.5 Seagrass Beds 11

5.1.6 Unvegetated Benthic Habitats 13

5.1.7 Open Water 13

5.1.8 Submerged Rock/Rip-Rap Habitats within the Port/Harbor 13

5.2 Essential Fish Habitat 14

5.3 Federally-listed Species in Project Area and Vicinity 14

5.3.1 West Indian Manatee 14

5.3.2 North Atlantic Right Whale 15

5.3.3 Southeastern Beach Mouse 15

5.3.4 Piping Plover 15

5.3.5 Sea Turtles 15

5.3.6 Eastern Indigo Snake 16

5.4 State-listed Species in Project Area and Vicinity 16

6.0 IMPACTS TO FISH AND WILDLIFE RESOURCES AND HABITATS 18

6.1 Preferred Alternative/Recommended Plan 18

6.1.1 Direct Impacts 18

6.1.2 Indirect Impacts 18

6.1.3 Cumulative Impacts 20

6.2 Other Alternatives 20

6.3 No Action Alternative 21

7.0 RECOMMENDATIONS OF THE U.S. FISH AND WILDLIFE SERVICE 21
7.1 Alternative Plans 21
7.2 Fish and Wildlife Resources and Protection/Conservation Measures 21
7.2.1 Manatees and Sea Turtles 21
7.2.2 Other Protected Species 23
7.3 Water Quality 23
8.0 SUMMARY OF POSITION OF THE U.S. FISH AND WILDLIFE SERVICE 24
9.0 LITERATURE CITED.....25

LIST OF FIGURES

Page

Figure 1: Project Location....2

Figure 2: Study Area....3

Figure 3: Recommended Plan - West....5

Figure 4: Recommended Plan - East....6

Figure 5; Land Use and Habitat Types in Project Area....10

Figure 6: Seagrass Occurence....12

Figure 7: Gopher Tortoise Burrows and Habitat....17

Figure 8: Potential Terrestrial Impacts....19

LIST OF TABLES

Page

Table 1: Project Component Acreages.....8
Table 2: Natural Upland and Wetland Communities in Project Area and Vicinity.....9

1.0 INTRODUCTION

The Canaveral Port Authority (CPA) has proposed to widen and deepen the ocean channel, interior harbor channel, and West Turning Basin of Port Canaveral, under the authority granted by Section 203 of the 1983 Water Resources Development Act (WRDA). The project is proposed in response to problems and issues identified by the CPA and Canaveral Pilots Association with regard to ship maneuvering within the existing Federal project.

2.0 AUTHORIZATION

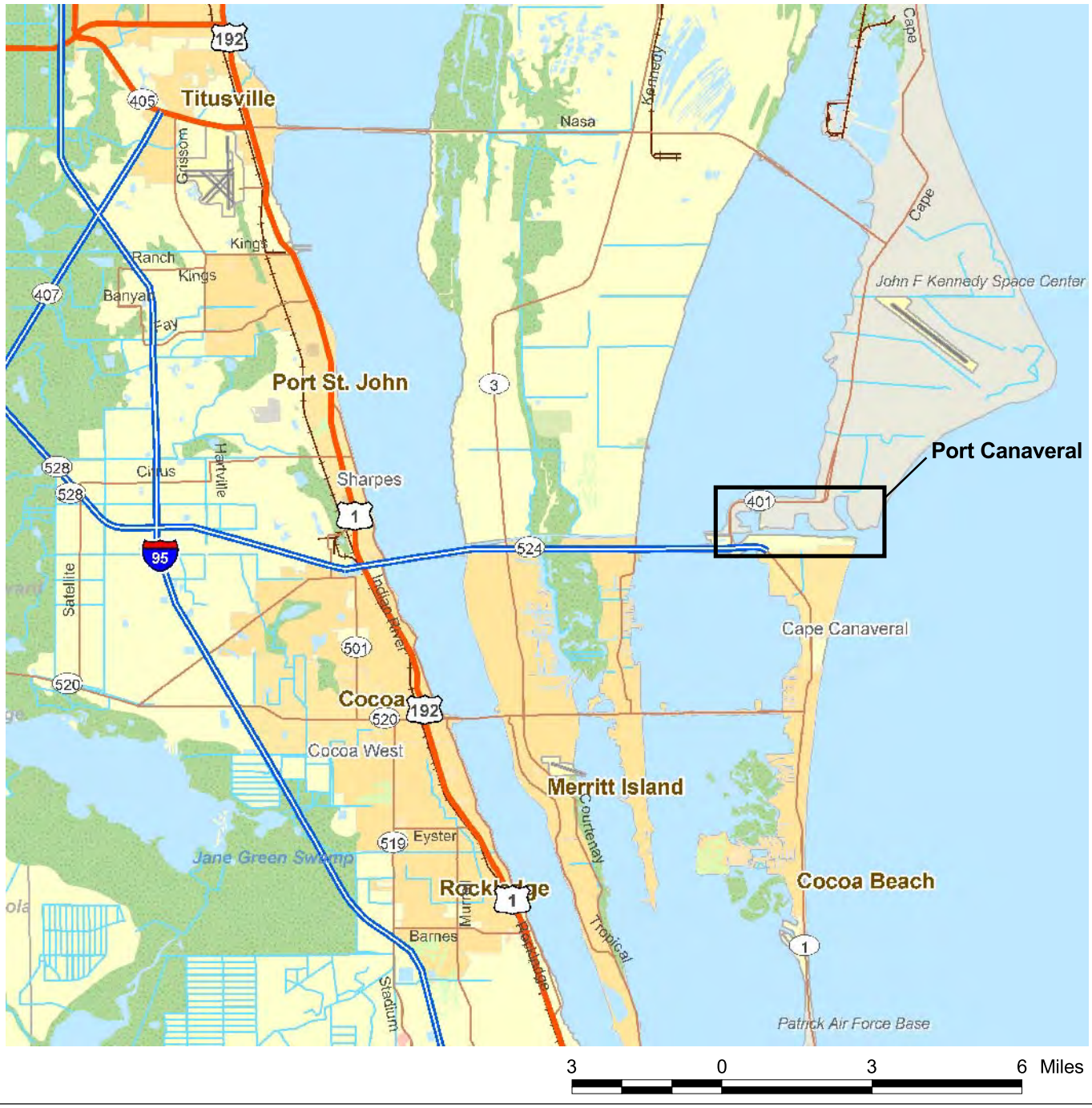
This report is submitted by the U.S. Fish and Wildlife Service (Service) in accordance with the Fish and Wildlife Coordination Act (FWCA) and constitutes the final report of the Secretary of the Interior as required by Section 2(b) of the FWCA. This FWCA Report evaluates the possible adverse effects of the proposed project on fish and wildlife resources, excluding federally listed species, and is submitted in accordance with provisions of the FWCA and the U.S. Endangered Species Act.

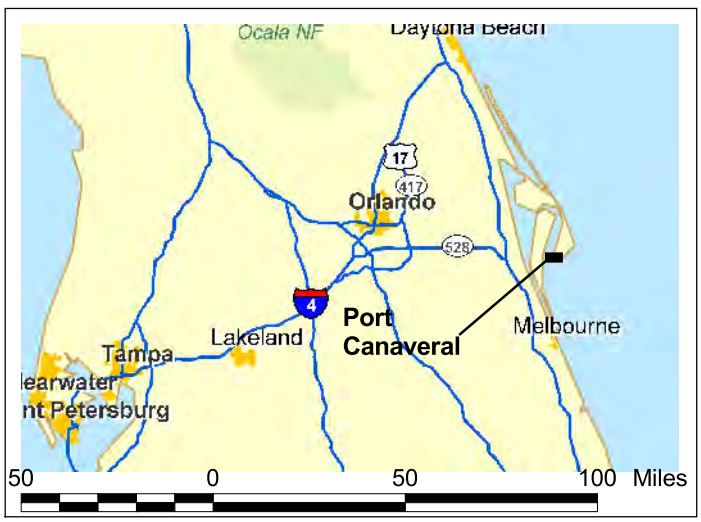
3.0 PROJECT HISTORY AND SERVICE INVOLVEMENT

The CPA and its consultants initiated coordination with the Service and NOAA Fisheries-Habitat Conservation Division on 14 December 2005 during a meeting at the FWS Jacksonville Field Office. Subsequently, the CPA initiated consultation with NOAA Fisheries-Protected Resources Division via a letter dated 14 April 2006, and with State of Florida resource agencies (i.e., Florida Department of Environmental Protection and Florida Fish and Wildlife Conservation Commission) via a letter also dated 14 April 2006. No further coordination has taken place with the Service.

4.0 DESCRIPTION OF RECOMMENDED PLAN

Port Canaveral is located in Brevard County on the east coast of Florida, approximately nine miles north of Cocoa Beach (Figure 1). The Port is orientated in an east–west direction, extending from the Banana River in the east to the Atlantic coast. The Port is bounded to the north by the Cape Canaveral Air Force Station (CCAFS) and the Banana River, and bounded on the south by the City of Cape Canaveral. The harbor consists of three turning basins (Figure 2). Starting from the east they are the Trident Turning Basin (TTB), the Middle Turning Basin (MTB), and the West Turning Basin (WTB). The basins are connected by a channel (i.e., East Access Channel, or “Inner Reach” as noted in Section 4.0; and West Access Channel) that forms the south boundary of each basin. Within this channel, a federally maintained Barge Canal extends from the south side of the MTB, through the Banana River, across Merritt Island, and connects with the Intracoastal Waterway (ICWW) system in the Indian River. Where the Barge Canal enters the Banana River, a 600-foot long Corps of Engineers’ lock (Canaveral Lock) separates the tidal harbor from the almost non-tidal river.





Project Location		
Draft Fish and Wildlife Coordination Act Report Port Canaveral, FL		
U.S. FISH & WILDLIFE SERVICE	Scale: 1 inch = 3 miles	Drawn By: MR
	Date: August 2007	Approved By: LS
	J05-850	Figure 1

0.5 0 0.5 1 Miles

Study Area		
Draft Fish and Wildlife Coordination Act Report Port Canaveral, FL		
	Scale: 1 inch = 0.5 mile	Drawn By: MR
	Date: August 2007	Approved By: LS
	J05 50	Figure 2

The CPA has identified three major problems associated with Port Canaveral, and has summarized them as follows:

1. Congestion at cargo berths reduces the effectiveness and efficiency of cargo vessels and landside facilities. Given the rapid growth in commodity movements at Port Canaveral, in the very near future a significant proportion of cargo vessels calling at Port Canaveral will have to wait offshore for a berth to become available. Some of these vessels may divert to an alternative port and incur increased transportation costs, if channels are not improved. In addition, landside facilities will stand temporarily idle as vessels wait offshore for an available berth or safe passage through the Federal channel.

2. The size of cargo vessels calling at Port Canaveral is constrained by existing channel dimensions and configurations. Larger, more efficient vessels could be used for bulk items such as petroleum products, aggregates, and cement if channels were improved.

3. The size of cruise ships calling at Port Canaveral is constrained by channel and turning basin dimensions. Increasingly larger cruise ships are calling at Port Canaveral and are beginning to exceed the dimensions for safe use of the existing West Turning Basin. Passage of large cruise ships through the narrow ship channel leading to the turning basin and cruise ship piers also causes surges at cargo piers that line the channel, which results in cargo vessels having to stop loading and unloading activities while the cruise ships pass. The potential for future cruise ship terminal expansion also cannot be fully exploited under existing channel and turning basin dimensions and configurations.

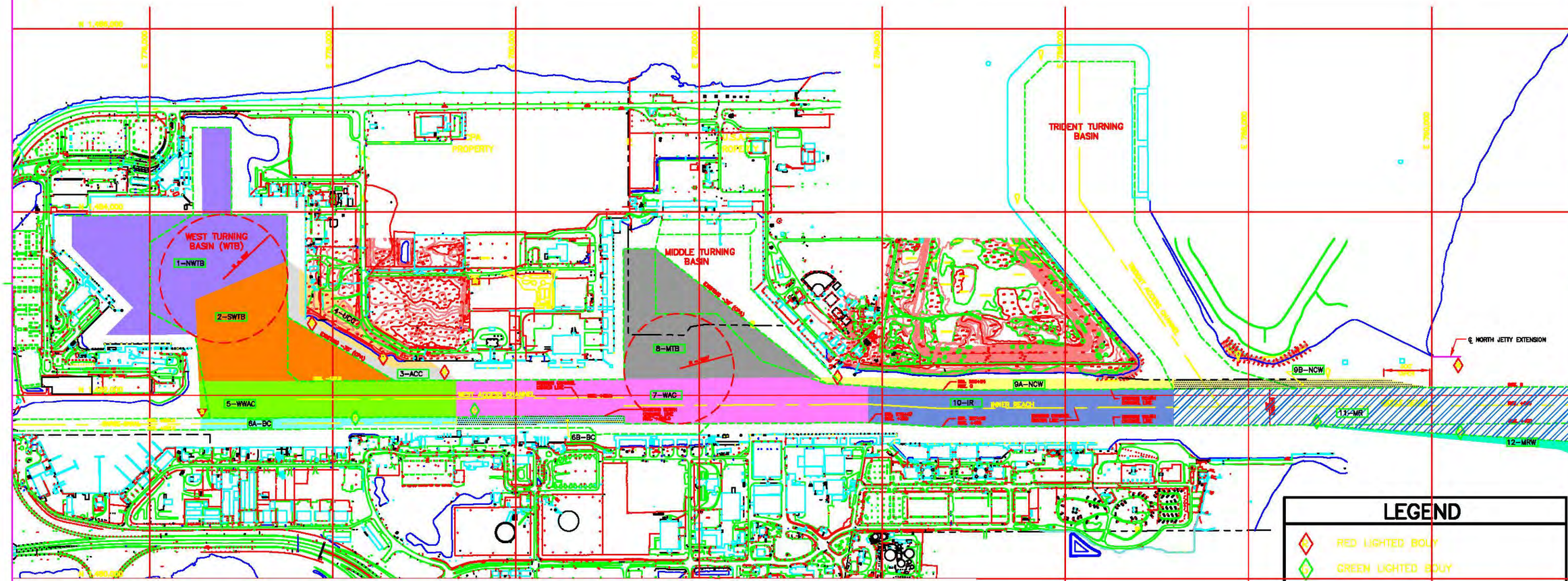
The plan proposed by the Corps and Port for alleviating the conditions above is detailed below. This description is based on Figures 3 and 4, created by CH2M Hill, the Port's engineering consultant. Maximum possible dredge depths were assumed, although the actual selected plan may involve shallower design depths. However, the plan below will be referred to in this document as the "preferred" or "recommended" plan. Component reference numbers in parentheses in the plan below refer to project elements in the aforementioned figures.

The project can generally be described as widening and deepening the Port Canaveral ocean channel, the interior harbor channel and the West Turning Basin. The design depths of the project are -46 MLW for the ocean channels, -44 MLW for the central portions of the harbor, and -43 MLW for the western portions. More specifically, proceeding east to west, the project can be broken down into ten elements as follows:

- Ocean Channel Deepening
- Ocean Channel Widening
- North Side Inner Reach Widening and Deepening
- Inner Reach Deepening
- Middle Turning Basin Deepening
- West Access Channel Deepening
- South Side West Access Channel Widening
- Existing West Access Channel Deepening
- West Turning Basin Expansion (Corner Cut-Off) and Deepening
- Addition of North West Basin to Federal Project (no Deepening)

LEGEND

- 1–NWTB MAINTAINED (M) = –35' MLLW, INCR. = 0
- 2–SWTB MAINTAINED (M) = –35' MLLW, INCR. –35' TO –43'
- 3–ACC MAINTAINED (M) = N/A, INCR. –13'/–35' TO –43' (1st INCR. –13'/–35' TO –35')
- 4–UCC MAINTAINED (M) = +10.5' MLLW, INCR. +10.5' TO –43' (1st INCR. +10.5' TO –13') (2nd INCR. –13' TO –35')
- 5–WWAC MAINTAINED (M) = –35' MLLW, INCR. –35 TO –43'
- 6A–BC MAINTAINED (M) = N/A, INCR. ACTUAL TO –35', –35' TO –43'
- 6B–BC MAINTAINED (M) = N/A, INCR. ACTUAL TO –35', –35' TO –44'
- 7–WAC MAINTAINED (M) = –39' MLLW, INCR. –39' TO –44'
- 8–MTB MAINTAINED (M) = –39' MLLW, INCR. –39' TO –44'
- 9A–NCW MAINTAINED (M) = N/A, INCR. ? TO –44', (1st INCR. ? TO –40')
- 9B–NCW MAINTAINED (M) = N/A, INCR. ? TO –46', (1st INCR. ? TO –40')
- 10–IR MAINTAINED (M) = –40' MLLW, INCR. –40' TO –44'
- 11–MR MAINTAINED (M) = –44' MLLW, INCR. –44' TO –46' (EXTENDS EAST TO STA. 53+00)
- 12–MRW MAINTAINED (M) = N/A (APPROX. –30' COE SURVEY) INCR. ?(–30') TO –46', (1st INCR. ?(–30') TO –44')
- 13–OR MAINTAINED (M) = –44' MLLW, INCR. –44' TO –48'



LEGEND

- RED LIGHTED BOUY
- GREEN LIGHTED BOUY
- LIGHTED BEACON
- EXISTING RANGE STRUCTURE
- SIGNAGE STRUCTURE
- RED DAYBEACON
- PROPOSED OUTBOUND RANGE STRUCTURE
- PROPOSED 500' CHANNEL

NOTES:

1. FLORIDA STATE PLANE COORDINATE GRID SHOWN, EAST ZONE, BASED ON NORTH AMERICAN DATUM 1983 (NAD83).
2. STATIONS AND RANGES REFER TO THE CANAVERAL HARBOR GRID SYSTEM.
3. TOPOGRAPHIC VERTICAL CONTROL IS BASED ON FEET, PORT CANAVERAL MEAN LOW WATER (MLW). HYDROGRAPHIC VERTICAL CONTROL IS BASED ON FEET, MEAN LOWER LOW WATER (MLLW).
4. MORGAN AND EKLUND, INC. COMPILED HYDROGRAPHIC AND TOPOGRAPHIC DATA FROM VARIOUS SOURCES INCLUDING THE U.S.A.C.E., CPA COMMISSIONED SURVEYS, AND MORGAN AND EKLUND, INC. SURVEYS.
5. TOPO SURVEY SHOWN ON THE UPLANDS EAST OF WEST TURNING BASIN AND EAST OF THE MIDDLE TURNING BASIN IS OBTAINED FROM THE 2003 AERIAL TOPOGRAPHY COMMISSIONED BY CPA.
6. TOPO SURVEY SHOWN ALONG THE ROCK ENBANKMENT ON BOTH SIDES OF THE TRIDENT BASIN IS FROM THE SURVEY FOR CHANNEL IMPROVEMENTS BY ALLEN ENGINEERING, INC. DATED MARCH 4, 2003.

DREDGING INCREMENTS PLAN AREAS

GRAPHIC SCALE

PRELIMINARY

NOT FOR CONSTRUCTION

DSGN	X
DR	X
CHK	X
APVD	X

NO.	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

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CAPE CANAVERAL, FLORIDA 32920
LB 0002934 AA C000656

PORT CANAVERAL

Recommended Plan
Draft Fish and Wildlife Coordination Act Report
Figure 3

DATE AUGUST 2007
PROJ J05-0650

port_dredging_increments_edit

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LEGEND

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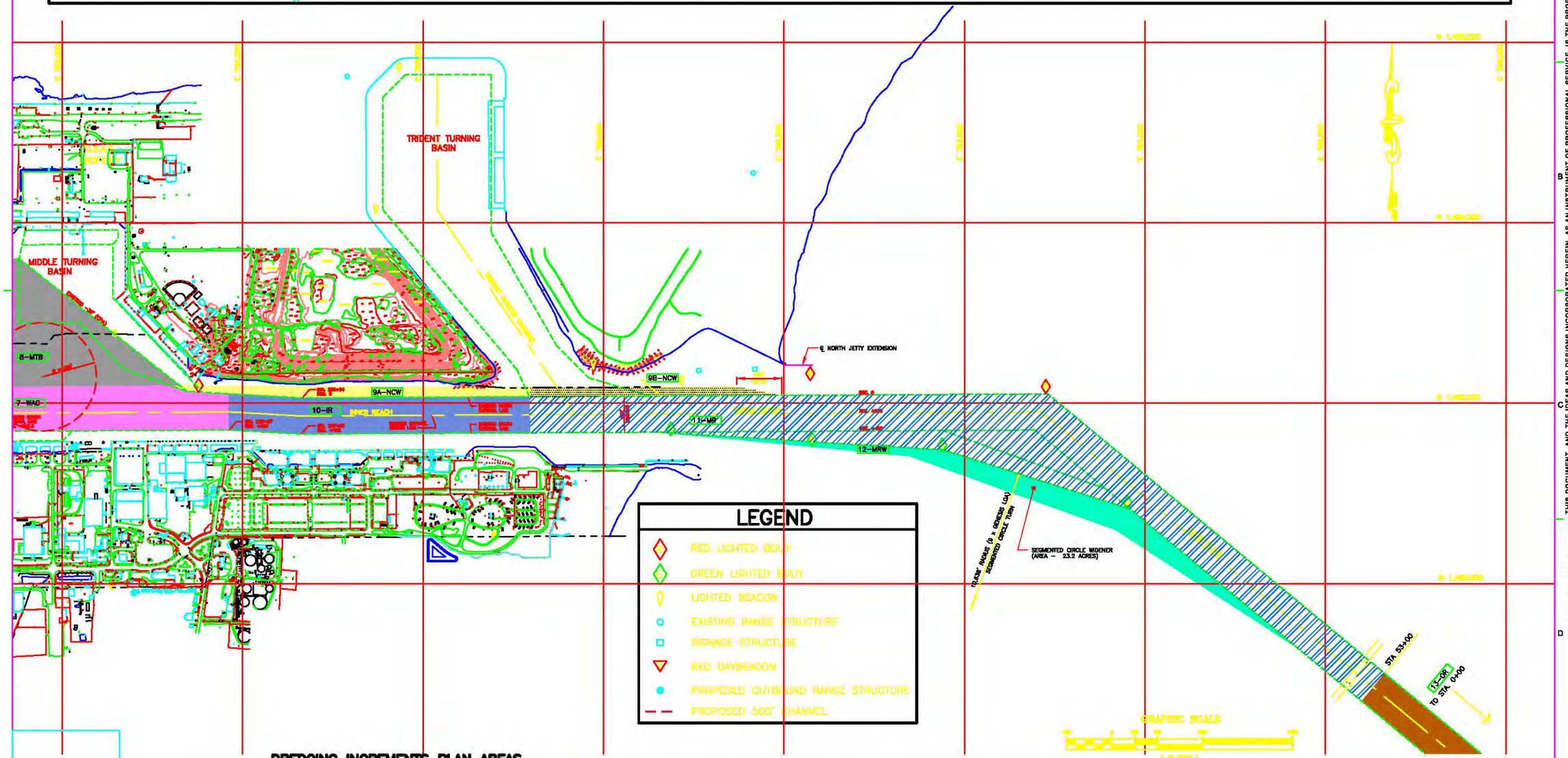

LEGEND

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- GREEN LIGHTED BOUY
- LIGHTED BEACON
- EXISTING RANGE STRUCTURE
- SIGNAGE STRUCTURE
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- PROPOSED OUTBOUND RANGE STRUCTURE
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DREDGING INCREMENTS PLAN AREAS

PRELIMINARY

NOT FOR CONSTRUCTION

DSGN	X
DR	X
CHK	X
APVD	X

NO.	DATE	REVISION	BY	APVD

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

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PORT CANAVERAL

Recommended Plan
Draft Fish and Wildlife Coordination Act Report
Figure 4

DATE AUGUST 2007
PROJ J05-0850

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Ocean Channel Deepening. The outermost ocean channel reaches will be deepened from -44 MLW to -48 MLW [Component 13-OR, in Figure legend but abbreviated on plan].

Ocean Channel Widening. The ocean channel widening is approximately 8,350 feet long and is located entirely on the south side of the channel centered on the bend before entering the harbor. This portion is essentially a widening of the interior angle of the bend [Component 12-MRW]. The widening is variable in width to a maximum of 350 feet wide and tapers on both ends. The dredging area for the widener is approximately 34 acres. The existing grade is approximately -30 MLW where the widener will be expanded, and the channel reaches immediately adjacent to it are currently authorized at -44 MLW [Component 11-MR]. The bend and adjacent channel reaches will all be dredged to -46 MLW.

North Side Inner Reach Widening and Deepening. The north side inner reach widening is an approximately 6,700-foot-long strip along the north side of the harbor channel from just east of the entrance of the Trident Turning Basin to the southeast corner of the Middle Turning Basin [Components 9A-NCW and 9B-NCW]. This portion of the project basically effects a widening of the channel from 400 feet to 500 feet along a natural, rock revetment shoreline. The dredging area is approximately 110 feet wide with tapered ends. The dredging area is approximately 16 acres. The existing grade slopes from Elevation -40 MLW to +10 MLW. Proposed depth is -44 MLW.

Inner Reach Deepening. The inner reach will be dredged from -40 MLW to -44 MLW [Component 10-IR].

Middle Turning Basin Deepening. The Middle Turning Basin will be dredged from -39 MLW to -44 MLW [Component 8-MTB].

West Access Channel Deepening. The west access channel (adjacent to the Middle Turning Basin) will be deepened from -39 MLW to -44 MLW [Component 7-WAC].

South Side West Access Channel Widening. The south side west access channel widening is approximately 4,620 feet long and lies along the south side of the harbor channel along the predominantly commercial and retail business portion of the Port [Components 6B-BC and 6A-BC]. This area is presently the east end of the barge canal and is not included in the Corps of Engineers or Canaveral Port Authority dredging programs. The proposed project will extend the Federal project to the south into this barge canal area, i.e., widening the channel from 400 feet to 500 feet, through to the point even with the southwest corner of the West Turning Basin. The area comprises two end-to-end rectangular areas 90 feet and 175 feet wide each, together encompassing 13 acres. The area slopes from an average low elevation of -16 MLW to an average high elevation of -34 MLW. Dredging to -44 MLW (east section) and -43 MLW (east section) is proposed.

Existing Western West Access Channel Deepening. The existing west access channel deepening is at the west end of the channel and the western limit for cruise and cargo shipping. The area is approximately 2,810 feet long and 400 feet wide (the current channel width), and approximately 26 acres in size [Component 5-WWAC]. This area is maintained by the Canaveral Port Authority to elevation -35 MLW. Dredging to the -43 MLW elevation is proposed.

West Turning Basin Expansion (Corner Cut-Off) and Deepening. The West Turning Basin expansion (corner cut-off) and deepening encompasses the entire basin in two parts defined by required depth. The lower (southerly) approximate one-half of the basin is proposed to be maintained at -43 MLW to accommodate cargo vessels [Components 2-SWTB, 3-ACC, and 4-UCC]. This area is approximately 52 acres. Approximately seven acres of this area is undeveloped upland area with a natural shoreline [Component 4-UCC]. A new turning basin will be formed superimposing a 1,750-foot turning diameter across the entrance of the WTB, which is required for new, larger cruise ships proposed to utilize the WTB. Dredging the submerged areas from that range in depth from -13 and -35 MLW to -43 MLW is proposed.

Addition of North West Basin to Federal Project. The remaining northerly part of the WTB [Component 1-NWTB] is approximately 57 acres in size with its borders defined as 100 feet offset from any berthing pier and 200 feet offset from any industry, and does not require greater than a -35 MLW elevation at this time. The Canaveral Port Authority currently maintains this area at elevation -35 MLW. This area does not represent new project dredging and is simply proposed to shift to Federal maintenance at the same -35 MLW elevation.

Material Disposal. All dredged material will be placed in the authorized Canaveral Offshore Dredged Material Disposal Site (ODMDS), which is centered 4.5 miles offshore of Cocoa Beach.

Mitigation. No compensatory mitigation for impacts to habitats or fish and wildlife has been proposed.

The following summary table is for dredging the entire project to elevations as described above. All areas are approximate and based on Morgan and Ecklund (2007).

Table 1: Project Component Acreages

PROJECT COMPONENTS	AREA acres)
13-OR	201
12-MRW and 11-MR	165
10-IR	31
9A-NCW and 9B-NCW	16
8-MTB	40
7-WAC	46
6B-BC and 6A-BC	11
5-WWAC	26
2-SWTB, 3-ACC, and 4-UCC	53
1-NWTB	0
TOTAL*	**587**

*area calculated based on toe-of-slope to toe-of-slope

5.0 AFFECTED ENVIRONMENT AND FISH & WILDLIFE RESOUCES

5.1 Biotic Communities

5.1.1 Uplands

Uplands in the project area include developed and undeveloped areas. Upland communities not considered natural communities make up the vast majority of the study area. These land use categories include those land uses normally associated with port facilities such as industrial and upland spoil disposal areas.

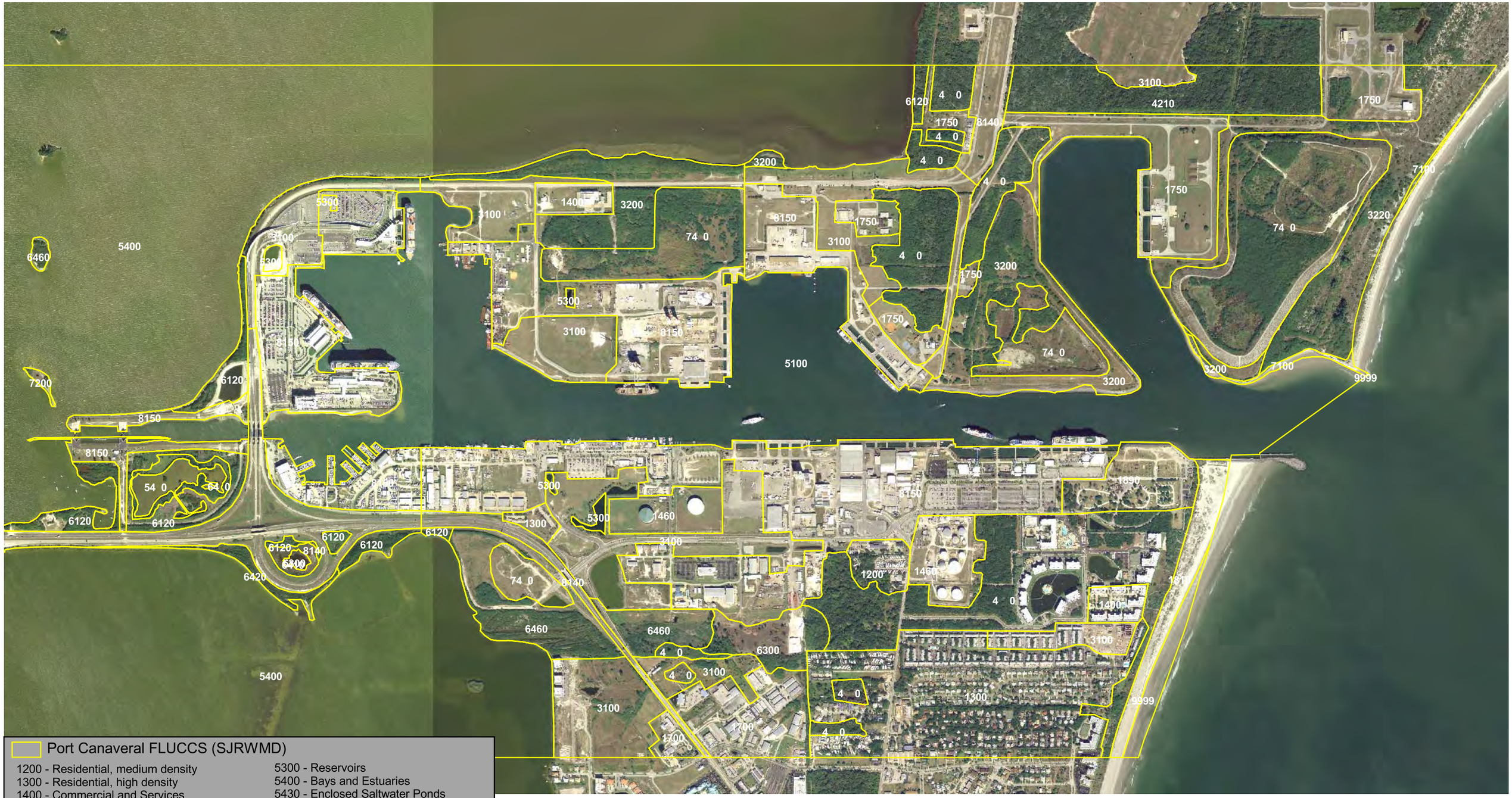
Natural upland communities within the study area are limited. There are a few isolated areas containing mixed hardwoods and conifers (Florida Land Use Cover and Forms Classification System, or "FLUCFCS" code 4340, as seen in **Figure 5**) including slash pine (*Pinus elliottii*), scrub oaks (*Quercus* spp.), Australian pine (*Casuarina equisetifolia*), Brazilian pepper (*Schinus terebenthifolius*), and cabbage palm (*Sabal palmetto*) within the study area. Areas of herbaceous rangeland (FLUCFCS 3100) and shrub and brushland (FLUCFCS 3200) are more common and may be occasionally inundated by water, but not enough to lead to hydric soils. They contain typical coastal grasses, sedges, rushes, and herbaceous species such as *Panicum* spp., natal grasses, clovers, and wiregrass (*Aristida stricta*). Saw palmetto (*Serenoa repens*) is also found scattered throughout this vegetative community (Dial Cordy and Associates 2006a). Table 2 provides a list and description of natural upland (as well as wetland) land cover for the study area.

Table 2: Natural Upland and Wetland Communities in Project Area and Vicinity

	LAND USE CATEGORY	HABITAT DESCRIPTION
Natural Upland Communities	3100	Herbaceous Rangeland
	3200	Shrub and Brushland
	4340	Mixed Hardwood-Conifer
Natural Wetland Communities	6120	Mangrove Swamp
	6300	Mixed Wetland Forest
	6420	Saltwater Marsh
	6460	Treeless Hydric Savanna

5.1.2 Wetlands

Wetland habitats within the study area are limited primarily to the western perimeter adjacent to the ICWW (Figure 5; Table 2). These wetlands are either mangrove swamps comprising white and black mangroves (FLUCFCS 6120), Brazilian pepper (FLUCFCS 6300), or saltwater marsh habitat (FLUCFCS 6420) vegetated with cordgrass (*Spartina alternifolia*), needlerush (*Juncus roemerianus*), saltgrass (*Distichlis spicata*), and other salt-tolerant species. Treeless hydric savannah (FLUCFCS 6460) occurs south of the Port facilities and is dominated by wiregrass and cutthroat grass (*Paspalum abscissum*) (Dial Cordy and Associates 2006a).



Land Use and Cover in Study Area	
Draft Fish and Wildlife Coordination Act Report Port Canaveral, FL	
Scale: 1 inch = 0.25 mile	Drawn By: MR
Date: August 2007	Approved By: LS
J05-850	Figure 5

5.1.3 Beaches and Dunes

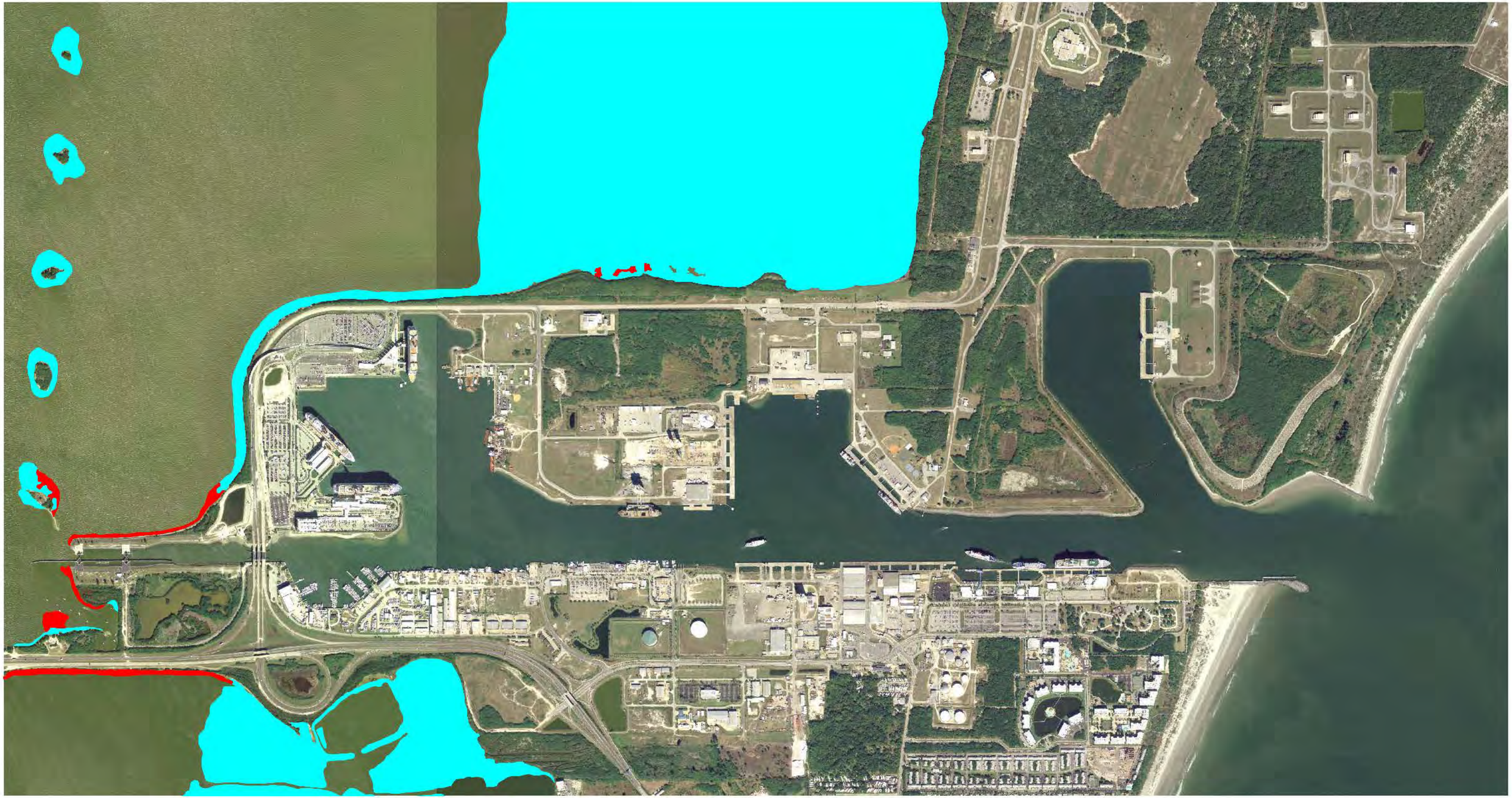
The high-energy beach is a challenging environment for animal and plant life. Species diversity is typically low, although species adapted to sandy beaches may be highly abundant. Typical beach fauna in the proposed project area includes the mole crab (*Emerita talpoida*), surf clam (*Donax variabilis*) and ghost crab (*Ocypode quadrata*). These and other beach infauna provide forage for a wide variety of shorebirds such as plovers (*Charadrius* spp.), willets (*Catoptrophorous semipalmatus*), and ruddy turnstones (*Arenaria interpres*). Drift algae and sargassum stranded on the beach may support large numbers of insects and other invertebrate life. As elevation increases, conditions become less severe for the establishment of plant life. Tendrils of various plants extend down the beach, notably the beach morning glory *Ipomoea pes-capre*. As the dune crest is approached, other salt tolerant plants are found such as sea oats (*Uniola paniculata*), sea rocket (*Cakile* sp.) and beach elder (*Iva imbricata*) (Dial Cordy and Associates 2006a). Sparsely vegetated beaches are preferred nesting habitat for the least tern (*Sterna antillarum*), listed as a threatened species by the State of Florida. The sea oat zone high on the dune provides habitat for another threatened species, the southeastern beach mouse (*Peromyscus polionotus niveiventris*). Beaches in Brevard County also provide nesting habitat for sea turtles.

5.1.4 Nearshore Hardgrounds

Continental Shelf Associates Inc. ("CSA" 1989) previously identified a well-developed line of rock outcroppings running approximately 10 miles from Patrick Air Force Base (R-59) south to Paradise Beach Park (R-110). The rock had low relief at the northern and southern ends, with well-defined ledges of 2-3 feet of vertical relief in the middle between R-78 and R-93 (USACE 1996). The rock outcrops comprise lithified coquina rock of the Pleistocene Anastasia Formation (CSA 1989). The coquina rock provides a substrate for the sabellariid polychaete worm *Phragmatopoma lapidosa*. These sabellariid worm reefs provide important functions of dissipating and absorbing wave energy, thus, giving the shoreline some protection against erosion, and providing habitat for marine organisms. In the nearshore area off Brevard County, worm rock ranges from large, dense patches to small, isolated patches along the sides of rock ledges. It was estimated that worm rock composes approximately 5-10 percent of the 32 acres of rock outcrop in the nearshore area of Brevard County. The rock and worm rock reefs provide habitat for a number of crustaceans, fish, macroalgae, sponges, and other invertebrates. The most recent comprehensive study of the nearshore habitat along Brevard County was conducted by CSA (1989) and provides detailed species list.

5.1.5 Seagrass Beds

No seagrass has been identified within the harbor or ocean channel, but there are some shallower areas where they may exist. The waters west of the Port in the Banana River State Aquatic Preserve support large areas of, and small, isolated patches of, seagrass adjacent to upland islands or other physical structures (Figure 6).



Indian River Lagoon Seagrass (FDEP/FMRI, 1999)
Patchy Seagrass Coverage
Continuous Seagrass Coverage

0.25 0 0.25 0.5 Miles

Seagrass Occurence Map		
Draft Fish and Wildlife Coordination Act Report Port Canaveral, FL		
U.S. FISH & WILDLIFE SERVICE	Scale: 1 inch = 0.25 mile	Drawn By: MR
	Date: August 2007	Approved By: LS
	J05-850	Figure 6

5.1.6 Unvegetated Benthic Habitats

Oceanic Nearshore. Unvegetated benthic habitats with sandy substrates occur along most of the nearshore area not occupied by worm rock habitat. Substrates predominately comprise medium to fine grain sands and may provide habitat for a variety of benthic organisms including annelids, bivalves, and gastropods such as penaeid shrimp (e.g., *Panaeus setiferus*), box crabs (*Hepatus epheliticus*), and seastars (*Luidia clathrata*).

Harbor and Channel. Sediments with the Port have been characterized in recent years; the most recent study (Anamar 2005) evaluated sediments within the West Turning Basin and entrance channel for disposal at the offshore dredged material disposal site (ODMDS). Sediments in the harbor and channel comprised mainly sand or silt/clay, with small amounts of gravel.

Inshore Waterways. The shallow, softbottom, unvegetated communities of the ICWW and Banana River house benthic communities interspersed with macrophytic algae. Common in such inshore, softbottom communities are macro-algae species such as *Caulerpa* sp., *Udotea* sp., *Penicillus* sp., *Halimeda* sp., *Dictyota* sp., and *Padina* sp. The most common fauna within these communities consist of several taxa of polychaete worms, oligochaetes, mollusks, sipunculans, peracarid crustaceans, platyhelminthes, and nemerteans.

5.1.7 Open Water

Surface water resources within the study area consist of marine and estuarine systems. The inshore waters are classified by the State of Florida as Class II Waters. Aquatic preserves are designated as Class II waters, and include the Banana River Aquatic Preserve and the Merritt Island National Wildlife Refuge. Class II waters are suitable for shellfish harvesting in addition to uses approved under Class III waters designation (recreation and propagation of fish and wildlife resources).

The open waters of the harbor serve as migratory habitat for the West Indian manatee to traverse from the Atlantic coastal waters to the Banana River, which provides foraging and sanctuary for the species. Sea turtles also are known to transit through the harbor's waters.

5.1.8 Submerged Rock/Rip-Rap Habitats within the Port/Harbor

The riprap along the channel walls on the northern boundary of the Port provides excellent foraging habitat for juvenile sea turtles. The 980 meters of riprap located between the Middle and Trident Turning Basins, in particular, appears to be heavily used for foraging. In surveys conducted in late August 2005 and February 2006, 200 and 111 individuals, respectively, were observed foraging along this portion of the harbor (Dial Cordy and Associates 2006a). The highest number of juvenile sea turtles observed at any other location during these surveys was nine, at a 266-meter stretch of riprap along the south side of the channel at Jetty Park. One of the unusual features of the riprap between the Middle and Trident Turning Basins is the diverse algal community on the riprap. A study is currently underway to characterize the algal makeup of the harbor.

5.2 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". Only species managed under a Federal fishery management plan (FMP) have habitats designated as EFH (50 C.F.R. 600). The act requires Federal agencies to consult on activities that may have direct (*e.g.*, physical disruption) or indirect (*e.g.*, loss of prey species) adverse influence on EFH. Said adverse activities on EFH may be site-specific or habitat-wide, and must be evaluated individually and cumulatively.

The South Atlantic Fisheries Management Council, or “SAFMC”, has designated seagrass, unvegetated sand bottom, nearshore hardbottom, offshore reef, and water column as EFH (SAFMC 1998). The seagrass habitats of South Florida have also been designated as Habitat Areas of Particular Concern (EFH-HAPC), and the nearshore bottom and offshore reef habitats of Central Florida have also been designated as Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPC).

Essential fish habitats that will be impacted by the proposed project include unvegetated sand substrates and the water column. NOAA Habitat Conservation Division may request further coordination with the applicant regarding impacts to EFH and any necessary compensatory mitigation.

5.3 Federally-listed Species in Project Area and Vicinity

5.3.1 West Indian Manatee

The Federal government has recognized the threats to the continued existence of the West Indian manatee (*Trichechus manatus*) manatee for nearly 40 years. The manatee was first listed as an endangered species in 1967 under the Endangered Species Preservation Act of 1966 (16 U.S.C. 668aa(c)) (32 FR 48:4001). The Endangered Species Conservation Act of 1969 (16 U.S.C. 668aa(c)) continued to recognize the West Indian manatee as an endangered species (35 FR 16047), and the West Indian manatee was also among the original species listed as endangered pursuant to the Endangered Species Act of 1973. Manatees are also protected under the provisions of the Marine Mammal Protection Act of 1972 (MMPA), as amended (16 U.S.C. 1361 et seq.) and have been protected by Florida law for over a century (since 1892).

Brevard County is one of the most utilized areas in Florida by manatees due to the presence of a warm water refuge and abundant foraging opportunities. Within Brevard County, manatees frequently use waters within or near the study area including the Banana River and Intracoastal Waterway, especially during the spring and fall. Brevard County also has one of the highest manatee mortality rates in the state due to the high concentration of manatees combined with the popularity of recreational boating along the eastern coast of Florida (Dial Cordy and Associates 2006a).

Details pertaining to the West Indian manatee will be further discussed under ESA Section 7 consultation with the applicant.

5.3.2 North Atlantic Right Whale

The “Southeastern U.S. Critical Habitat Area” for the endangered North Atlantic right whale (*Balaena glacialis*) extends from Sebastian Inlet, Florida (at the Brevard and Indian River county line) to the Altamaha River estuary in Georgia. Details pertaining to the right whale may be further addressed by the NOAA/Protected Species Division under separate cover (i.e., via ESA Section 7 consultation).

5.3.3 Southeastern Beach Mouse

The southeastern beach mouse (*Peromyscus polionotus neveiventris*) is listed as threatened. Beach mice primarily use coastal dune communities, frequently comprising sea oats (*Uniola paniculata*), for habitat. Grasslands and open sandy areas in the fore-dune area may also be utilized (Humphrey 1992). This subspecies was originally endemic to coastal dunes along the Florida coast from Ponce Inlet (Volusia County) to Hollywood Beach (Broward County). Decline in beach mouse populations has been attributed to loss of habitat due to coastal development and beach erosion. Southeastern beach mice were recently identified at CCAFS north of Port Canaveral in association with the North Jetty Permanent Sand-Tightening Project (Dynamac 2002).

Details pertaining to the southeastern beach mouse will be further discussed under separate cover (i.e., ESA Section 7 consultation) with the applicant.

5.3.4 Piping Plover

The piping plover (*Charadrius melodus*) is a threatened migratory shore bird protected under the Migratory Bird Treaty Act as well as the ESA. Piping plovers migrate to the Florida coast in September and are found through March, and nest on open sand, gravel, or shell-covered beaches above the high tide line and are often found on the accreting ends of barrier islands and along coastal inlets (USFWS 1995). Foraging areas include intertidal beaches, mudflats, sandflats, lagoons, and salt marshes, where they feed on invertebrates such as marine worms, insect larvae, crustaceans, and mollusks. Within Brevard County piping plovers have been observed along beaches (Dial Cordy and Associates 2006a).

5.3.5 Sea Turtles

Five species of sea turtle are found in the waters offshore of Brevard County, and of these, three have been documented as nesting on County beaches. The loggerhead (*Caretta caretta*) is responsible for the vast majority of the nesting in Brevard County, although data suggest increasing numbers of green (*Chelonia mydas*) and leatherback turtles (*Dermochelys coriacea*) nesting statewide. The green sea turtle and leatherback sea turtle are both listed under the U.S. Endangered Species Act, 1973 and Chapter 370, F.S. The loggerhead turtle is listed as a threatened species.

Sea turtles use the habitats offshore of Brevard County to different degrees during different stages of their life cycle. During the summer months hatchlings utilize this habitat as a corridor to deeper waters farther off the coast. Juvenile and sub-adult turtles use the offshore habitats as a foraging area and to travel to inshore areas, while adult turtles are present year round with seasonally high abundances during the breeding season.

Details pertaining to sea turtles may be further addressed by the NOAA/Protected Species Division under separate cover (i.e., via ESA Section 7 consultation).

5.3.6 Eastern Indigo Snake

The eastern indigo snake (*Drymarchon corais couperi)* is listed as threatened. Its range includes all Florida and southeast Georgia. Individuals occur in hardwood forests, moist hammocks, pine flatwoods, prairies, and around cypress ponds. Because it seeks refuge in gopher tortoise burrows in some parts of Florida the indigo is also called the "gopher snake." The habitat identified as gopher tortoise habitat (see below) is one of the habitats in the project area where this subspecies may be found, although none have been reported from the area.

5.4 State-listed Species in Project Area and Vicinity

The gopher tortoise (*Gopherus polyphemus*) is listed as a species of special concern by the State of Florida. This tortoise utilizes sandy, well-drained habitats including dunes, scrub, and pine flatwoods, although it has been noted to occupy poorly drained habitat in Brevard County. Habitat within the study area suitable for gopher tortoise utilization is limited to areas north of the harbor within the CCAFS. A recent survey (Dial Cordy and Associates 2006b) reported four burrows on the CCAFS between the Middle and Trident Turning Basins (50% of habitat was surveyed utilizing random pedestrian transects); see Figure 7.

The least tern (*Stern antillarum*) is a small member of the gull family (Laridae), listed by Florida as a threatened species and protected federally under the Migratory Bird Treaty Act. Least terns breed along the east coast of the United States from Massachusetts to Florida, with the Florida populations returning each year in April. The breeding season lasts through the summer. Least terns traditionally choose open sandy substrates to form breeding colonies. Least terns forage along coastal areas feeding on small fishes, as well as some crustaceans and insects. Within Brevard County least terns are known to nest on sandbars and spoil areas along the coastal area.

Gopher Tortoise Borrow Location
Gopher Tortoise Survey
Suitable Gopher Tortoise Habitat
Surveyed Area

0.25 0 0.25 0.5 Miles

Gopher Tortoise Burrows and Habitat	
Draft Fish and Wildlife Coordination Act Report Port Canaveral, FL	
Scale: 1 inch = 0.25 mile	Drawn By: MR
Date: August 2007	Approved By: LS
J05-850	Figure 7

6.0 IMPACTS TO FISH AND WILDLIFE RESOURCES AND HABITATS

6.1 Preferred Alternative/Recommended Plan

6.1.1 Direct Impacts

Direct impacts associated with the preferred alternative include possible impacts to both fish and wildlife and their habitats.

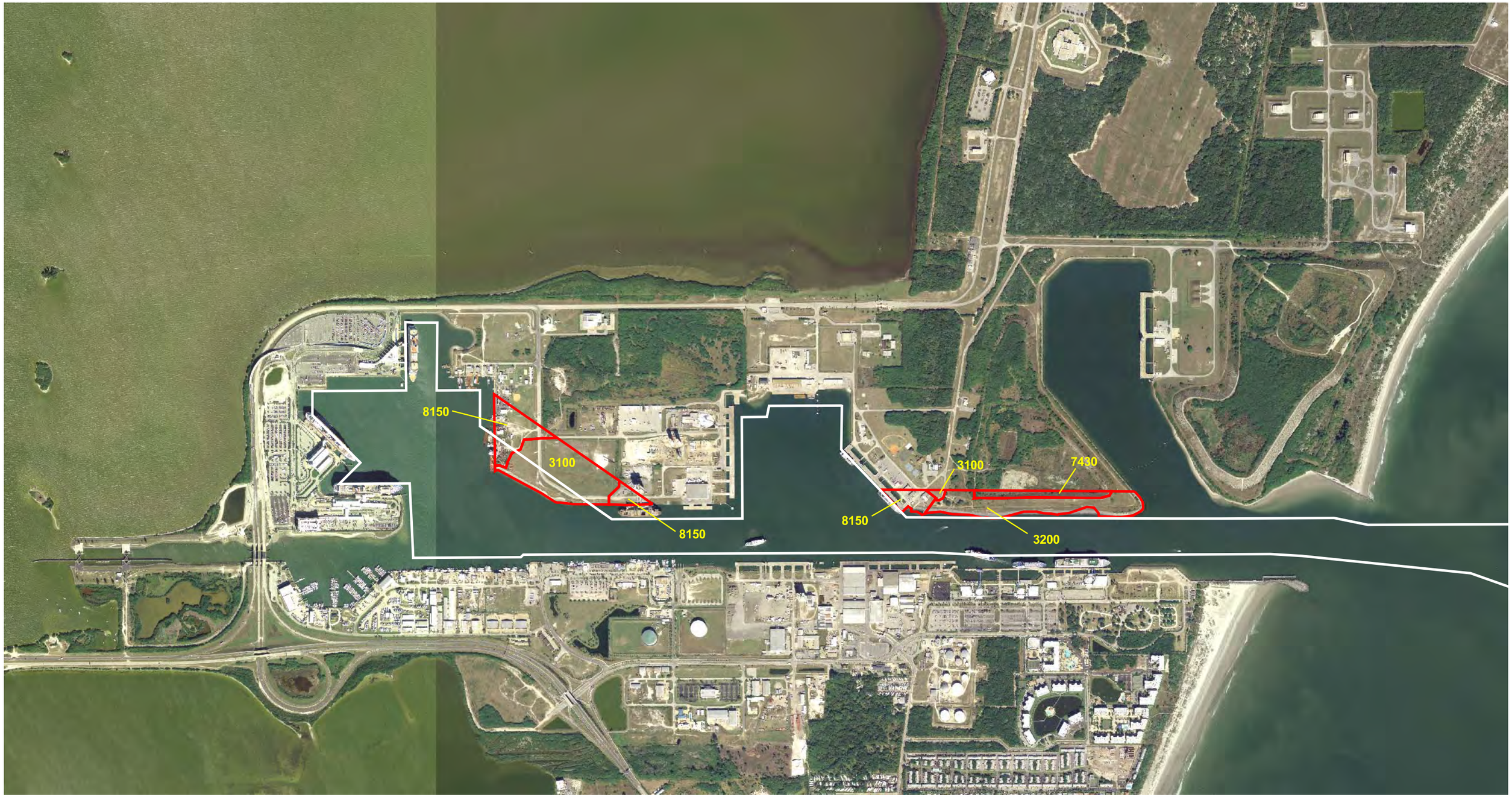
Marine habitats. Over 600 acres of reportedly unvegetated benthic habitats will be impacted within the harbor/port and offshore from the Port. These impacts will remove benthic infaunal communities as well as invertebrate communities residing on marine substrates. These communities are important as forage sources for more mobile marine species. The Service also suspects that there may be some seagrass in shallower portions of the Port that could also be affected by the proposed construction, but no such areas have been identified. Other direct impacts in the marine environment include rock/rip-rap habitats providing forage resources (algae) on the north side of the inner channel between the Trident Basin and the Middle Turning Basin. These algal communities are important for small fishes and invertebrates as well as the sea turtles that are known to feed on the algae. Finally, impacts to water quality will be apparent within the immediate dredging areas, and are likely to occur outside designated areas. Phytoplankton productivity will be decreased in the dredge areas and wherever turbidity occurs.

Terrestrial habitats. Up to 44.5 acres of direct impacts to terrestrial habitats may be incurred as a result of the proposed plan (see Figure 8). The most notable of these impacts is to habitat that is, or has been, utilized by gopher tortoises to the west of the entrance to the Trident Turning Basin.

Fish & Wildlife. Marine construction projects involve risks of direct impacts (i.e., death, injury, or harassment) to larger, slower moving species, such as sea turtles and manatees that may be present in the vicinity of construction vessels, equipment, and operations. The Service and NOAA-Protected Species Division will address possible impacts to these species through ESA Section 7 coordination in other correspondence. Direct impacts to other wildlife and fish also include the possible death or injury to individuals during construction activities and/or the temporary displacement of individuals of more motile species. Species that could be impacted include sharks, rays, various other fishes, and invertebrates. As noted above, gopher tortoises could be directly impacted. In addition, those species known to use their burrows such as the eastern indigo snake could be killed or injured.

6.1.2 Indirect Impacts

Indirect, or secondary, impacts/effects are those impacts that are reasonably foreseeable and caused by a project, but occur at a different time or place. One such impact due to the proposed project could involve temporary decreases in water quality, i.e., turbidity plumes, that may affect nearby seagrass beds. Sparse seagrass beds have been located immediately to the west of the Port near the barge canal in the Banana River.



Proposed Project Footprint
Port Canaveral Potential Terrestrial Impacts

3100 - Herbaceous (23.1 ac.)
3200 - Shrub and Brushland (17.2 ac.)
7430 - Spoil Areas (4.2 ac.)
8150 - Port Facilities (15.3 ac.)

0.25 0 0.25 0.5 Miles

Potential Terrestrial Impacts		
Draft Fish and Wildlife Coordination Act Report Port Canaveral, FL		
U.S. FISH & WILDLIFE SERVICE	Scale: 1 inch = 0.25 mile	Drawn By: MR
	Date: August 2007	Approved By: LS
	J05-850	Figure 8

Suspended material that settles on seagrasses not only affects the grasses themselves, but the entire community including periphyton, zooplankton, and macroinvertebrates and small fishes that use that habitat for food, cover, and breeding purposes. Furthermore, seagrass zones comprise important foraging resources for many fishes and protected species, including sea turtles and manatees. Although the nearest marine hardgrounds are over 15 km to the south (CSA 1989), an extreme uncontrolled release of silty dredged material could result in a turbidity plume that could be driven by currents even that far.

Indirect effects may also include growth-inducing effects and other effects related to changes in the pattern of land or water use, and related effects on natural systems, including ecosystems. A growth-inducing impact could occur if the proposed project could foster economic development or additional overland or seafaring traffic, either directly or indirectly, in the immediate or surrounding environment. A project may have some (or many) characteristic(s) that may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. In the case of the recommended plan, there is potential for the transit of additional ships, and larger ships, to call at the Port, as well as for additional infrastructure to be constructed at the Port and nearby areas to service additional barges, cargo, tourists, workers, etc. For example, it is likely that the spoil area and associated road just north of the impact area between the Trident Basin and Middle Turning Basin will be moved to the north, which may involve new impacts to previously undeveloped lands. Finally, the use of additional and larger ships at the Port could increase the risk of impacts to water quality and protected species and other fish and wildlife in the Port and offshore areas.

6.1.3 Cumulative Impacts

Under the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.), a “cumulative impact” is “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions…Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7). The cumulative impact of the proposed construction should be considered in light of deepening and widening other channels in the vicinity and other work producing similar direct and indirect impacts on the environment. Cumulative impacts include the risk of death, injury, or harassment to endangered and threatened species, habitat effects (such as sedimentation), especially to Essential Fish Habitats, and impacts to coastal terrestrial habitats (e.g., those occupied by gopher tortoises or eastern indigo snakes).

6.2 Other Alternatives

The CPA has proposed no *construction* alternatives other than the Preferred Alternative/Recommended Plan. The CPA asserts that all components of the Preferred Alternative are necessary; i.e., the elimination of any component would make all others futile. In lieu of the preferred alternative, there may be some operational and logistical changes, the nature of which have not been disclosed to the Service, that would have to occur to maintain status quo at the Port.

6.3 No Action Alternative

Without implementation of the recommended plan, no deepening or widening of channels or turning basins would occur. There would be no direct impacts to benthic habitats in the Port channels or basins (substrates would remain undisturbed the natural growth and recruitment of benthic infauna would result), no impacts to upland shrub/brushland habitat, and no impacts to rock/rip-rap habitats. Gopher tortoise/indigo snake habitat, and sea turtle foraging habitats would remain intact. Without dredge-related activities, water quality would be maintained at current/normal levels, and benthic and water column productivity would not hindered by turbidity. If the proposed construction were not carried out, there would be no increased risk to direct impacts to sea turtles, manatees and other marine mammals, or other sea life.

7.0 RECOMMENDATIONS OF THE U.S. FISH AND WILDLIFE SERVICE

7.1 Alternative Plans

The Service recommends that the Corps act on the following general recommendations regarding the proposed project:

1. The Service recommends that operational alternatives be developed in the absence of construction alternatives, such that they can be evaluated for feasibility. Alternative plans could be found to be useful toward furthering the goals of the project, but would also avoid and minimize all risk and harm to fish and wildlife resources.

2. Dredge depth, overdredge, and dredge error should be minimized wherever possible, to decrease the risk of turbidity outside the project area and to decrease the time of construction, during which protected species may be at risk in the Port.

3. If construction or operational alternatives are not practicable, and the “No Action Alternative” is not feasible, the Service recommends that only the previously authorized maintenance dredging be carried out, rather than more impactful alternatives.

4. Contractors must monitor tidal cycles and possible discharge/silt plumes to ensure that impacts to habitats outside the immediate vicinity of the project are avoided.

7.2 Fish and Wildlife Resources and Protection/Conservation Measures

7.2.1 Manatees and Sea Turtles

Direct Impacts. Potential for impacts to marine mammals, including manatees and dolphins, and sea turtles exist with the proposed work. To reduce the risk of death, injury, or harassment of these animals, it is recommended that the CPA, Corps, and Contractors observe recommendations outlined in ESA Section 7 consultation with NOAA-Protected Species Division and the Service, as well as the following provisions:

5. The contractor will instruct all personnel associated with construction of the project about the possible presence of sea turtles and/or manatees in the project area and the need to avoid contact with them. Trained observers will be onboard construction vessels at all times during construction. If sea turtles or manatees are sighted within 100 yards of construction activities, all appropriate precautions will be implemented by the contractor to ensure protection of the animals (refer to Section 7 consultation documents). All vessels associated with the project will operate at no-wake speeds at all times in shallow waters or channels where the draft of the boat provides less than 4 feet clearance of the bottom. Boats used to transport personnel will be shallow-draft vessels, preferably of the light-displacement category, where navigational safety permits. Vessels transporting personnel and/or supplies between the landing and work site will follow deep water to the extent possible. All personnel will be advised that there are civil and criminal penalties for harassing, harming, injuring or killing manatees which are protected under the Endangered Species Act and the Marine Mammal Protection Act; and sea turtles, which are protected under the Endangered Species Act. The Contractor will be held responsible for any manatee or sea turtle harassed, injured, or killed as a result of construction activities. As noted above, if manatee(s) or sea turtle(s) are seen within 100 yards of active vessel movement or equipment operation, all appropriate precautions will be implemented to ensure protection of the animal(s). These precautions will include the operation of all moving equipment no closer than 50 feet of the animal(s). At a distance of less than 50 feet, immediate shutdown of equipment will occur. Activities will not resume until the animal(s) have left the work area of its own volition. The Contractor will keep a log detailing all sightings, collisions, injuries, and fatalities involving manatees or sea turtles occurring during the construction period. The data will be recorded on forms provided by the Contracting Officer. All data in original form will be forwarded directly to Dr. Loren Mason, Chief, Environmental Branch, Corps of Engineers, P.O. Box 4970, Jacksonville, FL 32232-0019 within 10 days of collection, with copies to the Contracting Officer's representative. Any collision with, or sighting of an injured, incapacitated or dead manatee, or sea turtle will be reported immediately to the Corps of Engineers (904-232-2202), the Florida Marine Patrol (1-800-342-5367), and the U.S. Fish and Wildlife Service in Jacksonville (1-904-232-2580).

Indirect Effects: Vessel Traffic. The Service believes that the proposed work has the potential to indirectly affect manatees and sea turtles if vessel traffic is increased as a result of deepening and widening the channel and basins. Increases in manatee mortality are directly correlated with increases in boat traffic. To protect manatees and sea turtles, it is important to ensure that there is no net increase in vessels as a result of the project. Therefore,

6. The Service requests and recommends that this issue be fully analyzed in the Environmental Impact Statement (EIS) to determine if vessel traffic would increase as a result of the proposed work.

Indirect Effects: Habitat. Additional indirect effects on manatees and sea turtles exist from the potential of construction to affect seagrass patches nearby the project area in the Banana River. Any decreases in productivity of seagrasses due to turbidity or sedimentation would result in a reduction in forage area or habitat for turtles or manatees.

7. The Service recommends the most stringent precautions against incidental releases of sediment/turbidity plumes into the ICWW, and decreasing the amount of dredge depth wherever possible, so that the risk of incidental releases is minimized.

Also, there appear to be areas of adequate depth in portions of the port/harbor to permit growth of seagrasses (in some of the remote portions of turning basins and shallower areas north of the inner entrance channel); if seagrasses are present in some of these areas, construction would not only indirectly affect them, but they could also be partly directly impacted. Therefore,

8. The Service recommends the CPA perform seagrass surveys of the shallower portions of the port/harbor to determine whether seagrasses are present, and

9. Should SAV be present, that the habitat is mapped and a functional assessment is performed such that adequate mitigation can be determined, following demonstration by the CPA that all impacts have been avoided and minimized to maximum extent practicable.

Finally, foraging resources for sea turtles have been identified on the rock/rip-rap surfaces along the north side of the Inner Channel. Therefore,

10. Impacting sea turtle foraging resources along the Inner Channel should be avoided.

7.2.2 Other Protected Species

Gopher tortoises (protected by the State of Florida) and possibly eastern indigo snakes (listed as threatened under ESA) reside in an area that may be impacted by channel widening. Precautions must be taken not to kill, injure, or harass individual indigo snakes, and pursuant to Florida state law, all gopher tortoises must be relocated. The Service recommends that

11. Sightings of eastern indigo snakes should be regarded as those of manatees and sea turtles, and provisions found above should be carried out for their protection as well.

12. The Corps, CPA, and contractors are informed of the outcome of formal coordination regarding indigo snakes under Section 7 consultation.

13. The Corps, CPA, and contractors are mindful of their obligations under Florida state law regarding gopher tortoises.

7.3 Water Quality

Dredging in marine environments can have substantial effects on species and sensitive habitats, such as seagrass beds and livebottom areas, and can adversely affect water quality far from a construction site. Strong tidal currents may redistribute suspended sediments to other areas both inside and outside the study area that support submerged vegetation. Possibly affected areas would include seagrass habitats in the adjacent Banana River. Resuspended particulate matter may temporarily decrease water clarity and decrease primary production, not only for seagrasses, but also by phytoplankton in the water column.

Deposition of sediments on beds may have other adverse effects, such as the temporary displacement of fish and invertebrates. Therefore,

14. State Water Quality Certification must be obtained prior to construction and state water quality standards must be met during construction.

The State of Florida water quality regulations require that water quality standards not be violated during dredging operations. Therefore,

15. Appropriate protective measures and monitoring programs must be conducted during construction to ensure compliance with state water quality standards, and

16. Should turbidity exceed state water quality standards during construction as determined by monitoring, the contractor would be required to cease operations until water quality standards are met.

8.0 SUMMARY OF POSITION OF THE U.S. FISH AND WILDLIFE SERVICE

The Service has determined that the proposed project may have effects on fish and wildlife and their habitats. Construction activities may directly impact protected species and other species, and some species and assemblages may be affected indirectly by impacts to nearby seagrass beds, water quality, and/or sedimentation. The Service has recommended herein protective measures for threatened and endangered species and other species and assemblages that will be vulnerable during construction and could be possibly affected through indirect impacts to habitat (i.e., seagrasses). Among the notable recommendations of the Service is the need for strict turbidity controls during construction. The Service will carry out additional coordination via the ESA Section 7 consultation process, but advises that impacting important habitat for sea turtles, such as the algal resources on rock/rip-rap in the north side of the Inner Channel should be avoided. The Service recommends that the CPA and Corps carefully examine operational and construction alternatives that will satisfy the project goals and decrease the risks to fish and wildlife, including protected species, and their habitats.

9.0 LITERATURE CITED

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Farmland Protection Policy Act Coordination

DIAL CORDY
AND ASSOCIATES INC
Environmental Consultants

June 9, 2008

Natural Resources Conservation Service
2614 NW 43rd Street
Gainesville, FL 32606-6611

Dear Madam/Sir:

The Canaveral Port Authority is conducting a study for navigation improvements under the authority granted by Section 203 of Water Resources Development Act (WRDA) of 1986 (P.L. 99-662). Section 203 of WRDA 1986 allows non-federal interests, such as the Canaveral Port Authority, to undertake feasibility studies of proposed harbor projects and submit them to the Secretary of the Army. The Canaveral Port Authority has conducted this Section 203 study to determine the feasibility of deepening and widening the channels, wideners, and turning basins at Port Canaveral to accommodate the most modern vessels in the cruise ship fleet and to allow for the passage of deeper draft cargo vessels within the Port. The Canaveral Port Authority has completed form AD-1006, Farmland Conversion Impact Rating for the proposed project and is requesting review and determination of compliance with the Farmland Protection Policy Act with the Natural Resources Conservation Service.

The attachments to this letter include location map, site map, soils map, and copy of form AD-1006 for the Port Canaveral Section 203 Study Project Site. The Canaveral Port Authority appreciates your assistance with this project.

Sincerely,

DIAL CORDY AND ASSOCIATES INC.

Lee Swain
Vice President

Attachments

J05-850
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11/24/2008 11:19 AM

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OFFICE ALSO IN WILMINGTON, NORTH CAROLINA

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 6/9/08
Name Of Project Canaveral Port Authority Section 203 Study	Federal Agency Involved Jacksonville District, USACE
Proposed Land Use Ports and Waterways	County And State Brevard County, Florida
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).*	Yes ☐	No ☐	Acres Irrigated 0	Average Farm Size 0
Major Crop*(s)*	Farmable Land In Govt. Jurisdiction Acres: %		Amount Of Farmland As Defined in FPPA Acres: %	
Name Of Land Evaluation System Used	Name Of Local Site Assessment System		Date Land Evaluation Returned By NRCS	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	18.5			
B. Total Acres To Be Converted Indirectly	0.0			
C. Total Acres In Site	18.5	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	0	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use		4			
2. Perimeter In Nonurban Use		6			
3. Percent Of Site Being Farmed		0			
4. Protection Provided By State And Local Government		0			
5. Distance From Urban Builtup Area		0			
6. Distance To Urban Support Services		0			
7. Size Of Present Farm Unit Compared To Average		0			
8. Creation Of Nonfarmable Farmland		0			
9. Availability Of Farm Support Services		5			
10. On-Farm Investments		0			
11. Effects Of Conversion On Farm Support Services		0			
12. Compatibility With Existing Agricultural Use		0			
TOTAL SITE ASSESSMENT POINTS	160	15	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	15	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	15	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☒

Reason For Selection:

(See Instructions on reverse side) **Form AD-1006 (10-83)**

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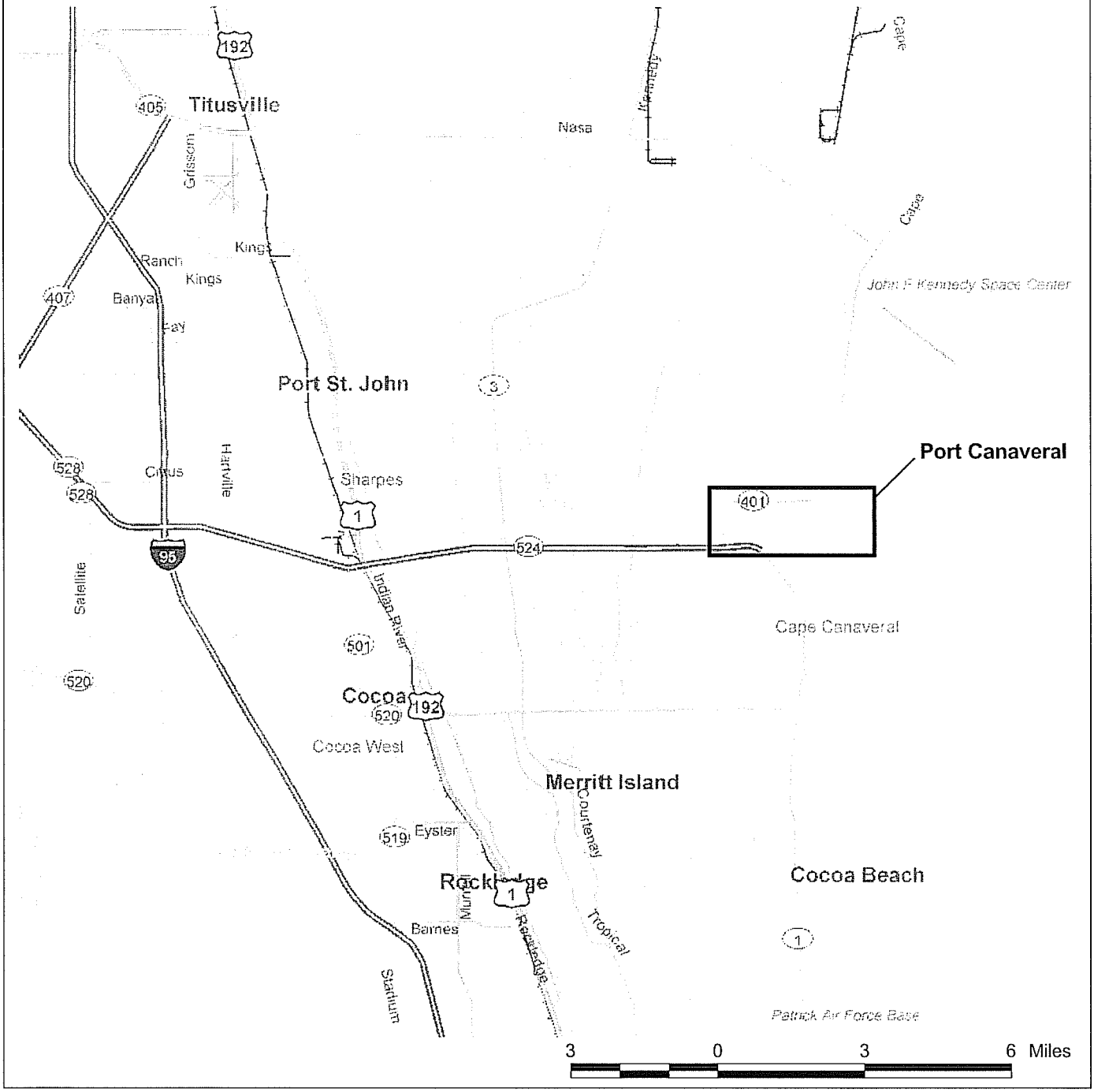
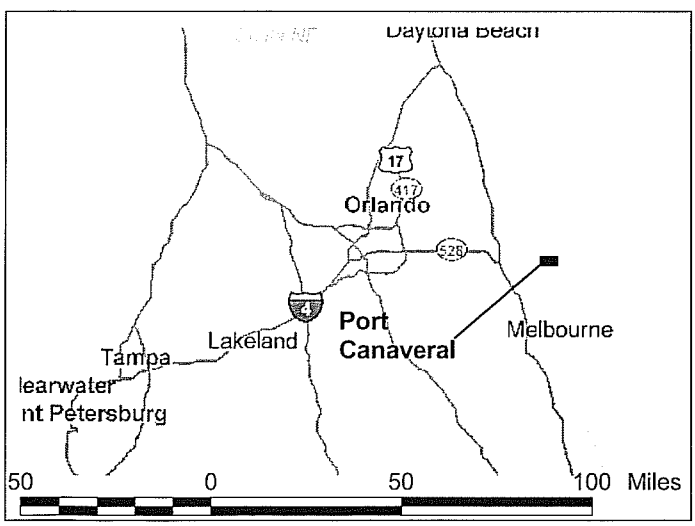




Location Map	
Port Canaveral Environmental Baseline Report	
Scale: 1 inch = 3 miles	Drawn By: MR
Date: April 2006	Approved By: LS
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J05-850
	Figure 1

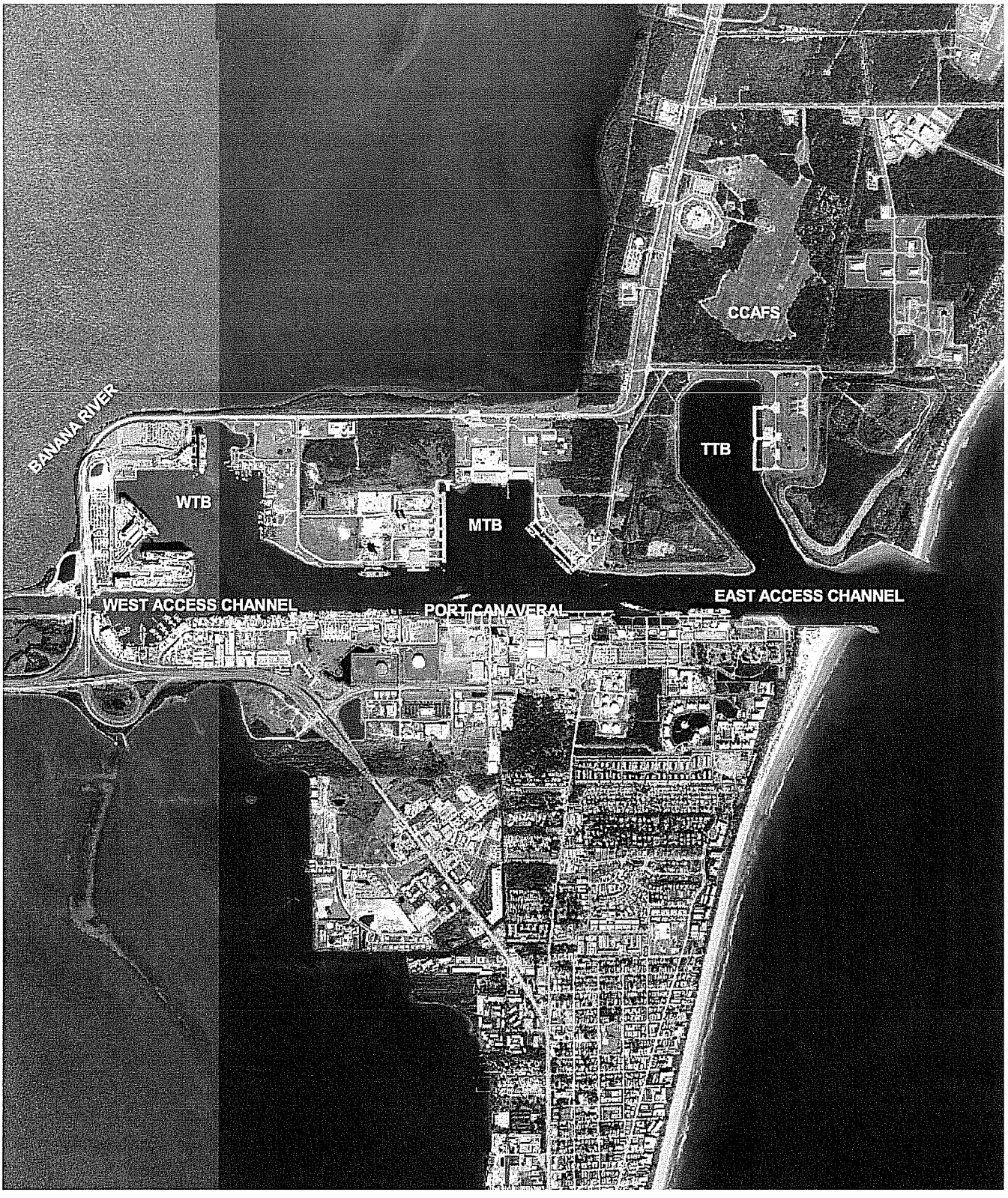
Port Canaveral Existing and Proposed Navigation Footprints

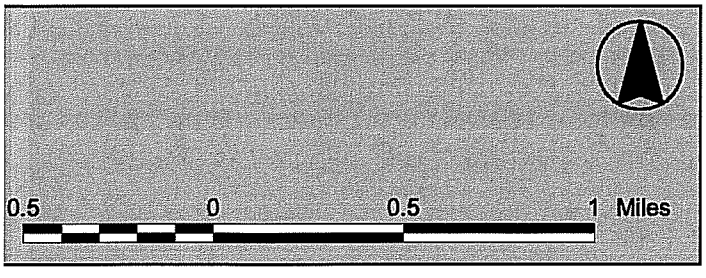
Proposed Navigation Improvement

NRCS Soils (Brevard County)

0.5 0 0.5 1 Miles

Port Canaveral Soils Map	
Port Canaveral Section 203 Study	
Scale: 1 inch = 0.5 mile	Drawn By: MR
Date: June 2008	Approved By: LS
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J05-850
	Figure 1





Study Area	
Port Canaveral Environmental Baseline Report	
Scale: 1 inch = 0.5 mile	Drawn By: MR
Date: April 2006	Approved By: LS
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J05-850
	Figure 2