CANAVERAL HARBOR, FLORIDA

Integrated Section 203 Navigation Study Report
&
Final Environmental Assessment

Volume 1: Integrated Section 203 Navigation Study Report & Final Environmental Assessment

December 2012

PORT CANAVERAL

COVER SHEET

FINAL

Canaveral Harbor, Florida

Integrated Section 203 Navigation Study Report & Final Environmental Assessment

This feasibility study of improvements to the federal navigation project at Canaveral Harbor, Florida has been prepared by the Canaveral Port Authority (CPA) 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 world's cruise ship fleet and to allow for the passage of deeper draft cargo vessels within the Port.

The Secretary will review this study to determine whether the study, and the process under which it was developed, complies with Federal laws and regulations applicable to feasibility studies of navigation projects for deep draft harbors. Following that review, the Secretary will transmit to Congress, in writing, the results of his review and any recommendations the Secretary may have concerning the project.

As part of the Secretary's review, this draft report will be submitted by the Jacksonville District, U.S. Army Corps of Engineers (Corps), on behalf of the Secretary, for agency and public review and comment following the requirements of the National Environmental Policy Act (NEPA) and the U.S. Army Corps of Engineers (Corps) implementing regulations, ER 200-2-2. To facilitate that review, this report has been prepared following the format and requirements of an integrated feasibility report and Environmental assessment, complying with requirements of the Corps and the Council of Environmental Quality, and is intended to reduce duplication and paperwork. An asterisk in the table of contents and report notes sections that are required for NEPA compliance.

Abstract

This Integrated Section 203 Navigation Study Report & Final Environmental Assessment analyzes the feasibility and potential environmental consequences of implementing improvements to the existing Federal navigation project at Canaveral Harbor, Florida. The recommended plan consists of widening plus deepening, which more specifically includes widening the main ship channel from 400 feet to 500 feet, expanding the West Turning Basin turning circle from 1,400 feet to 1,725 feet, and deepening the following channel segments:

- Outer Reach, Cut 1A
- Outer Reach, Cut1B
- Outer Reach, Cut 1
- US NAVY Turn Widener
- Civil Turn Widener
- New 203 Turn Widener

- Middle Reach
- Trident Access Channel and Trident Turning Basin
- Inner Reach, Cut 2 and Cut 3
- Middle Turning Basin
- West Access Channel (east of Station 260+00)
- West Turning Basin and West Access Channel (west of Station 260+00).

A detailed description of the proposed improvements by project segment is provided in Section 6.7. The other alternatives considered are different increments of deepening and widening, non-structural solutions, and as required, the No Action alternative. The recommended plan (Preferred Alternative) is the most economical plan analyzed.

Public Comments

Public involvement has been conducted throughout the course of the study. At the request of CPA, the Jacksonville District, U.S. Army Corps of Engineers published a Notice of Intent in the Federal Register. While not required at this stage of the Section 203 study process, CPA requested that the Corps initiate the public scoping process in order to solicit public input while plan formulation and evaluation was still being conducted by CPA.

A public scoping meeting was held by the Corps, as was a study initiation public meeting hosted by CPA at Port Canaveral. Coordination with resource agencies was conducted through agency coordination letters that solicited their comments. The Canaveral Port Authority considered the comments received by letter and statements made at public meetings in the plan formulation, evaluation, and alternative selection process. Individuals and agencies were provided the opportunity to present written comments relevant to the Section 203 study or request to be placed on the mailing list for announcements and for the eventual distribution of the Final Environmental Assessment by the Headquarters, U.S. Army Corps of Engineers (HQUSACE). The comments received were limited, but were considered in the preparation of the Integrated Section 203 Navigation Study Report & Final Environmental Assessment. Upon review by the Assistant Secretary of the Army (Civil Works), the Integrated Section 203 Navigation Study Report & Final Environmental Assessment will be circulated by the U.S. Army Corps of Engineers for formal review and comment as an Integrated Feasibility Report and Final Environmental Assessment.

SYLLABUS

Authority and Purpose

This study of potential navigation improvements at Canaveral Harbor, Florida has been prepared by the Canaveral Port Authority (CPA) under the authority granted by Section 203 of Water Resources Development Act (WRDA) of 1986 (P.L. 99-662).

The purpose of this Section 203 study is to determine the feasibility of improvements to the existing Federal navigation project at Port Canaveral[1] and to identify the solution that best meets the economic, environmental, physical, and social needs of the region and the nation. Pursuant to Section 203 of WRDA 1986, this study is also intended to determine the advisability and extent of both Federal and non-Federal participation in cost sharing the proposed improvements.

The Principles and Guidelines require that the plan which maximizes net benefits, the NED plan, be identified. Typically, the incremental analysis includes depths beyond the depth which maximizes net benefits in order to "bracket" the NED plan and to show that net benefits in fact decline at deeper depths. However, ER 1105-2-100 paragraph 3-2 b.(10) Categorical Exemption to NED Plan states:

> *For harbor and channel deepening studies where the non-Federal sponsor has identified constraints on channel depths it is not required to analyze project plans greater (deeper) than the plan desired by the sponsor.*

This study identifies the most economical plan analyzed, the plan that has the greatest net economic benefits of all plans considered. At the request of the non-Federal sponsor, plans greater in depth and width were not analyzed due to financial and logistical constraints.

Problems and Needs

The last major navigation improvements to the Federal navigation project at Port Canaveral were completed by the Corps of Engineers in 1995. Since that time, the demand by users of the Port to accommodate larger and deeper cruise ships and cargo vessels has resulted in a need to provide deeper and wider channels and expanded turning basins. Opportunities exist to increase the efficiency of existing operations by providing deeper and wider channels that allow larger cruise ships to use the Port and larger cargo vessels to carry greater loads.

There are vessels presently calling at Port Canaveral that could significantly benefit from deeper, wider channels, as well as newer, larger vessels that would use Port Canaveral if existing channels were improved. Since 2009, three new cruise ships which are among the largest in the world fleet have been homeported at Port Canaveral and a fourth is due to arrive in spring 2012. All of these vessels exceed the design dimensions of the project (nearly 300 feet longer and nearly 30 feet wider than the design vessel). The Canaveral Port Authority has made

[1] The existing project for deep draft navigation at Canaveral Harbor, Florida, authorized by the River and Harbor Acts of March 1945 and October 1962, and Sections 101, 114, and 117 of the Water Resources Development Act (WRDA) of 30 October 1992. The official name of the Federal project is Canaveral Harbor, Florida. Throughout the remainder of this report, this will be used interchangeably with the locally recognized name, Port Canaveral.

modifications to the Federal project (limited channel widening to 450 feet in selected locations, interim corner cutoff in West Turning Basin) in order to accommodate these vessels temporarily until the project can be upgraded. In addition, the new Seaport Canaveral facility, which began operations in 2010, provides the opportunity for substantial transportation cost savings if the project is deepened and widened to accommodate the longer and deeper tankers (up to 250 feet longer and 5 feet deeper than the design vessel) that Seaport Canaveral would like to use to transport petroleum products to their new facility. Additional transportation cost savings from project deepening would also accrue to other bulk carriers (rock, slag, cement), if existing vessels could be loaded more deeply and larger vessel could be used.

Projections for cruise traffic and cargo movements indicate sustained growth. The costs of transporting commodities could be significantly reduced if larger, more fully loaded vessels could call at Port Canaveral. Additionally, the cost of vessel operations within the Port could be substantially reduced by the improved vessel maneuverability afforded by a wider channel. Navigational safety, especially surge impacts on moored cargo and naval vessels, would be substantially improved by a wider channel.

Alternatives Considered

This study identified and evaluated alternatives to solve the following problems and take advantage of the following opportunities: 1) reduce ship congestion at Port Canaveral; 2) accommodate recent and anticipated future growth in cargo and cruise vessel traffic; 3) improve the efficiency of operations and improve safety for cruise ships and cargo vessels currently operating within the Port complex; 4) allow for use of the Port by larger cruise ships and larger and more efficient cargo vessels; and 5) allow for development of additional terminals/berths without encroaching on the existing Federal channels and turning basins.

Potential improvements evaluated in this study include: the No Action Plan; non-structural alternatives; and structural alternatives such as deepening and widening of navigational channels, expansion of the turning basins, and expanded wideners at the port. All viable alternative plans were considered that had the potential to improve the efficiency of operations and reduce the costs to cargo shippers and cruise lines. The only viable alternatives identified in the analysis involved various combinations of channel deepening, widening, turning basin extensions, and expanded wideners that would allow larger vessels to operate more efficiently and safely within in the Federal navigation project.

The formulation of alternative plans carefully considered the optimization of channel widths and depths to maximize net average annual benefits and contributions to the NED account. This included identification of design vessels (cruise and cargo) and associated dredging requirements, identification of structural and non-structural improvements, and estimation of incremental costs and benefits. The plan formulation process also considered the characteristics and quality of dredged material and requirements for disposal. All non-Federal ancillary facilities that are required to deliver project benefits were identified, costs estimated, and are included as associated costs in the alternative evaluation and economic analysis. All plans were evaluated using the System of Accounts framework established in the Principles and Guidelines (P&G 1983) promulgated by the Water Resources Council. The final alternatives were evaluated based on comparison to the No Action Plan, in order to identify the plan that maximized net economic benefits to the nation. Physical conditions at the Port constrained the array of

alternatives that were evaluated such that the most economical plan analyzed may be a smaller scale plan than the NED Plan. Environmental impacts were identified and evaluated to determine conformity with environmental laws, policies, and other guidelines. Finally, as previously mentioned, the views of the public were solicited and considered in the alternative formulation and evaluation process.

The Recommended Plan

The recommended plan, which is the most economical plan analyzed consists of widening the main ship channel from the harbor entrance inland to the West Turning Basin and West Access Channel, from its current authorized width of 400 feet to 500 feet. In addition to widening, deepening of the existing Federal project and expansion of turning basins is recommended in the following reaches:

- Outer Reach, Cut 1A: deepen from -44' to -46' for a length of 11,000';
- Outer Reach, Cut1B: deepen from -44' to -46' depth for a length of 5,500';
- Outer Reach, Cut 1: deepen from -44' to -46' for the 5,300' long portion of Cut 1 that is seaward of buoys 7/8 (Station 0+00 to Station 53+00). The remainder of Cut 1 from buoys 7/8 to the apex of the channel turn, a length of 7,200', would also be deepened from -44' to -46';
- US Navy Turn Widener: deepen from -44' to -46' X 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;
- Civil Turn Widener: deepen from -41' to -46' X 15.6 acres (irregular shaped area) bounded to the north and northeast by the middle reach and the US Navy turn widener;
- New Turn Widener: deepen to -46' X 23.1 acres (irregular shaped area) bounded to the north and northeast by the civil turn widener and Cut 1 of the outer reach. To maintain the sediment trap's design capacity, it is proposed that the trap be deepened consistent with the new channel depth, and slightly expanded to the south;
- Middle Reach: deepen from -44' to -46' for a length of 5,658' and widen from 400' to 500' for a length of 2,282'. The middle reach extends from the apex of the channel turn westward to the western boundary of the Trident access channel;
- Inner Reach, Cut 2 and Cut 3: deepen from -40' to -44' and widen from 400' to 500' for a length of 3,344';
- 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' project depth throughout an irregularly shaped area to remain as is, except at the southern boundary of the existing Trident Access channel, where the new 100' north side channel widener will consume a portion of the Trident Access Channel;
- Middle Turning Basin: expand and deepen to encompass 68.9 acres to a project depth of -43' and a turning circle diameter of 1422'. The existing -39' federal project provides a turning circle diameter of 1200';

- West Access Channel (east of Station 260+00): deepen from -39' to -43' and widen from 400' to 500' for a length of 1,840'; and

- West Turning Basin and West Access Channel (west of Station 260+00): expand the existing federally authorized turning circle from 1,400' diameter at a depth of -31' to 1,725' X 141 acres at a depth of -35'. The existing West Turning circle was deepened and is maintained to -35' by the Canaveral Port Authority. As part of the proposed expansion and shifting of the turning circle, the federally authorized depth will be increased to -35'.

The recommended plan for commercial navigation is economically feasible based upon a 50-year project life at the current FY 2013 price levels and Federal discount rate of 3.75 percent. The total average annual benefits are $5,393,000, total average annual costs are $2,647,000, which result in total net annual benefits of $2,747,000, and a benefit-cost ratio of 2.0 to 1.

Plan Implementation

In accordance with the provisions of Federal laws and policies, the Federal share of the first cost of implementing the recommended plan is estimated to be $27,927,000. The estimated non-Federal share of the recommended plan is $15,462,000, including lands, easements, rights-of-way, disposal areas, and associated non-Federal costs. Incremental annual maintenance costs are estimated to be $633,400 annually and will be shared between the Federal and non-Federal sponsor 71% - 29% in accordance with the cost sharing breakdown for General Navigation Features. The Federal share of incremental annual maintenance costs is currently estimated to be $452,200. Maintenance of any non-Federal ancillary facilities is a 100% non-Federal responsibility.

While the feasibility study was being conducted, a new fleet of larger cruise ships arrived at Port Canaveral. The dimensions of these vessels exceeded the design limits of the existing Federal navigation project (as predicted by the feasibility study) so, at the request of the cruise lines and Canaveral Pilots, CPA made the decision to advance construction of a portion of the planned improvements to the project to accommodate this new fleet of larger vessels, rather than turn them away. Navigation improvements in the West Turning Basin were constructed by the CPA in advance of completing the feasibility study in order to maintain safe navigation within the harbor for the newer, larger cruise ships that were entering the Port Canaveral fleet within the last several years.

The construction costs of these completed components ($13,775,063) are not included as a project cost in this report, because a prior agreement or authorization for these improvements to the existing Federal project was not yet in place between the Corps of Engineers and the non-Federal sponsor, the Canaveral Port Authority. However, as has been the case for a number of previous Federal navigation projects, the CPA intends to seek post-facto credit for those costs as part of the specific Congressional authorization for construction of the project improvements recommended in this report. The proposed project, including the costs of the advanced construction of navigation improvements, remains economically justified and the recommended plan does not change if the expended costs of this completed element are included. The required

environmental documentation and coordination was also conducted by CPA prior to construction of these navigation improvements.

This Section 203 Study report includes an Integrated Final Environmental Assessment prepared in accordance with the requirements of the National Environmental Policy Act. This report is being submitted by the Canaveral Port Authority to the Assistant Secretary of the Army (Civil Works) for approval, processing of the NEPA document, and submission to Congress for authorization of construction. Upon approval and authorization, the study will proceed to preconstruction, engineering and design (PED), and construction by the Corps of Engineers. The schedule to proceed with construction is estimated to be as early at 2013, subject to Congressional authorization and appropriations, and the project base year is estimated to be 2014.

Environmental Considerations

This report includes an integrated Final Environmental Assessment, which will be processed by the U.S. Army Corps of Engineers as a Final Environmental Assessment, and was prepared in accordance with the requirements of the National Environmental Policy Act. This Final Environmental Assessment presents the assessment and evaluation of impacts to environmental resources and other attributes in accordance with Federal and State laws, ordinances, regulations, statutes, and other guidelines. The selected plan will result in minor, short-term adverse impacts related to temporary disruptions to the marine algal community, sea turtle feeding habitat, a temporary increase in turbidity, and temporary transportation disruptions during construction. The selected plan has been found to be in conformance with Federal, State, and local statutes and policies.

Agency and Public Coordination

Coordination with the public and with Federal, State, and local agencies (Section 8: Public Involvement, Review and Consultation) was conducted to aid in the formulation and evaluation of the Recommended Plan. Public and agency views including informal comments received to date from representatives of the 45th Space Wing, Weather Squadron, Cape Canaveral Air Force Station U.S. Environmental Protection Agency, Seminole Tribe of Florida, U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. Coast Guard, Florida Department of Environmental Protection, and Florida Fish and Wildlife Conservation Commission, which have indicated no opposition or major issues with the proposed action.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES AND CHARTS

LIST OF ATTACHMENTS

LIST OF APPENDICES

PORT CANAVERAL, FLORIDA

INTEGRATED SECTION 203 NAVIGATION STUDY REPORT & FINAL ENVIRONMENTAL ASSESSMENT

1. INTRODUCTION

1.1 Project and Study Authority

The existing Port Canaveral, Florida project was authorized for "national security and the stabilization of employment" by the Rivers and Harbors Acts of 2 March 1945[2] and 23 October 1962[3], and Sections 101[4] and 117[5] of PL 102-580 dated 31 October 1992. The project is actively operated and maintained by the U.S. Army Corps of Engineers, Jacksonville District.

This study of potential navigation improvements at Port Canaveral, Florida has been prepared by the Canaveral Port Authority (CPA) under the authority granted by Section 203 of Water Resources Development Act (WRDA) of 1986 (P.L. 99-662).

---

[2] Public Law 14-79th Congress, Chapter 19-1st Session, S. 35, "Sec.2. The following works of improvement of rivers, harbors, and other waterways are hereby adopted and authorized in the interest of national security and the stabilization of employment, and shall be prosecuted as speedily as may be consistent with budgetary requirements, under the direction of the Secretary of War and supervision of the Chief of Engineers, in accordance with the plans in the respective reports hereinafter designated and subject to the conditions set forth therein…Canaveral Harbor, Florida; House Document Numbered 367, Seventy-seventh Congress"

[3] Public Law 87-874, 87th Congress, H.R. 13273, "Title 1-Rivers and Harbors, Sec. 101. That the following works of improvement of rivers and harbors and other waterways for navigation, flood control, and other purposes are hereby adopted and authorized to be prosecuted under the direction of the Secretary of the Army and supervision of the Chief of Engineers, in accordance with the plans and subject to the conditions recommended by the Chief of Engineers in the respective reports hereinafter designated: *Provided*, That the provisions of section 1 of the River and Harbor Act approved March 2, 1945 (Public Law Numbered 14, Seventy-ninth Congress, first session), shall govern with respect to projects authorized in this title; and the procedures therein set forth with respect to plans, proposals, or reports for works of improvement for navigation or flood control and for irrigation and purposes incidental thereto, shall apply as if herein set forth in full:…Canaveral Harbor, Florida: Senate Document Numbered 115, Eighty-seventh Congress, at an estimated cost of $605,000;"

4 Public Law 102-580 October 31, 1992, 102d Congress "TITLE I --WATER RESOURCES PROJECTS, SEC. 101. PROJECT AUTHORIZATIONS. Except as provided in this section, the following projects for water resources development and conservation and other purposes are authorized to be carried out by the Secretary substantially in accordance with the plans, and subject to the conditions, recommended in the respective reports designated in this section: … (7) CANAVERAL HARBOR, FLORIDA.--The project for navigation, Canaveral Harbor, Florida: Report of the Chief of Engineers, dated July 24, 1991, as modified by the letter of the Secretary dated October 10, 1991, at a total cost of $11,780,000, with an estimated Federal cost of $6,100,000 and an estimated non- Federal cost of $5,680,000."

[5] *SEC. 117. DEAUTHORIZATION OF A PORTION OF THE CANAVERAL HARBOR, FLORIDA, PROJECT. Section 1080 of the Intermodel Surface Transportation Efficiency Act of 1991 (105 Stat. 2020) is amended by inserting "thence north 00-18-51 west, a distance of 764.43 feet;" after "551.30 feet;".*

Section 203 of WRDA 86 states:

SEC 203. STUDIES OF PROJECTS BY NON-FEDERAL INTERESTS.
PUBLIC LAW 99-662, NOV. 17, 1986. 33 USC 2231.

(a) SUBMISSION TO SECRETARY - A non-Federal interest may on its own undertake a feasibility study of a proposed harbor or inland harbor project and submit it to the Secretary. To assist non-Federal interests, the Secretary shall, as soon as practicable, promulgate guidelines for studies of harbors or inland harbors to provide sufficient information for the formulation of studies.[6]

(b) REVIEW BY SECRETARY - The Secretary shall review each study submitted under subsection (a) for the purpose of determining whether or not such study and the process under which such study was developed comply with Federal laws and regulations applicable to feasibility studies of navigation project for harbors or inland harbors.

(c) SUBMISSION TO CONGRESS - Not later than 180 days after receiving any study submitted under subsection (a), the Secretary shall transmit to the Congress, in writing, the results of such review and any recommendations the Secretary may have concerning the project described in such plan and design.

(d) CREDIT AND REIMBURSEMENT - If a project for which a study has been submitted under subsection (a) is authorized by any provision of Federal law enacted after the date of such submission, the Secretary shall credit toward the non-Federal share of the cost of construction of such project an amount equal to the portion of the cost of developing such study that would be the responsibility of the United States if such study were developed by the Secretary.

The United States Army Corps of Engineers (USACE) is the lead agency under the National Environmental policy Act of 1969 (NEPA).

1.2 Study Purpose and Scope

The Canaveral Port Authority (CPA) was created by a Special Act of the Florida state legislature in 1953 (the year the Port was dedicated), and is an independent governmental agency of the State of Florida that operates the Port. The CPA is also the non-Federal sponsor of the Federal navigation project at Port Canaveral.

The Canaveral Port Authority has conducted this Section 203 study to determine the feasibility of improvements to the Federal navigation project at Port Canaveral. Potential improvements include deepening and widening of navigational channels, expansion of the West Turning Basin, and expanded wideners at the port. The purpose of these potential improvements is to efficiently accommodate larger cruise ships and cargo vessels which are already using or projected to use the port in the very near future. These proposed improvements will also increase the efficiency and safety of cargo and naval vessel operations by reducing the current disruptions to cargo and naval operations from the surge effects of operating these extremely large cruise ships under high wind conditions in the narrow federal channel. This study identifies and evaluates alternatives that will:

[6] Guidelines for implementation of Section 203 (WRDA 86) studies were prepared by the Corps and are contained in ER 1165-2-122, Studies of Harbor or Inland Harbor Projects by Non-Federal Interests, 26 August 1991. This guidance was used in the development of the Port Canaveral Section 203 Study

1) reduce congestion at Port Canaveral;
2) accommodate recent and anticipated future growth in cargo and cruise vessel traffic;
3) improve the efficiency and safety of operations for cruise ships, cargo vessels, and naval vessels within the Port complex;
4) allow for use of the Port by larger cruise ships and larger and more efficient cargo vessels; and
5) allow for development of additional terminals/berths without encroaching on the existing Federal channels and turning basins.

In February of 2002, the Jacksonville District, U.S. Army Corps of Engineers prepared an Initial Appraisal Study under the authority of Section 107 of the River and Harbor Act of 1960, as amended. Section 107 provides the U.S. Army Corps of Engineers authority to develop and construct small[7] navigation projects. The Initial Appraisal Report concluded that there was a Federal interest in conducting a feasibility study to evaluate expanding and deepening the West Turning Basin. However, funds were not available for the Corps of Engineers to initiate the feasibility phase of the Section 107 study at that time. Subsequently, concerns by CPA regarding the adequacy of the width of the Main Access Channel and wideners led to a desire to also evaluate project widening as another potential improvement. It was determined that widening in addition to expanding the West Turning Basin would result in a project that exceeded the cost limits of the Section 107 authority, requiring a new congressionally authorized feasibility study under the Corps' General Investigations Authority. Because no new project authorization bills had passed since the time of the Section 107 Initial Appraisal, Port Canaveral chose to conduct their own feasibility study under the authority of Section 203 of WRDA 1986.

Since the last major Canaveral Harbor navigation capacity improvements were completed by the Corps of Engineers in 1995, Port Canaveral has experienced significant growth in cargo volume, cruise traffic, and the size and frequency of vessels calling at the port. Over the intervening years, the Canaveral Port Authority has made major investments in landside infrastructure to accommodate burgeoning growth at the Port and the region that it serves. At the present time, Port Canaveral is the second busiest cruise port in the U.S., and has recently experienced record levels of commodity tonnage.

Port congestion and inadequate channel capacity have become major issues, providing the impetus for CPA to conduct this Section 203 study. Pursuant to Section 203 of WRDA 1986, this study is intended to determine the feasibility and extent of Federal and non-Federal participation in improving Port Canaveral, consistent with the Federal objective of maximizing contributions to National Economic Development (NED), and consistent with protecting the nation's environment.

[7] Section 107 Projects are limited to a maximum of $4,000,000 in Federal project costs. In addition to the per project limit, total Federal expenditures for construction and Operate, Maintain, Repair, Replace, and Rehabilitate (OMRR&R) under the Section 107 authority are limited to the greater of $4,500,000 or 2.25 times the Federal costs of the project, including costs for the feasibility through the construction phases.

1.3 Location and General Description of the Study Area[8]

Port Canaveral is located on the east coast of Florida in Brevard County, directly south of the John F. Kennedy Space Center, and approximately five to six miles north of Cocoa Beach. The Port is located about 155 miles south of Jacksonville Harbor, FL, about 198 miles north of Miami Harbor, 170 miles north of Port Everglades, 130 miles north of the Port of Palm Beach, and 50 miles east of Orlando, FL. The Port occupies both sides of the Canaveral Barge Canal and the Inner Reach of the deepwater entrance channel. A location map is provided on Figure 1-1 and a map showing the major channel and basins is provided on Figure 1-2.

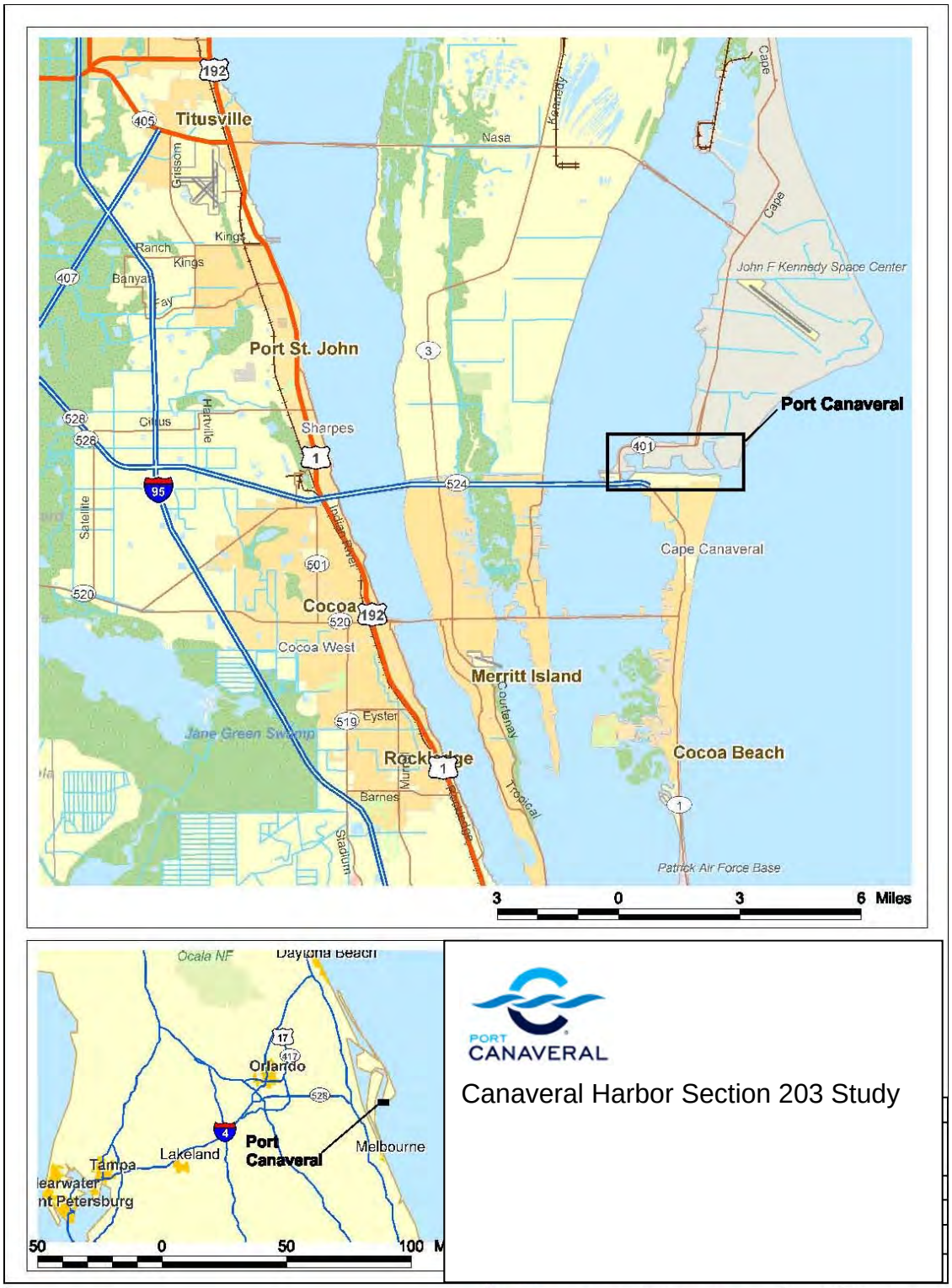
The City of Cape Canaveral, just south of the Port, is located on the north end of the offshore barrier island following the Florida coast line and is connected to the mainland by Florida State Road (SR) 528 Martin Andersen Beachline Expressway extending across the Banana and Indian Rivers.

The deepwater entrance to the Port is via a dredged channel approaching from the southeast, then in an east-west direction across the entrance to the east and middle basins on the north side of the channel. The deep draft channel then continues westerly for approximately 3,570 feet, terminating at the entrance to the west basin on the north side of the channel. The shallow draft Barge Canal runs from the western end of the West Access Channel in a westerly direction to the Canaveral Locks, operated by the US Army Corps of Engineers. The north side of the Barge Canal and the south side of the existing 400' deep draft channel share a common boundary from middle to west basins. The Canaveral Barge Canal continues through the lock, across the Banana River, and through Merritt Island to connect with the Atlantic Intracoastal Waterway running north-south in the Indian River.

The Port is a multiple-use facility composed of cruise ship berths, cargo berths, U.S. Navy, U.S. Coast Guard, and Military Sealift Command (MSC) berths. The Canaveral Port Authority is the owner of all cruise terminal and cargo berth facilities, some of which are leased to tenants on a term basis. Commercial waterfront facilities (described in detail in Section 2) are located along the south side of the main channel, along the north side of the channel west of the middle basin, and along the sides of the middle and west Basins. Approaching from the Atlantic Ocean, the eastern most basin (also referred to as the Trident Basin) is used by U.S. Navy vessels. The middle basin is jointly used by commercial, U.S. Navy and MSC vessels; and the west basin is used by commercial traffic, cruise ships, and home to the U.S. Coast Guard Station, Port Canaveral, Seventh District, Jacksonville Sector. The berths situated on the Inner Reach of the entrance channel are used primarily by cruise ships, cargo ships and tankers. The primary U.S. Navy facilities at Port Canaveral consist of the Trident Wharf on the east side of the East (Trident) Basin, the Poseidon Wharf on the southeast side of the Middle Basin, and the Military Traffic Management Command (MTMC) Wharf on the north side of the Middle Basin. Figure 1-3 presents the major port facilities.

[8] Source: Ports of Miami, Port Everglades, Palm Beach, and Port Canaveral, Florida, Port Series No. 16, Revised 1999, U.S. Army Corps of Engineers

Figure 1-1
Port Canaveral Location Map



PORT CANAVERAL

Canaveral Harbor Section 203 Study

Figure 1-2
Port Canaveral Existing Navigation Project Features

Figure 1-3
Port Canaveral Major Facilities

1.4 Existing Federal Project

The existing Federal project at Port Canaveral was authorized by the Rivers and Harbors Acts of 2 March 1945 and 23 October 1962, and Sections 101, and 117 of the Water Resources Development Act (WRDA) of 30 October 1992. The Federal navigation project consists of the outer, middle, and inner reaches, the west access channel, and three turning basins. The project terminates at the Barge Canal (see Figure 1-2 and Table 1-1).

Table 1-1
Port Canaveral Channel Dimensions

(Project depths in Federally Authorized feet MLLW, lengths and width in linear feet)

Project Feature	Cut and Centerline Station Start / End (ft)	Length	Width[1]	Depth
Outer Reach	Cut 1A, 0+00 to 110+00 Cut 1B 0+00 to 55+00 Cut 1, 0+00 to 125+00	29,000	400	-44[2]
Middle Reach	Cut 2, 125+00 to 181+70	5,658	400	-44[2]
Inner Reach	Cut2, 181+70 to 207+00 Cut 3, 207+00 to 215+00	3,344	400	-40
Middle Turning Basin	M.T.B., 215+00 to 241+70	2,260	NA	-39
West Access Channel (east of Station 260+00)	W.A.C., 241+60 to 260+00 Cut A, 0+00 to 18+40	1,840	400	-39
West Access Channel (west of Station 260+00)	W.A.C., 260+00 to 277+30 Cut A, 18+40 to 36+70	1,730	400	-31 (CPA maintains to -35)
Barge Canal[3]	Cut 1 to Canaveral Lock, 141+60 to 227+70	8,610±	125	-12

Notes: [1] CPA maintains additional channel width in some limited areas (see Figures 2-3 & 2-4)
[2] US Navy Project to 44 feet, Civil Works Project authorized to 41 feet
[3] Barge Canal length from start of West Access Channel to Canaveral Locks

The three turning basins have the following dimensions:

- Trident Turning Basin: Approximately 1,600 feet wide by 1,800 feet long basin with an access channel that tapers in width from 650 feet at the north end, to 400 feet at the south end, -41 foot depth. The access channel has an authorized depth of -44 feet.
- Middle Turning Basin: Approximately 2,260 feet long basin (including channel), 1,800 feet wide at the north end, 2,600 feet wide at the south end, -35 foot depth east and north portion, -39 feet west and south portion, 1,200 foot diameter turning circle located in the south west corner.

- West Turning Basin: Trapezoidal basin, 2,750 feet wide at the widest point in the north, 1,400 feet wide at the narrowest point near the existing corner cut off, 1,650 feet long between Cruise Terminals 5 and 10, -31 feet federal project depth, -35 feet CPA maintained depth, 1,400 foot diameter turning circle in the NE quadrant. At the north side is the Cruise Terminal 5 Basin, 650 feet wide by 800 feet long, -35 foot depth.

The US Navy first requested that Congress assess the navigation potential at Port Canaveral in the late 1800s. The most recent survey report completed by the Corps of Engineers and reported to Congress was the October 1991 Navigation Study, Canaveral Harbor, Florida, Final Feasibility Report and Environmental Assessment (EA). This report was the basis for the WRDA 1992 authorization and the navigation project improvements completed in 1995.

The last major improvement to the Federal project at Port Canaveral that increased port capacity was the deepening and widening that was authorized in WRDA 1992 and completed in 1995. Since that time, other Federal improvements have been made to increase project efficiency and decrease maintenance costs, such as improvement and extension of the north entrance jetty in 2005, south jetty improvement in 1993, 1995, and 2000, and the on-going sand by-pass project which initiated its third bypass event in November 2007 (previous bypasses were completed in 1995 and 1998). In addition, the CPA constructed a south entrance jetty sediment trap in 2007 to intercept sand shoaling from the south, as may occur during southerly non-tropical/tropical storm and/or hurricane events. The south jetty sediment trap compliments the north jetty extension in reducing shoaling at the entrance to the harbor.

1.5 Planning Process and Report Organization

The planning process employed by the CPA on the Port Canaveral Section 203 Study has followed the Corps of Engineers' six step planning process as described in the Corps' Planning Guidance Notebook (ER 1105-2-100, dated 22 April 2000). These steps include:

1) specify water resources problems and opportunities;
2) inventory, forecast, and analyze the water and related land resource conditions within the study area;
3) formulate alternative plans which address the identified problems and take advantage of the opportunities;
4) evaluate the effect of alternative plans;
5) compare alternative plans; and
6) select the recommended plan.

The Principles and Guidelines[9] (P&G) adopted by the Water Resources Council guide the formulation and evaluation of Federal water resource projects. P&G requires that the plan recommended for Federal action will be the alternative plan with the greatest net economic benefit consistent with protecting the nation's environment [the National Economic Development (NED) plan], unless the Secretary of Army grants an exception to this rule.

[9] The Water Resources Council's P&G (February 3, 1983) are comprised of two parts: The Economic and Environmental *Principles* for Water and Related Land Resources Implementation Studies and The Economic and Environmental *Guidelines* for Water and Related Land Resources Implementation Studies.

Planning for the Port Canaveral Section 203 Study has been a dynamic process resulting in multiple iterations of the six-step planning process. Through iterations of the six-step planning process, the study has been refined and has resulted in a recommendation for Federal action that is consistent with the Principles and Guidelines and ER 1105-2-100. The remainder of this report documents the results of the six step planning process.

The report is also organized similarly to a Corps of Engineers Integrated Feasibility Report and Environmental Assessment, in order to facilitate review and processing by the Assistant Secretary of the Army (Civil Works). As stated in ER 1165-2-122, "*upon [the Secretary's] determination that the information submitted [in this Section 203 study report] is adequate and the proposal is otherwise acceptable without additional studies or public involvement, the ASA(CW) will direct his representative to circulate a draft EIS or EA to other agencies, organizations, and the public for review and comment and the final filed with the Environmental Protection Agency (EPA) or a Finding of No Significant Impact (FONSI) will be made available to the public."*

The remainder of the Section 203 Study report is organized as follows, with NEPA specific sections noted with an asterisk:

Section 2 – Baseline Conditions / Affected Environment*

Section 3 – Without-Project Conditions

Section 4 – Problems, Opportunities, and Constraints

Section 5 – Formulation and Evaluation of Alternative Plans

Section 6 – Plan Selection

Section 7 – Environmental Consequences*

Section 8 – Public Involvement, Review and Consultation

Section 9 – Recommendations

Section 10 – List of Preparers and Reviewers*

Section 11 – References

Engineering Appendix

Environmental Appendix

Real Estate Appendix

Economics Appendix

Quality Control Appendix

2. BASELINE CONDITIONS / AFFECTED ENVIRONMENT*

This section of the Feasibility Study presents existing physical, environmental, and economic conditions in the study area. Physical conditions include climate and physical infrastructure. Environmental conditions include upland, wetland, and marine ecosystems. Economic conditions include general socio-economic conditions, Port Canaveral operations, and port-related activities.

2.1 General

2.1.1 Temperature and Precipitation

The National Climate Data Center at the National Oceanographic and Atmospheric Administration (NOAA) has calculated normal temperatures and precipitation levels for nearby Orlando, Florida based on 30 years of data from 1971 – 2000. The normal daily maximum temperature ranges from 71.8° F in January to 92.2° F in August. The annual average normal daily high temperature is 83.2° F. Normal daily minimum temperatures range from 49.9° F in January to 73.0° F in August. The annual average normal daily low temperature is 62.4°F. Normal monthly precipitation ranges from 2.31 inches in December to 7.35 inches in June. Average annual precipitation is 48.35 inches.

2.1.2 Geologic Setting

Canaveral Harbor is located within the Brevard County barrier island system between the Atlantic Ocean and the Banana River in the Coastal Lowlands physiographic unit. The regional geology for the Quaternary and upper Tertiary Systems range in age from Recent to Pleistocene to Miocene Age sediments. Undifferentiated Recent to Pleistocene Age sediments cover the entire Brevard County. They consist of unconsolidated quartz sands with beds of sandy coquina. These sediments occur at land surface and range in thickness from 20 feet in the St. Johns River valley to over 100 feet in depth in the coastal ridge area. These sediments lie conformably with the sediments of the Upper Miocene/Pliocene sediments. The Miocene/Pliocene sediments are composed of unconsolidated beds of quartz sands, shells, clay, and calcareous clay. The Upper Miocene/Pliocene sediments vary in thickness (20 – 90 feet) throughout Brevard County, with an overall trend to thicken to the southeast.

The Hawthorne Formation of Miocene Age lies unconformably below the Upper Miocene/Pliocene sediments that underlie all of Brevard County. The sediments of the Hawthorne Formation are composed of greenish/gray; calcareous clay; sandy phosphatic limestone; black and brown phosphorite; and light green to white phosphatic radiolarian clay. Its formational contact may occur at depths of approximately 50 to 100 feet below land surface and may be as thin as 10 feet in the north, thickening to approximately 220 feet in the south.

Areas within Port Canaveral have been dredged several times and dredged material was used to form portions of the Port. A cohesionless layer of clay and silt commonly found in this area is held in suspension at the bottoms of the channels and basins. This layer varies in thickness and becomes denser with depth.

2.1.3 Water Levels

Water levels at Canaveral Harbor are mainly the result of semi-diurnal tidal fluctuations in the Atlantic Ocean. Tidal elevation data for Canaveral Harbor are shown in Table 2-1 based on a tide station located at the Trident Pier in the Trident Basin. This tide station, established by NOAA, continuously records water levels and has been in operation since 1994. All datum elevations are referenced to Mean Lower Low Water (MLLW). The lowest and highest observed water levels have been included to provide an indication of the historical extreme water levels.

Table 2-1
Water Levels (ft.) – Trident Pier, Trident Basin

Highest Observed Water Level (09/16/2001)	6.25
Mean Higher High Water (MHHW)	3.97
Mean High Water (MHW)	3.62
Mean Sea Level (MSL)	1.90
Mean Tide Level (MTL)	1.89
NGVD 1929	1.80
Mean Low Water (MLW)	0.16
Mean Lower Low Water (MLLW)	0.00
Lowest Observed Water Level (02/08/2001)	-1.50

2.1.3.1 Sea Level Rise

Guidance for incorporating the direct and indirect physical effects of projected future sea-level change in USACE projects is provided in the Engineering Circular EC 1165-2-211 titled Water Resource Policies and Authorities Incorporating Sea-Level Change Considerations in Civil Works Programs (USACE 2009). EC 1165-2-211 has an expiration date of July 1, 2011 and is slated to be updated and replaced by a new guidance document, EC 1165-2-212. However, at this point, EC 1165-2-212 has not been formally issued and is still under review. Therefore, EC 1165-2-211 is considered to be the current guidance document for the Port Canaveral widening and deepening project.

The Corps guidance states that consideration should be given to how sensitive and adaptable proposed alternatives are to climate change and other related global changes. Because of the variability and uncertainty in projected future sea-levels, alternatives should be evaluated using low, intermediate, and high rates of future sea-level change for both “with” and “without” project conditions in order to bound the likely future conditions.

The estimated potential sea-level change at Port Canaveral over the period 2014 to 2064 based on guidelines presented in EC 1165-2-211 are presented below.

Low estimates of rate of sea-level change are based on extrapolation of historic rates of sea-level change. Intermediate and high rates include potential future acceleration of sea-level rise based on scenarios represented by modified NRC Curves I and III, respectively, from updates to NRC (1987).

Mean sea-level trends are available for a number of tidal stations along the Florida Atlantic coast from NOAA. The standard error for the calculated trends is related to the period of record for the individual stations. The uncertainty can become large compared to the calculated trend values for smaller periods of record and, therefore, EC 1165-2-211 indicates that the stations used for calculating sea-level trends should have a minimum duration of 40 years of data.

Engineering Appendix Table 25 presents sea-level trends for the three stations along the Florida Atlantic coast both north and south of Port Canaveral obtained from the NOAA website (http://tidesandcurrents.noaa.gov/sltrends/).

The nearest station, Daytona Beach Shores, contains a record that spans 48 years, but with significant gaps (on the order of 20 years of missing data) and therefore, has more uncertainty than the other two stations. For comparison, the next closest station, Mayport, located approximately 145 miles north of the Port has a continuous 78 year record. Miami Beach, located approximately 185 miles south of the Port has a 50 year record with a single gap in the record of about 5 years. EC 1165-2-211 directs to consider the next closest gauge if the period of record of the closest gauge is not greater than 40 years. The sea-level trend of +2.4 mm/year calculated for the Mayport station was used for this analysis to represent the regional sea-level change due to the period of record of the station and apparent relative uniformity of the trends between the three stations.

Engineering Appendix Figure 15 shows results of low, intermediate, and high relative sea-level projections based on methods from EC 1165-2-211. Engineering Appendix Table 26 presents the results of calculations from the project completion in 2014 through 2064 in five year increments. These show sea-level change estimates over a 50-year life of the project ranging from 0.120 meters (0.39 ft) for the low rate of change scenario, to 0.245 m (0.80 ft) for the intermediate rate scenario, and 0.653 m (2.14 ft) for the high rate scenario.

2.1.4 Tidal Currents

In support of the Section 203 study, a hydrodynamic model of Canaveral Harbor has been developed to evaluate the potential effects of project feature alternatives. Data used to calibrate the model were collected in August and September 2005. Details regarding the data collection and hydrodynamic modeling of existing conditions are found in a separate technical memorandum authored by CH2M HILL entitled "Port Canaveral Hydrodynamic Model Calibration", dated June 2007 (Engineering Appendix-Attachment F).

The results of the existing conditions modeling suggest maximum 90^{th} percentile and maximum average current speeds at the west end of the middle reach of 0.58 and 0.28 feet per second (fps) or 0.34 and 0.16 knots, respectively. Current speeds further decrease moving westward to the west basin. The Canaveral Locks connecting the Banana River with Canaveral Harbor largely limit tidal current effects within the harbor. Outside the harbor entrance jetties (north and south), a nominal longshore wind-driven current on the order of 0.3 knots is typically reported by the pilots. No channel cross current or yawing forces associated with currents exists within the harbor.

2.1.5 Water Quality

Water quality in the port is dependent, in part, on water exchange with the ocean, allowing the water in the harbor to be flushed with ocean water. Water exchange and flushing is greatest in the main channel near the mouth of the harbor and reduces further from the mouth, with the least amount of exchange occurring near the locks to the Banana River and in the back portions of the West Turning Basin, the Middle Turning Basin, and the Trident Turning Basin.

Monthly water quality sampling has been performed continuously by Canaveral Port Authority (CPA) since September 1992. Based on the *Port Canaveral Harbor Water Quality Monitoring 2011 Annual Report*, Port Canaveral Harbor generally met requirements of its designation as a Class III predominantly marine water body, per 62-302 Florida Administrative Code (FAC). Class III marine waters are designated for recreation, propagation and maintenance of a healthy, well balanced population of fish and wildlife.

CPA's water quality monitoring program assists the Authority in addressing concerns by the public as to the quality of the Port's water and identifies any potential issues that may exist. Monthly sampling is conducted at ten locations: four sampling stations are located in the main channel from near the locks out to the mouth of the harbor; one sampling station is located in each of the three turning basins, and three stations are located along the beach from Port Canaveral Harbor inlet to Cocoa Beach. In addition to harbor water testing, the Port Authority monitors, on average, nine freshwater outfalls under the National Pollutant Discharge Elimination System (NPDES).

Analysis of the samples from the seven sampling stations in 2011 provides the following results:

- The average dissolved oxygen (DO) values at all stations were well within the State standard for dissolved oxygen in marine waters of 4.0 parts per million (ppm). As with previous years, DO values decreased at all stations during the warm weather from July through October. Violations of State standards for DO were recorded at all stations during September in 2011. Biochemical Oxygen Demand (BODO and Total Organic Carbon (TOC) continue to be well within acceptable limits ;
- Both nitrogen and phosphorus were well within acceptable ranges throughout the Port. Values increased near the locks;
- Chlorophyll-a values increased in 2011 with 25% of the samples exceeding the TMDL of 11 ppm. This may be a result of the influence of the Banana River Lagoon where chlorophyll values were extremely high in the summer months. Values of less than 11 parts per billion (ppb) are considered acceptable by the State);
- Although there were no turbidity violations in the Port during 2011, the total suspended solids values continue to be high throughout the year;
- There were no violations of fecal coliform in 2011;
- There were violations of State standards for copper, iron, and mercury recorded during 2011 but values were all below the State standards in December and usually below detection limits;
- No exceedances for oil and grease have occurred in the harbor in the past year

2.1.6 Wind and Wave Climate

The wind and wave climate at Canaveral Harbor influence the transit conditions for vessel traffic at Port Canaveral. The wind particularly influences cruise ship transits due to the very large freeboard area of these vessels. Several of the larger cruise ships have air drafts exceeding 200 feet. Swell and wind-driven waves from southerly to southeasterly directions affect the navigation of inbound displacement vessel traffic outside of the jetties. Outbound transits are not normally affected by waves beyond the jetties because vessel speed can be increased as needed.

The Canaveral Pilots consider limiting vessel transits when wind speeds range from 15 to 20 knots for tanker and bulk carrier traffic and 25 to 30 knots for cruise traffic. Cargo vessel traffic is always accompanied by tug assist. The Pilots indicate that when winds exceed 15 to 20 knots from south to southeast directions, the wind and associated wave conditions in the Outer Reach are rough enough that the tugs are generally unable to make-up to the displacement vessels for navigation assistance inbound. The cruise vessel traffic, historically without tug assist, will generally transit the channels in winds of up to 30 knots and waves outside the jetties are not a factor based on the large channel water depth-to-vessel draft ratio. Tug assist is required for the newer largest cruise vessels in winds above 25 knots. A maximum design wind speed of 30 knots for cruise vessel transit and 20 knots for displacement vessel transit was selected to govern the assessment of navigation improvements at Port Canaveral for this study.

Analysis of site specific wind data can be used to establish the probability of occurrence of various wind speeds. Historical wind data for the National Aeronautics and Space Administration (NASA) Shuttle Landing Facility was readily available for the period March 1978 through April 2003. This data is collected at the standard measurement height of 10m. The record of data provided by the 45th Space Wing, Weather Squadron, Cape Canaveral Air Force Station, does not normally include high winds associated with tornados, tropical storms, or hurricanes as the equipment is generally secured to prevent damage. This site, at the Kennedy Space Center, is approximately 13 miles north of Port Canaveral and is largely unobstructed by land or buildings. This data is considered to be suitable to characterize the distribution and magnitude of winds at Port Canaveral. A detailed analysis of wind impacts on Port operations may be found in the Engineering Appendix and Economics Appendix.

Charts 2-1 and 2-2 present the percent frequency of occurrence and cumulative percent exceedance for all recorded hourly observed surface winds as well as the daily peak winds for the record period at the NASA Shuttle Landing Facility. The daily peak winds are obtained by considering only the peak wind recorded for each day during the record period, so analysis of this data represents a very conservative distribution of peak winds. The number of observations used in this data set is not reported. The data set considering all recorded surface wind data contains 215,719 observations over the record period. The cumulative exceedance plot for this 26-year period shows that less than 1% of all surface winds are 20 knots or greater. When only the daily peak winds are considered, then 10% of these winds are 30 knots or greater and 50% are 20 knots or greater.

Chart 2-1
Percent Frequency Occurrence, All and Daily Peak Surface Winds

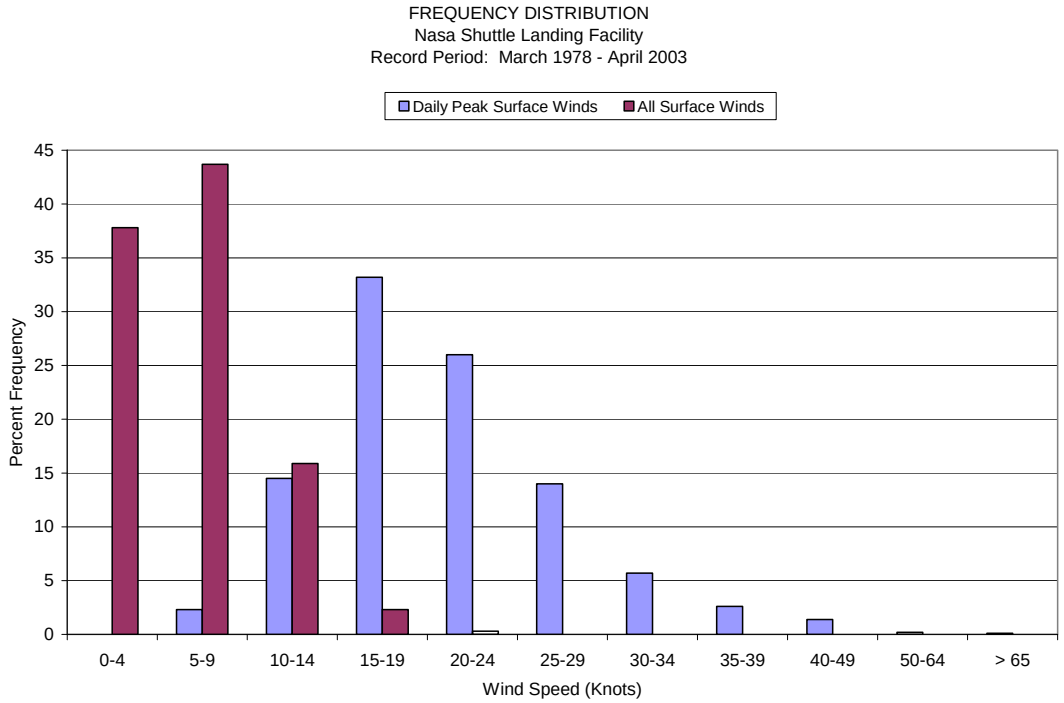
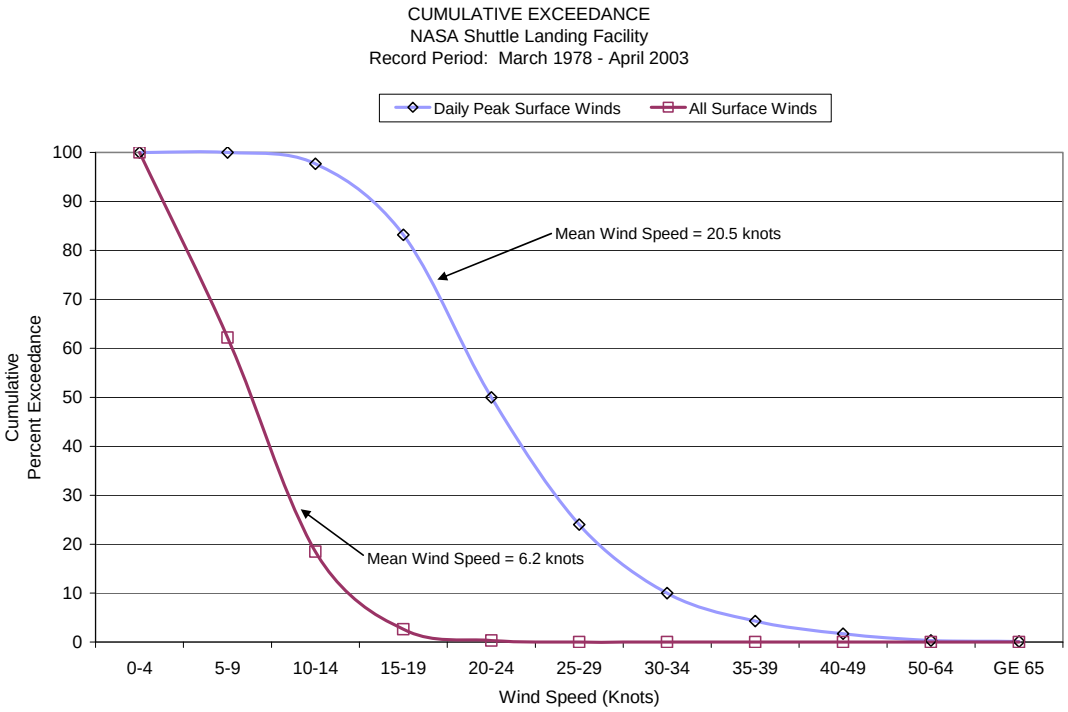


Chart 2-2
Cumulative Percent Exceedance, All and Daily Peak Surface Winds



The entrance from Port Canaveral offers some protection from wind-driven waves from deep water from the north through east directions due to the Cape Canaveral land mass to the north and the Southeast Shoal approximately 8 to 10 nautical miles east of the harbor.

Wave climate for the entrance channel was forecast for wind speeds ranging from 15 to 20 knots for tanker and bulk carrier traffic and 25 to 30 knots for cruise traffic. The wave conditions at the entrance to the harbor are duration-limited, so the wave growth in terms of height will be limited by the length of time the wind blows. Table 2-2 summarizes the wave parameter predictions for the Canaveral Harbor entrance. These parameters were used in the simulation-based navigation analyses conducted to determine alternative channel dimensions. Parameters estimated included: spectral wave height (Hmo), peak spectral period (Tp), and wave length (L) for durations of 1, 2, and 3 hours and for wind speeds of 15, 20, 25, and 30 knots based on linear wave theory for an average water depth of 45 feet.

Table 2-2
Wave Predictions – Entrance to Canaveral Harbor

Duration-Limited Wind Speed (knots)												
Duration of Wind (hrs)	15			20			25			30		
	Hmo (ft)	Tp (sec)	L (ft)	Hmo (ft)	Tp (sec)	L (ft)	Hmo (ft)	Tp (sec)	L (ft)	Hmo (ft)	Tp (sec)	L (ft)
3	1.8	3.0	46	2.8	3.7	70	4.1	4.3	94	5.5	5.0	125
2	1.4	2.5	32	2.1	3.1	49	3.0	3.7	70	4.1	4.2	90
1	0.8	1.9	19	1.3	2.3	27	1.9	2.8	40	2.5	3.2	52

2.1.7 Landside Access

State Road (SR) 528 terminates at the Port Canaveral interchange. This limited access highway connects to I-95 in Cocoa, and to I-4, the Florida Turnpike, and SR 417 (Central Florida Greenway) in Orlando. SR 528 connects to George J. King Boulevard, which provides access to all south side port facilities. SR 401 branches off from SR 528 to provide access to all north side port facilities before continuing on to the Cape Canaveral Air Force Station. Additional access to the south side of the Port is provided by A1A and North Atlantic Avenue, a two lane local street within the City of Cape Canaveral that has access from A1A, a four lane state road which turns into SR 528. There is no direct rail access in Port Canaveral. The nearest rail spur is in the City of Cocoa, 11 miles west via SR 528 with access to Florida East Coast Railway lines which extend along a 351-mile corridor between Jacksonville and Miami.

The Florida Department of Transportation (FDOT) is currently widening State Road 528 (Beachline Expressway) which runs between Orlando and Port Canaveral. Currently the road is a four lane (two lanes in each direction) toll road designed in 1960. A Project Development and Environment (PD&E) study was completed by the Florida Department of Transportation in August 2006 recommending a six lane widening project as the selected alternative. In May

2007, Florida's Turnpike Enterprise began Phase I of a project to widen the Beachline West. It encompasses the reconstruction of the mainline toll plaza located near Milepost 5, which is now complete. Ultimate roadway improvements will include four travel lanes in each direction, but due to construction costs, the improvements will be stage-constructed, with the interim improvements including three lanes in each direction. In June 2008, a project began to widen the Beachline from the Turnpike to McCoy Road. Improvements include widening the existing bridge structures at US 441, Landstreet Road, CSX Taft Yard, Orange Avenue and McCoy Road. A new bridge will also be constructed for the access ramp over CSX. The final phase, between Interstate 4 and the Turnpike, has been pushed out due to rising construction costs and expected traffic projections. That project is not included in the Turnpike's current five-year work program. A detailed traffic report may be found in the Engineering Appendix.

2.2 Navigation Features

Port Canaveral is located in Brevard County on the east coast of Florida, approximately five to six miles north of Cocoa Beach at Latitude: 28°24'26"N; Longitude: 80°30'49"W (see Figure 2-1, repeated from Section 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 and the Banana River, and bounded to the south by the City of Cape Canaveral. The harbor contains three turning basins (see Figure 2-2, repeated from Section 1). Starting from the east (ocean ward) 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 (Inner Reach and West Access Channel) that forms the south boundary of each basin. The Canaveral Pilots Association provides pilotage to vessels arriving and departing the port. The pilots typically board the arriving vessel in the vicinity of Approach Channel Buoys 7 and 8. The average pilotage time, from approach buoy to turning basin, is approximately one hour.

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 lagoon system.

Figure 2-1
Port Canaveral Location Map

Figure 2-2
Port Canaveral Existing Navigation Project Features

2.2.1 Channels and Turning Basins

The Federal navigation project consists of the outer, middle, and inner reaches, the west access channel, and three turning basins (see Figure 2-2 and Table 2-3). The harbor is close to sea lanes with an average travel time from the sea buoy to the turning basins of approximately one hour.

Table 2-3
Port Canaveral Existing Channel Dimensions

(Federally Authorized project depths in feet MLLW, lengths and width in linear feet)

Project Feature	Cut and Centerline Station Start / End (ft.)	**Length**	**Width[1]**	**Depth**
Outer Reach	Cut 1A, 0+00 to 110+00 Cut 1B 0+00 to 55+00 Cut 1, 0+00 to 125+00	29,000	400	-44[2]
Middle Reach	Cut 2, 125+00 to 181+70	5,658	400	-44[2]
Inner Reach	Cut2, 181+70 to 207+00 Cut 3, 207+00 to 215+00	3,344	400	-40
Middle Turning Basin	M.T.B., 215+00 to 241+70	2,260	NA	-39
West Access Channel (east of Station 260+00)	W.A.C., 241+60 to 260+00 Cut A, 0+00 to 18+40	1,840	400	-39
West Access Channel (west of Station 260+00)	W.A.C., 260+00 to 277+30 Cut A, 18+40 to 36+70	1,730	400	-31 (CPA maintains to -35)
Barge Canal[3]	Cut 1 to Canaveral Lock, 141+60 to 227+70	8,610±	125	-12

Notes: [1] CPA maintains additional channel width in some limited areas (see Figures 2-3 & 2-4)
[2] US Navy Project authorized to 44 feet, Civil Works Project authorized to 41 feet
[3] Barge Canal length from start of West Access Channel to Canaveral Locks

The three turning basins have the following dimensions:

- Trident Turning Basin: Approximate 1600 feet wide by 1800 feet long basin with an access channel that tapers in width from 650 feet at the north end, to 400 feet at the south end, -41 foot depth.
- Middle Turning Basin: Approximate 2200 feet long basin (including channel), 1800 feet wide at the north end, 2600 feet wide at the south end, -35 foot depth east and north portion, -39 feet west and south portion, 1200 foot diameter turning circle located in the south west corner.
- West Turning Basin: Trapezoidal basin, 2750 feet wide at the widest point in the north, 1400 feet wide at the narrowest point near the existing corner cut off, 1650 feet long between Cruise Terminals 5 and 10, -31 feet Federal Project depth, deepened and maintained to -35 feet by CPA , 1400 foot diameter turning circle in the NE quadrant. At the north side is the Cruise Terminal 5 Basin, 650 feet wide by 800 feet long, -35 foot depth.

Figure 2-3
"Pilot's Dredging" Areas Sheet 1 of 2

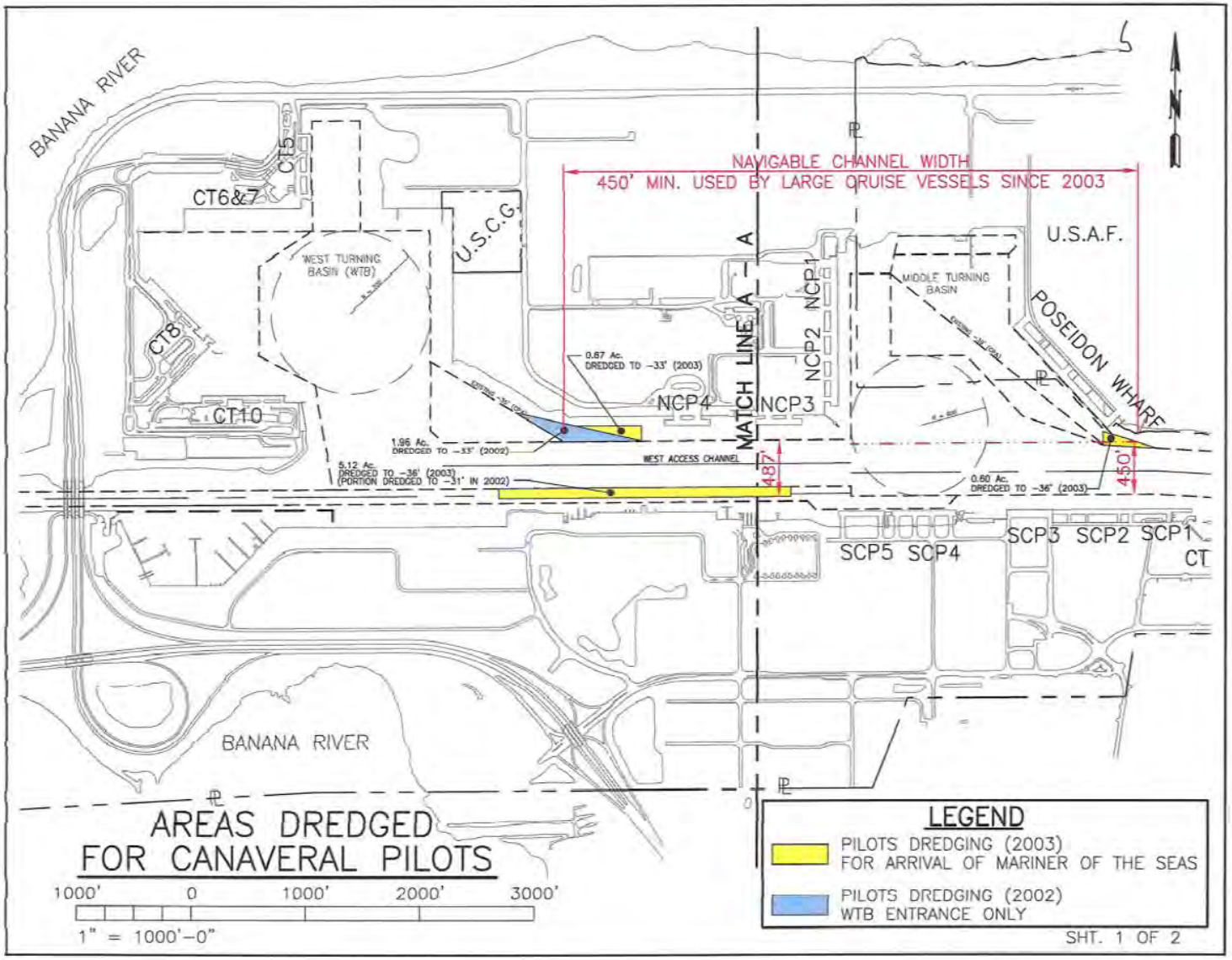
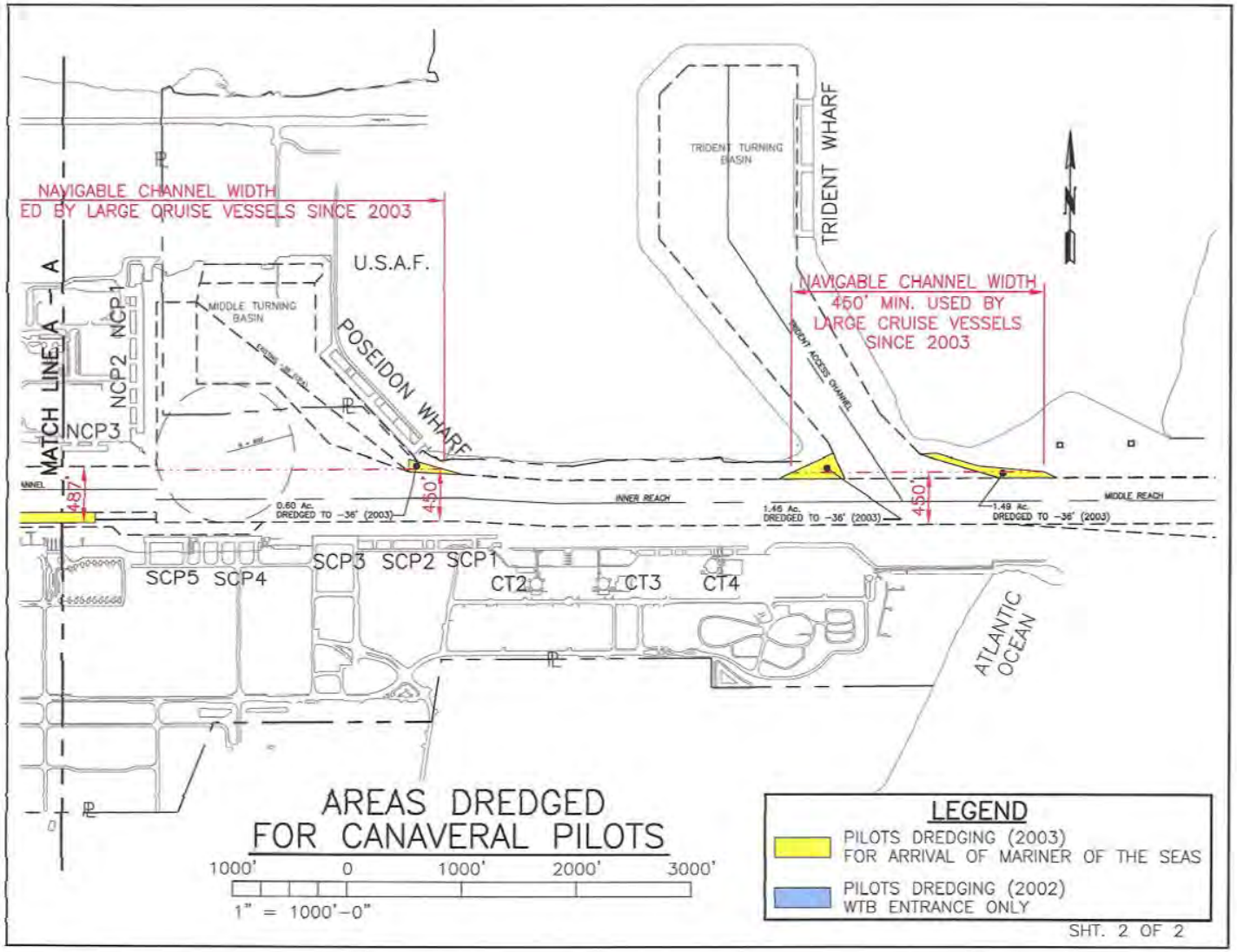


Figure 2-3 (continued)
"Pilot's Dredging" Areas Sheet 2 of 2



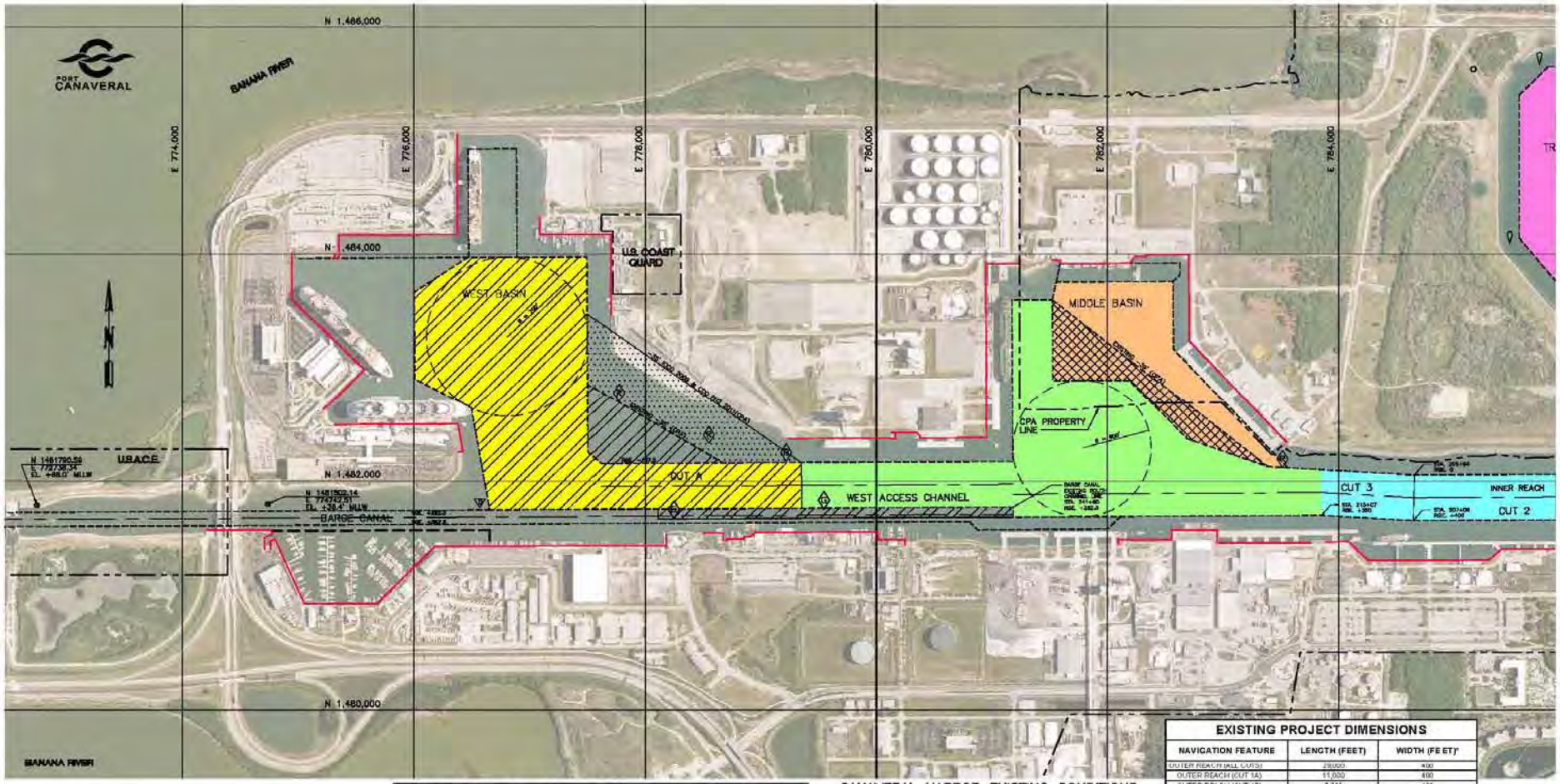
The channel and turning basin dimensions portray a tightly fitted seaport that heavily relies on pilot, multiple tug, and / or thruster assistance on all vessel maneuvers within the port. The channel is too narrow for turning a vessel, so all cargo, cruise, and naval vessels (with the exception of Trident submarine operations) use either the Middle Turning Basin or the West Turning Basin for maneuvering.

In order to accommodate regular access by Voyager Class and larger vessels, some areas beyond the existing authorized channel dimensions have been dredged and maintained by the CPA in order to extend the channel width beyond the 400-foot authorization at critical locations (Figure 2-3). This "Pilots Dredging", as these areas are known, provides a controlling depth of -33 ft to -36 ft to accommodate cruise ship transits. The effective width of the channel from the middle reach to the beginning of the West Access Channel is 450 feet. This area is also shown in Figure 2-5 in the gray cross-hatched area below (south of) the yellow and green segments of the West Access Channel between the Middle and West Basins, extending into the Barge Canal. As a result of the "Pilots Dredging", the effective width of portions of the West Access Channel is 487 feet. This dredging was originally conducted in 2002 and 2003 (Table 2-4).

In 2009, in preparation to homeport the newest & largest cruise vessels entering the world fleet, beginning with RCI's *Freedom of the Seas*, CPA executed the Interim Corner Cut Off (ICCO) new work dredging. This dredging project shifted the -35' CPA maintained dredge boundary further to the east and north. The ICCO new work dredging area is shown on Figure 2-5 in the gray dotted polygon extending northwest from the westward end of the green colored portion of the West Access Channel to the yellow cross-hatched West Basin turning circle. Phase 2 of the ICCO work was concluded in 2011 in order to temporarily accommodate the RCI *Freedom of the Seas*, the Carnival *Dream*, and the *Disney Dream* and *Disney Fantasy*. The CPA currently maintains a depth of -35' at 18.5 acres of navigation area that lie beyond the existing federal project limits at the entrance to west basin. The ICCO is intended to be an interim measure for cruise navigation, but is not anticipated to support access to the WTB in the full range of conditions encountered at Port Canaveral. The ICCO was originally intended to be a recommended feature of this Section 203 study. However, CPA had to dredge the ICCO in advance of Section 203 project authorization in order to accommodate these new cruise ships upon their arrival in 2009-2011. The ICCO dredging work is therefore included as a without-project condition in all alternative plan evaluations; however CPA recognizes that cost sharing credit will need to be specifically authorized by Congress for the ICCO, since it was constructed in advance of project authorization.

The grey cross-hatched right triangle between the ICCO and the yellow highlighted Federal channel is the portion of the WTB that was dredged by CPA to -35 feet in 1992 and maintained by them since that time.

Figure 2-4
Port Canaveral Navigation Features West of Trident Basin



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.

AUTHORIZED CIVIL WORKS NAVIGATION DEPTH LEGEND (MLLW)

- FEDERAL PROJECT, −41'
- FEDERAL PROJECT, −41' CW/ −44' USN
- WB CORNER CUT-OFF CPA PROJECT, −35'
- FEDERAL PROJECT, −40'
- FEDERAL PROJECT, −39'
- CPA PROJECT, −39'
- CPA PROJECT, −35'
- FEDERAL PROJECT, −35'
- FEDERAL PROJECT, −31' CPA PROJECT, −35'

CANAVERAL HARBOR EXISTING CONDITIONS

400' 0 400' 800' 1200'
1" = 400'-0"

LEGEND

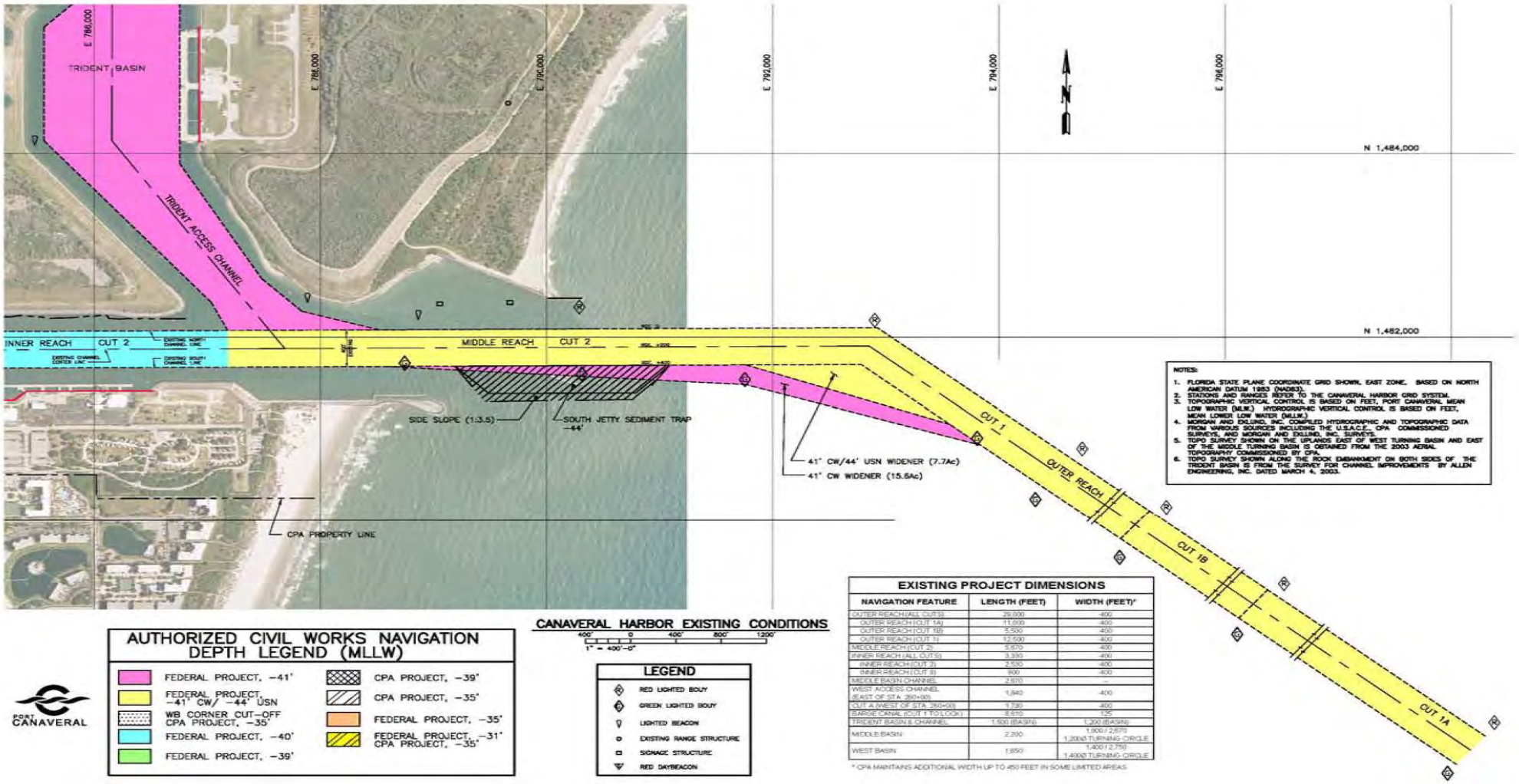
- RED LIGHTED BOUY
- GREEN LIGHTED BOUY
- LIGHTED BEACON
- EXISTING RANGE STRUCTURE
- SIGNAGE STRUCTURE
- RED DAYBEACON

EXISTING PROJECT DIMENSIONS

NAVIGATION FEATURE	LENGTH (FEET)	WIDTH (FEET)*
OUTER REACH (ALL CUTS)	29,000	400
OUTER REACH (CUT 1A)	11,000	400
OUTER REACH (CUT 1B)	5,500	400
OUTER REACH (CUT 1)	12,500	400
MIDDLE REACH (CUT 2)	5,670	400
INNER REACH (ALL CUTS)	3,330	400
INNER REACH (CUT 2)	2,530	400
INNER REACH (CUT 3)	800	400
MIDDLE BASIN CHANNEL	2,670	--
WEST ACCESS CHANNEL (EAST OF STA. 260+00)	1,940	400
CUT A (WEST OF STA. 260+00)	1,730	400
BARGE CANAL (CUT 1 TO LOCK)	9,810	125
TRIDENT BASIN & CHANNEL	1,500 (BASIN)	1,200 (BASIN)
MIDDLE BASIN	2,200	1,000 / 2,670 1,2000 TURNING CIRCLE
WEST BASIN	1,850	1,400 / 2,750 1,4000 TURNING CIRCLE

* CPA MAINTAINS ADDITIONAL WIDTH UP TO 450 FEET IN SOME LIMITED AREAS

Figure 2-5
Port Canaveral Navigation Features East of Trident Basin



2.2.2 Dredging History

Sedimentation in the Federal navigation channel occurs due to alongshore transport into the harbor from the coast and redistribution of sediments inside the harbor. Sand and finer suspended sediments are transported into and deposited in the harbor during rising tides due to the influence of waves and tidal currents. Redistribution of sediments inside the harbor results in additional shoaling in the channel and occurs episodically due to storm events.

The Canaveral Harbor Federal Sand Bypass Project was authorized by the Rivers and Harbors Act of 1962 (Public Law 87-874). The Sand Bypass Project transfers the equivalent of 156,000 cubic yards/year of sand, from north to south across the harbor entrance, in approximately 6 year cycles (i.e., approximately 900,000 CY once every 6 years). The sand is dredged from the Cape Canaveral Air Station shoreline within approximately 8,200 feet north of the north jetty, from between the Mean High Water and -16 feet MLLW depth contours. The sand is placed in a berm along the City of Cape Canaveral shoreline within approximately 12,800-feet south of the south jetty and then moved and shaped using earthmoving equipment. The sand transfer is accomplished by a hydraulic dredge and temporary pipeline that are mobilized to the site for the purpose in approximate 6-year cycles. Other than select environmental monitoring requirements, this project is one-hundred percent federally funded.

The South Jetty Deposition Basin (sediment trap) located on the south side of the Middle Reach was recently designed and constructed by the CPA to help reduce the amount of maintenance dredging in this area from major storm events approaching from a southeasterly direction. In addition, the north and south harbor entrance jetties have been extended seaward and "tightened" with sand tubes and riprap placement to minimize sand transport. Most recently, shoaling and emergency dredging occurred due to closely spaced Hurricanes Frances and Jeanne in September 2004.

Dredged material taken from below -13 feet MLLW generally consists of silts and clays, which are not suitable for reuse. Material taken from below -13 feet MLLW is, however, suitable for offshore disposal, which is the least cost disposal alternative. This material is disposed in the U.S. Environmental Protection Agency (EPA) designated Canaveral Ocean Dredged Material Disposal Site (ODMDS). The Canaveral ODMDS is a 2 nautical mile by 2 nautical mile square, which lies in the Canaveral Bight on the shallow continental shelf. The Canaveral ODMDS is centered 4.5 nautical miles offshore of Cocoa Beach, Florida, and has a depth range of 14 meters (47 feet) to 17 meters (55 feet).

The three primary users of the Canaveral ODMDS are:

- U.S. Army Corps of Engineers (West and Middle Turning Basins, Entrance Channel (Cut 1), Inner Channel (Cuts 2 and 3), and the Barge Canal);
- U.S. Navy (Trident Access Channel and Turning Basin, Cut 1A, Entrance Channel Widener); and
- Canaveral Port Authority (West and Middle Turning Basins and Berthing Areas).

The most recent management plan for the ODMDS is the Site Management and Monitoring Plan (SMMP) dated February 2012, which replaced the previous SMMP that expired October 2011. The SMMP is a ten-year plan, jointly implemented by the Corps' Jacksonville District and USEPA's Region 4. The new February 2012 SMMP does not identify an annual placement

volume limit. Additionally, overall planning for the revised SMMP specifically accounts for all construction and maintenance dredging volumes associated with this project. The SMMP identifies a ten-year cap of 9.2 million cubic yards, which may be increased if an increase is supported by future modeling.

Sands are generally located at and above elevation -13 feet (MLLW). Although these sands are not typically suitable for direct placement on the beach, they can either be stockpiled on land for reuse as construction fill material, or placed in the Near Shore Berm to augment the sand-sharing system, provided they meet regulatory standards.

Table 2-4 presents Port Canaveral's new work dredging history, which displays volumes associated with Corps Civil Works channel dredging, Navy channel dredging, and CPA dredging.

Table 2-4
New Work Dredging History

Year	Location	Volume (CY)	Agent	Composition
1974	Entrance Ch[1]. & Trident Basin	645,198	Navy	Sandy Silt
1975	Entrance Ch. & Trident Basin	2,196,470	Navy	Sandy Silt
1976	Entrance Channel	1,343,121	Corps	Sandy Silt
1986	Entrance Channel	63,370	Corps	Silty Sand
1993	West Turning Basin SE Corner	400,000	CPA	Clay
1994	Entrance Channel	454,000	Corps	Silty Sand
1994	Middle Turning Basin	1,039,000	Corps	Silty Sand
1994	West Turning Basin CT10	86,000	CPA	Silty Sand
1996	West Turning Basin CT8	212,000	CPA	Silty Sand
2002	West Turning Basin Entrance	89,000	CPA	Silts & Clays
2003	Inner Reach & West Access Ch.	132,000	CPA	Silts & Clays
2007	Canaveral Harbor South Jetty Sediment Trap	368,160	CPA	Silts & Clays

Source: CPA
1 Entrance Channel consists of the Outer Reach and portion of the Middle Reach outside of the jetties

As mentioned, maintenance dredging in the harbor is conducted by the Corps, the Navy, and the CPA. Navy maintenance dredging occurs in the Entrance Channel, in the Trident Access Channel, and in the Trident Basin. Since 1974, the Navy has conducted maintenance dredging

ten (10) times, with an average volume of 266,000 CY per maintenance dredging cycle. CPA maintenance dredging is generally conducted in the berths and in the West Turning Basin. The CPA maintains the West Turning Basin to a depth of -35 feet MLLW, four feet deeper than the federally authorized depth of the West Turning Basin of -31 feet MLLW. Since 1988, the CPA has conducted maintenance dredging in eight different years, with an average volume of 51,600 CY per dredging year. By far, the largest amount of maintenance dredging is conducted by the Corps. Since 1976, the Corps has conducted maintenance dredging 24 times, with an average volume of 660,500 CY per dredging year. Table 2-5 presents the Corps' maintenance dredging history at Port Canaveral.

Table 2-5
Corps of Engineers Maintenance Dredging History

Year	Location	Volume (CY)	Agent	Composition
1976	Entrance Channel	341,888	Corps	Sandy Silt
1977	Entrance Channel	48,017	Corps	Sandy Silt
1978	Entrance Channel	282,517	Corps	Sandy Silt
1980	Entrance Channel	1,402,547	Corps	Sandy Silt
1981	Entrance Channel	257,326	Corps	Sandy Silt
1983	Entrance Channel	929,555	Corps	Sandy Silt
1985	Entrance Channel	2,958,827	Corps	Silty Sand
1986	Entrance Channel	351,535	Corps	Silty Sand & Silt
1988	Entrance Channel	1,642,938	Corps	Silt
1989	Entrance Channel	203,000	Corps	Silt
1990	Entrance Channel	173,772	Corps	Silt
1991	Middle Turning Basin (MTB)	497,380	Corps	Silt
1992	Entrance Channel & MTB	550,000	Corps	Silt
1993	Entrance Channel	1,878,460	Corps	Silt
1994	Entrance Channel	98,820	Corps	Silt
1995	Entrance Channel	243,180	Corps	Silt
1996	Entrance Channel	245,274	Corps	Sandy Silt
1997	Entrance Channel	773,999	Corps	Sandy Silt
1998	Entrance Channel	688,839	Corps	Sandy Silt
2000	Entrance Channel	300,320	Corps	Silt
2002	Entrance Channel	410,000	Corps	Silts & Clays
2004	Entrance Channel	202,624	Corps	Silts & Clays
2005	Entrance Channel	417,997	Corps	Silts & Clays
2006	Entrance Channel & MTB	952,705	Corps	Silts & Clays
	Average Volume	660,500		

Source: CPA
1 Entrance Channel consists of the Outer Reach and portion of the Middle Reach outside of the jetties

2.3 Terminal Facilities

Port Canaveral terminal facilities can be generally grouped into four categories: dry bulk cargo, liquid bulk cargo, cruise, and naval. Naval facilities exist along the east side of the middle turning basin and at the Trident turning basin, although naval vessels do layover at cargo berths occasionally. Naval use of the port's facilities have an insignificant impact on overall port operations and therefore are not addressed in detail in this analysis. Ancillary benefits of navigation improvements at Port Canaveral, which accrue to the Navy mission, are presented in this report. Commercial industries that occur along the Port's waterfront, such as marinas, restaurants, and small commercial fishing enterprises are not addressed in detail. Figure 2-6 presents the major port facilities.

A Florida Power and Light (FPL) barge berth is located on the south side of the West Access Channel. The barges take fuel from the on-site FPL fuel storage tank (filled by tankers berthed at Tanker Berth 2) through the barge canal to FPL facilities on the Indian River. FPL barge traffic does not have a significant impact on Port Canaveral operations.

The types of cargo that can be handled at each of the Port's berths are listed in Table 2-6. Containers are typically handled at a temporary 300-foot berth at the north cargo area, but may also be handled at North Cargo Pier (NCP) 2 and South Cargo Piers (SCP) 3 & 5. The listing of south side tanker berths 1 & 2 may be somewhat misleading because the designation "tanker berth" indicates the presence of a fuel manifold for offloading tankers. The tanker berths are not physically separate berths, but are shared with SCP 4 & 5 on the south side. SCP 3 also has a fuel manifold that is often used to load bunker oil onto barges for delivery to cruise ships in the West Turning Basin. Fuel barges may also be loaded at tanker berths (TB) 1 & 2. The new Seaport Canaveral Terminal will unload tankers at NCP 1 & 2. Roll-on/Roll-off capabilities exist at NCP 1 and Cruise Terminal (CT) 2 (formerly used by Premier Cruise Line).

Table 2-6
Port Canaveral Cargo Category by Berth

South Side Berths	Dry Cargo	Liquid Bulk	Cruise
SCP1	Yes	No	No
SCP2	Yes	No	No
SCP3	Yes	Yes	No
SCP4	Yes	No	No
SCP5	Yes	No	No
TB1	N/A	Yes	N/A
TB2	N/A	Yes	N/A
CT2	No	No	Yes
CT3	No	No	Yes
CT4	No	No	Yes
North Side Berths	**Dry Cargo**	**Liquid Bulk**	**Cruise**
NCP1	Yes	Yes	No
NCP2	Yes	Yes	No
NCP3	Yes	No	No
NCP4	Yes	No	No
CT5	No	No	Yes
CT6	No	No	Yes
CT8	No	No	Yes
CT 9/10	No	No	Yes

Note: SCP = South Cargo Pier, TB = Tanker Berth, NCP = North Cargo Pier, CT = Cruise Terminal. Source: CPA

Figure 2-6
Port Canaveral Major Facilities

2.3.1 South Side Cargo Terminal Facilities

The south side of the Inner Reach features nearly continuous cruise and cargo wharfs from the entrance to the Trident turning basin to the west side of the Middle Turning Basin. Three cruise terminal berths (CT2, CT3, and CT4) are located at the east end of the southern berths. Five cargo berths (SCP1-5) and two tanker berths (TB1 and TB2) extend westward from the termination of the cruise terminal berths. From the western end of the south cargo berths westward to the SR401 bridge, the bulkhead wall is leased to commercial fishing, restaurant, small vessel and marina operators.

Use of SCP1 is limited by the narrow pier apron along the eastern end of the berth and by the narrowness of the channel at that point. The Canaveral Pilots Association limits the size and placement of vessels at SCP1 because of the potential need to "crab" (i.e., sail at an angle that increases a vessel's effective beam) cruise ships through this reach under windy conditions. SCP1, SCP2 and SCP3 share a continuous pier that is 1,614 feet long. SCP4 and SCP5 are not continuous. Cement and aggregates are both offloaded at SCP4 due to the location of offloading equipment. An overhead conveyor system is available to transport aggregates from the SCP4, over and across George King Boulevard, to the Ambassador Services, Inc. storage facility. Ambassador Services, Inc. is one of the major shipping agent and stevedore service providers at the port.

TB1 is the primary tanker berth used by Transmontaigne for multiple petroleum products and SCP3 is a secondary berth for tankers. Transmontaigne operates a tank farm off CPA property near the port's south cargo facilities. The tank farm includes 730,000-barrel storage capacity for gasoline, diesel, asphalt, and bunker fuel. TB2 is used by RRI Energy, Inc. and FPL. Historical deliveries to TB2 for FPL have recently been terminated, as the Cape Canaveral Power Plant is currently undergoing modernization as a gas-fired plant. It is important to note that tug/barge combinations are frequently used to deliver petroleum products to Port Canaveral. These tug/barge combinations are often greater than 600 feet long and are no different from tankers in their use of berth facilities. Smaller barges are used to deliver fuel to the plants located on the Indian River. Table 2-7 summarizes Port Canaveral's south side cargo terminal facilities. Additionally, vessels are also offloaded using mobile harbor cranes, ship's gear, and other mobile equipment.

Table 2-7
Port Canaveral South Side Cargo Terminal Facilities Summary

Berth	Length (ft)	Unloading Facilities	Storage facilities
SCP1	655	None	Warehouses (dry, cool, and freezer)
SCP2	660	None	Warehouses (dry, cool, and freezer)
SCP3	400	Petroleum Products Manifold	Warehouses (dry, cool, and freezer)
SCP4	560	Mobile conveyor system[1] Mobile cement unloader	Open Storage Cement silos
SCP5	400	None	Open Storage
TB-1	NA	Petroleum Products Manifold	Off-site tank farm
TB-2	NA	Petroleum Products Manifold	On-Site 325,000 barrel & 268,000 barrel storage tanks

Note: [1] Conveyor system transports materials off CPA property to an open storage facility. Source: CPA

2.3.2 North Side Cargo Terminal Facilities

Cargo berths on the north side of Port Canaveral are located along the western edge of the Middle Turning Basin, along the adjacent north side of the west access channel, and along the corner cut off at the West Turning Basin. The largest single cargo facility on the north side is the Seaport Canaveral Terminal. Seaport Canaveral is a 2.84 million barrel fuel storage and terminal facility. Vitol, S.A., Inc. has a 30-year lease agreement with the CPA for 36 acres of land in the north cargo area. The company is operating at Port Canaveral as Seaport Canaveral LLC. The lease agreement includes two 10-year extension options. Vitol, S.A., Inc. is an international fuel trading company previously operating fuel terminals in seven countries. Seaport Canaveral (Figure 2-7) makes the United States the eighth country in their system. Table 2-8 presents the Seaport Canaveral product storage capabilities as submitted in Vitol's permit applications.

Table 2-8
Seaport Canaveral (Vitol, S.A., Inc) Terminal Storage Capability

Product	Number of Tanks	Storage Capacity (bbls)
Marine Diesel Oil	3	150,000
#6 Fuel Oil	2	300,000
Ethanol	2	110,000
Diesel	4	600,000
Jet Fuel	2	300,000
Regular Gasoline	5	750,000
Premium Gasoline	3	450,000
Blend Components	3	180,000
Completed Construction Sub-Total	**24**	**2,840,000**
Future Tanks	7	950,000
Full Build Out Total	**31**	**3,790,000**

Source: CPA

Facility operations at Seaport Canaveral began in February 2010. Oil tankers and barges use a new petroleum product hook-up system at berths NCP1/NCP2.

From February 2010 through July 2011, Seaport Canaveral has used three types of vessels:

- tug/barge combinations, which may be a long as 600 feet and operate with arrival drafts up to 30 feet;
- multi-point service vessels, which are tankers typically in the 400 to 500-foot range with arrival drafts of 32 feet and less, and
- Point-to-point service vessels which are tankers typically 600 feet long with design drafts averaging 39.2 feet and operate at the port with arrival drafts from 34 to 36 feet.

Only the point-to-point tankers are depth constrained at Port Canaveral.

Most roll-on/roll-off activity has taken place at NCP1. Vessels berthed at NCP2 often extend beyond the southern limit of the pier, but this practice is limited by the proximity to the channel. NCP4, although not a dedicated berth, is used typically by vessels bringing cement to the adjacent Cemex (formerly Rinker) silos. Salt has always been offloaded at NCP1 and slag has always been offloaded at NCP2 due to the close proximity of the facilities to these berths. A temporary 300-foot berth, which mostly is used for containers, is the only cargo berth located in the West Turning Basin. Table 2-9 summarizes the existing condition of Port Canaveral's north side cargo terminal facilities.

Figure 2-7
Seaport Canaveral Fuel Terminal

Table 2-9
Port Canaveral North Side Cargo Terminal Facilities Summary

Berth	Length (ft)	Unloading Facilities	Storage facilities
NCP1	645	Mobile Conveyor Mobile Hoppers Petroleum Products Manifold	Paved container yard Open and paved storage On-site 2.8 million barrel storage facility
NCP2	645	Mobile Conveyor Mobile Hoppers Petroleum Products Manifold	Slag silo Open Storage On-site 2.8 million barrel storage facility
NCP3	400	None	Dry storage warehouse Paved open storage
NCP4	400	Rail mounted auger cement unloader	Cement silos
NCP5	750	Berth construction to be completed 2013	To be determined
NCP6	750	Berth construction to be completed 2013	To be determined

2.3.3 Cruise Terminal Facilities

Port Canaveral's cruise terminals are located at the eastern end of the Port's south side and in the West Turning Basin. Along the port's south side, CT2, 3, and 4 were the first cruise terminals to be developed at Port Canaveral. The newer cruise terminals (CT5, CT8, and CT9/10), which service the large multi-day cruise ships, are located in the West Turning Basin. Currently the *Carnival Sensation* uses CT5 and the *Carnival Dream*, which replaced the *Carnival Glory*, began using CT9/10 in mid-November 2009. The *Disney Magic*, *Disney Wonder* and *Disney Dream* share CT8. CT9/10 is also shared by Royal Caribbean International's (RCI) *Monarch of the Seas* and the *Freedom of the Seas*. The *Norwegian Spirit* also berths at CT9/10 during her seasonal homeport use of Port Canaveral. Port-of-call vessels typically use CT5 or small port-of-call vessels may use CT3 or CT4.

A new cruise terminal (CT6) to be located at the northwestern end of the West Turning Basin, is currently under construction and scheduled for completion in summer 2012. Port Canaveral has begun construction on a new $60 million terminal, which will be able to handle the largest cruise ships at sea. The Cruise Terminal 6 complex is the biggest project at Port Canaveral since 1995, when it constructed facilities to accommodate the then-new Disney Cruise Line. Construction has already begun on the pier portion of the project and it should be completed by July 2012. The complex will have a 2,500-person processing area and a 1,100-seat waiting area, and will be able to simultaneously load and unload passengers. It also includes a new pier, gangway and parking garage with a covered walkway to the terminal.

Recently completed construction activities for Port Canaveral's cruise terminal facilities include an additional mooring dolphin and pier expansion at CT10 to accommodate RCI's Freedom Class vessels. Near-term construction plans for Port Canaveral's cruise terminal facilities include expansion of the berth and terminal at CT8 to accommodate the new, larger Disney vessels. Table 2-10 summarizes Port Canaveral's cruise terminal facilities.

Table 2-10
Port Canaveral Cruise Terminal Summary

South Side				
Berth	Length (ft)	Maximum Vessel Length (ft)	Terminal Size (sq ft) Ticketing/Luggage	Passenger Capacity
CT2	468	440	8,000/16,500	1,800
CT3	694	782	8,000/16,500	1,800
CT4	882	782	9,000/20,700	1,800
North Side				
Berth	Length (ft)	Maximum Vessel Length (ft)	Terminal Size (sq ft) Ticketing/Luggage	Passenger Capacity
CT5	565	960	61,000/19,000	3,000
CT8	795	1,115	70,000/14,900	4,000
CT9/10	725	1,100	89,000/17,500	3,500

2.4 Existing Economic Conditions

2.4.1 Socio-Economics

The 2010 population of Brevard County (543,346) indicates 14.1% growth over the 2000 population of 476,230. The annual average population growth rate has been 1.6% since 1990. The median household income in the county in 2009 is $45,683, which is an average annual increase of 2.0% since 1989. Approximately 12% of the population was living below the poverty level in 2009. More than 76% of households are owner occupied. The labor force was 268,149 in 2010, an increase from 252,338 in 2005. However, the unemployment rate in Brevard County has increased markedly, from 3.7% in 2005 to 11.5% in 2010.

Neighboring Orange County, which includes the City of Orlando, has experienced a population increase of 27.8% (from 896,354 to 1,145,956) between 2000 and 2010, with an average annual growth rate of nearly 2.5%. Growth in central Florida has been occurring and is projected to continue to occur at a faster rate than the Florida state average. Research conducted for the Orlando Growth Management Plan (City of Orlando Planning and Development, 01 Feb 2005) projects Orange County annual population growth to be 2.06% annually between 2000 and 2030. The table presented below (Table 2-11) is a compilation of growth projections for Orlando. These growth projections provide strong indication of continued growth in construction and petroleum related products and other commodities moving through Port Canaveral.

Table 2-11
Projected Growth for City of Orlando 2004 - 2030

Item	Units	2004	2030	Increase	% Increase
Single Family	units	35,275	48,359	13,084	37.1%
Multi Family	units	67,078	97,072	29,994	44.7%
Office Space	sq. ft.	31,294,507	54,048,319	22,753,812	72.7%
Retail Space	sq. ft.	27,549,806	40,563,707	13,013,901	47.2%
Industrial Space	sq. ft.	35,183,626	53,888,668	18,705,042	53.2%
Hospital Space	sq. ft.	5,018,761	7,382,021	2,363,260	47.1%
Gov/Civic Space	sq. ft.	16,096,413	26,019,805	9,923,392	61.7%
Total	sq. ft.	115,143,113	181,902,520	66,759,407	57.9%
Hotel Rooms	rooms	19,604	36,252	16,648	84.9%
Employment	employees	223,038	361,941	138,903	62.3%

Source: Orlando Growth Management Plan, 01Feb05

2.4.2 Port Hinterland

The cargo terminals at Port Canaveral service one of the fastest growing regions in the country. US Census Bureau population growth projections for 2000 – 2010 show that Florida was the third fastest growing state with an annual population growth rate (1.88%) that is double the national average (0.94%). Some commodities handled at Port Canaveral are distributed throughout the state and farther, such as newsprint and food products (personal communication

Jeff Allen, formerly of Mid-Florida Freezer). A significant proportion of construction related materials are concentrated in the central Florida region, which is roughly defined as the area from Daytona Beach (Volusia County) south to Ft. Pierce (St. Lucie County) extending west to Orlando (Orange County). Delivery of as much as 50% of aggregate material is concentrated in the Orlando region, with the remainder going to central and south Florida (personal communication Brian Hubert, President, Ambassador Services, Inc.). There are no major aggregate material import terminals on the east coast of Florida, other than Jacksonville and Port Canaveral. The cement terminals at Port Canaveral predominantly service the central Florida region, with south eastern Florida being serviced from terminals in Port Everglades. A large proportion of building materials (60%) goes to The Home Depot and Lowe's distribution centers in central and southeastern Florida (City of Frostproof; Polk County and Pompano Beach; Broward County).

2.5 Port Canaveral Operations

2.5.1 Florida's Cruise Ship Industry

Florida's east coast ports are by far the nation's (and the world's) busiest cruise ports. Table 2-12 presents the volume of North American multi-day cruise passengers by departure port for 2003 – 2010. In 2010, Port Canaveral cruise passengers accounted for 12.2% of all North American cruise passengers (MARAD, 2011), ranking it as the 3rd busiest cruise port with more than twice as many passengers as the 4th busiest cruise port, New York. The market dominance of east coast Florida cruise ports is due to the Caribbean's prominence and allure as a cruise destination and Florida's proximity to it. Caribbean cruise destinations, including the Bahamas and Bermuda, accounted for more than 72% of all North American passenger volume in 2010 (Table 2-13). It is important to note that total multi-day cruise passenger counts and Port Canaveral Passenger counts have remained steady despite the recent economic recession and continued economic difficulties.

Table 2-12
North American Multi-Day Cruise Passengers by Departure Port (000's)

Port	2003	2004	2005	2006	2007	2008	2009	2010
Miami	1,867	1,683	1,771	1,890	1,890	2,099	2,044	2,151
Ft. Lauderdale	1,100	1,237	1,199	1,145	1,289	1,187	1,277	1,759
Port Canaveral	1,114	1,230	1,234	1,396	1,298	1,226	1,189	1,299
New York	432	548	370	536	575	435	403	556
San Juan	579	677	581	555	534	521	507	522
Seattle	165	291	337	382	386	435	430	469
Galveston	377	433	531	616	529	403	386	429
Tampa	419	399	408	461	368	393	401	425
Long Beach	171	401	363	380	370	365	415	414
Los Angeles	516	434	615	583	624	607	412	374
Total (all ports)	**8,349**	**9,418**	**9,747**	**9,971**	**10,289**	**9,915**	**9,858**	**10,609**

Source: MARAD, 2009 and 2011

Table 2-13
North American Cruise Passengers By Destination (000's)

Destination	2003	2004	2005	2006	2007	2008	2009	2010
Western Caribbean	2,924	3,094	3,142	3,151	3,107	2,817	2,828	3,264
Bahamas	1,292	1,431	1,390	1,541	1,442	1,448	1,741	1,970
Eastern Caribbean	1,037	1,215	1,315	1,386	1,409	1,407	1,249	1,661
Mexico (Pacific)	731	964	1,130	1,075	1,215	1,265	1,095	875
Alaska	776	880	930	939	1,014	1,015	1,011	872
Southern Caribbean	749	895	788	749	805	859	801	815
Hawaii	222	232	307	402	495	251	193	188
Bermuda	212	195	226	234	211	224	264	269
Canada/New England	173	214	179	165	189	231	226	265
Transatlantic	76	96	146	138	162	168	158	157
Trans-Panama Canal	95	108	112	91	117	102	146	166
Pacific Coast	25	48	56	60	59	58	63	44
South America	12	10	7	18	14	14	35	19
South Pacific/Far East	7	8	9	12	19	27	29	25
Nowhere	17	29	9	9	31	29	18	17
Total	**8,349**	**9,418**	**9,747**	**9,971**	**10,289**	**9,915**	**9,858**	**10,609**
Caribbean Sub Total	4,710	5,204	5,245	5,286	5,321	5,083	4,879	5,742
Percent of Total	56.4%	55.3%	53.8%	53.0%	51.7%	51.3%	49.5%	54.1%
Caribbean/Bahamas/ Bermuda Sub Total	6,215	6,830	6,861	7,061	6,774	6,755	6,620	7,712
Percent of Total	74.4%	72.5%	70.4%	70.8%	67.8%	68.1%	67.2%	72.7%

Source: MARAD, 2007 and 2011

There are 30 new cruise ships scheduled for delivery into the North American market between 2008 and 2012 (Cruise Industry News Annual Report, 2008). Seventeen of these new vessels are larger than 110,000 gross registered tons with passenger capacities of approximately 3,000 or more. The largest of the new vessels [RCI's Oasis (previously Genesis) Class] has a beam in

excess of 154 feet and a length overall of nearly 1,200 feet. Four of the largest new vessel classes are the:

- Disney Cruise Lines (two ships at 128,000 tons, 1,115 feet length overall (LOA), and 2,500 passengers);
- Royal Caribbean International Freedom Class (three ships at 158,000 tons, 1,112 feet length overall (LOA), and 3,600 passengers);
- Norwegian Cruise Lines Project F3 Class (one ship at 150,000 tons, 1,068 feet LOA, and 4,200 passengers); and
- Royal Caribbean International Oasis Class (two ships at 220,000 tons, 1,118 feet LOA, and 5,400 passengers)

Of the 30 new cruise ships scheduled for delivery into the North American fleet between 2008 and 2012, 16 are destined for service in the Caribbean (eight of which are also slated to share service in the European market), eight are slated for world-wide service, and six do not have a service destination identified.

2.5.2 Port Canaveral's Cruise Ship Industry

Port Canaveral has historically been a preferred port for the largest, newest cruise ships and, along with Miami and Port Everglades, a first homeport for the largest new vessels entering the world fleet. In 2003, Royal Caribbean International placed one of its newest Voyager Class vessels (*Mariner of the Seas*) at Port Canaveral. Disney Cruise Line placed its first two vessels (*Disney Wonder* and *Disney Magic*) at Port Canaveral directly from the ship yard. Royal Caribbean International replaced the *Mariner of the Seas* at Port Canaveral, with the new, larger Freedom Class vessel (the *Freedom of the Seas*) in 2009. Similarly, in November 2009 Carnival Cruise Lines replaced the *Carnival Glory*, previously homeported at Port Canaveral, with the *Carnival Dream*, its newest, largest cruise ship. Most recently, in January 2011 Disney Cruise Lines placed its newest ship, the *Disney Dream* into service at Port Canaveral, replacing the *Disney Wonder*, which has now been redeployed to the West Coast. The *Disney Fantasy* (same dimensions as the *Disney Dream*) has been homeported at Port Canaveral since it entered service in March 2012.

The cruise ships[10] homeported at Port Canaveral in 2011 include:

- *Carnival Dream* (3,646 normal capacity; 4,631 maximum capacity[11])
- *Carnival Sensation* (2,052 norm; 2,634 max);
- *Disney Magic* (1,754 norm; 2,713 max);
- *Disney Dream* (2,500 norm; 4,000 max);
- *RCI Monarch of the Seas* (2,345 norm; 2,744 max); and
- *RCI Freedom of the Seas* (3,634 norm; 4,375 max).

[10] Only multi-day cruise ships are included. Gaming vessels have also historically offered partial day cruises from Port Canaveral.

[11] Normal capacity is based on two occupants per stateroom, maximum capacity includes total number of berths – source MARAD Cruise Passenger Statistics Data

In addition, the port is also a port-of-call for other cruise ships, which in 2011 included: *Carnival Pride, Norwegian Sun, Norwegian Gem, Norwegian Jewel,* Royal Caribbean *Enchantment of the Seas,* and others. In the CPA fiscal year 2011 (01 Oct 2010 - 30 Sept 2011) the port was either the homeport or a port of call for 587 multi-day voyages. There are currently 579 homeport or a port of call multi-day voyages scheduled for Port Canaveral in 2012, including the new *Disney Fantasy,* which entered service and was homeported at Port Canaveral in March 2012. The number of calls includes typical 7-day and 4/5-day cruise itineraries for homeported vessels, port-of-call arrivals, and other scheduled itineraries.

Port Canaveral has experienced a 4.1% average annual growth in multi-day cruise passengers between 2000 and 2011, which includes the effects of the recent economic downturn. Day trip cruise (gaming vessel) passenger volumes grew between 2000 and 2004, but have fallen since then. Table 2-14 presents Port Canaveral revenue passenger volumes for fiscal years 2000 – 2011.

Table 2-14
Port Canaveral Cruise Ship Revenue Passengers

Fiscal Year	Multi-Day	Day Trip	Total
2000	1,995,619	1,793,002	3,788,621
2001	1,798,366	1,795,058	3,593,424
2002	1,951,196	1,873,044	3,824,240
2003	2,168,450	1,941,020	4,109,470
2004	2,631,320	1,954,910	4,586,230
2005	2,529,743	1,859,108	4,388,851
2006	2,782,712	1,759,344	4,542,056
2007	2,718,416	1,557,506	4,275,922
2008	2,484,504	1,089,456	3,573,960
2009	2,468,439	782,336	3,250,775
2010	2,722,751	80,200	2,802,951
2011	3,100,199	44,469	3,144,668

Source: CPA

Another important reason for Port Canaveral's highly competitive position in the cruise ship industry is the port's high vessel utilization rate, making it an extremely attractive and profitable homeport for the cruise industry. Cruise ship utilization is measured in two ways. A vessel's normal capacity is the comparison between the actual number of passengers and the vessel's capacity assuming two passengers per room. The vessel's maximum capacity compares the

actual number of passengers to the total number of berths on-board the vessel, recognizing that many rooms, especially those occupied by families, house more than 2 persons per trip. Port Canaveral consistently displays higher utilization rates than the 1st and 2nd ranked ports, Miami or Port Everglades (Table 2-15). CPA attributes the port's high utilization rates to a higher proportion of families with children traveling together, and to the many nearby landside family attractions, such as Walt Disney World, Universal Studios, Sea World, and the Kennedy Space Center.

Table 2-15
Comparative Normal Capacity Utilization (2004 – 2011)

	Port Canaveral	Miami	Port Everglades
2004	122.6%	110.1%	100.8%
2005	123.5%	110.9%	102.5%
2006	121.9%	110.6%	103.7%
2007	122.2%	110.7%	104.2%
2008	123.4%	110.7%	104.2%
2009	123.3%	111.7%	103.6%
2010	120.3%	111.4%	104.7%
2011*	122.3%	110.8%	104.9%

Source: MARAD 2011; *2011 data for 01Jan11 through 30June2011

Cruise ship utilization has consistently been high at Port Canaveral and has not been appreciably reduced during the economic downturn experienced in 2007 and 2008. It is important to note that the addition of the *Mariner of the Seas* to Port Canaveral's homeport fleet in 2004 did not reduce vessel utilization on the *Sovereign of the Seas* (Table 2-16). The immediately high utilization rate at Port Canaveral for the *Mariner of the Seas* and the *Freedom of the Seas* indicates that shifting the vessel from Miami to Port Canaveral did not reduce its utilization rate at Port Canaveral.

Table 2-16
Port Canaveral Cruise Ship Capacity Utilization (2003 – 2011)

Average Passengers Per Call

	Normal Capacity	2005	2006	2007	2008	2009	2010	2011*
Sovereign of the Seas	2,276	2,553	2,557	2,574	2,591	---	---	---
Mariner of the Seas	3,114	3,486	3,489	3,476	3,466	---	---	---
Freedom of the Seas	3,634	---	---	---	---	4,088	4,005	3,905
Disney Dream	2,500	---	---	---	---	---	---	3,649
Disney Magic	1,754	2,610	2,575	2,571	2,544	2,533	2,545	2,628
Disney Wonder	1,754	2,651	2,540	2,622	2,618	2,627	2,624	
Carnival Dream	3,646	---	---	---	---	---	4,212	4,346
Carnival Glory	2,758	3,331	3,331	3,291	3,341	3,323	---	---

Normal Capacity Utilization

	Normal Capacity	2005	2006	2007	2008	2009	2010	2011*
Sovereign of the Seas	2,276	112%	112%	113%	114%	---	---	---
Mariner of the Seas	3,114	112%	112%	112%	111%	---	---	---
Freedom of the Seas	3,634	---	---	---	---	112%	110%	107%
Disney Dream	2,500	---	---	---	---	---	---	146%
Disney Magic	1,754	149%	147%	147%	145%	144%	145%	150%
Disney Wonder	1,754	151%	145%	149%	149%	150%	150%	---
Carnival Dream	3,646	---	---	---	---	---	116%	119%
Carnival Glory	2,758	121%	121%	119%	121%	120%	---	---

*Data for 01 Jan through 30 June 2011; Source: MARAD 2011

2.5.3 Port Canaveral Cruise Ship Operations

This section discusses the operations of the large multi-day cruise ships which use Port Canaveral. These vessels are all berthed in the West Basin. Day-trip cruise ships, which are substantially smaller than multi-day cruise ships, operate out of cruise berths on the south shore of the port. The day-trip cruise ships are not constrained by existing channel conditions.

Operational constraints on the large multi-day cruise ships berthed in the West Basin are explained in the following paragraphs.

Large cruise ship operations in the port are constrained by existing channel width and by the close proximity to moored cargo ships, naval vessels, and the day-trip ships that berth at the south side cruise terminals. The Port Canaveral Pilots will only allow small day-trip size cruise ships to moor at the south side cruise terminals because of the narrow channel. The narrowness of the channel and the close proximity to moored vessels results in a "surge effect" when large cruise ships transit the channel at speeds in excess of 6 knots, which may occur during windy conditions (cross-winds greater than 15 knots). These surge effects have caused incidents of parted lines, minor vessel connection damage, and some personnel injuries over the years.

Port Canaveral's standard operating procedures require loading and unloading of cargo vessels to cease during the transit of large cruise ships during high wind conditions (cross-winds greater than 25 knots). The standard operating procedure also recommends that mooring lines be attended during large cruise ship transits. Port Canaveral operations personnel, port tenants, and the Canaveral Pilots Association all work to minimize the effects associated with surges, however minor delays in vessel loading and unloading along the south side docks still regularly occur. In addition, tugs are used to keep moored vessels alongside the piers to offset surge effects, which pull vessels away from their moorings (see Section 1-9 Canaveral Harbor Surge Effects and Modeling of the Engineering Appendix). Tugs are typically used at North Cargo Piers 1, 2, and 4, at the Poseidon Wharf, and in the Trident Basin.

Cruise ships currently transit Port Canaveral channels twice daily on regular schedules—inbound to the West Turning Basin from early to mid-a.m. hours and outbound from the West Turning Basin during approximately mid-p.m. hours. Often, as many as three cruise ships arrive or depart in 20 minute intervals on the port's busy days. Port Canaveral's largest homeport vessels, as well as various regularly scheduled port-of-call vessels, sail to and from the West Turning Basin in winds of up to 35 knots. These large vessels must travel at relatively slow speeds to minimize surge at critical locations in the west access and inner channels but are greatly affected by channel cross-winds at those speeds due to the vessel's large amount of sail area.

Cruise ships typically do not use assisting tugboats because they are maneuvered through the use of rudder, conventional fixed or azimuthing pod propeller, and bow and stern thrusters. However, tug assist is required under windy conditions. The larger ships have three or four thrusters forward and three or four thrusters aft. Those ships without stern thrusters generally have two or three azimuthing and/or fixed position pods aft. The fixed pod is on the centerline of the ship at the stern. Azimuthing pods are on either side of the centerline at the stern. The pods are positioned to optimize underway propulsion and have an override maneuvering power mode for use in port. However, the Disney ships currently homeported at Port Canaveral have traditional propulsion systems.

The size of cruise ships and cargo vessels entering Port Canaveral is currently constrained by the federally authorized 400-foot channel width. The narrow channel constrains the maximum length and beam of cruise and cargo vessels that can use the port and affects the operation of cruise and cargo vessels using the port. Wind conditions during large cruise ship transits and proximity to moored vessels along the Port's main channel compound the operational impacts imposed by the channel's narrow width. Safe navigation inside the harbor with minimal surge effects to moored vessels requires a balance between vessel speed and good ship handling

capability to manage the yaw of the vessel or "crab angle" as it moves through the waterway under the influence of moderate to high wind conditions.

A vessel's "crab angle", also known as drift angle, is defined as the difference between a ship's heading and the actual course made good. Cruise ships transiting the channels at Port Canaveral are susceptible to "crabbing" because of their large superstructure which acts as a sail in the wind and the moderate speeds which must be maintained so as to avoid surge impacts on moored vessels and to maintain braking control of the vessel. The wider the "crab angle", the larger the effective beam of the vessel as it moves through the channel.

The effective beam is a critical parameter for very large cruise ships such as the *Mariner of the Seas*, which has a length of 1,021 feet and a beam of 127 feet. For two vessels traveling with the same "crab angle" the longer vessel would have the larger effective beam. The extreme length of the *Mariner of the Seas* means that the vessel's effective beam approaches the limits of acceptable safe passage through the current configuration of Port Canaveral's channels.

The *Mariner of the Seas* effective beam was discussed in a letter from the Canaveral Pilots Association to CPA in December 2002. This letter was written in anticipation of the arrival of *Mariner of the Seas* in 2003 and the need for dredging of certain locations within the harbor, but outside and adjacent to the existing authorized 400-foot channel boundaries. The pilots requested these key areas of dredging to improve the safety of navigation for this new larger cruise ship.

A Port Canaveral Berth Access Simulation Study was conducted in May 2003 to evaluate *Mariner of the Seas* navigation through Port Canaveral in various configurations including the existing channel, the existing channel plus areas requested to be dredged by the pilots adjacent to but outside the authorized channel, and then for a 500-foot channel width. The Canaveral Pilots and RCCL ship captains participated in the simulations at the Simulation, Training, Assessment & Research (STAR) Center, located in Dania Beach, FL.

The simulation was based on the 400-foot channel width as it existed in 2003. Voyager Class vessel speeds were on the order of 6 to 10 knots between the Port entrance and the Navy's Poseidon Wharf in the MTB. Between the Poseidon Wharf and the entrance to the WTB, ship speeds were generally 6 knots or less. The study reported that for Voyager Class vessel speed of 6 knots, crab angles of 2.5 to 3 degrees were observed for 15-knot cross winds. The crab angle increased to approximately 4.5 degrees for 25-knot cross winds. Also noted were minimal clearances to berthed vessels that likely would have resulted in undesirable surge effects on those moored ships and associated operations. For the configuration that included the dredge areas requested by the pilots and for 30-knot cross winds, crab angles of 7 to 8 degrees were observed for transit speeds of 6 knots or less. For 30-knot winds, a more comfortable vessel speed of 6.2 knots limited the crab angle to about 6 degrees.

Prior to the arrival of the Voyager Class vessel, *Mariner of the Seas*, in 2003, and at the request of the Canaveral Harbor Pilots (also with confirmation by simulations at the STAR Center), CPA executed dredging at five locations adjacent to, but outside the federally authorized channel that were considered to be key navigation areas and/or restricted channel areas critical to the safe navigation of this cruise vessel. Those dredge areas effectively provided 50 feet of additional channel width north of the channel at either end of the Inner Reach and 80 feet of additional channel width south of the channel along both cuts of the West Access Channel. In essence, since November 2003, with the pilot's recommended dredging, the channel width at certain key

areas is effectively on the order of 450 feet. CPA dredging outside the federally authorized channel is included in the without-project condition.

The arrival of the *Freedom of the Seas* in 2009, which is nearly 100 feet longer than *Mariner of the Seas,* required the CPA to again dredge beyond the limits of the federal channel based on requests from the Canaveral Pilots Association and confirmed by simulations at the STAR Center. This additional dredging included expanding the southeast corner of the present entrance to the West Turning Basin to enable access by a Freedom Class vessel. CPA's widening of the West Turning Basin entrance, referred to as the Interim Corner Cut-Off (ICCO), was completed in 2011. The navigation effects of CPA dredging outside the federally authorized channel at the entrance to the West Turning Basin are included in the without-project condition.

Despite the narrow channel conditions at Port Canaveral, cruise ship arrival and departure delays are not common because of the importance of schedules to passengers and potential expenses to the cruise lines. Normal high wind conditions (20 - 35 miles per hour) may induce excessive "crabbing" as the vessel transits Port Canaveral's narrow channel. Normal high wind conditions typically do not delay cruise ship arrivals and departures because the cruise lines will use tug assist to transit the channel under normal high wind conditions. Wind direction, as well as speed, influences the Pilot's decision to use tug assist. Winds that are abeam of the vessel as it transits through the Port, i.e., winds from northerly and southerly directions, have a greater impact on the vessel's sail area and are more likely to result in tug assist. Tug assist typically consists of one or two tugs, depending on the strength and direction of the wind and other factors, such as vessel size, propulsion equipment, and size of vessels at cargo berths. Table 2-17 presents annual summations of the number of wind-related occurrences of tug assistance for cruise ships. Tug assist occurrences due to equipment failure or berth shifting are not included in the summation calculations. Discussions with representatives of the Canaveral Pilots Association indicate that tug assistance has continued and may be exacerbated by the arrival of the new larger cruise ships at Port Canaveral.[12]

Table 2-17
Port Canaveral Historical Wind-Related Cruise Ship Tug Assist Occurrences

	2006	2007	2008	2009
One Tug	10	20	7	16
Two Tugs	4	7	4	1
Total	**14**	**27**	**11**	**17**

Source: Port Canaveral Pilots

2.5.4 Port Canaveral Historical Cargo Volumes

Bulk cargo has been moving through Port Canaveral since its opening in 1955. During the early years of the port, petroleum products emerged as the dominant commodity. Construction materials such as cement and food goods such as orange juice and citrus were also major commodities. Over time, construction materials and petroleum products remained the largest

[12] Personal communication with Ben Borgie, Canaveral Pilots Association

commodities at the port, by volume. Table 2-18 presents historical tonnage volumes at the port since 1982.

Table 2-18
Port Canaveral Historical Total Annual Tonnage (short tons)

Fiscal Year	Total Tonnage	Fiscal Year	Total Tonnage
1982	2,036,007	1997	2,862,036
1983	2,027,979	1998	3,234,148
1984	2,206,558	1999	3,410,448
1985	2,156,186	2000	3,490,242
1986	2,322,729	2001	3,596,664
1987	2,102,427	2002	3,160,064
1988	2,291,477	2003	3,867,724
1989	2,468,168	2004	4,083,528
1990	2,314,933	2005	4,467,088
1991	2,521,901	2006	4,553,756
1992	2,285,888	2007	3,572,206
1993	2,722,268	2008	2,395,779
1994	3,232,476	2009	2,626,795
1995	2,647,861	2010	3,218,144
1996	2,940,868	2011	4,547,724

Source: CPA
Note: data is for fiscal years (01 Oct – 30 Sep), excludes potable water

Port Canaveral has experienced a steady and slightly accelerating growth trend in bulk cargo during the years from 1986 through 2006. The port's total FY 2006 tonnage was nearly double its FY 1986 total tonnage. In the ten years from FY 1996 through FY 2006, total tonnage increased by 55%. Table 2-19 presents long term average annual growth rates for Port Canaveral's total tonnage calculated through FY 2011. The recent economic downturn had a dramatic impact on cargo tonnage at Port Canaveral, especially in FY 2008 - 2009, however total tonnage had completely rebounded by 2011 to pre-recession 2006 levels, due in large part to Seaport Canaveral liquid bulk activity. Historically, the majority of dry bulk cargo commodities at Port Canaveral had been building and construction materials. These commodities have been especially hard hit by the downturn in residential and commercial construction in southeastern and central Florida, which began in 2007. Recovery of this sector of the economy is expected to

be a necessary precondition to recovery in Port Canaveral construction-related commodity tonnage to pre-downturn levels. Continued growth in new fuel terminal operations at Seaport Canaveral and resumption of residential, commercial, and municipal infrastructure construction have increased total tonnage to pre-downturn levels, and are projected to increase total without-project condition commodity tonnage at Port Canaveral to significantly greater than historical levels.

Table 2-19
Port Canaveral Total Annual Tonnage Long Term Growth Rates

Fiscal Years	Average Annual Growth Rate	Fiscal Years	Average Annual Growth Rate
1972 – 2010	2.71%	1992 – 2011	3.41%
1982 - 2011	2.81%	2002 - 2011	3.53%

Source: CPA

2.5.5 Existing Cargo Traffic Characterization

The growth experienced in central and south Florida population and housing through mid-2007 drove the growth and dominance of construction and energy related commodities at Port Canaveral. The amount of construction-related materials (stone products, cement, lumber, and slag) at Port Canaveral increased from 29% of total tonnage in 2000 to more than 58% of all tonnage in 2006[13]. Construction and energy related commodities combined for 88% of all goods moving through Port Canaveral in 2006 and 91% in 2011. Seaport Canaveral operations, which began in 2010, brought 857,207 tons of petroleum products through the port in 2010 and 2,490,926 tons in 2011. Table 2-20 presents a summary of commodities handled at Port Canaveral between 2001 and 2011.

During 2001 – 2006, although the port demonstrated an overall growth in cargo, only one commodity type, lumber, experienced constant growth from year to year (slag has only been imported to Port Canaveral since 2003). In 2011, only three major commodities: petroleum products, aggregate stone, and limestone, are above their 2006 tonnages. One of Port Canaveral's advantages, apart from proximity to Central Florida, is that it has the real estate – the physical space – available for large volume storage of liquid bulk and dry bulk commodities, such as stone products and petroleum products. The availability of physical space to store commodities is a major reason why two new dry bulk facilities are currently under construction at the Port.

The recent downturn in real estate and housing construction experienced throughout the nation has severely impacted construction-related commodity tonnage at Port Canaveral. For fiscal year 2011 construction-related commodity tonnage is down by 73% from 2006, although total tonnage is nearly equivalent. However, the impact to construction commodities has not been uniform. Cement import tonnage has fallen from 1.3 million tons in 2006 to zero tonnage during

[13] Data reported in Port Canaveral fiscal years (01Oct – 30Sep)

the past three years. Imported cement is used to augment domestic supply to meet the national demand. In 2006, the national consumption of cement was 127.7 million tons, of which 25% was met through imports. In 2010, national consumption has fallen to 69.5 million tons and the percentage of consumption met by imports had fallen to 9% (USGS Mineral Commodity Summaries, Jan. 2011). Alternatively, imports of stone commodities at the port (aggregate, granite, and limestone) in 2011 are 38% higher than the 2006 level of imports.

Port tenants are flexible in their ability to accommodate shifts in cargo volumes and types. For example, in response to reductions in lumber imports, warehouse construction on the north side cargo area has been deferred temporarily and the area has been paved over to accommodate car and truck imports and exports. Fiscal year 2011 tonnage for cars and trucks is greater than fiscal year 2006 tonnage by 26%.

Non-Seaport Canaveral petroleum deliveries have fallen by 33% from 2006 to 2011, largely because Florida Power and Light has totally ceased deliveries. The Cape Canaveral Power Plant is currently undergoing conversion to a gas-fired facility.

Table 2-20
Port Canaveral Commodity Tonnage FY 2001 – FY 2009 (Short Tons)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Petroleum	2,060,158	1,491,295	1,867,608	1,598,098	1,587,742	1,359,576	1,251,171	920,585	990,594	1,892,632	3,399,958
Cement	781,754	774,581	950,864	1,036,173	1,098,129	1,292,208	536,471	34,667	0		
Steel Scrap	24,594	13	0	0	0	0	0	0	0		
Salt	166,336	189,908	169,333	193,058	201,050	198,000	192,000	204,100	210,900	192,050	227,708
Newsprint	217,394	179,008	190,914	178,915	104,663	106,952	105,689	71,381	65,377	42,404	0
Juice Con.	47,566	55,973	53,531	56,206	49,550	50,883	50,739	39,427	46,448	37,539	50,972
Juice	86,535	57,456	40,355	64,111	70,206	59,655	34,264	42,580	66,432	41,191	35,492
Lumber	22,551	156,650	180,518	269,845	445,231	582,541	211,805	113,601	30,733	9,297	7,533
Plywood	0	0	11,394	18,845	30,599	17,435	0	0	0	0	0
Citrus	60,296	40,415	44,289	53,044	0	0	11,921	15,007	8,512	16,261	10,159
Fertilizer	0	0	0	0	24,590	0	0	0	0	9,320	55,914
Agg. Stone	34,513	101,221	205,878	350,662	308,750	246,236	306,769	147,170	672,191	545,684	300,701
Rebars	37,523	25,887	2,225	7,593	0	5,931	0	0	0	0	0
Limestone	0	0	0	0	144,515	97,864	476,177	433,468	263,373	65,694	175,732
Pumice	0	44,813	85,964	49,017	0	51,758	28,687	0	8,818	0	0
Sand	7,278	24,406	5,200	6,000	0	0	58,779	4,417	25,000	0	0
Slag	0	0	0	184,108	297,497	398,432	207,458	227,705	137,169	296,064	235,856
Cars	7,040	7,072	6,108	6,232	10,264	10,147	15,428	19,147	9,763	6,057	4,638
Trucks	352	424	1,310	4,023	8,937	8,352	9,059	12,777	11,352	18,405	18,599
Other	11,702	10,942	52,233	7,598	85,365	67,786	75,789	109,747	80,133	45,546	24,462
Total	**3,565,592**	**3,160,064**	**3,867,724**	**4,083,528**	**4,467,088**	**4,553,756**	**3,572,206**	**2,395,779**	**2,626,795**	**3,218,144**	**4,547,724**

Notes: Source – Canaveral Port Authority
Excludes potable water and bunkering fuel; Agg. Stone includes rock aggregate and granite

2.5.6 Existing Cargo Fleet

The cargo fleet calling at Port Canaveral can be characterized by the type of service the carrier is providing. Cargo services at Port Canaveral are generally either point-to-point services, which deliver a full vessel load, or multi-point services, which call at multiple ports delivering a partial load to each port. Lumber and Transmontaigne's petroleum products are examples of multi-point services, which typically deliver partial loads. Lumber vessels arriving from the Baltic region and call at New London, CT, Wilmington, NC, and Savannah, GA before reaching Port Canaveral. Transmontaigne-bound tankers typically call at Port Everglades prior to calling at Port Canaveral. Seaport Canaveral receives a mix of multi-point and point-to-point deliveries. Seaport Canaveral's multi-point deliveries are typically on smaller vessels with drafts less than 30 feet, which would not benefits from channel improvements. Multi-point services usually arrive at Port Canaveral with sailing drafts which are unconstrained by existing channel depths. In 2006 – 2008, cement imports, which previously were nearly always point-to-point deliveries, have included multi-point deliveries. This switch to multi-point cement deliveries was due to the reduced demand for cement during the economic downturn.

Point-to-point services typically arrive at Port Canaveral more fully loaded and offload the entire cargo at the port. Cargo vessels on point-to-point services arrive at Port Canaveral with the deepest drafts of all vessels using the port. Examples of point-to-point service dry bulk cargo include cement, slag, limestone, and rock products (aggregate and granite). Tables 2-21 through 2-24provide details for the deepest draft point-to-point dry bulk cargo vessels calls from January 2006[14] through September 2009. Seaport Canaveral also receives point-to-point liquid bulk deliveries and generates point-to-point liquid bulk shipments to other ports. Table 2-23 presents Seaport Canaveral point-to-point vessel calls for the 12 months between August 2010 and July 2011. It is important to note that point-to-point vessel calls at Seaport Canaveral are projected to benefit from channel improvements, but multi-port vessel calls at Seaport Canaveral are not projected to benefit from channel improvements.

[14] There is a gap in available data as the result of a change in data reporting at the port

Table 2-21
Large Bulk Cargo Vessel Call Characteristics - 2006

Cargo	Average LOA	Berth	Average Arrival Draft	Number of Calls	Average Tons Per Call
Agg Rock	526 ft	SCP4	30.6 ft	8	30,183
Agg Rock	700 ft	SCP4	38.7 ft	3	57,046
Cement	589 ft	NCP4	33.3 ft	6	34,117
Cement	609 ft	NCP4	33.5 ft	15	39,295
Cement	634 ft	NCP4	34.5 ft	4	23,155
Cement	565 ft	SCP5	30.4 ft	5	18,888
Cement	609 ft	SCP5	32.7 ft	9	20,428
Cement	627 ft	SCP5	28.8 ft	3	29,166
Granite	597 ft	SCP4	36.0 ft	1	37,529
Limestone	753 ft	SCP4	39.5 ft	1	60,335
Slag	599 ft	NCP2	34.8 ft	8	41,882

Source: CPA

2.5.7 Existing Cargo Fleet Operations and Tidal Advantage

Large bulk cargo vessels calling at Port Canaveral must operate under a combination of constraints that affect the vessel's potential use of tidal advantage, including channel depth and channel transit schedules. The deepest operating draft approved by the Canaveral Pilots Association is 39.5 feet, which requires special coordination so that the vessel arrives at peak high water. Any vessel arriving with a sailing draft of 36 feet or deeper must coordinate arrival with the rising tide, i.e., use tidal advantage. The channel transit schedule constraint is based on the priority given to cruise ship and submarine transits. When cruise ships and submarines are arriving or departing the port, all other vessel traffic must stand-by. Daily cruise ship morning arrival and evening departure times can effectively close the port to cargo vessel transits for an hour or more. Historically, some vessels awaiting tidal advantage have missed the tidal window because it occurred concurrently with cruise ship or submarine transits. Therefore, using tidal advantage at Port Canaveral includes the additional risk of missing a tidal cycle (and potentially two tidal cycles) due to conflicts with transits by cruise ships or submarines.

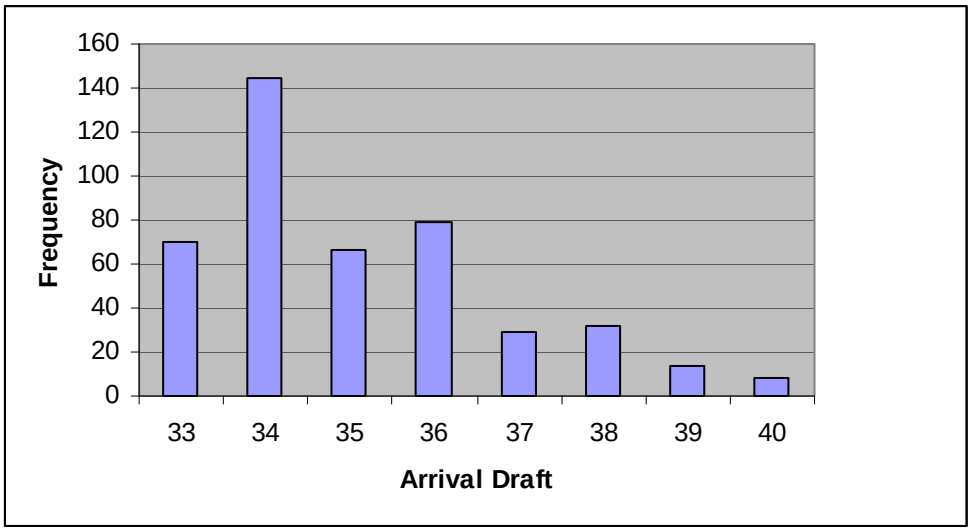
Vessel arrival draft data for the years prior to the recent economic recession (Table 2-22 and Chart 2-3) indicate that vessels were typically loaded to avoid reliance on a rising tide, which is consistent with discussions with the pilots and port personnel. Although most large cargo vessels are typically loaded to avoid channel depth constraints and the additional operational difficulties that would follow, some vessels and cargo types do consistently use tidal advantage. For example, dry bulk carriers delivering aggregates, slag, and cement - which are high volume, low value commodities that are stockpiled at the port - consistently arrive at Port Canaveral with drafts that require tidal advantage (Tables 2-21 through 2-24). These vessels typically take a few days to unload and their cargo may spend days or weeks stockpiled at the terminal facility prior to delivery to an end-user.

Table 2-22
Port Canaveral Deep Draft Vessel Arrival Drafts 2002 - 2006

Arrival Draft	2002	2003	2004	2005	2006	Total
33	12	13	17	16	12	70
34	31	29	39	24	22	145
35	9	6	18	16	17	66
36	4	15	13	30	17	79
37	2	3	2	13	9	29
38	4	6	5	7	10	32
39	4	3	3	2	2	14
40	0	0	0	4	4	8

Source: USACE, Waterborne Commerce Statistics 2002 - 2006

Chart 2-3
Port Canaveral Deep Draft Vessel Arrival Drafts (2002-2006)



Source: USACE Waterborne Commerce Statistics 2002 - 2006

Large vessel point-to-point calls at Seaport Canaveral typically avoid requiring tidal advantage (Chart 2-4) because Seaport Canaveral's vessel operations are closely coordinated with landside infrastructure availability, landside transport, and end-user delivery schedules. Between February 2010, when Seaport Canaveral began operations, and mid-July 2011 only two vessels have arrived with drafts deeper than 36.0 feet: one at 36.8 feet (Aug 2010) and one at 38.5 feet (Jun 2010). Avoidance of needing tidal advantage not only affects the vessels operating draft, but also affects the overall size of the vessel. Seaport Canaveral vessels tend to be in a narrow size range (Table 2-23 and Chart 2-5) because this is the vessel size that can efficiently operate within the operating draft constraint. Under improved conditions including a deeper channel, efficient vessel size would increase as the operating draft increases. Regardless of potential channel improvements, large vessel point-to-point calls at Seaport Canaveral will continue to avoid requiring tidal advantage due to the additional operational additional risk of missing a tidal cycle (and potentially two tidal cycles) due to transits by cruise ships or submarines.

Table 2-23
Seaport Canaveral Point-to-Point Vessel Sailing Drafts Aug 2010 – July 2011

Date	Vessel	LOA	Origin	Tonnage		Sailing Draft
				Inbound	Outbound	
13-Aug-10	Piltene	640	Latvia	47,162		32
23-Aug-10	Haruna Express	590	Canada	50,408		36.8
11-Dec-10	Atlantic Grace	601	US	46,709		35
19-Jan-11	Politisa Lady	599	Venezuela	40,285		32
31-Jan-11	Athiri	752	India	66,497		32
10-Feb-11	Citron	600	Algeria	53,388		35
14-Feb-11	Oriental Ruby	620	Venezuela	40,244	39,490	35
24-Feb-11	Cartagena	601	Netherlands	40,246	40,345	34
27-Feb-11	Arendal	601	Venezuela	40,276		34
5-Mar-11	Lichtenstein	601	Canada		41,111	34
9-Mar-11	Box	601	US	40,310		35
2-Apr-11	Ajax	614	Venezuela	40,238	40,245	35
29-Apr-11	United Ambassador	750	Canada	50,211		35
2-May-11	Kate Maersk	601	Venezuela	40,213	39,472	35
6-May-11	Nordic Hanne	600	Venezuela	36,351	40,203	34.6
21-May-11	Marvea	578	Aruba	34,649		35
22-May-11	Amphitrite	600	Venezuela	40,299		31
9-Jun-11	Nordic Hanne	600	Venezuela	40,392		34.6
29-Jun-11	Nordic Agnetha	602	Venezuela	40,250	39,361	34
3-Jul-11	Eskden	600	Venezuela	40,223	307	33
13-Jul-11	Overseas Kythnos	600	United Kingdom	51,394		34.5
23-Jul-11	Mount Hope	597	US	40,223	38,122	26.3
25-Jul-11	Atlantic Queen	601	Aruba	34,002		35.6

Source: CPA

Chart 2-4
Seaport Canaveral Point-to-Point Vessel Sailing Drafts August 2010 – July 2011

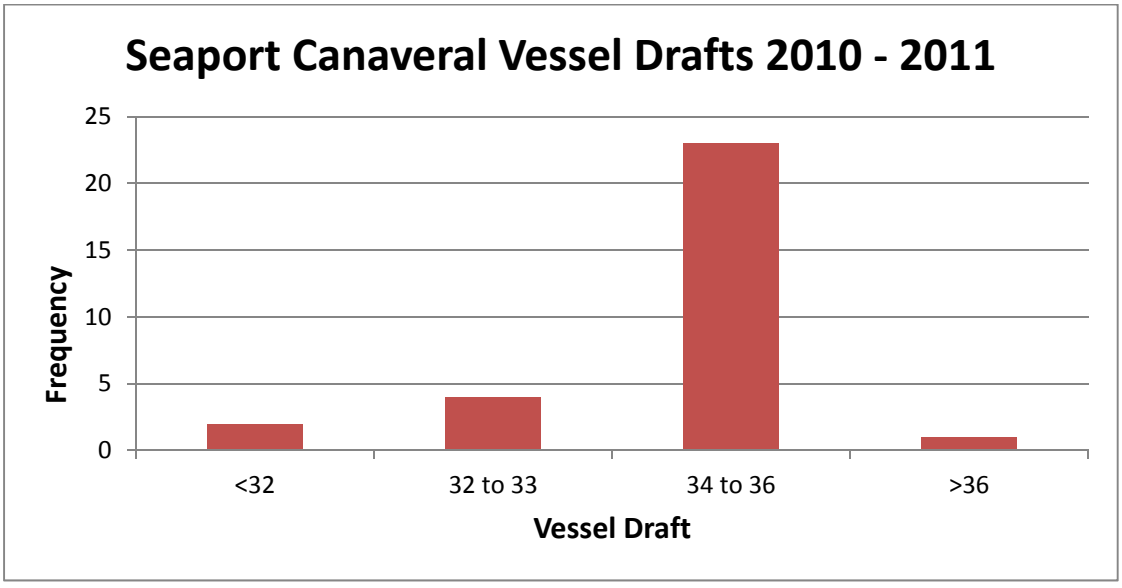
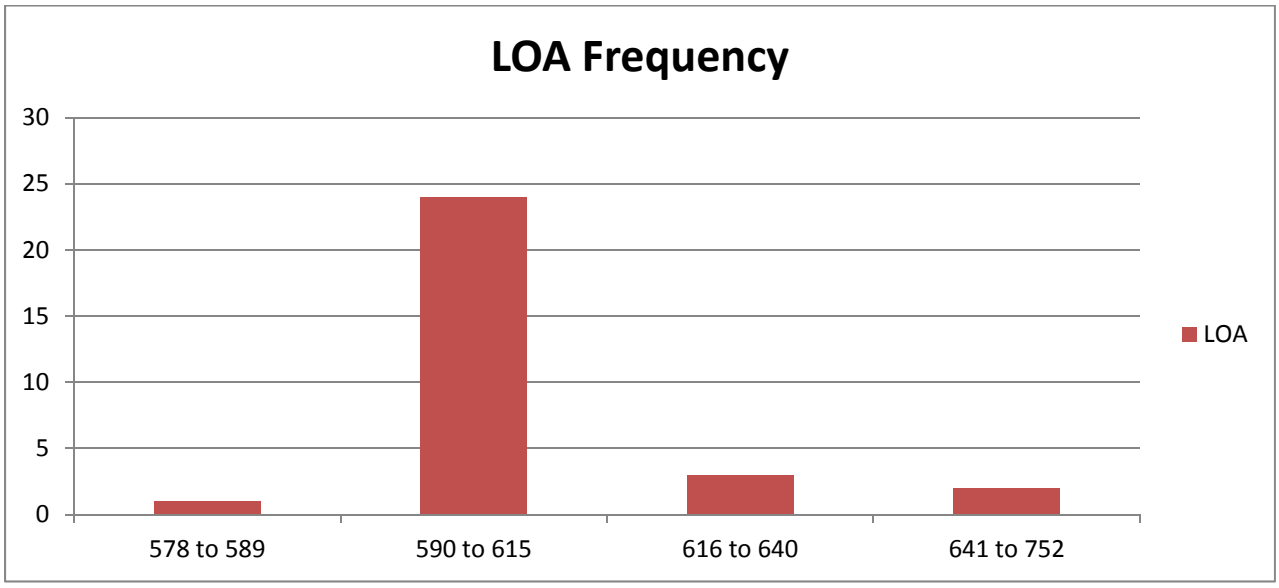


Chart 2-5
Seaport Canaveral Point-to-Point Vessel Length Overall August 2010 – July 2011



2.6 Environmental and Cultural Resources

The following sections describe the existing environmental and cultural resources within the potential influence of the project. Potential project impacts to environmental and cultural resources may be found in Section 7 Environmental Consequences. Although the immediate project area only includes the harbor and adjacent uplands including a portion of the Cape Canaveral Air Force Station (CCAFS), selected resources that could be affected by project activities extend outside of these physical boundaries. The analysis of these resources was, therefore, expanded to include broader geographic areas necessary to provide a baseline for development and comparison of future with and without project conditions.

2.6.1 Sediments

Sediments within the Port have been extensively characterized in recent years. A recent study was conducted in 2009 and 2010 to support placement of material associated with maintenance dredging of the Harbor in the ODMDS (Anamar 2010). The December 2009 sampling event included the following sample locations: the WTB; WAC; MTB; and CPA Cut1, Cut2, Cut2B, and Cut3. The March 2010 sampling event included the Sand Trap and the Trident Basin. Twenty-eight subsamples from six dredging units in Canaveral Harbor were collected in December 2009 and nineteen subsamples from four dredging units where collected in March 2010. Both sampling events included two subsamples from offshore reference stations, water samples from the ODMDS, and site water for elutriate generation.

Samples collected had gravel, percent sand (coarse, medium, and fine) ranged from 0.4% to 57.3%, and silt/clay ranged from 42.6% to 99.6%. Sand trap sediment subsamples were not

homogenized into a composite sample. Sand Trap subsamples did not contain gravel, percent sand ranged from 89.5% to 92.9%, and silt/clay ranged from 7.1% to 10.5%.

Copper was detected above the Threshold Effects Level (TEL) but below the Effects Range-Low (ERL) in most of the samples, but no other metals were detected above the TEL or ERL. TOC concentrations ranged from 0.828 mg/kg to 2.41 mg/kg. Total HEM concentrations ranged from non-detect (ND) to 470 mg/kg. Total Organotins ranged from 3.0 mg/kg to 17.24 mg/kg. Most PAHs analyzed for were detected above the MRL or in J-flagged amounts in all samples. No sample result was greater than the TEL or ERL. . No sample had an EPA Region 4 total PCB value or a NOAA total PCB value greater than the TEL or ERL.

Elutriate and toxicity studies were conducted along with ADDAMS model simulations on the sediments targeted for maintenance dredging. It was determined that the sediments were suitable for offshore disposal.

The Port typically disposes of dredged material from new work and maintenance dredging at the ODMDS (Table 2-24). There is no indication that future dredged material would not be suitable for the ODMDS. A Section 103 Evaluation is currently being conducted and will be completed for approval by the USEPA for placement in the ODMDS.

Table 2-24
Port Canaveral Dredging Operations Using the ODMDS

New Work Projects	USACE Permit		Sampling	ODMDS Approval	
	Issuance	Expiration	Year	Authorization	Expiration
CT 6&7 Pier Construction	09/05/01	11/10/08	2004	11/10/05	11/10/08
Corner Cut Off (except -33 to -43)	09/05/01	11/10/08	2004	11/10/05	11/10/08
Corner Cut Off (-33 to -43)	09/05/01	11/10/08	2004	11/10/05	11/10/08
L-Shaped Area (WTB)	09/05/01	11/10/08	2004	11/10/05	11/10/08
Maintenance Projects	**USACE Permit**		**Sampling**	**ODMDS Approval**	
	Issuance	**Expiration**	**Year**	**Authorization**	**Expiration**
Non-Federal portions of WTB, MTB, others	09/28/01	09/08	2004	10/13/05	10/13/08
Federal portions of main channel, WTB, MTB	---	---	2006	5/03/06	5/03/09

Source: CPA

2.6.2 Vegetation

Natural upland communities within the Port boundaries are limited (Figure 2-6). There are a few isolated areas containing mixed hardwoods and conifers (Florida Land Use and Cover, Classification System (FLUCCS) 4340 including slash pine (*Pinus elliottii*), scrub oaks (*Quercus spp*.), Australian pine (*Casurina equisetifolia*), Brazilian pepper (*Schinus terebenthifolius*), and cabbage palm (*Sabal palmetto*) within the Port. Areas of herbaceous rangeland (FLUCCS 3100) and shrub brushland (FLUCCS 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 wire grass (*Aristida stricta*). Saw palmetto (*Serenoa repens*) is also found scattered throughout this vegetative community. There are no threatened or endangered plant species in the boundaries of the Port.

Undeveloped upland communities within the immediate project area include shrub and brushland and spoil areas (7430), which occur on CCAFS between the MTB and TTB. Vegetation within the shrub and brushland community between the MTB and TTB has been altered over the years, and presently includes bahiagrass and coastal grasses. The spoil area cover includes bare, sandy areas, with sporadic vegetation including wax myrtle (*Morella cerifera*) and prickly pear cactus (*Opuntia stricta*). There are no threatened or endangered plant species in either of these communities within the Port.

2.6.3 Wildlife Resources

Wildlife found within Port boundaries are typical species found in heavily developed Florida coastline communities. Mammals include raccoons (*Procyon lotor*), domestic and feral cats (*Felis cattus*), and mice (*Mus musculus*). Migratory bird species including warblers and sparrows typically roost in forested areas along the coast, particularly near open water. Protected (listed) wildlife resources are discussed in detail in Section 2.6.8.

2.6.4 Wetlands

Wetland habitats within the Port are limited primarily to the western perimeter adjacent to the Banana River, away from Port operations. These wetlands are either mangrove swamps vegetated with white and black mangroves and Brazilian pepper, or saltwater marsh habitat vegetated with cordgrass (*Spartina alternifolia*), needlerush (*Juncus roemerianus*), saltgrass (*Distichlis spicata*), and other salt-tolerant species. Treeless hydric savannah habitat occurs south of the Port facilities and is dominated by wiregrass and cutthroat grass (*Paspalum abscissum*). The immediate upland study area was surveyed for wetlands (Dial Cordy, 2006) and no wetlands were found within or adjacent to the study area.

Figure 2-8
FLUCCS Map

2.6.5 Marine Resources

2.6.5.1 Beach and Dune Habitat

Beach and dune habitat do not occur within the immediate project vicinity, but do occur along the ocean east and northeast and southwest of the project area. 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 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 imbricate*). Sparsely vegetated beaches are preferred nesting habitat for the least tern (*Sterna antillarum*), which is listed as a threatened species by the Florida Fish and Wildlife Conservation Commission. The sea oat zone high on the dune provides habitat for another threatened species, the southeastern beach mouse (*Peromyscus polionotus niveiventris*), which occurs northeast of the project area on the CCAFS. Beaches in Brevard County also provide nesting habitat for sea turtles, which are discussed further in Section 2.6.8. The Port has an active ongoing beach and sand dune protection and restoration program that dates back to the mid-1990s.

2.6.5.2 Hardbottom

There is no hardbottom habitat located within the project area. The closest hardbottom area was previously identified by Continental Shelf Associates (1989) and consisted of a well-developed line of rock outcroppings (more than 12 miles south of the port entrance channel) 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 are comprised of lithified coquina rock of the Pleistocene Anastasia Formation (Continental Shelf Associates 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. In addition, they can serve as an important staging and foraging area for juvenile sea turtles prior to entering their important foraging habitats in the inshore estuaries and lagoons.

2.6.5.3 Unvegetated Sand Bottom

Unvegetated sand bottom occurs along most of the nearshore area and throughout the harbor. Sediments within the harbor are comprised mainly of sand or silt/clay, with small amounts of gravel. Substrate in the nearshore area is predominately comprised of medium to fine grain

sands. The infaunal benthic community associated with the sand bottom habitat is dominated by a variety of polychaete annelids, bivalves, gastropods, and crustaceans. The coarser to fine sand habitat typically supports a more diverse benthic community than the finer sand with high silt/clay content. No benthic community studies have been performed within the Port based on review of available records.

2.6.5.4 Seagrass

No seagrass has been identified within the harbor or entrance channel, and it is unlikely that it occurs. The water depths and sediment conditions within the Harbor are not conducive for seagrass growth. The seagrass maps prepared by FDEP/FMRI included the areas within the Port, and no seagrass was identified. The areas along the shorelines and bulkheads were observed by divers during the sea turtle studies and no seagrasses were observed at that time. The waters far outside of the Port to the west, in the Banana River State Aquatic Preserve, support large and small, isolated areas of seagrass adjacent to upland islands and other physical structures (Figure 2-7).

2.6.5.5 Algal Communities within the Port

The algal community growing on granite boulder riprap along the channel walls of the Port provides excellent foraging habitat for juvenile sea turtles (see Section 2.6.8). Riprap occurs on the northern boundary of the Port, the south side berthing areas, and the north and south jetties [the northern area is along Air Force property (Figure 2-8)]. The 980 meters of riprap located between the middle and east turning basins and the inside perimeter of the Trident submarine basin, in particular, are heavily used for foraging by juvenile green turtles (Dial Cordy 2007; Ehrhart and Redfoot 1994; Ehrhart and Redfoot 2002; and Ehrhart and Redfoot 2005)

A survey of the algal community associated with the entire length and depth of 980 meters of riprap located between the MTB and ETB was performed in August 2005 and February 2006 (Dial Cordy 2007). Algae collected along the 980 meters along north side of the channel entrance was identified only to the family level due to the large amount of material and high diversity, with eight families represented during the summer sampling and 10 during the winter.

Figure 2-9
Seagrass Occurrence Map

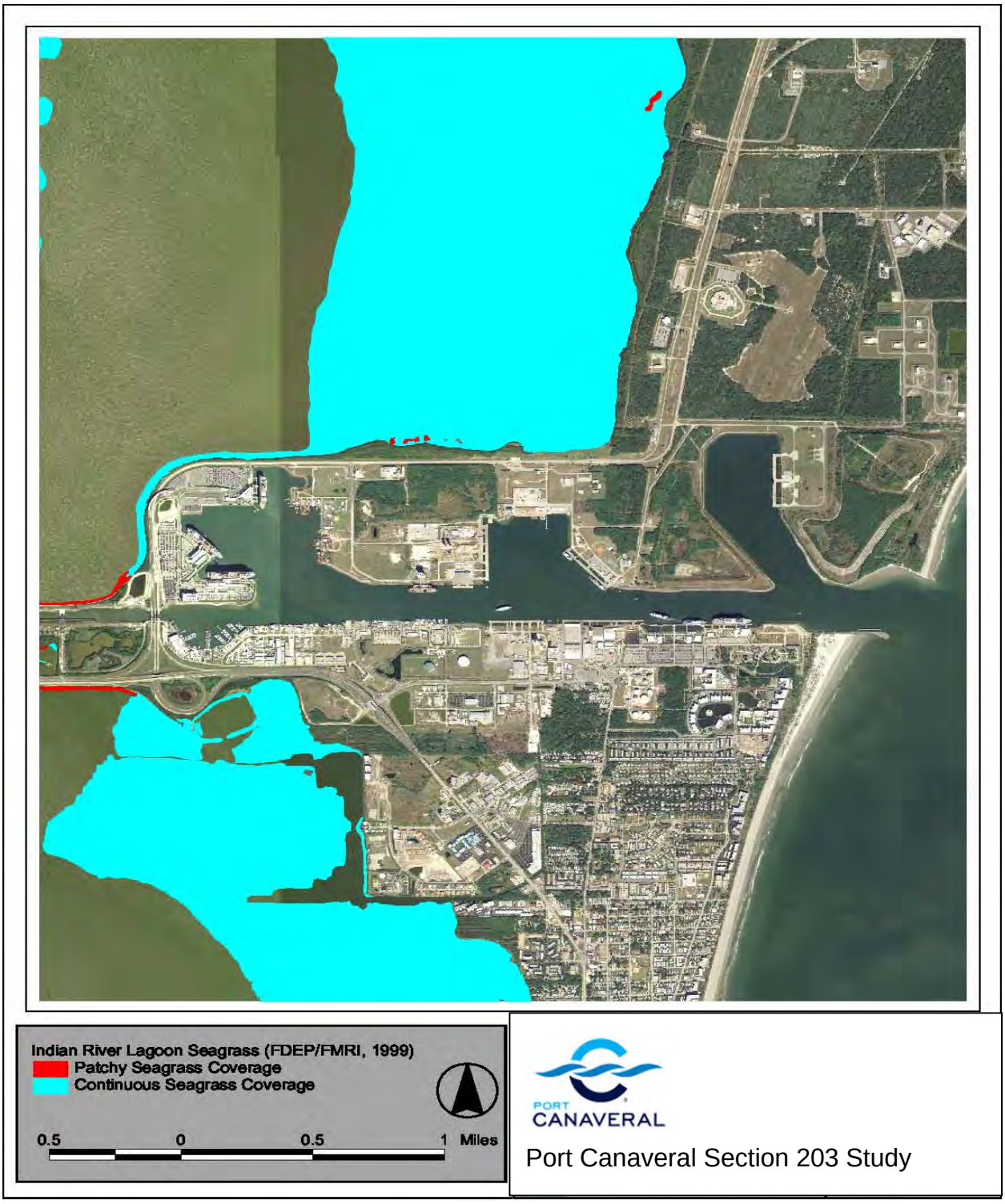
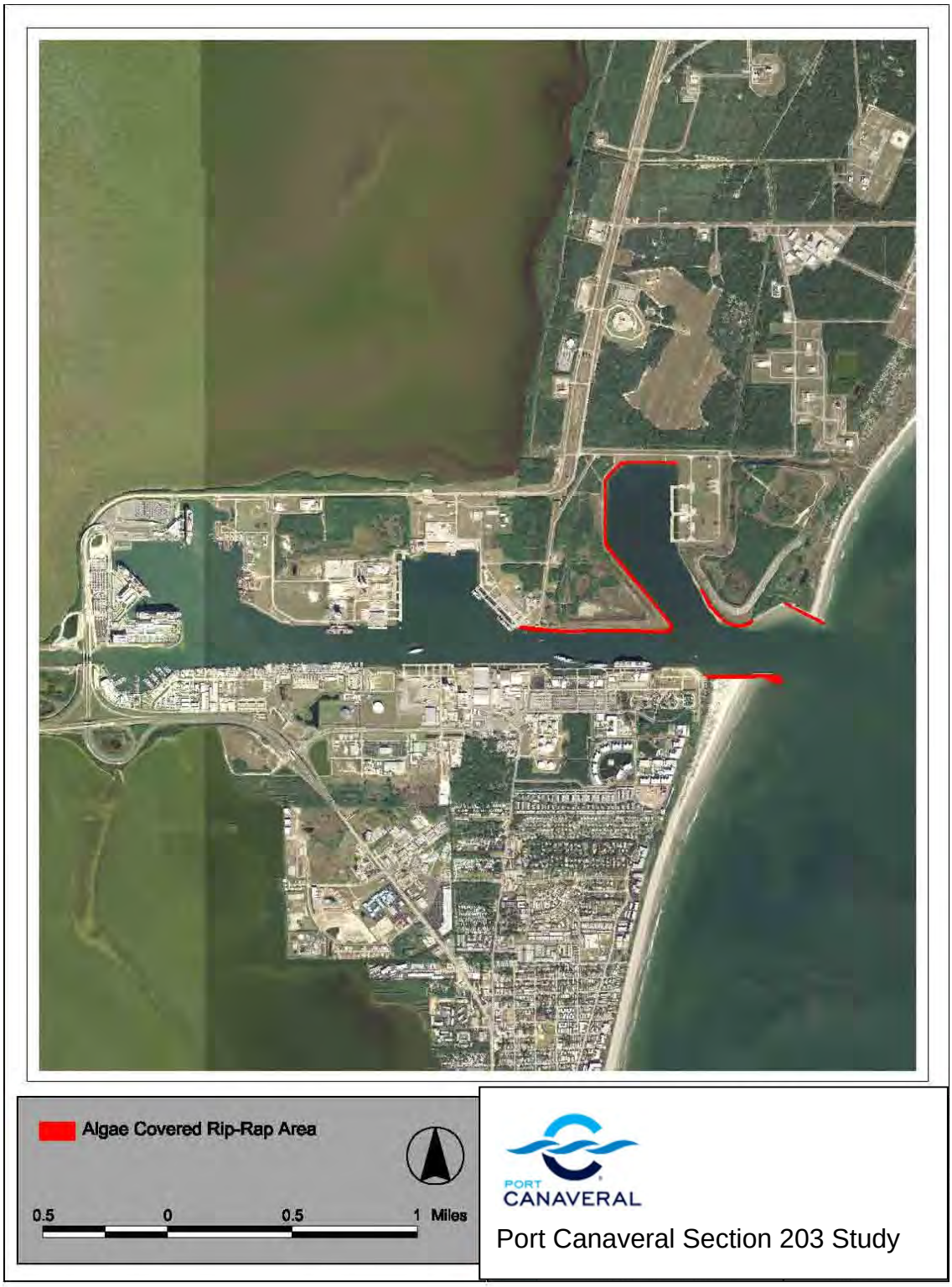


Figure 2-10
Algae Covered Rip-Rap



Algal species of the families Rhodomeleaceae and Ulvaceae were present during the winter that were not present during the summer sampling event. Ehrhart and Redfoot's (1997) analysis of algal species located in the adjacent Trident submarine basin 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 is no documentation of reef fish foraging on the riprap in this area (Section 2.6.6 Essential Fish Habitat). However, it is likely based on observations while performing the algal study, that these riprap features do provide at least some temporary shelter and foraging for demersal species common to the nearshore hardbottom habitat located along the beaches in Brevard County.

2.6.6 Essential Fish Habitat (EFH)

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 used 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 CFR, Part 600). The act requires federal agencies, including the Corps of Engineers, 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.

The South Atlantic Fisheries Management Council (SAFMC 1998) has designated sargassum, water column, unvegetated bottom, and live/hardbottom habitat within the area as EFH. The nearshore hardbottom and offshore reef habitats of Central Florida have also been designated as Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPC) (SAFMC 1998). As many as 60 corals can occur off the coast of Florida (SAFMC 1998) and all fall under the protection of the management plan. As previously stated, the nearest hardbottom habitat occurs over 12 miles south of the study area; however, the occurrence of man-made rock structure within the Port provides habitat for some managed species and their prey.

Managed species that commonly inhabit the nearshore and offshore waters near the harbor include pink shrimp (*Penaeus duorarum*) and spiny lobster (*Panularis argus*). Members of the 73 species Snapper-Grouper Complex include sailors choice (*Haemulon parra*), gray snapper (*Lutjanus griseus*), mahogany snapper (*Lutjanus mahogoni*), and porkfish (*Anisotremus virginicus*). These species utilize the inshore habitats of Indian River Lagoon as juveniles and sub-adults and as adults utilize the hardbottom and reef communities offshore. Other important species that utilize the inshore and nearshore areas of Brevard County include the red drum (*Sciaenops ocellatus*) and the snook (*Centropomis undecimalis*). In the offshore habitats, the

number of species within the Snapper-Grouper Complex that may be encountered increases. Coastal migratory pelagic species also commonly utilize the offshore area adjacent to the study area, but not within the Port. The king mackerel (*Scomberomorus cavalla*) and the Spanish mackerel (*Scomberomorus maculatus*) are the most common.

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 these fishes, brown shrimp, white shrimp, pink shrimp, and spiny lobster (Table 2-25). Six coastal migratory pelagic fish species have been included owing to their distribution patterns along the Florida coast. In addition, the nearshore bottom and offshore reef habitats of South Florida have also been designated as Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPC) (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). Information on life histories of managed species identified for this assessment is provided in Dial Cordy (2007b).

Table 2-25
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*
Ephippidae	
Spadefish	*Chaetodipterus faber*
Haemulidae	
Black Margate	*Anisotremus surinamensis*
Porkfish	*Anisotremus virginicus*
Margate	*Haemulon album*

Table 2-25
Managed Species Identified by the South Atlantic Fishery Management Council That Are Known to Occur in Brevard County, Florida

Common Name	**Taxa**
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*

Table 2-25
Managed Species Identified by the South Atlantic Fishery Management Council That Are Known to Occur in Brevard County, Florida

Common Name	Taxa
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

2.6.7 Protected Species

The 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 CCAFS and Port Canaveral were reviewed for potential protected species that may occur within the study area. Four terrestrial species were identified that could potentially occur within upland portions of the study area. These species include the gopher tortoise (*Gopherus polyphemus*), Florida scrub jay (*Aphelocoma coerulescens*), eastern indigo snake (*Drymarchon corais couperi*), and the southeastern beach mouse (*Peromyscus polionotus niviventris*). These species are known to occur only on the CCAFS property, north of CCAFS, or on Merritt Island, and are not known to occur on Port Canaveral property within the project area. The bald eagle (*Haliaeetus leucocephalus*) may also occur in the area but was delisted in 2007. This species is still protected under the Bald and Golden Eagle Protection Act. In addition to the terrestrial species, three sea turtle species were identified as potentially utilizing the nearby beach habitat for nesting. These species include the loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), and green sea turtles (*Chelonia mydas*). Algal communities within the Port and the Trident Basin serve as a source of nutrition for juvenile green sea turtles. The beaches and spoil areas may also be utilized by nesting and foraging shorebirds including the least tern (*Sterna antillarum*) (threatened) and piping plover (*Charadrius melodus)* (threatened*)*. The nearshore and inshore waters within the study area are frequented by protected marine mammals including the West Indian manatee (*Trichechus manatus*). The North Atlantic right whale (*Eubalanus glacialis*), while not found within the confines of the Port, has been occasionally found in the Atlantic Ocean off the coast of Brevard County.

2.6.7.1 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 (Figure 2-9). It is important to note however, that there are no sea turtles nesting in the project area at Port Canaveral. The loggerhead (*Caretta caretta*) is responsible for the vast majority of the nesting, 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, Florida Statutes (F.S.). The loggerhead turtle is listed as a threatened species. The hawksbill turtle (*Eretmochelys mydas*) and Kemp's Ridley turtle (*Lepidochelys kempii*) are two additional sea turtle species that could potentially be found in the area but are not known to nest on Brevard County beaches.

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.

Juvenile green sea turtles have been known to forage in the Trident Basin and 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 (Ehrhart and Redfoot 2007; Dial Cordy 2007; Ehrhart and Redfoot 1994; Erhart and Redfoot 1997).

2.6.7.2 Loggerhead Sea Turtle

Loggerheads nest in the southeastern U.S. from April through September, with peak nesting occurring in June and July (National Marine Fisheries Service [NMFS] and United States Fish and Wildlife Service [USFWS], 1991a). The highest density of loggerhead nesting occurs from Canaveral National Seashore in Volusia County south to John U. Lloyd State Recreation Area in Broward County. Nesting may reach densities of over 600 nests per kilometer. Nesting along the northern beaches is substantially lower than nesting in the southern portions of the County. Between 1988 and 2010, County-wide loggerhead nesting ranged from a low of 13,181 in 1988 to a high of 34,596 in 1998 (Table 2-26). There were 25,741 documented loggerhead nests in 2010.

Hatchlings emerge primarily at night and swim offshore in a "frenzy" until they arrive at offshore weed and debris lines (Carr 1986) (Wyneken and Salmon 1992). Post hatchling turtles from the Florida coast enter currents of the North Atlantic Gyre, eventually returning to the western Atlantic coastal waters (Bowen, et al. 1993). Adult loggerhead turtles in South Florida utilize foraging grounds in the Caribbean basin, the Gulf of Mexico, and along the U.S. east coast (Meylan, et al. 1983). Abundances of adult loggerhead turtles in Florida waters increase during the nesting season (Magnuson, et al., 1990). Loggerhead turtles do not typically forage in the harbor at Port Canaveral but can occasionally be found swimming in the harbor.

Figure 2-11
Sea Turtle Nesting

Table 2-26
Sea Turtle Nesting Data for Brevard County, 1988-2010

Year	Beach Length (km)	Green Turtle Nests	Leatherback Turtle Nests	Loggerhead Turtle Nests
1988	77.9	134	0	13,181
1989	97.4	246	1	19,589
1990	98.3	841	0	27,673
1991	98.5	214	3	28,279
1992	101.0	1,232	2	25,555
1993	100.1	116	1	20,600
1994	102.8	1,720	5	28,029
1995	103.4	171	4	31,653
1996	105.2	1,351	16	28,742
1997	110.0	259	11	25,221
1998	108.0	2,764	30	34,596
1999	108.0	125	43	34,134
2000	108.0	3,907	22	32,910
2001	115.2	193	61	26,198
2002	115.2	4,316	18	23,492
2003	115.2	705	68	22,994
2004	103.2	1,494	25	15,678
2005	115.2	4,878	68	19,339
2006	-	2051	16	18,089
2007	-	5743	105	14,829
2008	-	4169	33	21,242
2009	-	1697	70	17,194
2010	-	5940	77	25,741

2.6.7.3 Green Sea Turtle

Green turtle nesting occurs along southeastern Florida beaches from Volusia County through Broward County, but at much lower densities than loggerheads (Meylan, et al. 1995). Densities range from 1-5 per kilometer on most beaches, with higher densities of 13-30 nests per kilometer on the beaches within the major nesting zone in south Brevard County and Palm Beach County (Erhart and Witherington 1986). Brevard County accounts for approximately 40 percent of green turtle nesting in Florida. Green turtle nesting data for Brevard County are shown in Table 2-26. In 2010, green turtle nesting reached a record (1988-2010) high of 5,940 nests. Clutch sizes for green turtle nests may range from 75-200 eggs per nest, with approximately 136 hatchlings per nest (USFWS 2007). In a high nesting year such as 2010, over 500,000 green turtle hatchings will occur on Brevard County beaches.

Green turtles show a similar life history pattern as loggerheads, but they leave the pelagic phase and enter developmental habitats at a considerably smaller size, about 20-25 cm carapace length (Magnuson, et al. 1990). Typical developmental habitats are shallow, protected waters where seagrass is prevalent (Carr, et al. 1978), but green turtles are commonly found in reef habitats where algae is present (Ehrhart, et al. 1996) (Coyne 1994). In Florida, these turtles feed primarily on a diet of seagrasses such as *Halodule wrightii*, *Syringodium filiforme*, and red and green algae (Lutz and Musick 1997). The seasonal abundances of algal species offshore may limit the offshore foraging areas in the winter months. Nelson (1988) noted a great seasonal

reduction in algal species richness (56 summer vs. 16 winter) on the nearshore reefs at Sebastian Inlet. The Indian River Lagoon is an important foraging area for juvenile green turtles, and other offshore and inshore areas also provide foraging opportunities.

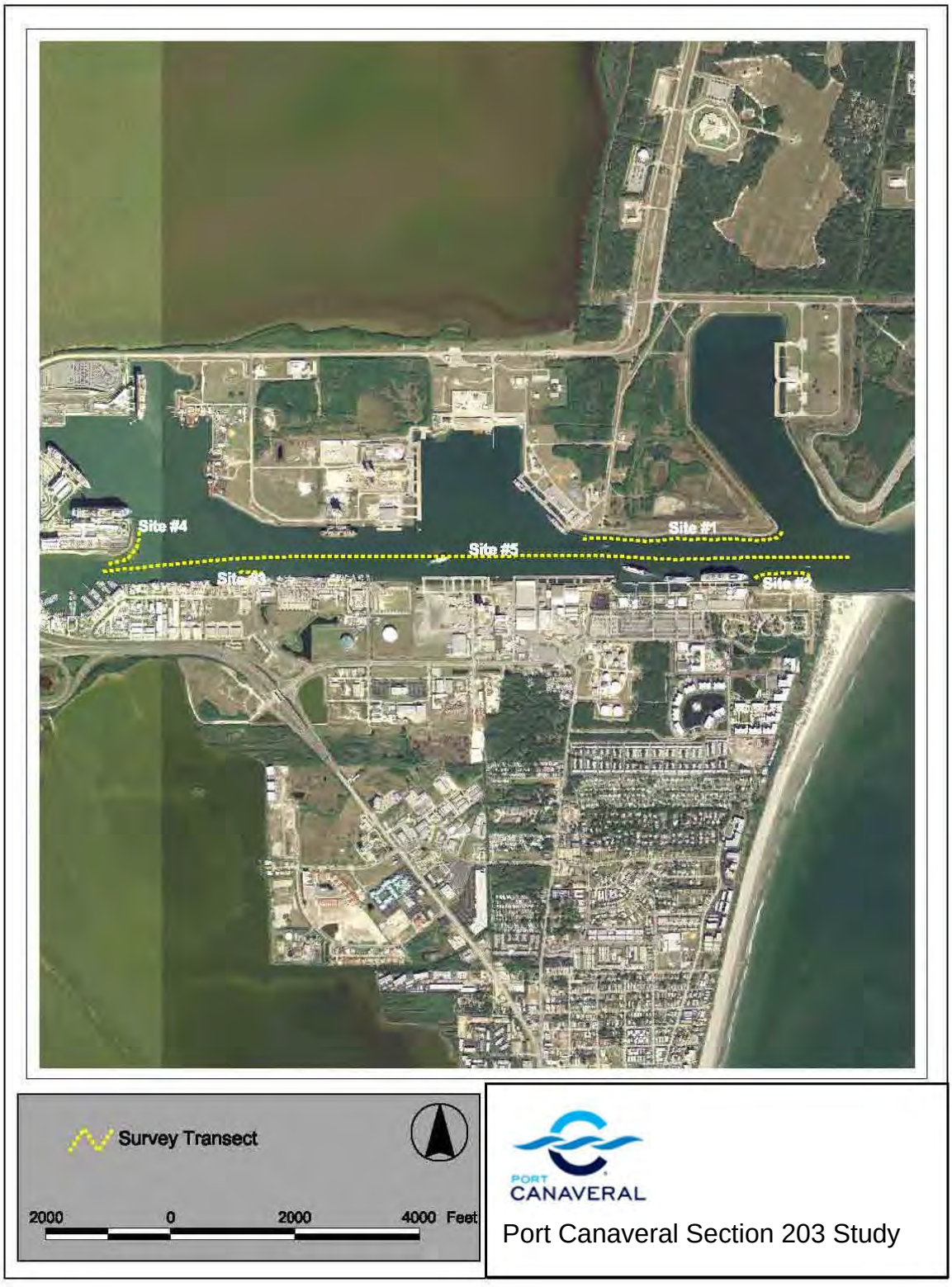
Green turtles nesting in Florida have a minimum size of 83.2 cm carapace length, but they appear to leave Florida developmental habitats by about 60-65 cm carapace length (Witherington and Ehrhart 1989), perhaps migrating to the southeastern Caribbean. Brevard County contains two significant developmental habitats for green turtles, the Indian River Lagoon and the nearshore reef system, both of which are not within the Port study area. (Ehrhart, et al. 1996). Dietary needs of juvenile turtles along with seasonal abundances of seagrasses and algae within the area may be factors influencing the habitat use of juvenile turtles within the area. As adults, offshore habitat utilization would be greatest during the nesting period.

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 to nesting beaches to reproduce.

Sea turtle surveys were conducted by the Inwater Research Group Inc. (IRG) on August 27-29, 2005 and February 11-13, 2006 using methodology developed by IRG and accepted by the Florida Department of Environmental Protection (FDEP) and the National Marine Fisheries Service (Dial Cordy 2007). 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 sighting 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 2-10). 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

Figure 2-12
Sea Turtle Sighting Transects



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.

Sea turtles, mostly all Green 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 meter transect on 30 repetitions (Table 2-27). 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). No turtles were observed during 31 repetitions along transect 4. In the spring 2006, 111 turtles were observed along transect 1 (36 repetitions), and six turtles were observed along transect 2 (38 repetitions) (Table 2-27). 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 (Table 2-27).

Table 2-27
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

Areas within and adjacent to the Trident Turning Basin (including the shoreline between MTB and TTB) have been extensively studied by researchers from the University of Central Florida (UCF) (Ehrhart 1995; Ehrhart 1996; Redfoot 1996; Redfoot 1997; Redfoot 2000; Nelson 1994). These studies have shown a persistent and distinct assemblage of juvenile green turtles inhabiting the area of the Trident Turning basin. This assemblage is characterized by a distinctly smaller average size than is typical of other central Florida developmental habitats. 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 the UCF studies have been caught over 20 times over a period of up to 12 years (Personal communication, D. Bagley, 2007).

2.6.7.4 Leatherback Sea Turtle

Leatherback turtles occur worldwide in pelagic waters from the tropics to near the Arctic and Antarctic Circles. Nesting is primarily on the Pacific coast of Mexico and the Caribbean coast of South America, with some continental U.S. nesting in Florida. The majority of leatherback nesting activity is located within St. Lucie, Martin, and Palm Beach counties (Meylan, et al. 1995). Nesting data provided by FWC, however, show at least some nesting occurring in Brevard County, with 77 leatherback nests documented in 2010. Leatherback turtles seldom use the inshore waters of Brevard County and only are known to frequent the area during nesting periods.

2.6.7.5 West Indian Manatee

The West Indian manatee (*Trichechus manatus*) is protected under the both the Endangered Species Act and the Marine Mammal Protection Act and is also listed as protected under Florida State law. The manatee is generally restricted in range to the Georgia coast southward around the Florida peninsula. Manatees frequently inhabit shallow areas where seagrasses are present and are commonly found in protected lagoons and freshwater systems. Manatees occasionally use open ocean passages to travel between favored habitats (Hartman 1979). Manatees migrate seasonally, particularly on the east coast of Florida. During the summer months manatees utilize habitats all along the coast. During winter, when water temperatures drop, manatees use warm water refuges such as springs or warm water discharges at power plants.

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 and the proportion of fatalities caused by watercraft is average when compared to the rest of the state. Between 1974 and 2007, 1191 manatee deaths have been reported from Brevard County, 265 of which were watercraft-related deaths (approximately 22%) (FWRI 2007). A total of 43 (3.8%) of the deaths were reported as occurring within Port Canaveral, the Port Canaveral Barge Canal, and the Port Canaveral inlet, with 15 being attributed to collisions with watercraft.

Port Canaveral has had a Manatee Protection Plan for the harbor in place since 1996. It was one of the first ports to voluntarily institute such a plan. In 2003, the Brevard County Board of County Commissioners approved a Manatee Protection Plan to identify and implement measures to provide protection for the manatee.

The Corps of Engineers operates a lock facility at the western end of Canaveral Harbor that allows vessel traffic to access the Banana River through the Port, as well as manatees. The lock also reduces tidal-current velocities in Canaveral Harbor, prevents entry of hurricane tides into the Banana River, and prevents salt water intrusion into the Banana River. Corps of Engineers manatee sighting data within the lock facility since 2003 (Table 2-28), shows that the facility is heavily used by manatees, with lulls often, though not always, occurring during the cold winter months of December, January, and February (USACE, unpublished data). The locks are equipped with manatee detection devices to eliminate the potential of manatee mortality as the gates are closed. Seven of the deaths were due to entrapment in gate/lock facilities at the Port Canaveral locks (the most recent occurring in 1999), prior to the installation of the detection devices.

Table 2-28
Canaveral Lock Manatee Sightings: 2003 - June 2012

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
January	1	24	10	42	447	110	No data	40	Lock closed	322
February	15	54	10	143	26	108	No data	42	Lock closed	805
March	277	57	39	315	794	412	234	58	Lock closed	350
April	500	308	331	597	1277	1057	722	316	1009	561
May	571	616	598	920	1156	1073	690	1300	1032	840
June	411	658	388	1031	753	1145	1075	732	1321	751
July	544	657	446	844	1198	653	1511	818	1356	NA
August	626	578	596	0	1329	807	1424	821	1138	NA
September	452	188	544	0	807	759	1272	627	962	NA
October	610	414	0	687	958	914	1516	701	720	NA
November	324	177	0	320	912	858	1219	503	475	NA
December	101	79	0	405	849	716	586	197	1015	NA

Source : USACE

2.6.7.6 Right Whale

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. Aerial surveys have been conducted near Port Canaveral since 2001. The western North Atlantic population size was estimated to be 291 individuals in 1998 (NMFS 2005).

The North Atlantic right whale is primarily found 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, which includes the nearshore waters off Port Canaveral. 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.

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

The Port has participated and supported the Right Whale Monitoring Program for many years. Since 1994, five incidents have been reported where vessels have come within close proximity to North Atlantic right whales, but none of them resulted in injury or death. There have been three reported whale-vessel incidents involving five different vessels directly off Port Canaveral.

2.6.7.7 Southeastern Beach Mouse

The southeastern beach mouse (*Peromyscus polionotus neveiventris*) is listed as a threatened species at both the Federal and State levels. Beach mice primarily use coastal dune communities comprised of 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 in 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. The nearest southeastern beach mouse population is on CCAFS east of the Trident Turning Basin and north of Port Canaveral (Figure 2-13; Dynamac 2002). The upland habitat between the MTB and TTB is not suitable for the southeastern beach mouse, and they have not been found within the immediate study area.

Figure 2-13
Southeastern Beach Mouse – Suitable Habitat

2.6.7.8 Scrub Jay

The scrub jay (*Aphelocoma coerulescens*) is listed as threatened at both the State and Federal levels. The scrub jay is endemic to Florida's xeric oak scrub and scrubby pine habitat, maintaining territories approximately 22 acres in size. The nearest known populations of scrub jays are located over one-half mile northeast of the harbor along the coast of the CCAFS (Figure 2-14; FNAI/FSU 2007). A one-day survey for scrub jays was performed on the small upland area between the MTB and TTB using approved FFWC and USFWS survey methodology. No scrub jays were observed (Dial Cordy 2006b).

2.6.7.9 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is no longer listed by either the State and Federal levels, although it is still protected under the Bald and Golden Eagle Protection Act. The breeding range of the bald eagle is associated with aquatic habitats (coastal areas, river, lakes, and reservoirs) with forested shorelines or cliffs in North America. Throughout their range, they select large, super-canopy roost trees that are open and accessible, mostly conifers. They winter primarily in coastal estuaries and river systems.

No bald eagle nests are located within the study area, and no appropriate habitat for nesting was observed during the recent investigation by Dial Cordy and Associates. According to the FWC bald eagle website, the nearest known bald eagle nest locations are west of the Banana River Aquatic Preserve (Figure 2-15).

2.6.7.10 Least Tern

The least tern (*Sterna antillarum*) is a small member of the gull family (Laridae). The least tern is listed by Florida as a threatened species and is 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 coast. Least terns are not known to nest within the project study area.

2.6.7.11 Piping Plover

The piping plover (*Charadrius melodus*) is a state and federally listed threatened species. Piping plovers are a migratory shore bird that also is protected under the Migratory Bird Treaty Act. Piping plovers migrate to the Florida coast in September and are found through March (USFWS 1995). Piping plovers 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 the beach areas within the County, but have not been observed nesting within the project study area.

2.6.7.12 Gopher Tortoise and Eastern Indigo Snake

The gopher tortoise (*Gopherus polyphemus*) is listed as a species of special concern (SSC) by the State, but is proposed for re-classification as threatened. It is a large, terrestrial turtle and utilizes

Figure 2-14
Scrub Jay Groups

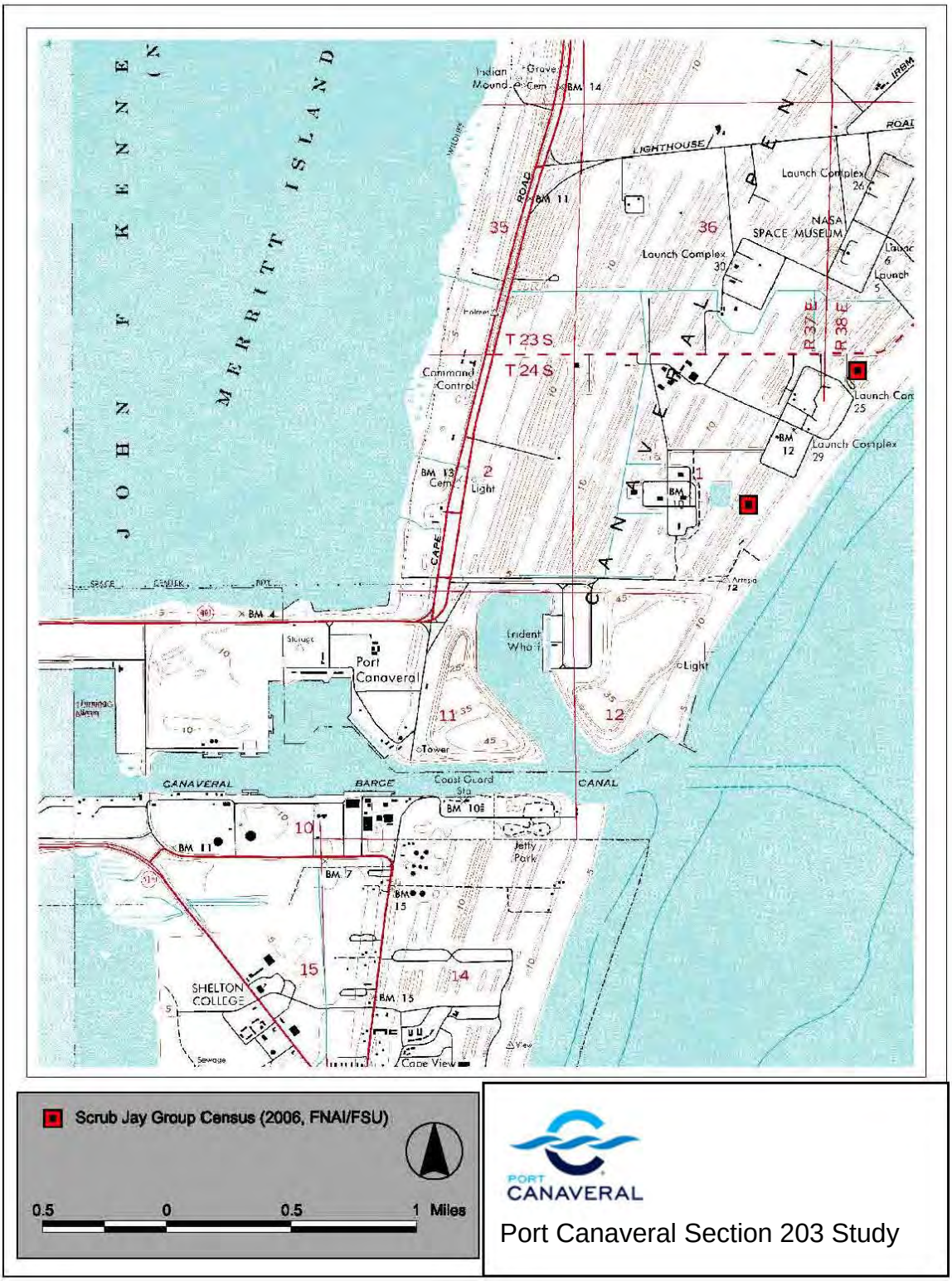
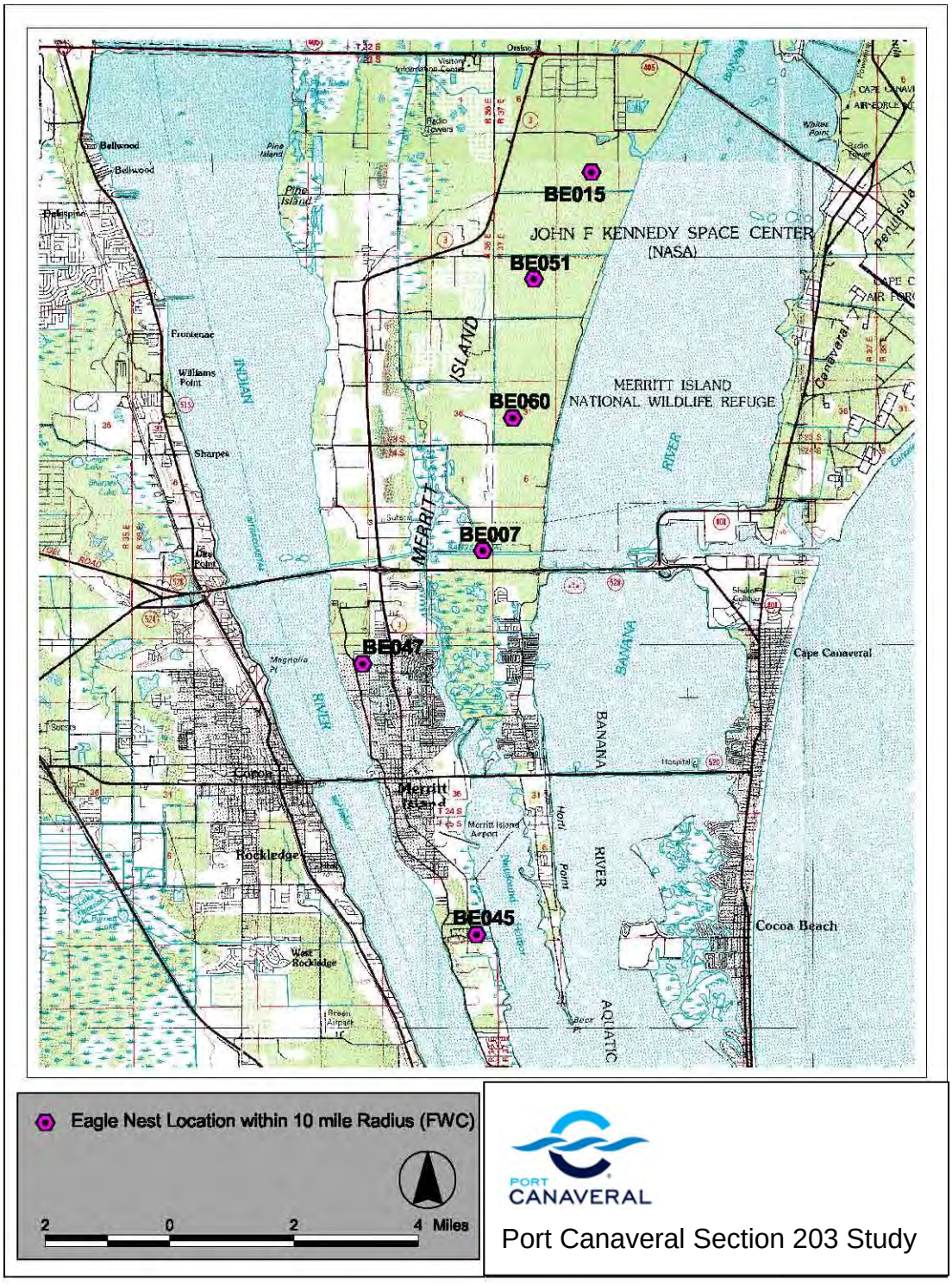


Figure 2-15
Bald Eagle Nest Locations



mainly sandy, well-drained habitat including dunes, scrub, and pine flatwoods, although the gopher tortoise 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 property. A recent survey conducted by Dial Cordy and Associates (Dial Cordy 2006) identified burrows on the CCAFS between the MTB and TTB (Figure 2-16). CCAFS is currently working with the Corps to utilize the upland site between the middle and east turning basins for dredged material disposal (Personal communication, Angy Chambers, CCAFS 2007). This would result in the CCAFS relocating all gopher tortoises on the site to another location approved by the Florida Fish and Wildlife Conservation Commission (FWC) during the relocation permitting process. The eastern indigo snake has been classified as a threatened species by the Florida Game and Fresh Water Fish Commission since 1971 and by the U.S. Fish and Wildlife Service since 1978. Eastern indigo snakes have not been previously identified on the site, and it is highly unlikely that eastern indigo snakes occur in this area (Personal communication; Angy Chambers, CCAFS 2007).

2.6.8 Coastal Barrier Resources

Congress passed the Coastal Barrier Resources Act (CBRA) in 1982 to address problems caused by coastal barrier development. This Act defined a list of undeveloped coastal barriers along the Atlantic and Gulf coasts. Designated coastal barrier resources have been identified within the project study area but not within the proposed work area as shown in Figure 2-17. COBRA resources within the study area include the Canaveral National Seashore, the Merritt Island National Wildlife Refuge, and the Banana River State Aquatic Preserve.

2.6.9 Cultural Resources

The Cape Canaveral Air Force Station (CCAFS) is located just north of Canaveral Harbor. The CCAFS is listed as a National Historic Landmark (NHL) for its vital contribution to the nation's space program (Figure 2-18). The significant structures within this designation include various launch complexes and the Mission Control Center (PBS&J 2006). In addition, one archaeological site (Site 8BR1641) was previously recorded adjacent to, but outside of, the project area. Site 8BR1641 is located on a sandy ridge paralleling the old Banana River shoreline. Investigations identified the presence of gray midden soils containing shell and ceramics. No designated cultural resources are known to occur within the project study area based on records search and site reconnaissance within the Port (PBS&J 2006). The 2006 PBS&J assessment covered all of the proposed navigation improvement areas (shown in Figure 2-17 in yellow) west from the relict shoreline along the Atlantic (now the entrance to the Harbor).

The Harbor is completely artificial and was dredged in the 1960s, the potential (should any exist) for prehistoric/historic submerged resources would be limited to the relict shoreline along the Atlantic Coast, which is outside of the project area. The Florida Department of State Division of Historical Resources was consulted and did not require an underwater investigation prior to the department's concurrence that the project would not impact historic or cultural resources. However, CPA conducted an underwater archaeology assessment in December 2007, which confirmed that no submerged historic or cultural resources would be impacted by the project (Environmental Appendix: Submerged Cultural Resource Survey, Mid-Atlantic Technology, February 2008).

Figure 2-16
Gopher Tortoise Borrows and Habitat

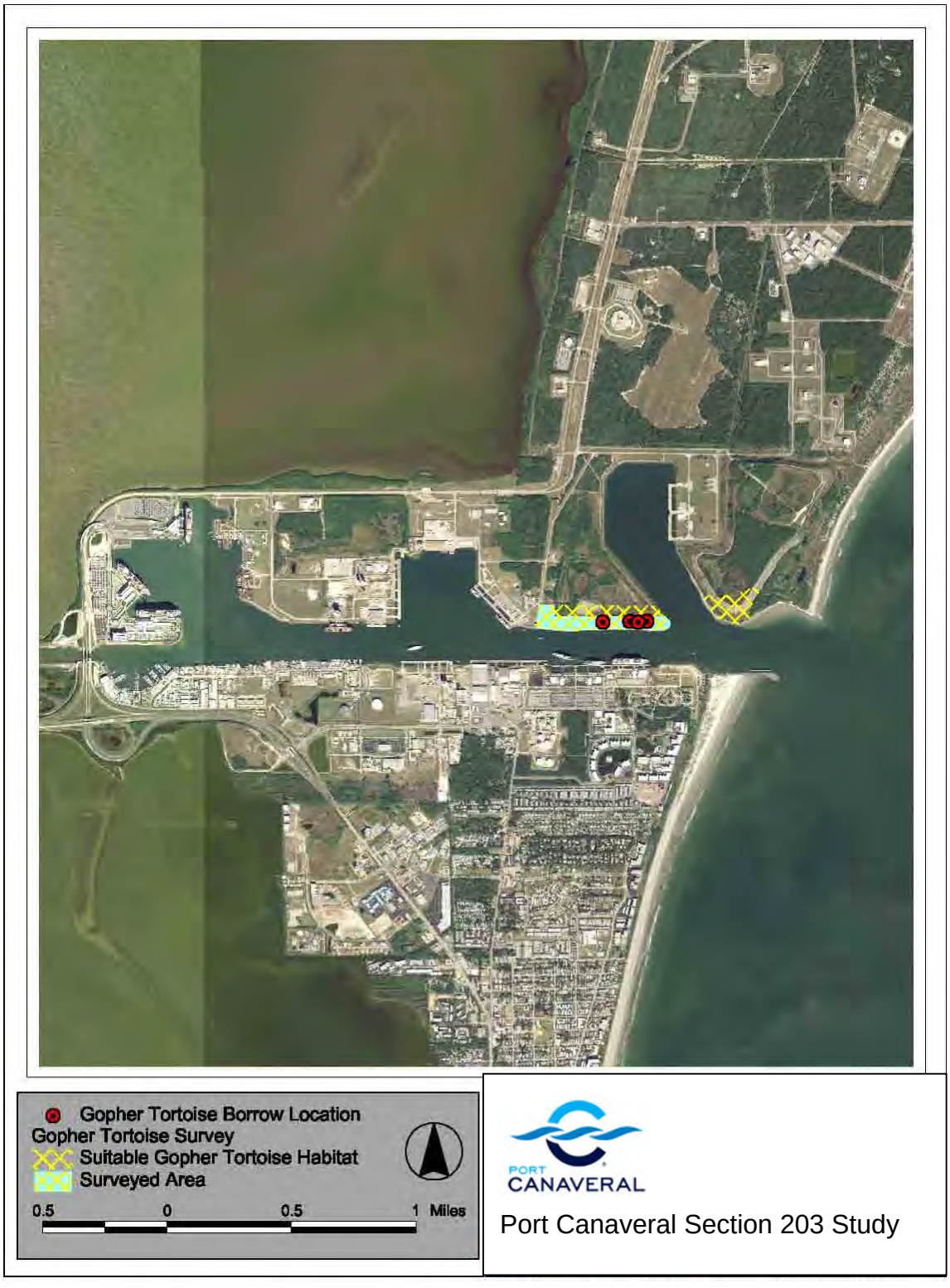


Figure 2-17
Coastal Barrier Resources System (CBRA)

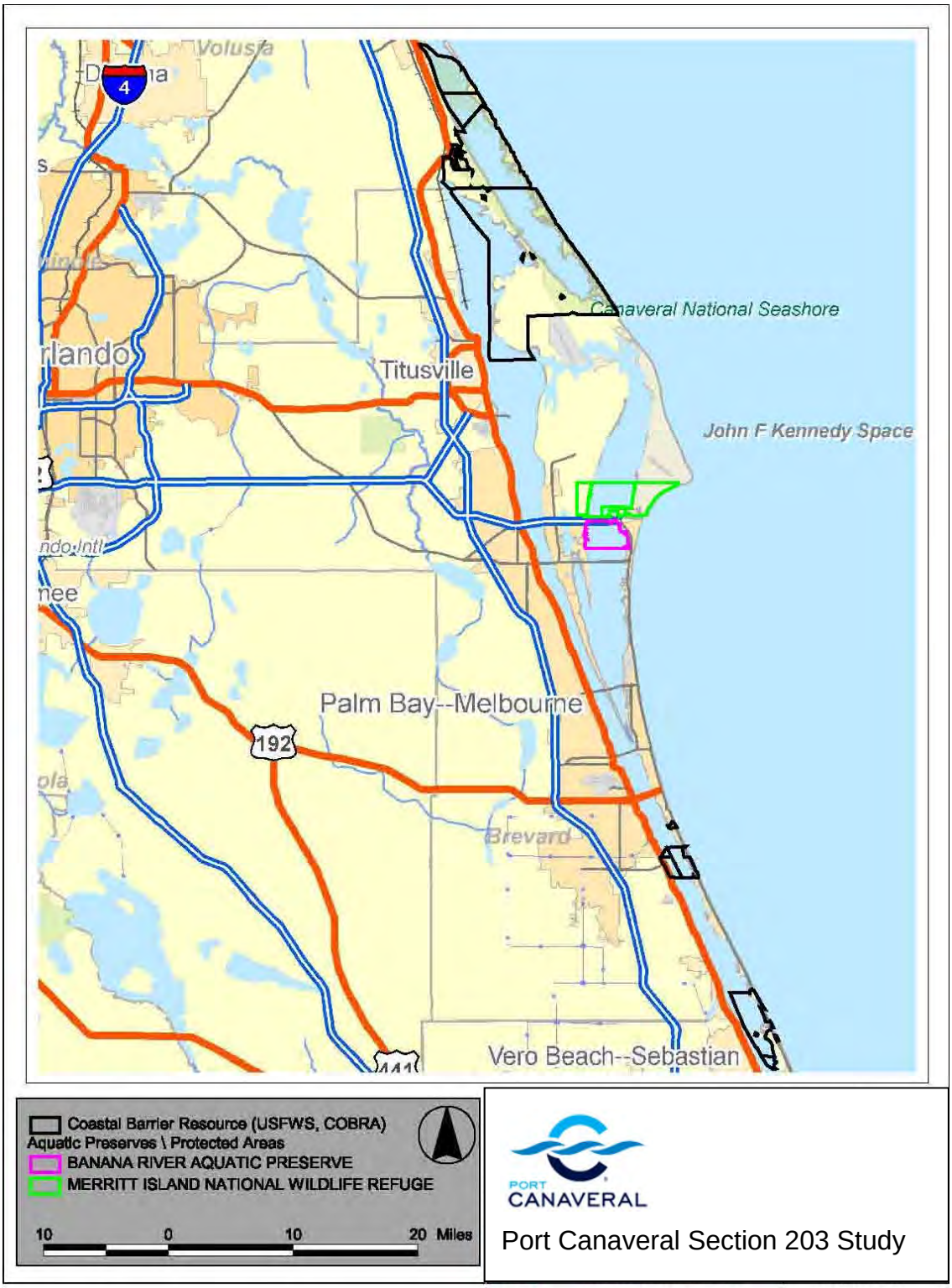


Figure 2-18
Cultural Resources Sites

3. WITHOUT-PROJECT CONDITIONS

Most general conditions relating to climate, winds, waves, and current are expected to be similar to existing conditions. Water quality conditions will continue to be monitored and any necessary corrective actions would be taken. One major change to general conditions will be the projected widening of State Road 528 (Beachline Expressway) which runs between Orlando and Port Canaveral. Currently the road is a four lane (two lanes in each direction) toll road designed in 1960. A Project Development and Environment (PD&E) study was completed by the Florida Department of Transportation in August 2006 recommending a six lane widening project as the selected alternative. In May 2007, Florida's Turnpike Enterprise began Phase I of a project to widen the Beachline West. It encompasses the reconstruction of the mainline toll plaza located near Milepost 5, which is now complete. Ultimate roadway improvements will include four travel lanes in each direction, but due to construction costs, the improvements will be stage-constructed, with the interim improvements including three lanes in each direction. In June 2008, a project began to widen the Beachline from the Turnpike to McCoy Road. Improvements include widening the existing bridge structures at US 441, Landstreet Road, CSX Taft Yard, Orange Avenue and McCoy Road. A new bridge will also be constructed for the access ramp over CSX. The final phase, between Interstate 4 and the Turnpike, has been pushed out due to rising construction costs and expected traffic projections. That project is not included in the Turnpike's current five-year work program.

3.1 Navigation Features

3.1.1 Canaveral Ocean Dredged Material Disposal Site

Under without-project conditions, maintenance dredging is projected to continue with volumes similar to recent historical volumes. Material samples from more than 300 borings indicate that project and future maintenance material will be similar in quality to recent historical dredged material and therefore suitable for disposal at the Canaveral ODMDS. Long-term monitoring of the ODMDS will continue as outlined in the Canaveral ODMDS Site Management and Monitoring Plan (SMMP). Offshore disposal at the Canaveral ODMDS will continue to be the long term disposal plan for port users (CPA, USACE, USN) and is the most cost-effective disposal alternative, consistent with engineering and environmental criteria. Disposal alternatives for dredged material, other than the ODMDS, consist of very expensive and restrictive upland placement alternatives. Use of the Canaveral ODMDS is not expected to cause significant adverse impacts to Essential Fish Habitat. The disposal site is clear of any coral, coral reef, live / hard bottom or artificial reef habitat. The disposal site's revised SMMP (February 2012) specifically includes this project's proposed new work dredged material and has a ten-year capacity of 9.2 million cubic yards. The revised SMMP does not identify an annual capacity limit. The ODMDS is sufficient for placement of both maintenance and new project dredging (Table 29, Engineering Appendix), and this project requires no changes to the Canaveral ODMDS SMMP.

3.1.2 Channel Conditions

Royal Caribbean International (RCI) homeported a new Freedom Class vessel at Port Canaveral in 2009, the *Freedom of the Seas*. The Freedom Class is an additional 91 feet longer than the previous Voyager Class vessel, *Mariner of the Seas*, which was homeported at Port Canaveral

prior to the arrival of the *Freedom of the Seas*. Other dimensions are similar to the Voyager Class. As discussed in Section 2.5.3 Existing Port Canaveral Cruise Ship Operations, limited additional dredging outside of authorized project limits was conducted in order for the *Mariner of the Seas* (Voyager Class) to operate safely within Port Canaveral.

Prior to bringing a Freedom Class vessel to Port Canaveral, additional limited dredging beyond existing authorized channel and turning basin dimensions, as recommended by the Pilots and RCI, was conducted. This additional dredging included expanding the southeast corner of the present entrance to the West Turning Basin to enable access by a Freedom Class vessel. The immediate widening of the West Turning Basin entrance is referred to as the Interim Corner Cut-Off. The Pilots stated their willingness to transit a Freedom Class vessel through Port Canaveral if these interim modifications to the Federal navigation channel were made, but only under the condition that further improvements (including full length channel widening) would be forthcoming. The Pilots have stated that interim channel modifications are not a long term solution to the restrictions on navigation of a Freedom Class vessel at Port Canaveral. Additional discussion of without-project condition vessel operations is contained in Section 3.4 Port Operations.

3.2 Terminal Facilities

3.2.1 Cargo Terminals

Recently completed construction projects include extending SCP4 and widening SCP1. Ongoing construction includes building North Cargo Berths 5 and 6, which are projected to be in operation in 2013. The largest difference between existing and without-project conditions for Port Canaveral's cargo terminal facilities will be the completion of Seaport Canaveral's (formerly Vitol) 36 acre, 2.8 million barrel petroleum product storage facility. This fuel terminal is located on the port's North Cargo Area adjacent to the Middle Turning Basin (North Cargo Piers 1-2). Initial construction, which was completed in December 2009, includes 24 storage tanks with a combined capacity of 2.8 million barrels. Initial construction cost was $45 million. Seaport Canaveral Terminal capacity is more than three times the existing capacity at Transmontaigne's facility (formerly Coastal Fuels). Seaport Canaveral has delivery contracts in place and the first delivery occurred in February 2010. As of September 2011, 3.3 million tons of petroleum products have been delivered to the facility. The facility currently has 24 storage tanks with a capacity of 2.84 million barrels and a six lane truck rack. At full build-out, whenever that might occur, Seaport Canaveral will have 31 storage tanks with a capacity of 3.79 million barrels. Additional development at the facility may also include a pipeline to the Orlando International Airport and potentially a biodiesel production plant. Full build-out, jet fuel pipeline, and the biodiesel plant are all potential developments at Seaport Canaveral, which have not been included as elements that affect project benefits because of their speculative nature.

3.2.2 Cruise Terminals

Under without-project conditions, the Canaveral Port Authority undertook a $32 million effort in 2010 to upgrade and expand Cruise Terminal (CT) 8 to accommodate the new, larger Disney vessels. The first of these new, larger vessels, the *Disney Dream*, entered service at Port Canaveral in January 2011. The second of two new Disney cruise ships, the *Disney Fantasy*,

began sailing from Port Canaveral in March 2012. These vessels are 128,000 Gross Registered Tonnage (GRT), with a draft of 27 feet, length overall of 1,115 feet, and a beam at the waterline of 121 feet. The older Disney ships are 83,000 GRT (with 965 feet LOA, 106 feet beam, and 25 feet draft), so the new vessels are considerably longer and wider, although they will still employ traditional propulsion systems. Completed modifications to CT 8 to accommodate the new larger Disney cruise ships include berth extension and additional mooring features without compromising the safety of navigation for cruise vessel traffic to and from adjacent CT 10. The passenger terminal was also substantially upgraded, and additional plans are being drawn up better accommodate up to 4,000 passengers.

CT 10 was modified in 2009 to accommodate RCI's new Freedom Class vessel. Prior to modifications CT 10 was capable of berthing a vessel with a maximum length of 1,020 feet. The new Freedom Class vessels are 1,112 feet LOA. Completed modifications to CT 10 include the construction of a mooring dolphin to the east of the existing pier and additional pier extension, which satisfy the requirements of the larger vessel. The passenger terminal was also enlarged to accommodate up to 3,500 passengers.

3.3 Economic Conditions

Even throughout the recent severe economic downturn, the population of the six-county region encompassing the project area continued to grow at a significant rate. For example, the population of Brevard County grew 14.1% from 2000 to 2010 (see Section 2.2.4). Under a medium growth scenario generated by the Bureau of Economic and Business Research (BEBR)[15] at the University of Florida, the six-county port hinterland region is projected to increase population by 43% (1.4 million people) between 2010 and 2035, an average annual growth rate of 1.45%. This projected regional population growth is proportionately greater than projected statewide growth, which is projected to increase by 33%, an average annual rate of 1.1%. Table 3-1 presents the BEBR population growth estimates for the port's six-county hinterland region.

[15] BEBR, 2010

Table 3-1
Six-County Regional Population Projections (2010 – 2035)

County	2010	2035	Population Increase	Percent Increase	Average Annual Growth Rate
Brevard	554,900	727,200	172,300	31.1%	1.1%
Lake	293,500	487,700	194,200	66.2%	2.1%
Orange	1,111,000	1,623,200	512,200	46.1%	1.5%
Osceola	273,300	506,400	233,100	85.3%	2.5%
Seminole	423,700	548,900	125,200	29.5%	1.0%
Volusia	506,500	636,600	130,100	25.7%	0.9%
Region Total	3,162,900	4,530,000	1,367,100	43.2%	1.45%
Florida	18,773,400	24,970,700	6,197,300	33.0%	1.15%

Source: Bureau of Economic and Business Research, University of Florida; Publication 156; March 2010

In addition to the projected population growth within the port's hinterland, operation of the Seaport Canaveral fuel terminal will expand the area historically serviced by the existing fuel terminal at Port Canaveral. Transmontaigne cannot expand or substantially change its operation due to permit and zoning constraints within the City of Cape Canaveral. Transmontaigne's facility is off port property and surrounded by residential development, drastically limiting its growth potential. Seaport Canaveral's business plan and physical plant design do not suffer from the same limitations and are aimed at expanding the existing hinterland for fuel beyond the area serviced by Transmontaigne to include the Orlando area and the Orlando International Airport.

The Florida 2006 Energy Plan states that 90% of the state's waterborne deliveries of fuel oil are handled by three principal ports: Tampa, Jacksonville, and Port Everglades. On Florida's east coast, there is only a very small volume handled at Fort Pierce, apart from Jacksonville, Port Everglades, and Port Canaveral. The hurricane seasons of 2004 and 2005 demonstrated severe disruptions of fuel distribution within Florida, which prompted the state to assess its need for expanded distribution and storage infrastructure improvements and contingency planning. The Florida 2006 Energy Plan's first recommendation for transportation fuels was to "facilitate diverse petroleum supply and distribution mechanisms into and within Florida". The new Seaport Canaveral Terminal adds capacity at a strategic location in central Florida, because of its proximity to Orlando and its mid-coast location between major delivery ports at Jacksonville and Port Everglades.

The Annual Energy Outlook 2011 projects (Table 3-2) that the South Atlantic region will increase its share of the nation's gasoline consumption from 39.6% in 2010 to 44.3% in 2035. Similarly, the South Atlantic region's distillate fuel consumption is expected to increase from 32.7% to 35.1% of national consumption. Overall, gasoline consumption in the South Atlantic region is projected to increase by 15.4% during 2010 through 2035, an annual rate of 0.6%. Distillate fuel consumption in the South Atlantic region is projected to increase by 40.2% from 2010 through 2035, an annual rate of 1.4%. The South Atlantic region's ethanol consumption in gasoline is projected to increase by 86.3% over the same period, an annual growth rate of 2.5%.

National ethanol net imports are projected to increase by a factor of more than 300 from less than 1,000 barrels per day in 2010 to more than 250,000 barrels per day by 2035.

Table 3-2
Fuel Consumption Projections in Millions of Barrels per Day (2010 – 2035)

Fuel	2010	2035	Consumption Increase	Percentage Increase	Average Annual Growth Rate
National					
Gasoline	9.02	9.31	0.29	3.2%	0.1%
Distillate	3.73	4.87	1.14	30.6%	1.1%
Ethanol Imports	0.0008	0.2562	0.2554	32,534%	---
South Atlantic					
Gasoline	3.57	4.12	0.55	15.4%	0.6%
Distillate	1.22	1.71	0.49	40.2%	1.4%
Ethanol in Gasoline	0.248	0.462	0.214	86.3%	2.5%

Source: Annual Energy Outlook 2011; South Atlantic Supplemental Regional Table (Table 5)

3.4 Port Operations

3.4.1 Commodity Projections

The without-project condition commodity forecast for Port Canaveral is based on recent historical commodity volumes and growth at the port, projected demographic and economic growth in the port's hinterland (see Section 3.3 Economic Conditions), and on existing port development. As discussed in Section 2.4, growth in overall commodity tonnage at Port Canaveral has been growing steadily over the past 40 years, although volumes of specific commodities have fluctuated significantly. Commodities with the most consistent historical growth have been construction-related commodities such as lumber, cement, and stone products and petroleum products (see Sections 2.4.1 and 2.4.2).

The effects of the recent recession were first seen in a total tonnage reduction from 2006 to 2007. By 2008, total tonnage had been reduced to 53% of 2006 levels. Since 2008, total tonnage at Port Canaveral has risen, though not yet to pre-recession levels. Total tonnage for 2009 was 9.64% greater than total 2008 tonnage, and 2010 total tonnage was 22.5% greater than total 2009 tonnage. By 2011, the Port's total tonnage was 99.9% of 2006 tonnage (Table 2-19). The effects of the recession have not impacted all commodities equally. Tonnage for lumber and cement has substantially reduced, but petroleum products and stone products have increased. Overall, residual tonnage impacts due to the recession are expected to be short-lived.

The commodity forecast used in this analysis focuses only on the four categories of bulk commodities that are carried on vessels large enough to potentially benefit from navigation improvements at Port Canaveral: fuel, rock, slag, and cement. Other commodities handled at Port Canaveral, such as lumber, salt, food products, etc., will continue to be carried on vessels

which are too small to require navigation improvements at Port Canaveral. Therefore, these other commodity groups are excluded from further analysis.

Rock (aggregate, limestone, and granite) forecasts were provided by the CPA based on term sheets for the two major bulk handling firms operating at the port. The term sheet is a planning document used by both the operator and the CPA to allocate resources and terminal area. The term sheet provides a revenue stream estimate for the CPA and is used to establish minimum guarantee fees. As a consequence of the guarantee fees, the projections contained in the term sheets are both conservative and as accurate as possible. The term sheets for both firms provide commodity projections from 2011 through 2035. In this analysis, there is no further growth projected for these commodities beyond growth identified in the term sheets, due to forecast uncertainty.

Port Canaveral is uniquely situated as the only deep water port on Florida's central east coast with the ability to handle and store the amount of rock products identified in the term sheets. The commercial importance of Port Canaveral's location, as explained by the operators, is that continued infrastructure development along the Orlando/Interstate 4 corridor requires more rock products than can be supplied through existing and historical local sources. The fixed location of rail infrastructure and the inability to develop potential sources within the Everglades due to land use constraints increase the need for imported rock products. At the same time, vessels carrying international rock products are increasing in size, lowering per unit transportation costs and increasing their cost competitiveness in the central Florida market. For example CSL, one of the world's major bulk carriers which calls regularly at Port Canaveral, will have a new fleet of Panamax bulk vessels in service by 2012 with draft capabilities of 44 feet.

Seaport Canaveral began operation in February 2010. From February 2010 through September 2011, Seaport Canaveral has handled 3.3 million tons of petroleum products. A detailed analysis of individual point-to-point shipments from the twelve month period from August 2010 through July 2011 was used to inform the Seaport Canaveral forecast (Table 2-25). The Transmontaigne facility, which also handles petroleum products, operates in a very different way than the Seaport Canaveral facility, due to its use as one of three Transmontaigne east Florida facilities which share deliveries and coordinate operations. The Transmontaigne facility, which cannot expand due to its proximity to residential development, does not provide a reference for future operations at Seaport Canaveral.

In early 2010, a short-term (2011 – 2013) forecast for Seaport Canaveral, based on current contracts, was provided by the terminal operator. This forecast, which projected an approximate 50% utilization of the Seaport Canaveral facility, included the recessionary impact of existing and near-term economic conditions. Actual Seaport Canaveral tonnage for point-to-point vessels during the 12 month period from August 2010 through July 2011 was 1,272,625 tons, which is 15.87% larger than the projection provided in 2010 (1,098, 334 tons). The actual 1,272,625 tons was used in place of the 2011 forecast and the remaining two short-term forecast years (1.4 million tons in 2012 and 1.9 million tons in 2013) were increased by 15.87% to 1.65 million tons in 2012 and 2.21 million tons in 2013. The long-term forecast (2014 – 2064) is based on the South Atlantic annual growth rates for gasoline (0.6%) and distillate fuel (1.4%) consumption, as presented in the Annual Energy Outlook 2011. These growth rates are proportionally applied to the short-term 2013 forecast (2.21 million tons; 1.78 million tons gasoline and 0.44 million tons distillate fuel) to generate the long-term (2014 – 2064) forecast..

The cement forecast is based on observed recent growth and includes the substantial impact that the recent recession had on cement imports. Domestic cement production is historically supplemented with imported cement. During the period from 1997 through 2007, cement imports, on average, accounted for 20.6% (23.6 million tons) of national cement consumption[16]. In 2009, cement import tonnage had fallen to 6.2 million tons and domestic consumption had fallen to a level equivalent to consumption in 1991. There have been no cement imports to Port Canaveral in 2009 – 2011. Nonetheless, the two cement terminal facilities at Port Canaveral, even though they have recently been idle, are being constantly maintained in operating condition on a monthly basis by Continental Cement (south side terminal) and CEMEX (north side terminal). These terminals have not been closed and the cement industry projects a strong recovery in cement imports due to pent up demand, environmental regulations restricting domestic cement production, and the permanent closure of domestic cement production plants that have not weathered the current economic downturn.

The Portland Cement Association (PCA) produced an analysis of projected future industry characteristics in 2011 titled "Overview Impact of Existing and Proposed Regulatory Standards on Domestic Cement Capacity". The PCA analysis projects domestic cement consumption, production, and imports through 2025 under two regulatory scenarios. One regulatory scenario includes the effects of five currently enacted environmental regulations and two proposed regulations (the with-current emissions policy condition). The second regulatory scenario excludes these existing and proposed regulatory standards (the without-current emissions policy condition). The implications of these two policy scenarios is that imports are expected to increase more rapidly as a percentage of total cement usage under current emissions policy due to regulatory impacts on the level and cost of domestic production.

Under the with-current emissions policy scenario, the most likely condition for USACE planning purposes, U.S. cement consumption is projected by the PCA to increase from observed 2010 levels (68.9 million tons) to 170.8 million tons in 2025, an annual growth rate of 6.2%. Cement imports under the with-current emissions policy scenario are projected to increase from observed 2010 levels (5.9 million tons) to 82.0 million tons in 2025, an annual growth rate of 19.2%. This reflects an increasing share of imports versus domestic production over this period.

Even under the without-current emissions policy scenario, which favors domestic production over imports, the PCA projects that cement imports are projected to grow at an annual rate of 15.0%, achieving 48.0 million tons in 2025. Under the without-current emissions policy scenario, the PCA projects that cement imports at the national level will more than double between 2010 and 2015. One important contributing factor to the PCA import projections under both policy scenarios is that domestic production is expected to level off beginning in 2015. Under the without-current emissions policy scenario, domestic production levels off at a greater tonnage than under the with-current emissions policy scenario.

The cement forecast uses the Port's 2007 level of imports (536,000 tons) as the cement tonnage projected to be achieved in 2015, which represents a much slower return of consumption levels than projected by the Portland Cement Association. This 2007 level of imports is 42% of the peak level (1.3 million tons) achieved in 2006. The projected growth rate for cement imports through Port Canaveral is based on the observed relationship between historical population

[16] USGS Cement Statistics, last modification: December 13, 2010

growth in the port's six-county hinterland and growth in cement imports. This relationship is based on the assumption that increases in population require increases in infrastructure, such as buildings and roads, which are cement intensive structures. During the years from 2000 to 2006, the six-county population grew at an average annual rate of 2.96% and cement imports at Port Canaveral increased at a rate of 5.73%. BEBR population projections indicate an average annual population increase of 1.45% from 2010 through 2035 for the six-county region. Based on the observed proportional relationship between population growth and cement imports during the years from 2000 through 2006, the projected average annual increase in cement imports for a 1.45% population growth rate would be 2.81% [(1.45%/2.96) * 5.73% = 2.81%].

Note that the cement import tonnage growth assumptions used in this analysis (no resumption of cement imports at Port Canaveral until 2015 with a subsequent growth rate of 2.8% thereafter) are considerably lower than the cement industry's projections. The impact of alternative cement forecasts on project benefits are assessed in Section 6.8 Risk and Uncertainty.

Ground granulated blast furnace slag is a by-product of iron and steel production that is an input into concrete production and a substitute for Portland cement. Unground blast furnace slag is the import commodity, which is typically ground at and distributed from marine terminal facilities such as the Hanson plant and terminal at Port Canaveral. The forecast for slag is based on observed 2011 tonnage. The annual growth rate for slag is the same growth rate used for cement. The slag facility at Port Canaveral does not have the consistent historical use, due to ownership changes, that would allow for a separate growth rate to be developed in a manner similar to the cement growth rate.

Fly ash, which is a residual product of coal combustion, is also a substitute for Portland cement and an alternative product to slag. Fly ash and slag compete as low cost replacements for Portland cement in concrete production. The USGS reports[17] that USEPA regulations, which reclassify fly ash as a hazardous waste, will likely result in increased sales and market share of slag as a substitute for fly ash as an input into concrete production. The USGS states that long-term growth in the supply of slag is likely to rely primarily on imports because of environmental restrictions on domestic production[18]. A sensitivity analysis for the slag forecast is presented in Section 6.8 Risk and Uncertainty.

Domestic slag consumption has not fallen as much as domestic cement consumption has fallen during the recent recession. This is because the market share of slag as an input to concrete production has been increasing relative to Portland cement as more concrete design specifications are written to include slag as a component of concrete mix. The net reliance on imported slag, as compared to domestically produced slag, has also increased from 2006 to 2010 from 8% to 10% of domestic consumption. The slag facility at Port Canaveral has an annual capacity of 600,000 tons, which is projected to be achieved in this forecast by 2045. Projected growth for slag is discontinued after 2045. Slag is the only commodity at Port Canaveral that reaches a capacity constraint before the end of the evaluation period.

The forecasted commodity tonnages for each of the potentially benefitting commodities are presented in Table 3-3. One important perspective on these forecasts is that they do not include

[17] U S Geological Survey, Mineral Commodities Summaries, Iron and Steel Slag, January 2011.
[18] US Geological Survey, Mineral Commodities Summary, Iron and Steel Slag, January 2011

the effects of potential future development at the Port. Because its cruise business has not been negatively affected by the recent economic downturn, the port has had the financial resources to continue to improve and expand its infrastructure even during the recessionary period, increasing its competitiveness relative to other ports for new business once the recessionary period is over. For example, the forecasts do not include any new commodity shipments through North Cargo Berths 5, 6 & 8, which are currently under development by Port Canaveral and should be completed within the next several years. The CPA is aggressively looking for opportunities to increase trade opportunities, such as containerized shipping; and has undeveloped, or under-developed real estate available for future port expansion. Additionally, these forecasts do not attempt to account for any future effects of the Panama Canal Expansion on Port trade.

Table 3-3
Base Case Commodity Forecast – Selected Years (Tons)

	2011	2020	2030	2040	2050	2060
Aggregate	400,000	800,000	800,000	800,000	800,000	800,000
Cement	---	616,178	812,881	1,072,376	1,414,710	1,414,710
Limestone	600,000	960,000	960,000	960,000	960,000	960,000
Granite	400,000	640,000	640,000	640,000	640,000	640,000
Slag	235,856	302,646	399,260	526,715	604,973	604,973
Gasoline[1]	874,905	1,851,168	1,965,285	2,086,438	2,215,059	2,351,609
Distillate Fuel[1]	223,429	479,947	551,534	633,800	728,336	836,973

Note: 2011 data based on observed FY 2011 tonnage reported by CPA
[1] Includes only Seaport Canaveral point-to-point tonnage

3.4.2 Cargo Fleet Forecast

Channel depths at Port Canaveral will be the same under existing and without-project conditions. Large bulk carriers and tankers are constrained by existing channel depths as described in Section 2.4.3, and will continue to be constrained under without-project conditions. Vessels operating under this constraint include vessels carrying stone products (aggregate, limestone, and granite), cement, slag, and petroleum products.

The vessels of the future without-project fleet are based on the vessels observed at the port in 2006, 2007 and 2008, with the exception of Seaport Canaveral Terminal tankers, which are instead based on Seaport Canaveral point-to-point vessels which arrived during August 2010 – July 2011. The number of future vessel calls for each commodity is based on the project commodity level divided by the average delivered tonnage per vessel call observed in 2006. Future without-project fleet operations at the port are expected to exhibit the same characteristics and patterns which were observed in 2006. For example, cement vessels delivered both full and partial loads in 2006, and are projected to deliver similar sized loads under without-project conditions. The distribution of cargo to vessels of different sizes is also based on the observed 2006 distribution. For example granite and limestone vessels were sorted into two categories

based on average Length overall (LOA) and arrival draft. Based on this categorization, 38% of granite and limestone was delivered on vessels with an average LOA of 597 feet and an arrival draft of 36.0 feet, and 62% was delivered on vessels with an average LOA of 753 feet and an arrival draft of 39.5 feet. These proportions and vessel sizes are used in the without-project condition fleet projections. Table 3-4 presents the projected number of vessel calls for the commodities that would potentially benefit from navigation improvements at Port Canaveral.

Table 3-4
Base Case Without-Project Condition Cargo Vessel Calls for Selected Years

	2020	2030	2040	2050	2060
Aggregate	5	5	5	5	5
Cement	10	14	20	26	35
Limestone	16	16	16	16	16
Granite	16	16	16	16	16
Slag	7	9	12	14	14
Gasoline[1]	44	47	50	53	56
Distillate Fuel[1]	11	13	15	17	20

[1] Includes only Seaport Canaveral point-to-point vessels

3.4.3 Cruise Ship Forecast and Operations

The overall industry demand for cruise ship services is projected to exhibit strong growth in the near-term. The Cruise Lines Industry Association (CLIA) estimates that 16.4 million people experienced multi-day cruises in 2011 (CLIA, 2012). Of the 30 new cruise ships currently scheduled for delivery into the North American fleet between 2008 and 2012, 16 are destined for service in the Caribbean, and 8 are slated for world-wide service. All but three of these new vessels are larger than 110,000 gross registered tons with passenger capacities of approximately 2,500 or more. The largest new vessel classes, RCI's Freedom Class, RCI's Oasis Class, the two new Disney vessels, and the Norwegian Cruise Lines Epic (previously Project F3) Class, all have vessels scheduled to be deployed in Caribbean service, as does Carnival's new Dream Class vessels, which are similar in size to RCI's Voyager Class.

The demand for cruise ship services at Port Canaveral is projected to remain strong. The consistently high cruise ship utilization levels at Port Canaveral (Table 2-21) have not been reduced during the recent economic downturn. Discussions with port personnel indicate that cruise lines are marketing their cruise packages as a relatively low cost family vacation and that more passengers are driving to the port in order to reduce total vacation costs. The most recent cruise ship utilization data available for the port indicates that overall multi-day cruise ship utilization levels for 2010 and the first half of 2011 are relatively unchanged from utilization levels during 2005 through 2009.

Cruise ship operations at Port Canaveral under without-project conditions will be very similar to operations under existing conditions, which includes the interim channel modifications that allow temporary use of the channel by the *Freedom of the Seas*. As of January 2011, Port Canaveral is the home port for three new vessels: RCI's *Freedom of the Seas*, *The Disney Dream* and Carnival Cruise Line's *Carnival Dream* (Table 2-15). In March 2012, the second new Disney vessel, *The Disney Fantasy* was homeported at Port Canaveral and one of the smaller Disney vessels currently homeported at Port Canaveral is projected to be re-deployed.

The *Freedom of the Seas* is the largest cruise ship projected to use Canaveral Harbor's Federal channel system in the near-term (Table 3-5). Under without-project conditions, regularly scheduled use of Port Canaveral by the *Freedom of the Seas* is projected to be restricted by wind conditions. The Port Canaveral Pilots consider the Freedom Class vessels to be too large for regularly scheduled unassisted passage through Port Canaveral's existing channels, based on the vessel's length and effective beam under normal high wind conditions. The Interim Corner Cutoff modification to the West Turning Basin was conducted to provide a temporary solution to allow these vessels to call at the Port until a permanent improvement to the navigation project can be implemented. Until that time, the Freedom Class vessels exceed design constraints of the Federal navigation channel and will require tug assist under normal high wind conditions.

The new Disney cruise ships, which are deployed from Port Canaveral, are narrower, but longer than the Freedom Class vessels. The Port Canaveral Pilots project that these vessels will be operated under more restrictive wind condition criteria than the previous Disney fleet because, although they are larger than the existing Disney vessels, they will have traditional propulsion equipment. The new Disney vessels also are projected to require tug assist under normal high wind conditions. The new Norwegian F3 Class vessel, *Epic*, is projected to use Port Canaveral as a port of call.

RCI has been in contact with the CPA concerning Oasis Class vessels using Port Canaveral as a potential port of call and as a port of refuge during emergency conditions. Under without-project conditions, including interim channel modifications, Oasis Class vessels are too large to operate in Canaveral Harbor's Federal channels on a regularly scheduled basis. Simulation-based evaluations conducted for the Oasis Class indicate an Oasis Class vessel could potentially operate in Port Canaveral in a limited fashion under with-project conditions, however; Oasis Class vessels are not projected to use Port Canaveral and the benefits calculations do not include any benefits related to Oasis Class vessels.

Table 3-5
Present and Future Large Cruise Ships and Classes

Cruise Ship or Class	Design Draft (ft)	Length Overall (ft)	Beam at Waterline (ft)	Disp. At Design Draft (m. tons)	Side Wind Sail Area	GRT
Disney *Dream & Fantasy* Homeport 2011 & 2012	27	1,115	121	62,414	132,181	128,000
CCL *Dream* Homeport 2009	27	1,004	122	58,262	126,404	130,000
RCI Voyager Class Homeport 2003 - 2009	28	1,021	127	62,716	119,523	138,000
NCL *Epic* Port of Call	29	1,081	133	73,761	144,959	150,000
Cunard *Queen Mary 2* Potential Port of Call	33	1,131	135	79,827	139,716	150,000
RCI *Freedom of the Seas* Homeport 2009	28	1,112	127	71,019	140,092	158,000
RCI Oasis Class Potential Port of Call	30	1,187	154	106,000	168,664	220,000

Other Florida ports also have structural constraints that preclude calls by the larger vessels. New, larger cruise ships have air drafts in excess of 200 feet. Freedom Class vessels have an air draft of 210 feet, as do Voyager Class vessels. Oasis Class vessels have an air draft of 230 feet. Cruise ship activity at the ports of Tampa and Jacksonville are constrained by bridge heights:

- Tampa: Sunshine Skyway Bridge 175 feet vertical clearance (Tampa Bay Pilots Port Guide, 2004); and
- Jacksonville: Dames Point Bridge 169 feet vertical clearance (St. Johns Bar Pilots Association, www.jaxpilots.com).

Other alternative ports for Caribbean cruise destinations include Charleston, SC, Galveston, TX and San Juan, PR. However, each of these ports has constraints which would not allow the largest new cruise ships to be homeported there. Charleston is limited by berth space availability - the largest cruise ships cannot fit into Charleston's limited berth space (300 linear feet plus 150 feet provided by a mooring dolphin), although adjacent cargo berth space is occasionally used. Galveston's passenger volumes have shown strong growth since 2003 (from 377,000 in 2003 to 616,000 passengers in 2006) but remain less than half of Port Canaveral's levels. Continued strong passenger growth at Galveston is constrained by berth availability: only 2 cruise ship berths comprising 2,000 linear feet. San Juan is a limited alternative because of significantly higher air travel costs.

3.5 Environmental and Cultural Resources

Undeveloped upland habitat within Port Canaveral consists primarily of historic spoil disposal sites and disturbed shrub/brushland. Under the future without-project condition, much of the upland communities within the Port will be developed. There are currently a number of proposed projects such as a hotel and conference center, Canaveral Cove Phase II, and the Seaport Canaveral fuel tank farm that would be constructed on much of the undeveloped (or

underdeveloped) lands within the Port. Wetland habitats within the study area are limited primarily to the western perimeter adjacent to the Banana River, which is outside of the study area for this project. These wetlands are either mangrove swamps vegetated with white and black mangroves and Brazilian pepper, or saltmarsh habitat. Treeless hydric savannah occurs south of the port facilities. Some wetland impacts could occur under the without project condition, particularly with development of the hotel and conference center in the southeast portion of the area adjacent to the Banana River, outside the harbor area.

Wildlife found within Port boundaries include raccoons, domestic and feral cats, and mice. Migratory bird species including warblers and sparrows typically roost in forested areas along the coast, particularly near to open water. Future development under the future without-project condition is not likely to have any significant effect on wildlife.

Five terrestrial protected species were identified that could potentially occur within uplands in the vicinity of the Port including the gopher tortoise, Florida scrub jay, eastern indigo snake, bald eagle, and the southeastern beach mouse. These species are known to occur only on the Cape Canaveral Air Force Station (CCAFS) property, north of CCAFS, or on Merritt Island, and are not known to occur on Port Canaveral property. Gopher tortoises occur in the uplands between the MTB and TTB, and the CCAFS is currently working with the Corps to utilize the upland site between the MTB and TTB for dredged material disposal (Personal communication, Angy Chambers, CCAFS 2007). This would result in the CCAFS relocating all gopher tortoises on the site to another location. Indigo snakes have not been previously identified on the site, and it is highly unlikely that indigo snakes occur in this area (Personal communication, Angy Chambers, CCAFS 2007).

Three sea turtle species were identified as potentially utilizing terrestrial beach habitats along Brevard County beaches, including those adjacent to the Port. These species include the loggerhead, leatherback, and green sea turtles. The beaches and spoil areas may also be utilized by nesting and foraging shorebirds including the least tern and piping plover. The nearshore and inshore waters within the vicinity are frequented by protected marine mammals including the West Indian manatee, and the North Atlantic right whale is known to occur in the waters offshore of Brevard County. The without project condition is not likely to result in any significant changes to marine species from the current (existing) condition.

The harbor in Port Canaveral is utilized by marine species, particularly sea turtles and manatees. The harbor serves as an access point for the West Indian manatee to traverse to the Atlantic coastal waters and the Banana River, which provides foraging and sanctuary for the species. Juvenile green turtles in particular forage on algal communities found on riprap boulders within the Port and will likely continue to do so under the without-project condition. The riprap located between the MTB and TTB, in particular, appears to be used for foraging as is much of the area within the Trident submarine basin. Other areas within the harbor also support substantial algal communities, including riprap along both the North and South jetties. Potential impacts to manatees and foraging sea turtles due to future without-project maintenance dredging are addressed through monitoring and reporting during dredging operations. No seagrass or hardbottom habitat occurs within the harbor or entrance channel. These resources would likely not be affected under the without-project condition.

Surface water resources within the study area consist of marine and estuarine systems. The inshore waters of the harbor are classified by the State of Florida as Class III Waters. Aquatic

preserves are designated as Class II waters, and include the Banana River Aquatic Preserve (classified as an Outstanding Florida Water) and the Merritt Island National Wildlife Refuge. The Port's water quality monitoring program assists the Authority in addressing concerns by the public about the quality of the Port's water and beach areas and identifies any potential issues that exist. In addition to harbor water testing, the Port Authority monitors stormwater runoff under the NPDES. The Port monitors discharge from nine representative outfalls of the 42 freshwater outfalls entering the Harbor. Under the without-project condition, water quality is expected to remain in the same good condition as it is currently (section 2.1.5 Water Quality).

Brevard County is not classified by FDEP as an attainment/maintenance area for any criteria pollutants. Ambient air quality along the Brevard County coastline is relatively good due to the presence of either on or off shore breezes. Current development trends, however, would result in more traffic, which would result in additional air emissions. Under the without project condition, it is not likely that Brevard County's air quality classification would differ from the current attainment status.

The CCAFS located just north of Canaveral Harbor is listed as a National Historic Landmark (NHL) for its vital contribution to the nation's space program. The significant structures within this designation include various launch complexes and the Mission Control Center (PBS&J 2006). In addition, one archaeological site was previously recorded adjacent to the project study area. Site 8BR1641 is located on a sandy ridge paralleling the old Banana River shoreline. Investigations identified the presence of gray midden soils containing shell and ceramics. These resources are protected under current regulations and are not expected to be disturbed under the without-project condition.

3.5.1 Potential Rule Change to Atlantic Right Whale Regulations

In 2004, new regulations were proposed by the Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) to reduce North Atlantic right whale ship strikes (FR 69(105)30857-61, June 1, 2004). The following is a summary of measures proposed for southeastern United States. The proposed regulations would 1) establish designated shipping routes with the greatest possibility of reducing the risk of ship strikes; 2) set seasonal speed restrictions within the designated lanes unless it is determined that no whales are present (criteria to be determined later), and 3) coordination with vessel operators (i.e., large recreational vessels, tugs, barges, etc.) that primarily transit along the coast locally and between ports, to use the designated traffic lanes, avoid the area, or impose a uniform speed restriction. These proposed regulations are not projected to have a major effect on cargo and cruise vessels operating at Port Canaveral, which operate in offshore ocean shipping lanes.

3.5.2 Gopher Tortoise Status

The State of Florida recently reclassified the gopher tortoise to "threatened" from "species of special concern" under state law. The Gopher Tortoise Management Plan (September 2007) describes the proposed permitting system, which includes new thresholds for specific permits, monetary contributions for gopher tortoise mitigation, and allows for emergency take without relocation only under special conditions.

4. PROBLEMS, OPPORTUNITIES AND CONSTRAINTS

This section of the Section 203 Study Report:

1. defines the water resource problems (i.e., negative conditions) that were addressed in the study;
2. identifies the opportunities (i.e., desirable future outcomes) that were identified during the study to resolve the problems and improve water resources conditions in the study area;
3. establishes the planning objectives (i.e., desired results) that were used to guide plan formulation; and
4. identifies the constraints (i.e., conditions to avoid, things that cannot be changed) which limited the development and selection of alternative plans.

4.1 Problems

Five major problems have been identified based on the analysis of existing and without-project conditions at Port Canaveral. These problems are summarized below and discussed in the following paragraphs. The five major problems are:

1. Channel and turning basin dimensions at Port Canaveral limit the size of cruise ships that are able to call at the Port and impact large cruise ship operations within the Port.
2. Channel dimensions and depths at Port Canaveral limit the size and efficient utilization and movement of cargo vessels that call at the Port.
3. Surges occur at cargo and Navy piers due to the passage of large cruise ships through the narrow ship channel. Surge effects cause damages to cargo and Naval vessels, such as parted lines and minor connection damage, personnel injuries, and result in cargo ships having to stop loading and unloading activities while the cruise ships pass.
4. Congestion at cargo berths is expected (future without project conditions) to result in vessel delays and additional transportation costs.
5. Channel and turning basin dimensions are restricting the port's ability to develop new cargo and cruise terminals needed to accommodate growing demand and larger vessels.

4.1.1 Problem 1: Cruise Ship Size Limitations

Current and future cruise ships calling and expected to call at Port Canaveral are constrained by channel widths and the dimensions of the West Turning Basin.

4.1.1.1 Channel Widths

The existing channels and turning basins were sized for much smaller vessels than are currently calling at Port Canaveral. The navigation project improvements authorized in 1992 (WRDA 1992) and completed in 1995 justified widening and deepening the project based on a composite design vessel (a 67,000 Dead Weight Tonnage (DWT) tanker and a 45,000 DWT bulk cement carrier) with an average length of 750 feet, a beam of 100 feet, and maximum draft of 40 feet. Cruise ships calling at the Port at that time were not large enough to be constrained by channel dimensions.

Since the time of the 1992 authorization, the cruise ships calling at Port Canaveral have increased substantially in Gross Registered Tonnage (GRT), length, beam, draft, and passenger capacity. As the second busiest cruise port in the world serving the world's largest cruise destination (the Caribbean), Port Canaveral attracts among the largest cruise vessels currently afloat.

The largest cruise vessel currently homeported at Port Canaveral is the Royal Caribbean International (RCI) Freedom Class vessel, *Freedom of the Seas*. The *Freedom of the Seas* has the following dimensions: 160,000 GRT; length 1,112 feet; beam 127 feet; draft 28 feet; and passenger capacity 3,634. This vessel replaced the *Mariner of the Seas* at Port Canaveral, a Voyager Class a 138,000 GRT vessel, with a length of 1,020 feet, a beam of 127 feet (at the waterline), a draft of 29 feet, and a capacity of 3,114 passengers.

There are currently two Freedom Class vessels in the RCI fleet, *Liberty of the Seas* and *Freedom of the Seas*. The *Liberty of the Seas* is currently homeported in Miami.

The *Mariner of the Seas*, the smaller Voyager Class vessel, had difficulty during adverse weather conditions navigating the current 400 foot wide channel, maneuvering the channel bends, and operating within the 1,400 foot West Turning Basin. Given its larger size, the Freedom Class faces even greater difficulties. The wind and wave climate at Canaveral Harbor influence the transit conditions for cruise vessel traffic (Engineering Appendix: Section 1.3 Site Environmental Conditions). The wind, in particular, influences cruise ship transits due to the very large freeboard area of these vessels. Safe navigation inside the harbor requires a balance between vessel speed and good ship handling capability to manage the yaw of the vessel or "crab angle" as it moves through the waterway under the influence of moderate to high wind conditions.

A vessel's "crab angle" is defined as the difference between the ship heading and the actual course made good, sometimes also called the "drift angle". Cruise ships transiting the channels at Port Canaveral are susceptible to "crabbing" because their large superstructure acts as a sail in the wind and moderate speeds must be maintained to avoid surge impacts on moored vessels and to maintain braking control of the vessel. The wider the "crab angle", the larger the effective beam of the vessel.

The first ship in the next generation of RCI cruise ships, the Oasis Class *Oasis of the Seas* is homeported in Port Everglades and began service in November 2009. The Oasis Class is now the world's largest cruise ships. The Oasis Class vessels have a capacity of at least 5,400 passengers, weigh approximately 220,000 GRT, and will have a length of 1,186 feet, beam of 154.2 feet, and draft 2 feet deeper than the Freedom Class (approximately 30 feet). The first two Oasis Class vessels deployed out of Ft. Lauderdale. Port Canaveral currently does not have sufficient channel dimensions to be a homeport for an Oasis Class vessel. This projected deployment schedule is consistent with passenger demand for cruise ship services which is focused on east Florida ports (56% of all U.S. passenger departures in 2006) and Caribbean destinations (71% of all U.S. passenger destinations in 2006).

As explained in Section 3.4, the Canaveral Pilots Association considers the Oasis Class vessels to be too large for regularly scheduled passage through Port Canaveral's channels under without-project conditions, based on the vessel's length and effective beam under normal high wind conditions. The newest, largest cruise ships are designed with propulsion systems intended to allow them to transit ports without tug assists. However, under high wind conditions and

considering the narrow channels and turns at Port Canaveral, these vessels will require tug assist to conduct channel transits.

The existing authorized channel width (400 feet) is only 2.6 times the beam of the Oasis Class vessel (and 3.1 times the beam of the Freedom Class vessel), which is substantially below international and USACE channel width design guidelines[19]. Corps channel width design guidelines range from 3.5 to 4.0 times design ship width, with consideration of various environmental and operational factors. The overall vessel length (LOA) of the Oasis Class vessel (1,186 feet) is an additional 74 feet longer than the Freedom Class. This increase in beam and length over the Freedom Class will preclude the Oasis Class from transiting through Port Canaveral's channels under without project future conditions.

4.1.1.2 Turning Basins

As previously stated, the dimensions of the West Turning Basin (WTB) are inadequate for existing vessels homeported at Port Canaveral and cannot safely accommodate future cruise ships projected to call at Port Canaveral. The WTB is currently 1,400 feet in diameter, authorized to -31 feet, and maintained at -35 feet by the CPA. Corps design guidelines for turning basins are contained in EM 1110-2-1613 (excerpt below).

> *9-2. Turning Basins. c. Size. (1) The size of the turning basin should provide a minimum turning diameter of at least 1.2 times the length of the design ship where prevailing currents are 0.5 knot or less. Recent ERDC/WES simulator studies have shown that turning basins should provide minimum turning diameters of 1.5 times the length of the design setup where tidal currents are less than 1.5 knots. The turning basin should be elongated along the prevailing current direction when currents are greater than 1.5 knots and designed according to tests conducted on a ship simulator.* ***Turning operations with*** tankers in ballast condition or ***other ships with high sail areas and design wind speeds of greater than 25 knots will require a special design study using a ship simulator*** *[emphasis added].*

The WTB diameter is considered by the Pilots to be inadequate for the Freedom Class vessels (1.26 times vessel LOA). The minimum acceptable WTB diameter for the Freedom Class vessel, as determined in STAR Center simulations conducted on the *Freedom of the Seas* in 2009, was 1,675 feet. The design cruise ship *(Freedom of the Seas)* is well powered and highly maneuverable. However, the wind sail area of these classes of ultra-large cruise ships is extremely significant and results in large applied forces in the moderate to high (30 knot) design winds experienced at Port Canaveral. Therefore, in consideration of safety and vessel operations under high wind conditions, the minimum effective WTB diameter is 1,725 feet (1.55 times LOA).

The West Turning Basin authorized dimensions are 1,400 feet by -31 feet and it is maintained at -35 feet by CPA. The authorized depth of -31 feet was justified based on the maximum operating draft of the smaller cargo and cruise vessels using the west basin at the time of the 1992 authorization. Currently, RCI's Voyager and Freedom class cruise ships, and similarly sized CCL and Disney cruise ships are nearly 300 feet longer than the 1992 design vessel and have operating drafts of 28 to 30 feet. These vessels also cannot use tidal advantage because of

[19] EM 1110-2-1613, 31 May 06, Hydraulic Design of Deep-Draft Navigation Projects, Table 8-2

their rigid sailing schedules. In addition, the azimuth steering equipment of these ultra-large modern cruise ships, which allow them to navigate into Ports without tug assist, also require adequate clearance (typically 1-2 meters) between the vessel and channel bottom to function properly. For these reasons, the authorized dimensions of the WTB are not considered adequate for safe navigation of the current cruise ship fleet. Alternatives to increase the diameter and depth of the WTB are evaluated in this report in order to meet the needs of the current cruise ship fleet.

4.1.2 Problem 2: Cargo Vessel Size Limitations

Current and future cargo vessels calling at Port Canaveral are constrained by channel and turning basin depths.

The existing channels and turning basins at Port Canaveral were sized for smaller cargo vessels than those currently calling at Port Canaveral. The design vessel used for the 1992 deepening and widening project was a composite design vessel (a 67,000 DWT tanker and a 45,000 DWT bulk cement carrier) with an average length of 750 feet, a beam of 100 feet, and maximum operating draft of 40 feet.

The largest cargo vessels currently calling at Port Canaveral (and those projected to call in the without-project condition), are vessels carrying stone products, slag, cement, and petroleum products. Table 4-1 presents the largest cargo vessels which called at Port Canaveral in 2006. The two dry bulk vessels, the *Gdynia* (65,738 DWT, 738' LOA, 105.6' beam, 42.4' design draft) and the *Bernardo Quintana A* (67,044 DWT, 753' LOA, 105.6' beam, 43.3' design draft) each arrived at Port Canaveral depth limited, with a 39.5-foot operating draft. The only other vessel to arrive with a 39.5-foot operating draft in 2006 was the tanker *Falcon* (dimensions unknown), which delivered power plant fuel oil.

Table 4-1
Largest Cargo Vessels to Call at Port Canaveral in 2006

Ship	Maximum Draft (ft)	Length Overall (ft)	Beam at Waterline (ft)	Deadweight Tonnage (m. tons)
Gdynia (Dry Bulk-Aggregate)	42.4	738	105.6	65,738
Bernardo Quintana A (Dry Bulk-Limestone)	43.3	753	105.6	67,044
Bregen (Liquid Bulk-Gasoline)	44.7	797	105.6	68,159

The tanker, *Bregen* (68,159 DWT, 797' LOA, 105.6' beam, 44.7' design draft), delivered fuel oil to Transmontaigne, arriving with only a 26-foot sailing draft. Vessels delivering fuel oil to Transmontaigne often arrive at drafts less than the port's operating maximum draft and also less than the vessel's maximum operating draft. These vessels arrive less than fully loaded because Port Canaveral is one of several ports called on by these vessels and they often arrive at Port

Canaveral partially offloaded after already having delivered fuel oil to other ports during their in-bound voyage.

Under without-project conditions, the commodities projected to demonstrate the most growth, with the exception of lumber, are the same commodities which use the largest cargo vessels calling at the port: i.e., stone products, cement, slag, and petroleum products (see Sections 3.4.1 and 3.4.2). Bulk vessels carrying these commodities to Port Canaveral generally range in size from 60,000 Dead Weight Tons (DWT) to 80,000 DWT. A statistical description of dimensions for vessels ranging from 60,000 DWT and 80,000 DWT is presented in the Economics Appendix (Table 4-2). Tankers projected to call at Seaport Canaveral Terminal will be the largest cargo vessels calling at the Port, with sizes up to 100,000 DWT or more. A statistical analysis of vessel dimensions in the appropriate DWT range, as opposed to the dimensions of a specific vessel, is presented because, based on the historic record of cargo vessel calls at the Port, no single specific large bulk vessel is likely to make regular repeated calls at Port Canaveral. A discussion of the characteristics of the world fleet in the appropriate DWT range is a better representation of the characteristics of vessels that are likely to use the Port under future without and with project conditions.

The maximum operational draft at Port Canaveral, as stated in the *Port Canaveral Operational Guidelines*, is currently 39.5 feet. Vessels arriving with an operating draft of 39.5 feet must time their arrival at the port with high water. Vessels arriving with operational drafts greater than 36 feet must arrive with a rising tide. The effects of channel depth constraints on cargo vessels at Port Canaveral were presented previously in Sections 2.5.6 and 2.5.7. These sections present data which show that large cargo vessels typically arrive at the port with operating drafts just less than the 36-foot restriction imposed by the port's operational guidelines.

Projected operating drafts for the future large cargo vessel fleet calling at Port Canaveral are expected to be depth constrained in the same manner as under existing conditions, including point-to-point petroleum product vessels calling at the Seaport Canaveral fuel terminal. The point-to-point vessels calling at Seaport Canaveral Terminal are projected to avoid the need for tidal advantage in the same manner as observed under existing conditions. The tug/barges and multi-port delivery vessels arriving at Seaport Canaveral Terminal do not require tidal advantage and are not anticipated to benefit from any project improvements.

Large cargo vessels in the fleet currently calling at the Port, and large cargo vessels projected to use the Port in the future without-project condition cannot load to their most efficient potential due to channel depth constraints. As shown in Table 4-1, the design drafts of the majority of these vessels are in excess of the channel constraint and the vessels could be filled more deeply if not for the Port's channel restrictions. Because of the 39.5 foot channel restriction, these vessels must light-load in order to transit the navigation channel. Channel depth constraints directly impact Port Canaveral cargo terminal operators and carriers. Port Canaveral's cargo terminal facilities are capable of handling larger vessel loads for each of the following impacted commodities: stone products, cement, slag, and petroleum products. The channel depth constraint reduces the effectiveness and efficiency of cargo terminal operations by restricting the size of individual vessel loads, which causes equipment to be underutilized. Carriers are similarly operating at less than optimum efficiency when vessels are light-loaded and more trips are required to deliver the same quantity of cargo.

4.1.3 Problem 3: Surge Effects and Safety

Under existing and without-project conditions, cruise ships transiting the channel in normal high wind conditions (i.e., winds in excess of 15 knots) generate water surges due to the speeds required to maintain headway and reduce crab angles to provide safe bank clearance in the 400 foot wide channel. These surges result from the piston-effect of the Post-Panamax width vessels transiting the narrow channel, which pushes water into (and then pulls water out of) the Trident Basin and Middle Turning Basin and also pulls vessels away from the multi-use berths adjacent to the channel, primarily the Trident Basin, NCP 3 & 4 and CT 3[20]. These surges have caused damage to cargo and naval vessels, damage to connecting equipment, and have caused serious injuries. The port's standard operating procedures include distribution of a Surge Warning Letter to all port users, which recommends appropriate attention to mooring lines and cessation of loading and unloading activities during cruise ship passage under moderate and more severe wind conditions. Surge effects are caused, in part, by the existing narrow channel dimensions and would be reduced by increasing channel dimensions.

Surge effects directly impact port tenants who must stop loading and unloading activities during cruise ship transits. Cessation of loading and unloading activities causes inefficiencies at the dock and adds to the total time that the vessel must spend in port. Surge effects may be offset by the placement of a tug, which pushes the vessel against the dock as the cruise ship passes through the channel, however this also contributes to the overall cargo cost. Under existing and historical conditions, the use of an assisting tug to offset surge forces has occurred only infrequently. Under future without-project conditions, which include substantially larger cruise ships and tankers moored at the vulnerable piers NCP 1 & 2, tug assist is projected to occur more frequently.

An analysis of vessel-induced surge was commissioned in 2011 by the Canaveral Port Authority (CPA). The Naval Ordnance Test Unit (NOTU), a United States Air Force 45th Space Wing (USAF 45 SW) tenant on the Cape Canaveral Air Force Station (CCAFS) and the USAF 45 SW (the Mission Partners) requested the study to demonstrate that the recommended project and the present and foreseeable future ship traffic will not adversely impact current or future NOTU and CCAFS port operations within the Trident and Middle Basins. NOTU accommodates various classes of US and UK Navy submarines at Trident wharf located on the eastern side of the Trident Basin. NOTU and the Military Sealift Command (MSC) accommodate various military ships at Poseidon wharf located on the southeastern side of Middle Basin. The Boeing Evolved Expendable Launch Vehicle (EELV) berth and the AF wharf are located at the north end of Middle Basin. The EELV berth supports the Delta IV rocket launch program at CCAFS. The AF wharf is used for a variety of small scale ship and barge operations.

NOTU has experienced surge effects on vessels moored at both the Poseidon and Trident wharves when outbound cruise ships, departing from West Basin, are required to increase transit speed under the occasional occurrence of high quartering or cross-wind conditions. Under the existing navigation project conditions, operational mitigation measures have been employed for several years to manage the surge effects. Those measures include increased coordination and notification of conditions between the Canaveral Harbor Pilots and NOTU Port Operations,

[20] Passing ship forces on vessels moored parallel to the channel and perpendicular to the channel are discussed in greater detail in the Engineering Appendix.

diligent tending of moored vessel lines in preparation for transit, and use of tugs to restrain vessel movements at the wharves. USAF 45 SW and NOTU expressed the need for a surge study to demonstrate that the recommended navigation channel widening and deepening plan will result in no additional impact on current and future port operations. The CCAFS and NOTU collectively identified a number of facilities and operations of concern that were incorporated into the surge modeling.

4.1.3.1 Surge Effects Modeling

Large cruise ships transiting the Canaveral Harbor main channel cause motions and forces on moored vessels at berths along the main channel or at berths within the east and middle basins. Transiting vessels pass moored vessels in the main channel in a parallel configuration and in the basins in perpendicular or oblique orientation. These motions and forces are typically referred to as surge or passing effects. Over the last decade and on a limited number of occasions, passing effects have caused mooring lines to part or failed facility fixtures, damaged shore side connections and personnel gangways, and injured shipboard personnel.

Passing effects are more problematic in complex or confined waterway configurations such as Canaveral Harbor and its east-west main channel, which is constrained by the Canaveral Locks system and three dead-end basins oriented in the north-south direction and positioned north of the main channel. Recent modeling and research suggests that in addition to the passing ship-moored ship interaction due to the flow effects surrounding a transiting vessel, the free surface effects associated with long period (low-frequency) waves that may be generated even by slow moving ships in channels and harbors with restricted water depths, sloping banks, and bulkheads, can significantly contribute to moored vessel motions and forces.

Physical and numerical modeling on this subject for both open water and more confined boundary conditions has been advanced in this decade. In 2005 and 2007, the Ocean Engineering Program within the U.S. Naval Academy accomplished a series of parallel and perpendicular passing model test cases in open water conditions, where the free surface effects would not be present. Since 2004, the Department of Marine and Transport Technology, Delft University of Technology in the Netherlands has developed and enhanced numerical modeling of both the primary flow potential method for ships moored in open water conditions and most recently a model based on potential flow but to also include the free surface effects where harbor boundary conditions create discontinuities in the flow field. Most recently, Coast & Harbor Engineering developed numerical modeling tools for vessel hydrodynamics and loading on berthed vessels that address the complete range of vessel-generated hydrodynamic (surge) effects. These proprietary numerical models with various levels of validation represent the state of the art for passing ship-moored ship analysis. The Navy's model test data and empirical force formulations that are in the public domain provide a means of estimating the passing ship effects on moored ships as limited to open water conditions, which does not represent the situation at Port Canaveral.

The free surface effects, which are long period water level fluctuations, arise from the excitation and interaction of the water motions associated with the flow field moving with the passing ship by the surrounding harbor geometry. Port Canaveral's constrained geometry, the size of the largest cruise ships operating within Port Canaveral's constrained geometry, and the speed cruise ships need to maintain during channel transits all work to increase the magnitude and severity of

dynamic motions and forces that may be experienced by moored ships in basins adjacent to channels.

With the start of Seaport Canaveral's tanker operations in Port Canaveral's Middle Basin at north cargo piers 1 & 2, there is a growing awareness of and intolerance to injury, disruption of operations, and environmental impacts that accidental disconnections could generate as a result of certain passing ship conditions. It is anticipated that the increase in large cruise ship passing traffic events will increase the incidence of passing effects on moored tankers with potentially detrimental consequences. In fact, a moored vessel at NCP 2 recently experienced surge effects that parted lines as a result of consecutive outbound cruise ship traffic. The surge effects were experienced some 13 minutes following the passing departure of the Freedom of the Seas.

Coast & Harbor Engineering performed the numerical modeling in accordance with a rigorous modeling plan coordinated and endorsed by the Mission Partners to evaluate several combinations of berthed vessel scenarios at commercial and military berths under without-project and with-project channel dimensions. The berthed vessels included detailed three-dimensional hull definitions for commercial and military surface ships and submarines. The passing vessel scenarios included the consecutive outbound transit of the *Carnival Fantasy*, the *Freedom of the Seas,* and the *Disney Dream* in a timed sequence, from the West Basin, a typical Saturday late afternoon departure scenario. The passing vessel conditions considered prescribed track, speed, and leeway carried relative to the existing conditions and recommended plan channel centerlines as fully coordinated with the Canaveral Pilots. Attachment F to the Engineering Appendix contains the existing conditions and recommended plan modeling domain drawings.

4.1.3.2 Surge Modeling Presentation and Results

The dynamic surge effects within the harbor, at key locations and berths, and passing ship forces for select berthed vessel scenarios were demonstrated in a presentation at the CPA on September 20, 2011, and delivered to the CPA, the Mission Partners, the Canaveral Pilots, the U.S. Coast Guard, and the Canaveral Harbor Section 203 Project Team. The presentation compared the modeled impacts under "without-project" and "with-project" channel dimensions.

Key findings shared during the presentation include:

- The numerical modeling reproduced the primary surge effects as observed by the Canaveral Pilots and associated with the present channel (existing conditions) as follows:
- Significant and consistent surge effects at SCP4 due to the limited separation between the passing and berthed vessel (parallel passing case);
- Surge effects at Trident Wharf for passing speeds of 7.5 knots or greater—very large distance between the passing and berthed vessel (perpendicular passing case);
- Delayed surge effects at NCP2 occurring some 10 to 15 minutes following the departure of one or more cruise ships; and
- Water level retreat and wave breaking at the north jetty area just east of the Trident Access Channel.

Surge modeling results under with project conditions are discussed in Section 6.4.1.1.

4.1.4 Problem 4: Future Berth Congestion

Berth congestion resulting in vessel delays will become a problem in the future without-project condition. Port facilities are already highly utilized and under without-project conditions will become increasingly congested. The mid-range commodity growth scenario predicts berth usage as high as 80% for the north cargo berths shared by Seaport Canaveral tankers, salt, slag, and lumber products. The frequency and duration of tanker calls at NCP 1 and 2 will likely cause some traffic to shift to other berths as available. South cargo berths are currently shared by petroleum products, stone products, cement, perishable items, newsprint and lumber. Congestion at cargo berths reduces the effectiveness and efficiency of cargo vessels and landside facilities. Vessel delays due to berth congestion have historically occurred sporadically at the multi-purpose berths along the south cargo piers. Projected growth in commodity movements, especially at NCP 1 and 2 when Seaport Canaveral's operation commences, at Port Canaveral will result in a larger number of cargo vessels that will have to wait offshore for a berth to become available.

4.1.5 Problem 5: Limitations on New Cargo and Cruise Terminals

Channel and turning basin dimensions are restricting the port's ability to develop new cargo and cruise terminals needed to accommodate growing demand. Because existing large vessels are operating at or above channel design dimensions, there is little or no opportunity to develop new berths and terminals to accommodate future growth in cargo and cruise services. Given the current levels of growth, the Port will need to develop new landside facilities and infrastructure to keep pace with demand. However, inadequately sized channels and turning basins are already beginning to impinge on vessel handling facilities which lie immediately adjacent to the navigation channel and turning basins. Absent expansion of the channels and turning basins, there are limited opportunities to develop new facilities.

4.2 Opportunities

There are opportunities for Port Canaveral to more effectively and efficiently meet the demand for the cruise and cargo services it provides. Opportunities for improvement include:

1. improve the efficiency of large cruise ship operations within the Port and accommodate larger cruise ships at the Port;
2. allow existing cargo vessels to be loaded more efficiently;
3. allow larger cargo vessels to be used that can deliver more cargo at lower unit cost;
4. increase the efficiency and safety of cargo and naval vessel operations by reducing surge effects on existing vessels and piers; and
5. accommodate development of more efficient berths and terminals.

Widening and deepening navigation channels, the West Turning Basin, and wideners would increase the efficiency of cargo vessels and cruise ships using the Port, as well as allow the use

of larger more efficient vessels[21]. This will result in significant transportation cost savings when compared to the expected future without-project condition, especially as navigation traffic and congestion increases in the future. The plan formulation section of this analysis presents a detailed quantitative assessment of the benefits resulting from alternative plans which take advantage of these opportunities.

4.3 Federal Objective

The federal objective in formulating alternative plans is based largely on contributions to NED. Contributions to NED are increases in the net value of the national output of goods and services expressed in monetary units. Contributions to NED are the direct net economic benefits that accrue in the planning area and in the rest of the Nation. NED benefits for deep draft navigation projects are transportation cost savings that typically result from general navigation features, such as channels, dredged material disposal facilities, turning basins, etc. Transportation cost savings are calculated as reductions in the cost of transporting goods from their ultimate origin to their ultimate destination. Cargo vessel-related transportation cost savings typically result from more efficient use of the existing cargo fleet and from the use of larger, more efficient cargo vessels in the future. Cargo vessel-related transportation cost savings are the basic type of economic benefits typically used for navigation project justification and cost-sharing purposes.

Additionally, Federal law and Corps of Engineers guidance identifies cruise ship-related benefits as commercial navigation benefits for project justification and cost sharing purposes. Section 230 of the Water Resources Development Act of 1996 specifically directs that benefits generated by cruise ships are categorized as commercial navigation benefits. Planning Guidance Letter #97-06 (07Jul97) provides specific implementation guidance for Section 230 of WRDA 1996. PGL #97-06 states that the benefits generated by cruise ships are to be based on more efficient ship operations and increased tourism or enhanced tourism experience. In addition, PGL #97-06 states that cruise ship related benefits are to be considered commercial navigation benefits for project justification and cost sharing purposes. The Navigation chapter of the Corps' Policy Digest, EP 1165-2-1 (30Jul99), restates the implementation guidance contained in PGL #97-06 in Section 12-4-c.

4.3.1 Other Planning Objectives

In addition to the Federal objective, other project specific planning objectives have been identified, which guided the plan formulation process in this analysis. Based on the problems posed by the combination of channel and berth constraints, continued population and economic growth in the port's hinterland, and ongoing port facility development, as detailed in Section 4 Problems and Opportunities, the following planning objectives have been established to assist in the development of management measures and evaluation of alternative plans:

- Objective 1: Reduce the requirement for tug assists to cruise ships and docked cargo vessels under high wind conditions from 2014 to 2064 (base year plus 50 years)

[21] Channel widening and deepening also provides a benefit to naval operations by reducing the period of tide-restricted access to the Trident Basin. The monetary value of this project benefit has not been calculated in the economic analysis.

- Objective 2: Allow for deeper and more efficient loading of bulk vessels at Port Canaveral from 2014 to 2064
- Objective 3: Allow for more efficient operations through use of longer and deeper draft bulk vessels at Port Canaveral from 2014 to 2064
- Objective 4: Reduce damages to berthed vessels from surge effects of vessel transit through the Port Canaveral main channel from 2014 to 2064; and
- Objective 5: Support national defense requirements and needs, which include coordination with military tenants of the port and reduction of surge effects on the port's military infrastructure from 2014 to 2064.

4.4 Constraints

The principal constraint on the formulation of alternatives for navigation improvements at Port Canaveral is avoidance of significant impacts to protected species located at or near Port Canaveral, including the:

- West Indian Manatee;
- Right Whale;
- Least Tern;
- Florida Scrub Jay;
- Southeastern Beach Mouse;
- Gopher Tortoise; and
- a variety of Sea Turtles, including Loggerhead, Leatherback, Green, Hawksbill and Kemp's Ridley.

Of the species listed above, it should be noted that only the West Indian Manatee, Gopher Tortoise, and Sea Turtles are located within the Port boundaries. The other species are located outside the Port, but within the region (Section 2.6.7 Protected Species).

Two resources constraints on the formulation of alternative plans include avoidance of:

- impacts of the existing land and waterfront uses (docks, wharves, terminals) at Port Canaveral on the range of alternatives under consideration;
- impacts on adjacent shoreline erosion.

Much of the Port's current terminal and berth configuration cannot be altered to any considerable degree without incurring unacceptable service disruptions and extremely significant expense to relocate or replace those facilities that the project is intended to serve. Therefore, the non-Federal sponsor, the Canaveral Port Authority, has requested that channel widening alternatives considered be limited to no greater that a 500 foot channel, under the Categorical Exemption to the NED Plan provision of ER 1105-2-100 (Paragraph 3-2.b.(10)). Similarly, the Canaveral Port Authority has requested that channel deepening alternatives considered be limited to no greater that a -44 foot deep channel.

5. FORMULATION AND EVALUATION OF ALTERNATIVE PLANS*

This section of the report presents the planning process that was used to formulate alternative plans, describes the development of alternative plans, and provides an overview of the preliminary screening of alternative plans. Based on the problems, opportunities, and constraints identified in the analysis, the development of alternative plans followed the standard planning model, which includes:

- Establishment of plan formulation rationale;
- Identification and screening of potential solutions, including non-structural solutions; and
- Detailed assessment and evaluation of alternative plans.

Corps of Engineers project planning follows the six-step process first described in the Principles and Guidelines (1983), which is the basis for Federal agency water resources planning, and further elaborated in the Planning Guidance Notebook, ER 1105-2-100 (April 2000). Although presented in series, these steps are applied in an iterative process, which focuses emphasis on succeeding steps. Steps in the plan formulation process include:

1. The specific problems and opportunities to be addressed in the study are identified, and the causes of the problems are discussed and documented. Planning goals are set, objectives are established, and constraints are identified.

2. Existing and future without-project conditions are identified, analyzed and forecast. The existing condition resources, problems, and opportunities critical to plan formulation, impact assessment, and evaluation are characterized and documented.

3. The study team formulates alternative plans that address the planning objectives. A range of alternative plans are identified at the beginning of the planning process and screened and refined in subsequent iterations throughout the planning process.

4. Alternative project plans are evaluated for effectiveness, efficiency, completeness, and acceptability. The impacts of alternative plans will be evaluated using the system of accounts framework (NED, EQ, RED, OSE) specified in the Principles and Guidelines and ER 1105-2-100.

5. Alternative plans will be compared. Contributions to National Economic Development (NED) will be used to prioritize and rank alternatives. The public involvement program will be used to obtain public input to the alternative identification and evaluation process.

6. A plan will be selected for recommendation, and a justification for plan selection will be prepared.

5.1 Plan Formulation Rationale

The Planning Guidance Notebook (ER 1105-2-100, dated 22 April 2000) states that "water and related land resources project plans shall be formulated to alleviate problems and take advantage of opportunities in ways that contribute to study planning objectives and, consequently, to the Federal objective" (page 2-1). Plan formulation has been conducted for this Section 203

Feasibility Study with a focus on achieving the Federal objective of water and related land resources project planning, which is to contribute to National Economic Development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Plan formulation also considers all effects, beneficial or adverse, to each of the four evaluation accounts identified in the Principles and Guidelines (1983), which are National Economic Development, Environmental Quality, Regional Economic Development, and Other Social Effects.

5.1.1 System of Accounts Framework

The four evaluation accounts were established by the Principles and Guidelines to facilitate evaluation and display of effects of alternative plans. EC 1105-2-409, Planning in a Collaborative Environment (31 May 2005) also reemphasized the use of the four accounts in conducting Corps water resource feasibility studies as a means of ensuring that Federal water resources projects are planned and implemented in a collaborative manner with other Federal, state and local programs. In order to be consistent with Corps planning and environmental operating principles, and to ensure maximum participation in the planning process, this approach was also employed for the Section 203 study. As is the case for a Corps developed feasibility study, the National Economic Development (NED) account (described in detail below) is required and formed the primary basis of plan formulation, evaluation, and selection of the recommended plan for the Port Canaveral Section 203 study. Other information that is required by law or that will have a material bearing on the decision making process has been included in the other three accounts to organize information on effects. Briefly, the categories of effect considered under each of the four accounts include the following:

(a) The National Economic Development (NED) account displays changes in the economic value of the national output of goods and services.

(b) The Environmental Quality (EQ) account displays non-monetary effects on significant natural and cultural resources.

(c) The Regional Economic Development (RED) account registers changes in the distribution of regional economic activity that result from each alternative plan. Evaluations of regional effects focus on plan induced changes in regional income, employment, output and population.

(d) The Other Social Effects (OSE) account registers plan effects from perspectives that are relevant to the planning process, but are not reflected in the other three accounts. Examples of effects categorized under the OSE account include: urban and community impacts; life, health, and safety factors; displacement; long-term productivity; and energy requirements and energy conservation.

5.2 Plan Formulation Criteria

Management measures and alternative plans were developed to address the problems of constrained cargo vessel size, constrained cruise ship vessel size, and berth congestion at the port. Each alternative plan is formulated in consideration of four general criteria, as identified in the Principles and Guidelines (1983): completeness, efficiency, effectiveness, and acceptability.

Completeness is the extent to which the alternative plans provide and account for all investments, or other actions, necessary to ensure the realization of the planning objectives,

including actions by other Federal and non-Federal entities. **Efficiency** is the extent to which an alternative plan is the most reasonable, least cost means of achieving the objectives. **Effectiveness** is the extent to which the alternatives plans contribute to achieving the planning objectives. **Acceptability** is the extent to which the alternative plans are acceptable in terms of applicable laws, regulations, and public policies. Appropriate mitigation of any unavoidable adverse effects shall be an integral component of each alternative plan.

Identification of project-specific planning criteria used in Corps of Engineers project planning is guided by the Principles and Guidelines (1983), the Planning Guidance Notebook, ER 1105-2-100 (22 Apr 2000), and The National Environmental Policy Act (NEPA) of 1969, and Procedures for Implementing NEPA, ER 200-2-2 (4 Mar 1988). The following technical, economic, institutional, environmental, and social formulation and evaluation criteria have been identified for this study.

Technical Criteria

- The selected plan should be consistent with local, regional, and state goals for water resources development;
- Plans must be realistic and reflect state-of-the-art measures and analysis techniques;
- The optimal scale of project development should be identified by analyzing NED and engineering feasibility;
- The plan should accommodate vessels projected to call at Port Canaveral during the planning period, based on observed industry operations and reasonable forecasts;
- The plan should maintain existing vessel operability under various weather conditions; and
- The plan should be a product of proven elements and practices which will withstand projected weather and sea conditions, such as storms, floods, and waves.

Economic Criteria

- Each separable unit of improvement should be optimized to provide the maximum net benefits;
- The scope of the proposed development must be scaled to provide maximum net NED benefits. However, departure from the economically optimal (i.e., NED) project is possible in cases where the departure is justifiable and substantiated and an exception is granted from the Assistant Secretary of the Army (Civil Works); and
- There must be no more economical means, evaluated on a comparable basis, of accomplishing the same purpose that would be precluded from development if the Federal plan were undertaken. This limitation applies only to those alternative possibilities that would be physically displaced or economically precluded from development by the project.

Institutional Criteria

- Plans must be consistent with existing Federal, state, and local laws;

- Plans must be locally supported to the extent that non-Federal partner provides a letter of intent stating that it understands its responsibilities and obligations as set forth in the WRDA of 1986, as amended, and related policy;
- Prior to the Preconstruction Engineering and Design (PED) Phase, the non-Federal partner would enter into a written Design Agreement to cost share 25 percent of the costs of the Design Phase upfront. Ultimate cost sharing of design is the same percentage as for construction. Settlement is made at the time of construction, subsequent to execution of the Project Partnership Agreement (PPA); and
- Prior to the Construction Phase, the non-Federal partner would enter into a written PPA to provide all items of local cooperation satisfactory to the Secretary of the Army, as mandated by Section 221 of The Rivers and Harbors Act of 1970 (Public Law 91-611), as amended.

Environmental Criteria

- The plan should minimize the commitment of natural resources, whether they are marine bottom-lands, wetlands, other coastal zones, inland environments, or wildlife in these areas;
- The plan should avoid or minimize environmental impacts and maximize environmental quality in the project area to the extent practicable considering environmental, economic, and engineering criteria;
- A mitigation plan will be developed to fully mitigate any remaining unavoidable adverse consequences which may result from the Recommended Plan.
- The available sources of expertise should be used to identify environmental resources that might be endangered, damaged, or destroyed by plan implementation. These would include the USFWS, USEPA, NMFS, and appropriate state agencies, such as the Florida Department of Environmental Protection; and
- Measures should be incorporated into the Recommended Plan to protect, preserve, restore, or enhance environmental quality in the project area.

Social Criteria

- The plan should be capable of being integrated into local or regional planning for water and air pollution abatement, transportation, recreation, and land use;
- As much as possible, the plan should minimize noise, dust, odor, unsightliness, and potential health risks;
- The plan should meet existing public health and environmental control standards;
- The plan should not displace, devalue, or destroy important historical and cultural landmarks or sites; and
- Adverse impacts on area recreation resources should be avoided or minimized.

5.3 Management Measures

Management measures are the general categories of actions which are the basis for alternative plan development. The management measures used in this feasibility study were developed through discussions and interviews with Port Canaveral operations and management personnel, Canaveral Pilots Association members, and consultants working for the CPA. Management measures identified to address the navigation-related problems at Port Canaveral include operational (i.e., non-structural) measures, locally implemented structural measures, and structural modification of the Federally authorized channel.

Operational (i.e., non-structural) measures include modifications to vessel operating procedures, such as varying transit speeds, increasing vessel controllability, and restricting operations. Modifying aids to navigation are also considered as operational measures. Locally implemented structural measures include modifications to port infrastructure (berths, piers, mooring conditions) and terminals. Structural modifications to the Federally authorized channels include deepening and/or widening of channels and turning basins.

5.3.1 Planning Elements

A set of planning elements, were developed from the management measures identified in Section 5.3. These planning elements were assessed for potential inclusion in preliminary alternative plans based on the planning criteria identified in Section 5.2. Each planning element was considered for its potential as a stand-alone alternative and as an element used in coordination with other elements. Table 5-1 presents the results of the planning element screening conducted for this analysis. Table 5-2 shows the potential for each management measure to contribute to one or more of the study objectives identified in Section 5.1.3.

Table 5-1
Planning Element Screening

Measure #	Measure	Carried Forward	Excluded
	No Action	√	
	Operational Measures		
1	Reduce vessel speed		√
2	Increase vessel speed		√
3	Additional aids to navigation	√	
4	Additional tug assistance	√	
5	Turn cargo vessels in ballast		√
	Locally Implementable Measures		
6	Berth deepening	√	
7	Mooring conditions improvements		√
8	Relocate cargo terminals		√
9	Relocate cruise terminals		√
	Structural Modifications to Federal Channel		
10	Channel widening	√	
11	Channel deepening	√	

Table 5-2
Objectives-Measures Matrix

Measures		Objectives				
		1	**2**	**3**	**4**	**5**
1	Reduce vessel speed				**X**	**X**
2	Increase vessel speed					
3	Additional aids to navigation				**X**	
4	Additional tug assistance		**X**	**X**		
5	Turn cargo vessels in ballast					
6	Berth deepening		**X**	**X**		
7	Mooring conditions improvements	**X**				**X**
8	Relocate cargo terminals					
9	Relocate cruise terminals					
10	Channel widening	**X**	**X**	**X**	**X**	**X**
11	Channel deepening	**X**	**X**	**X**	**X**	**X**

Objective 1: Reduce the requirement for tug assists to cruise ships and docked cargo vessels under high wind conditions from 2014 to 2064 (base year plus 50 years)

Objective 2: Allow for deeper and more efficient loading of bulk vessels at Port Canaveral from 2014 to 2064

Objective 3: Allow for more efficient operations through use of longer and deeper draft bulk vessels at Port Canaveral from 2014 to 2064

Objective 4: Reduce damages to berthed vessels from surge effects of vessel transit through the Port Canaveral main channel from 2014 to 2064; and

Objective 5: Support national defense requirements and needs, which include coordination with military tenants of the port and reduction of surge effects on the port's military infrastructure from 2014 to 2064.

5.3.1.1 No Action

Under the no action alternative, none of the operational measures, locally implementable measures, or the structural modifications to the Federal channel would be conducted. The result

of the no action plan would be severely constrained vessel operations in Canaveral Harbor as described in Section 3: Without-Project Conditions. The no action alternative is the without-project condition, which is used as the base of comparison for all other alternative plans.

5.3.1.2 Operational Measures

Three operational measures were excluded from further analysis: reducing vessel speed, increasing vessel speed, and turning vessels in ballast.

Reducing vessel speed would be applicable to deeply laden cargo vessels because reducing vessel speed would also reduce the vessel's amount of squat, which in turn would reduce the vessel's effective draft. This planning element is not reasonably applicable because vessels are currently transiting the channel at the minimum speeds necessary to maintain adequate safe steerage. Reducing speeds even further would impact safe operation in the port.

Increasing the speed of a cruise ship as it transits the channel would reduce the vessel's crab angle and effective beam, thereby maximizing use of the available channel width. However, increasing cruise ship speed also has the negative effect of increasing surges at adjacent cargo piers and naval facilities, increasing the likelihood of vessel damage and requiring costly delays in vessel loading and unloading. The pilots already increase speed, when absolutely necessary, in order to transit the channel under high wind conditions. The use of increased speed on a regular basis would increase the frequency of unacceptable surge effects (parted lines, equipment damage, injury to personnel). Higher channel speeds would also require rapid vessel breaking upon entrance to the West Access Channel and West Turning Basin, creating additional surges.

Tug assistance for cruise ships and cargo vessels transiting the channel are currently part of port operations. However, cruise ships are equipped with powerful azimuth steering and thrusters, providing high maneuverability, and do not typically require tug assistance except under high wind conditions. Emergency situations arising at sea where power and/or steering control is compromised may require tug assistance to navigate into port and berth safely for repairs, but this is clearly the exception and a rare occurrence. The required use of tugs under high wind conditions is costly, although relatively infrequent.

Of most importance, the cruise lines typically navigate smaller cruise ships (1,000 feet LOA or less) within port and harbor channels and maneuver within basins and to and from berths under their own power, without tug assistance. The vessel pilots, captains and crew are trained to fully implement the propulsion features of a cruise vessel to provide the highest level of navigation safety. Only the largest cruise ships (LOA greater than 1,000 feet) require tug assistance under wind conditions of 25 knots or greater. The use of tug assist for large cruise ships under high wind conditions allows the vessel to maintain a safe speed at a reduced crab angle within the confines of the Port's narrow channel. Therefore, tug assist is carried forward as a without-project condition and as a component of alternative improvement plans.

Turning vessels in ballast requires that cargo vessels use the Middle Turning Basin only in light loaded or ballast conditions. This operational restriction, if effective, would reduce the controlling depth needed in the Middle Turning Basin. Under this operating restriction, deeply loaded in-bound vessels would proceed directly to the berth, unload their cargo, and then proceed to the Middle Turning Basin in a light or ballast condition in order to be turned around for the transit to sea. This operational restriction would be a feasible non-structural plan element if the Middle Turning Basin were functionally separable from the channel. However, due to the tight

configuration of Canaveral Harbor, as discussed in the Structural Modification to the Federal Channel section below, the Middle Turning Basin also provides access to NCP1 and NCP2. The controlling depth of the Middle Turning Basin needs to be consistent with the controlling depth of the channel in order to provide access to the cargo berths.

The one planning element derived from operational measures which may be effective at Port Canaveral is an improvement to aids to navigation. Currently, there is no outbound range which the pilots can use to center cruise ships in the channel when leaving the port. Construction of an outbound range would allow the pilots to take full advantage of available channel width by providing a navigation benchmark that currently doesn't exist. This planning element does not, by itself, eliminate the channel width constraint or allow larger cruise ships to use the channel. It is, however, highly desirable to the pilots and will be considered in combination with other planning elements. Coordination with the U.S. Coast Guard (Chief, Aids to Navigation and Waterways Branch, Seventh Coast Guard District) has been initiated to identify the appropriate characteristics of navigational aid improvements and to estimate the costs of potential improvements.

5.3.1.3 Locally Implementable Measures

Three locally implementable structural measures: relocating cargo terminal facilities, relocating cruise terminal facilities, and improving mooring conditions were evaluated and eliminated from more detailed analysis. There is no possible relocation of cruise or cargo terminals which would reduce channel constraints or their impacts. In general, the cargo facilities that require the deepest drafts are already closest to the sea. Currently, the facilities which need the least water depth, i.e., the cruise terminals in the West Turning Basin, are located furthest from open water at the inland end of the channel. The relatively shallow water at the West Turning Basin does not restrict cargo vessels whose docks are presently located ocean-ward along the ship channel and in the middle turning basin.

CPA has recently (2009) improved mooring conditions to accommodate Freedom Class vessels at Cruise Terminal 10. Freedom Class vessels are up to 100 feet longer than the Voyager Class vessels, which also use Terminal 10, and therefore required the construction of a new mooring dolphin. The new Disney Cruise line vessels are 1,115 feet long, which is more than 150 feet longer than the Disney vessels currently homeported at Port Canaveral. The Port is currently constructing necessary mooring facility/equipment changes to accommodate these vessels under without project conditions. These improvements to mooring conditions at the Cruise Terminals do not affect channel width constraints on Freedom Class and larger size vessels. No changes to mooring conditions would reduce constraints on the larger cruise vessels using the port. Therefore, because this measure is ineffective, it was not carried forward for further consideration.

The only locally implementable structural measure which is included for further analysis is berth deepening. Increased water depth at cargo berths would allow vessels to be loaded more deeply and would be required as a locally funded (i.e., ancillary) component of an alternative plan which includes channel deepening. Although a necessary component of a channel deepening plan, berth deepening alone is not a viable solution to channel depth constraints. The discussion in Section 2 concerning existing port operations indicates that vessels do not typically load beyond the depth that would require them wait for the tide (i.e., 36 foot draft or more). The reason vessels operating at the port are averse to relying on tidal advantage is the schedule uncertainties

resulting from cruise ship and naval transit priorities and safety zones, which preclude other vessels from using the channel when these vessels are entering or exiting the port. At certain times during the lunar cycle, it could be possible to miss two tide cycles in a row due to conflicts with regularly scheduled cruise ship operations. These systematic delays are usually unacceptable to carriers and their agents, and are the reason why most vessel operating drafts are truncated by shippers at the 34 – 36 foot range (Chart 2-3 Port Canaveral Deep-Draft Vessel Arrival Drafts (2002-2006).

5.3.1.4 Structural Modifications to Federal Channel

The two structural modifications to the Federal channel system: deepening and widening, were both included for more detailed analysis. These planning elements are technically feasible, institutionally and publicly acceptable, and may be implemented in conjunction with other planning elements. These two planning elements are the basis of the alternative plans described below.

The Economic and Environmental Principles for Water and Related Land Resources Implementation Studies (Principles and Guidelines, 1983), paragraph 5 states that: *"various alternative plans are to be formulated in a systematic manner to ensure that all reasonable alternatives are evaluated"*. In order to systematically assess structural modifications to the federal channel, major channel segments and features are identified according to their navigational function in the harbor. All of the cargo and cruise berths at Canaveral Harbor are configured along a single deep draft channel and two adjoining turning basins (Middle Turning Basin and West Turning Basin). The Navy submarine Trident Basin (Navy use only) also adjoins the single channel. The single deep draft channel provides access from the sea to the commercial berths situated along the north and south sides of the channel, and terminates at the cruise ship terminals in the West Turning Basin, where a shallower Barge Canal continues to the Intracoastal Waterway (ICWW) and to NASA at the Kennedy Space Center. Because the deep draft channel ends at the West Turning Basin, all deep draft vessels entering Canaveral Harbor must turn around to exit the harbor.

The Middle Turning Basin, which is located between the entrance from the sea and the West Turning Basin, is adjacent to the single deep draft channel (there is no separate access channel). Two commercial cargo berths, NCP 1 and NCP 2, are adjacent to the Middle Turning Basin. Because of the very close proximity of NCP 1 and NCP 2 to the Middle Turning Basin, the Middle Turning Basin is used as a navigation channel and as the turning basin for all cargo vessels. Similarly, the West Turning Basin is effectively the navigation channel linking the north cruise terminals with the single channel. All of the multi-day cruise vessels currently use the West Turning Basin for turning and access to the north cruise terminals.

The combination of a straight line channel configuration, a dead end terminus of the single deep draft channel, and the location of cargo and cruise berths adjacent to the channel and turning basins dictates the navigational function of channel segments and features. For planning purposes, the single deep draft channel can be divided into two segments. One segment goes from the sea to the cargo berths, terminating at NCP 4, just west of the Middle Turning Basin. This segment services deep draft cargo vessels and cruise ships, and is used by all vessels utilizing the Middle Turning Basin. The second channel segment continues from the western end of the cargo berths to the cruise terminals in the West Turning Basin. This segment services cruise ships and relatively shallow draft cargo vessels (drafts no deeper than -35 feet MLW).

The largest of the deep draft cargo vessels typically do not use this channel section or the West Turning Basin.

Although the Middle Turning Basin can be identified as an individual Canaveral Harbor navigation feature, it is functionally a component of the channel segment that services the north and south cargo piers and the south side cruise terminals. Cargo vessels which use NCP1 and NCP 2 use the Middle Turning Basin to access those berths. Additionally, all deep draft cargo vessels turn in the Middle Turning Basin. Similarly, the West Turning Basin can be identified as an individual Canaveral Harbor navigation feature. However, it is functionally a component of the channel segment that services the north side cruise terminals. All cruise ships using the north side cruise terminals use the West Turning Basin to access the terminals and all cruise ships using the north cruise terminals turn in the West Turning Basin.

In the development and evaluation of alternative plans for channel widening, which only affects large cruise ship navigation to and from the north side cruise terminals, the major channel segments and navigation features include:

- The entire length of the deep draft channel from the sea to the West Turning Basin; and
- The West Turning Basin.

In the development and evaluation of alternative plans for channel deepening the major channel segments and navigation features are divided into:

- The main channel westward from the sea to the cargo piers ending at NCP 4;
- The Middle Turning Basin, which provides access to NCP 1 and NCP 2, and which is used by all deep draft cargo vessels;
- The main channel westward from the end of the cargo piers (NCP 4) to the West Turning Basin, which provides access to the north side cruise terminals; and
- The West Turning Basin, which is used by all cruise ships serviced by the north side cruise terminals.

5.4 Preliminary Alternative Plans

None of the four planning elements carried forward to more detailed analysis are feasible as stand-alone alternative plans. As described in the previous section, berth deepening and improving aids to navigation, by themselves, do not fully address the navigational constraints and associated problems at Port Canaveral. Each of the structural measures to the federal channel requires a companion locally implemented planning element to fully address the navigational constraints and problems. Widening the channel, which would allow larger cruise ships to more safely and efficiently use the port's cruise terminals, requires improved aids to navigation to be fully effective. Similarly, channel deepening requires associated berth deepening so that channel deepening benefits can be realized.

Channel widening and channel deepening are separable planning elements. Channel widening would beneficially affect cruise ship operations, without affecting cargo operations. Channel deepening would only benefit cargo vessel operations in the near term, because cruise ships are not currently depth constrained at Port Canaveral. However, it is important to note that cruise ships are not currently depth constrained because the CPA maintains the West Turning Basin at a depth of -35 feet, even though the Federally authorized depth is -31 feet. In the early 1980's, the additional dredging to -35 feet was carried out by CPA concurrently with the federal project

construction of the WTB to -31 feet to accommodate the planned and anticipated cruise traffic at that time. In 2006 and for the first time since initial construction, the CPA conducted maintenance dredging at the WTB federal project area to the 35-foot project depth. The formulation of alternative plans therefore develops incremental widening with improved aids to navigation and incremental deepening with berth deepening as separate plans, and in combination.

Alternative plans for incremental channel widening of the existing 400 foot channel, with improved aids to navigation, were preliminarily formulated in 50-foot increments (450 feet, 500 feet). Each alternative width includes a similar outbound range constructed as an aid to navigation. Preliminary plans for incremental deepening were formulated in one foot increments from existing channel depths, which vary based on reach, as described in Section 2.2.1 Channels and Turning Basins. The common Corps of Engineers practice of evaluating one-foot depth increments beginning with two feet was followed (e.g. for a -40 foot channel the first evaluated increment is -42 feet, then in one foot increments thereafter through -44 feet).

Preliminary plans for channel deepening were further segmented incrementally according to functionally separable channel segments, as described in Section 5.3.1 Planning Elements. All deep draft cargo vessels use the channels from the sea to the West Access Channel (WAC) and the Middle Turning Basin (MTB). This reach was evaluated in one-foot depth increments.

Table 5-2 presents the existing authorized depth, operational restrictions, and maximum vessel draft (without tidal assistance) for each reach of the channel, from the sea to the West Turning Basin. Deep draft cargo vessels transit channel reaches from the Outer Reach Cut 1A/1B to the West Access Channel. Cruise ships using the north side cruise terminals transit channel reaches from the Outer Reach Cut 1A/1B to Cut A, which is in the West Turning Basin (west of Station 260+00). Note that all vessels with operating drafts deeper than 36 feet require tidal assistance.

Table 5-3
Existing Channel Depth and Draft Requirements (feet below MLLW)

Channel Section	Existing Authorized Depth	Wave Motions[22]	Squat[23]	Safety Clearance	Maximum Unrestricted Draft
Outer Reach Cut 1A/1B	44	1.4	2.9	2.5	37.2
Outer Reach Cut B7/B8	44	1.4	2.4	2.5	37.7
Middle Reach Cut 2A	44	1.4	2.3	2.5	37.8
Middle Reach Cut 2B	44	-	2.0	2.5	39.5
Inner Reach Cut 2 CT	40	-	1.5	2.5	36
Inner Reach Cut 3	40	-	1.1	2.5	36.4
Middle Turning Basin	39	-	-	2.5	36.5
West Access Channel (east of Station 260+00)	39	-	1.0	2.5	35.5
West Access Channel (west of Station 260+00)	31	-	0.5	2.5	28

Note: Maximum unrestricted draft is calculated as authorized depth - wave motion - squat - safety clearance

Table 5-3 presents the array of preliminary plans and the results of the preliminary screening process.

Table 5-4
Preliminary Plan Screening

	Carried Forward	Excluded
Widen Channel and Navigation Aids		
450 feet width	√	
500 feet width	√	
Deepen Channel to WAC/MTB w/berths*		
42 feet depth	√	
43 feet depth	√	
44 feet depth	√	

*Note that the first deepening increment is a two-foot increment

[22] Squat is the reduction in underkeel clearance between a vessel at-rest and a vessel underway.
[23] Wave motion is a vessel's vertical motion response due to heave and pitch from wind-driven waves.

Preliminary plan assessment was supported by a simulation-based evaluation of channel widths conducted at the Simulation, Training, Assessment and Research (STAR) Center in Dania Beach, Florida. The STAR Center was selected as the simulation facility because it has the most experience in modeling, research, and evaluation for federal navigation improvement projects at Florida ports. The STAR Center has the only known mathematical model that represents the Oasis Class cruise vessel. The STAR Center also has a current and accurate high fidelity resolution geographic and hydrodynamic model of Port Canaveral. The STAR Center performed navigation simulations in 2003 in support of the arrival of Royal Caribbean's *Mariner of the Seas* at Port Canaveral.

The following list provides examples of STAR Center analyses conducted for Federal Navigation projects since 1997:

- Port Everglades 1997 with USACE/WES,
- Cape Fear 1998 with USACE/WES,
- Port Miami Deep Draft Access 2000 with USACE/WES,
- Palm Beach Study 2002 with USACE/Jacksonville District,
- Miami Berth Transit 2002 with USACE/WES,
- Port Canaveral Berth Access 2003 with Canaveral Port Authority,
- Baltimore Harbor 2004 with Maryland Port Administration,
- Blair Waterway 2005 with Port of Tacoma,
- Ybor Sparkman Channel 2005 with USACE/WES and Jacksonville District, and
- Key West Channel Evaluation 2007 with Port of Key West.

5.4.1 Alternatives Eliminated from Detailed Analysis

The CPA currently maintains the West Turning Basin at a depth of -35 feet to allow use of the basin by existing cruise ships. Deepening alternatives greater than -35 feet were excluded from further analysis because the cruise vessels and smaller cargo ships projected to use the West Turning Basin under future without-project conditions do not have sufficient draft to require depths greater than -35 feet. Therefore, no incremental benefits would accrue from deepening beyond -35 feet. Federal assumption of maintenance responsibility to a depth of -35 feet in the West Turning Basin is addressed in an addendum to this report.

Extending the channel width to 550 feet was also eliminated from detailed analysis because of consideration for existing land uses on both sides of the channel. Land to the south side of the channel is heavily developed for recreation, marinas, and restaurants and is not available. Land to the north side of the channel is Air Force property. Although typically vacant, minimization of use of these lands for navigation purposes is preferred, so as to minimize landside impacts. A channel extension to a width 550 feet was excluded from the analysis because of potential impacts and to minimize encroachment on Air Force property. Alternatives Carried Forward

The following alternative plans were carried forward for more detailed analysis:

- Channel widening to 450 feet (Widening Plan 1), from the sea to the West Turning Basin, and placement of an outbound range as an aid to navigation, repositioning of the existing inbound range, and extending an existing turn widener at the entrance from the sea;

- Channel widening to 500 feet (Widening Plan 2), from the sea to the West Turning Basin, and placement of an outbound range as an aid to navigation, repositioning of the existing inbound range, and extending an existing turn widener at the entrance from the sea; and
- Channel deepening from the sea to the West Access Channel and Middle Turning Basin, in three increments. The name of each increment is based on the channel depth at the Inner Reach, which is the first reach from the sea that is not affected by wave action. The without-project depth of the Inner reach is -40 feet. The first increment is a two-foot increment (-42 feet) and each successive increment is a one-foot increment (-43 feet and -44 feet). Each depth increment includes any necessary associated berth deepening (non-federal responsibility).

The Canaveral Port Authority is not interested in partnering in a project deeper than the -44-foot plan at this time, due to high associated costs (port infrastructure upgrades) which would be required by channel depths deeper than the -44-foot plan. Likewise, CPA is not interested in any widening alternatives greater than 500 feet (Widening Plan 2) because they would involve extensive and extremely expensive relocation and reconstruction of berthing facilities at the South Cargo Piers, as well as at NCP 1 & 2. As a result, Port Canaveral has requested a Categorical Exclusion under ER 1105-2-100 to not be required to analyze any plans wider than 500 feet or deeper than -44 feet.

Two widening plans and three deepening plans (Table 5-5) are evaluated incrementally and in combination. The detailed alternative plan evaluation is described in Section 6 Plan Selection. In addition to the plans listed above, the No Action alternative was evaluated as a viable option in accordance with 40 CFR 1502.14(d).

Table 5-5
Alternative Plan Channel Depths and Widths (feet below MLLW)

	Existing Authorized Depth	**-42 feet**	**-43 feet**	**-44 feet**
Outer Reach	41	44	45	46
Middle Reach	41	44	45	46
Inner Reach	40	42	43	44
Middle Turning Basin	39	41	42	43
West Access Channel	39	41	42	43
West Turning Basin	31*	35	35	35
	Existing Authorized Width		**Widen Plan 1**	**Widen Plan 2**
Channel Width	400 feet		450 feet	500 feet

*Maintained by CPA to -35 MLLW

6. PLAN SELECTION

This section presents the detailed alternative plan evaluation that was conducted to identify the recommended plan. The detailed alternative plan evaluation was prepared in accordance with Corps' guidance on formulation and evaluation of deep draft navigation projects as described in:

- The Planning Guidance Notebook, ER 1105-2-100 (22 April 2000);
- National Economic Development Procedures Manual: Deep Draft Navigation, IWR Report 91-R-13 (November 1991);
- Digest of Water Resource Policy and Authorities, EP 1165-2-1 (30 July 1999);
- Planning Guidance Letter #97-06, Cruise Ships and Benefits to Navigation (07 July 1997);
- Policy for Implementation and Integrated Application of the USACE Environmental Operating Principles and Doctrine, ER 200-1-5 (30 October 2003);
- Engineering and Design for Civil Works Projects, ER 1110-2-1150 (31 August 1999); and
- Planning in a Collaborative Environment, EC 1105-2-409 (31 May 2005).

6.1 Integration of Environmental Operating Principles

The proposed project integrated Environmental Operating Principles (EOP) as required under ER 200-1-5, dated 30 October 2003 and ER 1110-2-1150 31 August 1999 in affirming the Corps' commitment to include environmental considerations into the plan formulation and engineering design processes. These principles foster unity of purpose on environmental issues, reflect a new tone and direction for dialogue on environmental matters, and ensure that employees consider conservation, environmental preservation and restoration in all Corps activities.

As described in Section 4.3 Constraints, the principal constraint on the formulation for navigation improvements at Port Canaveral is the avoidance of significant impacts at or near Port Canaveral. Prior to developing project alternatives, environmental evaluations were conducted to define environmental resources that could be influenced by the project construction or operation. State and Federal natural resource agencies were contacted and consulted regarding potential impacts to these natural resources and potential measures that could be utilized to eliminate, reduce, or mitigate potential impacts. In addition, a public scoping meeting was conducted at Port Canaveral to elicit comments and suggestion from both the resource agencies and general public with regards to project design and plan formulation including elements for natural resource protection.

Channel widening and deepening has the potential to affect both manatees and sea turtles. Manatees and juvenile foraging sea turtles are protected species and are present in the harbor. Dredging methods and construction techniques were considered that would provide optimum protection to these species during the plan formulation process.

Construction techniques were selected that would protect resources within the project area such as manatees and sea turtles as well as preserving water quality. Consideration was given to include beneficial use of sediments and to conserve existing riprap material for reuse with the project to facilitate restoration of juvenile sea turtle foraging habitat. The Port has also adopted

new manatee protection measures at the recommendation of the U.S. Fish and Wildlife Service. Monitoring will be conducted during construction to ensure protection of the natural resources in the project area.

The predicted sea level rise will not produce any negative impacts on the existing port infrastructure during the current design life. Facilities developed in the future will be designed with Sea level rise impacts in mind. Sea level rise is not projected to affect project impacts on natural resources (see additional discussion in Section 6.8 Risk and Uncertainty).

6.2 Detailed Alternative Plan Description

6.2.1 Without-project Condition Channel Description

The without-project condition includes continuation of maintenance of the Federal navigation channel and also continued CPA dredging and maintenance of areas outside the current federally authorized channel. These CPA actions include:

- Maintenance of the West Turning Basin to a depth of -35;
- Spot dredging outside of the federally authorized channel in areas recommended by the Canaveral Pilots; and
- Maintenance of the area in the West Turning Basin outside of the federally authorized channel, which the CPA opened to navigation by constructing the Interim Corner Cut Off.

6.2.2 Alternative With-project Condition Channel Descriptions

The alternative plans carried forward for detailed analysis include:

- Channel widening in two 50-foot increments from 400 to 500 feet: Widening Plan 1 (450 feet) and Widening Plan 2 (500 feet). Both channel widening alternatives extend from the sea to the West Turning Basin and include placement of an outbound range as an aid to navigation, repositioning of the existing inbound range, and extending an existing turn widener at the entrance from the sea. The Canaveral Port Authority is not interested in partnering in a project wider than 500 feet at this time, due to high associated costs (port infrastructure upgrades) and severe impacts on CPA, Navy and Air Force facilities.
- Channel deepening from the sea to the West Access Channel and Middle Turning Basin, in three increments starting at -42 feet in the West Access Channel and Middle Turning Basin. The first increment is a two-foot increment (-42 feet) and each successive increment is a one-foot increment (-43 feet and -44 feet). Each depth increment includes associated berth deepening (non-federal responsibility). The Canaveral Port Authority is not interested in partnering in a project deeper than -44 feet at this time, due to associated costs (port infrastructure upgrades) which would be required by channel depths deeper than -44 feet.

6.2.3 Identification of Alternative Plan Increments

Widening Plans 1 and 2 (see Figures 6-1 through 6-3), which exclude any deepening below existing project depths, include the following components:

- Turn Widener:
    - Widening Plan 1 dimensions are -41' project depth X 11.14 acres (irregular shaped area) bounded to the north and northeast by the civil turn widener and Cut 1 of the outer reach;
    - Widening Plan 2 would provide dimensions of -41' project depth X 22.14 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' project depth X 400' wide X 5,658' long.
    - Widening Plan 1 would increase the project width from 400' to 450', providing a 50' widener of 2,282' 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 50' widener transitions from the existing to the new northern channel boundary over a plan distance of 500'
    - Widening Plan 2 would increase the project width to 500', providing a 100' widener of 2,282' 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' widener transitions from the existing to the new northern channel boundary over a plan distance of 500';
- Trident Access Channel: At the southern boundary of the existing Trident Access channel,
    - Widening Plan 1 will overlay 50' of the Trident Access Channel
    - Widening Plan 2 will overlay a total of 100' of the Trident Access Channel;
- Inner Reach, Cut 2 and Cut 3: Existing dimensions are -40' project depth X 400' wide X 3,344' long.
    - Widening Plan 1 would provide a 50' widening 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 50' northside channel widener;
    - Widening Plan 2 would increase the project width to 500', providing a 100' widening 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' northside channel widener
- West Access Channel (east of Station 260+00): Existing dimensions are -39' project depth X 400' wide X 1,840' long.
    - Widening Plan 1 provides 50' of widening along the entire length of the channel by redefining the northern channel boundary 12' north of the existing northern boundary, and widening the channel by 38' along the south side and into the barge canal

  - Widening Plan 2 would increase the project width to 500', providing 100' of widening along the entire length of the channel by redefining the northern channel boundary 12' north of the existing northern boundary, and widening the channel by 88' along the south side and into the barge canal;

- West Turning Basin and West Access Channel (west of Station 260+00): The existing federally authorized turning basin located west of the West Access Channel (west of Station 260+00) encompasses 78.6 acres to an authorized project depth of -31' (federally maintained) and a current depth of -35' (increment dredged and maintained by the CPA). The existing federal project provides a turning circle diameter of 1400'. Since the mid-1980's and as recently as 2003, the CPA also maintains additional areas adjacent to the northeast shoreline at the entrance to the West Turning Basin to -35' at the request of the Canaveral Pilots for ease of cruise ship navigation access. In preparation to homeport the wave of new larger cruise vessels, CPA executed the Interim Corner Cut Off (ICCO) new work dredging from 2009-2011, shifting the -35' CPA maintained dredge boundary further to the northeast. The CPA maintains a depth of -35' at 18.5 acres of navigation area that lie beyond the existing federal project limits at the entrance to west basin. The ICCO is intended to be an interim measure for cruise navigation, and is not anticipated to support access in the full range of conditions encountered at Port Canaveral. The ICCO is currently being included as a without-project condition in all alternative plan evaluations.

- Channel Widening Plans 1 and 2 include identical expansion of the federal project limits in the northern and western portions of the West Turning Basin to enlarge the entrance to the west basin and provide a turning circle diameter of 1,725', which is 325' greater than the existing turning circle and 50 feet wider than the 1,675-foot circle generated by the ship simulation modeling. The reason for a 50-foot larger circle in the West Turning Basin (1.55 times vessel length rather than 1.5 times vessel length) is that the margin of safety was considered by the Canaveral Pilots Association to be too small for the 1,675-foot turning circle. The pilots included the very close proximity of vessels moored at NCP 3 and 4 and the very close proximity of small recreational vessels at the adjacent small craft marinas in their rationale for requiring a slightly larger turning circle than what was generated by the ship simulation modeling. The additional 50 feet will also reduce the potential impact of hydrodynamic forces on moored vessels and small craft as the cruise ship maneuvers within the confines of the turning circle. 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' project boundary and 6.9 acres within the existing barge canal will be dredged to the currently maintained depth of -35' in order to complete the new turning circle.

Figure 6-1
Alternative Plans: Sheet 1

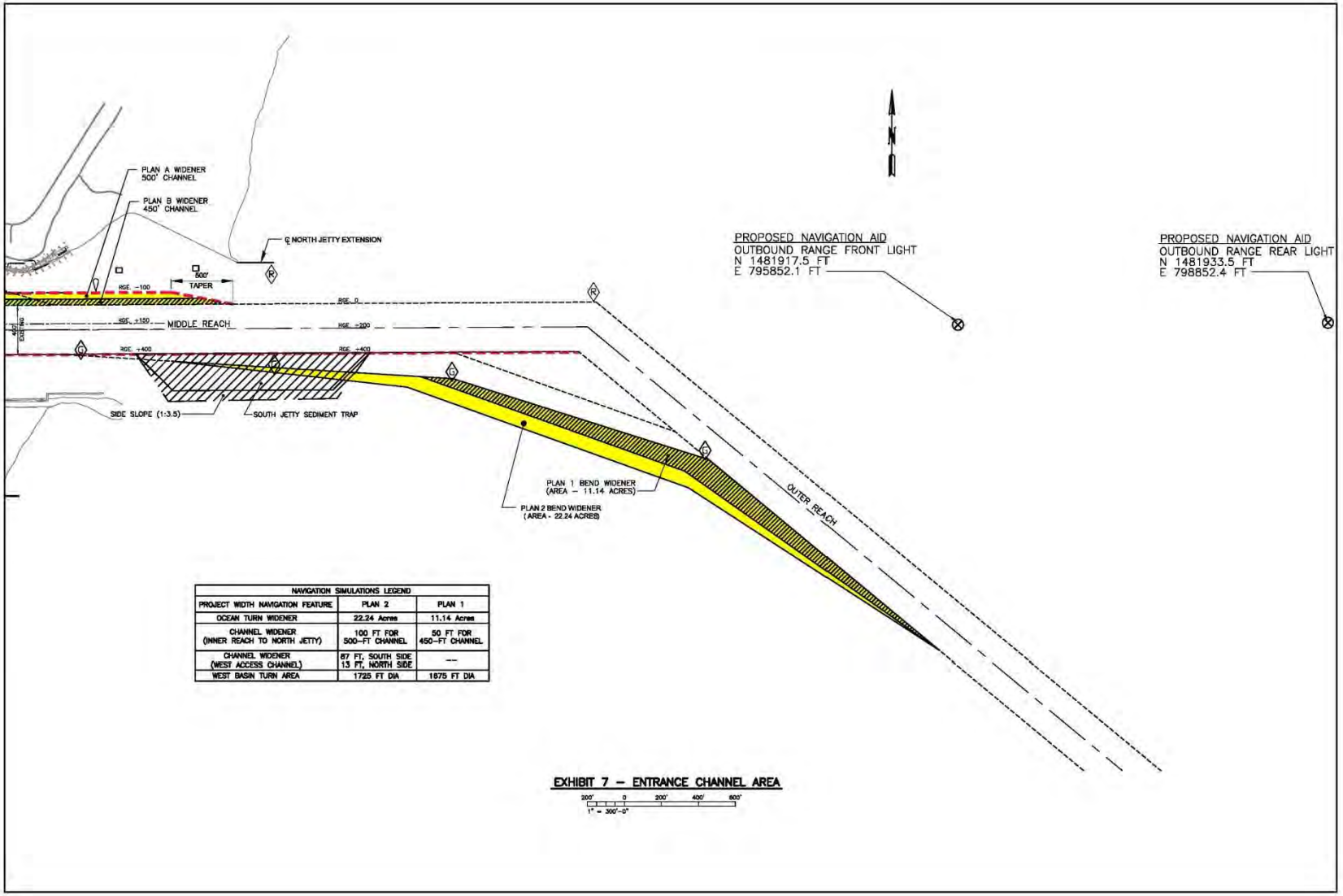


Figure 6-2
Alternative Plans: Sheet 2

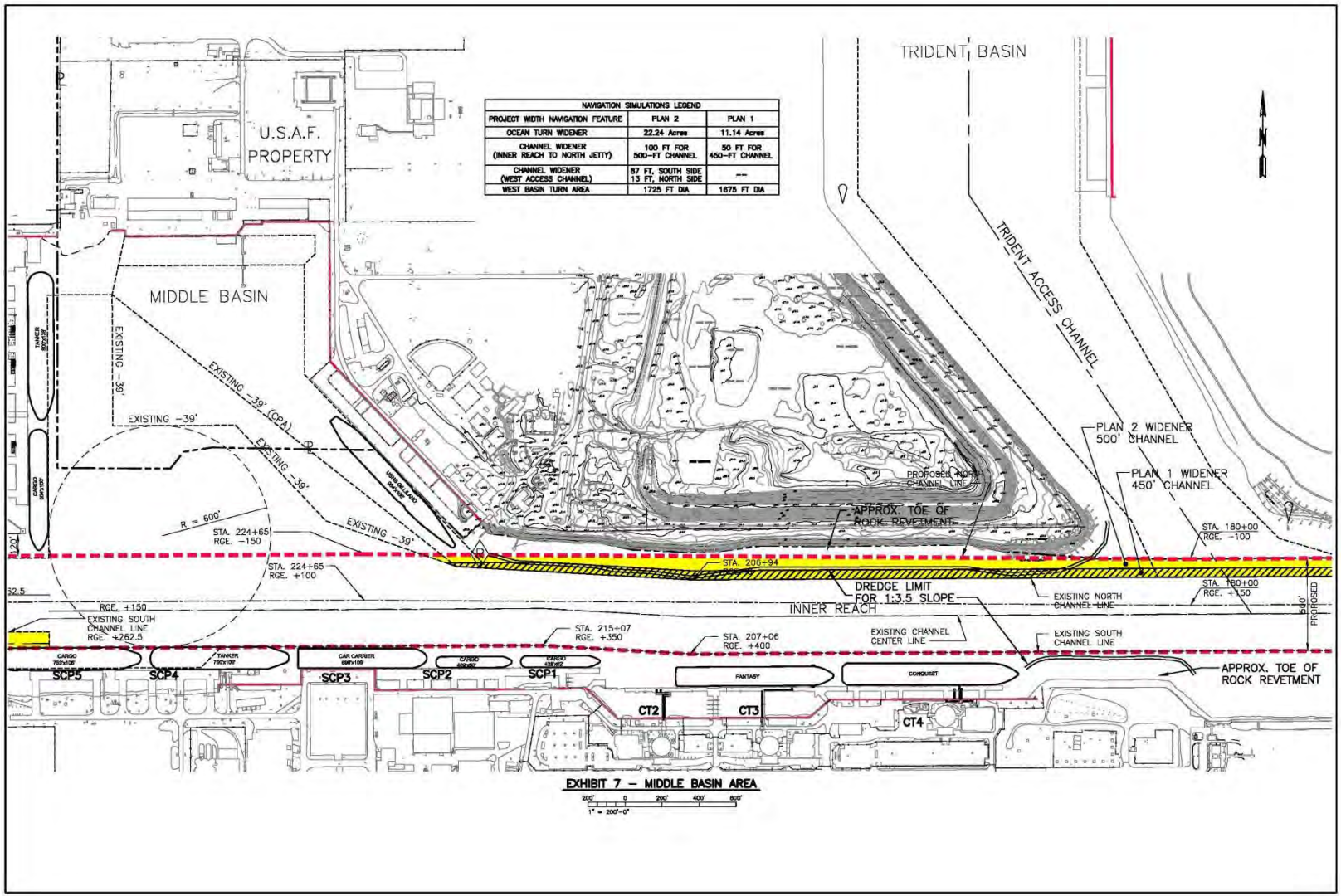
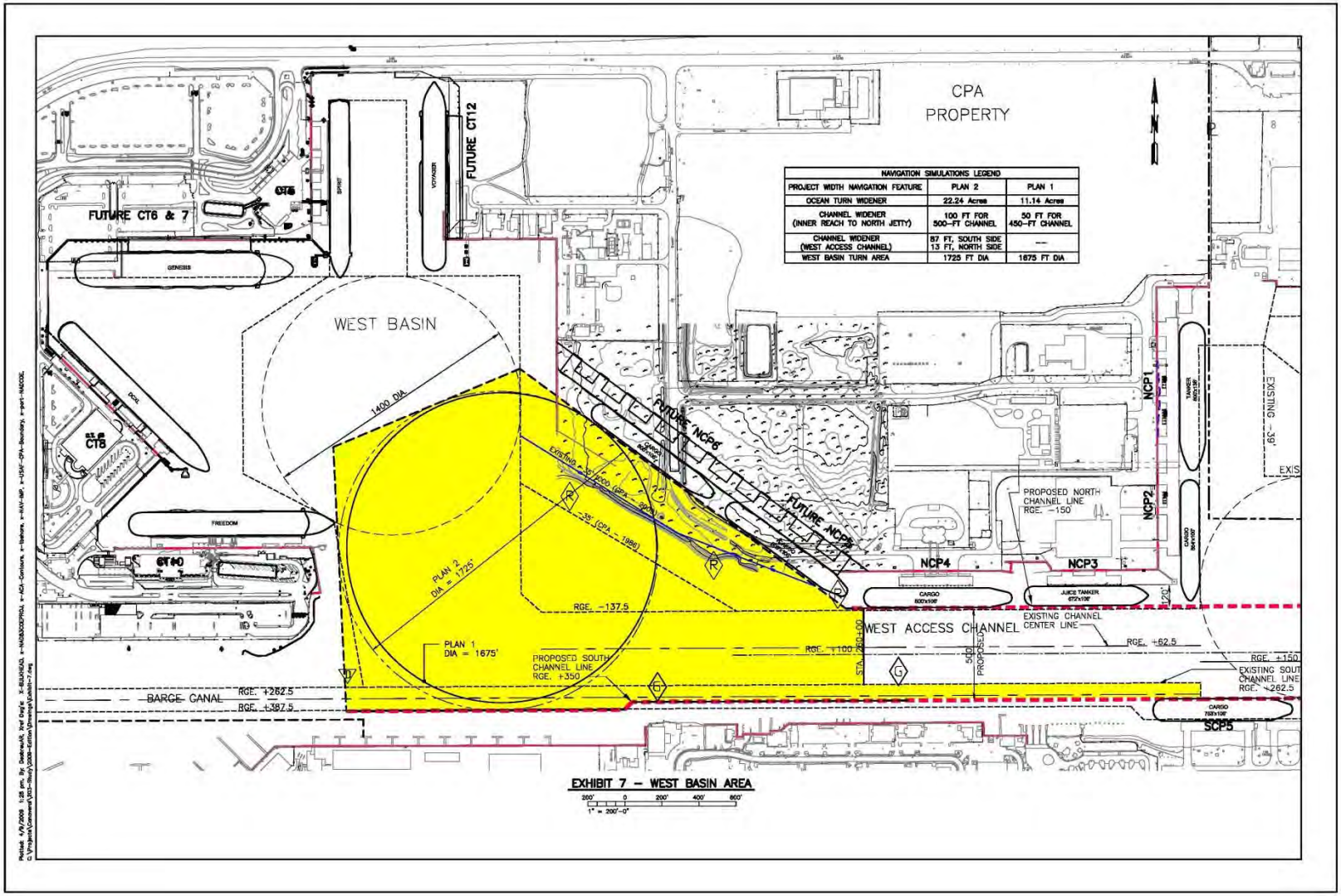


Figure 6-3
Alternative Plans: Sheet 3



Channel deepening increments are identified in the manner prescribed for Corps deep draft navigation feasibility studies, i.e., the first increment of deepening is a two-foot increment and successive increments are one-foot in additional depth. Existing channel depths and potential with-project depths vary among the multiple sections of the channel from the entrance-from-the-sea to each of the turning basins. The naming of channel deepening increments is based on the depth at the Inner Reach. Under this naming convention the first depth increment is named -42 feet (the without-project condition is -40 feet), the second increment is -43 feet, and the third increment is -44 feet. The CPA currently has no interest in channel depth increments greater than -44 feet. Design depths used in the alternatives analysis are based on a 60,000 – 80,000 DWT Bulk Carrier or Panamax Tanker with an operational draft in Port Canaveral of 39.5 feet, which is the projected maximum unrestricted operational draft according to CPA and the Canaveral Pilots Association. The design analysis assumes vessel transit at 0.0 MLLW tide height.

The water depths required in any section of the channel is the sum of wave motion, squat, and safety clearance. The West Access Channel and West Turning Basin are well within the harbor and therefore are subject to less squat and wave motion. Adequate clearance in this innermost channel section does require that the channel be a minimum of 3.5 feet deeper than the 39.5-foot sailing draft of the design vessel (i.e., -43 feet) in order to allow for proper operation of the directional propulsion systems of the cruise ships maneuvering and berthing in the WTB.

As the channel progresses towards the open ocean, channel depth requirements increase because the effects of squat and wave action are greater. At the Outer Reach of the Entrance Channel, which is the closest to the open ocean, the 39.5-foot design vessel sailing draft requires that the channel be 6.6 feet deeper than the vessel's sailing draft to provide adequate safety clearance during typical operations. Future vessels calling at Port Canaveral may arrive at operating drafts greater than 39.5 feet under advantageous tide conditions. Table 6-1 presents the design depth requirements for large cargo vessels arriving at Port Canaveral with an unrestricted operating draft of 39.5 feet. Figures 6-1 and 6-2 display the depths for each channel feature associated with an unrestricted operating draft of 39.5 feet.

Table 6-1
Channel Depth Design Requirements for Unrestricted Operating Draft of 39.5 feet (feet below MLLW)

Channel Section	Existing Authorized Depth	Wave Motions	Squat	Safety Clearance	Total Depth Requirement
Outer Reach Cut 1A/1B	44	1.4	2.9	2.5	46.3
Outer Reach Cut B7/B8	44	1.4	2.4	2.5	45.8
Middle Reach Cut 2A	44	1.4	2.3	2.5	45.7
Middle Reach Cut 2B	44	-	2.0	2.5	44.0
Inner Reach Cut 2 CT	40	-	1.5	2.5	43.5
Inner Reach Cut 3	40	-	1.1	2.5	43.1
Middle Turning Basin	39	-	-	2.5	42.0
West Access Channel	39	-	1.0	2.5	43.0

Note: Total depth requirement calculated as 39.5 ft sailing draft +wave motion +squat +safety clearance

6.3 Alternative Plans Costs

Potential project costs include construction costs, real estate costs, financial costs (interest during construction), engineering and design, supervision and administration, and operation and maintenance costs (Engineering Appendix: Section 10 Cost Estimates). Project economic costs also include any non-financial (i.e., non-cost shared) associated non-Federal costs, such as berth deepening, landside infrastructure, or other modifications that must be incurred in order for project benefits to be realized. A Cost Risk Analysis was conducted, which resulted in a project cost contingency of 20.97%. All project costs used in this analysis include 20.97% contingency. All costs are calculated using FY 2012 dollars, a 50-year project life, and all discounting is conducted at the current FY 2012 Federal discount rate (4.00%). The following sub-sections provide detailed cost information for the alternative plans.

6.3.1 Construction and Investment Costs

Project elements which compose the construction cost for the widening alternatives, including West Turning Basin improvements, include:

- Dredging and disposal or reuse: channel widening, turn widener, and turning basin extension;
- Upland excavation with materials disposal, and reuse: along north side of inner reach, western end of middle reach and at eastern end of West Turning Basin;
- Rip rap revetment: construct revetment re-using existing rip-rap material along north side of inner reach;

- Associated general item costs including mooring dolphin, submarine sail, fence, tower guy, warning sign; and Seawall construction to protect existing Air Force structures;
- Aids to Navigation: two inbound and two outbound range structures;
- Real estate economic costs[24]: upland area (8.0 acres) along north side of inner reach;
- Interest during construction: 14 month construction duration; and
- Engineering and design (E&D) and supervision and administration (S&A);

Note that construction costs for the Interim Corner Cut Off are not included as project costs since they were incurred by CPA in advance of a project partnership agreement.

In addition to the construction first costs listed above, a contingency factor of 20.97% was developed through a cost and schedule risk analysis as the appropriate level of contingency for this project (Engineering Appendix Attachment M: Cost and Schedule Risk Analysis). Interest during construction was calculated on a monthly basis to reflect the opportunity cost of funds allocated to the project. Table 6-2 presents first costs for the two widening alternatives.

[24] Note that real estate costs are included as an economic cost only - in a manner similar to interest during construction. There will be no financial real estate costs other than administrative costs associated with federal involvement in permitting and coordinating other real estate issues during PED.

Table 6-2
Widening Alternatives: Construction First Costs*

Cost Category	Widening Plan 1 (450 feet)	Widening Plan 2 (500 feet)
Real Estate	$822,623	$1,645,245
Upland Excavation	$2,186,521	$4,588,251
Revetment	$2,890,370	$2,890,370
Fence	$100,758	$100,758
Tower Guy	$17,267	$17,267
Warning Sign	$90,301	$90,301
Retaining Wall	$1,189,696	$1,189,696
Submarine Sail	$43,888	$43,888
Aids to Navigation	$1,975,000	$1,975,000
Mooring Dolphin	$190,000	$190,000
Dredging (w/disposal, mob, & de-mob)	$5,105,230	$7,679,180
S&A and E&D (7.5% each)[25]	$2,454,447	$2,814,707
Interest During Construction	$357,840	$518,637
Sub-Total	**$17,423,940**	**$23,743,299**
Contingency (20.97%)[26]	$3,653,800	$4,978,970
Total Widening Plan Construction Costs	**$21,077,740**	**$28,722,269**

*Widening to existing depths only – no channel deepening

Construction costs for the channel deepening alternatives include dredging and disposal costs and minor associated costs required for some berth deepening. Dredge material volumes and costs are based on existing conditions and reflect the various existing channel depths presented in

[25] Supervision and Administration for Real Estate is included in the S&A for LERR items. Engineering and Design costs were not applied to the real estate cost estimate.
[26] The appropriate contingency level was identified by the Cost and Schedule Risk Analysis (Engineering Appendix Attachment M: Cost and Schedule Risk Analysis Report

Table 5-1. There are no utility relocations associated with the channel deepening alternatives. Table 6-3 presents the construction costs for deepening the channel at the existing 400-foot authorized channel width (excludes any channel widening). Construction costs for combined widening and deepening alternatives are presented in Table 6-4 (Widening Plan 1 plus deepening alternatives) and Table 6-5 (Widening Plan 2 plus deepening alternatives).

Table 6-3
Construction Costs: Channel Deepening Alternatives*

Cost Category	**-42 feet**	**-43 feet**	**-44 feet**
Unrestricted Operating Draft	38 feet	39 feet	40 feet
Channel Dredging (w/disposal, mob, & de-mob)	$2,287,271	$5,891,577	$10,021,292
Berth Dredging	$126,750	$190,125	$253,500
S&A and E&D (7.5% each)	$343,091	$883,737	$1,503,194
Interest During Construction	$47,791	$74,072	$84,737
Sub-Total	**$2,804,903**	**$7,039,510**	**$11,862,723**
Contingency (20.97%)[27]	$588,188	$1,476,185	$2,487,613
Total Deepening Only Construction Costs	**$3,393,091**	**$8,515,695**	**$14,350,336**

*Excludes channel widening – deepening at existing widths only

[27] The appropriate contingency level was identified by the Cost and Schedule Risk Analysis (Engineering Appendix Attachment M: Cost and Schedule Risk Analysis Report

Table 6-4
Construction Costs: Widening Plan 1 (450 feet) and Channel Deepening

Cost Category	**-42 feet**	**-43 feet**	**-44 feet**
Unrestricted Operating Draft	38 feet	39 feet	40 feet
Real Estate	$822,623	$822,623	$822,623
Upland Excavation	$2,186,521	$2,186,521	$2,186,521
Revetment	$2,890,370	$2,890,370	$2,890,370
Fence	$100,758	$100,758	$100,758
Tower Guy	$17,267	$17,267	$17,267
Warning Sign	$90,301	$90,301	$90,301
Retaining Wall	$1,189,696	$1,189,696	$1,189,696
Submarine Sail	$43,888	$43,888	$43,888
Aids to Navigation	$1,975,000	$1,975,000	$1,975,000
Mooring Dolphin	$190,000	$190,000	$190,000
Dredging (w/disposal, mob, & de-mob)	$6,327,537	$10,274,373	$14,749,236
Berth Dredging	$126,750	$190,125	$253,500
S&A and E&D (7.5% each)	$2,074,942	$2,622,481	$3,242,001
Interest During Construction	$371,200	$434,170	$444,263
Sub-Total	**$18,406,852**	**$23,027,572**	**$28,195,424**
Contingency (20.97%)[28]	$3,859,917	$4,828,882	$5,912,580
Total Widening 1 Plus Deepening Plan Construction Costs	**$22,266,769**	**$27,856,454**	**$34,108,004**

[28] The appropriate contingency level was identified by the Cost and Schedule Risk Analysis (Engineering Appendix Attachment M: Cost and Schedule Risk Analysis Report

Table 6-5
Construction Costs: Widening Plan 2 (500 feet) and Channel Deepening

Cost Category	-42 feet	-43 feet	-44 feet
Unrestricted Operating Draft	38 feet	39 feet	40 feet
Real Estate	$1,645,245	$1,645,245	$1,645,245
Upland Excavation	$4,588,251	$4,588,251	$4,588,251
Revetment	$2,890,370	$2,890,370	$2,890,370
Fence	$100,758	$100,758	$100,758
Tower Guy	$17,267	$17,267	$17,267
Warning Sign	$90,301	$90,301	$90,301
Retaining Wall	$1,189,696	$1,189,696	$1,189,696
Submarine Sail	$43,888	$43,888	$43,888
Aids to Navigation	$1,975,000	$1,975,000	$1,975,000
Mooring Dolphin	$190,000	$190,000	$190,000
Berth Dredging	$126,750	$190,125	$253,500
Dredging (w/disposal, mob, & de-mob)	$9,590,087	$13,849,784	$18,637,509
S&A and E&D (7.5% each)	$3,120,355	$3,768,816	$4,496,481
Interest During Construction	$563,586	$617,672	$629,839
Sub-Total	**$26,131,554**	**$31,157,174**	**$36,748,105**
Contingency (20.97%)	$5,479,787	$6,533,659	$7,706,078
Total Widening 2 Plus Deepening Plan Construction Costs	**$31,611,341**	**$37,690,833**	**$44,454,182**

6.3.2 Costs of Previously Completed Work

Construction of the Interim Corner Cut Off (ICCO) included upland excavation, dredging, the re-construction of Grouper Road and the adjacent utility corridor. The work included 354,322 cubic yards of upland excavation and 507,253 cubic yards of dredging. All dredging was conducted at depths above -45 feet. The total cost of the ICCO, including engineering, design, supervision, and administration is $13,775,063 (Table 6-6). These costs are not included in project costs in this report because they were expended in advance of project authorization in order to meet the near term navigation needs of new vessels arriving at the Port since initiation of

the Section 203 study. The CPA will seek credit for these costs as part of the specific Congressional authorization for the proposed project improvements.

Table 6-6
Cost of Work Completed By CPA

Work Item	Cubic Yards	Cost
Upland Excavation	354,322	$5,556,188
Dredging	507,253	$7,309,700
Dredging & Upland SA & ED		$454,991
Grouper Road and Utility Re-construction		$399,188
Grouper Rd & Utility SA & ED		$54,996
Total ICCO Cost		$13,775,063

6.3.3 Operations and Maintenance Costs

Operation and maintenance costs generated by the project are defined as those incremental operations and maintenance costs that are in excess of the costs already required to operate and maintain the existing Federal project. The operations and maintenance costs of the alternative plans are based on increased maintenance dredging volumes due to the widening of the existing channels. Analysis of historical maintenance dredging patterns and the hydrodynamics analysis of without and with-project conditions indicate that very minor changes in hydraulic conditions due to channel deepening would result in no additional maintenance dredging volumes due to the deepening alternatives. Therefore, no appreciable additional operations and maintenance costs are allocated to the channel deepening alternatives.

The estimated annual volume of additional maintenance dredging material generated by the Widening 1 alternative is 52,125 cubic yards. The resulting additional Widening 1 alternative plan-related maintenance dredging cost is $467,561 ($8.97/CY) annually. The estimated annual volume of additional maintenance dredging material generated by the Widening 2 alternative is 69,500 cubic yards. The resulting additional Widening 2 alternative plan-related maintenance dredging cost is $623,415 ($8.97/CY) annually.

6.3.4 Total Average Annual Equivalent Costs

Tables 6-7 through 6-10 present the total Average Annual Equivalent (AAEQ) project costs for each alternative plan and the incremental AAEQ cost for each successive plan increment. For tables presenting combined widening and deepening project AAEQ cost information (Tables 6-9 and 6-10), the first project increment is channel widening. Channel widening is the appropriate first increment because channel widening is the only type of improvement that benefits both the cargo and cruise industries operating at the Port (Section 6.3 With-Project Benefits). The succeeding increments are channel deepening starting with a two-foot increment followed by successive one-foot increments, where necessary to achieve the required depths identified in Table 5-1 (rounded up to the nearest full foot). All average annual equivalent costs are calculated with the FY 2012 price levels and discount rate of 4.00% over a period of 50 years.

Table 6-7
Average Annual Equivalent (AAEQ) Project Costs: Channel Widening

Alternative Plan	Total First Costs	Total AAEQ First Costs	Incremental Annual Maintenance Costs	Total AAEQ Costs	Incremental AAEQ Costs
Widening Plan 1 (450 feet)	$21,077,740	$981,173	$467,561	$1,448,734	$1,448,734
Widening Plan 2 (500 feet)	$28,722,269	$1,337,027	$623,415	$1,960,442	$511,708

Note: FY 2012 Price Levels, FY 2012 discount rate = 4.00%, period 50 years

Table 6-8
Average Annual Equivalent (AAEQ) Project Costs: Channel Deepening

Alternative Plan	Total First Costs	Total AAEQ First Costs	Incremental Annual Maintenance Costs	Total AAEQ Costs	Incremental AAEQ Costs
-42-foot Plan	$3,393,091	$157,949	$0	$157,949	$157,884
-43-foot Plan	$8,515,695	$396,407	$0	$396,407	$238,458
-44-foot Plan	$14,350,336	$668,011	$0	$668,011	$271,604

Note: FY 2012 Price Levels, FY 2012 discount rate = 4.00%, period 50 years

Table 6-9
Average Annual Equivalent (AAEQ) Project Costs: Widening Plan 1 (450 feet) and Channel Deepening

Alternative Plan	Total First Costs	Total AAEQ First Costs	Annual Maintenance Costs	Total AAEQ Costs	Incremental AAEQ Costs
450-foot widening (W1) only	$21,077,740	$981,173	$467,561	$1,448,734	$1,448,734
W1 and -42-foot deepening	$22,266,769	$1,036,523	$467,561	$1,504,084	$55,350
W1 and -43-foot deepening	$27,856,454	$1,296,724	$467,561	$1,764,285	$260,201
W1 and -44-foot deepening	$34,108,004	$1,587,734	$467,561	$2,055,296	$291,011

Note: FY 2012 Price Levels, FY 2012 discount rate = 4.00%, period 50 years

Table 6-10
Average Annual Equivalent (AAEQ) Project Costs: Widening Plan 2 (500 feet) and Channel Deepening

Alternative Plan	Total First Costs	Total AAEQ First Costs	Annual Maintenance Costs	Total AAEQ Costs	Incremental AAEQ Costs
500-foot widening (W2) only	$28,722,269	$1,337,027	$623,415	$1,960,442	$1,960,442
W2 and -42-foot deepening	$31,611,341	$1,471,514	$623,415	$2,094,929	$134,487
W2 and -43-foot deepening	$37,690,833	$1,754,516	$623,415	$2,377,931	$283,002
W2 and -44-foot deepening	$44,454,182	$2,069,351	$623,415	$2,692,766	$314,835

Note: FY 2012 Price Levels, FY 2012 discount rate = 4.00%, period 50 years

6.4 With-Project Benefits

The NED Procedures Manual Deep Draft Navigation (IWR Report 91-R-13) presents three general examples of NED navigation project benefits, which are based on the conceptual basis for navigation benefits identified in the Principles and Guidelines (1983). The NED Procedures Manual states as an example of navigation benefits (page 11):

"Reduced cost of transportation through use of vessels (modal shift), through safer or more efficient operation of vessels and/or use of larger more efficient vessels (channel enlargement), and through use of new or alternative vessel routes (new channels or port shift)."

The with-project condition transportation cost savings calculated in this analysis fully coincide with this example presented in the NED Procedures Manual. With-project condition cargo vessel transportation cost savings are based on safer more efficient operation of cargo vessels and use of larger, more efficient cargo vessels. With-project condition cruise ship transportation cost savings are based on safer more efficient cruise ship operations at the port and on reduced cruise ship impacts to cargo operations within the port.

In addition to transportation cost savings generated by the project, the channel widening and deepening reduces surge effects in the Middle Turning Basin, Trident Basin, and at berths NCP3 & 4. The direct benefits to the Navy and Air Force vessels using the Middle and Trident Turning Basins due to reduced surge effect, such as damage reduction or line handling cost reductions, has not been quantified in monetary terms; however, the tug assist cost savings for Trident Basin vessels under with-project conditions has been included in the benefits calculations.

The following sub-sections describe the surge reduction and NED benefit estimation process. NED benefits are presented for with-project channel widening and channel deepening conditions. Channel widening, with associated aids to navigation and turning basin extension, generate cargo ship and cruise ship-related NED benefits. Channel deepening generates cargo ship-related NED benefits. There are no cruise ship related benefits from channel deepening.

6.4.1 Surge Modeling Results – With Project Conditions

The surge modeling investigation described in Section 4.1.3 also compared the surge effects of harbor widening and deepening to surge effects under existing conditions. The results of this comparison showed an overall reduction in surge effects with the project. These included:

- a reduction in peak water surface elevations throughout the harbor under with project conditions;
- a reduction in maximum peak to trough surge height under with project conditions;
- a slight modification in the timing of surge waves under with project conditions; and
- a general reduction in the forces and moments on the berthed vessels ranging from slight to fairly significant under with project conditions.

The surge modeling and analysis documentation report was presented to the Mission Partners for review and comment, who concurred in the results. The final revised report is included in the Engineering Appendix. The final report confirms that surge effects will be moderately reduced (and not at all increased) by channel widening and deepening. Enhanced operational safety for naval and cargo vessels are projected to result from the proposed navigation improvements. NED benefits related to operational safety for naval and cargo vessels have not been calculated in the analysis; however, NED benefits (cost savings) associated with reduction in surge effects are described and quantified below.

6.4.2 Channel Widening Benefits

Channel Widening Plans 1 & 2, including associated aids to navigation and turning basin extension components, are standalone alternative plans. The two channel widening alternative plans do not require a channel deepening component to generate transportation cost savings. A wider channel would beneficially affect cruise ship operations in the Port, reduce the incidence and severity of surge effects on moored cargo vessels during cruise ship passage through the Port, and would allow larger tankers to navigate the channel to and from the Seaport Canaveral Fuel Terminal and other cargo berths. Transportation cost savings would be generated by fewer incidences of tug assist during cruise ship passage through the Port, by fewer incidences of tug assist for cargo vessels in the Port, and by efficiencies gained through the use of larger (longer) tankers at the Seaport Canaveral Fuel Terminal.

There are two components to the beneficial effects of the alternative channel widening plans. One component is that a wider channel would allow longer (greater Length Overall [LOA]) tankers to call at Seaport Canaveral Fuel Terminal. At the request of Seaport Canaveral, the Canaveral Pilots Association has made determinations concerning maximum vessel LOA for Seaport Canaveral tankers. Under without-project conditions, the maximum LOA for Seaport Canaveral tankers is 800 feet. Under Channel Widening Plans 1 and 2, the maximum LOA for Seaport Canaveral tankers increases to 850 feet and 900 feet, respectively.

The second component of alternative widening plan beneficial effects is directly related to wind conditions at the Port. Under perfectly calm conditions (winds ranging from 0 to 5 knots) the existing channel is adequate for most vessel operations. As wind speeds increase, safe navigation within the channel becomes more challenging. At relatively high winds, additional tug assistance is required to maintain navigation within the channel or to provide stabilizing force to offset surge effects on vessels moored at vulnerable piers within the Port. Wind-related

beneficial effects on port operations projected to result from the alternative widening plans, which are assessed in this analysis include:

- Reduction in the frequency of tug assistance for the largest cruise ships under strong wind conditions;
- Reduction in the frequency of tug assistance for the largest Seaport Canaveral tankers (tankers 800 feet LOA and larger); and
- Reduction in the frequency of tug assistance to offset surge impacts for vessels moored in or at
    - Trident Basin (Navy vessels)
    - North Cargo Piers 1 and 2
    - North Cargo Piers 3 and 4.

6.4.2.1 Wind Analysis

An analysis of wind conditions at the Port was conducted to project the effects of winds on port operations. Wind speed, direction, and duration data were obtained from the following sources

- NASA Space Shuttle Landing Facility: March 1978 – August 2009
- Patrick Air Force Base: March 1945 – December 2004
- Trident Submarine Basin (NOAA Station TRDF1): April 2005 – December 2008, and
- NOAA Sea Buoy Station 41009: January 1988 – August 2008

Wind data recorded during cruise ship transit times (4 – 8 am and 3 – 7 pm) were sorted from the overall wind data and were exclusively used in the analysis. Wind data was adjusted for elevation differences between recording station and cruise ship instrumentation. Wind direction was also taken into account by reducing the effect of winds that are not directly abeam of a vessel transiting the channel within the Port (winds from due north or due south). Wind effectiveness ranges from 100% for winds from the north and south to 0% for winds coming directly from the east or west. The wind speeds used in this analysis represent an "effective wind speed" which discounts the effects of winds that are not directly abeam of the vessel during channel transit within the Port. This adjustment artificially reduces the effect of winds on vessels approaching the Port and in the turn at the entrance to the Port.

The lowest maximum wind speed for a continuous three hour period was calculated for cruise ship transit times (morning and afternoon) for Summer (April – October) and Winter (November – March) for NASA Space Shuttle Landing Facility and NOAA Sea Buoy Station 41009 wind records. These calculations were conducted in 5 knot increments: 10 to 15 knots, 15 to 20 knots, 20 to 25 knots, etc. The number of occurrences for each wind speed increment during cruise ship transit time periods was divided by the total number of cruise ship transit time periods to calculate the probability for each wind speed increment during cruise ship transit time periods. The probability for each wind speed increment was multiplied by the probability that a large cruise ship would transit the channel (50 days per year for weekly cruises and 100 days per year for bi-weekly cruises) to obtain a joint probability for each wind speed increment during a large cruise ship transit. The resulting joint probabilities are used to estimate the number of vessel

transits that would be affected by wind conditions (see Economics Appendix Section 5.3.1.1 Wind Analysis).

Similar calculations were conducted to obtain the joint probabilities of potential wind-related effects on other port operations. The joint probability for wind speed increments and large Seaport Canaveral tanker transits was calculated by multiplying the raw wind speed increment probability by the probability of the tanker transiting the channel. The joint probability for vessels moored at surge vulnerable piers was calculated by multiplying the joint probability for cruise ship transit by the probability that a vessel would be moored at the vulnerable pier (berth utilization rates). These berth utilization rates are based on the assumption that at least one vessel will be at the affected pier: North Cargo Piers 1 and 2 - 79%; North Cargo Piers 3 and 4 - 50%, Trident Basin – 10%.

6.4.2.2 Port Operations Analysis

An Operations Matrix was developed by the CPA's consulting engineers in consultation with the Canaveral Pilots Association and the operations personnel at the Canaveral Port Authority Tables 6-11 and 6-12). The Operations Matrix identifies the amount of tug assistance required under various wind speeds under without and with-project conditions. Other port operation activities which may be required under various wind conditions, such as relocation of cargo vessels from docks that are vulnerable to surge from passing vessels and lowering the maximum wind speed for entering and exiting the Port are less likely to be implemented and therefore are not addressed in the Operations Matrix. The beneficial effects of channel widening on these other port operation activities were not assessed in this analysis. The Operations Matrix was reviewed and approved by the Canaveral Pilots Association at one of their monthly membership meetings.

Table 6-11
Operations Matrix: Impact of Widening Plan 1(Number of Tugs)

	Sustained* Wind Speeds (Knots)					
	10-15	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**
Cruise Ship Tug Assist						
Without-project	0	0	0	1	2	2
With-Project	0	0	0	0	1	2
Cargo Vessel Tug Assist NCP 1&2						
Without-project	0	0	0	1	1	1
With-Project	0	0	0	0	1	1
Cargo vessel Tug Assist NCP 3&4						
Without-project	0	0	1	1	1	1
With-Project	0	0	0	1	1	1
Trident Basin Tug Assist						
Without-project	0	0	0	1	1	1
With-Project	0	0	0	0	1	1
Largest Tanker Additional Tug						
Without-project	0	1	1	1	1	1
With-Project	0	0	1	1	1	1

* Lowest maximum wind speed during a consecutive three hour period

Table 6-12
Operations Matrix: Impact of Widening Plan 2
(Number of Tugs)

	Sustained* Wind Speeds (Knots)					
	10-15	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**
Cruise Ship Tug Assist						
Without-project	0	0	0	1	2	2
With-Project	0	0	0	0	1	1
Cargo Vessel Tug Assist NCP 1&2						
Without-project	0	0	0	1	1	1
With-Project	0	0	0	0	0	1
Cargo vessel Tug Assist NCP 3&4						
Without-project	0	0	1	1	1	1
With-Project	0	0	0	0	1	1
Trident Basin Tug Assist						
Without-project	0	0	0	1	2	2
With-Project	0	0	0	0	1	1
Largest Tanker Additional Tug						
Without-project	0	1	1	1	1	1
With-Project	0	0	0	0	1	1

* Lowest maximum wind speed during a consecutive three hour period

6.4.2.3 Widening Plan Benefit Calculations – Tug Assistance Reductions

Alternative Widening Plan benefits (Table 6-13) were calculated using identical assumptions concerning cruise ship schedules, tug operations, and tug costs. Three of the world's largest cruise ships are projected to work out of Port Canaveral on a weekly schedule (*Freedom of the Seas, Carnival Dream, and Disney Dream*) and one (*Disney Fantasy*) is projected to work on a bi-weekly schedule. Cruise ship related benefits are calculated based on the operations of these four vessels only. The three weekly scheduled ships are projected to all arrive and depart on the same day (similar to existing weekly schedule operations). For the base case analysis, it is assumed that a single tug would be sufficient for each wind event. For example, under without-project conditions and a 25-30 knot wind event on a day when the three large cruise ships are entering or exiting the Port, the base case analysis assumes that the same tug would be able to service all three cruise ships at the cost of a single tug call plus stand-by charges for two of the cruise ships. Tug costs are based on the current rates charged by the two tug companies operating in the Port (see Economics Appendix Table 5-14 for sample calculation).

Table 6-13
Alternative Widening Plan Annual Benefits – Tug Assistance Reductions: 2020

	Tug Assist Events		Tug Assist Costs		
	Without Project	**With Project**	**Without Project**	**With Project**	**Transportation Cost Savings**
Channel Widening Plan 1 (450 feet)					
Seaport Canaveral Tankers	10	4	$49,125	$23,924	$25,201
Trident Basin (Navy vessel) Tug Assist	2	1	$20,418	$8,411	$12,007
North Cargo Piers 3 & 4 Tug Assist	17	8	$144,787	$70,628	$74,159
North Cargo Piers 1 & 2 Tug Assist	13	6	$111,592	$49,709	$61,883
Cruise Ship Tug Assist	24	10	$754,663	$310,883	$443,780
Total					**$617,030**
Channel Widening Plan 2 (500 feet)					
Seaport Canaveral Tankers	10	0.5	$49,125	$4,689	$44,436
Trident Basin (Navy vessel) Tug Assist	2	1	$20,418	$6,934	$13,484
North Cargo Piers 3 & 4 Tug Assist	17	4	$144,787	$31,462	$113,326
North Cargo Piers 1 & 2 Tug Assist	13	2	$111,592	$16,739	$94,853
Cruise Ship Tug Assist	24	8	$754,663	$256,301	$498,362
Total					**$764,461**

Alternative channel widening plans also allow the use of longer tankers at the Seaport Canaveral Terminal. The terminal operators have already engaged the Canaveral Pilots Association in discussions concerning the largest ships that can safely enter and exit the Port for diesel fuel and gasoline deliveries. The use of larger ships will allow Seaport Canaveral Terminal to import the same annual tonnage with fewer vessel trips (Table 6-14). The transportation cost savings are calculated as the avoided trip costs.

Avoided trip costs are calculated using most recent Corps of Engineers vessel operating costs for the appropriate vessel size and for an estimated trip one-way distance. Vessels are assumed to arrive at the Port's maximum unconstrained operating draft (36.0 feet) under without-project and alternative with-project conditions. Seaport Canaveral purchases spot cargoes rather than maintain multiple deliverable contracts with refineries. The terminal does not maintain time-charter relationships with carriers or long-term contracts with individual refiners. Under these "spot market" operations, vessels and import cargo may reasonably come from any one of the major petroleum product importers to the US.

Actual Seaport Canaveral point-to-point distance data mostly includes imports but also includes some domestic movements to Seaport Canaveral and some export movements which have been observed between February 2010 and July 2011. One-way travel distance per trip (2,014 miles) was calculated as a weighted average of the distances from the actual ports of origin or destination for all Seaport Canaveral point-to-point tanker calls observed between February 2010 and July 2011. The weights are based on the proportion of the origins or destinations total Seaport Canaveral point-to-point tanker tonnage for February 2010 through July 2011.

Table 6-14
Alternative Channel Widening Plan Annual Benefits – Larger Tankers: 2020

	Without Project (400 feet)	Widening Plan 1 (450 feet)	Widening Plan 2 (500 feet)
Vessel LOA	600 feet	850 feet	900 feet
Arrival Draft	36 feet	36 feet	36 feet
Tons per trip	41,323	57,852	74,381
Number of trips	55	39	30
Total Annual Cost	$8,639,226	$7,479,649	$6,708,974
Transportation Cost Savings	**---**	**$1,159,577**	**$1,930,252**

Total annual channel widening plan benefits are the sum of the benefits due to reduced tug assistance and avoided fuel import trips (Table 6-15). It is important to note that the without-project condition reflects the effects of the CPA's widening beyond the federal channel, which includes the Interim Corner Cut Off and channel notching as described in Section 3: Without-Project Conditions.

Table 6-15
Total Annual Channel Widening Benefits

	Total Benefits
Channel Widening Plan 1 (450 feet)	
Reduced Tug Assist	$606,126
Avoided Tanker Trips	$1,277,842
Total	**$1,883,968**
Channel Widening Plan 2 (500 feet)	
Reduced Tug Assist	$745,426
Avoided Tanker Trips	$2,084,322
Total	**$2,829,748**

6.4.3 Channel Deepening Benefits

With-project channel deepening benefits will result from cargo vessels arriving at Port Canaveral with deeper drafts and larger loads than under without-project conditions. Larger loads and deeper drafts allow vessels to operate more efficiently. This efficiency gain is calculated as the difference in operating costs for vessels delivering the projected commodity tonnage under without and with-project conditions. In the assessment of alternative plans, the annual projected tonnage is the same under without and with-project conditions, but the number of trips required and annual operating costs (ocean voyage costs plus landside costs) will decrease due to deeper with-project channel depths.

Identification of the commodities and vessel fleet that may be impacted by deeper channel depths is based on observed historical (fiscal years 2000 – 2009) and calendar year 2006 vessel operations and commodity data. Only six commodities (aggregates, cement, limestone, granite, slag, and fuel oil) are typically delivered in large enough quantities on cargo vessels of sufficient size to potentially take advantage of a deeper channel. For future fuel oil deliveries to the Seaport Canaveral Fuel Terminal, the projected fleet and projected volumes are based on Seaport Canaveral's operational projections as presented to the CPA and discussions with port planning and operations personnel.

Table 6-16 presents the calendar year 2006 vessel and load characteristics (with the exception of projected Seaport Canaveral Fuel Terminal vessel calls) used to project with-project condition drafts and loads. Vessel type classifications were used to differentiate between different size vessels carrying the same commodity, and to differentiate among vessels carrying the same commodity to different terminals at Port Canaveral (e.g., vessels carrying cement to north cargo pier (NCP) 4 and cement to south cargo pier (SCP) 5 are designated as different vessel types because cement vessels calling at NCP4 typically load more deeply and have different origins than cement vessels calling at SCP5). The allocation of commodity tonnage to each vessel type is based on the observed 2006 proportion of the commodity carried on that vessel type. For

example, a 60,000 DWT vessel delivering aggregate carried 41% (171,137) of the total 412,598 tons of aggregate delivered to Port Canaveral in calendar year 2006.

Vessel and load characteristics for vessels projected to call at the Seaport Canaveral Fuel Terminal are based on their first 18 months of operational data, discussions with CPA personnel and the projections provided to the CPA by Seaport Canaveral. Point-to-point calls at Seaport Canaveral accounted for 44% of all petroleum products moved through the facility from February 2010 through July 2011.

Under without-project conditions, Seaport Canaveral point-to-point fuel oil tanker length is based on observations presented in Section 2.5.7 Existing Cargo Fleet Operations and Tidal Advantage. Although 800 feet LOA is the longest cargo vessel the Canaveral Pilots will bring into the harbor, at the existing unconstrained operating draft (36 feet) large tankers are required to light load to the extent that they are less efficient than a smaller tanker, which can be more fully loaded when operating with a draft of 36 feet. Because Seaport Canaveral point-to-point tankers do not use tidal advantage, they are regularly 600 feet LOA, which allows more efficient operations under the without-project depth constraint. Under channel widening and deepening conditions, Seaport Canaveral point-to-point tankers are projected to increase in length and operate at deeper drafts, which allow the longer vessels to operate efficiently.

- without-channel widening conditions (800 feet LOA maximum);
- with-project Widening Plan 1 (850 feet LOA maximum); and
- with-project Widening Plan 2 (900 feet LOA maximum).

Vessel arrival draft is based on the without-project condition unrestricted maximum vessel operating draft (no tidal advantage required; 36.0 feet).

Table 6-16
Large Cargo Vessel Characteristics

	2006 Observed Averages				
Commodity	**DWT**	**Length**	**Arrival Draft**	**Tonnage per call**	**Percent of Commodity Total**
Aggregate	60,000	700	38.7	57,046	41%
Cement	35,000	589	33.3	34,117	16%
Cement	35,000	609	33.5	39,295	47%
Cement	40,000	634	34.5	23,155	7%
Limestone	35,000	597	36.0	37,529	38%
Granite	60,000	753	39.5	60,335	62%
Slag	35,000	599	34.8	41,882	100%
Fuel Oil w/o*	50,000	600	36.0	41,323	44%
Fuel Oil Wide Plan 1	70,000	850	36.0	57,852	44%
Fuel Oil Wide Plan 2	90,000	900	36.0	74,381	44%

Source: CPA data
*Note: Fuel oil vessels based on actual (without-project) and projected with-project Seaport Canaveral Terminal fleet characteristics

Table 6-17 presents the without and with-project condition operating drafts and tonnage per call for selected large cargo vessels. Operating drafts under future with-project conditions are estimated based on observed 2006 operating drafts. Large deep draft cargo vessels arriving at Port Canaveral typically arrive with loads just less than the 36-foot constraint in order to avoid tide and priority traffic delays (see discussion in Section 2.5.7 Existing Cargo Fleet Operations). In 2006, 51 vessels arrived with drafts between 33 and 36 feet and only 19 vessels arrived at drafts greater than 36 feet. Projected with-project operating drafts maintain the observed relationship between a vessel's arrival draft and the port's maximum unconstrained arrival draft. In this way the carrier's observed reliance on tidal advantage, or conversely, the carrier's observed reluctance to use the tide is projected in the alternative depth scenarios under with-project conditions. For example, in 2006 slag vessels arrived, on average, with an operating draft of 34.8 feet, which is 1.2 feet less than the 36-foot maximum unconstrained arrival draft. Under with-project conditions, slag vessels always maintain that 1.2–foot differential, so that under a two-foot deepening with-project condition the maximum unconstrained arrival draft increase to 38 feet and slag vessels are projected to arrive at 36.8 feet (38 – 1.2 = 36.8).

With-project unconstrained vessel operating drafts are truncated at 39.5 feet. Port terminal operators and the pilots have identified 39.5 feet as the required unconstrained maximum

operating draft for existing and future vessels. Currently, vessels arriving with drafts greater than 36 feet are constrained by channel depth conditions. Port terminal operators do not project that future vessels will regularly arrive at operating drafts greater than 39.5 feet, although occasional vessels may arrive with deeper drafts. The reason for this unconstrained maximum operating draft (39.5 feet) is that 40 feet of depth at the port's berths is considered approximately the maximum depth that can be achieved without the need for major reconstruction. A depth of 40 feet at the berth provides the minimum one-half foot of required underkeel clearance for vessels berthed with a draft of 39.5 feet. For these reasons, the deepest future unconstrained operating draft at the port would be no greater than 39.5 feet in accordance with the limitations of the port's existing berths and the dimensions of the projected fleet. No benefits are associated with channel depths greater than the design requirements identified in Table 5-3 Existing Channel Depth and Draft Requirements.

Channel deepening also extends the period of time when naval vessels can access the Trident Basin without the need for tidal advantage. Reducing the need for tidal advantage extends the unrestricted operational capability of naval vessels. NED benefits have not been calculated for this ancillary benefit to the US Navy.

Table 6-17
Without and With-project Operating Drafts and Tons per Call

		Operating Drafts			
Commodity	**DWT**	**Without Project (-40 feet)**	**-42 feet**	**-43 feet**	**-44 feet**
Aggregate	60,000	38.7	39.5	39.5	39.5
Cement	35,000	33.3	35.3	36.3	37.3
Cement	35,000	33.5	35.5	36.5	37.5
Cement	40,000	34.5	36.5	37.5	38.5
Limestone	35,000	36.0	38.0	39.0	39.5
Granite	60,000	39.5	39.5	39.5	39.5
Slag	35,000	34.8	36.8	37.8	38.8
Fuel Oil w/o	50,000	36.0	38.0	39.0	39.5
Fuel Oil Wide Plan 1	70,000	36.0	38.0	39.0	39.5
Fuel Oil Wide Plan 2	90,000	36.0	38.0	39.0	39.5
			Tons per Call		
Commodity	**DWT**	**Without Project (-40 feet)**	**-42 feet**	**-43 feet**	**-44 feet**
Aggregate	60,000	57,046	57,174	57,174	57,174
Cement	35,000	34,117	36,749	38,066	39,382
Cement	35,000	39,295	41,928	43,245	44,561
Cement	40,000	23,155	26,015	27,446	28,876
Limestone	35,000	37,529	40,162	41,478	42,136
Granite	60,000	60,335	60,335	60,335	60,335
Slag	35,000	41,882	44,515	45,832	47,148
Fuel Oil w/o	50,000	41,323	44,717	46,414	47,263
Fuel Oil Wide Plan 1	70,000	57,852	62,061	64,165	65,217
Fuel Oil Wide Plan 2	90,000	74,381	79,323	81,794	83,030

The number of projected cargo vessel calls for the mid-level (base case) commodity forecast is presented in Table 3-4. Only a sub-set of Port Canaveral commodities and vessels would benefit

from channel deepening as discussed above. Table 6-18 presents the total number of vessel calls for benefiting commodities for the mid-level (base case) commodity forecast at alternative plan depths without channel widening. Year 2020 is presented in the table as an example. Note that as the channel depth increases the number of vessel calls required to move an equivalent amount of cargo decreases.

Table 6-18
Projected Benefiting Cargo Vessel Calls: 2020

	Without Project (-40 feet)	-42 feet	-43 feet	-44 feet
Aggregate	5	5	5	5
Cement	10	9	9	9
Limestone	16	15	14	14
Granite	16	15	14	14
Slag	6	6	6	6
Gasoline[1]	44	41	39	39
Distillate Fuel[1]	11	10	10	10
Totals	**108**	**101**	**97**	**97**

[1] Seaport Canaveral point-to-point tankers only

Total and incremental average annual equivalent transportation costs for large cargo vessels under without and with-project conditions are presented in Table 6-19. Benefits are calculated with and without alternative widening plans in effect. Channel widening impacts deepening benefits because the projected tanker fleet (fuel oil vessels only) calling at Seaport Canaveral Terminal shifts to larger vessels under Widening Plans 1 and 2. Channel deepening benefits decline slightly with widening plans in effect because without-deepening project transportation costs are less due to the use of larger tankers resulting in fewer tanker calls. Projected benefits exhibit diminishing returns to channel deepening in that incremental benefits decline at successively deeper project depths.

Table 6-19
Average Annual Equivalent Transportation Cost Savings: Deepening Alternatives

Plan	Total Transportation Cost	Total Transportation Cost Savings	Incremental Cost Savings
Without Channel Widening			
Without-deepening	$26,708,104		
-42 feet	$25,074,989	$1,633,114	$1,633,114
-43 feet	$24,345,037	$2,363,067	$729,953
-44 feet	$23,767,018	$2,941,086	$578,019
With Widening Plan 1 (450 feet)			
Without-deepening	$25,430,262		
-42 feet	$23,976,241	$1,454,021	$1,454,021
-43 feet	$23,306,902	$2,123,360	$669,339
-44 feet	$22,755,178	$2,675,084	$551,724
With Widening Plan 2 (500 feet)			
Without-deepening	$24,623,781		
-42 feet	$23,231,700	$1,392,081	$1,392,081
-43 feet	$22,621,773	$2,002,008	$609,927
-44 feet	$22,092,217	$2,531,564	$529,556

Tables 6-15 and 6-19, above, separately present the benefits of alternative widening and deepening plans. Projects that employ widening and deepening plans would generate the cumulative benefits of both types of improvement. For example, a project that combines Widening Plan 1 (450-foot channel width) with a -42-foot channel depth would generate $1,883,968 in widening plan benefits (Table 6-15) and $1,454,021 in deepening plan benefits (Table 6-19) for a total project benefit of $3,337,989. Table 6-20 presents a matrix of total project benefits which would be generated by combining Widening Plan 1 (450 feet) or Widening Plan 2 (500 feet) with incremental deepening from -42 feet to -44 feet.

Table 6-20
Total Project AAEQ Benefits: Widening and Deepening Plan Combinations

	No Deepening	-42 feet	-43 feet	-44 feet
No Widening	-	$1,633,114	$2,363,067	$2,941,086
Widening Plan 1 (450 feet)	$1,883,968	$3,337,989	$4,007,328	$4,559,051
Widening Plan 2 (500 feet)	$2,829,748	$4,221,830	$4,831,756	$5,361,312

6.5 Net Benefits of Alternative Plans

The alternative plan net benefits presented in Tables 6-21 through 6-24 are calculated as the difference between the total annual average equivalent costs and benefits of each alternative. The incremental net benefits of the alternative plans are decreasing with successive plan increments, but remain positive overall, which indicates that the incremental benefits of each successive alternative are greater than the incremental costs. The plan with the greatest net benefits of all plans evaluated is Widening Plan 2 (500 feet) combined with -44 foot deepening. This is the recommended plan, consistent with CPA's request for a categorical exemption from the NED plan.

Table 6-21
Cost – Benefit Analysis: Channel Widening Only

Alternative Plan	Total AAEQ Costs	Total AAEQ Benefits	Total Net Benefits	Incremental Net Benefits	B/C Ratio
Widening Plan 1 (450 feet)	$1,448,734	$1,883,968	$435,233	$435,233	1.3
Widening Plan 2 (500 feet)	$1,960,442	$2,829,748	$869,306	$434,073	1.4

Note: Discount rate = 4.00%, period 50 years

Table 6-22
Cost – Benefit Analysis: Channel Deepening Only

Alternative Plan	Total AAEQ Costs	Total AAEQ Benefits	Total Net Benefits	Incremental Net Benefits	B/C Ratio
-42 feet	$157,949	$1,633,114	$1,475,165	$1,475,165	10.3
-43 feet	$396,407	$2,363,067	$1,966,660	$491,494	6.0
-44 feet	$668,011	$2,941,086	$2,273,075	$306,415	4.4

Note: Discount rate = 4.00%, period 50 years

Table 6-23
Cost – Benefit Analysis: Widening Plan 1 (450 feet) and Channel Deepening

Alternative Plan	Total AAEQ Costs	Total AAEQ Benefits	Total Net Benefits	Incremental Net Benefits	B/C Ratio
450-foot widening (W1) only	$1,448,734	$1,883,968	$435,233	$435,233	1.3
W1 and -42-foot deepening	$1,504,084	$3,337,988	$1,833,905	$1,398,671	2.2
W1 and -43-foot deepening	$1,764,285	$4,007,328	$2,243,043	$409,138	2.3
W1 and -44-foot deepening	$2,055,296	$4,559,051	$2,503,756	$260,713	2.2

Note: Discount rate = 4.00%, period 50 years

Table 6-24
Cost – Benefit Analysis: Widening Plan 2 (500 feet) and Channel Deepening

Alternative Plan	Total AAEQ Costs	Total AAEQ Benefits	Total Net Benefits	Incremental Net Benefits	B/C Ratio
500-foot widening (W2) only	$1,960,442	$2,829,748	$869,306	$869,306	1.4
W2 and -42-foot deepening	$2,094,929	$4,221,830	$2,126,900	$1,257,594	2.0
W2 and -43-foot deepening	$2,377,931	$4,831,756	$2,453,826	$326,925	2.0
W2 and -44-foot deepening	$2,692,766	$5,361,312	$2,668,546	$214,721	2.0

Note: Discount rate = 4.00%, period 50 years

Updating plan W2 and -44-foot deepening using the FY 2013 price level (based on EM 1110-2-1304 revised 31March11) and with the FY 2013 discount rate (3.75%) results in total average annual benefits of $5,393,000, total average annual costs of $2,647,000, total net annual benefits of $2,747,000, and a benefit-cost ratio of 2.0 to 1.

6.6 Summary of Accounts and Plan Comparison

Plan formulation has been conducted for this study with a focus on contributing to National Economic Development (NED) with consideration of all effects, beneficial or adverse, to each of the four evaluation accounts identified in the Principles and Guidelines (1983).

Plan selection is based on a weighting of the projected effects of each alternative on the four evaluation accounts. Qualitative and quantitative information has been reviewed for major project effects and for major potential effect categories. The alternatives were also compared and contrasted according to their achievement of the additional criteria of a) effectiveness; b) completeness; c) acceptability, and d) efficiency according to applicable Corps guidelines.

In addition to these four traditional criteria, information on achievement of project-specific opportunities and avoidance of project-specific constraints is also presented in System of Accounts format, for comparison at the same level of scrutiny of the information presented in other accounts.

The comparison of final alternatives includes future without-project conditions and future with-project conditions for each alternative plan, in a "System of Accounts" comparison format (Tables 6-25 – 6-27).

Table 6-25
Contributions to Planning Objectives: Individual Plans

Opportunities	No Action	Widening Plan 1 (450 feet)	Widening Plan 2 (500 feet)	-42 feet	-43 feet	-44 feet
Plan Description	Channel 400 feet wide; -39 feet deep in the Middle Turning Basin	Channel 450 feet wide; -40 feet deep in the Inner Reach	Channel 500 feet wide; -40 feet deep in the Inner Reach	Channel 400 feet wide; -42 feet deep in the Inner Reach	Channel 400 feet wide; -43 feet deep in the Inner Reach	Channel 400 feet wide; -44 feet deep in the Inner Reach
Improve cruise ship operations efficiency	Under wind conditions large cruise ships require tug assistance	Minor improvement because fewer tug assist events are needed	Largest improvement because fewer tug assist events are need than under Wide 1	No change to cruise ship tug assistance	No change to cruise ship tug assistance	No change to cruise ship tug assistance
More efficient cargo vessel loading	Cargo vessels are depth constrained causing light loaded conditions	No change to vessel loading	No change to vessel loading	Vessels may load up to two feet deeper draft with minor efficiency improvements	Vessels may load up to three feet deeper draft with moderate efficiency improvements	Vessels may load up to four feet deeper draft with greatest efficiency improvement
Use of larger cargo vessels	Cargo vessel length is constrained to a maximum of 800 feet	Minor improvement; cargo vessel length is constrained to 850 feet	Largest improvement; cargo vessel length is constrained to 900 feet	No change in cargo vessel size	No change in cargo vessel size	No change in cargo vessel size
Increase safety by reducing surge effects	Transit speeds to maintain safe crab angle cause surge effects at cargo piers and Trident basin	Minor increase in safe crab angle allows slower transit speed with minor reduction in surge effects	Largest increase in safe crab angle allows slower transit speed with largest reduction in surge effects	Minor reduction in surge effects	Minor reduction in surge effects	Minor reduction in surge effects
Accommodate development of more efficient berths and terminals	Berth operations constrained by surge effects; cargo vessels must stop loading and unloading when large cruise ships pass by	Minor reduction in berth operation constraints	Largest reduction in berth operation constraints	Minor reduction in berth operation constraints	Minor reduction in berth operation constraints	Minor reduction in berth operation constraints

Constraints	**No Action**	**Widening Plan 1 (450 feet)**	**Widening Plan 2 (500 feet)**	**-42 feet**	**-43 feet**	**-44 feet**
Avoid Significant Impacts to West Indian Manatee	No additional effects; existing and future protection measures would be followed	No additional effects; manatee protection measures will be followed during construction	No additional effects; manatee protection measures will be followed during construction	No additional effects; manatee protection measures will be followed during construction	No additional effects; manatee protection measures will be followed during construction	No additional effects; manatee protection measures will be followed during construction
Avoid Significant Impacts to Right Whales	No additional effects; existing future protection measures would be followed	Minor reduction in impacts to Right Whales due to fewer tug assist events	Minor reduction in impacts to Right Whales due to fewer tug assist events	Minor reduction in impacts to Right Whales due to fewer cargo vessel calls	Minor reduction in impacts to Right Whales due to fewer cargo vessel calls	Minor reduction in impacts to Right Whales due to fewer cargo vessel calls
Avoid Significant Impacts to Least Terns	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area
Avoid Significant Impacts to Florida Scrub Jay	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area
Avoid Significant Impacts to Southeastern Beach Mouse	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area
Avoid Significant Impacts to Gopher Tortoise	No additional effects; existing future protection measures would be followed	No significant impacts projected; any Gopher Tortoises found within the project area would be relocated	No significant impacts projected; any Gopher Tortoises found within the project area would be relocated	No additional effects; species is not present in the dredging or placement area	No additional effects; species is not present in the dredging or placement area	No additional effects; species is not present in the dredging or placement area
Avoid Significant Impacts to Sea Turtles	No additional effects; existing future protection measures would be followed	Protection measures will be taken during rip-rap removal to avoid significant impacts	Protection measures will be taken during rip-rap removal to avoid significant impacts	Dredging blackout window not required; no significant impacts projected	Dredging blackout window not required; no significant impacts projected	Dredging blackout window not required; no significant impacts projected
Avoid significant impacts to existing terminal facilities and operations	Existing facilities will be maintained and operated at existing levels of efficiency	Widening on the north side of the channel avoids impacts to south cargo piers	Widening on the north side of the channel avoids impacts to south cargo piers	No significant impacts to existing terminal facilities and operations	No significant impacts to existing terminal facilities and operations	No significant impacts to existing terminal facilities and operations

Evaluation Criteria	**No Action**	**Widening Plan 1 (450 feet)**	**Widening Plan 2 (500 feet)**	**-42 feet**	**-43 feet**	**-44 feet**
Completeness	Planning objectives would not be realized	Assumes that trend towards larger more efficient vessels, as historically observed at Port Canaveral and elsewhere will continue	Assumes that trend towards larger more efficient vessels, as historically observed at Port Canaveral and elsewhere will continue	Assumes that trend towards larger more efficient vessels, as historically observed at Port Canaveral and elsewhere will continue	Assumes that trend towards larger more efficient vessels, as historically observed at Port Canaveral and elsewhere will continue	Assumes that trend towards larger more efficient vessels, as historically observed at Port Canaveral and elsewhere will continue
Efficiency	Inefficient use of port, terminal, and vessels resources	Minor improvement in efficient use of port, terminal, and vessels	Moderate improvement in efficient use of port, terminal, and vessels	Minor improvement in efficient use of port, terminal, and vessels	Moderate improvement in efficient use of port, terminal, and vessels	Higher improvement in efficient use of port, terminal, and vessels
Effectiveness	No contribution to achievement of objectives	Minor contribution to achievement of objectives	Moderate contribution to achievement of objectives	Minor contribution to achievement of objectives	Moderate contribution to achievement of objectives	Higher contribution to achievement of objectives
Acceptability	Compliant with applicable laws, regulations, and public policies	Compliant with applicable laws, regulations, and public policies	Compliant with applicable laws, regulations, and public policies	Compliant with applicable laws, regulations, and public policies	Compliant with applicable laws, regulations, and public policies	Compliant with applicable laws, regulations, and public policies

System of Accounts	**No Action**	**Widening Plan 1 (450 feet)**	**Widening Plan 2 (500 feet)**	**-42 feet**	**-43 feet**	**-44 feet**
NED	Highest transportation costs	Minor transportation cost savings	Moderate transportation cost savings	Minor transportation cost savings	Moderate transportation cost savings	Greater transportation cost savings
RED	Port is a major contributor to local economic activity	No discernible impact to RED account	No discernible impact to RED account	No discernible impact to RED account	No discernible impact to RED account	No discernible impact to RED account
EQ	Port maintains all protection and impact avoidance policies and procedures	Temporary minor impacts during construction; no significant environmental impacts	Temporary minor impacts during construction; no significant environmental impacts	Temporary minor impacts during construction; no significant environmental impacts	Temporary minor impacts during construction; no significant environmental impacts	Temporary minor impacts during construction; no significant environmental impacts
OSE	Safe vessel and terminal operations are compromised by channel dimensions	Minor improvement to safe vessel and terminal operations	Major improvement to safe vessel and terminal operations	Minor reduction in energy requirements due to reduced vessel trips	Moderate reduction in energy requirements due to reduced vessel trips	Highest reduction in energy requirements due to reduced vessel trips

Table 6-26
Contributions to Planning Objectives: Combined Plans (Widening Plan 1 [450 feet] and Deepening)

Opportunities	**No Action**	**Widening Plan 1 & -42 feet**	**Widening Plan 1 & -43 feet**	**Widening Plan 1 & -44 feet**
Improve cruise ship operations efficiency	Under wind conditions large cruise ships require tug assistance	Minor improvement because fewer tug assist events are needed	No incremental change to cruise ship tug assistance	No incremental change to cruise ship tug assistance
More efficient cargo vessel loading	Cargo vessels are depth constrained causing light loaded conditions	Vessels may load up to two feet deeper draft with minor efficiency improvements	Vessels may load up to three feet deeper draft with moderate efficiency improvements	Vessels may load up to four feet deeper draft with greatest efficiency improvement at this channel width
Use of larger cargo vessels	Cargo vessel length is constrained to a maximum of 800 feet	Minor efficiency improvement; cargo vessel length is constrained to 850 feet but vessel may load two feet deeper	Moderate efficiency improvement; cargo vessel length is constrained to 850 feet but vessel may load three feet deeper	Greatest efficiency improvement at this channel width; cargo vessel length is constrained to 850 feet but vessel may load four feet deeper
Increase safety by reducing surge effects	Transit speeds to maintain safe crab angle cause surge effects at cargo piers and Trident basin	Minor increase in safe crab angle allows slower transit speed with minor reduction in surge effects	Minor increase in safe crab angle allows slower transit speed with minor reduction in surge effects	Minor increase in safe crab angle allows slower transit speed with minor reduction in surge effects
Accommodate development of more efficient berths and terminals	Berth operations constrained by surge effects; cargo vessels must stop loading and unloading when large cruise ships pass by	Minor reduction in berth operation constraints	Minor reduction in berth operation constraints	Minor reduction in berth operation constraints

Constraints	**No Action**	**Widening Plan 1 & -42 feet**	**Widening Plan 1 & -43 feet**	**Widening Plan 1 & -44 feet**
Avoid Significant Impacts to West Indian Manatee	No additional effects; existing and future protection measures would be followed	No additional effects; manatee protection measures will be followed during construction	No additional effects; manatee protection measures will be followed during construction	No additional effects; manatee protection measures will be followed during construction
Avoid Significant Impacts to Right Whales	No additional effects; existing future protection measures would be followed	Minor reduction in impacts to Right Whales due to fewer tug assist events	Minor reduction in impacts to Right Whales due to fewer tug assist events	Minor reduction in impacts to Right Whales due to fewer cargo vessel calls
Avoid Significant Impacts to Least Terns	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area
Avoid Significant Impacts to Florida Scrub Jay	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area
Avoid Significant Impacts to Southeastern Beach Mouse	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area
Avoid Significant Impacts to Gopher Tortoise	No additional effects; existing future protection measures would be followed	No significant impacts projected; any Gopher Tortoises found within the project area would be relocated	No significant impacts projected; any Gopher Tortoises found within the project area would be relocated	No significant impacts projected; any Gopher Tortoises found within the project area would be relocated
Avoid Significant Impacts to Sea Turtles	No additional effects; existing future protection measures would be followed	Protection measures will be taken during rip-rap removal to avoid significant impacts	Protection measures will be taken during rip-rap removal to avoid significant impacts	Dredging blackout window not required; no significant impacts projected
Avoid significant impacts to existing terminal facilities and operations	Existing facilities will be maintained and operated at existing levels of efficiency	Widening on the north side of the channel avoids impacts to south cargo piers	Widening on the north side of the channel avoids impacts to south cargo piers	No significant impacts to existing terminal facilities and operations

Evaluation Criteria	**No Action**	**Widening Plan 1 & -42 feet**	**Widening Plan 1 & -43 feet**	**Widening Plan 1 & -44 feet**
Completeness	Planning objectives would not be realized	Assumes that trend towards larger more efficient vessels, as historically observed at Port Canaveral and elsewhere will continue	Assumes that trend towards larger more efficient vessels, as historically observed at Port Canaveral and elsewhere will continue	Assumes that trend towards larger more efficient vessels, as historically observed at Port Canaveral and elsewhere will continue
Efficiency	Inefficient use of port, terminal, and vessels resources	Minor improvement in efficient use of port, terminal, and vessels	Moderate improvement in efficient use of port, terminal, and vessels	Greatest improvement in efficient use of port, terminal, and vessels at this channel width
Effectiveness	No contribution to achievement of objectives	Minor contribution to achievement of objectives	Moderate contribution to achievement of objectives	Greatest contribution to achievement of objectives at this channel width
Acceptability	Compliant with applicable laws, regulations, and public policies	Compliant with applicable laws, regulations, and public policies	Compliant with applicable laws, regulations, and public policies	Compliant with applicable laws, regulations, and public policies

System of Accounts	**No Action**	**Widening Plan 1 & -42 feet**	**Widening Plan 1 & -43 feet**	**Widening Plan 1 & -44 feet**
NED	Highest transportation costs	Minor transportation cost savings $3,329,576 Average Annual Transportation Cost savings	Moderate transportation cost savings $3,996,894 Average Annual Transportation Cost savings	Greatest transportation cost savings at this channel width $4,544,503 Average Annual Transportation Cost savings
RED	Port is a major contributor to local economic activity	No discernible impact to RED account	No discernible impact to RED account	No discernible impact to RED account
EQ	Port maintains all protection and impact avoidance policies and procedures	Temporary minor impacts during construction; no significant environmental impacts	Temporary minor impacts during construction; no significant environmental impacts	Temporary minor impacts during construction; no significant environmental impacts
OSE	Safe vessel and terminal operations are compromised by channel dimensions	Minor improvement to safe vessel and terminal operations and Minor reduction in energy requirements due to reduced vessel trips	Moderate improvement to safe vessel and terminal operations and Moderate reduction in energy requirements due to reduced vessel trips	Greatest improvement to safe vessel and terminal operations and Largest reduction in energy requirements due to reduced vessel trips for this channel width

Table 6-27
Contributions to Planning Objectives: Combined Plans (Widening Plan 2 [500 feet] and Deepening)

Opportunities	**No Action**	**Widening Plan 2 & -42 feet**	**Widening Plan 2 & -43 feet**	**Widening Plan 2 & -44 feet**
Improve cruise ship operations efficiency	Under wind conditions large cruise ships require tug assistance	Greatest improvement because fewer tug assist events are needed	No incremental change to cruise ship tug assistance	No incremental change to cruise ship tug assistance
More efficient cargo vessel loading	Cargo vessels are depth constrained causing light loaded conditions	Vessels may load up to two feet deeper draft with minor efficiency improvements	Vessels may load up to three feet deeper draft with moderate efficiency improvements	Vessels may load up to four feet deeper draft with greatest efficiency improvement
Use of larger cargo vessels	Cargo vessel length is constrained to a maximum of 800 feet	Minor efficiency improvement; cargo vessel length is constrained to 900 feet but vessel may load two feet deeper	Moderate efficiency improvement; cargo vessel length is constrained to 900 feet but vessel may load three feet deeper	Greatest efficiency improvement; cargo vessel length is constrained to 900 feet but vessel may load four feet deeper
Increase safety by reducing surge effects	Transit speeds to maintain safe crab angle cause surge effects at cargo piers and Trident basin	Greatest increase in safe crab angle allows slower transit speed with moderate reduction in surge effects	Greatest increase in safe crab angle allows slower transit speed with moderate reduction in surge effects	Greatest increase in safe crab angle allows slower transit speed with greatest reduction in surge effects
Accommodate development of more efficient berths and terminals	Berth operations constrained by surge effects; cargo vessels must stop loading and unloading when large cruise ships pass by	Moderate reduction in berth operation constraints	Moderate reduction in berth operation constraints	Greatest reduction in berth operation constraints

Constraints	**No Action**	**Widening Plan 2 & -42 feet**	**Widening Plan 2 & -43 feet**	**Widening Plan 2 & -44 feet**
Avoid Significant Impacts to West Indian Manatee	No additional effects; existing and future protection measures would be followed	No additional effects; manatee protection measures will be followed during construction	No additional effects; manatee protection measures will be followed during construction	No additional effects; manatee protection measures will be followed during construction
Avoid Significant Impacts to Right Whales	No additional effects; existing future protection measures would be followed	Minor reduction in impacts to Right Whales due to fewer tug assist events	Minor reduction in impacts to Right Whales due to fewer tug assist events	Minor reduction in impacts to Right Whales due to fewer cargo vessel calls
Avoid Significant Impacts to Least Terns	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area
Avoid Significant Impacts to Florida Scrub Jay	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area
Avoid Significant Impacts to Southeastern Beach Mouse	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area	No additional effects; species is not present in the project area
Avoid Significant Impacts to Gopher Tortoise	No additional effects; existing future protection measures would be followed	No significant impacts projected; any Gopher Tortoises found within the project area would be relocated	No significant impacts projected; any Gopher Tortoises found within the project area would be relocated	No additional effects; species is not present in the dredging or placement area
Avoid Significant Impacts to Sea Turtles	No additional effects; existing future protection measures would be followed	Protection measures will be taken during rip-rap removal to avoid significant impacts	Protection measures will be taken during rip-rap removal to avoid significant impacts	Dredging blackout window not required; no significant impacts projected
Avoid significant impacts to existing terminal facilities and operations	Existing facilities will be maintained and operated at existing levels of efficiency	Widening on the north side of the channel avoids impacts to south cargo piers	Widening on the north side of the channel avoids impacts to south cargo piers	No significant impacts to existing terminal facilities and operations

Evaluation Criteria	**No Action**	**Widening Plan 2 & -42 feet**	**Widening Plan 2 & -43 feet**	**Widening Plan 2 & -44 feet**
Completeness	Planning objectives would not be realized	Assumes that trend towards larger more efficient vessels, as historically observed at Port Canaveral and elsewhere will continue	Assumes that trend towards larger more efficient vessels, as historically observed at Port Canaveral and elsewhere will continue	Assumes that trend towards larger more efficient vessels, as historically observed at Port Canaveral and elsewhere will continue
Efficiency	Inefficient use of port, terminal, and vessels resources	Moderate improvement in efficient use of port, terminal, and vessels	Moderate improvement in efficient use of port, terminal, and vessels	Greatest improvement in efficient use of port, terminal, and vessels
Effectiveness	No contribution to achievement of objectives	Moderate contribution to achievement of objectives	Moderate contribution to achievement of objectives	Greatest contribution to achievement of objectives
Acceptability	Compliant with applicable laws, regulations, and public policies	Compliant with applicable laws, regulations, and public policies	Compliant with applicable laws, regulations, and public policies	Compliant with applicable laws, regulations, and public policies

System of Accounts	**No Action**	**Widening Plan 2 & -42 feet**	**Widening Plan 2 & -43 feet**	**Widening Plan 2 & -44 feet**
NED	Highest transportation costs	Moderate transportation cost savings $4,212,392 Average Annual Transportation Cost savings	Moderate transportation cost savings $4,820,195 Average Annual Transportation Cost savings	Greatest transportation cost savings $5,345,657 Average Annual Transportation Cost savings
RED	Port is a major contributor to local economic activity	No discernible impact to RED account	No discernible impact to RED account	No discernible impact to RED account
EQ	Port maintains all protection and impact avoidance policies and procedures	Temporary minor impacts during construction; no significant environmental impacts	Temporary minor impacts during construction; no significant environmental impacts	Temporary minor impacts during construction; no significant environmental impacts
OSE	Safe vessel and terminal operations are compromised by channel dimensions	Moderate improvement to safe vessel and terminal operations and Moderate reduction in energy requirements due to reduced vessel trips	Moderate improvement to safe vessel and terminal operations and Moderate reduction in energy requirements due to reduced vessel trips	Greatest improvement to safe vessel and terminal operations and Largest reduction in energy requirements due to reduced vessel trips

6.7 Recommended Plan

The Principles and Guidelines require that the plan which maximizes net benefits, the NED plan, be identified. Typically, the incremental analysis includes depths beyond the depth which maximizes net benefits in order to "bracket" the NED plan and to show that net benefits in fact decline at deeper depths. However, ER 1105-2-100 paragraph 3-2 b.(10) Categorical Exemption to NED Plan states:

> *For harbor and channel deepening studies where the non-Federal sponsor has identified constraints on channel depths it is not required to analyze project plans greater (deeper) than the plan desired by the sponsor.*

The non-Federal sponsor, the Canaveral Port Authority, has requested that channel widening alternatives considered be limited to no greater than a 500 foot wide channel, and channel deepening alternatives be limited to no greater than -44 feet depth under the Categorical Exemption to the NED Plan provision of ER 1105-2-100 (Paragraph 3-2.b.(10)).

The Recommended Plan is Widening Plan 2 (500 feet) with the -44-foot deepening, which is the plan that provides the greatest net benefits of all plans evaluated. The Recommended Plan is identified as the Preferred Alternative in Section 7: Environmental Consequences. Widening is the first added element because only the widening alternatives provide benefits to both cargo and cruise vessels. The last added element is the -44-foot deepening, which provides more than $214,271 in incremental net benefits (Average Annual Equivalent). Each added increment between the first added increment and the last added increment provide positive incremental net benefits. The recommended Plan is the most economical plan analyzed. The NED Plan has not been identified because the non-Federal sponsor has identified constraints to analyzing a greater plan than the 500-foot wide and -44-foot deep plan. The benefit-cost ratio of the Recommended Plan is 2.0 to 1. The Recommended Plan is:

- consistent with protecting the nation's environment;
- feasible from an engineering perspective;
- publicly acceptable; and
- implementable.

In addition, the Recommended Plan has greater net benefits than smaller scale plans, as required by ER 1105-2-100 para. 3-2 b. (10).

6.7.1 Description of the Recommended Plan

The Recommended Plan (see Figures 6-4 and 6-5) is described in terms of 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 in a generally east-west alignment. Various cuts comprise the outer, middle, and inner reaches. Existing and recommended plan dimension are described below.

- Outer Reach, Cut 1A: Existing dimensions are -44' project depth X 400' wide X 11,000' long. New dimensions would increase the project depth to -46' within the yellow highlighted area shown on Figure 6-5.

- Outer Reach, Cut 1B: Existing dimensions are -44' project depth X 400' wide X 5,500' long. New dimensions would increase the project depth to -46' within the yellow highlighted area shown on Figure 6-5.

- Outer Reach, Cut 1: Existing dimensions are -44' project depth X 400' wide X 12,500' long. New dimensions would increase the project depth to -46' within the yellow highlighted area shown on Figure 6-5 only for the 5,300' long portion of Cut 1 that is seaward of buoys 7/8 (Station 0+00 to Station 53+00). The remainder of Cut 1 from buoys 7/8 to the apex of the channel turn, a length of 7,200', would also be deepened from -44' to -46'.

- US NAVY Turn Widener: Existing dimensions are -44' project depth X 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' within the yellow highlighted area shown on Figure 6-5.

- Civil Turn Widener: Existing dimensions are -41' project depth X 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' within the yellow highlighted area shown on Figure 6-5.

- New Turn Widener: New dimensions are -46' project depth X 23.1 acres (irregular shaped area) bounded to the north and northeast by the civil turn widener and Cut 1 of the outer reach within the brown highlighted area shown on Figure 6-5. As part of the recommended plan, the new turn widener will be constructed, and cut through the footprint of the existing sediment trap. To maintain the sediment trap's design capacity, it is proposed that the trap be deepened, consistent with the new channel depth, and slightly expanded to the south as described in Attachment J of the Engineering Appendix.

- 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' project depth X 400' wide X 5,658' long. New dimensions would increase the project depth to -46' and the project width from 400' to 500' within the yellow highlighted area shown on Figure 6-5; and providing a 100' widener of 2,282' in length along the north side of the channel for the portion of the middle reach that is inside of the north jetty within the brown highlighted area shown on Figure 6-5. The eastern terminus of the 100' widener transitions from the existing to the new northern channel boundary over a plan distance of 500'.

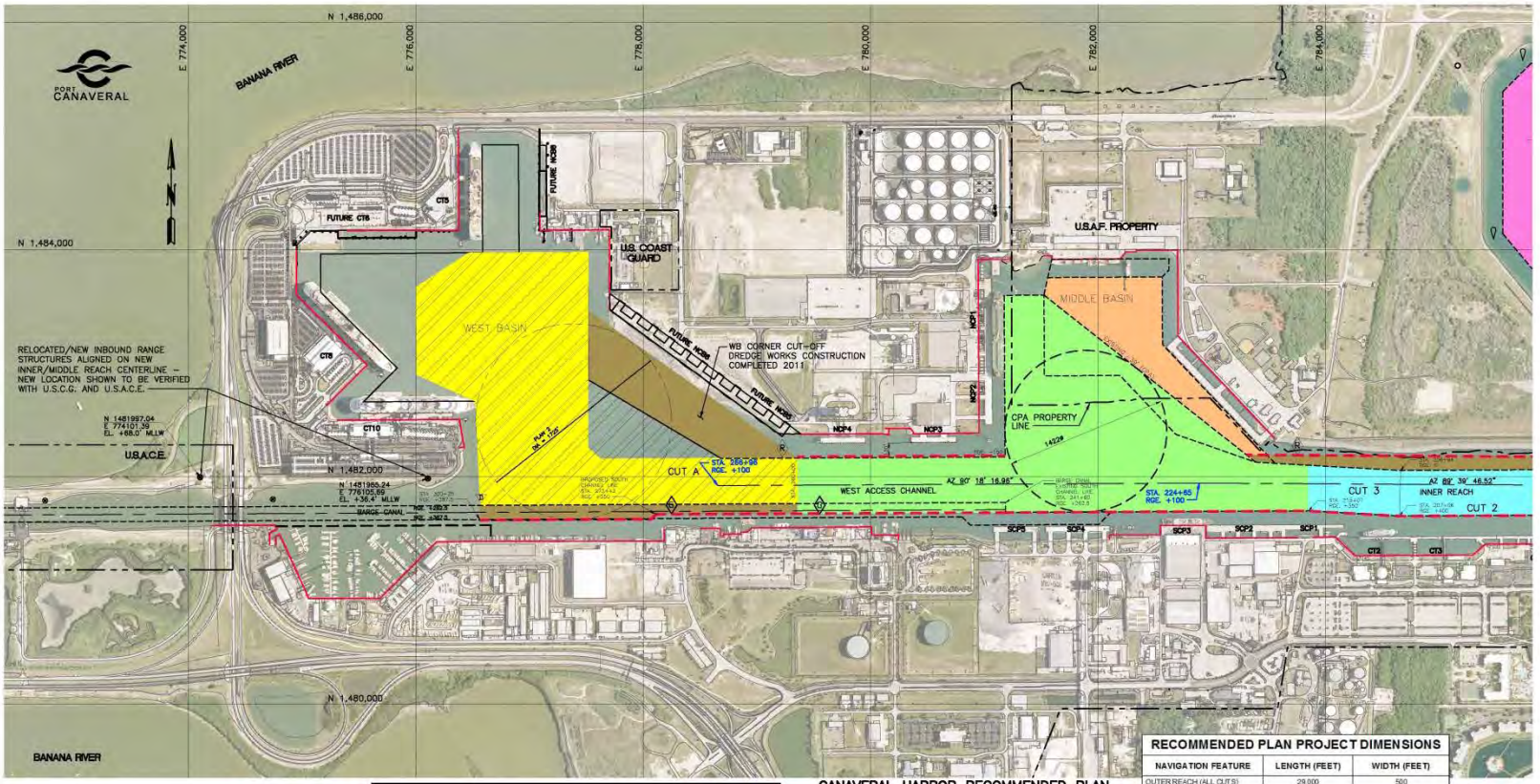
- Trident Access Channel and Trident Basin: With exclusive use by US Navy, the Trident Access channel connects the middle reach to the Trident basin. Existing dimensions are -44' project depth throughout an irregularly shaped area to remain as is, except at the southern boundary of the existing Trident Access channel, where the new 100' north side channel widener will consume that portion of the Trident Access Channel within the brown highlighted area shown on Figure 6-5.

- Inner Reach, Cut 2 and Cut 3: Existing dimensions are -40' project depth X 400' wide X 3,344' long. New dimensions would increase the project depth to 44' and the project width from 400' to 500' within the blue highlighted area shown on Figure 6-4 and 6-5,

providing a 100' widener along the entire length of the reach on the north side of the channel within the brown highlighted area shown on Figures 6-4 and 6-5. The rip-rap protected shoreline and berm between the Middle and Trident Basins will be relocated northward to accommodate the 100' 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' in the north and east portions of the basin used exclusively by the military and --39' in the remainder of the basin supporting commercial vessel traffic. Because of the somewhat limited room afforded by the present -39' federal project boundaries toward the northwest portion of the basin, CPA maintains an irregular shaped central portion of the basin to -39'. This provides additional area for maneuvering cargo vessels to and from the North Cargo Pier 1 and roll-on/roll-off ramp and enlarges the available area for turning displacement vessels on arrival or departure. The existing 39' federal project provides a turning circle diameter of 1200'. The new project dimensions for commercial purposes encompass 68.9 acres with a project depth of -43' yielding a turning circle diameter on the order of 1422' within the green highlighted area shown on Figure 6-4. Approximately 1.9 acres of the new -43' 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.
- West Access Channel (east of Station 260+00): Existing dimensions are -39' project depth X 400' wide X 1,840' long. New dimensions would increase the project depth to -43' and increase the project width from 400' to 500' within the green highlighted area shown on Figure 6-4; and providing 100' of widening along the entire length of the channel by redefining the northern channel boundary 12' north of the existing northern boundary, and widening the channel by 88' along the south side and into the barge canal.
- West Turning Basin and West Access Channel (west of Station 260+00): The West Turning Basin has exclusive use by commercial activities and the U.S. Coast Guard. The existing Federal basin the West Access Channel (west of Station 260+00) take up 78.6 acres with a project depth of -31' as federally maintained and -35' as maintained by the CPA. The CPA has also maintained a triangular shaped -35' 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'. 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' to encompass the yellow, brown and grey cross hatched areas shown in Figure 6-4. 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' project boundary and 6.9 acres within the existing barge canal will be dredged to the new project depth of -35'.

Figure 6-4
Recommended Plan: West of Trident Basin



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 EMBANKMENT ON BOTH SIDES OF THE TRIDENT BASIN IS FROM THE SURVEY FOR CHANNEL IMPROVEMENTS BY ALLEN ENGINEERING, INC. DATED MARCH 4, 2003.

RECOMMENDED CIVIL WORKS NAVIGATION DEPTHS LEGEND (MLLW)

- FEDERAL PROJECT, -41' USN
- FEDERAL PROJECT, -46'
- FEDERAL PROJECT, -44'
- FEDERAL PROJECT, -43'
- CPA PROJECT, -35'
- FEDERAL PROJECT, -35'
- FEDERAL PROJECT, -31' CPA PROJECT, -35'
- WIDENED AREA, PROJECT DEPTH SAME AS ADJACENT CHANNEL FEATURE

CANAVERAL HARBOR RECOMMENDED PLAN

400' 0 400' 800' 1200'
1" = 400'-0"

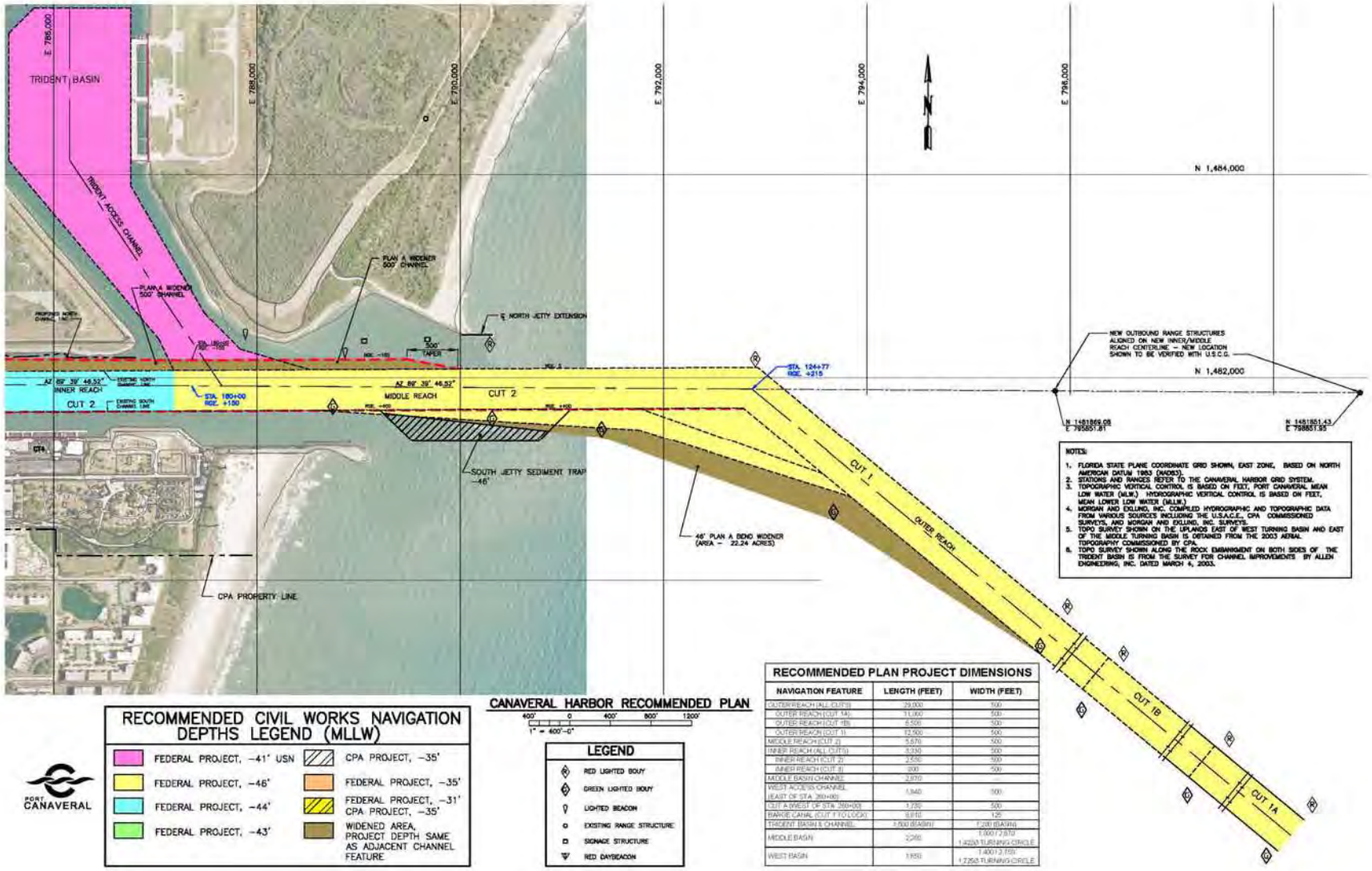
LEGEND

- RED LIGHTED BOUY
- GREEN LIGHTED BOUY
- LIGHTED BEACON
- EXISTING RANGE STRUCTURE
- SIGNAGE STRUCTURE
- RED DAYBEACON

RECOMMENDED PLAN PROJECT DIMENSIONS

NAVIGATION FEATURE	LENGTH (FEET)	WIDTH (FEET)
OUTER REACH (ALL CUTS)	29,000	500
OUTER REACH (CUT 1A)	11,000	500
OUTER REACH (CUT 1B)	5,100	500
OUTER REACH (CUT 1)	12,500	500
MIDDLE REACH (CUT 2)	5,670	500
INNER REACH (ALL CUTS)	3,330	500
INNER REACH (CUT 2)	2,530	500
INNER REACH (CUT 3)	800	500
MIDDLE BASIN CHANNEL	2,670	–
WEST ACCESS CHANNEL (EAST OF STA. 260+00)	1,840	500
CUT A (WEST OF STA. 260+00)	1,730	500
BARGE CANAL (CUT 1 TO LOCK)	8,610	125
TRIDENT BASIN & CHANNEL	1,500 (BASIN)	1,200 (BASIN)
MIDDLE BASIN	2,200	1,800 / 2,670 1,422Ø TURNING CIRCLE
WEST BASIN	1,650	1,400 / 2,750 1,725Ø TURNING CIRCLE

Figure 6-5
Recommended Plan: East of Trident Basin



6.7.2 Recommended Plan Construction

The major cost and construction time component of the project is the harbor and channel dredging. Dredging accounts for approximately 75% of the total project cost. Construction duration is estimated at 400 days or approximately 14 months (Figure 6-6). It is anticipated that the non-dredging project elements can be performed independently within this time frame with some sequencing of work necessary in the area of the northside widener. This excavation and dredging work must be performed far enough in advance to accommodate the berm and rock revetment replacements.

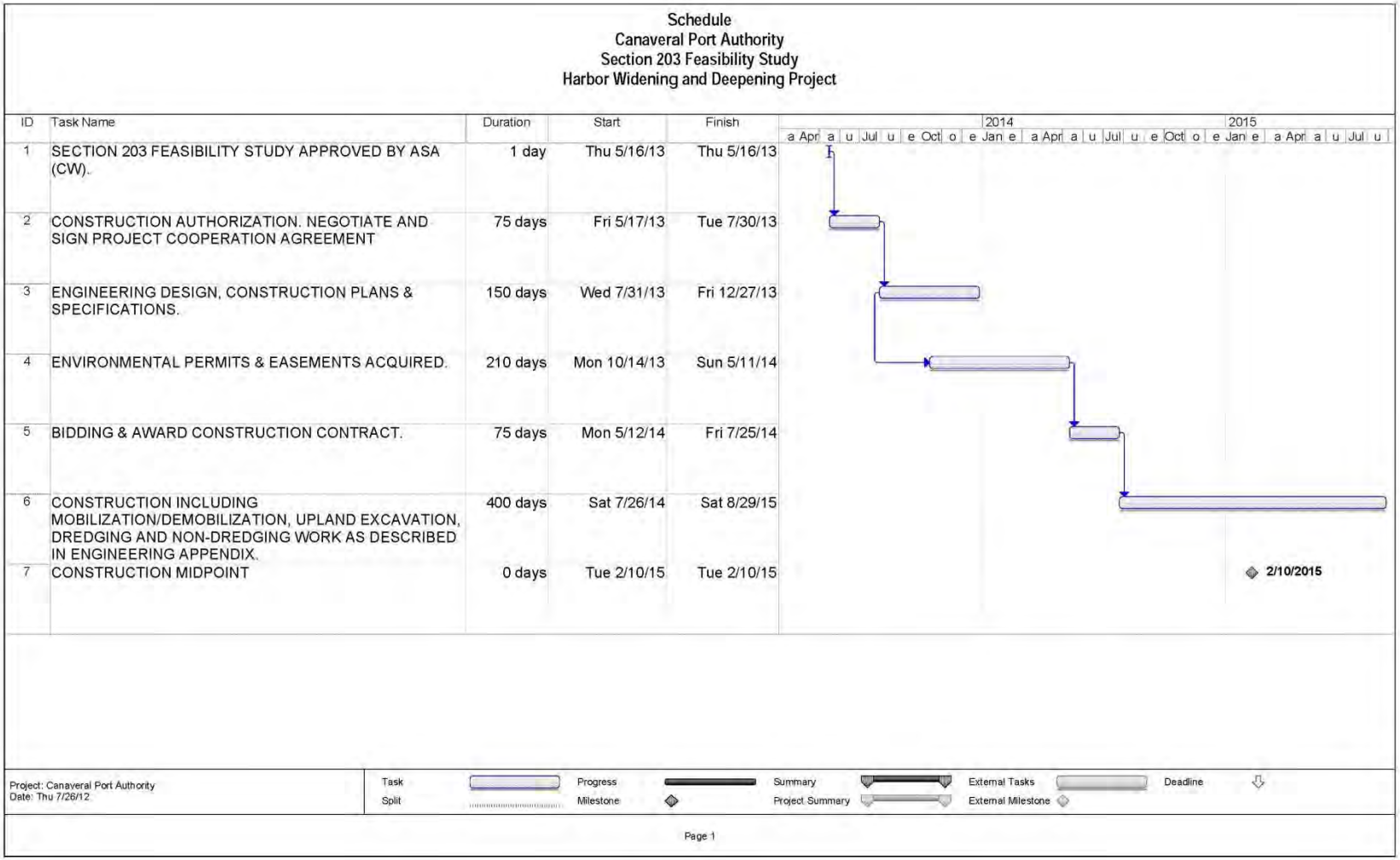
Construction methods will conform to applicable federal, state and local environmental permitting regulations. State standards for maintaining water quality, manatee protection and sea turtle protection will be adhered to throughout the project. Hopper dredging would not be employed and has been discouraged in past state and federal permits. Hydraulic and clamshell dredging are the methods of choice for economic and environmental concerns. More detailed environmental project information can be found in Section 7.3 of this report and in the Environmental Appendix.

Construction of the project involves both marine and uplands work and equipment. The following sequence of work is provided to generally describe the progression of the project.

- Remove all physical obstructions within the submerged project area and remove or relocate all physical obstructions within the uplands portions of the project area.
- Install temporary project security measures for protection of the uplands property and work. A plan will be created to address how vessel movements in and out of the Middle Turning Basin will be achieved during construction. The 45th Space Wing will request Explosive Site Plan (ESP) approval from the Department of Defense Explosives Safety Board (DDESB) as required to account of any changes in configuration to the channel adjacent to Air Force property.
- Perform the uplands earth work along the north side of the channel from the middle basin to the start of the north jetty and along the corner cut off at the entrance to the west basin. For the north dike project feature, remove and stockpile rip-rap for reuse.
- At the same time, dredging of the project features would begin, starting in the Outer Reach and working toward the Harbor and to the west basin.
- Replacement of the rock revetment at the northside widener, installation of the security fencing for the USACE dredged material containment site, realignment/addition of the aids to navigation (range structures) and replacement of the west “Surge Warning” sign at the North Jetty will complete the project.

The dredging operation will consist of clamshell bucket dredge(s) and bottom dumping scows for Canaveral ODMDS disposal. This method is preferred due to the 10 mile distance from the mouth of the harbor to the ODMDS. Piping of hydraulically dredged material would not prove to be logistically (from a navigation standpoint) or economically feasible. Dredged material suitable for nearshore disposal or other beneficial reuse would be stockpiled in the port in an existing diked containment area. Work would be closely coordinated with local pilots to ensure the safety of navigation while working around ship transits with the least disruption to both port

Figure 6-6
Recommended Plan: Construction Schedule



and dredge operations. The dredge contractor will be able to take advantage of working inside the harbor when conditions are such that it is not feasible to work offshore outside the jetties.

Port Canaveral currently has U.S. Coast Guard navigational range structures[29] for inbound traffic centered on the present 400 ft wide entrance channel middle and inner reaches. There is currently no outbound range, although Canaveral Pilots Association has requested that the Coast Guard provide an outbound range for the existing channel. The local pilots consider the inbound and outbound range structures as key navigation aids. The inbound aids will be relocated or replaced north and east of their existing locations to align with the new middle and inner reach centerline. Similarly, with expansion of the channel and handling of the largest cruise vessels afloat—the pilots and the STAR Center strongly urge that outbound range structures be installed to align with the new channel centerline in the Atlantic Ocean waters east of the turn widener area. The pilots conducted the recent simulations with inbound and outbound range structures featured in the visual geographical database. The outbound range structures were found to be extremely useful and enhanced safety as confirmed by the 2007 and 2009 simulations.

The authorization, funding, design and construction of aids to navigation such as the channel ranges and buoys are under the jurisdiction of the US Coast Guard. This navigation improvement project has recently been identified to the US Coast Guard District 7 Waterways Management Branch in Miami, Florida, to prepare a formal cost estimate of construction for new outbound ranges and realignment of the existing inbound ranges as dictated by the channel realignment due to widening. Documentation of coordination of the range navigation aids between the USCG and the Canaveral Port Authority and its consultants is included as Attachment N to the Engineering Appendix. The Canaveral Pilots confirm that the Recommended Plan project may be appropriately marked by relocating the existing floating aids to navigation such that no new floating aids will be required.

6.7.3 Dredged & Upland Material Management Plan

New work and incremental maintenance dredging volumes resulting from the proposed improvements to the Port Canaveral Florida federal Navigation Project fit within the limitations of the Jacksonville District's existing Dredge Material Management Plan (DMMP) and there are no substantial modifications to existing placement sites required. The existing DMMP describes the least cost method of dredge material disposal from the Canaveral Harbor project, which is the same method recommended in this report for project material.

The project recommended in this report does not include the previously completed work area in the West Turning Basin (the ICCO). Prior to construction of the ICCO, the project plan required dredging of approximately 3.6 million CY and excavation of approximately 808,391 CY of sand, silts and clays. The completed Interim Corner Cutoff (ICCO) dredging resulted in placement of 507,253 CY in the ODMDS, and 354,322 CY was placed in uplands on CPA property. Completion of the ICCO leaves approximately 3.1 million CY of project material for future ODMDS placement extending over a 14-month project implementation period.

The remaining 454,069 CY of excavation would occur at the north side widener. Approximately 100,000 CY of this volume is existing revetment material that would be reused as a component

[29] Navigation range structures are used by the Canaveral Pilots to identify the channel centerline on an inbound transit. The structures are in alignment with the centerline of the channel and are a visual aid to the pilot.

of revetment reconstruction. The remaining 354,069 CY of upland material from existing grade down to elevation -13 MLLW is designated for disposal in the adjacent upland disposal site, pending formal Air Force approval for use of that area for material placement. Air Force approval will be based on an evaluation of competing interests and on test results on the composition of the spoils to be placed. Based on the previous channel widening and the Sponsor's experience with the ICCO, the material above elevation -13 feet will be recovered using upland excavating methods. Dredged and excavated material disposal site alternatives are shown in the Engineering Appendix Attachment J.

The last series of sketches in Attachment J show the uplands and offshore disposal sites that would receive dredged or excavated material. The upland site consists of one existing diked area utilized by the USACE on Air Force property between the Middle and Trident Basins. The offshore sites, Canaveral Ocean Dredged Material Disposal Site (ODMDS) and the Nearshore Disposal Area are located approximately 10 miles from the entrance jetties via the outer reach.

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.

The following two subsections discuss in more detail the disposal plans for the excavated material below and above elevation -13 MLLW.

6.7.3.1 ODMDS (Ocean Dredged Material Disposal Site)

Dredge material below -13 feet (MLLW) generally consists of silts and clays, and are not suitable for reuse. Because CPA upland disposal sites are at capacity and the preference is to store suitable material for reuse, these silts and clays must be disposed in the Canaveral ODMDS located approximately 10 miles south of Canaveral Harbor.

It is the responsibility of the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (USACE) under the Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972 to manage and monitor each of the Ocean Dredged Material Disposal Sites designated by the EPA pursuant to Section 102 of MPRSA. Section 102(c)(3) of the MPRSA requires development of a Site Management and Monitoring Plan (SMMP) for each ODMDS and review and revision of the SMMP not less frequently than every 10 years.

The present management plan for the Canaveral Harbor ODMDS is the Site Management and Monitoring Plan (SMMP) dated February 2012, and is included as Engineering Appendix Attachment P. This updated SMMP replaces the previous SMMP dated October 2001. The estimated project dredged material quantity (below -13 MLLW) is 3.1 million CY, which would be dredged during a period of more than 200 days, spanning two calendar years. The current SMMP identifies an approved ten-year volume capacity as 9.2 million cubic yards (mcy) (i.e., half of the estimated remaining capacity of 18.4 mcy), and specifically recognizes and accounts for all construction dredging volumes associated with this project. Engineering Appendix Table 29 provides the history of disposal within the Canaveral ODMDS.

The suitability of the dredged material for ocean disposal will be verified as part of the permit process. Based on the recent and ongoing history of testing and evaluation of dredged material

in Port Canaveral for ongoing O&M dredging, CPA projects like the ICCO, and the current Section 103 EPA authorizations, it is expected that all of the material below -13 MLLW proposed for ocean disposal will be determined suitable and approved for disposal in the ODMDS.

6.7.3.2 Disposal and Reuse of Upland Excavated Material

The maximum amount of excavated material for reuse and/or upland disposal is estimated to be 354,069 cubic yards and will be disposed at the existing USACE upland containment site on the USAF property. Reuse of upland excavated material is considered to consist of the sands that are generally found at and above elevation -13 feet MLLW. The dredge material is expected to be of a quality suitable for construction fill material and would be stockpiled at an agreeable location on the containment site for later reuse pending formal Air Force approval for use of that area for material placement.

Air Force approval for use of the existing USACE upland containment site for material placement will be based on an evaluation of potentially competing interests and on test results of the composition of the spoils to be placed. Brevard County has a beach restoration project that also intends to use the USAF disposal area to stockpile beach quality sand. Disposal of upland material from the Canaveral Harbor project can complement the Brevard County project disposal on this site.

The beach quality sand from the Brevard County project will be hydraulically dredged from just offshore of the USAF coastline and will require a competent dike system to contain the fluid spoil. The existing USAF containment dike, however, is in poor condition and will need to be restored, and possibly raised in elevation, with a new intermediate dike constructed to subdivide the containment area. Based on the previous channel widening and the Sponsor's experience with recent dredging, the Canaveral Harbor material above elevation -13 feet will be construction grade fill material recovered using excavation methods. This material will be suitable for the necessary dike modifications and the new intermediate dike needed for the Brevard County project. CPA is currently coordinating with USAF and Brevard County to insure that the one-time placement of the recovered spoil will complement the Brevard County project. Use of the recovered stockpiled material to reconstruct and improve the containment dike system would not reduce the area available for spoil on the USAF site.

In the unlikely event that the USAF should not approve placing the excavated upland material on their existing spoil disposal site, other options for reuse of the upland excavated material can be further developed, including off-site placement on CPA property, or existing disposal area dike upgrades requiring suitable fill. If the USAF wishes to retain ownership of their material (since the upland material is being excavated from their property), then the Sponsor could truck the material to a different site on CCAFS as designated by the USAF. Adequate areas are also available on Port property owned by CPA if USAF sites are unavailable. These alternatives would be somewhat more expensive than the recommended upland disposal plan due to additional haul distances, but would be expected to remain within the contingency allowance estimated in this report.

6.7.4 Recommended Plan Operations and Maintenance

The operation and maintenance of the Recommended Plan is nearly identical to operation and maintenance of the existing Canaveral Harbor project, with the exception of an additional 69,000

cubic yards of annual maintenance dredging that is expected to occur mostly in the vicinity of the extended turn widener in the entrance channel. Material from this area has historically been suitable for placement at the ODMDS. This small volume of additional maintenance material is not projected to have a substantial impact on ODMDS capacity.

This additional maintenance volume in combination with the construction material, plus all other projected volumes as listed in the SMMP equal 9.75 mcy over a 10-year period, exceeding half of the remaining site capacity (9.2 mcy of 18.4 mcy) and therefore will (per the SMMP) require an assessment of the proposed action's impacts upon the ODMDS' capacity requirements prior to the next 10-year renewal cycle of EPA's Site Management and Monitoring Plan (SMMP). Impacts on the ODMDS site capacity would be assessed through a combination of management alternatives, evaluation of capacity based on bathymetric surveys, and an assessment using the USACE MDFATE or MPFATE modeling. At this time it is anticipated that the ODMDS, which is established in the Jacksonville District Corps of Engineers' Canaveral Harbor Dredge Material Disposal Plan (DMMP) as the least cost dredge material disposal site, will continue to be available throughout the project life, subject to decennial development and approval of SMMPs.

6.7.5 Recommended Plan Real Estate Considerations

Based on the recommended channel improvements, real estate owned by the CPA, the State, and the USA will be impacted. Navigation servitude will be exercised to use, control, and regulate the necessary submerged lands from CPA and the State for the channel widening. Real property rights for approximately 8 acres of USAF uplands required for the channel widening and approximately 11 acres of USAF uplands associated with land damages due to the channel widening will be sought via a modification of the existing permit. The permit modification would also include the 28 acres north of the USAF spoil containment dike and south of the existing leased spoil disposal area. These interests and estates are detailed in the Real Estate Appendix and illustrated in the real Estate Appendix: Exhibit 3: Preliminary Acquisition Map.

A preliminary meeting between the Canaveral Port Authority and United States Air Force representatives was held November 22, 2005, to discuss the potential land impacts. At that time, USAF representatives indicated that ownership in the land would not be transferred but an easement would likely be granted as was done in past Federal projects along the harbor channel. Subsequent meetings between CPA and the USAF have recently been held in July, August, and December 2011. The existing lease and permit documents were obtained at these later meetings. Current USAF personnel agree that the land would not be transferred and that interests could be sought via an easement. A June 28, 2012, memorandum from the 45th Space Wing of the USAF to the USACE-Jacksonville District as well as meeting minutes is included in the Real Estate Appendix: Attachment D. The letter provides comment from the USAF Commander acknowledging working closely with the USACE and CPA project team to work project issues and offering a continued partnership as the channel widening project moves forward. The next meeting is set for late September 2012.

Neither the Recommended Plan, nor any of the evaluated alternatives, requires the relocation of Coast Guard Station Port Canaveral.

6.7.6 Summary of Accounts

The National Environmental Quality (EQ) account impacts of alternative plans are described in detail in Section 7: Environmental Consequences of the Section 203 Study. Contributions to the

Regional Economic Development (RED) account are presented here, based on the Canaveral Port Authority FY 2009 Economic Impact Study (September, 2010). The alternative plans are not projected to affect total cargo volume at the port. Cargo is projected to be delivered more efficiently on more deeply laden vessels, but growth in the overall volume will not be influenced by the project. Table 6-28 presents Port Canaveral's estimated economic impact on business revenues, employment, and wages.

Table 6-28
Port Canaveral Economic Impacts

Port Canaveral Business Line	Business Revenues	Employment	Wages
Cruise	$916,011,000	8,908	$392,195,000
Cargo	$126,187,000	2,389	$178,393,000
Other	$98,711,000	1,796	$78,179,000
Total	**$1,140,910,000**	**13,093**	**$648,767,000**

Source: Port Canaveral FY 2003 Economic Impact (July, 2005)

Alternative plan contributions to the Social Effects account are limited by the nature of with-project beneficial effects, which are reduced transportation costs for some commodities and cruise ships. Transportation cost reductions at the Port would improve the relative efficiency and competitive advantage of Port Canaveral as compared to other ports. Improved competition at Port Canaveral would conceivably support job, income, and revenue stability at the Port. Improved local economic stability, although not measured or assessed in this analysis, would be considered a positive contribution to the Social Effects account.

6.8 Risk and Uncertainty

The potential impacts of relative sea-level change on this project has been assessed in accordance with USACE guidance (see Section 3.2 Sea Level Change Projections in the Engineering Appendix for more details). Guidance for incorporating the direct and indirect physical effects of projected future sea-level change in USACE projects is provided in the Engineering Circular EC 1165-2-211 titled *Water Resource Policies and Authorities Incorporating Sea-Level Change Considerations in Civil Works Programs* (USACE 2009), which was in effect when the analysis was conducted. EC 1165-2-211 has since been updated and replaced by a new guidance document, EC 1165-2-212. However, there is a negligible difference in sea-level rise projections (less than 0.1 feet) between EC 1165-2-211 and EC 1165-2-212; therefore, Agency Technical Review concluded that it was unnecessary to conduct a reanalysis using EC 1165-2-212.

The Corps guidance states that consideration should be given to how sensitive and adaptable proposed alternatives are to climate change and other related global changes. Because of the variability and uncertainty in projected future sea-levels, alternatives should be evaluated using low, intermediate, and high rates of future sea-level change for both "with" and "without" project conditions in order to bound the likely future conditions.

The estimated potential sea-level change at Port Canaveral was assessed over the period 2014 to 2064 based on guidelines presented in EC 1165-2-211, which includes an assessment of low, intermediate, and high relative sea-level projections. The results of calculations from the project completion in 2014 through 2064 indicate that sea-level change estimates over a 50-year life of the project range from 0.120 meters (0.39 ft) for the low rate of change scenario, to 0.245 m (0.80 ft) for the intermediate rate scenario, and 0.653 m (2.14 ft) for the high rate scenario. Sea-level rise at these rates will have little or no impacts related to the proposed navigation improvements.

With respect to the channel deepening, an increase in sea-level can result in greater water depths within the Port. However the channel depth is set relative to Mean Lower Low Water (MLLW), so as sea-level rises and the MLLW datum is adjusted upward in response, the dredged water depth relative to the new datum will not change. The same can be said about the navigation improvements outside the mouth of the Port. As part of the recommended plan, the new turn widener will be constructed, and cut through the footprint of the existing sediment trap. To maintain the sediment trap's design capacity, it is proposed that the trap be deepened, consistent with the new channel depth, and slightly expanded to the south as described in Attachment J of the Engineering Appendix. Sea level rise should have no impact related to these improvements. Depths of the sediment trap and the widener are both set relative to MLLW and though sea level may rise, maintenance dredging of these features will maintain similar depths relative to the future sea level.

The Engineering Appendix Attachment M: Cost and Schedule Risk Analysis Report addresses risk and uncertainty on the cost side of the project's economic analysis. The Cost and Schedule Risk Analysis identified 20.97% as the appropriate contingency level for this analysis. On the benefit side of the economic analysis, sensitivity analyses are conducted on parameters that affect cargo and cruise ship related benefits:

- Reduced cruise ship schedule and lower commodity forecast as compared to the base case;
- Higher commodity projection as compared to the base case; and
- Alternative Seaport Canaveral forecasts.

Additionally, commodity forecast uncertainty is addressed by ranking base-case commodity projections from most certain to least certain and assessing the benefit to cost ratio at alternative levels of certainty (Table 5-41). Additional sensitivity analyses concerning alternative origins for Seaport Canaveral vessels and alternative aggregate, slag, and cement forecasts are presented in Section 5.6 Risk and Uncertainty of the Economics Appendix.

The reduced cruise ship schedule and lower commodity forecast sensitivity analysis evaluates the effects of using a combined low cargo growth forecast and a reduced cruise ship schedule. The low growth scenario extends the impacts resulting from the recent economic down turn, such that rock products remain at one-half their projected 2011 through 2020, at which time they return to the base case forecast levels. Under this low growth sensitivity analysis Seaport Canaveral gasoline and distillate fuel imports remain at projected 2013 levels through 2020, at which time growth begins using the base case growth rates. This sensitivity analysis also reduces large cruise ship calls by 25%. Table 6-29 presents the cost-benefit analysis of the low forecast

scenario for incremental increases in the project, from Widening Plan 1 to Widening Plan 2 with Deepening Plan 3.

Table 6-29
Cost – Benefit Analysis: Low Forecast Scenario

Alternative Plan	Total AAEQ Costs	Total AAEQ Benefits	Total Net Benefits	Incremental Net Benefits	B/C Ratio
450-foot widening (W1) only	$1,448,734	$1,823,291	$374,557	$374,557	1.3
500-foot widening (W2) only	$1,960,442	$2,760,320	$799,878	$425,321	1.4
W2 and -42-foot deepening	$2,094,929	$4,087,131	$1,992,202	$1,192,324	2.0
W2 and -43-foot deepening	$2,377,931	$4,673,059	$2,295,128	$302,926	2.0
W2 and -44-foot deepening	$2,692,766	$5,177,039	$2,484,273	$189,145	1.9

Note: Discount rate = 4.00%, period 50 years

The most substantial differences between the high commodity forecast and the base case commodity forecast concerning Seaport Canaveral tanker and cement shipments to the Port. Under the high forecast Seaport Canaveral terminal grows at a faster short-term rate so that the facility achieves approximately 75% capacity by 2015, which is a 25% increase over the base case. The high commodity forecast for cement has cement imports returning to 2007 levels by 2012 instead of 2015. In addition, a third rock product terminal comes into operation by 2020. This higher estimate of projected calls increases channel widening benefits and channel deepening benefits, as presented in Table 6-30.

Table 6-30
Cost – Benefit Analysis: High Forecast Scenario

Alternative Plan	Total AAEQ Costs	Total AAEQ Benefits	Total Net Benefits	Incremental Net Benefits	B/C Ratio
450-foot widening (W1) only	$1,448,734	$2,212,348	$763,614	$763,614	1.5
500-foot widening (W2) only	$1,960,442	$3,365,043	$1,404,601	$640,987	1.7
W2 and -42-foot deepening	$2,094,929	$4,990,449	$2,895,520	$1,490,919	2.4
W2 and -43-foot deepening	$2,377,931	$5,680,659	$3,302,728	$407,208	2.4
W2 and -44-foot deepening	$2,692,766	$6,238,321	$3,545,555	$242,827	2.3

Note: Discount rate = 4.00%, period 50 years

Alternative Seaport Canaveral forecasts used as a sensitivity analysis include forecasts ranging from 80% of the base case forecast to 120% of the base case forecast (Table 6-31). The sensitivity analysis indicates proportionately similar impacts to net benefits for the higher and

lower alternatives. The highest alternative (120% of the base case forecast) increases the net benefits of Widening Plan 2 (500 feet) with the -44-foot deepening by 19.95%. The lowest alternative (80% of the base case forecast) decreases net benefits by 19.97%. Total AAEQ net benefits for Widening Plan 2 (500 feet) with the -44-foot deepening range from $2,847,125 for the higher forecast to $1,899,611 for the lower forecast. The benefit/cost ratio similarly ranges from 2.2 to 1.8.

Table 6-31
Cost – Benefit Analysis: Alternative Seaport Canaveral Forecasts

Alternative Forecast	Total Net Benefits	Impact to Net benefits	B/C Ratio
120%	$3,205,840	$537,294	2.2
110%	$2,918,011	$249,464	2.1
105%	$2,802,391	$133,845	2.0
Base Case	**$2,668,546**	**- - -**	**2.0**
95%	$2,516,379	-$152,167	1.9
90%	$2,393,951	-$274,595	1.9
80%	$2,101,632	-$566,923	1.8

Note: Discount rate = 4.00%, period 50 years

An additional assessment of the impact of commodity forecast uncertainty is developed by ranking commodity projections based on perceived levels of certainty, from the most confident forecast to the least confident (Table 6-32). Benefits based on commodities with the highest level of certainty (fuel) are presented as Scenario 1. Using fuel oil alone, as the single benefitting commodity, results in a benefit to cost ratio of 1.3 for the recommended plan. The addition of construction-related commodities (Scenario 2) increases the benefit to cost ratio up to the base case level (2.0) for the recommended plan. This assessment of uncertainty indicates that each alternative plan is economically justified using the most confident forecast assumptions. Therefore, the risk of recommending too large a plan is acceptable because the recommended plan is justified under the most restrictive commodity forecast.

Table 6-32
Port Canaveral Commodity Forecast Uncertainty Ranking

Scenario 1 Tug and Fuel Vessels Only (Most Certain)				
	500-foot widening only (W2)	W 2 and -42-foot deepening	W 2 and -43-foot deepening	W 2 and -44-foot deepening
Tugs	$745,426	$745,426	$745,426	$745,426
Fuel Vessels	$2,084,322	$2,476,427	$2,637,048	$2,719,182
Total Benefits	$2,829,748	$3,221,853	$3,382,474	$3,464,608
Costs	$1,960,442	$2,094,929	$2,377,931	$2,692,766
Net benefits	$869,306	$1,126,924	$1,004,543	$771,842
BCR	1.4	1.5	1.4	1.3
Scenario 2 Tug, Fuel Vessels, & Other Commodities (Less Certain)				
	500-foot widening only (W2)	W 2 and -42-foot deepening	W 2 and -43-foot deepening	W 2 and -44-foot deepening
Tugs	$745,426	$745,426	$745,426	$745,426
Fuel Vessels	$2,084,322	$2,476,427	$2,637,048	$2,719,182
Other Commodities	$ -	$999,976	$1,449,282	$1,896,704
Total Benefits	$2,829,748	$4,221,830	$4,831,756	$5,361,312
Costs	$1,960,442	$2,094,929	$2,377,931	$2,692,766
Net benefits	$869,306	$2,126,900	$2,453,826	$2,668,546
BCR	1.4	2.0	2.0	2.0

6.9 Implementation Requirements

6.9.1 Division of Responsibilities

This section defines implementation responsibilities necessary to ensure that the Recommended Plan's goals and objectives are achieved. Included are discussions of the division of plan responsibilities between Federal and non-Federal interests, institutional requirements, cost sharing, analysis of non-Federal financial capability, a discussion of the Project Cost Agreement, and views of the non-Federal sponsor.

6.9.2 Cost Sharing

Cost sharing for the Recommended Plan will be done in accordance with Section 101 of the WRDA 1986 and cost shared as a General Navigation Feature. The Recommended Plan requires a blended cost sharing structure as there are two cost sharing depth increments involved (Table 6-33). Channels with depths from 21 feet to 45 feet are cost shared 25 percent non-Federal and 75 percent Federal (78.5% of material to be dredged). Any depth greater than 45 feet is cost shared 50 percent non-Federal and 50 percent Federal (21.5% of material to be dredged). For the purposes of allocating the cost by depth, the 78.5% of the mobilization-demobilization costs are included in the cost for the 21 to 45-foot increment and 21.5% of the mobilization-demobilization costs are included in the cost for the deeper than 45-foot increment. The non-Federal sponsor will provide all Lands, Easements, Right-of-ways, and Relocations (LERR). The only financial LERR costs are administrative costs associated with federal involvement in permitting and other real estate issues. Disposal necessary for the federal project is cost-shared as a general navigation feature. An additional 10 percent of the total costs of General Navigation Features will be repaid by the non-Federal sponsor over a period not to exceed 30-years. All or a portion of this 10% can be offset by LERR costs borne by the non-Federal sponsor. The Interim Corner Cut Off dredging volumes and construction costs are not included in the cost sharing calculations.

A summary of cost shares at FY 2013 price levels is presented in Table 6-34. Cost sharing details for the Recommended Plan at FY 2013 price levels are presented in Table 6-35. Explanatory notes are provided in Table 6-36. The total certified project cost in FY 2012 price levels is $41,349,356, of which $30,234,799 is the federal cost share and $11,114,556 is the non-Federal cost share. Table 6-37 presents the fully funded cost estimate at the mid-point of each year of construction.

Table 6-33
Cost Share Zones

	Dredging Volume (Cubic Yards)	Percentage
-21 to -45 feet	2,441,661	78.51%
Deeper than -45 feet	668,396	21.49%
Total	3,110,057	100.00%

Table 6-34
Project Cost Sharing Summary (FY 2013 Price Levels)

PROJECT FEATURES	TOTAL PROJECT COSTS	FEDERAL SHARE	NON-FEDERAL SHARE
General Navigation Features (GNF)			
Dredging: 20 feet to 45 feet	$14,867,000	$11,150,000	$3,717,000
Dredging: Increment to deepen to greater than 45 feet	$4,070,000	$2,035,000	$2,035,000
Upland Construction Costs (in reach deepened to <45 ft)	$4,661,000	$3,496,000	$1,165,000
Revetment (in reach deepened to <45 ft)	$2,936,000	$2,202,000	$734,000
Associated General Items	$1,659,000	$1,244,000	$415,000
Total General Navigation Features	$28,193,000	$20,127,000	$8,066,000
Lands and Damages (LERRs)[1]	$84,000	$0	$84,000
Aids to Navigation	$2,007,000	$2,007,000	$0
Additional Non-Federal Funding Requirements	$0	($3,811,000)	$3,811,000
Local Service Facilities			
Berth Dredging	$258,000	$0	$258,000
E&D and S&A	$4,485,000	$3,260,000	$1,225,000
Contingency	$7,345,000	$5,325,000	$2,020,000
Total Cost	**$42,372,000**	**$26,908,000**	**$15,464,000**

[1] Includes Real Estate S&A costs (without contingency), which are not included in the general E&D and S&A line item

Table 6-35
Project Cost Sharing Details

PROJECT FEATURES	TOTAL PROJECT COSTS	FEDERAL SHARE	NON-FEDERAL SHARE
General Navigation Features (GNF)			
Dredging: 20 feet to 45 feet	$17,983,753	$13,487,815	$4,495,938
Dredging: Increment to deepen to greater than 45 feet	$4,922,988	$2,461,494	$2,461,494
Upland Construction Costs (in reach deepened to <45ft)	$5,639,267	$4,229,450	$1,409,817
Revetment (in reach deepened to <45ft)	$233,523	$175,142	$58,381
Mooring Dolphin	$1,462,216	$1,096,662	$365,554
Boat Ramp Wall	$53,941	$40,456	$13,485
Sub Sail Monument	$123,838	$92,879	$30,960
Fencing	$21,222	$15,917	$5,306
Tower Guy Demolition	$110,986	$83,239	$27,746
Warning Sign	$3,552,458	$2,664,343	$888,114
GNF Subtotal	**$34,104,192**	**$24,347,397**	**$9,756,795**
Engineering & Design and Supervision & Administration	$5,014,523	$3,579,929	$1,434,594
Total General Navigation Features	**$39,118,715**	**$27,927,326**	**$11,191,389**
Lands and Damages (LERRs)			
Land Acquisition	$0	$0	$0
Subtotal LERRs	$0	$0	$0
Engineering & Design and Supervision & Administration[1]	$101,106	$0	$101,106
Total LERRS	**$101,106**	$0	**$101,106**
Aids to Navigation	$2,427,407	$2,427,407	$0
Engineering & Design and Supervision & Administration	$364,111	$364,111	$0
Total Aids to Navigation[2]	**$2,791,518**	**$2,791,518**	$0
Additional Non-Federal Funding Requirements			
10% of GNF		$0	$3,911,871
Adjustment for LERR Credit		$0	($101,106)
Net 10% GNF Requirement		**($3,810,766)**	**$3,810,766**
Local Service Facilities			
Berth Dredging	$311,568	$0	$311,568
Engineering & Design and Supervision & Administration	$46,735	$0	$46,735
Total Local Service Facilities	**$358,304**	$0	**$358,304**
Total Financial Cost and Cost Sharing	**$42,369,642**	**$26,908,078**	**$15,461,564**

[1] S&A of 5% of the economic (non-financial) real estate cost including contingency
[2] Plans for proposed Aids to Navigation will be forwarded to Coast Guard District Seven Waterways Management Division for comprehensive review and determination

Table 6-36
Cost Sharing Explanations

Explanatory Notes
The Federal interest extends only to GNF (General Navigation Features): primary access channels, anchorages, turning basins, locks and dams, harbor areas, jetties and breakwaters
Non-Federal sponsor may plan, design and construct navigation projects and be reimbursed with the Federal share. NOTE: Use of this authority requires advance approval and close coordination with HQUSACE
For providing depths to 20 feet below Mean Low Water (MLW), the non-Federal sponsor pays 10% of the GNF
Per Section 203 of WRDA 1986, for authorized projects the Secretary shall credit toward the non-Federal share of the cost of construction of such project an amount equal to the portion of the cost of developing such study
Non-Federal sponsors must:
Provide, at their expense, all ancillary shore side harbor facilities such as docks, terminal and transfer facilities, berthing areas, and local access channels
Provide all Lands, Easements, Rights-of-way, and Relocations (LERR) for construction and maintenance. The costs of any utility relocations, arising from dredging in excess of 45', should be borne equally by the Sponsor and the owner of the utility, and that the Sponsor would be credited only for 50% of the costs of such relocations
For providing depths from 20 feet to 45 feet below mlw, the non-Federal sponsor pays 25% of the GNF
For providing depths beyond 45 feet below mlw, the non-Federal sponsor pays 50% of the GNF
Provide cash contributions toward the costs for construction of the GNF of the project, which includes the costs of constructing land-based and aquatic dredged material disposal facilities, paid during construction
Hold and save the U.S. free from damages due to the construction, operation and maintenance dredging
Contribute 50% of the incremental costs for maintenance dredging associated with project depths in excess of 45 feet
For all depths, provide an additional cash contribution equal to 10% of GNF, which includes dredged material disposal construction costs. These costs may be paid over a period not exceeding 30 years
The sponsor’s costs for LERR, are credited against the additional cash contribution

Table 6-37
Fully Funded Costs

Civil Works Feature	Cost	Contingency	Total
Navigation Aids	$2,100,000	$440,000	$2,541,000
Navigation Ports and Harbors	$28,738,000	$6,026,000	$34,764,000
PED	$2,267,000	$475,000	$2,473,000
Construction Management	$2,400,000	$503,000	$2.904,000
Totals	$35,505,000	$7,445,000	$ 42,951,000

Note: Totals may not sum due to rounding

6.9.3 Special Consideration: Credit for Previously Completed Work

The CPA is seeking Congressional Authorization to credit the CPA costs for the Interim Corner Cut Off (ICCO) towards the non-Federal cost share of the recommended project. The construction costs of the ICCO ($13,775,063) are not included as a project cost in this report, because a prior agreement or authorization for project improvement was not yet in place between the Corps of Engineers and the non-Federal sponsor, the Canaveral Port Authority. However, as has been the case for a number of previous Federal navigation projects, the CPA intends to seek post-facto credit for those costs as part of the specific Congressional Authorization for construction of the project improvements recommended in this report. The ICCO is fully within the recommended project area and is an integral component of project design. The ICCO was completed while the feasibility study was being conducted.

The CPA constructed the ICCO in advance of completing the feasibility study to maintain safe navigation within the harbor for newer, larger cruise ships that were entering the Port Canaveral fleet at that time. These vessels were larger than the design limits of the existing Federal navigation project so CPA made the decision to advance construction to serve the existing and future fleet. The ICCO is included as a without-project condition throughout the feasibility analysis. The project, including the costs of the ICCO, remains economically justified and the recommended plan does not change if the expended costs of this completed element are included. The required environmental documentation and coordination was also conducted by CPA prior to construction of these interim ICCO improvements.

6.9.3.1 Section 203 Study Costs

Should the project that is recommended in this feasibility study be authorized by Congress, the Canaveral Port Authority, who has fully funded this Section 203 feasibility study, intends to seek credit under the provisions of Public Law 99-662, 99th Congress, November 17, 1986, (WRDA 1986), Section 203.(d) Credit and Reimbursement.

Section 203(d) states *"If a project for which a study has been submitted under subsection (a) is authorized by any provision of Federal law enacted after the date of such submission, the Secretary shall credit toward the non-Federal share of the cost of construction of such project an amount equal to the portion of the cost of developing such study that would be the responsibility of the United States if such study were developed by the Secretary."*

6.9.4 Financial Analysis of Non-Federal Sponsor's Capabilities

A financial analysis is required for any plan being considered for USACE implementation that involves non-Federal cost sharing. The purpose of the financial analysis is to ensure that the non-Federal sponsor understands the financial commitment involved and has reasonable plans for meeting that commitment. The financial analysis includes the non-Federal sponsor's statement of financial capability, the non-Federal sponsor's financing plan, and an assessment of the sponsor's financial capability.

The Canaveral Port Authority has expressed support for a potential project. Their funding of this Section 203 study is proof of their willingness to proceed with the proposed solution to the channel constraint problems identified at Port Canaveral. The Canaveral Port Authority has the capability to fund the non-Federal share of project design and construction costs. Furthermore, their capability as a non-Federal sponsor has been evidenced by their performance as the non-Federal sponsor on all previous Federal projects at Port Canaveral.

The Chief Financial Officer of the Canaveral Port Authority has signed a self-certification of financial capability (Attachment 2) as required by CECW-PC Memorandum on Lean Six Sigma Actions to Improve the Project Cooperation Agreement Process – Non-Federal Sponsor's Self-Certification of Financial Capability (12 June 2007). The form at enclosure 3 of that memo has been completed and is submitted with this Section 203 Report.

7. ENVIRONMENTAL CONSEQUENCES*

This section provides the scientific and analytical basis for comparison of the project alternatives to assist in the decision making process. The following sections include summaries of anticipated changes to resources within the area of influence of the proposed action (the selected plan) including direct, secondary, and cumulative effects.

7.1 Environmental Evaluation Methodology

The evaluation of anticipated effects included consideration of both existing information and new data collected specifically for these analyses where existing information was determined to be insufficient. Various resource agencies were contacted early in the process to determine regulatory and coordination requirements and potential resources of concern. The agencies assisted the Port in determining what additional studies and information may be required. Public input was also important in determining additional issues for evaluation, and is described in Section 8.

A number of studies and field investigations were conducted to evaluate potential impacts to resources from the project. A field investigation was conducted to evaluate vegetative communities, wetlands, and terrestrial protected species and habitat within the study area (Figure 2-3). An additional field study was conducted to identify sea turtle foraging areas within the harbor, including extent of use and algal community characteristics of the foraging areas (Figure 2-5). A study was conducted to identify the presence or likely presence of hazardous substances or petroleum products in and around the project area, and an assessment of essential fish habitat was completed. The information in these reports was summarized in an environmental baseline report (see Environmental Appendix). A report evaluating potential impacts of channel widening to the north and south jetties as well as the south jetty sediment trap was also conducted (see Engineering Appendix, Attachment G).

7.2 Effects on Significant Resources

7.2.1 General

The general environmental effects identified as resulting from the proposed project would be those short-term, construction related direct effects from constructing and dredging a deeper and wider navigation channel. In addition, there would be the long-term direct effects from maintaining a larger navigation channel and secondary effects attributable to the operation of the port facilities once construction is complete.

Three alternatives are being considered in this NEPA analysis along with the No Action Alternative. During the plan formulation process (see Section 5), a series of measures were considered and evaluated for effectiveness in achieving the goals of the study. Operational measures included modifications to vessel operating procedures, such as varying transit speeds and increasing vessel controllability. Modifying aids to navigation were also considered as operational measures. Locally implemented structural measures included modifications to port infrastructure (berths, piers, and mooring conditions) and terminals. Structural modifications to the Federally authorized channels included deepening and/or widening of channels and turning basins.

None of the planning elements are feasible as standalone alternative plans. As described in Section 5.3, berth deepening and improving aids to navigation, by themselves, do not adequately address the navigational constraints and associated problems at Port Canaveral. Each of the structural measures to the federal channel requires a companion locally implemented planning element to fully address the navigational constraints and problems. Widening the channel, which would allow larger cruise ships to more safely and efficiently use the port's cruise terminals, requires improved aids to navigation to be fully effective. Similarly, channel deepening requires associated berth deepening so that channel deepening benefits can be realized. Therefore, three action alternatives were developed for analysis.

Alternative 1, the Preferred Alternative includes the following features:

- Channel widening from 400 feet to 500 feet, from the sea to the West Turning Basin, and placement of an outbound range as an aid to navigation;
- Channel deepening from the sea to the West Access Channel and Middle Turning Basin, in one-foot increments starting at -42 feet in the Inner Reach, plus berth deepening; and

Alternative 2 is similar to Alternative 1, but without the channel widening feature:

- Channel deepening from the sea to the West Access Channel and Middle Turning Basin, in one-foot increments starting at -42 feet in the Inner Reach, plus berth deepening; and

Alternative 3 is similar to Alternative 1, but the channel widening extends only 50 feet, from 400 feet to 450 feet:

- Channel widening from 400 feet to 450 feet, from the sea to the West Turning Basin, and placement of an outbound range as an aid to navigation, and
- Channel deepening from the sea to the West Access Channel and Middle Turning Basin, in one-foot increments starting at -42 feet in the Inner Reach, plus berth deepening.

7.2.2 Sediments (see 2.6.1)

7.2.2.1 No Action Alternative

The No Action Alternative would have no effect on sediments. Maintenance dredging in the harbor and port facilities would continue on its current schedule.

7.2.2.2 Alternative 1 – Preferred Alternative

Alternative 1 would result in the immediate removal of 3,110,057 CY of sediments from the existing and proposed confines of the navigation channel. Dredging would be performed using clamshell or hydraulic dredge and loaded into scows for offshore disposal. The sediments would be placed in the existing authorized ODMDS. The present management plan for the ODMDS is the Site Management and Monitoring Plan (SMMP) dated February 2012. The SMMP is a ten-year plan, which is jointly implemented by the Corps' Jacksonville District and USEPA's Region 4. The SMMP specifically accounts for construction and maintenance material resulting from the project. The SMMP does not identify an annual limitation on placement volume. Historically, the Corps was authorized a maximum of 500,000 CY of maintenance dredging material to be placed in the ODMDS annually. The Port is permitted to dispose a maximum of 100,000 CY of maintenance material in the ODMDS annually. Historically, however, the

amounts have been significantly less. Preliminary evaluations indicate that approximately 69,500 CY of additional annual maintenance dredging material would be generated by the proposed project, which is well within the confines of the existing authorizations.

Upland soils would be removed via upland excavation to the greatest extent possible down to -13 ft. MLLW and used as fill or transported to approved upland storage sites for future use. Turbidity control for the project has not been specified, but options could include installing temporary sheet pile walls or double turbidity barriers. In all cases, the contractor would be required to comply with the state water quality standards during construction.

7.2.2.3 Alternative 2

Alternative 2 would result in the immediate removal of 1,520,349 CY of sediments from the existing navigation channel. Dredging would be performed using clamshell or hydraulic dredge and loaded into scows for offshore disposal. Dredged material would be treated as is described for Alternative 1. Preliminary evaluations indicate that no substantial additional annual maintenance dredging material would be generated by the proposed project.

7.2.2.4 Alternative 3

Alternative 3 would result in the immediate removal of 2,496,731 CY of sediments from the existing navigation channel. Dredging would be performed using clamshell or hydraulic dredge and loaded into scows for offshore disposal. Dredged material would be treated as is described for Alternative 1. Preliminary evaluations indicate that no substantial additional annual maintenance dredging material would be generated by the proposed project.

7.2.3 Vegetation (see 2.6.2)

7.2.3.1 No Action Alternative

The No Action Alternative would have no effect on vegetation. Native upland communities are limited on the property currently owned-operated by the Canaveral Port Authority. However, the vegetation in the upland communities on the CCAFS property between the MTB and TTB would be further removed with continued use of the site as a spoil disposal area by the US Navy / US Air Force.

7.2.3.2 Alternative 1 – Preferred Alternative

Alternative 1 would result in loss of vegetation associated with the loss of 8 acres of open field (shrub and brushland/spoil area) between the MTB and the TTB north of the channel. The vegetation in the upland communities on the CCAFS property between the MTB and TTB would be removed with future USAF and USN planned use of the site as a spoil disposal area, probably within the next two years, as would also occur under the No Action alternative. There is no additional vegetation loss associated with the rip-rap placement, which would be within the 8 acres.

7.2.3.3 Alternative 2

Alternative 2 would have no effect on vegetation. Impacts would be the same as with the No Action Alternative.

7.2.3.4 Alternative 3

Alternative 3 would result in loss of vegetation associated with the loss of 4 acres of open field (shrub and brushland/spoil area) between the MTB and the TTB north of the channel. The vegetation in the upland communities on the CCAFS property between the MTB and TTB would be removed with future USAF and USN planned use of the site as a spoil disposal area, probably within the next two years, as would also occur under the No Action alternative. There is no additional vegetation loss associated with the rip-rap placement, which would be within the 4 acres.

7.2.4 Wildlife Resources

7.2.4.1 No Action Alternative (see 2.6.3)

The No Action Alternative would have no effect on wildlife. The US Navy and US Air Force are currently using the upland area between the MTB and TTB on the CCAFS as a spoil disposal area. CCAFS is currently planning relocation of gopher tortoises and associated commensal species to a designated site on the CCAFS.

7.2.4.2 Alternative 1 – Preferred Alternative

Alternative 1 would have no discernible impact on wildlife. Wildlife found within Port boundaries in the study area are typical species found in heavily developed Florida coastline communities. Mammals include raccoons (*Procyon lotor*), domestic and feral cats (*Felis cattus*), and mice (*Mus musculus*). Migratory bird species, including warblers and sparrows, typically roost in forested areas along the coast, particularly near to open water. These species would not be displaced or otherwise significantly affected by construction or operation activities. The relocation of gopher tortoises and associated commensal species, which will occur under the No Action Alternative, would also occur under Alternative 1.

7.2.4.3 Alternative 2

Alternative 2 would have no effect on wildlife. Impacts would be the same as with the No Action Alternative.

7.2.4.4 Alternative 3

Alternative 3 would have no discernible effect on wildlife. Impacts would be similar to Alternative 1.

7.2.5 Wetlands (see 2.6.4)

7.2.5.1 No Action Alternative

The No Action Alternative would have no effect on wetlands. There are no wetlands within the project area (Figure 2-3).

7.2.5.2 Alternative 1 – Preferred Alternative

Wetland habitats within the study area are limited primarily to the western perimeter adjacent to the Banana River outside the project area, and would not be affected by construction, dredging,

or operational activities with the project. Therefore, Alternative 1 would have no effect on wetlands. The project would be constructed within the 100-year flood plain. Due to the nature of the proposed activities (i.e., widening and deepening of the existing channel), no practical alternative exists that would not occur within the 100-year flood plain. However, the project would not adversely affect flooding in the region.

7.2.5.3 Alternative 2

Alternative 2 would have no effect on wetlands. Impacts would be the same as with Alternative 1.

7.2.5.4 Alternative 3

Alternative 3 would have no effect on wetlands. Impacts would be the same as with Alternative 1.

7.2.6 Marine Resources (see 2.6.5)

7.2.6.1 No Action Alternative

The No Action Alternative would have no additional effect on marine resources. Maintenance dredging of sand bottom habitat in the harbor and port facilities would continue on its current schedule and permit conditions require for the monitoring of manatees and sea turtles during construction activities.

7.2.6.2 Alternative 1 – Preferred Alternative

Alternative 1 would impact marine resources, but these impacts would be temporary in nature. No beach or dune habitat, hardbottom, or seagrass would be affected by the alternative. A study was performed by Olsen Associates, Inc. (2007) (see Engineering Appendix) to evaluate the potential impact to downdrift sand supply and the south jetty sediment trap. The study concluded that the proposed alternative would have no effect. As with the No Action Alternative, maintenance dredging of sand bottom habitat in the harbor and port facilities would continue on its current schedule. The additional dredging impacts that would affect sand bottom would be associated with the ocean channel widener. The dredging area is approximately 34 acres, with an existing grade of approximately -30 MLW. Dredging is proposed to -46' MLW (+ 2 overdredge), resulting in approximately 600,000 CY of dredging.

There would be a temporary loss of approximately one acre of the marine algal community associated with removal of the riprap located between the MTB and the TTB. This riprap area is presently used for foraging by juvenile green sea turtles. Once the new riprap was installed, recolonization of the algal community should occur relatively quickly, likely within one year from placement. It may be possible to stockpile the riprap in the water during construction to minimize impacts to the algal community. An additional 2.5 acres of algal covered riprap exists along the southern jetty, and an unknown amount of algal mats occur in the Trident Turning Basin. It is estimated that less than 20% of the algal community used by juvenile greens in the Port would be temporarily impacted as a result of the project, especially given the extent of riprap present in the Trident Basin (Ehrhart and Redfoot 2007). The shoreline segment proposed for construction is approximately 980 meters in length. The shoreline length of similar habitat within the Trident Basin is approximately three times that size (2,700 meters) and so offers a

significant amount of adjacent habitat for any displaced turtles. The turtle survey effort also identified some other locations within the Port near the shoreline segment proposed for construction that would also offer potential refugia for displaced turtles, notably the riprap shoreline at Jetty Park along the south side of the channel (266 meters) and the interior areas of the north entrance jetty (740 meters) and the South Entrance Jetty (590 meters) (Dial Cordy 2007). Like the Trident Basin, these areas have habitat similar to the shoreline segment between the two turning basins. Taken together, these areas represent a total of nearly 4,300 meters of appropriate habitat in the vicinity of the shoreline segment proposed for construction that would be available as a refuge for any turtles temporarily displaced by the construction activities.

7.2.6.3 Alternative 2

Alternative 2 would impact marine resources, but these impacts would be temporary in nature. No beach or dune habitat, hardbottom, or seagrass would be affected by the alternative. A study was performed by Olsen Associates, Inc. (2007) (see Engineering Appendix) to evaluate the potential impact to downdrift sand supply and the south jetty sediment trap. The study concluded that the proposed alternative would have no effect. As with Alternative 1 and the No Action Alternative, maintenance dredging of sand bottom habitat in the harbor and port facilities would continue on its current schedule. The dredging area is approximately 34 acres, with an existing grade of approximately -30 MLW. Dredging is proposed to -46 MLW (+ 2 overdredge), resulting in approximately 1,520,349 CY of dredging.

7.2.6.4 Alternative 3

Alternative 3 would impact marine resources, but these impacts would be temporary in nature. Impacts would be very similar to Alternative 1.

7.2.7 Essential Fish Habitat (see 2.6.6)

7.2.7.1 No Action Alternative

The No Action Alternative would have no effect on EFH beyond the current impacts to water column and un-vegetated sand bottom associated with continued maintenance dredging.

7.2.7.2 Alternative 1 – Preferred Alternative

Alternative 1 would result in temporary impacts to EFH. There would be a temporary impact to the water column during construction due to increased turbidity (within State water quality parameters) during dredging, but this would be minor and temporary in nature. Impacts to populations of managed species will occur due to dredging of soft bottom habitats, including those that lack seagrasses. Dredging will temporarily 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).

As a result of the north side inner reach widening, an additional 16 acres of sand bottom would be created, and an additional 13 acres of sand bottom would be created with the south side west access channel widening. Approximately one acre of man-made hardbottom habitat in the form of boulder riprap would be temporarily removed during the project widening, with replacement

of these features once dredging is completed (see Section 7.2.6.2 for additional information). Impacts to managed species and their prey would be minimal and short-term in nature. An EFH assessment was completed for the project and concurrence from NMFS was received on June 13, 2012. These documents are included in the Environmental Appendix.

7.2.7.3 Alternative 2

Alternative 2 would result in temporary impacts to EFH. There would be a temporary impact to the water column during construction due to increased turbidity (within State water quality parameters) during dredging, but this would be minor and temporary in nature. Impacts to populations of managed species will occur due to dredging of soft bottom 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).

7.2.7.4 Alternative 3

Alternative 3 would result in temporary impacts to EFH. Impacts would be very similar to the widening aspects of Alternative 1.

7.2.8 Protected Species (see 2.6.7)

7.2.8.1 No Action Alternative

The No Action Alternative would have no additional effect on protected species. Maintenance dredging activities would continue under the current schedule, and protection and monitoring measures for manatees and sea turtles would continue to be followed according to the state and federal requirements (see Section 7.2.8.3). Due to the CCAFS and the Corps' plans to utilize the upland site between the middle and east turning basins for dredged material disposal, the CCAFS would relocate all gopher tortoises on the site. In the unlikely event that indigo snakes were encountered during construction, standard protection measures would be taken in accordance with the U.S. Fish and Wildlife Service (USFWS) guidelines.

7.2.8.2 Alternative 1 – Preferred Alternative

Alternative 1 has the potential to affect certain protected species within the project area. However, no impacts to the scrub jay, bald eagle, least tern, or piping plover are expected, since these species are not present in the project impact area (see Figures 2-8, 2-9, and 2-10).

Since there would be no direct beach placement of sand with this alternative, there would be no direct effect on nesting or hatchling sea turtles or the southeastern beach mouse. However, light from upland sources has been shown to have an effect on sea turtle hatchlings as they emerge from nests. Light from upland sources may disorient the hatchlings and prevent them from reaching the ocean. Direct lighting can also impact beach mouse activity and predation. The Port developed a light management plan in cooperation with the USFWS and FFWCC to mitigate the Port's overall lighting impact, including direct light and cumulative glow. Measures include type and orientation of exterior lighting, management of new and existing exterior light

sources, and the use of cutoff style light fixtures and shielding for pier and cargo-handling areas. These measures apply to Port tenants as well as Port operations.

Light generated during construction activities also has the potential to affect and disorient sea turtle hatchlings. Appropriate measures would be required during construction to mitigate for potential effects. A construction-specific light management plan may be required and include such measures as limiting nighttime construction activities during the nesting season and specifying placement and types of exterior lighting. The USFWS determined in their letter dated June 29, 2012 that the project would not adversely affect nesting or hatchling sea turtles with the inclusion of the lighting conditions outlined for the project of the West Indian manatee, described in greater detail below.

The USACE determined that the proposed project may affect, but is not likely to adversely affect the Eastern indigo snake with the incorporation of the USFWS standard protection measures into the project plans and specifications. The USFWS concurred with this determination in their letter dated June 29, 2012 (see Environmental Appendix).

Alternative 1 has the potential to impact the West Indian manatee during construction and dredging. The manatee can be found in Canaveral Harbor year round and precautions and monitoring are undertaken to ensure they are not impacted during normal operations associated with Port activities. The Port has had a Manatee Protection Plan since 1996 for the harbor. In 2003, the Brevard County Board of County Commissioners approved a Manatee Protection Plan to identify and implement measures to provide protection for the manatee. Standard manatee protection measures are also followed during maintenance dredging, and these measures would be implemented with any dredging activities associated with Alternative 1. Standard protection measures include:

- All personnel associated with the project shall be instructed about the presence of marine turtles, manatees and manatee speed zones, and the need to avoid collisions with (and injury to) these protected marine species. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.

- All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four- foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

- Siltation or turbidity barriers shall be made of material in which manatees and marine turtles cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee or marine turtle movement.

- Any collision with or injury to a marine turtle or manatee shall be reported immediately to the FFWCC Hotline at 1-888-404-3922, and to FFWCC at ImperiledSpecies@myFWC.com. Collision and/or injury should also be reported to the USFWS (in Jacksonville 1-904-731-3336.

- Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Temporary signs that have already been approved for this use by the FFWCC must be used.
    - One sign which reads *Caution: Manatee Habitat* must be posted.
    - A second sign measuring at least 8 ½" by 11" explaining the requirements for "Idle Speed/No Wake" and the shutdown of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities.
    - These signs can be viewed at MyFWC.com/manatee. Questions concerning these signs can be sent to the email address listed above.

In addition to the above-mentioned standard manatee conditions for in-water work, the USFWS letter dated June 29, 2012, requires incorporating the following conditions into the project plans and specifications to reduce the probability of take of manatees, nesting and hatchling sea turtles, and the southeastern beach mouse, to insignificant or discountable levels:

1. All in-water operations, including vessels, must be shut down if a manatee(s) comes within 50 feet of the operation (75 feet during nighttime operations). Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation (75 feet during nighttime operations), or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation (75 feet during nighttime operations). Animals must not be herded away or harassed into leaving.
2. To reduce the risk of a vessel crushing a manatee, the Permittee shall install and maintain the proposed wharf fenders to provide sufficient standoff space of at least four (4) feet under maximum designed compression. Fenders or buoys providing a minimum standoff space of at least four (4) feet under maximum designed compression shall also be utilized between two vessels that are moored together such as, but not limited to, the mooring of the scow and dredge barges.
3. During clamshell operations, the dredge operator shall gravity-release the clamshell bucket only at the water's surface, and only after confirmation that there are no manatees within the 50-foot safety distance during the day or the 75- foot distance during nighttime operations. The observers shall notify the dredge operator if manatees enter within the designated safety distances.
4. During daylight hours, at least one person shall be designated as a protected marine animal observer when in-water work is being performed. During nighttime hours, at least two people shall be designated as protected marine animal observers. Designated observers shall have appropriate qualifications and observation experience. Appropriate experience shall be demonstrated by a minimum of 100 hours of documented experience as an approved USFWS or FFWCC observer that has monitored marine animals and their behaviors in association with in-water construction projects. No later than 15 calendar days prior to the commencement of each dredging event, the Permittee shall ensure that the names, contact information, and experience has been submitted to the USFWS at jaxregs@fws.gov. The protected marine animal observer must be on-site during all in-water construction activities and shall advise personnel to cease operation

upon sighting a manatee within 50 feet of any in-water construction activity (75 feet for nighttime operations).

5. All observers shall maintain a daily log that details sightings, collisions, or injuries to protected marine animals, as well as project specific information such as work itinerary, weather, work shutdowns, observer shift changes, etc. In regard to manatee behavior, the observers shall also log time of observation, estimated distance of manatees from the dredge, type of behavior (such as passing through, pausing in the vicinity of the project, interacting with the dredge, scows, tugs, etc., attracted to running or dripping water), detection method (i.e., unaided visual, infrared, light intensification equipment, etc.) and whether the dredge is operating at the time of observation. A final report for each dredging event, summarizing all activities noted in the daily observer logs, an assessment and documentation (via photo or digital imagery) of effectiveness of any new technology implemented for observation (such as infrared) and new protocols, the location and name of project, and the dates and times of work shall be submitted within 30 days following project completion. The final report shall be submitted to the USFWS at jaxregs@fws.gov.

6. From March 1 through November 30, all project lighting east of the port locks shall be limited to the immediate area of active construction only and shall be the minimal lighting necessary to comply with U.S. Coast Guard, USACE and/or OSHA requirements. In order to better observe manatees during nighttime clamshell operations, the Contractor shall use shielded lights to illuminate the water surface for 75 feet around the hoist line (cable attached to bucket). These lights shall be shielded and/or positioned such that they are not visible from any sea turtle nesting beaches immediately north and south of Port Canaveral. The light intensity shall be a minimum of 54 lux (5 foot candles) at the water surface throughout this 111uminated area including the edge. The Contractor shall also have a handheld spotlight with a minimum of 10,000,000 candle power available to better observe manatees outside of this illuminated area. The Contractor shall measure the size of the illuminated area, intensity of the specified illumination, and assess its direct visibility from adjacent beaches, prior to commencement of the project. Prior to commencement of work, USACE shall provide to the FWS at jaxregs@fws.gov written verification from the contractor that the lighting described above conforms to the required specifications. No night-time operations shall commence or continue if one or more of these lighting parameters do not comply with the required specifications.

7. If the dedicated observers determine that detection of manatees during certain weather conditions (i.e., fog, rain, wind, etc.) is not possible, and if other optional technologies, e.g., infrared and/or light intensification equipment, cannot be effectively used to compensate for the loss of visual detection during certain weather (i.e., fog, rain, wind, etc.), then dredging operations shall cease until weather conditions improve and detection is again possible. The observers shall report any issues of non-compliance with the special operating measures to the Permittee and record these instances on their logs.

8. At least 48 hours prior to the commencement of each dredging event, the Permittee shall ensure that notification is sent to the USFWS indicating the actual start date and the expected completion date to the USFWS at jaxregs@fws.gov.
9. Blasting is prohibited. If no other alternative exists, consultation must be reinitiated.

With the implementation of the above-referenced conditions and monitoring, Alternative 1 is not likely to adversely affect the West Indian manatee. The Biological Assessment submitted to the USFWS, and the USFWS' concurrence letter dated June 29, 2012, are included in the Environmental Appendix.

Alternative 1 has the potential to affect swimming juvenile sea turtles. Juvenile sea turtles forage on algae within the harbor, so protection measures would be required during removal of rock riprap, dredging activities, and replacement of riprap between the MTB and TTB. Appropriate safeguards during construction operations will be developed to minimize any potential "take", such as using a turbidity curtain around the riprap and using divers to ensure all sea turtles have been excluded prior to removal and replacement of rock riprap. The other major potential source of "take" involves the displacement of turtles foraging on the riprap habitat for the time period between its removal and up to the time following its replacement when it has developed an algal community similar to what currently exists. The most likely scenario is that turtles would be displaced from the shoreline area between the MTB and TTB to other areas within the Port that have suitable similar habitat, most likely within the TTB itself (see discussion in Section 7.2.6.2). The potential for "taking" sea turtles is reduced when protective measures are used during hydraulic and clamshell dredging, so no dredging blackout window would be in effect. With standard protection measures and use of the above defined safeguards, as would be included in any Federal or State permit, Alternative 1 would not likely adversely affect juvenile sea turtles. A Biological Assessment was submitted to NMFS. A response was received from NMFS dated May 14, 2012, concurring with the USACE determination that the project "may affect, but is not likely to affect" any of the species of sea turtles or smalltooth sawfish with the incorporation of the NMFS Sea Turtle and Smalltooth Sawfish Construction Conditions dated March 23, 2006 (see Environmental Appendix).

Alternative 1 has the potential to affect the right whale. However, as previously discussed in this document, Alternative 1 is not expected to result in an increase in ship traffic calling on Port Canaveral. The project purpose is to handle the existing and projected cargo and cruise ship traffic, including larger vessels that the Port already sees, in a more efficient and safer manner. Alternative 1 would result in less delays for ships entering the harbor and reduce the amount of time offshore in right whale critical habitat, thus, reducing the potential of ship-whale incidents. Therefore, Alternative 1 is not likely to have an adverse effect on the right whale. The Port has been a primary sponsor of the Northern Right Whale Education & Monitoring Program with the Marine Resources Council since the mid to late-1990's.

Approximately 3.1 million cubic yards of material would be excavated and placed in the ODMDS. Based on the recently completed Corner Cut-Off dredging project, an average of 4,361 cubic yards of material was transferred per barge to the ODMDS. The proposed action would require approximately 710 trips to transfer the material to the ODMDS. The average time to traverse from the dredging site, disposal time, and travel back to the dredge site was 273 minutes. Transit velocity ranged from 3.4 knots (outbound speed) to 7.1 knots (return speed).

A Biological Assessment was prepared and submitted to the NMFS for concurrence (see Environmental Appendix). The NMFS determined that the project "may affect, but is not likely to adversely affect" the North Atlantic right whale and that non-federal vessels in excess of 65 feet in length entering and leaving the area are requested by NMFS to comply with the 10 knot speed restriction within the North Atlantic Right Whale Seasonal Management Area between November 15 and April 15 (73 FR 60173, October 2008). Federal vessels and contractors working on federal projects are exempt from this requirement.

7.2.8.3 Alternative 2

Alternative 2 has the potential to affect certain protected species within the project area. However, no impacts to the scrub jay, bald eagle, least tern, or piping plover are expected, since these species are not present in the project impact area (see Figures 2-8, 2-9, and 2-10).

Alternative 2 would have similar effects on nesting and hatchling sea turtles, the southeastern beach mouse, the West Indian manatee, and the right whale as Alternative 1. Potential effects and mitigation measures have been previously described.

7.2.8.4 Alternative 3

Alternative 3 has the potential to affect certain protected species within the project area. However, no impacts to the scrub jay, bald eagle, least tern, or piping plover are expected, since these species are not present in the project impact area (see Figures 2-8, 2-9, and 2-10). Effects on other species would be very similar to Alternative 1.

7.2.9 Cultural Resources (see 2.6.17)

7.2.9.1 No Action Alternative

The No Action Alternative would have no effect on cultural resources.

7.2.9.2 Alternative 1 – Preferred Alternative

The cultural resource report was revised in December 2007 (PBS&J 2007) and submitted to the State Historic Preservation Office (SHPO) for review. Subsequently, after the report was finalized it was determined that the National Register boundary associated with the Cape Canaveral Air Force Station is larger than the National Landmark Boundary for the Cape Canaveral Air Force Station. While project impacts will not adversely affect significant elements key to the listing of the Historic Property on both the National Register of Historic places and the listing as a National Landmark, clarification will be sought prior to project implementation during the Corps consultation on its final determination of effects under Section 106 of the National Historic Preservation Act. The report stated that the project was unlikely to affect historic properties. A letter was received from SHPO concurring with this determination (see Environmental Appendix). Therefore, Alternative 1 would have no effect on cultural resources. Initial recommendations from SHPO during the scoping process included providing 10-20 meter buffer areas around two distinct areas of cultural deposits identified in the initial cultural resource survey (PBS&J 2006). However, these sites are located on the CCAFS and are the responsibility of the U.S. Air Force. To ensure that no cultural resources are impacted an Archaeological Monitor will be utilized during initial ground clearing operations in preparation

of the work to ensure that no portions of these sites extend into the project area. All work will also be subject to an unexpected finds clause should any archeological materials are identified.

7.2.9.3 Alternative 2

Alternative 2 would have no effect on cultural resources.

7.2.9.4 Alternative 3

Alternative 3 would have the same effect on cultural resources as Alternative 1, and similar protective measures would be implemented.

7.2.10 Socio-Economic Resources

7.2.10.1 No Action Alternative

The No Action Alternative would generate no change to the study area's socio-economic conditions.

7.2.10.2 Alternative 1 – Preferred Alternative

Alternative 1 would generate no change to the study area's socio-economic conditions.

7.2.10.3 Alternative 2

Alternative 2 would generate no change to the study area's socio-economic conditions.

7.2.10.4 Alternative 2

Alternative 3 would generate no change to the study area's socio-economic conditions.

7.2.11 Aesthetics

7.2.11.1 No Action Alternative

The No Action Alternative would have no effect on aesthetic resources.

7.2.11.2 Alternative 1 – Preferred Alternative

Alternative 1 would have no significant effect on aesthetic resources, although construction and dredging equipment would be visible from nearby beaches and parks. The Port has construction equipment and industrial amenities visible on a regular, if not continuous, basis. Therefore, this would not present an aesthetic change from current conditions.

7.2.11.3 Alternative 2

Alternative 2 would have a similar effect on aesthetics as Alternative 1.

7.2.11.4 Alternative 3

Alternative 3 would have a similar effect on aesthetics as Alternative 1.

7.2.12 Recreation

7.2.12.1 No Action Alternative

The No Action Alternative would have no effect on recreational resources.

7.2.12.2 Alternative 1 – Preferred Alternative

Alternative 1 would have no significant effect on recreational resources. Dredging activities may be noticeable from the local recreation amenities in the port or from the nearby beaches located within a half-mile of the proposed channel widener, and dredging of the ocean widener would temporarily displace any fishing activities within or near the dredge area, but these effects would be minor and temporary.

7.2.12.3 Alternative 2

Alternative 2 would have no significant effect on recreational resources. Dredging activities may be noticeable from the local recreation amenities in the port or from the nearby beaches.

7.2.12.4 Alternative 3

Alternative 3 would have no significant effect on recreational resources. Impacts would be very similar to Alternative 1.

7.2.13 Coastal Barrier Resources

7.2.13.1 No Action Alternative

The No Action Alternative would have no effect on coastal barrier resources.

7.2.13.2 Alternative 1 – Preferred Alternative

No coastal barrier resources are located within the project study area and are unlikely to be affected by the project construction or operations. Therefore, Alternative 1 would have no effect on coastal barrier resources.

7.2.13.3 Alternative 2

No coastal barrier resources are located within the project study area and are unlikely to be affected by the project construction or operations. Therefore, Alternative 2 would have no effect on coastal barrier resources.

7.2.13.4 Alternative 3

No coastal barrier resources are located within the project study area and are unlikely to be affected by the project construction or operations. Therefore, Alternative 3 would have no effect on coastal barrier resources.

7.2.14 Water Quality

7.2.14.1 No Action Alternative

The No Action Alternative would have no effect on water quality other than the minor temporary water column turbidity impacts associated with historical maintenance dredging. Maintenance dredging would continue in the harbor on the current schedule.

7.2.14.2 Alternative 1 – Preferred Alternative

Alternative 1 would have only a minor, temporary effect on water quality. Dredging would result in a temporary water column impact from turbidity, but all dredging would be conducted in accordance with the State water quality standards. Turbidity monitoring would be required to ensure that turbidity levels would not exceed 29 nephelometric turbidity units (NTUs) above background at the edge of a mixing zone. If turbidity levels exceed 29 NTUs over baseline at any time, construction activities would cease immediately and not resume until modifications or corrective measures were taken and turbidity has returned to acceptable levels.

Upland sediments would be removed by land to the greatest extent possible down to -13 ft. MLLW and used as fill or be transported to an upland storage site for future use. Turbidity control for the project has not been specified, but options could include installing temporary sheet pile walls or double turbidity barriers. In any case, the contractor would be required to comply with state water quality standards during construction.

7.2.14.3 Alternative 2

Alternative 2 would have only a minor, temporary effect on water quality similar to Alternative 1. Dredging would result in a temporary water column impact from turbidity, but all dredging would be conducted in accordance with the State water quality standards. Turbidity monitoring would be required to ensure that turbidity levels would not exceed 29 nephelometric turbidity units (NTUs) above background at the edge of a mixing zone. If turbidity levels exceed 29 NTUs over baseline at any time, construction activities would cease immediately and not resume until modifications or corrective measures were taken and turbidity has returned to acceptable levels.

7.2.14.4 Alternative 3

Alternative 3 would have only a minor, temporary effect on water quality. Impacts would be very similar to the widening aspect of Alternative 1.

7.2.15 Hazardous, Toxic, and Radioactive Waste

7.2.15.1 No Action Alternative

The No Action Alternative would have no adverse effects pertaining to the presence of any hazardous, toxic, and radioactive waste.

7.2.15.2 Alternative 1 – Preferred Alternative

Alternative 1 would have no adverse effects pertaining to the presence of any hazardous, toxic, and radioactive waste. A Hazardous, Toxic, and Radioactive Waste Assessment was conducted

for this study in 2006 (see Engineering Appendix). The 2006 Assessment concluded that the proposed action may potentially encounter low to moderate concentrations of hazardous toxic waste. This assessment stated that "a further detailed study is required for the property leased by Beyel Brothers, Inc. associated with the WTB area of the project. Additionally, a file review and summary of the activities associated with Coastal Fuels and Mid-Florida Freezer should be performed." The Beyel Brothers, Inc. property was assessed in August 2007, which indicated high levels of Volatile Organic Vapor. Contaminated soils from the site were excavated, and the excavation sites were backfilled with clean material. Subsequent sampling from six of seven groundwater wells indicated no presence of petroleum impacts, and a sampling from a seventh well did not result in any contaminants in excess of the groundwater cleanup target level (GCTL). The site meets the FDEP criteria for a "No Further Action Required" status. The 2007 assessment report may be found in Attachment K of the Engineering Appendix. The Coastal Fuels and Mid-Florida Freezer property is located outside of the project area and would not be affected by the preferred alternative.

7.2.15.3 Alternative 2

Alternative 2 would have no adverse effects pertaining to the presence of any hazardous, toxic, and radioactive waste (see previous section for additional information).

7.2.15.4 Alternative 3

Alternative 3 would have no adverse effects pertaining to the presence of any hazardous, toxic, and radioactive waste. Impacts would be very similar to Alternative 1.

7.2.16 Air Quality

7.2.16.1 No Action Alternative

Ambient air quality along the Brevard County coastline is relatively good due to the presence of on and off shore breezes. Under the No Action Alternative, increase in traffic with normal growth and development could result in potential impacts to air quality (see Section 7.2.18.1). Emissions from motor vehicles and non-road engines primarily hydrocarbons and nitrogen oxides, contribute to the formation of ground level ozone. Brevard County is not classified by EPA as a non-attainment/maintenance area for ozone or any criteria pollutants.

7.2.16.2 Alternative 1 – Preferred Alternative

Alternative 1 would result in minor, temporary impacts to air quality due to the operation of construction and dredging machinery. With Alternative 1, traffic will increase due to additional vehicles associated with larger cruise ships calling on the Port as well as with normal growth and development (see Section 7.2.18.2). This could result in potential impacts to air quality. Emissions from motor vehicles and non-road engines primarily hydrocarbons and nitrogen oxides, contribute to the formation of ground level ozone.

Direct emissions from Alternative 1 involving dredging of the channel, disposal of the material in the ODMDS, and construction of the new wharves would be confined to exhaust emissions from labor transport equipment (land and water vehicles) and construction equipment (dredge, barges, tugs, etc.). The proposed action may result in small, localized, temporary increases in concentrations of nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon monoxide (CO), volatile

organic compounds (VOC), and particulates (PM). Since the project is located in an attainment area, there is no requirement to prepare a conformity determination. However, the total increases are relatively minor in context of the existing point and nonpoint and mobile source emissions in Brevard County (Table 7-1). Projected emissions from the proposed action would not adversely impact air quality given the relatively low level of emissions and the likelihood for prevailing offshore winds. With the proposed action, the criteria pollutant levels would be well within the national ambient air quality standards.

Table 7-1: 2002 Countywide Emissions for Brevard County (Tons Per Year)

	Emissions (tons)					
	NOx	**SO2**	**CO**	**VOC**	**$PM_{2.5}$**	**PM_{10}**
Nonpoint + Mobile	34,251	15,547	216,995	44,902	5,548	11,989
Point and Nonpoint + Mobile	46,403	25,865	218,319	45,561	6,712	13,350

7.2.16.3 Alternative 2

Alternative 2 would result in minor, temporary impacts to air quality due to construction and dredging machinery as previously described for Alternative 1.

7.2.16.4 Alternative 3

Alternative 3 would result in minor, temporary impacts to air quality due to construction and dredging machinery as previously described for Alternative 1.

7.2.17 Noise

7.2.17.1 No Action Alternative

The No Action Alternative would have no effect on noise levels.

7.2.17.2 Alternative 1 – Preferred Alternative

Alternative 1 would result in only minor, temporary impacts to ambient noise levels due to construction and dredging activities. Construction techniques for the proposed improvements may include activities such as pile driving for temporary turbidity control, which can create abrupt changes in the ambient noise levels. If techniques such as this are employed, mitigative measures such as limiting certain actions to daylight hours where they would be less disruptive may be implemented. However since the port operates 24/7 there is a constant noise level within the harbor associated with shipping and cargo movement and construction activities.

7.2.17.3 Alternative 2

Alternative 2 would result in minor, temporary impacts to noise due to construction and dredging machinery as previously described for Alternative 1.

7.2.17.4 Alternative 3

Alternative 3 would result in minor, temporary impacts to noise due to construction and dredging machinery as previously described for Alternative 1.

7.2.18 Traffic

7.2.18.1 No Action Alternative

Future traffic conditions (see Engineering Appendix: Attachment J) were determined from trip generations for future development described by the Port Authority and a 3% annual growth rate for traffic not associated with the Port's development. Southside expansion projects include the aggregate conveyor/yard by, fully occupied Premier Office Building, Milrose Hotel, and a Hotel and Conference Center on the Banana River site. North side expansion projects include the Cruise Terminals 6 and 7, Cargo Piers 5 and 6 supported by 18.5 acres of uplands by 2010 and then another 35 acres by 2015, and the Seaport Canaveral fuel tank farm. Future traffic analysis was performed for years 2010 and 2025. By 2010, the proposed developments will generate approximately 15,330 new daily trips. By 2025, the proposed developments under the No Action Alternative will generate approximately an additional 1,630 new daily trips, for a total trip increase of 16,960 by 2025.

7.2.18.2 Alternative 1 – Preferred Alternative

Alternative 1 would result in minor, temporary impacts to traffic due to construction and dredging machinery.

7.2.18.3 Alternative 2

Alternative 2 would result in minor, temporary impacts to traffic due to construction and dredging machinery as previously described for Alternative 1.

7.2.18.4 Alternative 3

Alternative 3 would result in minor, temporary impacts to traffic due to construction and dredging machinery as previously described for Alternative 1.

7.2.19 Navigation

7.2.19.1 No Action Alternative

Channel depths at Port Canaveral under the No Action Alternative will be the same as with existing conditions, based on the reasonable expectation of continued maintenance dredging. Large bulk carriers and tankers are constrained by existing channel depths as described in Sections 1 and 2 of this document, and will continue to be constrained under without-project conditions. Large bulk cargo vessels calling at Port Canaveral must operate under a combination

of constraints. These constraints consist of channel depth, channel transit schedules, and berth availability. The deepest operating draft currently approved by the Canaveral Pilots is 39.5 feet, which requires special coordination with the pilots so that the vessel arrives at peak high water. Any vessel arriving with a sailing draft of 36 feet or deeper must coordinate arrival with the rising tide. Schedule constraints are based on the priority given to cruise ship and submarine transits. When cruise ships and submarines are arriving or departing the port, all other vessel traffic must stand-by. Daily peak cruise ship arrival and departure times can effectively close the port to cargo vessel transits for an hour or more. Typically, arriving vessels are loaded to avoid reliance on a rising tide. The rationale for avoiding the need for tidal advantage is that having to wait for, or time arrival with the tide would likely cause conflict with scheduling or berth availability constraints.

Cruise ship operations at Port Canaveral under the No Action Alternative will be very similar to operations under existing conditions with the exception that interim channel modifications (i.e., spot dredging) will allow use of the channel by Freedom Class vessels. Port Canaveral will continue to be the home port for RCI's *Monarch of the Seas* (Sovereign Class), seven day cruises and RCI's *Freedom of the Seas* Freedom Class vessels (3, 4, and 7 day cruises).

Under the No Action Alternative, including interim channel modifications, Oasis Class vessels are too large to operate in Port Canaveral. Simulation-based evaluations conducted for this analysis indicate that an additional 100 feet of channel width, West Turning Basin expansion, and additional widener areas in the entrance channel would be required before an Oasis Class vessel can safely operate in Port Canaveral. In addition, Cruise Terminal 6/7 would need to be constructed to accommodate an Oasis Class vessel. The new Disney cruise ships will operate at Port Canaveral under without-project conditions. The newest Carnival cruise ship (*Dream*) is making Port Canaveral her homeport. The industry trend is towards ever larger and more luxurious cruise ships operating on their signature routes from the main Florida cruise ports (Miami, Port Canaveral, Fort Lauderdale). These largest and newest vessels are more highly prized by cruise customers, so it is reasonable to anticipate that the major cruise lines operating out of or calling at Port Canaveral will likely continue in the foreseeable future in upgrading the size of vessels in their Canaveral fleet to meet the demands of the cruise market.

7.2.19.2 Alternative 1 – Preferred Alternative

A detailed discussion of the navigation impacts of the preferred alternative is presented in Section 6: Plan Selection.

7.2.19.3 Alternative 2

A detailed discussion of the navigation impacts of Alternative 2 is presented in Section 6: Plan Selection.

7.2.19.4 Alternative 3

A detailed discussion of the navigation impacts of Alternative 3 is presented in Section 6: Plan Selection.

7.2.20 Energy Requirements and Conservation

The energy requirements for the preferred alternative would be associated with construction and dredging activities, and normal operations would not result in any increase in energy use. Energy use should actually decrease, since ships calling on the Port would not have a reduced wait time to enter the harbor, and ships would be less likely to be diverted to alternate ports. Diversion to alternate ports would also require higher energy use due to higher trucking costs for goods to reach final destinations, particularly in the Orlando area. Passengers on cruise ships using Port Canaveral as the home port would also be required to drive longer distances if cruise ships were diverted to alternate ports.

7.2.21 Natural or Depletable Resources

The sand and silt being dredged from below -13 feet MLW the harbor would be placed in the ODMDS. If any of the material is suitable for beach placement, it would be placed in the authorized nearshore berm area. If any of the material excavated from above -13 feet MLW is suitable for construction, it would be temporarily placed in the upland disposal site for future use.

7.2.22 Scientific Resources

No scientific resources would be lost with the project. Some of the studies performed during the evaluation process provide scientific data for future reference.

7.2.23 Native Americans

There are no Native American tribes or nations utilizing the area of influence of the proposed project and therefore, no Native American tribe or nation would be affected by this project.

7.2.24 Reuse and Conservation Potential

The sand and silt being dredged from the harbor would be placed in the ODMDS. It is not anticipated that any of the material dredged from below -13 feet MLW would be suitable for beach placement or construction. Material excavated from above -13 feet MLW is projected to be suitable for beneficial reuse as construction fill or dike construction material. The riprap between the MTB and TTB that would be removed may be conserved and reused once the channel has been widened.

7.2.25 Cumulative Impacts

Cumulative impacts are “impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or when a person undertakes such other actions” (40 CFR 1508.7). The purpose of the preferred alternative is to widen and deepen the current navigation channel. Only minor effects would be associated with loss of upland habitat, and no wetlands would be affected. Table 7-2 provides volumes of dredged material placed in the authorized ODMDS. This is a good indicator of cumulative dredging in the region because it includes dredging performed by the USACE, the Navy, and the CPA. Placement in the ODMDS has traditionally been the disposal method of choice since there are few options for upland disposal. Since 1974, approximately 22.6 million CY of dredged material from the entrance channel and various basins within the harbor have been disposed in the ODMDS site (USEPA

and USACE 2001). The proposed project would result in approximately 3,110,057 CY of material being removed and placed in the ODMDS. Historically, the Corps was authorized for 500,000 CY of maintenance dredging material to be placed in the ODMDS annually. The Port was authorized to dispose of 100,000 CY of maintenance material in the ODMDS annually, although actual amounts have been much lower. Preliminary evaluations indicate that an additional annual maintenance dredging volume of approximately 69,000 CY would be required with the proposed project improvements.

Tables 7-3 and 7-4 include a list of permits issued by the USACE and the State (FDEP and the SJRWMD) for various CPA projects. Few projects resulted in wetland impacts or involved protected species issues not associated with dredging. In addition, the Port is limited with regards to geographic expansion due to the proximity of the CCAFS to the north and the City of Cape Canaveral to the south. The uplands within the Port boundaries do not provide optimal habitat for protected species, but the surrounding areas including Brevard County beaches and dune habitat on the CCAFS support a variety of protected species including sea turtles, beach mice, and avian species. The Merritt Island National Wildlife Refuge (see Figure 2-13) was established, which is protected and provides habitat for many wildlife species and ensures that the region will be able to support significant natural resources in the years to come.

Future expansion projects identified in the 2007 Port Canaveral Master Plan include a hotel and conference center, Canaveral Cove Phase II, improvements to cruise terminals 6, 7, 11, and 12, improvements to cargo piers 5 and 6, and a fuel tank farm. Direct impacts to natural resources would be minimal as a result of these projects due to the highly urbanized nature of Port lands. The proposed tank farm and hotel and convention center would be constructed on historic spoil disposal sites, although there could be wetland impacts (treeless hydric savannah) with the hotel and convention site. The remainder of the future projects would occur in currently developed areas of the Port. Minor, temporary impacts to traffic would result due to construction and dredging machinery.

Cumulative impacts to nesting sea turtles could occur due to the additive effect of increased lighting from new buildings, increased Port operations, and increased traffic. However, as previously addressed, the Port has implemented a lighting plan that details appropriate mitigation measures to ensure the long-term success of nesting sea turtles. In fact, as older facilities are removed to make way for newer facilities, light pollution may be reduced, since some of the older structures may not have been designed to shield ambient light according to current standards.

Table 7-2
Volume of Dredged Material Placed in the Canaveral ODMDS (1974-2005)

Year	Action Type	Source	Volume (CY)	Sponsor	Composition
1974	NW	EC and TB	645,198	Navy	Sandy silt
1974	MD	EC and TB	223,986	Navy	Sandy silt
1975	NW	EC and TB	2,196,470	Navy	Sandy silt
1975	MD	EC and TB	187,212	Navy	Silty sand
1975	MD	TB	63,077	Navy	Sandy silt
1976	MD	EC	1,343,121	Civil Works	Sandy silt
1976	MD	EC	341,888	Civil Works	Sandy silt
1977	MD	EC	48,017	Civil Works	Sandy silt
1978	MD	EC	282,517	Civil Works	Sandy silt
1980	MD	EC	1,402,547	Civil Works	Sandy silt
1981	MD	EC	257,326	Civil Works	Sandy silt
1983	MD	EC	929,555	Civil Works	Sandy silt
1985	MD	EC	2,958,827	Civil Works	Silty sand
1986	NW	EC	63,370	Civil Works	Silty sand
1986	MD	EC	351,535	Civil Works	Silty sand
1988	MD	EC	442,750	Civil Works	Silty sand
1988	MD	EC	1,200,188	Civil Works	Silt
1989	MD	EC	203,000	Civil Works	Silt
1990	MD	EC	173,772	Civil Works	Silt
1991	MD	MTB	497,380	Civil Works	Silt
1992	MD	EC	342,000	Civil Works	Silt
1992	MD	MTB	208,000	Civil Works	Silt
1993	MD	EC	1,878,460	Civil Works	Silt
1993	MD	TAC	108,410	Navy	Silty sand
1993	NW	WTB SE CC	400,000	CPA	Clay
1994	NW	EC	454,000	Civil Works	Silty sand
1994	NW	MTB	1,039,000	Civil Works	Silty sand
1994	MD	EC	98,820	Civil Works	Silt
1994	MD	TAC	17,510	Navy	Sandy silt
1994	MD	WTB CT5	24,000	CPA	Sandy clay
1994	NW	WTB CT10	86,000	CPA	Silty sand
1995	MD	EC	243,180	Civil Works	Silt
1995	MD	TAC, TTB	12,090	Navy	Silt

Table 7-2
Volume of Dredged Material Placed in the Canaveral ODMDS (1974-2005)

Year	Action Type	Source	Volume (CY)	Sponsor	Composition
1996	MD	EC	245,274	Civil?	Sandy silt
1996	NW	WTB CT8	212,000	CPA	Silty sand
1997	MD	EC	773,999	Civil Works	Sandy silt
1997	MD	TTB	36,965	Navy	Silts & clays
1998	MD	EC	688,839	Civil Works	Sandy silt
1998	MD	EC,TTB,PW	160,044	Navy	Sandy silts clays
1998	MD	WTB CT5	5,600	CPA	Sandy clay
1999	MD	EC	1,312,703	Navy	Sandy silt
2000	MD	EC	300,320	Civil Works	Silt
2001-2005	MD	EC, WTB, MTB, IC, BC	500,000/yr	Civil Works	Silt & Fine sand
2001-2005	MD	EC, Cut 1A, TAC, TB	100,000/yr	Navy	Silt & Fine sand
2002-2003	NW	WTB Deepening	900,000	CPA	Silt & clay
2004-2005	MD	WTB	250,000/yr	CPA	Silt & fine sand
2002-2004	NW	CT 6&7	76,000	CPA	Fine sand
2002-2004	NW	WTB CC	750,000	CPA	Silt & fine sand
2002-2004	NW	Canaveral ADA	1,000,000	CPA	Silt and clay

Source: USEPA and USACE. 2001. Canaveral ODMDS Site Management and Monitoring Plan

NW – new work; MD – maintenance dredging;
EC – Entrance Channel;
TB – Trident Basin;
MTB – Middle Turning Basin;
TAC – Trident Access Channel;
WTB – West Turning Basin;
SE CC – Southeast Corner Cutoff;
TTB – Trident Turning Basin;
PW Poseidon Wharf;
CPA – Canaveral Port Authority

Table 7-3
Federal Permits Issued

Project	USACE Permit	Date Issued
West Turning Basin Deepening	198701217-IP-TB	9/9/99
ODMDS Extension	198701217 IP-TB Extension	9/6/02
Cruise Terminal 6&7, Corner Cutoff, Cruise Terminal 8	198701217 IP-TB Mod 1	9/5/01
Master Pier Permit	200000674 IP TB	7/27/01
Cruise Terminal 10 Scour Protection	200000674 IP-TB Mod 1	7/10/02
Cruise Terminal 10 Berth Improvements & Scour Repair	200000674 IP-TB Mod 2	11/6/02
Poseidon Wharf	200000674 IP-TB Mod 3	10/24/03
Temporary Tug Boat Berth	200000674 IP-TB Mod 4	11/12/03
Tanker Berth 2	200000674 IP-TB Mod 5	1/30/04
Maintenance Dredging	200005030 IP-TB	9/28/01
Maintenance Dredging	200005030 IP-TB Mod 1	8/27/02
Maintenance Dredging	200005030 IP-TB Mod 2	6/27/03
Cruise Terminal 12 Construction	200207924 IP-TSB	12/1/03
Artificial Reef Sites	200301550 IP-TB	3/15/04
Nationwide Permit 3	NW Permit 3	
N. Cargo Area Regional Stormwater Pond	NW Permit 6 200303787	5/6/03
West Turning Basin Stormwater Pond	NW Permit 7 200208539	2/18/03
SCP 1,2,3, Ct4, Tb2 Repair & Improvements	200000674 (IP-TB) MOD 6	02/15/2005
Time Extension – Master Pier Permit	200000674 (IP-TSB) MOD 7	
South Cargo Pier 2 Repair	200000674 (IP-TSB) MOD 8	11/13/2006
Time Extension – Master Pier Permit	200000674 (IP-TSB) MOD 9	
Sand Bypass	200309051(IP-TSB)	01/08/2003
South Jetty Sand Trap	20053195 (IP-TSB)	11/16/2005
SW Area Stormwater Management	20052677 (IP-TSB)	05/15/2007
Avocet Lagoon Mitigation Area	SAJ-2007-2109 (NW-TSD)	Application

Table 7-4
State Permits Issued

Project	FDEP/SJRWMD Permit	Date Issued
Cove Berth Improvements	0028763-001-ES	2/2/98
Canaveral Harbor Maintenance Dredging	0129260-001 JC	2/5/99
Cruise Terminal 12 Bulkhead Construction	01322822-007 EI	10/8/02
Maintenance Dredging	01322822-001 EI	6/18/01
Portwide Pier Improvement	01322822-002 EI	8/7/00
Freddie Patrick Park	01322822-003 EI	10/3/00
Cruise Terminal 5 Improvements	01322822-004 EI	12/15/00
Landbridge	01322822-005 EM	6/20/01
Cruise Terminal 8 & 5 Scour Repair	01322822-006 EM	7/13/01
Cruise Terminal 10 Repair and Improvements	01322822-008 EM	8/15/02
Cruise Terminal 10 Repair and Berth Improvements	01322822-009 EM	1/21/03
Canaveral Patrol Boat Berth	01322822-010 EM	7/21/03
Temporary Tug Boat Berth	01322822-011 EM	2/13/04
North Cargo Piers 1,2,3,4 South Cargo Pier 5	01322822-013 EM	4/30/04
West Turning Basin Deepening	0141951-001 EI	9/14/98
West Turning Basin Deepening	0141951-002 EM	8/2/00
West Turning Basin Corner Cutoff	0141951-003	8/8/01
West Turning Basin Corner Cutoff	0141951-004 EM	9/9/02
West Turning Basin Corner Cutoff	0141951-005 EM	10/8/02
West Turning Basin & Pilots Dredging	0209821-001-EI	6/20/03
Canaveral Harbor Bypassing	0220629-001-JC	8/24/04
Tug Boat Berth SW Pond	05-228973001	
Jetty Park	BE-1022	12/19/01
Jetty Park	BE-914	12/31/93
Jetty Park	BE-914 Amend 2	6/21/04
West Turning Basin Intermodal Gate	ERP05-0186093-001 ES	9/5/01
Marlin Street Improvements	ERP05-0186093-002 EM	4/8/02
Cruise Terminal 10 Parking Extension	ERP05-0186093-003	5/15/02
Grouper Road Improvements	ERP05-0186093-004 SI	9/30/02
West Turning Basin Stormwater Pond	ERP05-0186093-005 letter	4/13/04
West Turning Basin Stormwater Pond Mod	ERP05-0186093-005 SI	1/27/03
Port Canaveral Piers Minor Repairs	0132822-014-Ee	04/30/2004
Canaveral Maintenance Dredging	0132822-015-Em	11/04/2005
Portwide Pier Improvements	0132822-016-EM	06/26/2006
Master Pier Permit	0132822-016-DF	05/11/2006

7.2.26 Irreversible and Irretrievable Commitment of Resources

The loss of disturbed upland habitat associated with channel widening between the MTB and TTB would be for the most part irreversible. Sand dredged from the channel and the ocean widener that is not suitable for beach nourishment or construction would be placed in the ODMDS and lost. The benthic habitat associated with the sandy bottom would be temporarily displaced, but would recover quickly.

7.2.27 Unavoidable Adverse Environmental Effects

Temporary loss of sea turtle foraging habitat would occur with channel widening, and is unavoidable, but would quickly be replaced once new or recycled riprap is installed.

7.2.28 Local Short-Term Uses and Maintenance/Enhancement Of Long-Term Productivity

The proposed project would result in long-term economic benefit to the Port and the region. The Port's ability to accommodate current and projected cargo and cruise traffic depends on its ability to provide efficient service without costly delays, which would result in loss of projected revenues without the project.

7.2.29 Indirect Effects

Indirect effects are limited, since the proposed project was developed to handle current and projected cargo and cruise ship traffic more efficiently. Potential indirect impacts would include post-construction effects from erosion such as increased turbidity and sedimentation. Indirect effects were taken into consideration along with direct impacts in the analysis.

7.2.30 Compatibility with Federal, State, and Local Objectives

The project is consistent with local, state, and federal objectives. The need for more efficient and expanded port facilities is a high priority to the federal and state governments, and the proposed improvements are consistent with the Port's adopted comprehensive master plan.

7.2.31 Conflicts and Controversy

No conflicts or controversies have been identified being associated with this project. The project has been coordinated with the public as well as the various local, state, and federal government agencies (see Section 8).

7.2.32 Uncertain, Unique, or Unknown Risks

No uncertain, unique, or unknown risks have been identified being associated with this project.

7.2.33 Precedent and Principle for Future Actions

Implementation of this project would not set any precedent or principle for future actions.

7.2.34 Environmental Commitments

The Corps has established a policy of incorporating environmental and regulatory conditions into their construction contract specifications. This ensures that the contractor performing the work is obligated to comply with various construction methods, safeguards, monitoring, and other

specified precautions. Environmental commitments with this project would include standard manatee protection requirements, sea turtle protection, water quality protection and monitoring, and erosion control measures. The Corps oversees the projects to ensure permit compliance and address any issues that may arise.

7.2.35 Compliance with Environmental Requirements

7.2.35.1 National Environmental Policy Act of 1969

Environmental information on this project has been compiled and this Final Environmental Assessment has been prepared.

7.2.35.2 Endangered Species Act of 1973

Biological Assessments were prepared and submitted to the U.S. Fish and Wildlife Service and the National Marine Fisheries Service for their concurrence with Section 7 of this Act (Environmental Appendix). A response was received from the National Marine Fisheries Service on May 14, 2012, which determined that the project may affect, but is not likely to affect sea turtles, smalltooth sawfish, and the North Atlantic right whale with the incorporation of NMFS' Sea Turtle and Smalltooth Sawfish Construction Conditions. The U.S. Fish and Wildlife Service issued a letter on June 29, 2012, determining that the project may affect, but is not likely to adversely affect, the Eastern indigo snake, the West Indian manatee (with the inclusion of additional conditions), nesting or hatchling sea turtles, and the southeastern beach mouse.

7.2.35.3 Fish and Wildlife Coordination Act of 1958

A Draft Coordination Act Report was prepared by USFWS, and the recommendations were incorporated into the project to the extent practicable. One recommendation was to avoid impacts to algae-covered riprap used for foraging by juvenile sea turtles. If possible, impacts to algae-covered riprap will be minimized by stockpiling the riprap underwater during construction. Any loss would be temporary, and the proposed project would result in an area of riprap of approximately the same area as would be impacted. In addition, the existing algae-covered riprap would be preserved and used for the new riprap area to facilitate colonization. Once installed, re-colonization of the algal community should occur relatively quickly. Due to the temporal nature of the impact, additional mitigation is not warranted. This is consistent with planning guidance contained in ER 1105-2-100, Appendix C (Environmental Evaluation and Compliance), paragraph C-3.d(4)(b), which states "impacts of alternate plans shall be evaluated based on the extent, intensity, and duration of the impact on *significant (emphasis added)* ecological resources compared to the "future without plan" condition." The decision that mitigation is not warranted is consistent with additional planning guidance provided by the South Atlantic Division to the Jacksonville District, for the Port Everglades navigation project, on 31 August 2007 regarding impacts associated with navigation projects (see Environmental Appendix).

The U.S. Fish and Wildlife Service reviewed the proposed project for impacts to other Federal Trust and natural resources pursuant to the Fish and Wildlife Coordination Act of 1958, and provided their comments in a letter dated June 29, 2012 (see Environmental Appendix). In this letter, they determined that the proposed project would have minor, temporary effects on natural

resources, and no significant, long-term effects on other Federal Trust and natural resources. Therefore, they did not have any objection to the proposed project.

7.2.35.4 National Historic Preservation Act of 1966 (Inter Alia)

A cultural resource assessment was conducted for this project, and the report submitted to the State Historic Preservation Office. Section 106 consultation was completed when a letter from the Division of Historical Resources dated December 14, 2007 was received concurring with the conclusions and recommendation of the report (Environmental Appendix). The project is in full compliance with this Act.

7.2.35.5 Clean Water Act of 1972

As stated in the Florida Department of Environmental Protection's May 9, 2007 response to the Scoping Notice and June 19, 2012 response to the Notice of Availability of the Draft EA, the project will require issuance of a State environmental resource permit or joint coastal permit from the Bureau of Beaches and Coastal Systems in compliance with Section 401 of this Act. A Federal 404(b)1 evaluation is included in this report (Environmental Appendix).

7.2.35.6 Clean Air Act of 1972

The proposed action would not result in a change in attainment status for Brevard County and no air quality permits would be required for this project. Therefore, this project is in compliance with this Act.

7.2.35.7 Coastal Zone Management Act of 1972

A federal consistency determination in accordance with 15 CFR 930 Subpart C is included in this report (Environmental Appendix). The state issued preliminary determinations that the proposed project is consistent with the Florida Coastal Management Program in the FDEP's May 9, 2007 response to the Scoping Notice and June 19, 2012 response to the Notice of Availability of the Draft EA (see the Environmental Appendix). Comments provided by the reviewing agencies, as part of the state's most recent review, were incorporated into this report where applicable (see the public comment matrix included in the Environmental Appendix). Final review of the project's consistency with the Florida Coastal Management Program will be conducted during the environmental permitting stage.

7.2.35.8 Farmland Protection Policy Act of 1981

A Farmland Conversion Impact Rating form AD-1006 has been prepared and submitted to the U.S. Department of Agriculture, Natural Resources Conservation Service for determination of the effects to prime and unique farmlands. There are no effects to prime or unique farmlands.

7.2.35.9 Wild and Scenic River Act of 1968

No wild or scenic river would be affected by this project. This Act is not applicable.

7.2.35.10 Marine Mammal Protection Act of 1972

Incorporation of safeguards used to protect threatened or endangered species during construction would also protect any marine mammals in the area. These were included in the Biological

Assessment to the National Marine Fisheries Service. In their letter dated May 14, 2012, NMFS noted that the ESA section 7 process does not authorize incidental takes of listed or non-listed marine mammals. If any such take occurs, an incidental take authorization under MMPA section 101 (a)(5) will be obtained.

7.2.35.11 Estuary Protection Act of 1968

No designated estuary would be affected by the project. This Act is not applicable. The Port is adjacent to the Indian River Lagoon; however, this project will have no impact to the estuary.

7.2.35.12 Federal Water Project Recreation Act

This Act is not applicable to this project.

7.2.35.13 Fishery Conservation and Management Act of 1976

The project was coordinated with the National Marine Fisheries Service and is in compliance with this Act.

7.2.35.14 Submerged Lands Act of 1953

The project does not occur on submerged lands of the state of Florida. The CPA holds title to all of the submerged lands within the harbor (with the exception of Navy and Air Force parcels which are outside of the project limits) and a perpetual easement for the offshore entrance channel. The project is in compliance with this Act.

7.2.35.15 Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990

Coastal barrier resources in the region have been identified, and no coastal barrier resources would be affected by the project. The project is in full compliance with this Act.

7.2.35.16 Rivers and Harbors Act of 1899

The project would not obstruct navigable waters of the United States. The project has been subject to public notice, public hearings, and other evaluations normally conducted for activities subject to this Act. The project is in full compliance with this Act, as it is a navigation improvements project.

7.2.35.17 Anadromous Fish Conservation Act

Anadromous fish species would not be affected with this project. This project has been coordinated with the National Marine Fisheries Service and is in full compliance with this Act.

7.2.35.18 Migratory Bird Treaty Act and Migratory Bird Conservation Act

No migratory birds would be affected by this project. The project is in full compliance with this Act.

7.2.35.19 Marine Protection, Research and Sanctuaries Act

All dredged materials would be placed in the authorized Canaveral ODMDS, the authorized nearshore berm, or authorized upland disposal site. Therefore, the project is in full compliance with this Act.

7.2.35.20 Magnuson-Stevens Fishery Conservation and Management Act

An Essential Fish Habitat evaluation was conducted to determine impacts from this project and was coordinated with the National Marine Fisheries Service (NMFS) on November 7, 2011. NMFS concluded that the project would not adversely impact EFH in their letter dated June 13, 2012, and they did not have any EFH conservation recommendations to provide (see Environmental Appendix). This project is in full compliance with this Act.

7.2.35.21 E.O. 11990, Protection of Wetlands

No wetlands would be affected by this project. Therefore, the project is in full compliance with this Executive Order.

7.2.35.22 E.O. 11988, Flood Plain Management

The project is in the base flood plain (100-year flood) and has been evaluated in accordance with this Executive Order. The project would not result in an adverse effect with regard to flooding within the region.

7.2.35.23 E.O. 12898, Environmental Justice

This environmental justice assessment recognizes the issues addressed in the Environmental Justice Guidance under NEPA (CEQ 1997), and uses the EPA Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses (EPA 1998) as a guide.

An environmental justice assessment requires an analysis of whether minority and low-income populations (i.e., "the populations of concern") would be affected by a proposed federal action and whether they would experience adverse impacts from the proposed action at any of the site alternatives. If there are adverse impacts, the severity and proportionality of these impacts on populations of concern must be assessed in comparison to the larger non-minority or non-low-income populations. At issue is whether such adverse impacts fall disproportionately on minority and/or low-income members of the community and, if so, whether they meet the threshold of "disproportionately high and adverse." If disproportionately high and adverse effects are evident, then the EPA Guidance advises that it should trigger consideration of alternatives and mitigation actions in coordination with extensive community outreach efforts (EPA 1998).

The CPA conducted public notification and outreach to the local community including minority and low income populations. A Notice of Intent (NOI) was published in the Federal Register on March 16, 2007 announcing the Jacksonville District, USACE intended to prepare a Draft Environmental Impact Statement (DEIS) for the Port Canaveral Improvements Section 203 Feasibility Study (FR 72(51) 12598). A letter was issued on March 21, 2007 inviting interested parties and stakeholders to attend a public meeting for the project. The meeting was advertised in the legal section of the Florida Today, the main newspaper in Brevard County. The meeting

was held on April 4, 2007 in the Commission Room of the Canaveral Port Authority. Additional public meetings will be held as the project continues to move forward.

The population of Brevard County was 534,000 in 2006, with 10% of the population of Brevard County was considered as living below the poverty level (U.S. Census 2007). The total population was reported (on race alone) as 86% White, 10% Black or African American; less than 0.5% American Indian and Alaska Native; 2% Asian; less than 0.5% Native Hawaiian or Pacific Islander; and 1% some other race (U.S. Census 2007). Two percent of the people of Brevard County reported 2 or more races. Six percent of the people in Brevard County was Hispanic, and 80% of were reported as White non-Hispanic. It is important to note that there are no residential areas within the immediate vicinity of the project, which is located in a highly industrialized area.

The project would not result in adverse human health or environmental effects. The project would not disproportionately adversely affect any minority or low-income population. The majority of the low-income populations reside west of the Banana River and the minority populations are not disproportionately located within the region of influence of the proposed action. The activity would not (a) exclude persons from participation in, (b) deny persons benefit of, or (c) subject persons to discrimination because of their race, color, or national origin. Therefore, the project is in compliance with this Executive Order.

7.2.35.24 E.O. 13089, Coral Reef Protection

No coral reef or hardbottom habitat would be affected by this project as there are none in the project area. This document was submitted to the National Marine Fisheries Service for review and concurrence. The project is in full compliance with this Executive Order.

7.2.35.25 E.O. 13112, Invasive Species

The project would not result in the propagation or spread of invasive species. Ships calling on Port Canaveral will continue to comply with industry protocols regarding ballast water discharges to prevent introduction of invasive marine species that could affect the region. Therefore, the project is in compliance with this Executive Order.

7.3 Measures to Avoid, Minimize and Mitigate Environmental Effects

The following text describes natural resources potentially affected by the proposed project and measures proposed to avoid, minimize and mitigate environmental effects.

Upland Habitat

The proposed project would result in a loss of 8 acres of upland habitat and associated vegetation (shrub and brushland) between the MTB and the TTB north of the channel. Vegetation that could be impacted is predominately bahia grass. The upland resources are not considered significant and mitigation would not be appropriate.

Wetlands

Wetland habitats within the study area are limited primarily to the western perimeter adjacent to the ICW and would not be affected by construction, dredging, or operational activities with the project. Therefore, the proposed project would have no effect on wetlands and no mitigation is required.

Marine Resources

The proposed project would impact marine resources (sand bottom and algae covered riprap), but these impacts would be temporary in nature. Dredging will remove benthic organisms, but these populations 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). No beach or dune habitat, hardbottom, or seagrass would be affected by the proposed project. Maintenance dredging of sand bottom habitat in the harbor and port facilities would continue, and the additional dredging impacts that would affect sand bottom would be associated with the ocean channel widener. The dredging area is approximately 34 acres.

There would be a temporary loss of approximately one acre of marine vegetation in the form of an algal community associated with the riprap between the MTB and the TTB. The proposed project would result in new riprap of approximately the same area as would be impacted. Once installed, recolonization of the algal community should occur within approximately one year. New riprap was placed on the north side of the channel between the TTB and Poseidon Turning Basin several years ago, and new algal growth occurred in approximately one year, although it could have been somewhat longer (B. Redfoot, personal communication). An additional 2.5 acres of algae covered riprap exists along the southern jetty, and an unknown amount of algal community occurs in the TTB. It is estimated that less than 20% of the algal community would be temporarily affected by the project. The temporary loss of this habitat is not considered significant. Although juvenile sea turtles utilize the proposed impact area for foraging, they also forage within areas that will not be impacted by the project. Adequate habitat would remain in the interim to ensure that the juvenile sea turtle population would be unaffected by the proposed project. Due to the temporal nature of the impact, mitigation is not warranted. This is consistent with planning guidance contained in ER 1105-2-100, Appendix C (Environmental Evaluation and Compliance), paragraph C-3.d(4)(b), which states "impacts of alternate plans shall be evaluated based on the extent, intensity, and duration of the impact on ***significant (emphasis added)*** ecological resources compared to the "future without plan" condition." The decision that mitigation is not warranted is consistent with additional planning guidance provided by the South Atlantic Division to the Jacksonville District, for the Port Everglades navigation project, on 31 August 2007 regarding impacts associated with navigation projects (see Environmental Appendix).

Essential Fish Habitat

The proposed project would result in temporary impacts to EFH (water column and sand bottom) during construction and dredging. The impacts to water column would be minor and temporary in nature. Sand bottom habitat (34 acres) would be impacted due to dredging, but the benthic community would quickly recolonize the impacted area. As a result of the north side inner reach widening, an additional 16 acres of sand bottom would be created, and an additional 13 acres of sand bottom would be created with the south side West Access Channel widening. Dredging will temporarily 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). Please see Sections 7.2.6, 7.2.7, and 7.2.35.20 for additional information.

Protected Species

The proposed project has the potential to affect the indigo snake and gopher tortoise. Four gopher tortoise burrows (approximately two tortoises) were identified along the berm adjacent to the patrol road in the upland area. However, the Air Force has indicated that the site will be cleared and used as a staging area for dredged material in the near future. If that occurs, any gopher tortoises and/or indigo snakes on the site will be relocated to an approved site by Air Force personnel. If the site is not cleared for this purpose, the gopher tortoise burrows would likely be impacted during construction of the patrol road and fence, but approximately 125 acres of suitable habitat would remain unaffected by the project. Prior to construction activities, the area would need to be re-surveyed, and if gopher tortoise burrows would be impacted, a relocation permit from the Florida Fish and Wildlife Conservation Commission (FFWCC) would need to be obtained. Any active or inactive gopher tortoise burrows affected by the project would need to be excavated and relocated either on-site or an approved off-site location. New rule changes are currently under consideration. If indigo snakes were identified utilizing the burrows during construction, standard protection measures would be taken in accordance with the U.S. Fish and Wildlife Service (FWS) guidelines.

Since there would be no beach placement of sand with the proposed project, there would be no direct effect on nesting sea turtles. However, light from upland sources has been shown to have an effect on sea turtle hatchlings as they emerge from nests, and on southeastern beach mouse activity and predation. Compliance with the Port's light management plan and implementation of the conditions outlined in the USFWS' June 29, 2012 letter would mitigate for any potential effects.

The proposed project has the potential to impact the West Indian manatee during construction and dredging. The manatee can be found in Canaveral Harbor year round and precautions are taken to insure they are not harmed during normal operations associated with Port activities. The Port has a Manatee Protection Plan for the harbor and in 2003, the Brevard County Board of County Commissioners approved a Manatee Protection Plan to identify and implement measures to provide protection for the manatee. Standard manatee protection measures are also followed during maintenance dredging, and these measures would be implemented with any dredging activities. Additional conditions were required pursuant to the USFWS' June 29, 2012 letter to ensure the protection of the West Indian manatee. The standard manatee protection measures and the additional conditions required as part of the consultation with the USFWS under Section 7 of the Endangered Species Act are provided in Section 7.2.8.2.

The proposed project has the potential to affect swimming juvenile sea turtles. Juvenile sea turtles forage on algae within the harbor, so protection measures would be required with dredging activities and removal of any algae covered riprap between the MTB and TTB. Hopper dredging is not approved for Port Canaveral. Hydraulic and clamshell dredging are not known to "take" sea turtles, so no dredging blackout window would be in effect. With standard protection measures as would be included in any Federal or State permit, the proposed project would not likely adversely affect juvenile sea turtles.

The proposed project has the potential to affect the North Atlantic right whale. The Corps will comply with North Atlantic right whale protection measures as identified in the Section 7 NMFS May 14, 2012, consultation letter, including the federal speed zone rule (73 FR 60173, October

2008). Non-federal vessels in excess of 65 feet in length entering and leaving the area are required to comply with the 10 knot speed restriction within the North Atlantic Right Whale Seasonal Management Area between November 15 and April 15 (73 FR 60173, October 2008). Federal vessels and Contractors working on federal projects are exempt from this requirement. In addition, protection measures recommended by the FFWCC in their letter dated June 15, 2012, will be incorporated into the project from December 1 until March 31, including:

- A dedicated observer shall be posted to spot right whales. Additionally, all personnel on all support vessels (vessels associated with dredging and dredge spoil deposition in the off-shore dredge management disposal site) shall observe for right whales in the southeastern critical habitat area. The southeastern critical habitat area extends from 31o 15'N to 30°15'N out 15 miles offshore and from 30°15'N to 28°00'N out 5 miles offshore. If a whale is seen by the dedicated whale observer or support vessel personnel during daylight hours, the vessel operator shall take necessary precautions to avoid whales;
- Daily updates of whale sightings during this portion of the year are maintained by the National Marine Fisheries Service (NMFS) and should be obtained by contacting NMFS at se.rw.sightings@NOAA.gov. Such sighting update requests should include one valid return email address capable of receiving emails with sighting alerts;
- If whales have been spotted within 15 nautical miles (nm) of the vessel's path within the previous 24 hours, the dredge and support vessels shall slow to 5 knots or less when transiting between areas during evening hours or when there is limited visibility due to fog or sea states of greater than Beaufort 3 (unless weather and sea conditions dictate greater speeds for safe navigation);
- All dredge and support vessel operators shall be familiar with, and adhere to, the federal right whale minimum approach regulation, as defined in 50 CFR 224.103(c).

The FFWCC recommendation for vessels to slow to 5 knots or less when the Early Warning System (EWS) surveys have not been flown within the previous 24 hours goes above the federal standard as set in the NMFS South Atlantic Regional Biological Opinion, and will not be incorporated into the project specifications.

Summary

Habitat loss with the project would either be temporary or not significant, so no mitigation for these resources is proposed. No wetlands, beach or dune habitat, hardbottom, or seagrass would be affected by the proposed project. Impacts would occur to upland habitat (8 acres), sand bottom habitat (34 acres), and algae covered riprap (1 acre). Potential impacts to protected species would be provided through appropriate management measures (manatees, sea turtles) and on-site relocation (gopher tortoises).

7.4 Occupational Health and Safety (32 CFR 989.27)

All project activities will comply with the USACE EM 385-1-1, Safety and Health Requirements Manual. Specifications will be included in all bid documents and plans to ensure that all local, state, and federal safety regulations are followed.

8. PUBLIC INVOLVEMENT, REVIEW AND CONSULTATION*

8.1 Public Involvement Program

Prior to preparation of the Integrated Section 203 Navigation Study Report & Final Environmental Assessment by the Canaveral Port Authority, public involvement was conducted throughout the course of the study. At the request of CPA, the Jacksonville District, U.S. Army Corps of Engineers published a Notice of Intent in the Federal Register. While not required at this stage of the Section 203 study process, CPA requested that the Corps initiate the public scoping process in order to solicit public input while it could be considered in the plan formulation and evaluation process being conducted.

A public scoping meeting was held by the Corps, as was a study initiation public meeting hosted by CPA at Port Canaveral. A Scoping Letter was issued on March 21, 2007 inviting interested parties and stakeholders to attend a Scoping meeting for the project. The meeting was advertised in the legal section of Florida Today, the main newspaper in Brevard County. The Scoping meeting was held on April 4, 2007 at the Commission Room of the Canaveral Port Authority. A total of 15 persons registered at the meeting, of which six were involved with preparation of the DEIS. Coordination with resource agencies was conducted through agency coordination letters that solicited their comments. The Canaveral Port Authority considered the comments received by letter and statements made at public meetings in the plan formulation, evaluation, and alternative selection process. Individuals and agencies were provided the opportunity to present written comments relevant to the Section 203 study or request to be placed on the mailing list for announcements and for the eventual distribution by HQUSACE of the Draft EA. The comments received were very limited, but were considered in the preparation of the Integrated Section 203 Navigation Study Report & Final Environmental Assessment (Environmental Appendix: Scoping Documents and Correspondence).

8.2 Additional Required Coordination

At the request of CPA, formal consultation under the Fish and Wildlife Coordination Act has been initiated by the U.S. Army Corps of Engineers, Jacksonville District. Section 7 of the Endangered Species Act consultation with the USFWS and NMFS has been initiated and Biological Assessments have been submitted for review and concurrence. Section 7 consultation under NMFS was completed upon receipt of their concurrence letter dated May 14, 2012. Section 106 coordination has been completed with the SHPO regarding cultural and archaeological resource protection. An Essential Fish Habitat assessment was completed and submitted to the National Marine Fisheries Service for concurrence under the Magnuson-Stevens Fishery Conservation and Management Act, and a Farmland Conversion Impact Rating form AD-1006 has been prepared and submitted to the U.S. Department of Agriculture, Natural Resources Conservation Service for determination of the effects to prime and unique farmlands. State water quality certification review under Section 401 of the Clean Water Act and Clean Air Act compliance will be conducted by the Florida Department of Environmental Protection during the final environmental resource permitting process, which is currently underway.

The Integrated Section 203 Navigation Study Report & Draft Environmental Assessment has been circulated by the Jacksonville District, U.S. Army Corps of Engineers for formal review and comment as an Integrated Feasibility Report and Draft Environmental Assessment.

8.3 Scoping and Draft EA

A Notice of Intent (NOI) was published in the Federal Register on March 16, 2007 announcing the Jacksonville District, USACE intended to prepare a Draft Environmental Impact Statement (DEIS) for the Port Canaveral Improvements Section 203 Feasibility Study (FR 72(51) 12598). A Scoping Letter was issued on March 21, 2007 inviting interested parties and stakeholders to attend a Scoping meeting for the project. The meeting was advertised in the legal section of the Florida Today, the main newspaper in Brevard County. The Scoping meeting was held on April 4, 2007 in the Commission Room of the Canaveral Port Authority. A total of 15 persons registered at the meeting, of which six were involved with preparation of the DEIS. All comments and pertinent correspondence and scoping documents are included in the Environmental Appendix: Scoping Documents and Correspondence.

The USACE determined that preparation of an EA was the appropriate level of NEPA compliance with the proposed project due to the lack of significant adverse environmental impacts and agency and public comments.

A Notice of Availability was published issued on April 10, 2012 informing the public of the Draft EA and Feasibility Study for the project was available for review and comment. The notice also informed the public that a workshop was to be held to provide information about the project and answer any questions. The workshop was held in the Commission Room of the Canaveral Port Authority on May 14, 2012. A total of four persons not directly involved with preparation of the Feasibility Report attended the meeting. No written comments were submitted at that time.

A 60-day public notice period was completed on June 9, 2012, and formal comments were received from: the U.S. Environmental Protection Agency; the Seminole Tribe of Florida; the NMFS; the U.S. Coast Guard, the 45 SW Attachment of the U.S. Air Force Space Command (AFSPC/A4/7), and the Florida Department of Environmental Protection with the combined comments of FDEP, Florida Department of State, the St. Johns River Water Management District, the Florida Fish and Wildlife Conservation Commission, and East Central Florida Regional Planning Council. None of the commenters voiced objections to the project. Comments focused on clarification of items and measures for the protection of protected species. The individual comments were addressed, as appropriate and revisions were made in the Final EA and Feasibility Study Report. Please see the Environmental Appendix for a matrix summarizing the comments received and the responses/actions taken for each comment.

8.4 Agency and Public Coordination

Coordination with Federal, State, and local agencies has been initiated to aid in the formulation and evaluation of the Recommended Plan. Public and agency views including informal comments received to date from representatives of the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, National Marine Fisheries, US Navy, US Air Force, and Florida Department of Environmental Protection have indicated no opposition or major issues with the proposed action. The analysis of surge effects has resulted in a positive endorsement of the project from the US Coast Guard, US Air Force, and the US Navy.

8.5 List of Statement Recipients

The Integrated Section 203 Study Report and Environmental Assessment was circulated by the Jacksonville District per the requirements of Section 203 of WRDA 1986, and the Corps implementing guidance, ER 1165-2-122, Studies of Harbor or Inland Harbor Projects by Non-Federal Interests, 26 August 1991.

9. RECOMMENDATIONS

The Canaveral Port Authority recommends that the Assistant Secretary of the Army (Civil Works) transmit a favorable recommendation to Congress that the existing project for deep draft navigation at Canaveral Harbor, authorized by the River and Harbor Acts of March 1945 and October 1962, and Sections 101, 114, and 117 of the Water Resources Development Act (WRDA) of 30 October 1992, be modified as described herein to provide for implementation of a Federal project to deepen and widen the existing Federal channels, turning basins, and wideners, with such modifications as in the discretion of the Secretary may be deemed advisable; at a first cost to the United States presently estimated at $27,927,000; with an annual incremental operations and maintenance cost to the United States presently estimated at $452,200.

The recommended plan, which is the most economical plan analyzed consists of widening the main ship channel from the harbor entrance inland to the West Turning Basin and West Access Channel, from its current authorized width of 400 feet to 500 feet. In addition to widening, deepening of the existing Federal project and expansion of turning basins is recommended in the following reaches:

- Outer Reach, Cut 1A: deepen from -44’ to -46’ for a length of 11,000’;
- Outer Reach, Cut1B: deepen from -44’ to -46’ depth for a length of 5,500’;
- Outer Reach, Cut 1: deepen from -44’ to -46’ for the 5,300’ long portion of Cut 1 that is seaward of buoys 7/8 (Station 0+00 to Station 53+00). The remainder of Cut 1 from buoys 7/8 to the apex of the channel turn, a length of 7,200’, would also be deepened from -44’ to -46’;
- US Navy Turn Widener: deepen from -44’ to -46’ X 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;
- Civil Turn Widener: deepen from -41’ to -46’ X 15.6 acres (irregular shaped area) bounded to the north and northeast by the middle reach and the US Navy turn widener;
- New 203 Turn Widener: deepen to -46’ X 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: deepen from -44’ to -46’ for a length of 5,658’. The middle reach extends from the apex of the channel turn westward to the western boundary of the Trident access channel;
- Inner Reach, Cut 2 and Cut 3: deepen from -40’ to -44’ for a length of 3,344’;
- Middle Turning Basin: expand and deepen to encompass 68.9 acres to a project depth of -43’ and a turning circle diameter of 1422’. The existing -39’ federal project provides a turning circle diameter of 1200’;
- West Access Channel (east of Station 260+00): deepen from -39’ to -43’ for a length of 1,840’; and
- West Turning Basin and West Access Channel (west of Station 260+00): expand the turning circle diameter from 1,400’ to 1,725’ X 141 acres at a depth of -35’. The recommended plan for commercial navigation is economically feasible, with total average annual benefits of $5,393,199, total average annual costs of $2,646,629, total net annual benefits of $2,746,570, and a benefit-cost ratio of 2.0 to 1. The plan was

evaluated based upon a 50-year project life at the current FY 2013 Federal discount rate of 3.75 percent using FY 2013 price levels.

The CPA will seek specific Congressional Authorization to credit the expended costs of the already constructed ICCO ($13,775,063) towards the non-Federal cost share of project costs, and therefore these ICCO costs are not included in this section of the report addressing future recommended actions.

The Canaveral Port Authority will:

a. Provide 25 percent of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

b. Provide, during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs;

c. Provide, during the period of construction, a cash contribution equal to the following percentages of the total cost of construction of the general navigation features:

i. Twenty-five percent of the costs attributable to dredging to a depth in excess of 20 feet, but not in excess of 45 feet; plus

ii. Fifty percent of the costs attributable to dredging to a depth in excess of 45 feet;

d. Provide 50 percent of the excess cost of operation and maintenance of the project over that cost which the Federal Government determines would be incurred for operation and maintenance for depths deeper than 45 feet;

e. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the project, up to an additional 10 percent of the total cost of construction of general navigation features. The value of LERRs and deep-draft utility relocations provided by the Sponsor for the general navigation features, described below, may be credited toward this required payment. The value of deep-draft utility relocations for which credit may be afforded shall be that portion borne by the Sponsor, but not to exceed 50 percent, of deep-draft utility relocation costs;

If the amount of credit equals or exceeds 10 percent of the total cost of construction of the general navigation features, the Sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of LERRs and deep-draft utility relocations in excess of 10 percent of the total cost of construction of the general navigation features;

f. Provide all LERRs and perform or ensure the performance of all relocations and deep-draft utility relocations determined by the Federal Government to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features (including all lands, easements, and rights of way, relocations, and deep-draft utility relocations necessary for the dredged material disposal facilities);

g. Provide, operate, maintain, repair, replace, and rehabilitate, at its own expense, the local service facilities in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

h. Accomplish all removals determined necessary by the Federal Government other than those removals specifically assigned to the Federal Government;

i. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the Sponsor owns or controls for access to the project for the purpose of operating, maintaining, repairing, replacing, and rehabilitating the general navigation features;

j. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors;

k. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence is required, to the extent and in such detail as will properly reflect total cost of construction of the general navigation features, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;

l. Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights of way that the Federal Government determines to be necessary for construction, operation, maintenance, repair, replacement, or rehabilitation of the general navigation features. However, for lands that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigation unless the Federal Government provides the Sponsor with prior specific written direction, in which case, the Sponsor shall perform such investigations in accordance with such written direction;

m. Assume complete financial responsibility, as between the Federal Government and the Sponsor, for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights of way that the Federal Government determines to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the project;

n. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under CERCLA;

o. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the Sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

p. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987, and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights of way, required for construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

q. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army." The State is also required to comply with all applicable Federal labor standards requirements including, but not limited to, the Davis-Bacon Act (40 USC 3144 *et seq.*), the Contract Work Hours and Safety Standards Act (40 USC 3701 *et seq.*), and the Copeland Anti-Kickback Act (40 USC 3145 *et seq.*);

r. Provide the non-Federal share that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project, in accordance with the cost sharing provisions of the agreement;

s. Prevent obstructions of or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) which might reduce the ecosystem restoration, hinder its operation and maintenance, or interfere with its proper function, such as any new development on project lands or the addition of facilities which would degrade the benefits of the project;

t. Do not use Federal funds to meet the Sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds in authorized;

u. Provide a cash contribution equal to the non-Federal cost share of the project's total historic preservation mitigation and data recovery costs attributable to commercial navigation that are in excess of 1 percent of the total amount authorized to be appropriated for commercial navigation; and

v. In the case of a deep-draft harbor, provide 50 percent of the excess cost of operation and maintenance of the project over that cost which the Secretary determines would be incurred for operation and maintenance if the project had a depth of 45 feet."

The recommendation contained herein reflects the information available at this time and current departmental policies governing formulation of individual projects. It does not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program or the perspective of higher review levels within the executive branch. Consequently, the recommendation may be modified before it is transmitted to the Congress as a proposal for authorization and implementation funding. However, prior to transmittal to the Congress, the State of Florida, the Canaveral Port Authority (the non-federal sponsor), interested Federal agencies, and other parties will be advised of any significant modifications and will be afforded an opportunity to comment further.

Alan Dodd
Colonel, U.S. Army
District Commander

10. LISTS OF PREPARERS AND REVIEWERS

Preparers

Lee Swain	Dial Cordy and Associates Inc.	Botanist	Final EA Author Biological Assessments
Jason Croop	Dial Cordy and Associates Inc.	Marine Biologist	EFH Assessment
Mark Howell	Dial Cordy and Associates Inc.	Wildlife Biologist	Protected Species Report Environmental Baseline Report
Jason Evert	Dial Cordy and Associates Inc.	Fisheries Biologist	Fish and Wildlife Coordination Act Report
Michael Bresette	Inwater Research Group	Marine Biologist	Sea Turtle Evaluation
Lee Terzis	PBS&J	Archaeologist	Cultural Resources Assessment

Reviewers

Robert Musser	Canaveral Port Authority	Past Director, Environmental Plans & Programs	Final EA
Carol Noble	Canaveral Port Authority	Director, Environmental Plans & Programs	Final EA
Mike Camardese	US Air Force Space Command, AFSPC/A4/7	Environmental Specialist	Final EA
Steve Dial	Dial Cordy and Associates Inc.	Marine Biologist	Final EA Biological Assessments Environmental Baseline Report EFH Assessment Protected Species Report
Lee Swain	Dial Cordy and Associates Inc.	Botanist	Protected Species Report Environmental Baseline Report Sea Turtle Evaluation Cultural Resources Assessment
Jerry Diamantides	David Miller & Associates	Planner/Economist	Final EA

11. REFERENCES

Anamar Environmental Consulting, Inc. 2005. Final Report for Canaveral Harbor 103 Evaluation – Deepening Work West Turning Basin Entrance Widening, Corner Cut-off and CT 6 & 7 Dredging.

Anamar Environmental Consulting, Inc. 2010. Final Report 2010 Canaveral Harbor Navigation Project 103 Sediment Report Cape Canaveral, Florida Bowen, B., J.C. Avise, J.I. Richardson, A.B. Meylan, D. Margaritoulis, and S.R. Hopkins-Murphy. 1993. Population structure of loggerhead turtles (Caretta caretta) in the northwestern Atlantic Ocean and Mediterranean Sea. Conservation Biology 7 (4):834-844.

Carr, A.F., M.H. Carr, and A.B. Meylan. 1978. The ecology and migrations of sea turtles. The Western Caribbean green turtle colony. Bull. Amer. Mus. Nat. Hist. 162(1): 1-46.

Carr, A. 1986. Rips, FADS, and little loggerheads. Bioscience. 36:92-100.

Carr, A. 1987. New Perspectives on the pelagic stage of sea turtle development. Conservation Biology 1(2): 103-121.

CH2M Hill 2006. Section 203 Feasibility Study Hazardous, Toxic and Radioactive Waste (HTRW) Assessment. Port Canaveral, Brevard County, Florida.

Cole, T.V.N., D.L. Hartley, R.L. Merrick. 2005. Mortality and serious injury determinations for large whale stocks along the eastern seaboard of the Unites States, 1999-2003. U.S. Dep. Commer., Northeast Fish Sci. Cent. Ref. Doc. 05-08. 18 pp.

Continental Shelf Associates, Inc. 1989. Environmental Impact Assessment for Beach Restoration. Brevard County, Florida.

Coyne, M. 1994. Feeding ecology of subadult green turtles in south Texas waters. MS Thesis, Texas A&M University. 76 pp.

Cruise Lines International Association. 2012. CLIA 2012 Industry Update. Accessed at http://www.cruising.org/sites/default/files/pressroom/2012CLIAIndustryUpdate.pdf on 05Sep12.

Dial Cordy and Associates Inc. 2006a. Protected Species Report, Port Canaveral Navigation Improvements, Port Canaveral, Florida.

Dial Cordy and Associates Inc. 2006b. Environmental Baseline Report, Port Canaveral Navigation Improvements, Port Canaveral, Florida.

Dial Cordy and Associates Inc. 2007a. Sea Turtle Foraging Report, Port Canaveral Navigation Improvements, Port Canaveral, Florida.

Dial Cordy and Associates Inc. 2007b. Essential Fish Habitat Assessment, Port Canaveral Navigation Improvements, Port Canaveral, Florida.

Dynamac Corporation. 2002. Environmental Site Survey in the Vicinity of the North Jetty at Canaveral Harbor, Brevard County, Florida.

Ehrhart, L. M. 1996. A study of the population ecology of in-water marine turtle populations on the east-central Florida coast from 1982-96 Comprehensive Final Report to U.S. Dept. of

Commerce-NOAA, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, FL 33149. Purchase Order No. 40GENF50015; 1996, 164 pp.

Erhardt, L.M. and W.E. Redfoot. 2007. Untitled Draft Report on Population Studies of Juvenile Green Sea Turtles in the Trident Submarine Basin, Port Canaveral FL. Prepared for the Cape Canaveral Air Station. 20 pp.

Ehrhart, L.M. and W.E. Redfoot. 2005. Final Report: Assessment of the Status and Population Dynamics of Marine Turtles in the Trident Submarine Basin at Port Canaveral, Florida in 2003 and 2004.

Ehrhart, L.M. and W.E. Redfoot. 2002. The structure, size, and feeding ecology of the unique juvenile green turtle population utilizing the Trident Turning Basin, Cape Canaveral Air Force Station, Florida as developmental habitat. Comprehensive Report to Specpro Inc. 37 pp.

Ehrhart, L.M., W.E. Redfoot, and D.A. Bagley. 1996. A study of the population ecology of in-water marine turtle populations on the east central coast of Florida. Comprehensive Final Report to NOAA. NMFS. 164 pp.

Ehrhart, L. M. and W.E. Redfoot. 1994. Assessment of green turtle relative abundance and behavior in Cape Canaveral Air Force Station Port Area, Trident Submarine Basin. Final Report to USAE Waterways Experiment Station, Coastal Ecology Group, Environmental Laboratory. 40 pp.

Erhart, L.M. and B.E. Witherington. 1986. Human and natural causes of marine turtle nest and hatchling mortality and their relationship to hatchling production on an important Florida nesting beach. Final Report No. GFC-84-018. Submitted to: Florida Game and Fresh Water Fish Commission, Tallahassee, Florida. 140 pp.

Frazer, N.B. and L.M. Ehrhart. 1985. Preliminary growth models for green (Chelonia mydas) and loggerhead (Caretta caretta) turtles in the wild. Copeia 1985: 73-79.

Humphrey, S.R. (Ed.). 1992. Rare and endangered biota of Florida: mammals.

Inwater Research Group. 2007. Canaveral Section 203 Project Sea Turtle Census, 2007 Supplemental Surveys, prepared for Dial Cordy and Associates Inc. Jensen Beach, Florida.

Knowlton, A.R. and S.D. Kraus. 2001. Mortality and serious injury of the northern right whales (Eubalaena glacialis) in the western North Atlantic Ocean. The Journal of Cetacean Research and Management Special Issue 2:193-208.

Magnuson, et al. (National Research Council). 1990. Decline of the Sea Turtles: Causes and Prevention. National Academy Press, Washington D.C.

Meylan, A.B., K.A. Bjorndal, and B.J. Turner. 1983. Sea turtles nesting at Melbourne Beach, Florida. II. Post-nesting movements of Caretta caretta. Biological Conservation 26:79-90.

Meylan, A., B. Schroeder, and A. Mosier. 1995. Sea turtle nesting activity in the state of Florida. Fla. Mar. Res. Publ. 52:1-51.

National Marine Fisheries Service (2003) Endangered Species Act – Section 7 Consultation for Dredging in the Gulf of Mexico and Use of Hopper Barges Biological Opinion Prepared by National Marine Fisheries Service, St. Petersburg, Florida.

National Marine Fisheries Service (2005) Recovery Plan for the North Atlantic Right Whale (Eubalaena glacialis) Prepared by National Marine Fisheries Service, Silver Spring, Maryland.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1995. Status Reviews for Sea Turtles Listed under the Endangered Species Act of 1973. National Marine Fisheries Service, Silver Spring, Maryland.

Nelson, W.G. 1988. Sebastian Inlet rock outcrop reefs biological inventory study. Technical Report to Sebastian Inlet Commission. 86 pp.

Nelson, D. A. 1994. Preliminary assessment of juvenile green sea turtle behavior in the Trident submarine basin Patrick AFB, Florida Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-351, 323 pp.; 1994, p. 104-108.

Olsen Associates, Inc. 2007. Memorandum on the Canaveral Harbor Navigation Channel Improvements: Jetty Impacts, prepared for CH2M Hill, Jacksonville, FL. 12 pp.

PBS&J. 2006. Cultural Resources Assessment for Proposed Navigation Improvements, Canaveral Port Authority, prepared for Dial Cordy and Associates Inc. Jacksonville, Florida, 11 pp.

Redfoot, W. E. 2000. The feeding ecology of juvenile green turtles utilizing the Trident Basin, Port Canaveral, Florida as developmental habitat Proceedings of the Eighteenth International Sea Turtle Symposium. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum NMFS-SEFSC-436, 293 pp.; 2000, p. 33

Redfoot, W. E. 1997. Population Structure and Feeding Ecology of Green Turtles Utilizing the Trident Submarine Basin, Cape Canaveral, Florida as Developmental Habitat, Master Thesis, University of Central Florida, Orlando, Florida.

Redfoot, W. E. 1996. A population of juvenile green turtles utilizing the Trident Submarine Basin, Port Canaveral, Florida Proceedings of the Fifteenth Annual Symposium on Sea Turtle Biology and Conservation. National Oceanic and Atmospheric Administration Technical Memorandum NMFS-SEFSC-387, 355 pp.; 1996, p. 258-259.

South Atlantic Fisheries Management Council. 1998. Final habitat plan for the South Atlantic region. South Atlantic Fisheries Management Council, Charleston, South Carolina. 457 pp.

U.S. Army Corps of Engineers. 1996. Final Environmental Impact Statement, Brevard County, Florida Shore Protection Project Review Study. U.S. Army Corps of Engineers, Jacksonville District. Jacksonville, Florida.

U.S. Fish and Wildlife Service. 1995. Piping Plover (Charadrius melodus), Atlantic Coast populations, revised recovery plan. USFWS, Hadley, Massachusetts. 245 pp.

U.S. Fish and Wildlife Service. 2007. Green Turtle Fact Sheet.

Witherington, B.E. and L.M. Ehrhart. 1989. Status and reproductive characteristics of green turtles (Chelonia mydas) nesting in Florida. Proc. 2nd Western Atlantic turtle symposium. 351-352.

Wyneken, J. and M. Salmon. 1992. Frenzy and post frenzy swimming activity in loggerhead, green, and leatherback hatchling sea turtles. Copeia (2): 478-484.

ATTACHMENT 1

SPONSOR'S LETTER OF INTENT

CANAVERAL
PORT AUTHORITY

16 December 2011

Mr. David S Hobbie
Deputy District Engineer for Programs and Project Management
USACOE/Jacksonville District
701 San Marco Blvd.
Jacksonville, FL 32207-8175

RE: Port Canaveral, Florida
Integrated Section 203 Navigation Study Report and Assessment
Draft Environmental Assessment Document

Dear Mr. Hobbie:

On behalf of Canaveral Port Authority, I am writing to express full support for the plan recommended within the *Integrated Section 203 Navigation Study Report and Assessment and Draft Environmental Assessment Documents (October 2011)* prepared for the Section 203 Feasibility Project. The Canaveral Port Authority staff and Board of Commissioners have both approved support of pursuing this project as presented; therefore this office fully supports the recommendation and implementation plan of the Section 203 Study Report. Canaveral Port Authority understands that under the project partnership agreement it will be responsible for sharing the costs of the project as the non-federal sponsor.

Sincerely,

Canaveral Port Authority

J. Stanley Payne
Chief Executive Officer

Cc: Osvaldo Rodriguez, U.S. Corps of Engineers Jacksonville District
Jerry Scarborough, U.S. Corps of Engineers Jacksonville District
Candida Bronson, U. S. Corp of Engineers Jacksonville District

Port Canaveral
445 Challenger Road P.O. Box 267 Cape Canaveral, Florida 32920 USA
321.783.7831 888. 767.8226 www.portcanaveral.com

ATTACHMENT 2

NON-FEDERAL SPONSOR'S
SELF CERTIFICATION OF FINANCIAL CAPABILITY
FOR DECISION DOCUMENTS

CANAVERAL
PORT AUTHORITY

NON-FEDERAL SPONSOR'S
SELF CERTIFICATION OF FINANCIAL CAPABILITY
FOR DECISION DOCUMENTS

I, Jeffrey M. Long, do hereby certify that I am the Chief Financial Officer of the Canaveral Port Authority (the "Non-Federal Sponsor"); that I am aware of the financial obligations of the Non-Federal Sponsor for the Canaveral Harbor Deepening and Widening Project; and that the Non-Federal Sponsor will have the financial capability to satisfy the Non-Federal Sponsor's obligations for that project. I understand that the Government's acceptance of this self-certification shall not be construed as obligating the Government or the Non-Federal Sponsor to implement a project.

IN WITNESS THEROF, I have made and executed this certification this fourteenth (14th) Day of October, two thousand and eleven (2011).

BY: Jeffrey M. Long

TITLE: CFO

DATE: 10-14-11

Port Canaveral
445 Challenger Road P.O. Box 267 Cape Canaveral, Florida 32920 USA
321.783.7831 888. 767.8226 www.portcanaveral.com