MIAMI HARBOR
GENERAL REEVALUATION REPORT STUDY

FINAL ENVIRONMENTAL IMPACT STATEMENT

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Prepared for:
Jacksonville District
U.S. Army Corps of Engineers
701 San Marco Blvd
Jacksonville, FL 32207

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

U.S. Army Corps of Engineers, Jacksonville District
FINAL ENVIRONMENTAL IMPACT STATEMENT
Navigation Improvements Miami Harbor
Miami-Dade County, Florida

ABSTRACT

The Port of Miami requested that the U.S. Army Corps of Engineers study the feasibility of widening and deepening most of the major channels and basins within Miami Harbor. Two major improvement goals were identified to achieve the project purpose of providing greater navigational safety and accommodating larger vessels: 1) widen the Entrance Channel, Fisher Island Turning Basin and Fisherman's Channel; and 2) deepen the Entrance Channel, Government Cut, and Fisher Island Turning Basin. A number of alternatives were originally considered, but in an effort to reduce impacts to the natural environment, many were eliminated from further analysis. Three alternatives were analyzed (two action alternatives and the No-Action Alternative) in the document. The Recommended Plan (Alternative 2) includes components that would widen and deepen the Entrance Channel, deepen Government Cut, deepen and widen Fisher Island Turning Basin, relocate the west end of the Main Channel (no dredging involved), and deepen and widen Fisherman's Channel and the Lummus Island Turning Basin. Disposal of dredged materials would occur at up to four disposal sites (seagrass mitigation area, offshore permitted artificial reef areas, a potential upland disposal area, or the Miami Offshore Dredged Material Disposal Site). The Recommended Plan would impact 0.2 acre of seagrass habitat within the existing channel, 7.7 acres of seagrass habitat outside of the existing channel, 0.6 acre of low relief/hardbottom reef habitat, 28.1 acres of previously dredged low relief/hardbottom reef habitat, 2.7 acres of high relief hardbottom/reef habitat, 18.0 acres of previously dredged high relief hardbottom/reef habitat, 3.0 acres of rock rubble habitat, 120.5 acres of previously dredged rock/rubble habitat, 23.3 acres of unvegetated bottom habitat, and 213.1 acres of previously dredged unvegetated bottom habitat. Impacts to marine mammals, sea turtles, and fish species may occur due to loss of habitat and blasting activities associated with project construction activities. The Recommended Plan would cause temporary increases in turbidity; however, these levels would not exceed permitted variance levels outside the mixing zone. The preferred mitigation plan proposed for seagrass impacts would include restoration of previously dredged borrow areas within northern Biscayne Bay, while the preferred mitigation plan proposed to offset new impacts to high and low relief hardbottom/reef habitat, and rock/rubble habitat, would include creation of artificial reefs within permitted offshore artificial reef sites.

Send your comments to the
District engineer by:

For Information Contact:
Ms. Terri Jordan
U.S. Army Corps of Engineers
Jacksonville District
P.O. Box 4970
Jacksonville, FL 32232-2325
Telephone: 904-232-1817

EXECUTIVE SUMMARY

Background. The Seaport Department of Miami-Dade County requested that the U.S. Army Corps of Engineers, Jacksonville District, study the feasibility of modifying portions of the Port of Miami (Port) to improve the Federal navigation system of channels. The Port is one of the major port complexes along the east coast of the United States. The Port lies in the north side of Biscayne Bay, a shallow, expansive, subtropical lagoon. Land surrounding Port waters is essentially fully developed, except for Virginia Key. Terrestrial and marine habitats in the vicinity include beaches, mangroves, seagrass beds, hardbottom and reef communities, rock/rubble bottom, and unvegetated bottom. The Biscayne Bay Aquatic Preserve and the Bill Sadowski Critical Wildlife Area are located in the vicinity. Manatees, crocodiles, sea turtles, and many important species of managed fishes and invertebrates utilize Biscayne Bay and offshore habitats. Protection of vital habitats is essential to the survival and maintenance of stocks of these and other fish and wildlife resources.

The Port offers the greatest frequency of cargo service, with the largest number of shipping lines, calling at the most destinations, in the world. The Port has more than 35 shipping lines calling on over 100 countries and over 254 ports. In addition to its strength as a cargo port, the Port is also the largest multi-day cruise passenger homeport in the world. The Port's link to important trading and cruise routes, as well as the strength and characteristics of its large and growing hinterland, have positioned the Port as a top performer, and will continue to drive the Port's growth as long as the infrastructure to support marine transportation is in place. The total economic impact of Port operations on the nation is estimated at more than $8 billion per year. More than 45,000 jobs are directly or indirectly attributable to Port operations. Jobs created by Port and trade activity tend to be good jobs: they pay significantly more than other job growth sectors in the local economy, have better long-term opportunities for employees and offer better training programs (particularly for minorities). The Port also utilizes the local, regional, and inter-regional transportation network components consisting of roads, railway lines, and channels to facilitate the efficient movement of goods and passengers.

Improvements including channel deepening and widening are required to ensure navigational safety and allow for more effective handling of the existing and future commercial ship fleet. The recommended improvements would also allow commercial ships with increased draft and cargo tonnage to call at the Port, resulting in transportation cost savings.

Alternatives. Two action alternatives and the No-Action Alternative are evaluated in this document. Modifications under the Recommended Plan (Alternative 2) include (1) deepening all channels except for the Main Channel, (2) widening the east end of the Entrance Channel, (3) widening the intersection of channels at the northeast side of Fisher Island, (4) creation of a turning basin just east of Lummus Island, and (5) widening Fisherman's Channel. The second alternative (Alternative 1) includes all of the components of the Recommended Plan plus (6) deepening and relocating Dodge Island Cut and Dodge Island Turning Basin. The following table provides detailed descriptions of the components comprising the two action alternatives.

Component 1C*	Flaring the existing 500-foot wide entrance channel to provide an 800-foot wide entrance at Buoy #1. The widener extends from the beginning of the entrance channel about 150 feet parallel to both sides of the existing entrance channel for about 900 feet before tapering back to the existing channel edge over a total distance of about 2,000 feet. Deepening of the entrance channel and proposed widener along the Entrance Channel from an existing depth of 44 feet in one-foot increments to a depth of 52 feet received consideration.
Component 2A*	Widen the southern intersection of Government Cut with Fisherman's Channel at Buoy #15. The length of the widener is about 700 feet with a maximum width of about 75 feet. Depths considered for 2A varied from an existing project depth of 42 feet to 50 feet.
Component 3B*	Extend the existing Fisher Island Turning Basin to the north. A turning notch of about 1,500 feet by 1,200 feet extends approximately 300 feet to the north of the existing channel edge near the West End of Government Cut. Depths from 43 to 50 feet at one-foot increments below the existing depth of 42 feet received consideration in the area of the turning notch.
Component 4*	Relocate the west end of the Main Channel about 250 feet to the south between channel miles 2 and 3 over a two- or three-degree transition to the existing cruise ship turning basin. No dredging is expected for Component 4 since existing depths allow for continuation of the authorized depth of 36 feet.
Component 5A*	Increase the width of Fisherman's Channel about 100 feet to the south of the existing channel. Component 5 includes a 1500-foot diameter turning basin, which would reduce the existing size of the Lummus Island Turning Basin. A widener at the northwest corner of the turning basin helps ease the turn to the Dodge Island Cut. The deepening evaluation examined depths below the existing 42-foot depth at one-foot increments from 43 to 50 feet along the proposed widened channel from Government Cut Station 0+00 to Station 42+00 and within Gantry crane berthing areas 99-140.
Component 6	Deepen Dodge Island Cut and the proposed 1,200-foot turning basin from 32 and 34 feet to 36 feet. It also involves relocating the western end of the Dodge Island Cut to accommodate proposed Port expansion.

***Components of the Recommended Plan.**

Environmental Consequences of the Recommended Plan. The proposed improvements would impact an estimated total surface area of 415.6 acres including 7.9 acres of seagrass habitat, 49.4 acres of hardbottom/reef habitat, 123.5 acres of rock/rubble habitat, and 236.4 acres of unvegetated bottom, and Essential Fish Habitat. Impacts to marine mammals, sea turtles, and fish species may occur due to loss of habitat and blasting activities with project construction. Blasting would be implemented in those areas where the hardness of rock prevents removal by other dredging techniques. The impacts are expected to be temporary, as much of the habitat would either recover or be replaced as demonstrated after previous dredging and construction operations within the Port boundaries. The Recommended Plan could also impact water quality by causing increased turbidity during construction activities, although these impacts would be minor and temporary. Materials dredged from the above components would be deposited at up to four locations: seagrass mitigation site; artificial reef site; Offshore Dredged Materials Disposal Site (ODMDS), or an approved upland disposal site.

Mitigation. The preferred mitigation plans for seagrass and hardbottom/reef impacts would provide restoration of seagrass beds and creation of artificial reefs. Based upon the extent of impacts and ratios discussed, restoration of approximately 24 acres of seagrass beds is proposed as compensation for unavoidable impacts. In order to replace local seagrass functions and values, restoration would be implemented within Biscayne Bay, preferably in areas where seagrass once occurred and is now absent due to past anthropogenic activities such as dredging.

New impacts to low relief hardbottom/reef and high relief hardbottom/reef total 0.6 acre and 2.7 acres, respectively. Based on the Habitat Equivalency Analyses (HEA) calculations, direct impacts to hardbottom/reef habitats would require the creation of artificial reef habitat at an effective mitigation ratio of 2:1 for high relief hardbottom/reef habitat and an effective mitigation ratio of 1.3:1 for low relief hardbottom/reef habitat. Mitigation reefs would be constructed in two different designs, to reflect the differences in the habitat structure of the two types of hardbottom/reef habitat to be impacted. The proposed mitigation would be type-for-type, to reflect the ecological differences between the different reef types impacted. A total of 0.8 acre of low relief-low complexity (LRLC) reef would be required to mitigate for the new low relief hardbottom/reef. A total of 5.4 acres of high relief-high complexity (HRHC) reef would be required to mitigate for the high relief impact. Reefs would be constructed at proposed artificial reef sites to be managed by Miami-Dade County Environmental Resources Management (DERM).

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ACRONYMS/DEFINITION OF TERMS

BSCWA	Bill Sadowski Critical Wildlife Area
CBD	Miami Central Business District
CBRA	Coastal Barrier Resources Act
CBIA	Coastal Barrier Improvement Act
County	Miami-Dade County
CWA	Clean Water Act
DC&A	Dial Cordy and Associates Inc.
DERM	Miami-Dade County Environmental Resources Management
DCMPZ	Miami-Dade Manatee Protection Zone
EFH	Essential Fish Habitat
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EQ	Accounts for non-monetary effects on environmental resources
ESA	Endangered Species Act
FAC	Florida Administrative Code
FCMP	Florida Coastal Management Program
FDEP	Florida Department of Environmental Protection
FDER	Florida Dept of Environmental Regulation (presently FDEP)
FDOT	Florida Department of Transportation
FFWCC	Florida Fish and Wildlife Conservation Commission
FP&L	Florida Power & Light
FWS	U.S. Fish and Wildlife Service
GRR	General Reevaluation Report
HAPC	Habitat Areas of Particular Concern
HEA	Habitat Equivalency Analyses
HRHC	High relief-high complexity
HTRW	Hazardous, Toxic, & Radioactive Waste
LMLW	Local Mean Low Water
LO/LO	Load on/Load off
LRLC	Low relief-low complexity
MIA	Miami International Airport
MLW	Mean Low Water
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
NEPA	National Environmental Policy Act
NMFS	U.S. National Marine Fisheries Service
NOAA	National Oceanic & Atmospheric Administration
NTU	Nephelometric Turbidity Units
ODMDS	Offshore Dredged Material Disposal Site
OFW	Outstanding Florida Water
Panamax	Vessels that can navigate the Panama Canal
PCA	Project Cooperation Agreement

Pilots	Biscayne Bay Pilots Association
POMTOC	Port of Miami Terminal Operating Company
Port	Port of Miami
Post-Panamax	Vessels too large to navigate the Panama Canal
ppt	parts per thousand
RO/RO	Roll on/Roll off
RTGS	Rubber Tire Gantries
SAFMC	South Atlantic Fisheries Management Council
SAV	Submerged Aquatic Vegetation
SFRPC	South Florida Regional Planning Council
SHPO	State Historic Preservation Officer
TEU	Twenty-foot equivalent units
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
WASD	Miami-Dade Water and Sewer Department
WRDA	Water Resources Development Act

1.0 PURPOSE AND NEED FOR THE CONSIDERED ACTION

1.1 Project Authorization

The Miami-Dade County Seaport Department of the Port of Miami (Port) requested the U.S. Army Corps of Engineers (USACE), Jacksonville District, to study the feasibility of widening and deepening portions of the Port, Miami-Dade County, Florida. A resolution from the Committee on Transportation and Infrastructure, United States House of Representatives, adopted October 29, 1997, provides the study authority as follows:

> "Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, that the Secretary of the Army is requested to review the report of the Chief of Engineers on Miami Harbor published as Senate, Document 90-93, 90th Congress, 2nd Session, and other pertinent reports, with a view to determining the feasibility of providing channel improvements in Miami Harbor and channels."

Additional authorization appeared in a subsequent appropriations bill for Miami Harbor, Florida, which contained the following language:

> "The Committee has provided $25,000,000 to reimburse the Miami-Dade Seaport Department for the Federal share of dredging work which has been accomplished and an additional $300,000 to initiate a General Reevaluation Report (GRR) to determine the feasibility of further Port deepening."

1.2 Project Location

The Port is an island facility consisting of 518 upland acres and is located in the northern portion of Biscayne Bay in South Florida. The City of Miami is located on the west side of Biscayne Bay; the City of Miami Beach is located on an island on the northeast side of the bay, opposite Miami. Both cities are located in Miami-Dade County, Florida, and are connected by several causeways crossing the bay. The Port is the southernmost major Atlantic Coast port. Referenced to other major South Atlantic Region ports, the Port is located 21 nautical miles south of Port Everglades (Fort Lauderdale), Florida; 83 nautical miles south of Palm Beach, Florida; 173 nautical miles south of Port Canaveral, Florida; 306 nautical miles south of Jacksonville, the most northern port on Florida's Atlantic Coast; 386 nautical miles south of Savannah, Georgia; and 420 nautical miles south of Charleston, South Carolina. It is 144 nautical miles north of Key West, the southernmost port in Florida (USACE 2002).

The first modifications to the Port were authorized by Congress to expand the Port in 1902 and several Acts have been authorized since to accommodate larger vessels using the Port. The current study area comprises the Federal Channel from Buoy #1 offshore, Government Cut, areas within and adjacent to the Port from Government Cut to the cruise ship channel turning basin, and Fisherman's Channel to the southwest end of Dodge Island (Figure 1). Areas adjacent to the project area, including protected habitat areas, were also evaluated for indirect project impacts.

1.3 Project Purpose

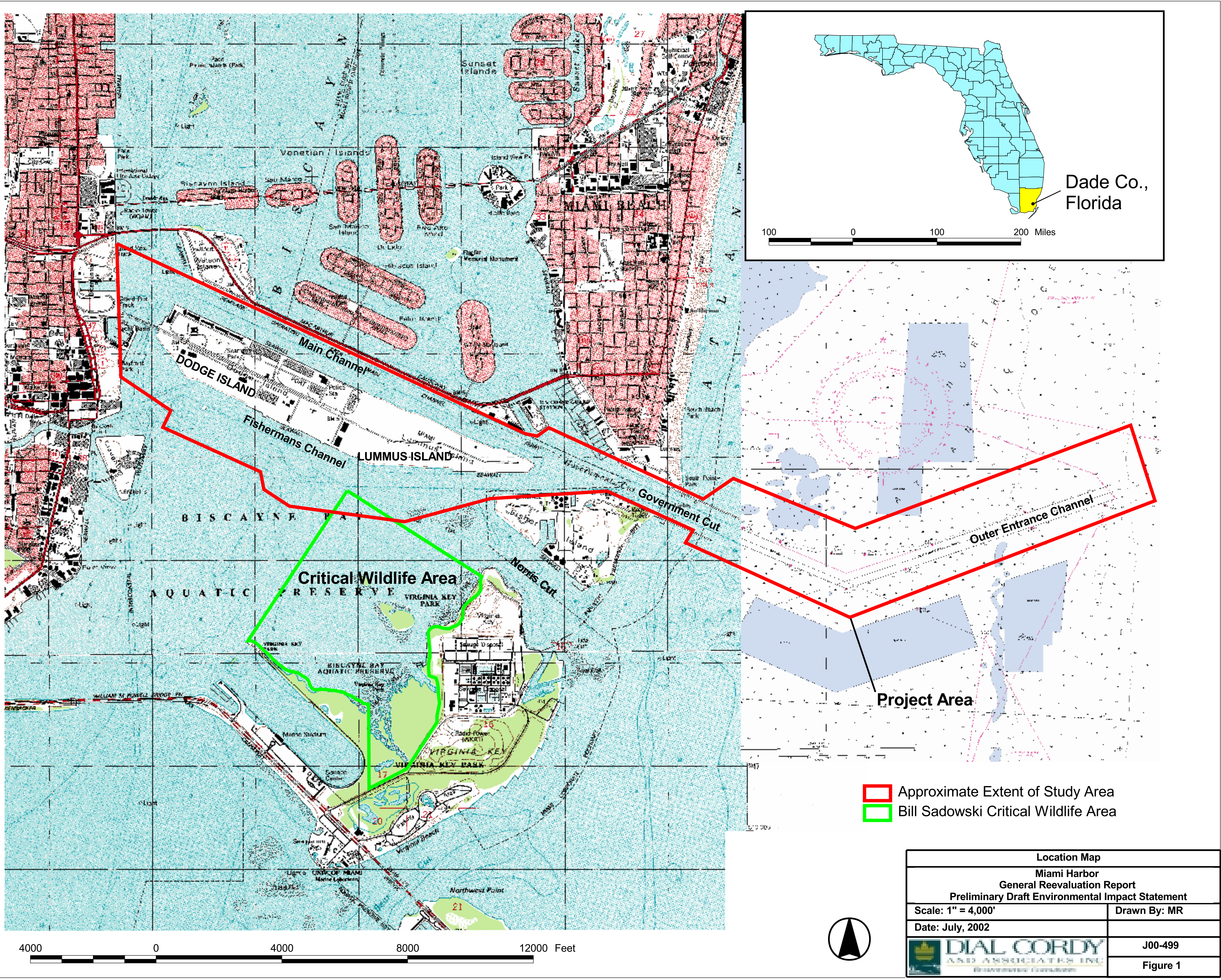
Improvements including channel deepening and widening are required to provide improved navigation and safety within the Federal Channel and Port and to more effectively handle the existing and future commercial ship fleet. The recommended improvements would allow commercial ships with increased draft and cargo tonnage to call at the Port, resulting in transportation cost savings.

The current project features for Government Cut, Fisherman's Channel and the Fisher Island Turning Basin were designed for Panamax container ships; however, the world container ship fleet has significantly changed since these features were authorized in 1989. Since 1989, Post-Panamax container ships, currently deployed in the Far East trade region, have become more numerous. It is anticipated that within the next five years, Post-Panamax container ships will be deployed in the Atlantic trade region and will call at U.S. East Coast ports (USACE 2002).

In addition to assessing the benefits of channel deepening to accommodate larger container ships, this document will also address the need for improvements to remedy navigation and safety problems within the Port that were identified in a letter from the Biscayne Bay Pilots (Pilots) to the Port Authority, dated October 23, 1997 (as discussed below). The improvements recommended by the Pilots call for widening the project channels at three locations.

The first location identified in the letter was the Entrance Channel. According to the Pilots, "The currents in this area are variable and unpredictable, putting large deep draft vessels at risk when making their approach to Miami. Several container ships have already grounded off Buoy #1." The Pilots recommended that the Entrance Channel be flared with an 800-foot wide entrance.

The second area identified by the Pilots as needing improvements was on the south side of Government Cut between Buoy #13 and Buoy #15. In this area, ships are turning from one channel to another (Government Cut and Fisherman's Channel). According to the Pilots, "The strong currents in this area compounded by the necessity for the ship to have as little speed as possible, makes it important for the ship to have as much swinging room as possible. Tugboats assisting ships in this area have grounded and sustained damage." The Pilots recommended widening the channel between Buoys #13 and #15 as much as possible.



Dade Co., Florida
100 0 100 200 Miles
Main Channel
DODGE ISLAND
Fishermans Channel
LUMMUS ISLAND
Government Cut
Outer Entrance Channel
Norris Cut
Critical Wildlife Area
Project Area
MIAMI BEACH
VIRGINIA KEY PARK
BISCAYNE BAY AQUATIC PRESERVE
Approximate Extent of Study Area
Bill Sadowski Critical Wildlife Area
4000 0 4000 8000 12000 Feet
Location Map
Miami Harbor
General Reevaluation Report
Preliminary Draft Environmental Impact Statement
Scale: 1" = 4,000'
Drawn By: MR
Date: July, 2002
DIAL CORDY AND ASSOCIATES INC
J00-499
Figure 1

The third area identified in the letter was Fisherman's Channel, just south of the gantry crane area. Ships transiting Fisherman's Channel pass extremely close to vessels docked at the gantry crane berths on Dodge Island. This results in a "surging" effect on the ships at the berths. Moreover, frequently vessels with on-board cranes have their cranes swung outboard 90 degrees, thereby blocking a portion of the channel. According to the Pilots, "Given the variables of wind, current, ship size, draft, etc., this creates an unsafe condition." The Pilots recommended that the southern edge of the Fisherman's Channel be extended 100 feet further to the south.

The number of people taking cruises has been growing, and this growth is expected to continue in the future. In response to this increasing demand, cruise ship companies have been constructing larger cruise ships to carry more passengers. The largest cruise ships in the world include Royal Caribbean International's Voyager-class cruise ships. Two of these Voyager-class vessels, the VOYAGER OF THE SEAS and the EXPLORER OF THE SEAS, currently call at the Port. These cruise ships are 1,019 feet long and carry 3,114 passengers. Because of the increase in size, both length and breadth, of cruise ships, the amount of berthing area at the current cruise ship terminals has been reduced. To provide more berthing area for cruise ships, the Port is berthing small cruise ships at Cruise Terminal 12 located at the southwest corner of Dodge Island.

Because cruise ships will continue to increase in size, Port improvements will be required to accommodate the larger cruise ships. Accordingly, improvements will be needed to extend the current Federal Channel from a point 1,200 feet west of the Lummus Island Turning Basin to the southwest corner of Dodge Island and to construct a separate turning basin within this segment.

In addition, many ships are currently required to wait for other incoming or outward bound ships utilizing the existing turning basins before they are able to continue. These delays of 30 minutes or more reduce the Port's capacity and efficiency to service existing vessel traffic.

1.4 Related Environmental Documents

Two related environmental documents that have been generated for other Miami Harbor Expansion projects are the 1989 USACE Navigation Study for Miami Harbor Channel Feasibility Report and Environmental Impact Statement (EIS) and the 1996 USACE Miami Harbor Channel 10140 General Reevaluation Report (GRR).

1.5 Scoping

In accordance with the National Environmental Policy Act (NEPA), an information letter was sent to interested parties on January 6, 2000. In addition, all parties were invited to participate in the plan formulation process by identifying any additional concerns on issues, studies needed, alternatives, procedures, and other matters related to the project. A local, state, and Federal resource agency meeting was held on March 13, 2000, to determine the areas of coverage for an environmental baseline resource survey. A meeting followed on November 1, 2000, with those resource agencies to review preliminary results. Appendix A and Appendix B include all documents associated with scoping including comments received from various stakeholders during the scoping process. A Notice of Intent (NOI) was published in the Federal Register (Volume 66, No. 167:45290) on August 28, 2001 informing the public of the USACE's intent to prepare a Draft EIS.

A Notice of Availability (NOA) was published in the Federal Register (Volume 68, No. 80:20386-20387) on April 25, 2003 to advertise the release of the Draft EIS for public review and comment. A public meeting was held on May 6, 2003 at the Port of Miami to present the results of the Draft GRR and Draft EIS and to give the public an opportunity to express their views and furnish specific data to support their views for consideration in preparing the final report. Written comments from commenting federal, state, and local government agencies, various private and non-profit organizations and individuals are included in Appendix N along with the official responses from the USACE.

Federal agencies invited to attend meetings and provide comments throughout the scoping and public involvement process included the USACE, the U.S. Coast Guard (USCG), the Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service (FWS), and the National Marine Fisheries Service (NMFS). State agencies included the Florida Department of Environmental Protection (FDEP), Florida Fish and Wildlife Conservation Commission (FFWCC), State Historic Preservation Office (SHPO), and the Florida Department of Transportation (FDOT). Local agencies included Miami-Dade County Department of Environmental Resources Management (DERM), South Florida Regional Planning Council (SFRPC), and the City of Miami. Non-Government Organizations/Institutions included the Pilots and the Biscayne Bay Regional Coordination Team (formerly the Biscayne Bay Partnership Initiative).

1.6 Permits, Licenses, and Entitlements

The proposed action affects seagrass and hardbottom/reef communities and other waters of the United States subject to Section 404 of the Clean Water Act (CWA). A Section 404(b)(1) Evaluation Report has been completed and is included in this document (Appendix C) to comply with the CWA. State approval is required for certification of water quality through Section 401 of the CWA and concurrence. A Coastal Zone Management Consistency Determination was prepared by the USACE and received concurrence from State during the Draft EIS review process (Appendix D).

2.0 ALTERNATIVES

2.1 Background

The Port is a 518-acre island facility created from two spoil islands, Dodge Island and Lummus Island. The western end is Dodge Island, and the eastern end is Lummus Island. The Port is connected to the Miami mainland by two bridges, a 65-foot high, fixed span vehicular bridge and a road and a rail bridge linking to the Florida East Coast Railroad Company's main line track (USACE 2002).

The Port is a "clean port," the designation of a seaport that does not handle bulk cargoes or potentially dangerous or hazardous cargoes such as fuel oil. The Port handles only palletized, roll-on/roll-off (RO/RO), and containerized cargo. In addition to cargo traffic, the Port is also the world's largest cruise ship homeport. It is the year-round homeport of one of the largest cruise ship in the world, the VOYAGER OF THE SEAS. As reported in the 1999 Port Master Development Plan (Miami-Dade County 1999c), the Port consists of 518 acres of actual landmass. Of the 518 acres, 372.5 acres (71.9 percent) is devoted to cargo operations, mainly on Lummus Island, and 52 acres (10.0 percent) is devoted to cruise operations on Dodge Island.

The Port is a landlord port, owned by Miami-Dade County, Florida and managed by the Miami-Dade County Seaport Department. The Port Director reports to the County Manager. Facilities are leased to Port users and operators. There are three principal terminal operators at the Port: Seaboard Marine, the Port Terminal Operating Company (POMTOC), and Universal Maritime/Maersk. Seaboard Marine's container terminal and storage areas are located along the southern portion of Dodge Island and the southwest corner of Lummus Island. POMTOC's container terminal is located exclusively on Lummus Island, as is Universal Maritime/Maersk's (northeastern portion).

Currently there are three Panamax and seven Post-Panamax gantry cranes. Two additional Super-Post-Panamax gantry cranes are scheduled to arrive in late 2004. Panamax, Post-Panamax, and Super-Post-Panamax gantry cranes are designed to reach across 13 containers (each approximately 8 feet wide), 17 containers, and 22 containers, respectively.

In addition to gantry cranes, the Port's cargo handling equipment includes forklifts, toploaders, and mobile truck cranes including three Mi-Jack 850-P Rubber Tire Gantries (RTGs), which allow containers to be stacked 6-wide and 4-high.

There are eleven passenger terminals that accommodated 3.4 million passengers in Fiscal Year 2001. The Port's passenger terminals are designated Terminals 1 through 5, Terminal 6/7, Terminal 8/9, Terminal 10, and Terminal 12.

As identified in the Port's 1999 Master Plan, approximately 47.5 acres of the Port's land area is utilized by support facilities: parking, 17.0 acres; circulation and open space, 10.5 acres; office – Federal Government, 8.5 acres; recreation, 7.5 acres; office-miscellaneous and office-Seaport Department, 1.7 acres.

CSX Transportation, Inc. serves the Port. The Port owns 2.1 miles of trackage at the Port on Dodge Island, which consists of a main line track extending the length of the island and a four-track, closed-end intermodal rail yard. The main track on Dodge Island connects with the Florida East Coast Railway via a rail bridge. A connection with CSX Transportation, Inc. is effected through an interchange in the west part of the City of Miami. Moreover, the Port is less than one mile from major highways: Interstate 95 and Federal Route 1 via Interstate 395, and Interstate 75 via Dolphin and Palmetto Expressways.

There is a private petroleum facility at Fisher Island. This facility receives Number 6 fuel oil and diesel fuel by tankers and barge (integrated tug and barge units). The fuel is used solely for bunkering the Port's cargo and cruise ships, which are bunkered at the berth by tank truck or by bunkering barge. This facility has an 800-foot long berth with a depth of 36 feet and 12 storage tanks having a total capacity of 667,190 barrels.

As reported in the USACE Port Series No. 16 document (revised 1999), 12 companies operate warehouses having a total of over 1,000,000 square feet of dry storage space and over 6,000,000 cubic feet of cooler and freezer space within Metropolitan Miami-Dade County. All except three of the warehouses have railroad connections, and each is accessible to arterial highways.

Anchorage for deep-draft cargo vessels lies north of the Entrance Channel to the Port. There are no bridges crossing the shipping channels for Dodge and Lummus Islands.

2.2 Description of the Alternatives

2.2.1 No-Action Alternative

The Port would continue operations under existing conditions. Currently, there are two options available for moving cargo to terminal facilities in those areas. One is to use vessels with drafts that enable access over existing depths and widths. The second is to use another terminal at the Port and move the cargo to the facilities (USACE 1996b). Current dimensions of the channels and turning basins are described below in Table 1.

Table 1 Current Channel and Turning Basin Dimensions

Entrance Channel	500 feet wide and 44-foot depth
Government Cut	500 feet wide and 42-foot depth
Fisher Island Turning Basin	Triangular-shaped bottom with a 42-foot depth
Main Channel	400 feet wide and 36-foot depth
Fisherman's Channel and Lummus Island Turning Basin	The channel is 400 feet wide and 42-foot depth. The turning basin has a turning diameter of 1,500 feet and 42-foot depth.
Dodge Island Cut and Turning Basin	400 feet wide and 34-foot depth

2.2.2 Alternative 1

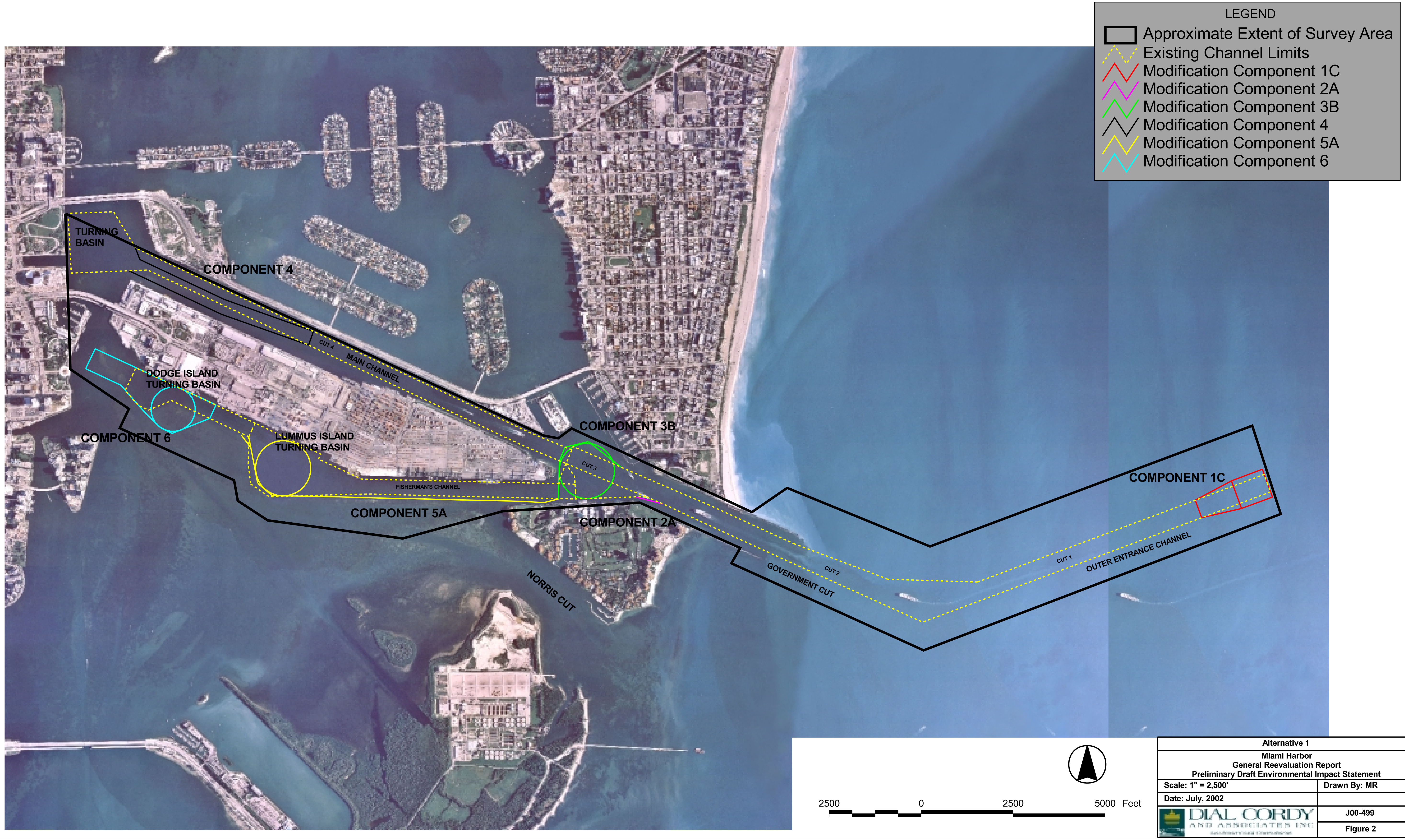
Alternative 1 consists of six components that will improve Port transit for the existing and future fleets (Figure 2). It represents a combination of Components 1 through 6.

Component 1C — Flare the existing 500-foot wide Entrance Channel to provide an 800-foot wide entrance at Buoy #1. The widener would extend from the beginning of the Entrance Channel approximately 150 feet parallel to both sides of the existing Entrance Channel for approximately 900 feet before tapering back to the existing channel edge over a total distance of approximately 2,000 feet. Deepen the Entrance Channel and proposed widener along Government Cut from an existing depth of 44 feet to a depth of 52 feet.

Component 2A — Widen the southern intersection of Government Cut near Buoy #15. The length of the widener would be approximately 700 feet with a maximum width of approximately 75 feet. Deepen from existing project depth of 42 feet to 50 feet.

Component 3B — Extend the existing Fisher Island Turning Basin 300 feet to the north of the existing channel edge near the west end of Government Cut. Widen the basin to 1,500 feet by 1,200 feet. Deepen channel below existing project depths of 42 feet to 50 feet.

Component 4 — Relocate the west end of the Main Channel approximately 250 feet to the south between channel miles 2 and 3 over a two- or three-degree transition to the existing cruise ship turning basin. No dredging is expected for this component since existing depths allow for continuation of the authorized depth of 36 feet.


LEGEND
Approximate Extent of Survey Area
Existing Channel Limits
Modification Component 1C
Modification Component 2A
Modification Component 3B
Modification Component 4
Modification Component 5A
Modification Component 6
TURNING BASIN
COMPONENT 4
CUT 4
MAIN CHANNEL
DODGE ISLAND TURNING BASIN
COMPONENT 6
LUMMUS ISLAND TURNING BASIN
FISHERMAN'S CHANNEL
COMPONENT 5A
COMPONENT 3B
CUT 3
COMPONENT 2A
NORRIS CUT
GOVERNMENT CUT
CUT 2
CUT 1
OUTER ENTRANCE CHANNEL
COMPONENT 1C
2500 0 2500 5000 Feet
Alternative 1
Miami Harbor
General Reevaluation Report
Preliminary Draft Environmental Impact Statement
Scale: 1" = 2,500'
Drawn By: MR
Date: July, 2002
DIAL CORDY AND ASSOCIATES INC
J00-499
Figure 2

Component 5A — Increase the width of the Fisherman's Channel approximately 100 feet to the south of the existing channel. This component also includes a 1,500-foot diameter turning basin, which would reduce the existing size of the Lummus Island Turning Basin. This widener at the northwest corner of the turning basin eases the turn to the Dodge Island Cut. Deepen channel and Gantry crane berthing areas 99-140 from the current authorized depth of 42 feet to 50 feet along the proposed widener of Fisherman's Channel from Station 0+00 to the Lummus Island Turning Basin.

Component 6 — Deepen Dodge Island Cut and the proposed 1,200-foot turning basin from 32 and 34 feet to 36 feet. Relocate the western end of the Dodge Island Cut to accommodate proposed Port expansion.

2.2.3 Alternative 2 (Recommended Plan)

Alternative 2 is the Recommended Plan and the Locally Preferred Plan. It consists of five components that would improve Port transit for the existing and future fleets (Figure 3).

Component 1C — Flare the existing 500-foot wide Entrance Channel to provide an 800-foot wide entrance at Buoy #1. The widener would extend from the beginning of the Entrance Channel approximately 150 feet parallel to both sides of the existing Entrance Channel for approximately 900 feet before tapering back to the existing channel edge over a total distance of approximately 2,000 feet. Deepen the Entrance Channel and proposed widener along Government Cut from an existing depth of 44 feet to a depth of 52 feet.

Component 2A — Widen the southern intersection of Government Cut near Buoy #15. The length of the widener would be approximately 700 feet with a maximum width of approximately 75 feet. Deepen from existing project depth of 42 feet to 50 feet.

Component 3B — Extend the existing Fisher Island Turning Basin 300 feet to the north of the existing channel edge near the west end of Government Cut. Widen the basin to 1,500 feet by 1,200 feet. Deepen channel below existing project depth of 42 feet to 50 feet.

Component 4 — Relocate the west end of the Main Channel approximately 250 feet to the south between channel miles 2 and 3 over a two- or three-degree transition to the existing cruise ship turning basin. No dredging is expected for this component since existing depths allow for continuation of the authorized depth of 36 feet.

Alternative 2	
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	Figure 3

Component 5A	Increase the width of the Fisherman's Channel approximately 100 feet to the south of the existing channel. This component also includes a 1,500-foot diameter turning basin, which would reduce the existing size of the Lummus Island Turning Basin. This widener at the northwest corner of the turning basin eases the turn to the Dodge Island Cut. Deepen channel and Gantry crane berthing areas 99-140 from the current authorized depth of 42 feet to 50 feet along the proposed widener of Fisherman's Channel from Station 0+00 to the Lummus Island Turning Basin.

2.3 Alternatives Eliminated from Detailed Evaluation

The USACE developed preliminary designs to meet the goals of the study and needs of the Port. In accordance with NEPA procedures to avoid and minimize impacts to environmental resources, the various components of the preliminary designs considered for this project have been revised several times to minimize cost and reduce or eliminate impacts to the environment. The Plan Formulation Appendix of the GRR describes the complete evaluation process. Brief descriptions of the previous versions of each project component are listed below, and a comparison of the preliminary design with the current components evaluated in this document is included in Table 2.

Component 1
Four different versions of Component 1 received consideration during the plan formulation process. Receipt of the Environmental Baseline Resource Study and ship simulation results allowed additional evaluations of the Entrance Channel alternatives based on the location of environmental resources and ship transits.

Further discussions with the Pilots resulted in two additional modifications of Component 1, which completely avoids one reef area (Component 1C). Component 1A avoided one reef location, but did not provide sufficient widening in the area where currents impact vessel transits. Component 1B avoided both reef areas, but did not provide widening in the area of the difficult north and south currents.

Component 2
Two different orientations for the widener received consideration, which included Component 2 and Component 2A. The first recommended by the Pilots (Component 2) extended from the southern edge of Fisherman's Channel parallel to Government Cut between Buoys #13 and #15 over a distance of approximately 2,400 feet.

Ship simulation testing of Component 2 indicated the Pilots did not use the widener during any of the simulation exercises. Subsequent discussions on May 16, 2001 with the Pilots resulted in a reduction of the widener from 2,400 to 700 feet. During a later simulation of the revised Component 2A at the pilot station, a ship grounded at the location of the proposed widener.

Table 2 Avoidance and Minimization of Impacts of the Preliminary Design Plan and Recommended Plan

Habitat Type	Component													
	1[1]	1C[2]	2[1]	2A[2]	3[1]	3B[2]	4[2]	5[1]	5A[2]	6[1]	6A[3]		Previous Total	Revised Total
Seagrass beds (ac)	0	0	0	0	**0.7**	**0.1**	0	**1.7**	**7.8[4]**	**22.8**	NA		**25.2**	**7.9**
Low relief hardbottom/reef (ac)	**35.1**	**28.7**	0	0	0	0	0	0	0	0	NA		**35.1**	**28.7**
High relief hardbottom/reef (ac)	**21.1**	**20.7**	0	0	0	0	0	0	0	0	NA		**21.1**	**20.7**
Rock/rubble w/ live bottom (ac)	**51.7**	**51.7**	0	0	0	0	0	0	0	0	NA		**51.7**	**51.7**
Rock/rubble w/ algae/sponges (ac)	**41.3**	**41.3**	**3.9**	**0.6**	**5.4**	**26.1**	0	**59.4**	**3.8**	0	NA		**136.2**	**71.8**
Unvegetated (ac)	**70.1**	**68.2**	**1.7**	**0**	**9.4**	**24.4**	**0**	**166.8**	**143.8**	**55.4**	**NA**		**333.5**	**236.4**
Total Project Footprint (ac)	**227.8**	**210.6**	**5.6**	**0.6**	**15.5**	**50.5**	**0**	**228.9**	**147.8**	**78.2**	**0**		**612.3**	**409.5**

[1]Original Proposed Impacts
[2]Recommended Plan Impacts
[3]Not Evaluated
[4]Includes 7.6 acres of impacts due to side slope equilibration

Component 3

Component 3 proposed a 1,600-foot diameter turning basin. Following review of the Environmental Baseline Survey and ship simulation tests, Component 3A was identified which reduced the turning basin to a turning notch of approximately 1,500 by 1,450 feet. Since ship simulation testing indicated the Pilots did not use the northernmost section of Component 3, Component 3A was identified since it avoided impacts to most of the seagrass beds to the north.

Later discussions on May 16, 2001 resulted in the Pilots' proposal to completely avoid the seagrass area to the north by truncating the northeast section of the turning basin (Component 3B).

Component 4

No alternative design was considered for Component 4.

Component 5

During the ship simulation exercise, Component 5 provided additional room for vessels passing berthed ships along the container terminals. The Pilots used the additional width during almost every proposed condition test in the Fisherman's Channel.

Component 5A resulted from coordination with Fisher Island's engineering representatives to improve clearance between the proposed widener and a proposed new bulkhead in that area.

Component 6

Component 6 includes deepening of Dodge Island Cut and the proposed 1200-foot turning basin from 32 and 34 feet to 36 feet. It also involves relocating the western end of the Dodge Island Cut to accommodate proposed Port expansion.

Component 6A proposed widening about 1,200 feet of the Dodge Island Cut an additional 50 feet to the south as a result of ship simulation testing. During the ship simulation testing a number of ships left the south side of the channel segment between Lummus Island Turning Basin and Dodge Island Turning Basin. The Engineering Research and Development Center (Waterways Experiment Station) of the USACE recommended Component 6 on the condition that the southern edge of that segment is widened 50 feet, which resulted in Component 6A.

2.4 Recommended Plan

The Recommended Plan (Alternative 2) consists of five components that are designed to improve the Port transit for the existing and future fleets.

Component 1C — Flare the existing 500-foot wide Entrance Channel to provide an 800-foot wide entrance at Buoy #1. The widener would extend from the beginning of the Entrance Channel approximately 150 feet parallel to both sides of the existing Entrance Channel for approximately 900 feet before tapering back to the existing channel edge over a total distance of approximately

2,000 feet. Deepen the Entrance Channel and proposed widener along Government Cut from an existing depth of 44 feet in one-foot increments to a depth of 52 feet.

Component 2A — Widen the southern intersection of Government Cut and Fisherman's Channel at Buoy #15. The length of the widener would be approximately 700 feet with a maximum width of approximately 75 feet. Deepen from existing project depth of 42 feet to 50 feet.

Component 3B — Extend the existing Fisher Island Turning Basin 300 feet to the north of the existing channel edge near the west end of Government Cut. This would widen the basin to 1,500 feet by 1,200. Deepen at one-foot increments below existing depths of 42 feet to 50 feet.

Component 4 — Relocate the west end of the Main Channel approximately 250 feet to the south between channel miles 2 and 3 over a two- or three-degree transition to the existing cruise ship turning basin. No dredging is expected for this component since existing depths allow for continuation of the authorized depth of 36 feet.

Component 5A — Increase the width of the Fisherman's Channel approximately 100 feet to the south of the existing channel. This component also includes a 1,500-foot diameter turning basin, which would reduce the existing size of the Lummus Island Turning Basin. This widener at the northwest corner of the turning basin would ease the turn to the Dodge Island Cut. Deepen at one-foot increments from the existing 42-foot depth to 50 feet along the proposed widened Government Cut channel from Station 0+00 to Station 42+00 and Gantry crane berthing areas 99-140.

2.5 Comparison of Alternatives

The following table (Table 3) provides a comparison of the No-Action Alternative, Alternative 1, and Alternative 2 (Recommended Plan) with regards to costs and potential impacts to natural resources and human environment. A more thorough analysis of potential impacts is included in Section 4.0, Environmental Consequences.

Table 3 Comparison of Alternatives

Resource	No-Action Alternative	Alternative 1	Alternative 2 (Recommended Plan)
Coastal Environment	No significant impact.	No significant impact.	No significant impact.
Geology and Sediments	No significant impact.	Additional sediment or material removal would occur.	Sediment or material removal would occur.
Water Quality	No significant impact.	Temporary increases in turbidity during dredging events may cause increased turbidity at the point of discharge from the disposal sites.	Temporary increases in turbidity during dredging events may cause increased turbidity at the point of discharge from the disposal sites.
Seagrass Communities	No significant impact.	Significant direct impacts would include the removal of seagrass habitat due to widening of the channel and equilibration of the channel side slopes once widening has been completed.	Impacts would include the removal of seagrass habitat due to widening of the channel and equilibration of the channel side slopes once widening has been completed.
Hardbottom and Reef Communities	No significant impact.	Widening and deepening would result in both direct and indirect impacts to hardbottom and reef communities within the Entrance Channel. Additional impacts could occur with cutterhead dredging is used for work on the Entrance Channel.	Widening and deepening would result in both direct and indirect impacts to hardbottom and reef communities within the Entrance Channel. Additional impacts could occur with cutterhead dredging is used for work on the Entrance Channel.
Rock/ Rubble Communities	No significant impact.	Proposed impacts to rock/rubble habitats are principally in areas that have already been dredged.	Proposed impacts to rock/rubble habitats are principally in areas that have already been dredged.
Unvegetated Bottom	No significant impact.	Direct impacts to unvegetated bottom communities would include the impacts to both benthic epifauna and infauna but other direct effects and indirect effects would differ based on the general location of the impacts.	Direct impacts to unvegetated bottom communities would include the impacts to both benthic epifauna and infauna but other direct effects and indirect effects would differ based on the general location of the impacts.
Essential Fish Habitat (EFH)	No significant impact.	EFH would be impacted.	EFH would be impacted.

Table 3 Continued

Resource	No-Action Alternative	Alternative 1	Alternative 2 (Recommended Plan)
Protected Species	No significant impact.	Potential impacts due to blasting and loss of habitat may occur during dredging and construction activities.	Potential impacts due to blasting and loss of habitat may occur during dredging and construction activities.
Other Areas of Special Concern	No significant impact.	No significant impacts.	No significant impacts.
Air Quality	No significant impact.	Short-term impacts from dredge emissions and other construction equipment would not significantly impact air quality.	Short-term impacts from dredge emissions and other construction equipment would not significantly impact air quality.
Noise	No significant impact.	None of the project components are expected to have a significant impact to noise levels.	None of the project components are expected to have a significant impact to noise levels.
Utilities	No significant impact.	Four utility crossings would be impacted.	Four utility crossings would be impacted.
Hazardous, Toxic, and Radioactive Waste (HTRW)	No significant impact.	No significant impacts to HTRW within the project area would occur.	No significant impacts to HTRW within the project area would occur.
Economic Factors	Significant loss of cargo business would occur at the Port due to the inability to handle new industry standard deep draft cargo vessels.	Cargo business would be retained and may increase.	Cargo business would be retained and may increase.
Land Use	No significant impacts.	No significant impacts.	No significant impacts
Recreation	No significant impacts.	No significant impacts.	No significant impacts.
Aesthetic Resources	No significant impacts.	No significant impacts.	No significant impacts.
Cultural Resources	No significant impacts.	No significant impacts.	No significant impacts.

2.6 Disposal Sites

Materials dredged from the above components would be deposited at up to four locations (Figure 4). Rock from the Entrance Channel (Component 1C), Government Cut (Component 2A) and Fisher Island Turning Basin (Component 3B) may be placed in the permitted artificial reef sites as mitigation for impacts to hardbottom and reef communities. Materials that cannot be utilized for artificial reef site placement would be transported to the Offshore Dredged Materials

Disposal Site (ODMDS), the seagrass mitigation site in North Biscayne Bay, or an approved upland disposal area.

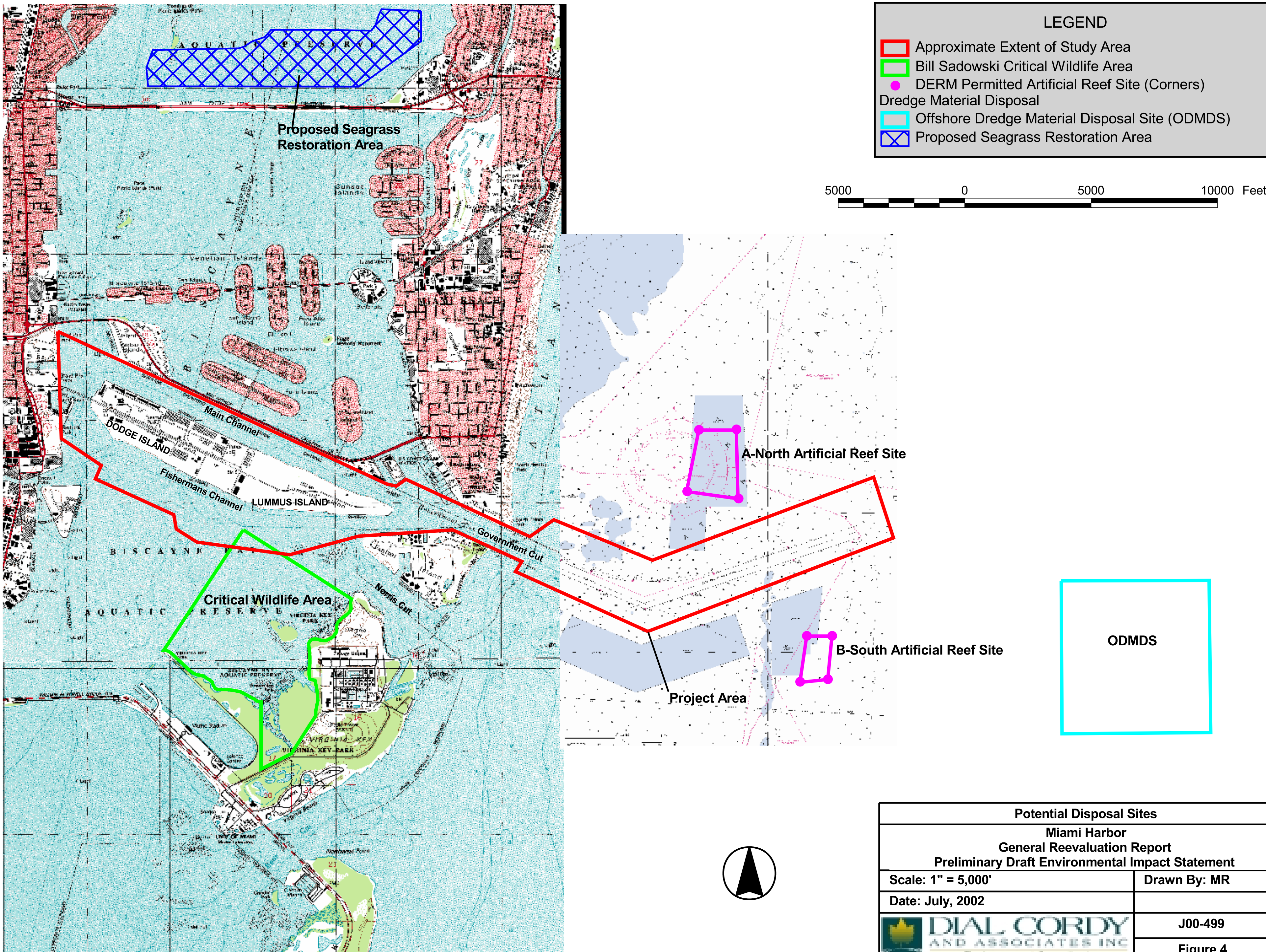
2.7 Construction Techniques

Construction methodology of the project would be determined by the contractor selected by the USACE during the bid process. However, certain assumptions can be made regarding various techniques that may be needed to complete construction. Dredged material would most likely be excavated using either a hydraulic cutterhead dredge or mechanical excavator with some or all of the material pretreated using blasting or some other method to break the rock prior to dredging. If a mechanical dredge is used, the larger dredged material may be removed and segregated at the construction site for use in constructing the mitigation sites. Larger rock material would be placed on one barge to be transported to the artificial reef site, while other materials would be placed on a separate barge for placement at either the seagrass mitigation site or the offshore disposal site. In any event, disposal of all dredged material would be at the proposed mitigation sites, the offshore disposal site, or an approved upland disposal site.

2.7.1 Dredging

Dredging equipment is classified as either hydraulic or mechanical based upon the means of transporting the dredged material from the bottom surface. Hydraulic dredges use water to pump the dredged material as slurry to the surface and mechanical dredges use some form of bucket to excavate and raise the material from the channel bottom. The most common hydraulic dredges include suction, cutter-suction, and hopper dredges and the most common mechanical dredges in the United States (U.S.) include clamshells, backhoes, and marine excavator dredges. U.S. law requires that dredges working on U.S. projects have U.S. built hulls and no large scale dipper or bucket ladder dredges are currently available for U.S. work.

Various project elements influence the selection of the dredge type and size. These factors include the type of material (rock, clay, sand, silt, or combination); the water depth; the dredge cut thickness, length, and width; the sea or wave conditions, vessel traffic conditions, environmental restrictions, other operating restrictions; and the required completion time. All of these factors impact dredge production and as a result costs. Multiple dredges of the same or different types may be used on projects where conditions vary between dredging locations or to expedite the work.



Potential Disposal Sites

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	Figure 4

The following discussion of dredges and their associated impacts will be limited to potential dredging equipment suitable for the Miami Harbor deepening project. The key project elements for this deepening project include the following:

- Material is primarily rock, much of which is classified as hard to very hard and may require pretreatment (such as blasting or other fracturing technique) prior to dredging.
- The widening areas include an overburden of silt, sand, and soft rock over the hard rock areas.
- Significant environmental resources, including reefs and seagrass meadows, are located adjacent to project.
- Project includes both open water and protected water dredging.
- Project depth is -50/52 feet MLW + 1 foot overdepth.
- Dredging volume is 4.1 million CY.

The project scale limits potential equipment to large-scale hydraulic or mechanical dredges. Potential equipment must be able to reach 55 to 60 feet depending upon wave and tide conditions as well as excavate large material volume. In some areas the rock may require some type of pretreatment prior to dredging such as blasting or fracturing with large cutterhead dredges.

<u>Mechanical Dredging</u>

Mechanical dredges are classified by how the bucket is connected to the dredge. The three standard classifications are structurally connected (backhoe), wire rope connected (clamshell), and chain and structurally connected (bucket ladder). The advantage of mechanical dredging systems is that very little water is added by the dredging process to the dredged material and the dredging unit is not used to transport the dredged material. This is important when the disposal location is remote from the dredging site. The disadvantage is that mechanical dredges require sufficient dredge cut thickness to fill the bucket to be efficient and greater re-suspended sediment is possible when the bucket impacts the bottom and as fine-grained sediment washes from the bucket as it travels through the water column to the surface. Clamshell or backhoe marine excavators may be used on the Miami Harbor project.

<u>Clamshell Dredge</u>

Clamshell dredges are the most common of the mechanical dredges. Grab dredges use a number of different bucket types for mud, gravel, rock, or boulders. Clamshell is a type of bucket on a grabber dredge. The clamshell dredging operation cycle is to lower bucket in open position to bottom surface, close bucket penetrating material with weight of bucket, raise bucket above hopper level, swing, dump, swing and repeat. The dredging depth is limited by the length of the wire to lower the bucket and production depends upon the bucket size, dredging depth, and type of material. Clamshell dredges are able to work in confined areas, can pick up large particles, and are less sensitive to sea (wave) conditions than other dredges. However, their capacity is low and they are unable to dig in firm or consolidated materials. Clamshell dredges could be used to remove the unconsolidated overburden in Miami Harbor.

Clamshell dredging environmental impacts in unconsolidated sediment include resuspension of sediments when the clamshell drops into on the bottom and as material washes from the bucket as it rises through the water column. Operational controls such as reducing the bucket speed as it drops to the bottom and as it rises through the water column will reduce impacts, as will use of a closed bucket system. Silt curtains may be deployed around the dredge if water quality standards cannot be met using operational controls.

Backhoe Marine Excavator

A backhoe dredge is a *back-acting* excavating machine that is usually mounted on pontoons or a barge. The backhoe digs toward the machine with the bucket penetrating from the top of the cut face. The operation cycle is similar to the clamshell dredge, as are the factors affecting production. Backhoe marine excavators have accurate positioning ability and are able to excavate firm or consolidated materials. However, they are susceptible to swells and have low to moderate production. Backhoe marine excavators could be used to excavate unconsolidated overburden, fractured rock, and possibly some unfractured rock. It should be noted that one of the largest backhoe marine excavators in the U.S. was unsuccessful in dredging Miami Harbor rock to -42 feet MLW in some locations without a pretreatment fracturing technology.

Backhoe marine excavator dredging environmental impacts in unconsolidated sediment are similar to those of a clamshell dredge, as are the operation controls to reduce that impact. The key is slowing the movement of the bucket through the water. Silt curtains may be deployed around the dredge if water quality standards cannot be met using operational controls. Environmental impacts are significantly less for a backhoe marine excavator dredge removing fractured (blasted) rock as the volume of fine grained sediment is significantly less in fractured rock than unconsolidated sediment and as a result the potential for sediment resuspension is reduced. The same operational controls can be applied to fractured rock as unconsolidated sediment, basically slowing the bucket's speed in the water.

Both types of mechanical dredges require transport barges to move the dredged material from the dredge to the disposal site. The type and size of barges will depend upon the distance to the disposal site and the production rate of the dredge. Barges are less expensive than dredges, therefore, the operation is generally designed so that the dredge is always working and does not experience down time waiting for a barge to be available to load. There are three general types of transport barges that could be used on the Miami Harbor project depending upon the disposal requirements. Barges may be used to transport dredged material to the ODMDS for disposal or to an in-water mitigation site as construction material for the site.

Potential barge environmental impacts could occur as the barge is loaded if material is allowed to spill over the sides, during transport if the barge leaks material, and during disposal if the material escapes from the disposal area. Operational controls eliminate spilling material during loading by monitoring the dredge operator to make sure that the dredge bucket swings completely over the barge prior to opening the bucket. Requiring barges in good repair with new seals minimizes leaking during transport. Hauling rock is often damaging to transport barges, so intermediate inspection and repairs may be required during the project to maintain the barges in good working condition. Seals may require replacement. Proper use of the ODMDS minimizes the environmental impacts during disposal. The barges will be required to use positioning equipment to place dredged material within the designated ODMDS and inspectors may be required to monitor disposal activity. NOAA has real-time monitoring of prevailing currents in this area and no disposal is allowed when suspended sediment could be carried onto adjacent resources. Use of silt curtains, interior barrier berms or other barriers may be installed as required for construction of mitigation site(s) within Biscayne Bay.

Split Hull Barge

A split hull barge has two hulls connected with hinges at the front and back. This allows the hulls to swing apart, opening at the bottom to allow dredged material to fall from the barge. This provides a rapid disposal of dredged material which as a result is placed within a small area. The rapid descent of material through the water column reduces the potential for resuspension of sediments into the water column during disposal. This barge may be used either for ODMDS disposal or construction of mitigation site.

Bottom Dump Barge

A bottom dump barge has doors on the bottom of the hopper which open at the disposal site to allow the dredged material to fall to the bottom. This type of barge has slower disposal than split hull dump barges and material spreads over a larger area. This barge may be used either for ODMDS disposal or construction of mitigation site.

Flat Top Barge

A flat top barge transports dredged material stacked on a barge deck and must be unloaded mechanically at the disposal site. As a result disposal time is slow but it is possible to drain dredged material with filters prior to disposal. This type of barge generally has a shallower draft requirement than the other two barge types and may be used for construction of mitigation site during final filling stages or when access is limited by depth of water.

Hydraulic Dredging

Hydraulic dredges mix dredged material into a sediment-water slurry and pump the mixture from the bottom surface to a temporary location such as a barge or re-handling site, or to a permanent location such as a confined or unconfined upland or aquatic site. The advantage of hydraulic dredges is that there is less turbidity (re-suspended sediments) at the dredge than with mechanical dredges. The disadvantage of hydraulic dredges is that a large quantity of water is added to the dredged material and this excess water must be dealt with at the disposal location.

Hopper Dredge

Hopper dredges are self-propelled ocean going vessels that hydraulically lift dredged material from the bottom surface and deposit it into an open hopper within the ship. The draghead(s) operates like a vacuum cleaner being dragged along the bottom. When the hopper is full, the dredge transits to a disposal location and releases the dredged material into an underwater disposal site by opening doors on the hopper bottom or in some cases the vessel is designed to split open longitudinally. Hopper dredges can also be designed to hydraulically pump the material from the hopper to an upland location. This is often used for beach nourishment projects. Hopper dredges are not efficient in removing blasted or unblasted rock, however, this equipment could be used to remove overburden material or accumulated maintenance material above the rock, especially on the entrance channel. Since hopper dredges are self-propelled, they are more maneuverable than dredges that rely upon tug boats to move. However, they require numerous passes over the same area to remove the required material, they are inefficient in small confined dredging areas and are most effective in removing sand and other unconsolidated materials. Hopper dredges could be used to remove unconsolidated overburden material from the Miami Harbor entrance channel, however; only a small volume of this material is present which may reduce the efficiency of this method. The dredge would transport material to the ODMDS for disposal.

Environmental impacts from hopper dredges include localized suspended sediment along the bottom around the draghead and fine-grained sediment turbidity plumes from hopper overflow. This could impact both water quality and the local reef system. The turbidity can be reduced or eliminated by restricting the amount of hopper overflow time, eliminating hopper overflow, or directing the hopper overflow toward the channel bottom through tubes. Suspended sediment is expected to settle quickly because overburden in the entrance channel is mostly sand.

Large Cutter-Suction Dredge

Large cutter-suction dredges, or cutterhead dredges, are mounted on barges. The key parts of a cutter suction dredge include the following:

- The cutter suction head that resembles an egg beater with teeth that break up the dredged material as it rotates. The broken material is hydraulically moved into the suction pipe for transport.
- The cutter suction head is located at the end of a ladder structure that raises and lowers it to and from the bottom surface.
- The cutter suction dredge moves by means of a series of anchors, wires, and spuds. The cutter suction dredges as it moves across the dredge area in an arc as the dredge barge swings on the anchor wires. One corner of the dredge barge is held in place by a spud and the dredge rotates around that spud. The dredge requires workboat or tug assistance to move the anchors and a tug is required to move the dredge to and from a location.
- The discharge pipeline connects the cutter suction dredge to the disposal area. The dredged material is hydraulically pumped from the bottom, through the dredge, and through the discharge pipeline to the disposal location. This is generally an upland site, but can be a barge for transport to a remote location or an in-water site.
- Dredge pumps are located on the barge with additional pump(s) often located on the ladder, especially for deep water dredging projects such as the Port of Miami. Booster pumps can also be added along the discharge pipeline to move the material greater distances.

Depending upon their design, cutterhead dredges can be used to remove blasted or unblasted rock and unconsolidated material. Cutterhead dredges are more limited than hopper dredges to the size of waves.

A large cutterhead dredge could be used for the entire Miami Harbor deepening project. Some pretreatment may be required for portions of the rock prior to dredging. Disposal options include direct placement of the dredged material on Virginia Key via pipeline or transport by barges to the ODMDS.

Environmental impacts from cutterhead dredges include localized suspended sediment along the bottom around the cutterhead and fine-grained sediment turbidity plumes from barge overflow or pipeline leaks. This can be reduced or eliminated by restricting the amount of overflow time, eliminating barge overflow, and performing regular inspections of the pipeline. Locating barges the furthest possible distance from resources can further reduce environmental impacts. If booster pumps are used, noise impacts may be possible.

Anchors are placed to both sides of the dredge to provide the ability to swing the dredge. The anchors are placed using a crane on a workboat. Implementation of an anchoring and vessel operation plan to effectively minimize anchor and cable impacts to hardbottom habitat would occur through the Request for Proposal (RFP) process and would include incentives to encourage potential contractors to avoid reef impacts. The evaluation criteria in the RFP would consider the technical aspects of the contractor's proposal as the most significant factor. As a result, the vessel operational and anchoring plan that best avoids or reduces impacts to reefs would receive the highest evaluation and the incentives that follow. Potential ideas provided by coordination with DERM, dredging companies, and other consultants that would probably appear in contractor proposals for evaluation during the RFP process include:

- Use of surge buoys along the anchor cable to help lift it up off the reef areas during dredging operations to minimize the area impacted by the anchor cable;

- Restricted anchor placement, which restricts placement of the anchors for the cutter-suction dredge to within the channel edge limits. That method reduces impacts but almost doubles dredging time since only half of the channel can effectively be dredged at a time.

Pre-Treatment Techniques

There are two primary pre-treatment alternatives: blasting or mechanical such as use of spudding or a hydrohammer. Blasting is the most likely pre-treatment for the Miami Harbor Project.

Spudding or Hydrohammer

Spudding is the process of fracturing the rock by dropping an array of chisels or spuds onto the rock causing a fracture. A hydrohammer is a jackhammer mounted on a backhoe. A dredge (hydraulic or mechanical) then follows this process and excavates the rock. This is a slow process and can be relatively expensive. The primary environmental impact of spudding or hydrohammer is noise and vibration.

The USACE investigated methods to remove the rock in the Port of Miami without blasting using a punchbarge. It was determined that the punchbarge, which would work for 12-hour periods, strikes the rock below approximately once every 30-seconds. This constant pounding would serve to disrupt manatee behavior in the area, as well as impact other marine animals in the area. Using the punchbarge will also extend the length of the project temporally, thus increasing any potential impacts to all fish and wildlife resources in the area.

2.7.2 Blasting

To achieve the deepening of the Port from the existing depth of -42 feet to project depth of -50 feet, pretreatment of the rock areas may be required. Blasting is anticipated as that pretreatment for some or all of the deepening of the project. The total volume with the project to be removed is up to 6 million cubic yards. The work may be completed in the following manner:

- *Contour dredging* with either bucket, hydraulic or excavator dredges may be used to remove material that can be dredged conventionally and to determine what areas cannot be dredged by conventional methods.
- *Pre-treating (blasting) the remaining above grade rock*, drilling and blasting the "Site Specific" areas where rock could not be conventionally removed by the dredges. The decision regarding what rock requires blasting may be made based upon contour dredging or based upon analysis of geotechnical data.
- Excavating with bucket, hydraulic or excavator dredges to remove the *pre-treated* rock areas to grade.

All drilling and blasting would be conducted in strict accordance with local, state, and Federal safety procedures. *Marine Wildlife Protection, Protection of Existing Structures, and Blasting Programs* would be coordinated with Federal and state agencies.

Based upon industry standards and USACE, Safety & Health Regulations, the blasting program may consist of the following:

- The lowest poundage (~90 lbs. or less) of explosives that can adequately break the rock.
- Up to three blasts per day, preparing for removal of approximately 1,500 cubic yards per blast. If the entire project required the use of blasting, and assuming three blasts per day, this would equate to approximately 1,333 blast days to complete the project (based on one drillboat, assuming all rock).
- Drill patterns a minimum of 8 feet separation from a loaded hole.
- Hours of blasting from 2 hours after sunrise to 1 hour before sunset.
- Selection of explosive products and their practical application addressing vibration and air blast (overpressure) control for protection of existing structures and marine wildlife.
- Loaded blast holes would be individually delayed to reduce the maximum pounds per delay at point detonation, which in turn would reduce the mortality radius.
- Matching the energy in the “work effort” of the borehole to the rock mass or target for minimizing excess energy vented into the water column or hydraulic shock.

Because of the potential duration of the blasting and the proximity of the blasting to a Critical Wildlife Area, a number of issues would need to be addressed. One of the key issues is the extent of a safety radius for the protection of marine wildlife. This is the distance from the blast site which any protected species must be in order to commence blasting operations. Ideally the safety radius is large enough to offer a wide buffer of protection for marine animals while still remaining small enough that the area can be intensely surveyed.

It is crucial to balance the demands of the blasting operations with the overall safety of the species. A radius that is excessively large would result in significant delays that prolong the blasting, construction, traffic and overall disturbance to the area. A radius that is too small puts the animals at too great of a risk should one go undetected by the observers and move into the blast area. Because of these factors, the goal is to establish the smallest radius possible without compromising animal safety and provide adequate observer coverage for whatever radius is agreed upon. The USACE has completed coordination with the FWS and NMFS through the Endangered Species Act (ESA) regarding an appropriate safety radius (Appendix H).

In an urban environment such as the Port, which is surrounded by commercial properties, utilities, historic structures, and high-end residential communities, protection of structures must be considered. Once the blasting area(s) have been identified, critical structures within the blast zones would be identified. Where vibration damage may occur, energy ratios and peak particle velocities shall be limited in accordance with state or county requirements, whichever is more stringent.

The USACE Safety and Health Requirements Manual (EM 385-1-1 3, Sept/96) 29.E.06 limit of “air blast pressure exerted on structures resulting from blasting shall not exceed 133 dB (0.013 psi)" and industry standard vibration limitations would be incorporated into the design process. A conservative regression analysis of similar projects may be used to develop the design and then continually updated with calibration of the environment.

Vibration-monitoring devices would be installed to ensure that established vibration limits are not exceeded. If the energy ratio or peak particle velocity limits are exceeded, blasting would be stopped until the probable cause has been determined and corrective measures taken. Critical monitoring locations may include structures such as bulkheads, hazardous materials storage areas, and buried utilities.

The USACE believes that blasting is actually the least environmentally impactful method for removing the rock in the Port. Each blast will last no longer than 25 seconds in duration, and may even be as short as 2 seconds, and will be spaced out twelve hours apart. Additionally, the blasts are confined in the rock substrate. Boreholes are drilled into the rock below, the blasting charge is set and then the chain of explosives is detonated. Because the blasts are confined within the rock structure, the distance of the blast effects are reduced as compared to an unconfined blast.

2.7.3 Miami Harbor Project Construction Method

The most likely dredging methodology alternatives for the Miami Harbor project are listed below in order of estimated costs:

1. Blasting all of the channel, followed by mechanical dredge cleanup, and barge transport of dredged material either to ODMDS or to mitigation site.

2. Blasting of all of the channel except for Cuts 1 and 2 (entrance channel) exclusive of the widening at the elbow (which would also be blasted), followed by mechanical dredge cleanup of the blasted areas, and transport to either ODMDS or to Mitigation site. The non-blasted portions of the channel would be excavated with large cutterhead dredge with no restrictions on anchor placement.

3. Same as alternative 2 above but with restricted anchor placement (i.e., within the limits of the channel).

The USACE investigated methods to remove the rock in the Port of Miami without blasting using a punchbarge. It was determined that the punchbarge, which would work for 12-hour periods, strikes the rock below approximately once every 30-seconds. This constant pounding would serve to disrupt manatee behavior in the area, as well as impact other marine animals in the area. Using the punchbarge will also extend the length of the project temporally, thus increasing any potential impacts to all fish and wildlife resources in the area.

The USACE believes that blasting is actually the least environmentally impactful method for removing the rock in the Port. Each blast will last no longer than 25 seconds in duration, and may even be as short as 2 seconds, and will be spaced out twelve hours apart. Additionally, the blasts are confined in the rock substrate. Boreholes are drilled into the rock below, the blasting charge is set and then the chain of explosives is detonated. Because the blasts are confined within the rock structure, the distance of the blast effects are reduced as compared to an unconfined blast.

3.0 AFFECTED ENVIRONMENT

Miami Harbor lies in the north side of Biscayne Bay, a shallow subtropical lagoon that extends from the City of North Miami (Miami-Dade County, Florida) south to the northern end of Key Largo (at the juncture of Miami-Dade and Monroe Counties). Biscayne Bay is a long, narrow, water body approximately thirty-eight miles long, and three to nine miles wide. Average depth is six to ten feet (USACE 1989). Biscayne Bay is bordered on the west by the mainland of peninsular Florida and on the east by both the Atlantic Ocean and a series of barrier islands consisting of sand and carbonate deposits over limestone bedrock (Hoffmeister 1974).

A thin layer of sediment less than six inches in depth characterizes the bay bottom over most of its area. Sediment thickness is increased up to 40 inches in the northern part of Biscayne Bay near Miami Beach. Two major natural communities inhabit the bay bottom: seagrass communities and hardbottom communities. In the Atlantic Ocean, waterward of Biscayne Bay and barrier islands, similar communities occur. Nearshore seagrass beds give way to mixed seagrass and hardbottom, deeper channels and, finally, the Florida Reef Tract, which runs from Soldier Key south through the Florida Keys.

3.1 Coastal Environment

Tides within the Miami area are semi-diurnal having two high and two low tides each day. The mean range at Miami Beach is 2.5 feet (3.0 feet in spring). The lowest tide is 1.4 feet below mean low water (USACE 1989).

The Florida Gulf Stream current off the east coast of Florida flows north and varies in velocity from 17 miles per day in November to 37 miles per day in July. Maximum tidal current velocities through Government Cut are approximately 5.5 feet per second on average tide, but occasional velocities of approximately 6.2 feet per second have been recorded during spring tide (USACE 1989). Flood tidal currents are often oriented perpendicular to the Entrance Channel centerline in the vicinity of the seaward ends of the jetties. This affects vessel handling especially inbound when speed is being reduced approaching docks and wharves.

During the months of September through February the prevailing winds and predominant waves approach from the northeast to east. During March, April, and May winds and waves usually approach from an easterly direction. June through August the winds and waves prevail from the southeast. Waves and swells generally have no effect on deep draft navigation due to their amplitude and short period.

3.2 Geology and Sediments

Due to previous dredging projects of the Port and Entrance Channel, the majority of the project area is exposed rock and rubble. A few localized areas are mantled by a few feet of sand due to shoaling. The sand is usually tan or gray, contains some fines and also fills solution holes in the underlying rock. A portion of the Entrance Channel, between the hardbottom/reefs is sand with no rock. In areas not previously dredged, yellow to white massive limestone and sandstone units of the Miami Oolite Formation are overlain by sand and silt. The Miami Oolite Formation has many solution channels and is very permeable. It has a maximum thickness of 30 feet in the project area and has its base at an approximate elevation of –35.0 feet MLW. The presence of a hard basal conglomerate at this elevation signifies the unconformable contact with the older Fort Thompson Formation. The Fort Thompson consists of tan colors, sandy limestone, calcareous sandstone, and seams of sand. With deeper depths, the sand seams increase in size and are thicker than the rock strata in some places. Many solution holes are present and are either open or filled with sand or secondary limestone. In both the Miami Oolite and the Fort Thompson Formations solution activity and re-crystallization have created zones of different rock strength that cause the rock to fragment into large pieces that makes excavation difficult (USACE 2001).

3.3 Water Quality

The Biscayne Bay area, including Miami Harbor is located within State of Florida Class III waters. Class III is the standard designation covering most open marine waters of the state. Biscayne Bay is also classified as Outstanding Florida Waters (OFW) under Section 62-302.700 of the Florida Administrative Code. The OFW designation carries with it the requirement that ambient water quality cannot be degraded below its existing level. Federal navigation channels at the Port are excluded from the OFW designation. Overall, Biscayne Bay has good water quality probably due primarily to its configuration as an open system that readily flushes out pollutants. Some localized water quality problems are present, primarily in the northern Biscayne Bay where circulation is more restricted and where previous dredge and fill activity has resulted in the loss of most natural submerged and shoreline habitat.

The study area itself is significantly altered from its original natural state. Extensive fill activities on Miami Beach, Fisher Island, Virginia Key and the mainland resulted in the loss of seagrass and mangrove shorelines and restricted flushing to Government Cut and Norris Cut. Much of the remaining bay bottom was channelized, and the Port island was created from spoil islands left from earlier dredging. The main sources of water quality degradation in the area today include stormwater discharges and runoff, particularly from the Miami River, and developed upland areas. Sediments within the study area are frequently suspended by tides, currents, and wind, as well as by vessel transits in and adjacent to the channel by a variety of recreational and commercial watercraft. Due to the high volume of water moving through the deep-water channels on each tidal cycle, the area remains well flushed; however, other contributing sources of sediment, including stormwater discharge and extensive shallow flats to the south, provide continuous material for suspension in the water column.

3.4 Seagrass Communities

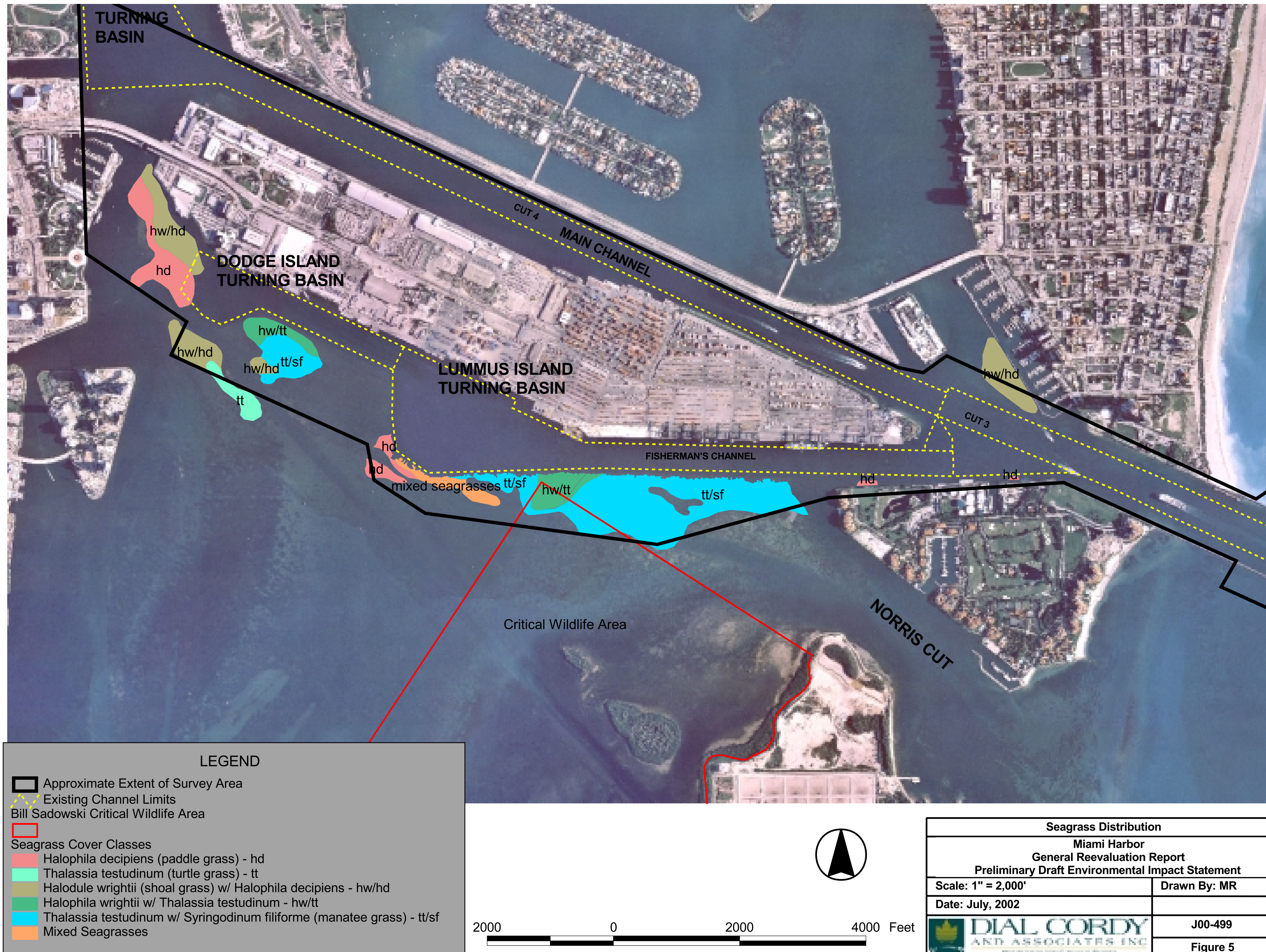
Seagrass distribution and occurrence within the study area were surveyed from approximately 400 feet south of Fisherman’s Channel, including the area of the Bill Sadowski Critical Wildlife

Area (BSCWA), and the area adjacent to the Coast Guard Station north of the Entrance Channel at the southern tip of Miami Beach (Figure 5).

Marine seagrass species observed within the study area included *Halodule wrightii, Halophila decipiens, Syringodium filiforme*, and *Thalassia testudinum*. Seagrass occurrence in these areas consisted of mixed beds of *H. decipiens* and *H. wrightii*, mixed beds of *H. wrightii,* and *T. testudinum,* mixed beds of *T. testudinum and S. filiforme,* mixed beds of all species, and monospecific beds of *T. testudinum* and *H. decipiens*. No *Halophila johnsonii* was observed during the survey (DC&A 2001, Appendix E), nor has any been reported in the study area by resource agencies or other sources (Craig Grossenbacher, DERM 2002, personal communication).

Review of historic aerial photography over an approximate ten-year period (1989 to 1998) shows that major seagrass coverage patterns have essentially remained the same in the Port and BSCWA. Site-specific coverage patterns along Fisherman's Channel revealed that the "colonizing" species, especially *H. wrightii* and *H. decipiens* tended to occur along the turning basins and nearshore areas in softer sediments with higher chronic turbidity (see Figure 5). During seagrass surveys, some *H. decipiens* beds near the turning basins were covered with heavy silt loads. These colonizing species may predominate closer to shore because they can better withstand daily fluctuations in water quality. Mixed beds of the more climactic species, *T. testudinum* and *S. filiforme*, were predominant in silty sand substrate along Fisherman's Channel. This area may experience more flushing by high tides and a more stable substrate with less chronic resuspension. All seagrass beds were patchy and interspersed with bare substrate and the density of individual beds decreased from east to west. The seagrass communities located directly along the channel edge were of moderate quality when compared to the seagrasses in the surrounding area, especially to the south. Daily water quality perturbations from runoff, river flushing, shipping activities and propeller dredging by recreational boaters create a less stable, less diverse habitat although nutrient loads are probably exploited by some marine species at times.

The FWS noted in 1989 that seagrasses might be declining in the vicinity of the mouth of the Miami River because of the deleterious effects of sediments transported into Biscayne Bay (USFWS 1989). An introduction of sediments from the Miami River has reportedly changed areas of the northern part of Biscayne Bay from a turtle grass climax community to an early successional stage, with paddle grass (*H. decipiens*) and shoal grass (*H. wrightii*) as the predominant species. The U.S. Department of the Interior, National Park Service reported that pollutants from the Miami River might have contributed to the loss of large areas of seagrasses adjacent to the Biscayne National Park.


TURNING BASIN
DODGE ISLAND TURNING BASIN
LUMMUS ISLAND TURNING BASIN
CUT 4
MAIN CHANNEL
CUT 3
FISHERMAN'S CHANNEL
NORRIS CUT
Critical Wildlife Area
hw/hd
hd
hw/tt
tt/sf
tt
mixed seagrasses
LEGEND
Approximate Extent of Survey Area
Existing Channel Limits
Bill Sadowski Critical Wildlife Area
Seagrass Cover Classes
Halophila decipiens (paddle grass) - hd
Thalassia testudinum (turtle grass) - tt
Halodule wrightii (shoal grass) w/ Halophila decipiens - hw/hd
Halophila wrightii w/ Thalassia testudinum - hw/tt
Thalassia testudinum w/ Syringodinum filiforme (manatee grass) - tt/sf
Mixed Seagrasses
2000 0 2000 4000 Feet
Seagrass Distribution
Miami Harbor
General Reevaluation Report
Preliminary Draft Environmental Impact Statement
Scale: 1" = 2,000'
Drawn By: MR
Date: July, 2002
DIAL CORDY AND ASSOCIATES INC
J00-499
Figure 5

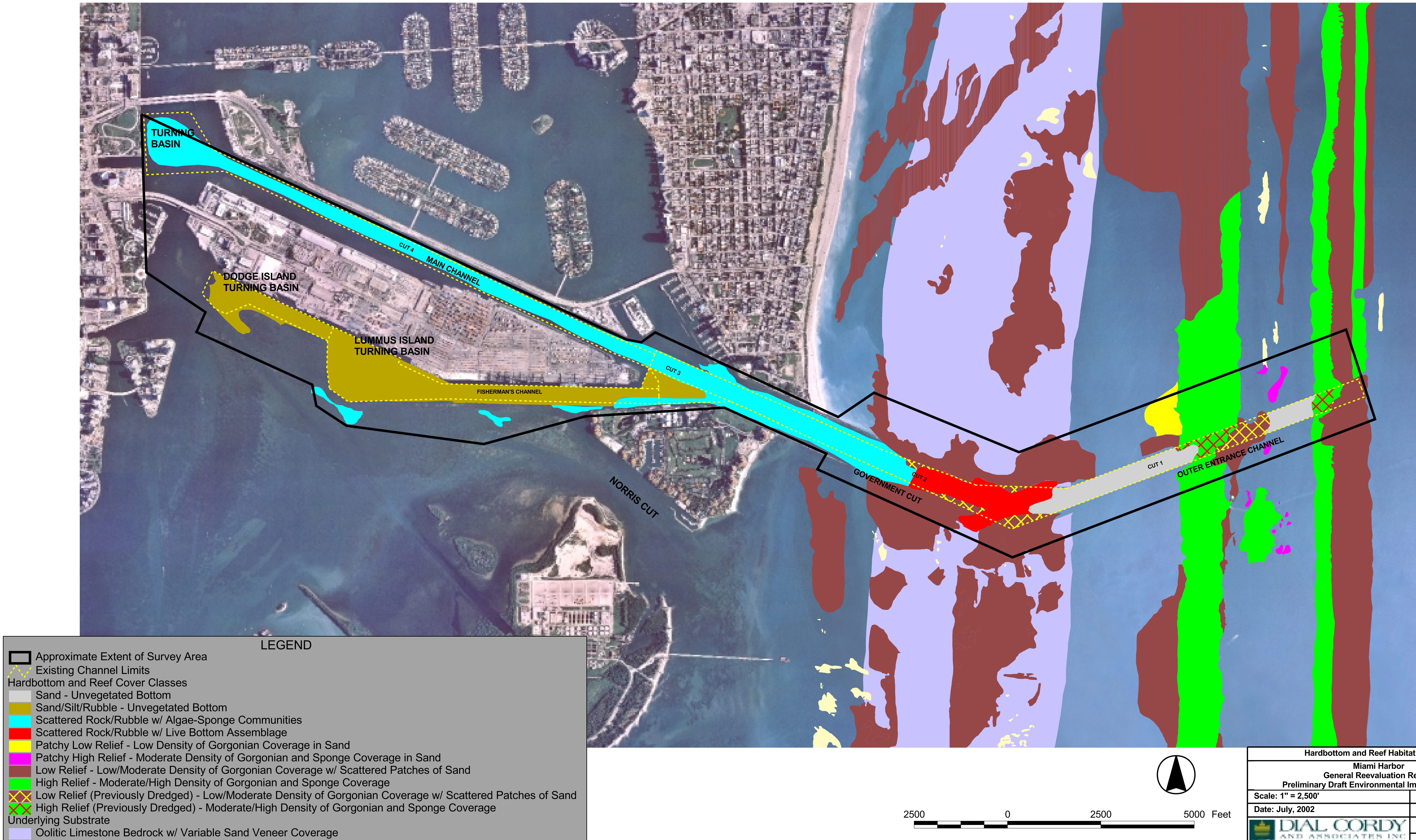
3.4.1 Flora and Fauna Associated with Seagrasses

Seagrass communities provide important habitat for many different species of flora and fauna. *Caulerpa prolifera* was observed in video transects associated with *H. wrightii*, and algae of the genera *Udotea*, and *Penicillus* were also observed in the field along the channel edge. Many invertebrate species also utilize seagrass communities. There is a prevalence of bottom feeders in the beds directly along the channel edge including the queen conch (*Strombus gigas*), urchins such as the sea biscuit (*Clypeaster* spp.), bivalve mollusks, and crustaceans including the spiny lobster (*Panulirus argus*). These species are typical of areas experiencing stress due to existing turbidity and coastal processes. Filter feeders such as soft corals and sponges were observed scattered within adjacent seagrass beds further away from the channel, especially in the BSCWA where increased water clarity appeared to allow a more diverse and higher quality habitat. Many fish species have also been shown to have life cycles dependent on seagrass beds. Of particular importance are the mullet (*Mugil cephalus*), snook (*Centropomis undecimalis*), and many prey species including mojarras (*Eucinostomus* sp.) and pinfish (*Lagodon rhomboides)*. Seagrass beds are also important nurseries for many of the fish associated with the South Atlantic Fisheries Management Council (SAFMC) Snapper-Grouper Complex (SAFMC 1998a).

3.5 Hardbottom and Reef Communities

Hardbottom/reefs associated with the study area include a nearshore hardbottom area and two parallel reef tracts that run generally north/south (Figure 6). The hardbottom zone nearest to shore exists in a physically stressed environment (DC&A 2001, Appendix E), and involves the Miami Oolite Formation (Hoffmeister et al. 1967). Offshore from this nearshore hardbottom area, there are two parallel reef tracts (Duane and Meisburger 1969), both of which are in the study area (Figure 6). The hardbottom environment occurs from approximately 400 to 7,500 feet offshore from Miami Beach. The inner reef tract occurs approximately 2 miles from shore, and the outer reef tract is located approximately 2.5 miles offshore. There is an extensive sand area located between the reef lines. The area between the inner and second outer reef lines is characterized by small isolated hermatypic coral heads and interspersed coral rubble with areas of open sand.

The hardbottom/reef habitat classifications used for characterizing resources within the study area and more specifically within the existing and proposed channel limits are shown in Figure 6 and defined below:



Hardbottom and Reef Habitat Distribution	
Miami Harbor General Reevaluation Report Preliminary Draft Environmental Impact Statement	
Scale: 1" = 2,500'	Drawn By: MR
Date: July, 2002	
DIAL CORDY AND ASSOCIATES INC	J00-499
	Figure 6

Patchy Low Relief Hardbottom/Reef

This habitat type occurred north of the Entrance Channel and is characterized by a low density of gorgonians with a sand veneer cover.

Patchy High Relief Hardbottom/Reef

This habitat type occurred both north and south of the Entrance Channel and is generally characterized by a moderate density of gorgonians and sponges with a sand cover.

Low Relief Hardbottom/Reef

This habitat type occurred both north and south of the existing channel, with a vertical relief of less than 3 feet and was characterized by a low to moderate density of gorgonians with shallow patches of sand.

High Relief Hardbottom/Reef

This habitat type comprises most of the "inner first reef tract" and the landward portion of the “outer second reef tract," and is located both north and south of the Entrance Channel. The vertical relief of the reef ranges from 3 to 5 feet and is dominated by a moderate to high density of gorgonians and sponges.

Low Relief Hardbottom/Reef - Previously Dredged

This habitat type is the remnant of the hardbottom/reef system that was left following dredging of the Entrance Channel. Structural relief is less than three feet and gorgonians and sponges with scattered patches of sand dominate the habitat.

High Relief Hardbottom/Reef - Previously Dredged

This habitat type is the dredged portion of the inner and outer reefs tracts, with little similarity in structure to the natural reef, but with structural complexity and 3 to 4 feet vertical relief amongst the rock features and is dominated by moderate to high density of gorgonians and sponges.

3.5.1 Hardbottom Within the Channel Zone

The existing dredged Entrance Channel traverses the nearshore hardbottom and inner and outer reef tracts (Figure 6). Resources found within the Main Channel included scattered low relief and high relief hardbottom/reef, with characteristic biota, but are largely comprised of unvegetated sand/silt/rubble and rock/rubble habitats, all of which have been previously dredged. The areas of scattered rock/rubble within the channel and channel walls do exhibit some sponge and coral growth, although this habitat is not of the same quality as areas of hardbottom outside of the channel. The channel hardbottom is rock/rubble exposed and colonized following prior dredging events.

3.5.2 Dominant Biota of Hardbottom/Reef Habitats

Hardbottom and reef communities in the offshore areas of the study area are predictably speciose and have been characterized several times (Seaman 1985; Blair and Flynn 1989; and USACE 1989). The dominant feature of the reefs (low and high relief habitats) off Miami-Dade County is the high density and diversity of gorgonian corals (USACE 1989; USACE 1996a). Observed gorgonians (soft corals) during a recent video survey were primarily of the genera *Eunicea* (e.g., *E. palmeri)*, *Plexaura* (e.g., *P. homomalla)*, and *Pseudopterogorgia* spp. (DC&A 2001, Appendix E). Other observed genera included *Gorgonia*, *Plexaurella* (*P. dichotoma)*, and *Pterogorgia* (*P. citrina* and *P. anceps*), and *Pseudoplexaura* spp. Hard coral species also make up a significant part of the reef assemblages in this area. They include *Porites asteroides, Diploria clivosa, Siderastrea siderea,* and *Montastrea cavernosa* (Blair and Flynn 1989). All four of these dominant species, and a fifth, *Montastrea annularis*, were observed during the 2000 survey (DC&A 2001, Appendix E). Sponges observed within the project area's hardbottom and reefs during the survey included *Ircinia campana*, *Callyspongia vaginalis*, *Cliona* sp., *Iotrochota* sp. (*I. birotulata*), *Geodia* spp. (*G. gibberosa* and *G. neptuni*) and *Amphimedon compresa*. The biota of the two outer reef tracts are consistent with the overall assemblage of stony corals, sponges, and gorgonians found offshore of Miami-Dade, Broward, and Palm Beach Counties (USACE 2000). Colonizing taxa such as sponges and certain gorgonians were more prevalent in the channel's hardbottom areas than were hard corals. Observed algal species in channel and offshore areas included *Caulerpa* spp., *Laurencia* spp., *Cladophora* spp., and *Halimeda* spp. Flynn, et al. (1991) noted the additional presence of *Dictyota* spp. and *Jania* spp. in the area. Hardbottom/reef habitat where these marine algal species cover large areas are indicative of a stressful environment and represent less than ideal conditions to support more than a low to moderate quality habitat. In general, the hardbottom habitats found in the existing channel have been previously dredged, are chronically impacted by localized disturbances and have less structural complexity than those found outside of the channel.

3.5.3 Fishes Associated with Hardbottom/Reef Habitats

A total of 27 species of fish were observed on the offshore reef sites (DC&A 2001, Appendix E). A summary of the species observed is shown in Table 4. The most abundant species encountered were cocoa damselfish (*Pomacentrus variabilis*), bicolor damselfish (*Pomacentrus partitus)*, barjack (*Caranx ruber*), and bluehead wrasse (*Thalasomma bifasciatum*). Many other fishes were commonly encountered within the study area. These included members of the families Chaetodontidae (butterflyfishes), Acanthuridae (surgeonfishes), Scaridae (parrotfishes), Labridae (wrasses), Haemulidae (grunts), Lutjanidae (snappers), and Pomacanthidae (angelfishes). Other species encountered in lesser numbers included hogfish (*Lachnolaimus maximus*), rock hind (*Epinephelus adsecnsionis*), and Spanish hogfish (*Bodianus rufus*). These results are similar to fish species observed by Bohnsack et al. (1992; 1999).

Table 4 Relative Abundance of Fish Species Observed During Visual Survey, Miami Harbor, Florida

Common Name	Scientific Name	South Transects	North Transects
Bar jack	*Caranx ruber*	*A*	--
Beaugregory	*Pomacentrus partitus*	*A*	*A*
Bluehead wrasse	*Thalassoma bifasciatum*	*A*	*C*
Bluestripe grunt	*Haemulon sciurus*	-	*C*
Cocoa damselfish	*Pomacentrus variabilis*	*A*	*A*
Foureye butterflyfish	*Chaetodon capistratus*	*C*	*C*
French angelfish	*Pomacanthus paru*	*O*	*O*
Gray snapper	*Lutjanus griseus*	*O*	*C*
Grey angelfish	*Pomacanthus arcuatus*	*O*	*O*
Hogfish	*Lachnolaimus maximus*	*O*	*O*
Ocean sturgeon	*Acanthurus bahianus*	-	*C*
Pearly razorfish	*Hemipteronotus novacula*	-	*O*
Pigfish	*Orthoprisits chysoptera*	*C*	*C*
Porkfish	*Anisotremus virginicus*	*C*	*C*
Princess parrotfish	*Scarus guacamaia*	*O*	*O*
Rainbow parrotfish	*Scarus guacamaia*	*O*	*O*
Redlip blenny	*Opioblennius atlanticus*	*O*	*O*
Reef butterflyfish	*Chaetodon sedentarius*	*C*	*C*
Rock beauty	*Holocanthus tricolor*	-	*C*
Seaweed blenny	*Parablennius marmoreus*	*O*	*O*
Slippery dick	*Halichores bivittatus*	*C*	*C*
Spanish hogfish	*Bodianus rufus*	-	*R*
Spotted scorpionfish	*Scorpaena plumieri*	*O*	*O*
Stoplight parrotfish	*Sparisoma viride*	*O*	*O*
Tomtate	*Haemulon aurolineatum*	*C*	*C*
Townsend angelfish	*Holocanthus* sp.	*R*	-
Yellowtail snapper	*Ocyurus chysurus*	*C*	*C*

Source: DC&A 2001
Key A = abundant
C = common
O = occasional
R = rare

3.6 Unvegetated Bottom

Unvegetated bottom habitat within the study area has been classified as either sand bottom habitat or sand/silt/rubble habitat (Figure 6). Off of Miami-Dade County, unvegetated sand bottom habitats fall between the inner and outer reef tracts within the study area (Figure 6) and hence may provide a corridor for reef species to travel between reef lines. They may also be an important foraging area for some fish species (Jones et al. 1991). Other unvegetated sand bottom habitats are located between scattered reef patches and rock/rubble habitats both within and adjacent to the channel and between seagrass beds that occur outside the channel. Areas surveyed along the channel edge in the Port (within 400 feet perpendicular) were classified as unvegetated bottom if no seagrass/algae beds were recorded and mapped (see Figure 5). The unvegetated sand bottom just west of the Lummus Island Turning Basin is an example (DC&A 2001, Appendix E). The unvegetated-sand/silt/rubble habitat is found within Fisherman's Channel, and occurs as a patchy mosaic of each of these components.

Softer silty-sand substrates occurred mainly inshore, while unvegetated habitats offshore included some bare sand substrate over rock with sparse algae. During the summer months, the most abundant of these algal species found in the study area belong to the green algae genera *Caulerpa*, *Halimeda*, and *Codium* (USACE 1989; USACE 1996b). The former two taxa were observed during summer 2000 surveys (DC&A 2001, Appendix E). In winter months, brown algae (*Dictyota* spp. and *Sargassum* spp.) dominate (USACE 1989; USACE 1996b). In addition, several species of sponges (e.g., *I. campana*, *C. vaginalis,* and *Iotrochota* sp.) and gorgonians (e.g., *Eunicia* spp. and *Gorgonia* sp.) were observed along transects through unvegetated habitats. Individual colonies of algae, soft corals, and sponges that occasionally occur in these areas where little structure is available may serve to provide temporary refugia for small, motile species. Invertebrate fauna utilizing sand bottom areas include the Florida fighting conch (*Strombus alatus*), milk conch (*Strombus costatus*), king helmet (*Cassia tuberosa*), and the queen helmet (*Cassia madagascariensis*) (USACE 1996b).

The most ubiquitous infauna of inshore softer sand/silt/rubble communities include polychaete and sipunculan worms, oligochaetes, platyhelminthes, nemerteans, mollusks, and peracarid crustaceans. Compared to shallow sand flats, seagrass communities, and areas adjacent to reef tracts, the deeper, dredged areas of the channel and Port likely support a less diverse infaunal species assemblage and are a lower quality habitat.

3.7 Rock/Rubble Communities

Within the project area there are both naturally occurring rock outcrops and rock/rubble material that have been left from prior dredging events (Figure 6). For mapping purposes the rock/rubble communities have been classified as either scattered rock-rubble with algae-sponge communities or scattered rock/rubble with live bottom assemblage. The most obvious biological features of most of the rock/rubble-based habitats are resident sponges and macroalgae, which occurs throughout the Main Channel, portions of the inner Entrance Channel and isolated areas south of Fisherman's Channel. The remainder of the rock/rubble habitat serves as raw material for reef-building species. The latter case was apparent in the channel zone adjacent to the existing hardbottom in Government Cut. Observed sponge species included *Ircinia campana*, *Callyspongia vaginalis*, and *I. birotulata*. Observed soft corals were similar to those of adjacent reefs, and included the genera *Eunicea, Plexaura* and *Pseudopterogorgia*. Habitats provided by rock and rubble and associated sponges, algae, and soft corals provide significant refugia for many species of juvenile fish. These habitats are quite resilient and have successfully recovered from past dredging.

3.8 Essential Fish Habitat

The SAFMC (SAFMC 1998b) has designated seagrass, nearshore hardbottom, and offshore reef areas within the study area as Essential Fish Habitat (EFH) (Table 5). In southeastern Florida these habitats have also been designated as EFH-Habitat of Particular Concern (HAPC) (SAFMC 1998b). Managed species that commonly inhabit the study area include penaid shrimp and spiny lobster (*Panulirus argus*). These shellfish utilize both the inshore and offshore habitats within the study area (DC&A 2001). Several managed finfish species may also be present (see Appendix F).

Table 5 Essential Fish Habitat Areas in the Study Area

Estuarine Areas (Fisher Island, Main Channel, Inner Entrance Channel)	
	Seagrass
	Estuarine Water Column
	Algae
Marine Areas (Entrance Channel, Nearshore, and Offshore Areas)	
	Live/Hardbottom
	Coral and Coral Reef
	Artificial Reefs
	Algae
	Water Column

Source: South Atlantic Fisheries Management Council 1998b

Members of the 73 species Snapper-Grouper Complex that commonly use the inshore habitats for part of their life cycle include blue stripe grunts (*Haemulon sciurus*), French grunts (*Haemulon flavolineatum*), mahogany snapper (*Lutjanus mahogoni*), yellowtail snapper (*Ocyurus chysurus*), and Nassau grouper (*Epinephelus striatus*). These species utilize the inshore habitats as juveniles and sub-adults. As adults, they utilize the hardbottom and reef communities offshore. In the offshore habitats, the number of species within the Snapper-Grouper Complex that may be encountered increases. Other species of the Snapper-Grouper Complex commonly seen offshore in the study area include gray triggerfish (*Balistes capriscus*) and hogfish (*Lachnolaimus maximus*). Coastal migratory pelagic species also commonly utilize the offshore area adjacent to the study area. In particular, the king mackerel (*Scomberomorus cavalla*), and the Spanish mackerel (*Scomberomorus maculatus*) are the most common. As many as 60 coral species have been documented off the coast of Florida. Those observed in the study area are described in Section 3.5.2. All coral species fall under the protection of the South Atlantic Fishery Management Plan (SAFMC 1998b).

3.9 Protected Species

3.9.1 Marine Vegetation

3.9.1.1 Johnson's Seagrass

Johnson's seagrass (*H. johnsonii*) was listed as a threatened species by NMFS on September 14, 1998 (63 FR 49035) and a re-proposal to designate critical habitat pursuant to Section 4 of the ESA was published on December 2, 1998 (64 FR 64231). The final rule for critical habitat designation for *H. johnsonii* was published April 5, 2000 (65 FR 17786). Federal navigation channel boundaries existing at the time of designation, including the Port project are excluded from the critical habitat designation. *H. johnsonii* has one of the most limited geographic ranges of all seagrass species. It is only known to occur between Sebastian Inlet and northern Biscayne Bay on the east coast of Florida (Kenworthy 1997). Although *H. johnsonii* has been reported to occur in north Biscayne Bay, no *H. johnsonii* was encountered within the study area (DC&A 2001, Appendix E). Further, past field surveys conducted by resource agency personnel and for other studies of the Port have failed to identify *H. johnsonii* within the study area (Craig Grossenbacher, DERM, 2002, personal communication). However, concerns were raised by a NOAA representative that *H. johnsonii* may occur within the project area. This was partially due to an un-confirmed specimen observed during an interagency site visit on March 20, 2002. An additional site visit in May 2003 did not result in identification of the species, and the interagency team of biologists (representatives from USACE, FWS, NMFS, FDEP, and DERM) expressed the opinion that the high energy conditions found along Fisherman's Channel probably do not favor recruitment of *H. johnsonii.*

3.9.2 Marine Mammals

3.9.2.1 West Indian Manatee

The West Indian manatee (*Trichechus manatus*) has been listed as a protected mammal in Florida since 1893. Federal law, specifically the Marine Mammal Protection Act of 1972 (MMPA) and the Endangered Species Act of 1973 (ESA) protects manatees. Florida provided further protection in 1978 by passing the Florida Marine Sanctuary Act designating the state as a manatee sanctuary and providing signage and speed zones in Florida's waterways.

Within Miami-Dade County there exist both permanent and transient populations of manatees. Surveys show that during the winter months when temperatures drop, manatees from north

Florida and also Miami-Dade County will migrate to the Florida Power and Light (FP&L) power plant at Port Everglades (USGS 2000). During the spring months when the water warms, manatees return to the counties to the north and south to forage and reproduce. Telemetry and aerial surveys (Figure 7) confirm manatees are present within Miami-Dade County all year (Miami-Dade County 1999a, USGS 2000). The surveys also confirm that they frequent the waters in and adjacent to the study area in the Port, especially in the BSCWA, and near the Miami River and Intracoastal Waterway (ICWW). There are fewer sightings documented in the habitats directly along the channel edge east of the Lummus Island Turning Basin (Miami-Dade County 1999a).

3.9.2.2 North Atlantic Right Whale

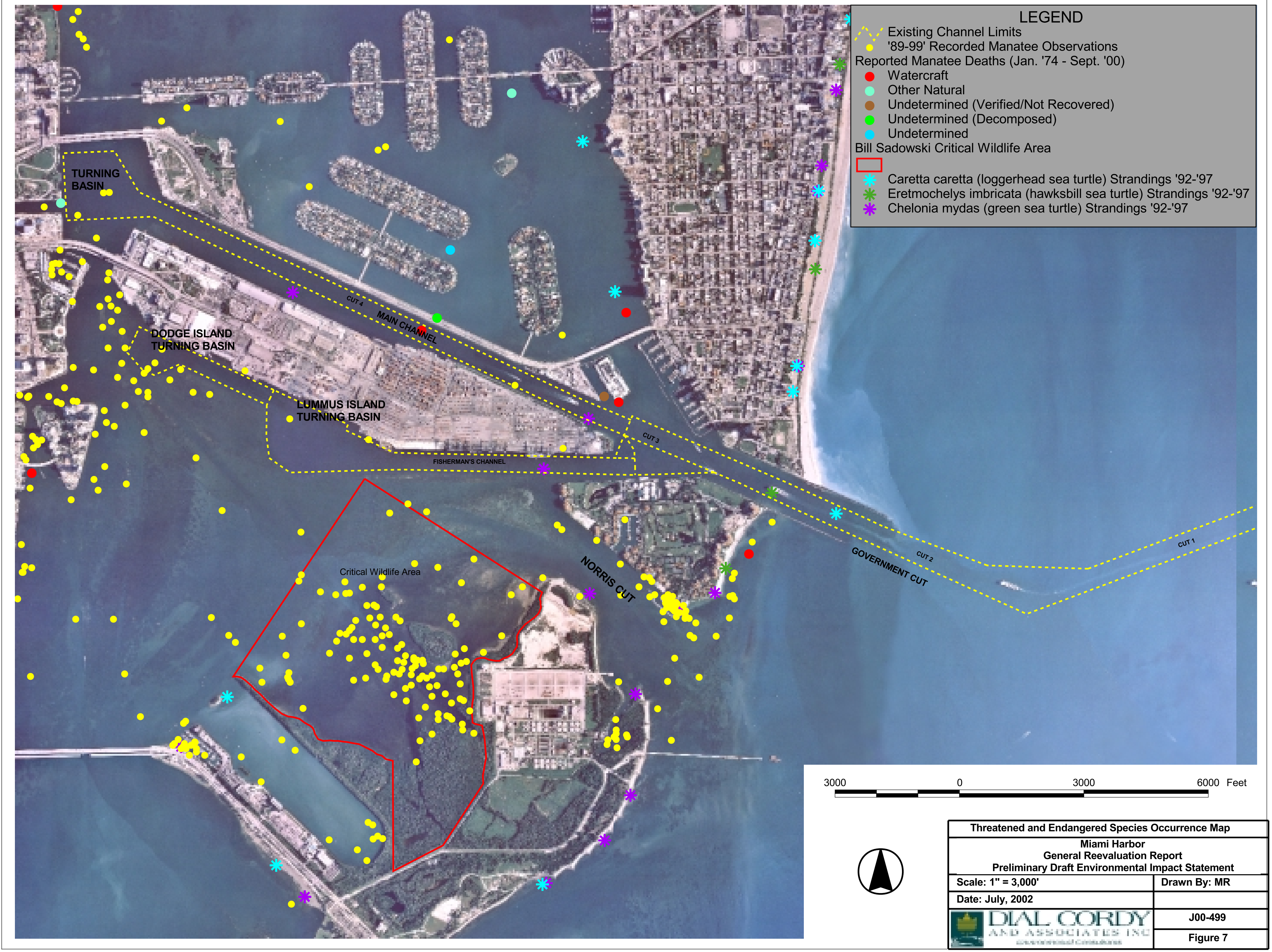
The North Atlantic right whale (*Eubalaena glacialis*) is a Federally listed endangered species and is also listed as a depleted stock under the MMPA. The minimum estimated population within the north Atlantic Region is 291 animals (NMFS 2001). North Atlantic right whales are highly migratory, summering in feeding and nursery grounds in New England waters and northward to the Bay of Fundy and the Scotian Shelf (NMFS 2001). They migrate southward in winter to the northeastern coast of Florida. The breeding and calving grounds for the right whale occur off of the coast of southern Georgia and north Florida and have been designated as critical habitat under the ESA in 1994 (59 FR 28793). During these winter months, right whales are routinely seen close to shore. While North Atlantic right whales have been historically reported in south Florida and the Gulf of Mexico, these sightings are extremely rare (Dan O'Dell, Hubbs-Sea World Research Institute, 2002, personal communication; North American Right Whale Consortium database, University of Rhode Island, accessed September 2003).

3.9.2.3 Bottlenose Dolphin

The USACE expects to find bottlenose dolphins (*Tursiops truncatus*) in the activity area. The National Marine Fisheries Service – Southeast Fisheries Science Center-Miami Laboratory has been conducting a photo-identification survey of the dolphins in Biscayne Bay since 1990. The study area encompasses an area of approximately 200 square miles. The study area ranged from Haulover Inlet south to the Card Sound Bridge behind Key Largo.

The study has identified 159 individual animals residing in Biscayne Bay, 146 of which have been resighted on at least one additional time. Many of these animals have been sighted within or transiting through the Port of Miami.

There is not currently a stock assessment available from NMFS concerning the status of bottlenose dolphins in the inshore and nearshore waters off of south Florida (Emily Menashes, pers.com 2002). Additionally, no status reviews or published reports of status of the Biscayne Bay dolphins have been published (although NMFS-SEFSC is currently working on one – Contillo, in press). The stocks of bottlenose dolphins that reside closest to the project area, that have a completed stock assessment report available for review is the western North Atlantic coastal stock and offshore stock of bottlenose dolphins. The assessment for these groups was completed in November 2001 and September 2000, respectively.



LEGEND
Existing Channel Limits
'89-99' Recorded Manatee Observations
Reported Manatee Deaths (Jan. '74 - Sept. '00)
Watercraft
Other Natural
Undetermined (Verified/Not Recovered)
Undetermined (Decomposed)
Undetermined
Bill Sadowski Critical Wildlife Area
Caretta caretta (loggerhead sea turtle) Strandings '92-'97
Eretmochelys imbricata (hawksbill sea turtle) Strandings '92-'97
Chelonia mydas (green sea turtle) Strandings '92-'97
TURNING BASIN
CUT 4
MAIN CHANNEL
DODGE ISLAND TURNING BASIN
LUMMUS ISLAND TURNING BASIN
CUT 3
FISHERMAN'S CHANNEL
Critical Wildlife Area
NORRIS CUT
GOVERNMENT CUT
CUT 2
CUT 1
3000 0 3000 6000 Feet
Threatened and Endangered Species Occurrence Map
Miami Harbor
General Reevaluation Report
Preliminary Draft Environmental Impact Statement
Scale: 1" = 3,000'
Drawn By: MR
Date: July, 2002
J00-499
DIAL CORDY AND ASSOCIATES INC
Figure 7

3.9.2.4 Sperm Whale

There are estimated to be approximately two million sperm whales worldwide with a population of 130,000 or more thought to occur in the North Atlantic (IWC 1983). In the western North Atlantic they range from Greenland to the GOM and the Caribbean. The sperm whales that occur in the eastern US EEZ are believed to represent only a portion of the total stock (Blaylock, et al. 1995). Sperm whales generally occur in waters greater than 180 meters in depth. While they may be encountered almost anywhere on the high seas their distribution shows a preference for continental margins, sea mounts, and areas of upwelling, where food is abundant (Leatherwood and Reeves 1983). Waring, et al. (1993) suggest sperm whale distribution is closely correlated with the Gulf Stream edge. Like swordfish, which feed on similar prey, sperm whales migrate to higher latitudes during summer months, when they are concentrated east and northeast of Cape Hatteras. Bull sperm whales migrate much farther poleward than the cows, calves, and young males. Because most of the breeding herds are confined almost exclusively to warmer waters many of the larger mature males return in the winter to the lower latitudes to breed.

3.9.2.5 Humpback Whale

Humpback whales feed in the northwestern Atlantic during the summer months and migrate to calving and mating areas in the Caribbean. Five separate feeding areas are utilized in northern waters after their return; one of which, the Gulf of Maine feeding population, lies within U.S. waters and is within the action area of this consultation. Most of the humpbacks that forage in the Gulf of Maine visit Stellwagen Bank and the waters of Massachusetts and Cape Cod bays. Sightings are most frequent from mid-March through November between 41°N and 43°N, from the Great South Channel north along the outside of Cape Cod to Stellwagen Bank and Jeffreys Ledge (CeTAP 1982), and peak in May and August. Small numbers of individuals may be present in this area year-round, including the waters of Stellwagen Bank.

Barlow and Clapham (1997) note an apparent increasing trend in the Gulf of Maine feeding population; whereas the western Greenland feeding population appears small and is perhaps static. It is not yet known which feeding populations the mid-Atlantic animals belong to. The current rate of increase of the North Atlantic humpback whale population overall has been estimated at 9.0 percent (CV=0.25) by Katona and Beard (1990) and at 6.5 percent by Barlow and Clapham (1997). Palsboll, et al. (1997) studied humpback whales through genetic markers to identify individual humpback whales in the northern Atlantic Ocean. Using breeding ground samples from 1992–1993, Palsboll, et al. (1997) estimated the North Atlantic humpback whale population at 4,894 (95% confidence interval 3,374 - 7,123) males and 2,804 females (95% confidence interval 1,776 –4,463), for a total of 7,698 whales. However, since the sex ratio in this population is known to be 1:1 (Palsboll, et al. 1997), the lower figure for females is presumed to be a result of sampling bias or some other cause for partitioning of the sampling. Photographic mark-recapture analyses from the YONAH (Years of the North Atlantic Humpback) project gave an ocean-basin-wide estimate of 10,600 (95% c.i. = 9,300 - 12,100) and an additional genotype-based analysis yielded a similar but less precise estimate of 10,400 (95% c.i. = 8,000 - 13,600) (Smith, et al. 1999). The estimate of 10,600 is regarded as the best available estimate for this population. The minimum population estimate for the North Atlantic humpback whale population is 10,019 animals (CV=0.067) (Waring, et al. 1999).

Humpback whales pass close to the south Florida coast while migrating from northern feeding waters to mating and calving locations in the Caribbean in the fall and on the return to the north in the spring.

3.9.2.6 Fin Whale

The fin whale is ubiquitous in the North Atlantic and occurs from the GOM and Mediterranean Sea northward to the edges of the Arctic ice pack (Waring, et al. 1999). The overall pattern of fin whale movement is complex, consisting of a less obvious north-south pattern of migration than that of right and humpback whales. Based on acoustic recordings from hydrophone arrays, however, Clark (1995) reported a general southward “flow pattern” of fin whales in the fall from the Labrador/Newfoundland region, south past Bermuda, and into the West Indies. The overall distribution may be based on prey availability. This species preys opportunistically on both invertebrates and fish. As with humpback whales, they feed by filtering large volumes of water for the associated prey. Fin whales are larger and faster than humpback and right whales and are less concentrated in nearshore environments. Due to these traits, fin whales are less prone to entanglements than are right and humpback whales, but because they do occur in many of the same areas, the potential exists.

Hain et al. (1992) estimated that about 5,000 fin whales inhabit the northeastern United States continental shelf waters. Shipboard surveys of the northern Gulf of Maine and lower Bay of Fundy targeting harbor porpoise for abundance estimation provided an imprecise estimate of 2,700 (CV=0.59) fin whales (Waring et al. 1997).

3.9.2.7 Sei Whale

Indications are that, at least during the feeding season, a major portion of the sei whale population is centered in Northerly waters, perhaps on the Scotian Shelf (Mitchell and Chapman 1977). The southern portion of the species' range during spring and summer includes the northern portions of the U.S. Atlantic Exclusive Economic Zone (EEZ) — the Gulf of Maine and Georges Bank. The period of greatest abundance there is in spring, with sightings concentrated along the eastern margin of Georges Bank and into the Northeast Channel area, and along the southwestern edge of Georges Bank in the area of Hydrographer Canyon (CETAP 1982). The sei whale is generally found in the deeper waters characteristic of the continental shelf edge region. Mitchell (1975) similarly reported that sei whales off Nova Scotia were often distributed closer to the 2,000 m depth contour than were fin whales.

This general offshore pattern of sei whale distribution is disrupted during episodic incursions into more shallow and inshore waters. The sei whale, like the right whale, is largely planktivorous — feeding primarily on euphausiids and copepods. In years of reduced predation on copepods by other predators, and thus greater abundance of this prey source, sei whales are reported in more inshore locations, such as the Great South Channel (in 1987 and 1989) and Stellwagen Bank (in 1986) areas (R.D. Kenney, pers. comm.; Payne, et al. 1990). An influx of sei whales into the southern Gulf of Maine occurred in the summer of 1986 (Schilling, et al. 1992). Such episodes, often punctuated by years or even decades of absence from an area, have been reported for sei whales from various places worldwide.

3.9.2.8 Blue Whale

The blue whale is best considered as an occasional visitor in USA Atlantic Exclusive Economic Zone (EEZ) waters, which may represent the current southern limit of its feeding range (CETAP 1982; Wenzel, et al. 1988). All of the five sightings described in the foregoing two references were in August. Yochem and Leatherwood (1985) summarized records that suggested an occurrence of this species south to Florida and the Gulf of Mexico, although the actual southern limit of the species' range is unknown.

Using the U.S. Navy's SOSUS program, blue whales have been detected and tracked acoustically in much of the North Atlantic, including in subtropical waters north of the West Indies and in deep water east of the USA EEZ (Clark 1995). Most of the acoustic detections were around the Grand Banks area of Newfoundland and west of the British Isles. Sigurjónsson and Gunnlaugsson (1990) note that North Atlantic blue whales appear to have been depleted by commercial whaling to such an extent that they remain rare in some formerly important habitats, notably in the northern and northeastern North Atlantic.

3.9.3 Sea Turtles

Miami-Dade County is within the normal nesting range of three species of sea turtles; the loggerhead (*Caretta caretta*), the green sea turtle (*Chelonia mydas*), and the leatherback (*Dermochelys coriacea*). The green and leatherback sea turtles are both listed as endangered under the ESA and Chapter 370, F.S. The loggerhead sea turtle is listed as a threatened species. Within the 21 miles of beach along Miami-Dade County, a total of 319 sea turtle nests were found in 1999 (Miami-Dade County 1999b). From 1980 through 2000, an average of 183 sea turtle nests were per year discovered on Miami-Dade County beaches. On Fisher Island, a total of 24 sea turtle nests were observed during 2000. The majority of sea turtle nesting activity involved loggerhead sea turtles and occurred during the summer months of June, July, and August, with nesting activity occurring as early as March and as late as September (Miami-Dade County 2000).

The waters offshore of Miami-Dade County and those of Biscayne Bay are also used for foraging and shelter for the three species listed above, the hawksbill sea turtle (*Eretmochelys* *imbricata*) and the possibly Kemp's ridley sea turtle (*Lepidochelys kempii*), and Olive ridley sea turtle (*Lepidochelys oliveacea)* (DC&A 2001; Foley, et al 2003). During the summer months, adult turtles tend to congregate just offshore during mating and nesting activities and between nesting events. During the fall northward migration along the Keys and South Florida, there may be a greater tendency for individuals to wander into harbors and inland waterways in search of food, foraging for a day or two and then moving on.

A total of 23 stranded sea turtle carcasses were recovered from the vicinity of the Port (7 loggerheads, 10 green, 1 leatherback, 2 hawksbills, and 3 unidentified species). Stranding data is recorded at the location where a dead or injured turtle was retrieved which is usually where the carcass has washed up on shore after mortality has occurred in some other location, or it is where the injured or sick turtle has crawled ashore. If the animal is dead, an attempt to determine the cause of death is made. Strandings occur for many reasons, including collisions with watercraft, drowning/suffocation from entanglement, ingestion of debris, and disease. In addition to the 23 stranded turtles that have been recovered, there is one record of a loggerhead sea turtle being incidentally captured on hook and line (Wendy Teas, NMFS - SEFSC Miami Laboratory, 2002, personal communication).

3.9.4 American Crocodile

The American crocodile is a state and Federally listed endangered species. It is distributed along coastal and estuarine shores of the extreme southern Florida peninsula. Crocodiles primarily nest from Florida Bay to Turkey Point and on northern Key Largo. In Biscayne Bay they have been observed nesting as far north as Crandon Park, Bill Baggs State Recreation Area and Snapper Creek (USFWS 1999; Mazzotti 2000). Nesting for the crocodile begins in March and extends until late April or early May until the eggs are laid. They build their nests in well-drained soil at sites adjacent to deep-water. Adult crocodiles feed at night on schooling fish in creeks, open water, and deep channels (FP&L 1987). Crocodiles are shy animals and prefer quiet, inland ponds and creeks and protected coves. They also prefer natural, undisturbed areas for nesting, resting and feeding (USFWS 1999).

3.9.5 Piping Plover

The piping plover is a state and Federally listed threatened species. The piping plover is 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). 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. Although the piping plover overwinters in South Florida, there are no records of the species in the project area.

3.9.6 Least Tern

The least tern (*Sterna antillarum*) is a small member of the gull family (Laridae). It is listed by the State of Florida as a threatened species (FFWCC 1997) and is protected Federally under the Migratory Bird Treaty Act. Least terns breed along the east coast of the United States from Maine to Florida (AOU 1998) 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. Although the species is found in South Florida, there are no records of the species occurring within the project area.

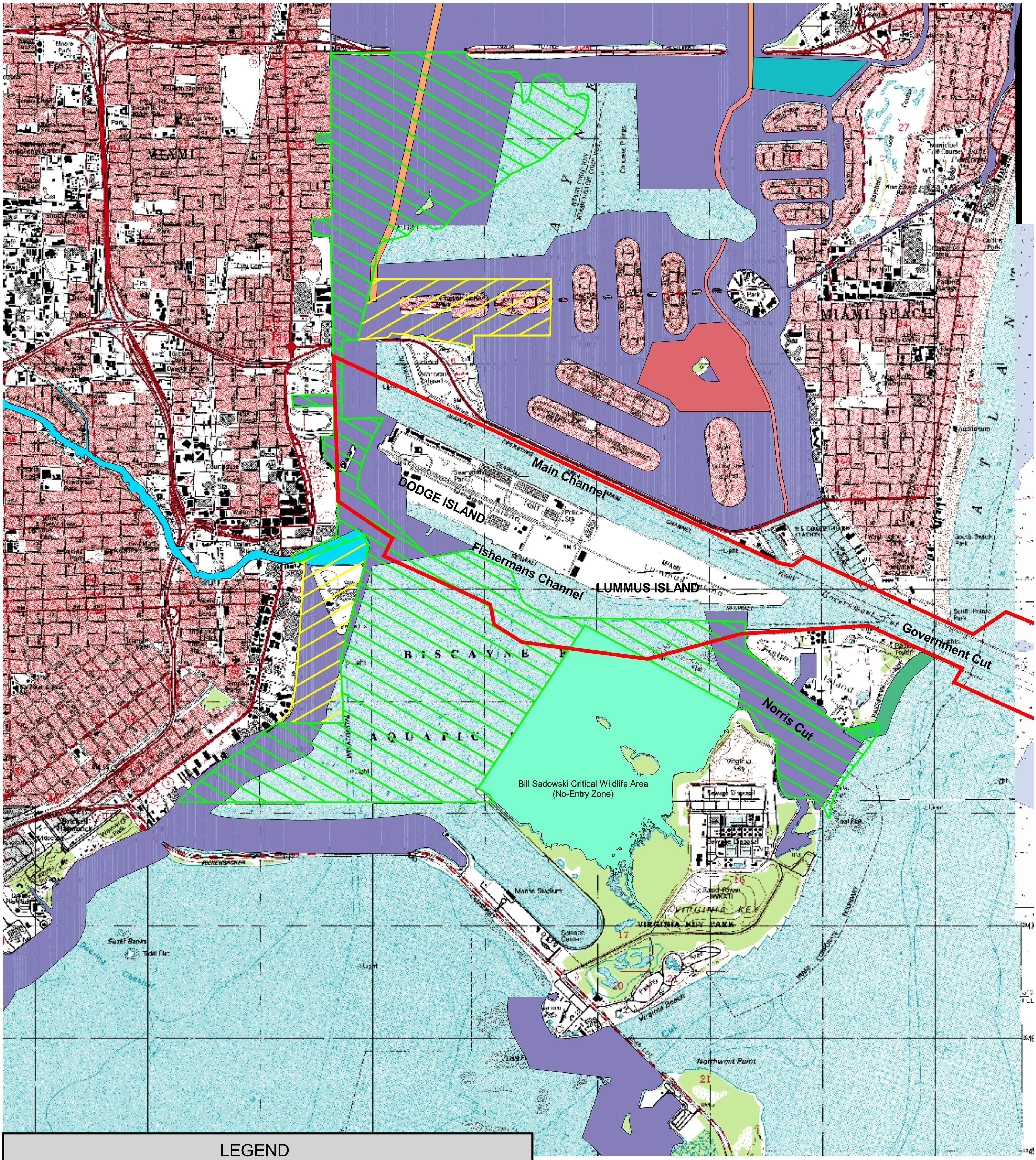
3.10 Other Areas of Special Concern

3.10.1 Manatee Protection Areas

Fisherman's Channel of the Port and its vicinity have been designated as essential manatee habitat under the 1995 Miami-Dade County Manatee Protection Plan (DERM 1995). Three manatee protection zones designated by DERM (Figure 8) are located in the vicinity of the Port. A Miami-Dade County designated Manatee Protection Zone (DCMPZ) Limited Marine Construction Area is located along the western portion of the Venetian Causeway, and an Essential Manatee Habitat designated area is located south and west of Dodge Island and Lummus Island which extends into the Port boundary. The existing BSCWA has also been designated as a No-Entry Manatee Protection Zone. Additionally, all of the waters in Miami-Dade County were designated critical habitat for the manatee under the ESA in 1976 (50 CFR 17.95(a)).

3.10.2 Bill Sadowski Critical Wildlife Area

Located south of the Port, BSCWA was established in 1990 by the Florida Game and Fresh Water Fish Commission (now called the Florida Fish and Wildlife Conservation Commission). This area of about 700 acres was designated to protect the shallow submerged seagrass and hardbottom habitats, intertidal mudflats, and coastal mangrove wetlands in the Biscayne Bay area west of Virginia Key (Figure 8). When first established, the area was protected primarily as a refuge for shorebirds and wading birds, but the boundary was later expanded to include important manatee habitat including calving grounds. Buoys mark the BSCWA boundary on-site and the area is closed to boating year-round.



4000 0 4000 8000 Feet

LEGEND

- Approximate Extent of Study Area

Port of Miami Manatee Protection Areas (Port of Miami)

- EMH - Essential Manatee Habitat (Special Manatee Protection Zone
- MDCMPZ - Dade County Manatee Protection Zone (Limited Marine Construction

Dade County Manatee Protection Zones (DERM)

- NO ENTRY
- NO ENTRY NOV 15 THROUGH APR 30, IDLE SPEED REMAINDER OF YEAR
- MOTOR BOAT EXCLUSION
- IDLE SPEED
- SLOW SPEED
- SLOW NOV 15 - APR 30; 30 MPH REMAINDER OF THE YEAR
- SLOW NOV 15 - APR 30; 35 MPH REMAINDER OF THE YEAR
- 30 MPH
- 35 MPH

Manatee Protection Zones

Miami Harbor
General Reevaluation Report
Preliminary Draft Environmental Impact Statement

Scale: 1" = 4,000'	Drawn By: MR
Date: July, 2002	
DIAL CORDY AND ASSOCIATES INC	J00-499
	Figure 8

3.10.3 Biscayne Bay Aquatic Preserve

The Port is located within the Biscayne Bay Aquatic Preserve. The preserve, which includes all of the waters of Biscayne Bay south to Biscayne National Park, was established in 1980 under Ch. 18-18, F.A.C. and is considered to be State-Owned Submerged Land under the jurisdictional authority of FDEP. All aquatic preserves in Florida are designated OFW. Authorized channels within the Port are excluded from the aquatic preserve due to their status as Federal navigation channels. New construction or other marine activities cannot result in a degradation of water quality outside of specially designated mixing zones (Miami-Dade County 1999c).

3.10.4 Biscayne National Park

The northernmost boundary of the Biscayne National Park lies approximately seven miles south of the Port and covers the widest part of Biscayne Bay down to its southern limit where it meets Card Sound.

3.11 Air Quality

Miami-Dade County is classified by FDEP as an attainment/maintenance area for the pollutant ozone. Ambient air quality data is also collected for four additional pollutants (carbon monoxide, nitrogen dioxide, particulate matter and sulfur dioxide) in Miami-Dade County. Air quality along the Miami-Dade County coastline is relatively good due to the presence of either on or off shore breezes. Ozone levels are slightly higher than ambient air quality standards (FDEP 1999).

FDEP does not regulate marine or mobile emission sources (dredge and construction equipment) within Miami-Dade County.

3.12 Noise

The urban setting of the Port produces noise not necessarily related to the operation of the Port. Sources of noise within the boundaries of the Port are related to the transportation trucks associated with the movement of containerized cargo and private vessels. The Port is located within the flight path of air traffic from Miami International Airport, and additional noise sources include automobiles and trucks associated with the major highways near the Port.

There is little to no noise produced as a result of vessel traffic except for the engine noise associated with vessel transit and tug operations. Port tariff restricts the blowing of whistles and horns by vessels while in Port and the only intermittent whistle blowing are signals between tugs while assisting vessels in their movement within the Port.

3.13 Utilities

Eight underwater lines consisting of four FP&L electric cables, three Miami-Dade County water and sewer lines, and one Bellsouth line are present within or adjacent to the project area (Figure 9). In addition, a wastewater treatment facility is located on Virginia Key, and an existing force main crosses Biscayne Bay from Virginia Key. The abandoned force main that was replaced also crosses Biscayne Bay from Virginia Key to the mainland.

The Miami-Dade Water and Sewer Department (WASD) owns a force sewer main in a submarine crossing within the project area leading from Miami Beach to its Fisher Island treatment plant. The crossing consists of a 54-inch ductile iron pipe running under the channel with top of pipe elevation at elevation –50 feet.

Additionally, WASD also owns a water main in the submarine crossing leading from Fisher Island to Lummus Island. This crossing consists of a 20-inch ductile iron pipe running under the channel with top of pipe elevation at elevation –53.8 feet.

FP&L owns two transmission lines in a submarine crossing leading from its Fisher Island plant to Lummus Island. The crossing consists of one 69 kV circuit and one 138 kV circuit each inside 24-inch pipe conduits with top of pipe elevation at elevation –45.8 feet and -45.6 feet Local Mean Low Water (LMLW).

3.14 Hazardous, Toxic, and Radioactive Materials

There are no hazardous, toxic, or radioactive materials located within the Port study area. The sediments within the Port channels and turning basins have been extensively tested and analyzed by Federal agencies. After each testing event, the USACE has determined, and the EPA has concurred, that sediments were free of objectionable levels of contaminants and bioassay results were completely satisfactory. The testing criteria used by these two agencies is as rigorous and conservative as any environmental testing required in the United States, surpassing criteria for upland disposal of sediments.

Sediment tests were performed at 23 different locations at the Port. The tests have included chemical analysis of sediment and sediment elutriates, liquid phase bioassays for three organisms and solid phase bioassays for two organisms and bioaccumulation impacts for two additional organisms.

Utility Map	
Miami Harbor General Reevaluation Report Preliminary Draft Environmental Impact Statement	
Scale: 1" = 2,500'	Drawn By: MR
Date: July, 2002	
DIAL CORDY AND ASSOCIATES INC	J00-499
	Figure 9

Channels and turning basins at the Port have been specifically tested for contaminants on four occasions in the last eight years. Results of all four testing events were reviewed by environmental experts at the EPA and the USACE, as follows:

- In 1992 the USACE conducted a chemical analysis of sediment, elutriates of sediments, bioassays, and bioaccumulation studies for 12 stations in the Port. The USACE determined, and the EPA concurred, that samples were found to be "free of objectionable levels of contaminants and bioassay results were completely satisfactory" (USACE 1997).

- In 1998 the USACE tested eight additional locations in the Port (PPB 1998). The USACE determined, with EPA concurrence, that materials in and adjacent to the Port remained uncontaminated. The testing found almost no difference between the quality of the Port's sediments compared to a clean "reference sample". In fact, survivorship of organisms in elutriate bioassays was found to be same as, or better than, survivorship of organisms in the control sediment in many of the tests.

- In 1998 the Port, in conjunction with the USACE, tested three additional locations in non-Federal portions of the channel. The USACE and EPA analyzed the results and determined that the materials were uncontaminated.

- In 2002, the USACE tested 14 locations in the Port channels. The USACE determined that materials were uncontaminated. EPA is the process of completing their review of the USACE determination, but all indications are that EPA will concur that the sediments are suitable for ocean disposal.

All sediments in Port channels are approved by the EPA and USACE for disposal at the ODMDS. This approval is based on a study of all-available sediment testing, including data from 1995 testing throughout Biscayne Bay conducted by National Oceanic and Atmospheric Administrative (NOAA). The NOAA data (NOAA 1999), which examined a smaller set of sediment quality parameters (for example only one bioassay was conducted instead of the three in the Port's sampling), found that approximately 70 percent of Port sediments had "no" or "slight" toxicity, and less than 6 percent had elevated, or "high" levels of toxicity. Because measurements of toxicity are relative (i.e. compared to reference samples, not set standards), even the few "high" toxicity measurements in the NOAA study do not demonstrate any environmentally significant contamination. Further, the NOAA study specifically states that it is "not intended to focus upon any potential discharger or other source of toxicants, or to provide evidence to be used to identify or regulate any source of pollution."

Port's channels are "Clean" for the following reasons:

- Port channels, when deepened, require minimal maintenance dredging due to the fact that fine sediments (which are generally associated with contaminants) tend not to settle in the channels due to the strong hydraulic currents in the channels.

- The Port has a low potential for on-site contamination: the Port handles primarily containerized cargo and has no facilities for large-scale storage or handling of hazardous or toxic materials.

- The Port's channels have been regularly deepened into environmentally unimpacted rock. Previous deepening projects removed all surface sediments (where contaminants might accumulate) and any potential historic contamination that might have accumulated in channel bottoms.

3.15 Economic Factors

The Port is one of the nation's most important ports. It handles more multi-day cruise passengers than any other port in the world. It is also Florida's largest container Port and it is the tenth biggest container Port in the United States.

Cargo: In fiscal year 2001, the volume of cargo moving through the Port was 8.2 million tons or approximately 955,671 twenty-foot equivalent units (TEU's). This is a 6 percent increase over 2000 volumes of 7,804,946 million tons. The year for which the latest data is available and incidentally the only year the Port cargo trade declined, containers moving through the Port represented approximately 3 percent of the nation's waterborne container volume and 7 percent of volume traded by the Atlantic ports. It is expected that Miami's national role increased significantly in the last two years, due to its significant increase in cargo tonnage.

The Port's cargo volume growth has been exponential over the last ten years, more than doubling between 1990 and 2001 (Table 6).

Table 6 General Cargo Tonnage, Port of Miami 1990-2001

Fiscal Year	Actual General Cargo	
	Total Tonnage	Percent Change
1990	3,590,937	12.0%
1991	3,882,284	8.1%
1992	4,596,481	18.4%
1993	5,198,292	13.1%
1994	5,574,252	7.2%
1995	5,841,212	4.8%
1996	6,002,744	0.3%
1997	6,735,388	15.0%
1998	7,056,664	4.8%
1999	6,930,372	-1.8%
2000	7,804,946	13.0%
2001	8,247,004	5.7%

Sources: 2001 Port of Miami Master Plan and the Miami-Dade County Seaport Department

The Port offers the greatest frequency of cargo service, with the largest number of shipping lines, calling at the most destinations, in the world. The Port has more than 35 shipping lines calling on over 100 countries and over 254 ports. Of these, 26 carriers serve 33 countries and 101 ports in Latin America and the Caribbean. While trade with Latin America has been the Port's mainstay over the last decade, trade with the Far East and Europe is growing, and last year accounted for 35 percent of the Port's gross tonnage (Table 7).

Table 7 Import and Export Tonnage by Region FY 2001

Region	Import Tonnage	% of Total	Export Tonnage	% of Total	Total Trade	% of Total
Caribbean	339,209	8.09%	913,766	23.99%	1,272,975	15.44%
Central America & Mexico	799,361	18.01%	881,567	23.14%	1,680,928	20.38%
Europe	1,436,240	32.36%	381,466	10.02%	1,817,706	22.04%
Far East, Asia, Pacific	622,649	14.03%	331,514	8.70%	954,163	11.57%
Middle East, SW Asia, Africa	49,566	1.12%	13,415	0.35%	62,981	0.76%
North America	241,358	5.44%	97,904	2.57%	339,262	4.12%
South America	929,623	20.95%	1,189,366	31.23%	2,118,989	25.69%

Source: Miami-Dade County Seaport Department 2001

Cruise: In addition to its strength as a cargo port, the Port is also the largest multi-day cruise passenger homeport in the world. Nineteen-cruise ships homeport in Miami, handling nearly 3.4 million passengers in 2001, and forming the mainstay of the North American cruise industry.

The Economic Region: The Port's success is linked in part to its geographic location. Miami-Dade County is the Western Hemisphere's principal hub for international trade with the Caribbean, Latin America, Europe, and Asia. Over half of Miami-Dade County's populace is Hispanic, with roots in Latin America and the Caribbean - the Port's strongest trading partners. Miami-Dade County is also a significant consumer base and the 29th largest metro-area in the world by gross domestic product. The Port's link to important trading and cruise routes, as well as the strength and characteristics of its large and growing hinterland, have positioned the Port as a top performer, and will continue to drive the Port's growth as long as the infrastructure to support marine transportation is in place.

Supporting Infrastructure: Deep-water channels and berths support commerce at the Port, cargo cranes and cruise terminals, and intermodal connections from the Port island to Gulf Stream shipping lanes. The Port's principal shipping channels and turning basins are shown in Figure 10**.** These waterways provide access to berthing areas at the Port, as well as to the Miami

River cargo operations and the ICWW. The Port's berths, RO/RO ramps, 10 gantry cranes and other associated yard equipment, staging and storage areas, transit sheds, and marshalling yards are within three and one-half nautical miles of ocean shipping lanes and less than one-mile from interstate highway connections. Existing channel information is shown in Table 8; existing berth information is shown in Table 9.

Table 8 Existing Channel and Turning Basin Specifics

Type	Name	Width/Radius (feet)	Depth (feet NGVD)	Length (nautical miles)
Channels	Entrance Channel (Government Cut)	500[1]	-44.0	21.50
	Bar Cut	500[1]	-44.0	0.66
	Government Cut	400-500	-42.0/-44.0	0.66
	Main Channel	400/900[2]	-36.5	2.44
	Fisherman's Channel	500	-35.0 to -42.0	2.50
Turning Basins	Fisher Island Turning Basin	r=1,000	-42.0	NA
	Main Channel Turning Basin	r=1,600	-36.0	NA
	Lummus Island Turning Basin	r=1,600	-42.0	NA
	Dodge Island Turning Basin	r=900	-32.0/34.0	NA

[1]At the junction of Entrance Channel and Bar Cut, where a turning movement of 35 degrees is required, a 0.55-nautical mile stretch of the channel has been widened to 600 feet.
[2]The 900-foot width occurs along Dodge Island.

Source: Miami-Dade County Seaport Department 1999

ICWW CUT DA-14
San Marino Island
Biscayne Island
San Marco Island
MacArthur Causeway
Belle Island
Rivo Alto Island
MIAMI BEACH
Watson Park
TURNING BASIN
Hibiscus Island
Palm Island
MacArthur Causeway
Star Island
DODGE ISLAND
CUT-4 MAIN CHANNEL
LUMMUS ISLAND
U.S. COAST GUARD STATION MIAMI
ATLANTIC OCEAN
CUT 3
BUOY #15
BUOY #13
DODGE ISLAND TURNING BASIN (1200' DIAMETER)
FISHERMAN'S CHANNEL
LUMMUS ISLAND TURNING BASIN (1500' DIAMETER)
BUOY #2
Fisher Island
CUT 1
BUOY #3
CUT 2
NORRIS CUT
GOVERNMENT CUT
BAY
VIRGINIA KEY
LEGEND
Existing Channel Limits
2000 0 2000 4000 6000 Feet
Principal Shipping Channels and Turning Basins
Miami Harbor
General Reevaluation Report
Preliminary Draft Environmental Impact Statement
Scale: 1" = 2,000'
Drawn By: MR
Date: July, 2002
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J00-499
Figure 10

Table 9 Existing Berth Inventory

Berth Number	Length (feet)	Depth (feet)	Berth Usage
Terminals 6/7	750	-32.0	Cruise, Ro/Ro
Terminals 1-5 & 10 (Bays 1-25¾)	3,220	-36.0	Cruise
Bays 25-38	1,600	-36.0	Cruise, Cargo
Terminals 8/9 (Bays 38-45)	1,680	-36.0	Cruise
Bays 45-55	1,200	-36.0	Cruise, Cargo, RO/RO
Bay 55W (RO/RO, LO/LO)	900	-36.0	RO/RO, LO/LO
Bay 59W (RO/RO, LO/LO)	550	-32.0	RO/RO, LO/LO
Bay 65W (RO/RO, LO/LO)	690	-32.0	RO/RO, LO/LO
Gantry Crane Berths 99-130.5	4,975	-28 – -42	LO/LO
Bays 144-148	600	-25.0	RO/RO
Bay 154 (RO/RO, LO/LO)	670	-25.0	RO/RO, LO/LO
Bay 155 (RO/RO, LO/LO)	550	-25.0	RO/RO, LO/LO
Bays 165-177 (171 and 172 RO/RO, LO/LO)	1,450	-25.0	Cargo, RO/RO, LO/LO
Bays 165-177	1,250	-31.0	Cargo, RO/RO LO/LO
Terminal 12/14 (Bays 187-195)	1,000	-28.0	Cruise
Bays 183-187	450	-25.0	Cruise, Cargo
"RO/RO" refers to cargo that is rolled on and rolled off a ship on a chassis; "LO/LO" refers to cargo that is lifted on and off a ship by a crane.			

Source: Miami-Dade County Seaport Department 2001

Future Growth: Future growth in cargo business at the Port is dependent in large part on the Port's ability to accommodate container ships. The number and size of new container ships delivered or on order from shipyards increased significantly during the past decade. As of November 1, 1998, an additional 419 container ships were on order, which will add capacity of 712,142 TEUs to the 5.9 million TEUs currently in service.

Container ship capacities and dimensions have increased substantially since the 1970's and 1980's. Principal deep-sea shipping routes to and from Asia, Europe, and the United States are currently serviced through use of Panamax (3,000 TEUs and over) and Post-Panamax (4,000 TEUs and over) vessels. First- and second-generation vessels, once the mainstay of the container shipping industry, today operate as feeder vessels from larger, regional hubs to smaller ports. Shipping lines are planning the future development of even larger container vessels (Post-Panamax Plus), which will be able to transport between 6,000 and 8,000 TEUs. The drafts of modern-day vessels are also significantly deeper than in the past. Modern container ships, on average, require drafts of between 30 and 35 feet. Some of the larger container ships require even deeper drafts, ranging from 40 to 45 feet. These larger ships want to call on the Port, but have been unable to access berths due to channel depth constraints.

Economic Impact: Cargo and cruise operations at the Port generate large and growing economic benefits for Miami-Dade County and the South Florida region. Port revenues in 2000 were up 12 percent from 1999, and have increased 37 percent over the last five years that data are available (Table 10). The total economic impact of Port operations on the nation is estimated at more than $8 billion per year. More than 45,000 jobs are directly or indirectly attributable to Port operations. Jobs created by Port and trade activity tend to be good jobs: they pay significantly more than other job sectors in the local economy, have better long-term opportunities for employees and offer better training programs (particularly for minorities). In the year 2000, Port related jobs have estimated average annual wages of $37,418. In Miami-Dade County, where unemployment is higher than the state or the national average, and over a quarter of the state's poor reside, these good jobs are particularly important.

Table 10 Port of Miami Annual Gross Revenue FY 1996-2001

Year	Total	% Change
1996	$53,110,000	1%
1997	$60,639,000	7%
1998	$67,751,000	12%
1999	$64,550,000	-5%
2000	$72,539,000	12%
2001	$76,169,000	5%

The Port has strict limitations on bulk cargo products and is a general cargo port. Primary cargoes include marble, clay, cement, tile, bricks, and concrete; fresh fruits and vegetables; beverages; apparel and textiles; paper and paper products; machinery and equipment; iron, steel, and other metal products; and lumber and wood products. These goods arrive and depart the Port primarily in containers and trailers.

Current and Future Challenges: The Port is only as strong as its weakest intermodal link. For cargo trade, the limiting factor on capacity appears to be navigation - the ability for mega-cargo ships (like the Regina Maersk) to access Port-berthing areas. The Port is increasingly faced with international competition from cargo hubs with these depths. For example, the Freeport Container Port, which officially opened in July of 1997, features 60-ton gantry cranes, a 47-foot-deep harbor, low labor costs, and ample land area for expansion.

The shift toward consolidation of the waterborne cargo shipping industry will continue to distribute a larger proportion of worldwide-containerized cargo through a small number of operators and through a smaller number of strategic hubs or "regional megaport facilities." As these port operations reach a critical mass, they will attract an expanding array of the services (i.e., carriers, freight forwarders, and intermodal connections) required making them even more flexible and profitable. However, if a port is unable to meet the navigational needs of its users, a contraction of the business will occur instead.

Cargo at the Port moves through one of three terminal operators (primary cargo businesses): POMTOC, Maersk, and Seaboard. The loss of any single operator would directly result in the loss of between 20 percent to 52 percent of the port's cargo business. Further loss would occur as synergies between remaining operators begin to decline.

3.16 Land Use

The Port is the primary water-dependent land use in downtown Miami, occupying a prominent location immediately east of the Miami Central Business District (CBD). In addition, the Port functions as an important component of Miami-Dade County's Empowerment and Foreign Trade Zones. These zones are designed to harness the Port's international trade links to stimulate job creation and economic redevelopment in the many neighborhoods proximate to the port. The Port thus has important functional and commercial relationships with adjacent urban areas (Miami-Dade County 1999c).

The pattern of land uses surrounding the Port is characterized as a mixture of low, medium, and high-density residential, commercial, office, and park/recreation uses. Specific land uses found to the north of the Port's Main Channel include the MacArthur Causeway (I-395/A1A), park/recreation and commercial uses at Watson Island, the Terminal Island industrial area, and the USCG Base at Causeway Island. Low-density residential uses are found beyond the MacArthur Causeway on Palm, Hibiscus, and Star Islands. Medium- and high-density residential, park/recreation, commercial, and institutional land uses are found to the east of the Port on Fisher Island and the southern portion of the City of Miami Beach. Approximately one-half mile south of the Port, across Biscayne Bay, is Virginia Key. Land uses there include park/recreation, environmentally protected areas, and institutional and public facilities including the Miami-Dade County Virginia Key Wastewater Treatment Plant. Miami's CBD is found to the west of the Port. Land uses include mixed commercial and office, transportation, park/recreation (American Airlines Arena and Bayfront Park), medium-high-density residential, and industrial.

The Port has complex and multi-faceted connections and relationships with Miami-Dade County intermodal facilities such as the MIA, the FEC Hialeah Intermodal Facility, and the West Miami-Dade trade-related, freight forwarding and consolidation warehouses. The Port also utilizes the local, regional, and inter-regional transportation network components consisting of roads, railway lines, and channels to facilitate the efficient movement of goods and passengers.

3.17 Recreation

The Port is a working Port conducting operations on a twenty-four hour basis. It has not been designed to accommodate recreational opportunities for the general public because of attendant safety and security consideration, particularly for cargo operations. For this reason, public access points to the Port shoreline and public access facilities providing recreational opportunities such as roads with scenic overlooks, marinas, boat ramps and public docks are limited (Miami-Dade County 1999). However, recreational boating and other water-dependent activities are commonly seen in Biscayne Bay and surrounding waters.

3.18 Aesthetics

The Port is located in Biscayne Bay, a shallow salt water sound on the Atlantic coast, near the southern end of the Florida peninsula. The City of Miami is situated on the western shore of Biscayne Bay. Miami Beach, Fisher Island, and Virginia Key are located northwest and northeast of the Port. Typical skyline associated with the Port includes light industrial sites, large cargo ships, cranes, and other facilities associated with Port infrastructure.

3.19 Cultural Resources

Biscayne Bay is frequently mentioned in historic literature and significant historic properties may be located in the Port vicinity. Shipwrecks occurred within Biscayne Bay, although exact locations of these wrecks are not known. To determine if any potentially historic or cultural resources exist within the specific project area, archival research and consultation with SHPO was conducted. In addition, a remote sensing survey was completed by the USACE (Watts 2002). Neither the archival review nor the remote sensing survey identified any historical or cultural resources within the study area. If the USACE constructs its reef mitigation sites in localities currently not permitted by DERM, then the USACE will coordinate the placement of this material with SHPO.

4.0 ENVIRONMENTAL CONSEQUENCES

This section describes the impacts associated with the proposed alternatives considered for widening and deepening of the Port. NEPA defines direct impacts as those effects caused by the action and occur at the same time and place. Indirect impacts are defined as those that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable [CEQ Regulation Section 1508.18; Section 1508.8(a) & (b)]. Figures 11, 12, and 13 depict the direct and indirect impacts to natural resources associated with both Alternative 1 and Alternative 2 (Recommended Plan).

4.1 Coastal Environment

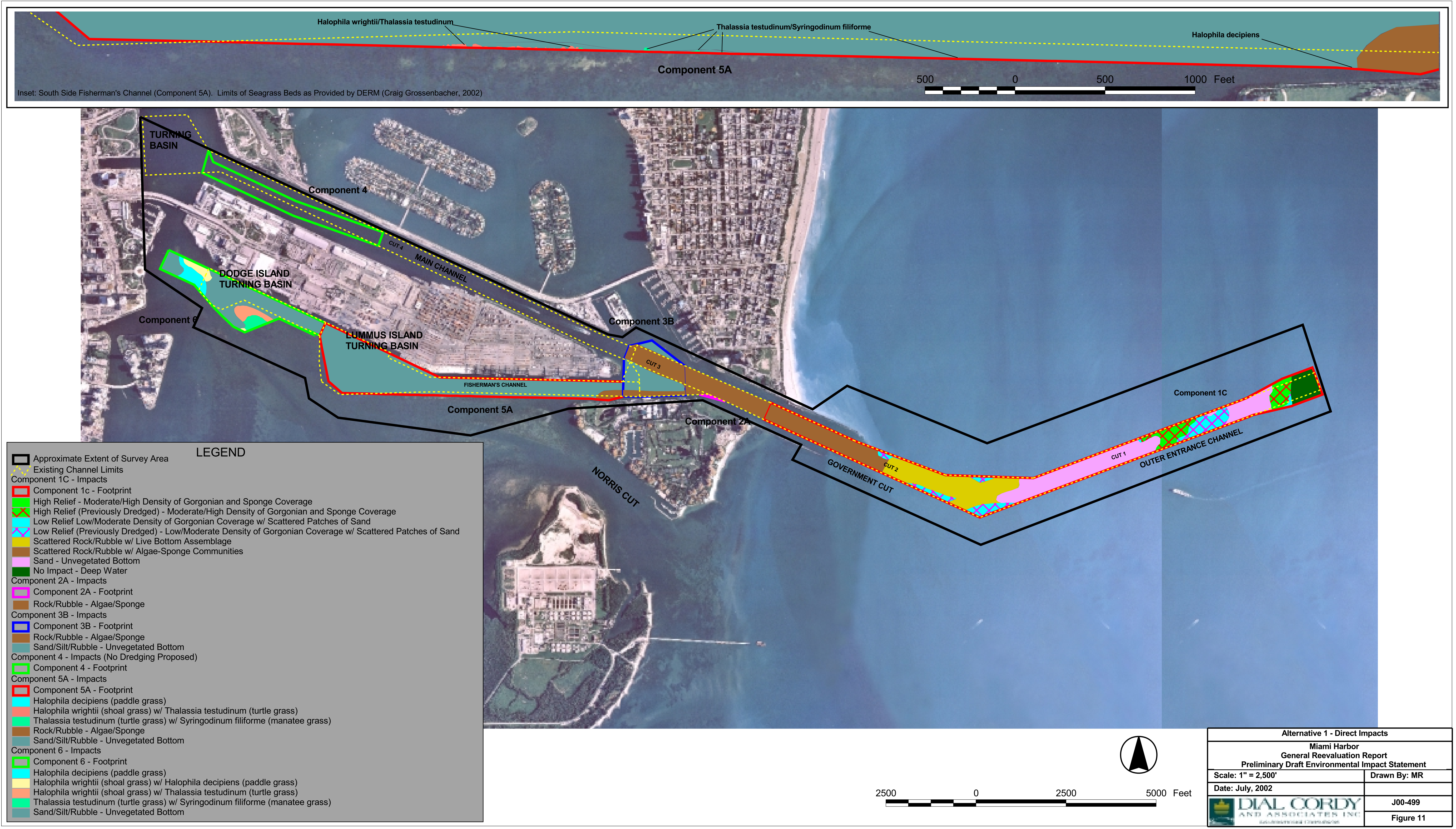
4.1.1 No-Action Alternative

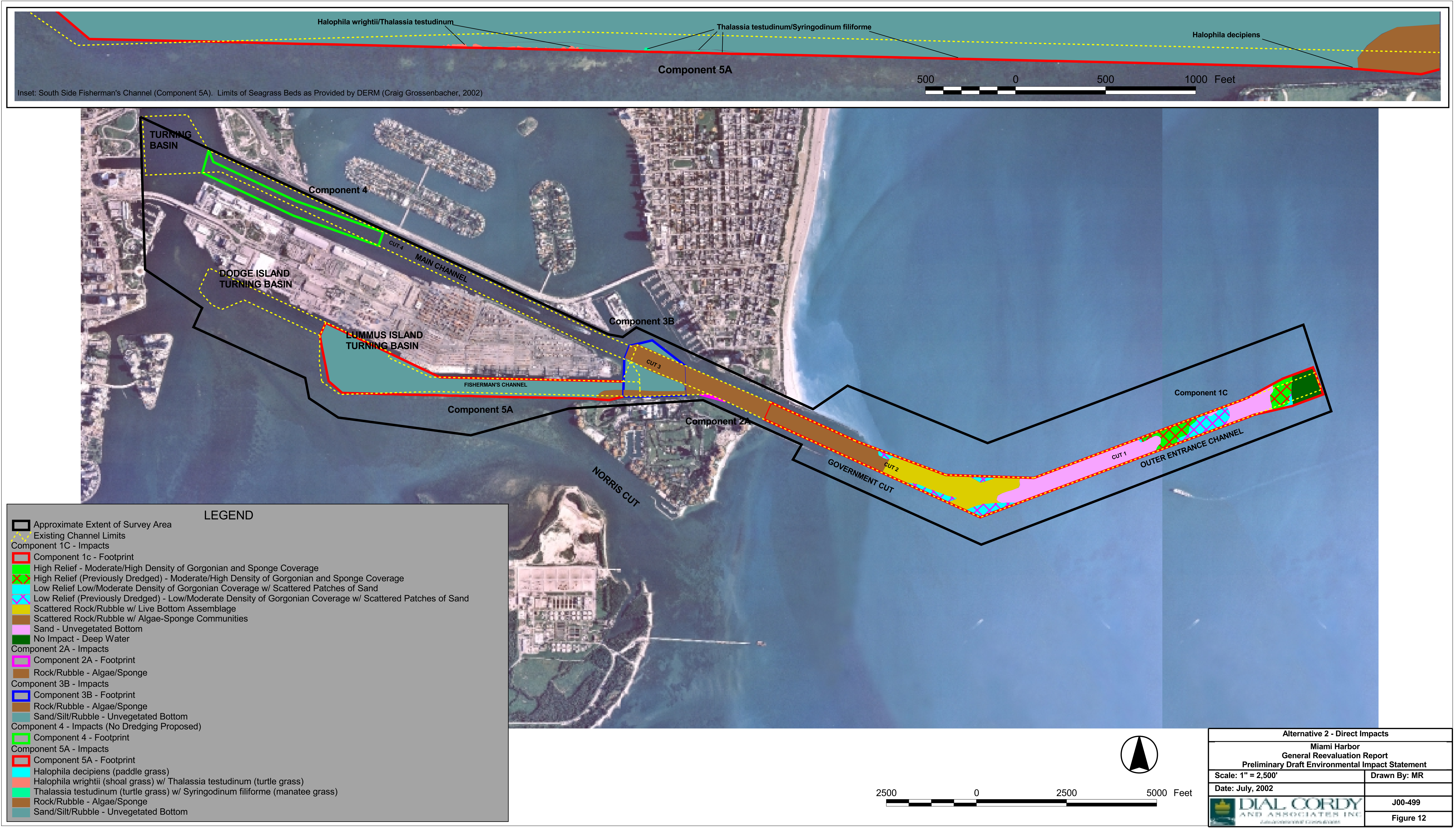
No impacts would occur to the coastal environment with the No-Action Alternative.

4.1.2 Alternative 1

The tidal ebb and flood velocity comparisons yield maximum differences between the existing conditions and Alternative 1 on the order of 0.5 ft/sec. These differences occur primarily in Government Cut, Fisherman's Channel, and Dodge Island Cut. The residual velocity difference comparisons show that a weak residual vortex appears in both the Fisher Island Turning Basin and proposed Dodge Island Turning Basins. These vortices have velocities of less than 0.2 ft/sec. The time-history analysis indicates that the channel deepening tends to divert some tidal flow from the Main Channel to Fisherman's Channel. Also, a tidal amplitude attenuation and a phase lag of approximately two hours are observed for the plan condition west of Dodge Island. There is no observable impact on the Atlantic Ocean shoreline tidal velocities in any of the simulations.

Subtle differences in salinity were also identified between existing conditions and Alternative 1. These changes are close to detection limits and confidence levels of present field data collection capability and associated model assessments. The salinity comparisons yielded maximum salinity differences on the order of 1.0 part per thousand (ppt). The maximum differences occur just west of Dodge Island Cut, with differences observable in Fisherman's Channel, the western end of the Main Channel, and to the northwest of the Port. The differences observed west of Dodge Island may be influenced by the attenuated tidal amplitude and tidal phase lag induced by the channel deepening. The influence of channel deepening on the salinity north of the Port appears to be most pronounced during neap tides (CHL 2001). Based on these results, the USACE has determined that the modeled changes in the coastal environment are insignificant and no impacts would occur from Alternative 1.


Halophila wrightii/Thalassia testudinum
Thalassia testudinum/Syringodinum filiforme
Halophila decipiens
Component 5A
500 0 500 1000 Feet
Inset: South Side Fisherman's Channel (Component 5A). Limits of Seagrass Beds as Provided by DERM (Craig Grossenbacher, 2002)
TURNING BASIN
Component 4
CUT 4
MAIN CHANNEL
DODGE ISLAND TURNING BASIN
Component 6
Component 3B
LUMMUS ISLAND TURNING BASIN
CUT 3
FISHERMAN'S CHANNEL
Component 5A
Component 2A
Component 1C
CUT 2
GOVERNMENT CUT
CUT 1
OUTER ENTRANCE CHANNEL
NORRIS CUT
LEGEND
Approximate Extent of Survey Area
Existing Channel Limits
Component 1C - Impacts
Component 1c - Footprint
High Relief - Moderate/High Density of Gorgonian and Sponge Coverage
High Relief (Previously Dredged) - Moderate/High Density of Gorgonian and Sponge Coverage
Low Relief Low/Moderate Density of Gorgonian Coverage w/ Scattered Patches of Sand
Low Relief (Previously Dredged) - Low/Moderate Density of Gorgonian Coverage w/ Scattered Patches of Sand
Scattered Rock/Rubble w/ Live Bottom Assemblage
Scattered Rock/Rubble w/ Algae-Sponge Communities
Sand - Unvegetated Bottom
No Impact - Deep Water
Component 2A - Impacts
Component 2A - Footprint
Rock/Rubble - Algae/Sponge
Component 3B - Impacts
Component 3B - Footprint
Rock/Rubble - Algae/Sponge
Sand/Silt/Rubble - Unvegetated Bottom
Component 4 - Impacts (No Dredging Proposed)
Component 4 - Footprint
Component 5A - Impacts
Component 5A - Footprint
Halophila decipiens (paddle grass)
Halophila wrightii (shoal grass) w/ Thalassia testudinum (turtle grass)
Thalassia testudinum (turtle grass) w/ Syringodinum filiforme (manatee grass)
Rock/Rubble - Algae/Sponge
Sand/Silt/Rubble - Unvegetated Bottom
Component 6 - Impacts
Component 6 - Footprint
Halophila decipiens (paddle grass)
Halophila wrightii (shoal grass) w/ Halophila decipiens (paddle grass)
Halophila wrightii (shoal grass) w/ Thalassia testudinum (turtle grass)
Thalassia testudinum (turtle grass) w/ Syringodinum filiforme (manatee grass)
Sand/Silt/Rubble - Unvegetated Bottom
2500 0 2500 5000 Feet
Alternative 1 - Direct Impacts
Miami Harbor
General Reevaluation Report
Preliminary Draft Environmental Impact Statement
Scale: 1" = 2,500'
Drawn By: MR
Date: July, 2002
DIAL CORDY AND ASSOCIATES INC
J00-499
Figure 11



Halophila wrightii/Thalassia testudinum
Thalassia testudinum/Syringodinum filiforme
Halophila decipiens
Component 5A
500 0 500 1000 Feet
Inset: South Side Fisherman's Channel (Component 5A). Limits of Seagrass Beds as Provided by DERM (Craig Grossenbacher, 2002)
TURNING BASIN
Component 4
CUT 4
MAIN CHANNEL
DODGE ISLAND TURNING BASIN
Component 3B
LUMMUS ISLAND TURNING BASIN
CUT 3
FISHERMAN'S CHANNEL
Component 5A
Component 2A
Component 1C
CUT 2
CUT 1
GOVERNMENT CUT
OUTER ENTRANCE CHANNEL
NORRIS CUT
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Existing Channel Limits
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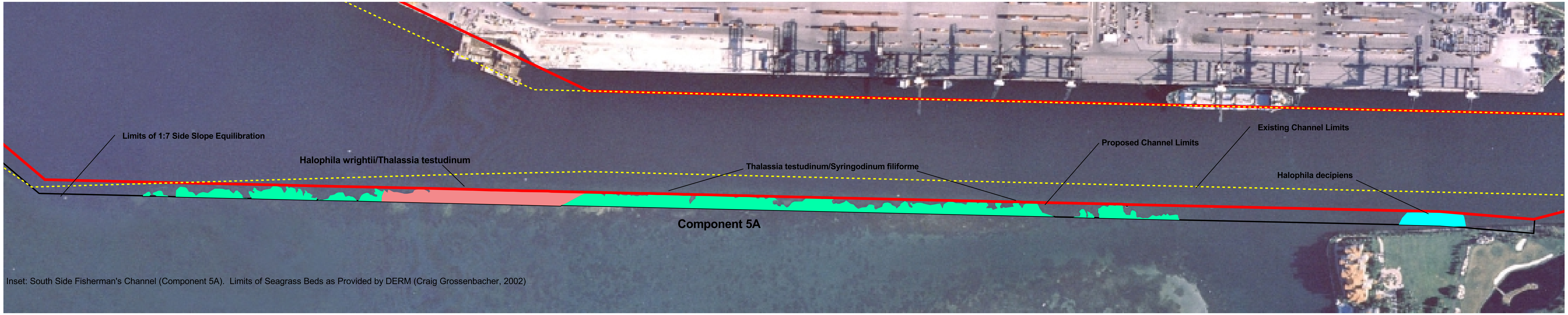
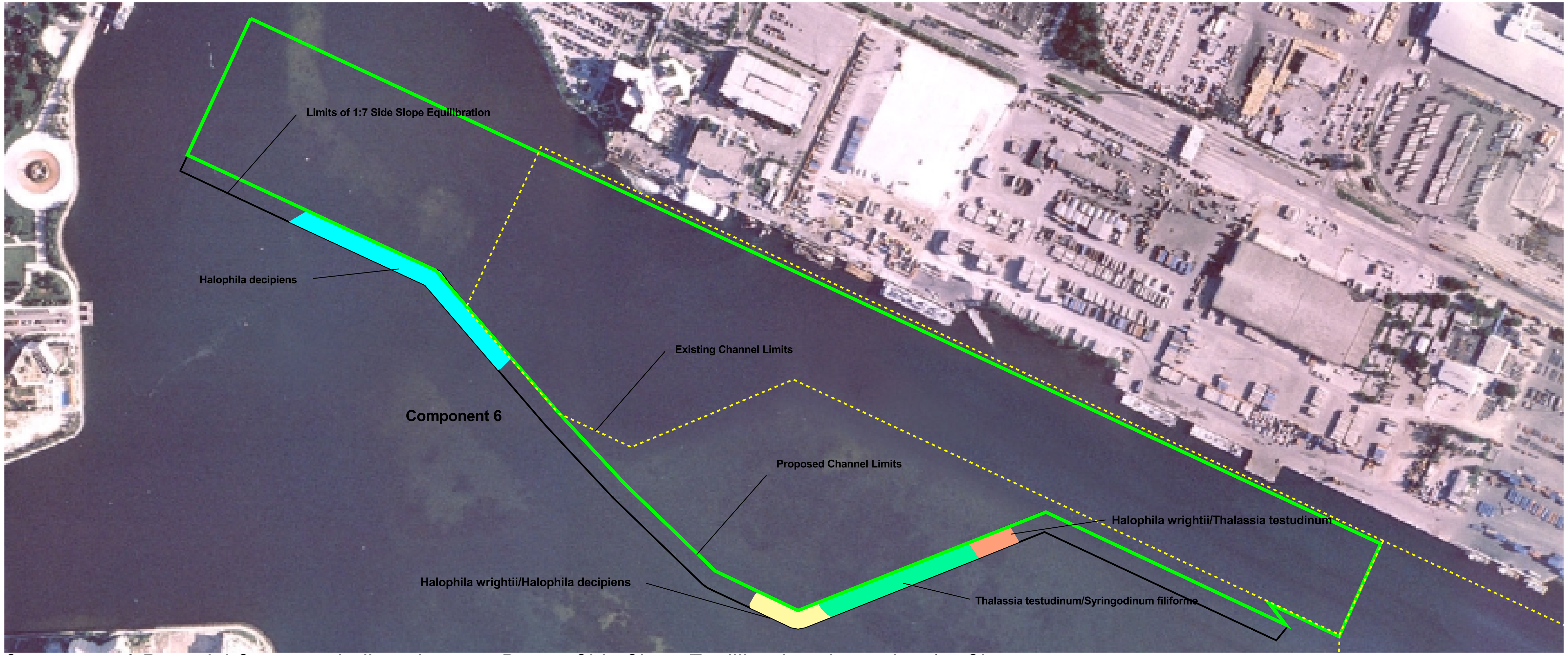
Low Relief (Previously Dredged) - Low/Moderate Density of Gorgonian Coverage w/ Scattered Patches of Sand
Scattered Rock/Rubble w/ Live Bottom Assemblage
Scattered Rock/Rubble w/ Algae-Sponge Communities
Sand - Unvegetated Bottom
No Impact - Deep Water
Component 2A - Impacts
Component 2A - Footprint
Rock/Rubble - Algae/Sponge
Component 3B - Impacts
Component 3B - Footprint
Rock/Rubble - Algae/Sponge
Sand/Silt/Rubble - Unvegetated Bottom
Component 4 - Impacts (No Dredging Proposed)
Component 4 - Footprint
Component 5A - Impacts
Component 5A - Footprint
Halophila decipiens (paddle grass)
Halophila wrightii (shoal grass) w/ Thalassia testudinum (turtle grass)
Thalassia testudinum (turtle grass) w/ Syringodinum filiforme (manatee grass)
Rock/Rubble - Algae/Sponge
Sand/Silt/Rubble - Unvegetated Bottom
2500 0 2500 5000 Feet
Alternative 2 - Direct Impacts
Miami Harbor
General Reevaluation Report
Preliminary Draft Environmental Impact Statement
Scale: 1" = 2,500'
Drawn By: MR
Date: July, 2002
DIAL CORDY AND ASSOCIATES INC
J00-499
Figure 12



Component 5A Potential Seagrass Indirect Impacts Due to Side Slope Equilibration, Assuming 1:7 Slope



Component 6 Potential Seagrass Indirect Impacts Due to Side Slope Equilibration, Assuming 1:7 Slope

LEGEND

- Existing Channel Limits
- Component 5A - Indirect Impacts
  - Component 5A - Footprint
  - Halophila decipiens (paddle grass)
  - Halophila wrightii (shoal grass) w/ Thalassia testudinum (turtle grass)
  - Thalassia testudinum (turtle grass) w/ Syringodinum filiforme (manatee grass)
- Component 6 - Indirect Impacts
  - Component 6 - Footprint
  - Halophila decipiens (paddle grass)
  - Halophila wrightii (shoal grass) w/ Halophila decipiens (paddle grass)
  - Halophila wrightii (shoal grass) w/ Thalassia testudinum (turtle grass)
  - Thalassia testudinum (turtle grass) w/ Syringodinum filiforme (manatee grass)

500 0 500 1000 Feet

Seagrass Indirect Impacts Due to Side Slope Equilibration	
Miami Harbor General Reevaluation Report Preliminary Draft Environmental Impact Statement	
Scale: 1" = 500'	Drawn By: MR
Date: July, 2002	
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J00-499
	Figure 13

4.1.3 Alternative 2 (Recommended Plan)

The effects of Alternative 2 would be similar to the effects of Alternative 1. The maximum ebb and flood velocity comparisons yield maximum differences between the existing conditions and Alternative 2 on the order of 0.5 ft/sec. These differences occur primarily in Government Cut, Fisherman's Channel, and Dodge Island Cut. The residual velocity difference comparisons show that a weak residual vortex appears in the Fisher Island Turning Basin. These vortices have velocities of less than 0.2 ft/sec. The time-history analysis indicates that the channel deepening tends to divert some tidal flow from the Main Channel to Fisherman's channel. Also, a tidal amplitude attenuation and a phase lag of approximately two hours are observed for the plan condition west of Dodge Island. There is no observable impact on the Atlantic Ocean shoreline tidal velocities in any of the simulations.

Subtle differences in salinity were also identified between existing conditions and Alternative 2. These changes are close to detection limits and confidence levels of present field data collection capability and associated model assessments. The salinity comparisons yielded maximum salinity differences on the order of 1.0 ppt. The maximum differences occur just west of Dodge Island Cut, with differences observable in Fisherman's Channel, the western end of the Main Channel, and to the northwest of the Port. The differences observed west of Dodge Island may be influenced by the attenuated tidal amplitude and tidal phase lag induced by the channel deepening. The influence of channel deepening on the salinity north of the Port appears to be most pronounced during neap tides (CHL 2001). The natural salinity variability existing in Biscayne Bay far exceeds the predicted changes associated with the deepened channels. Freshwater discharge, tidal, and wind condition variations have far greater influence on the Bay salinity conditions then the deepened channel condition. Based on these results, the USACE has determined that the modeled changes in the coastal environment are insignificant and no impacts would occur from Alternative 2.

4.2 Geology and Sediments

4.2.1 No-Action Alternative

The No-Action Alternative would not have any direct impact on geology and sediments since no construction activities would occur.

4.2.2 Alternative 1

Alternative 1 would impact geology and sediments in the locations where excavation would occur. The majority of materials within the project area include interbedded layers of sand and rock with a minority of the material including silts, clays, and peat/organics. Rock would be removed along some of the channel for widening, and rock may be encountered during channel deepening, as well. Sediments to be affected would be placed in the appropriate disposal site or mitigation area.

4.2.3 Alternative 2 (Recommended Plan)

Alternative 2 would impact geology and sediments in the locations where excavation would occur. The majority of materials within the project area include interbedded layers of sand and rock with a minority of the material including silts, clays, and peat/organics. Rock would be removed along some of the channel for widening, and rock may be encountered during channel deepening, as well. Sediments to be affected would be placed in the appropriate disposal site or mitigation area.

4.3 Water Quality

4.3.1 No-Action Alternative

The No-Action Alternative would not have any direct impact on water quality since no dredging or blasting would occur.

4.3.2 Alternative 1

Alternative 1 would impact water quality due to proposed construction activities. State Water Quality Certification would be obtained prior to construction and state water quality standards would be met during construction. Alternative 1 would result in temporary increases in turbidity where dredging is taking place and may cause increased turbidity at the point of discharge from the disposal sites. The State of Florida water quality regulations require that water quality standards not be violated during dredging operations. Various protective measures and monitoring programs would be conducted during construction to ensure compliance with state water quality standards. Should turbidity exceed state water quality standards during construction as determined by monitoring, the contractor would be required to cease operations until water quality standards are met.

Indirect impacts may result from implementation of Component 5A and Component 6. Based on sediment analysis, substrates along the southern margin of Fisherman’s Channel and the Dodge Island Cut include fine materials (USACE 2001). Therefore, dredging would likely resuspend fine sediments into the water column. The strong tidal currents may redistribute suspended sediments to other areas that support submerged vegetation both inside and outside the study area. Possibly affected areas would include seagrass habitats immediately adjacent to Fisherman’s Channel, as well as habitats inside the BSCWA, and possibly other areas of the Biscayne Bay Aquatic Preserve. Resuspended particulate matter may temporally decrease water clarity in the above areas. Deposition of sediments on beds may have adverse effects. These effects include, but are not limited to, the temporary displacement of, and/or alteration of, fish, invertebrate, and epiphyte communities.

4.3.3 Alternative 2 (Recommended Plan)

Alternative 2 would impact water quality due to proposed construction activities. State Water Quality Certification would be obtained prior to construction and state water quality standards would be met during construction. Alternative 2 would result in temporary increases in turbidity where dredging is taking place and may cause increased turbidity at the point of discharge from the disposal sites. The State of Florida water quality regulations require that water quality standards not be violated during dredging operations. Various protective measures and monitoring programs would be conducted during construction to ensure compliance with state water quality standards. Should turbidity exceed state water quality standards during construction as determined by monitoring, the contractor would be required to cease operations until conditions return to normal.

Indirect impacts may result from implementation of Component 5A. Based on sediment analysis, substrates along the southern margin of Fisherman's Channel and the Dodge Island Cut comprise a considerable amount of fine materials (USACE 2001). Therefore, dredging would likely resuspend fine sediments into the water column. The strong tidal currents may redistribute suspended sediments to other areas both inside and outside the study area that support submerged vegetation. Possibly affected areas would include seagrass habitats immediately adjacent to Fisherman's Channel, as well as habitats inside the BSCWA, and possibly other areas of the Biscayne Bay Aquatic Preserve. Resuspended particulate matter may temporally decrease water clarity in the above areas. Deposition of sediments on beds may have adverse effects. These effects include, but are not limited to, the temporary displacement of, and/or alteration of, fish, invertebrate, and epiphyte communities.

4.4 Seagrass Communities

4.4.1 No-Action Alternative

The No-Action Alternative would not have any direct impact on seagrass communities since no dredging or blasting would occur.

4.4.2 Alternative 1

For three of the project components (1C, 2A, and 4), direct and/or indirect impacts to seagrass beds are not anticipated (Table 11). No impacts would occur due to Component 2A (widening the channel at the intersection of Government Cut and Fisherman's Channel). Resources within 2,000 feet of the proposed dredge site for that component include an isolated *H. decipiens* bed (over 500 feet away), and a large mixed-species (*H. decipiens* and *H. wrightii*) bed (over 750 feet away). Since material to be dredged as a part of Component 2A principally comprises limestone, sandstone, and clean quartz sand (USACE 2001) transport and deposition of fine sand/ silt onto the nearby seagrass beds is not expected. Component 1C falls outside Biscayne Bay and inner channels and is not likely to result in any adverse direct or indirect impacts to seagrass. Component 4 does not involve any dredging activity, and would therefore not affect seagrass beds mapped during the 2000 survey (DC&A 2001).

Table 11 Dredging Impacts on Seagrass Habitat for Alternative 1

	Impact (ac)						
Habitat Type and Current Dredge Status	**Component**						
	1C	**2A**	**3B**	**4**	**5A**	**6**	**Total**
Seagrass- new direct impacts (side slope equilibration) to areas not previously dredged that exist outside proposed channel boundaries	0.0	0.0	**0.1**	0.0	**7.6**	**3.5**	**11.2**
Seagrass- new direct impacts, not previously dredged, inside proposed channel boundaries	0.0	0.0	0.0	0.0	**0.2**	**22.4**	**22.6**

Deepening/widening of the Fisher Island Turning Basin (Component 3B) would not result in the initial removal of seagrass communities but may include some secondary subsidence effects on adjacent seagrass habitats, particularly those immediately to the northeast (a large mixed-species bed of *H. decipiens* and *H. wrightii*) and southeast (an isolated *H. decipiens* bed associated with the littoral zone of Fisher Island) of the proposed dredging activity. No direct impacts are expected to occur as a result of Component 3B. Approximately 0.1 acre of indirect impact is expected due to side slope equilibration. Side slope impacts were estimated using the methodology described in Appendix G.

Direct impacts as a result of Components 5A and 6 would include the removal of seagrass habitat along Fisherman's Channel, Dodge Island Cut, Dodge Island Turning Basin, and Lummus Island Turning Basin during dredging activities. Dredging associated with deepening and widening would impact a total of 22.6 acres of seagrass habitat by removal of substrate, and an estimated additional loss of 11.2 acres due to side slope equilibration of adjacent substrate. Side slope impacts were estimated using the methodology described in Appendix G. Direct impacts would include the loss of 7.8 acres of *H. decipiens,* 4.7 acres of mixed *H. wrightii* and *H. decipiens*, 6.0 acres of mixed *H. wrightii* and *T. testudinum*, and 4.1 acres of mixed bed consisting of *T. testudinum* and *S. filiforme*. Indirect impact would include the loss of 2.1 acres of *H. decipiens*, 1.8 acres of mixed *H. decipiens* and *T. testudinum*, 6.3 acres of mixed *T. testudinum* and *S. filiforme*, and 0.5 acre of mixed *H. wrightii* and *H. decipiens*. The density and cover abundance values, generally an indication of habitat quality, for seagrass species ranged from low to moderate with *S. filiforme* having the highest mean abundance and density scores, and *T. testudinum* and *H. decipiens* having the lowest (Appendix E). Figure 13 shows the probable southern limit of subsidence for Component 5A.

Direct and indirect (side slope equilibration) impacts associated with the removal of these seagrass beds would include the loss of habitat and functional values attributable to submerged aquatic vegetation. The reduction of seagrass beds in the areas inside the proposed new channel and in areas immediately adjacent to dredging activities may result in the direct loss of forage habitat for manatees. This impact would be significant for Component 6, which includes several acres of seagrass removal from an area of frequent manatee occurrence (see Figure 7). Component 5A would have less impact because of the relative quality of the habitat and because of its location directly along the channel edge. Manatee sightings are much less frequent in this area. Because of direct loss of habitat of seagrass beds, impacts to resident and transient fish, and invertebrates may also result.

Since light penetration is a major factor limiting productivity of subtropical seagrasses (Fonseca et al. 1998), turbidity and sedimentation are expected to have indirect impacts where they occur over seagrasses. The seagrasses in Miami Harbor, especially adjacent to the Port, already experience a certain level of chronic turbidity and sedimentation due to erosion, daily outflow from the Miami River, and daily ship and tug activity. These sources are in addition to natural turbidity sources of runoff, and wind or tide-driven shifting of shallow sediments. Although the proposed dredging activity would need to comply with state water quality standards for turbidity, the additional turbidity and sedimentation would add to background sources already present at the Port. This is expected to place additional stress on adjacent seagrasses over the short-term.

Based upon field observations and assessment of historic aerial photography and past major dredging events, however, dredging is not expected to result in long-term negative impacts to seagrass beds outside the limits of the direct and indirect impacts discussed above. In addition, no seagrass habitat within the BSCWA south of Fisherman's Channel would be adversely affected.

4.4.3 Alternative 2 (Recommended Plan)

Alternative 2 includes all of the same components and impacts as listed in Alternative 1 except for Component No. 6 (Table 12). Exclusion of Component 6 significantly minimizes the direct impacts that would occur to areas along Fisherman's Channel, especially those containing seagrass beds (Figures 12 and 13). Dredging associated with deepening and widening would directly impact a total of 0.2 acre of seagrass habitat by removal of substrate, and an estimated additional loss of 7.6 acres due to side slope equilibration of adjacent substrate. Side slope impacts were estimated using the methodology described in Appendix G. Direct impacts (0.20 acre) would include the loss of 0.01 acre of sparse *H. decipiens*, 0.14 acre of sparse mixed *H. wrightii* and *T. testudinum*, and 0.05 acre of sparse mixed *S. filiforme* and *T. testudinum*. Additional losses would include 0.5 acre of *H. decipiens*, 5.3 acres of mixed *T. testudinum* and *S. filifome*, and 1.8 acres of mixed *H. wrightii* and *T. testudinum*. Additional impacts other than the aforementioned side slope equilibration and sedimentation described for Alternative 1, are not anticipated. The density and cover abundance values for seagrass species, generally an indication of habitat quality, ranged from low to moderate, with *S. filiforme* having the highest mean abundance and density scores, and *T. testudinum* and *H. decipiens* having the lowest (Appendix E).

Based upon field observations and assessment of historic aerial photography and past major dredging events, however, dredging is not expected to result in long-term negative impacts to seagrass beds outside the limits of the direct and indirect impacts discussed above. In addition, no seagrass habitat within the BSCWA south of Fisherman's Channel would be adversely affected.

Table 12 Dredging Impact on Seagrass Habitat for Alternative 2

	Impacts (ac)					
Habitat Type and Current Dredge Status	**Component**					
	1C	**2A**	**3B**	**4**	**5A**	**Total**
Seagrass- new direct impacts (side slope equilibration) to areas not previously dredged that exist outside proposed channel boundaries	0.0	0.0	**0.1**	0.0	**7.6**	**7.7**
Seagrass- new direct impacts, not previously dredged, inside proposed channel boundaries	0.0	0.0	0.0	0.0	**0.2**	**0.2**

4.5 Hardbottom and Reef Communities

4.5.1 No-Action Alternative

The No-Action Alternative would not result in any adverse direct impact on hardbottom and reef communities since no dredging or blasting would occur.

4.5.2 Alternative 1

Direct impacts to hardbottom and reef communities would occur as a result of the dredging process to deepen and widen channels within the Port (Figure 12). Areas that have been dredged previously would be affected. In total there would be 49.4 acres of impact to hardbottom and reef habitat within the existing channel, including 28.7 acres of low relief hardbottom/reef and 20.7 acres of high relief habitat (Table 13). Of the 49.4 acres of combined hardbottom/reef impacts, 46.1 acres are areas that have been previously dredged and recolonized.

Table 13 Dredging Impacts on Hardbottom and Reef Communities for Alternative 1

Habitat Type and Current Dredge Status	Impacts (ac)						
	Component						
	1C	2A	3B	4	5A	6	Total
Low relief hardbottom/reef- new impacts, not previously dredged	**0.6**	0.0	0.0	0.0	0.0	0.0	**0.6**
Low relief hardbottom/reef, previously dredged and recolonized	**28.1**	0.0	0.0	0.0	0.0	0.0	**28.1**
High relief hardbottom/reef- new impacts, not previously dredged	**2.7**	0.0	0.0	0.0	0.0	0.0	**2.7**
High relief hardbottom/reef, previously dredged and recolonized (ac)	**18.0**	0.0	0.0	0.0	0.0	0.0	**18.0**

New impacts would include only 0.6 acre of low relief hardbottom/reef and 2.7 acres of high relief hardbottom/reef. These habitats are located outside the present channel and have not been previously dredged. High relief hardbottom/reef is characterized by a vertical relief >3 feet and supports a diverse assemblage of soft corals and sponges. The low relief hardbottom/reef is <3 feet in profile and has minimal structure and a less diverse coral/sponge community than the high relief areas.

In addition, the proposed project would impact established hardground habitat on the limestone walls of the existing channel. Inshore channel walls may also function as hardgrounds, in particular the inshore wall habitat of Fisherman's Channel, which would be impacted with the proposed widening. All previously dredged areas including hardgrounds on channel walls are expected to recolonize rapidly with similar species assemblages after dredging.

Indirect impacts to dredging hardbottom/reef habitat may include temporary changes in adjacent habitats. In particular, hardbottom/reef habitats just outside the Entrance Channel and seaward to the Outer Entrance Channel may be affected. Potential indirect impacts may include the resuspension and deposition of sediments on nearby coral reef assemblages, although hard coral cover is typically <10 percent. This resuspension of sediments may also result in temporary periods of increased turbidity within the area. As previously stated, however, the majority of materials within the project area include interbedded layers of sand and rock that are not expected to generate significant turbidity on removal.

Other indirect effects include the displacement of fishes and invertebrates during dredge operations. Blasting impacts on finfish are addressed in Section 4.8. These effects would be short-term and not significantly adverse.

4.5.3 Alternative 2 (Recommended Plan)

Alternative 2 would have the same impacts to hardbottom/reef communities as Alternative 1 (Figure 12, Table 14), since all the affected resources are associated with Component 1C.

Table 14 Dredging Impacts on Hardbottom and Reef Communities for Alternative 2

Habitat Type and Current Dredge Status	Impacts (ac)					
	Component					
	1C	2A	3B	4	5A	Total
Low relief hardbottom/reef- new impacts, not previously dredged	**0.6**	0.0	0.0	0.0	0.0	**0.6**
Low relief hardbottom/reef, previously dredged and recolonized	**28.1**	0.0	0.0	0.0	0.0	**28.1**
High relief hardbottom/reef- new impacts, not previously dredged	**2.7**	0.0	0.0	0.0	0.0	**2.7**
High relief hardbottom/reef, previously dredged and recolonized	**18.0**	0.0	0.0	0.0	0.0	**18.0**

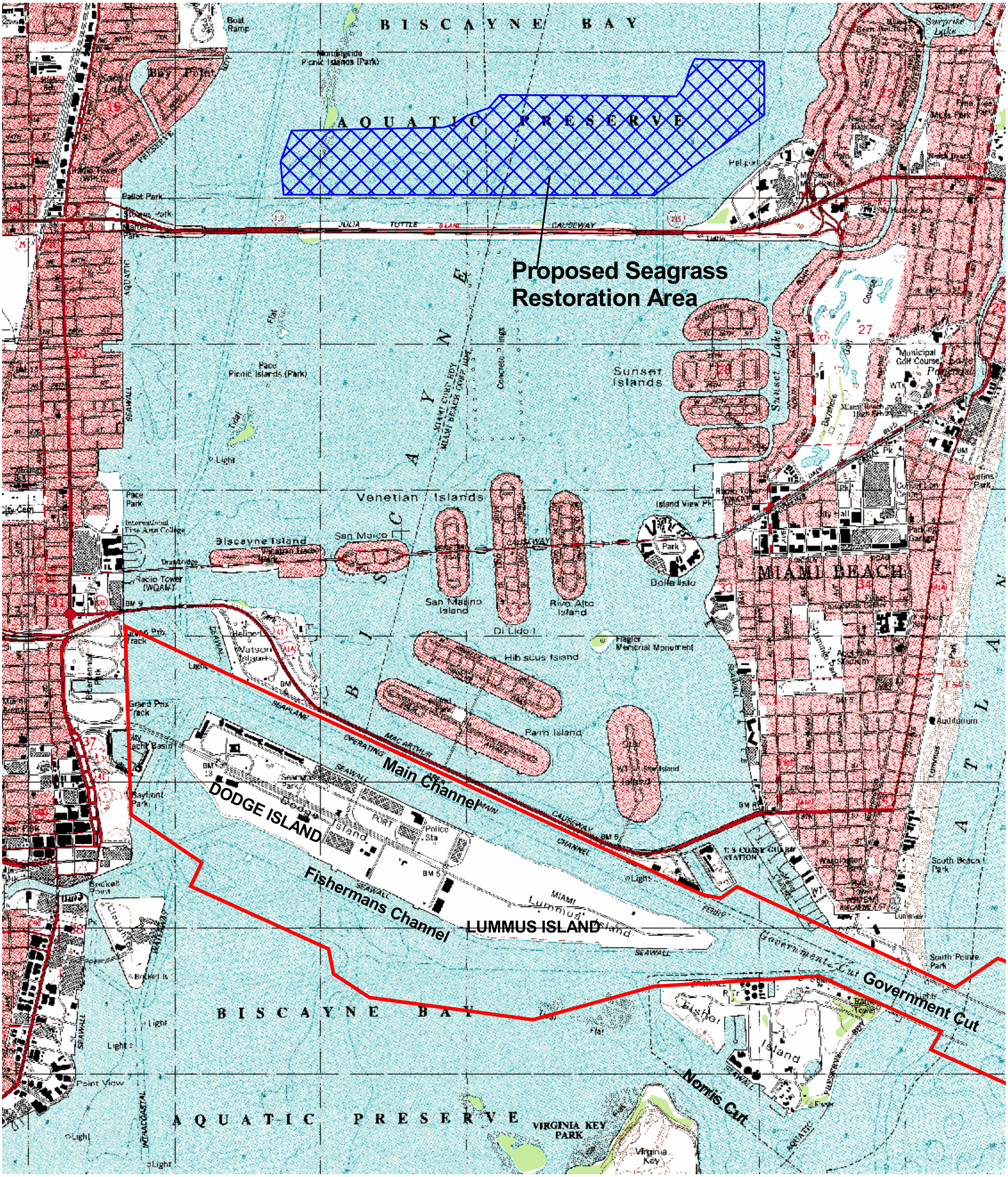
4.5.4 Cutterhead Dredge Impacts

If cutterhead dredging is used the construction method to deepen the Entrance Channel, additional direct impacts to both low relief and high relief hardbottom reefs would occur due to anchoring and cable systems for the cutterhead vessel. Figure 14 provides a worst-case scenario of potential hardbottom impacts with this construction method. The potential exists for up to 26.9 acres of low relief and 10.0 high relief hardbottom reefs to be impacted based on the maximum number of anchor positions and footprint of cable movement. However, as previously described in Section 2.7.1, implementation of an anchoring and vessel operation plan to effectively minimize anchor and cable impacts to hardbottom habitat would occur through the RFP process and would include incentives to encourage potential contractors to avoid reef impacts. The evaluation criteria in the RFP would consider the technical aspects of the contractor's proposal as the most significant factor. As a result, the vessel operational and anchoring plan that best avoids or reduces impacts to reefs would receive the highest evaluation and the incentives that follow. Measures such as the use of surge buoys to lift anchor cables and restricting anchor placement to minimize impacts would be important factors in determining the construction methodology. Since the construction method has not yet been determined, and since the actual impacts using this method are unknown, the USACE would conduct pre-construction and post-construction surveys to determine actual impacts and coordinate with the resource agencies on appropriate mitigation.

4.6 Unvegetated Bottom

4.6.1 No-Action Alternative

The No-Action Alternative would have no impact on unvegetated communities since no dredging or blasting would occur.



LEGEND

- Approximate Extent of Study Area
- Proposed Seagrass Restoration Area

3000 0 3000 6000 Feet

Proposed Seagrass Restoration Area	
Miami Harbor General Reevaluation Report Preliminary Draft Environmental Impact Statement	
Scale: 1" = 3,000'	Drawn By: MR
Date: July, 2002	
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J00-499
	Figure 14

4.6.2 Alternative 1

Unvegetated silt/sand/rubble and sand bottom habitats comprise a significant proportion of the total area proposed for dredging (Figure 11). In areas where these habitats comprise minor associates of other major habitat categories (such as seagrass beds, rock/rubble, or reef), substrata
were not categorized as unvegetated habitat during recent surveys (see DC&A 2001, Appendix E) unless the condition was clearly dominant. Wide expanses of this type of community in its natural state are found only in the area comprising Component 1C, but smaller tracts are also present adjacent to seagrass habitats along the south side of Fisherman's Channel and between the Lummus and Dodge Island Turning Basins. Direct impacts to unvegetated communities (due to dredging operations) in all three of these areas would mainly include impacts to benthic epifauna and infauna with the magnitude of impacts differing according to location. In total, there would be 68.2 acres of unvegetated habitat impacted during dredging under Component 1C, and the vast majority of this acreage comprises previously dredged substrate (66.9 acres). Benthic infaunal populations in these areas are expected to recolonize. The degree to which the substrate remains viable for benthos may depend on light attenuation relative to the additional eight feet of depth. Increased depth may not promote the growth of some macroalgae and epipsammic algae.

In comparison, impacts to unvegetated habitats within Component 3B would entail direct removal of 24.4 acres of unvegetated habitat, 19.1 acres of which has been dredged previously (Figure 11, Table 15).

Table 15 Dredging Impacts on Unvegetated Habitat for Alternative 1

Habitat Type and Current Dredge Status	Impacts (ac)						
	Component						
	1C	2A	3B	4	5A	6	Total
Unvegetated (i.e., silt/sand/rubble and sand bottom habitats without seagrasses)- new impacts, not previously dredged	**1.3**	0.0	**5.3**	0.0	**16.7**	**16.7**	**40.0**
Unvegetated (i.e., silt/sand/rubble and sand bottom habitats without seagrasses), previously dredged	**66.9**	0.0	**19.1**	0.0	**127.1**	**39.3**	**252.4**

The largest impact acreages in Alternative 1 to unvegetated sand/silt/rubble communities occur with Components 5A and 6, mainly within the previously dredged channel. Approximately 143.8 acres of the area proposed for dredging under Component 5A includes unvegetated bottom. Of this, 127.1 acres is from previous dredging activities, while an additional impact of 16.7 acres of unvegetated silt/sand/rubble habitat that has not been dredged previously is also required to complete this part of the project. Component 6 would comprise 56.0 additional acres of unvegetated sand/silt/rubble impacts, of which 39.3 acres is from previous dredging activities.

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

4.6.3 Alternative 2 (Recommended Plan)

Impacts would be similar to the impacts described in Alternative 1. However, overall impacts to unvegetated communities would be decreased to 213.1 acres that had previously been dredged and 23.1 acres of new impacts (not previously dredged) (Figure 12, Table 16).

Table 16 Dredging Impacts on Unvegetated Habitat for Alternative 2

Habitat Type and Current Dredge Status	Impacts (ac)					
	Component					
	1C	2A	3B	4	5A	Total
Unvegetated (i.e., silt/sand/rubble and sand bottom habitats without seagrasses), new impacts, not previously dredged	**1.3**	0.0	**5.3**	0.0	**16.7**	**23.3**
Unvegetated (i.e., silt/sand/rubble and sand bottom habitats without seagrasses), previously dredged	**66.9**	0.0	**19.1**	0.0	**127.1**	**213.1**

4.7 Rock/Rubble Communities

4.7.1 No-Action Alternative

The No-Action Alternative would not result any adverse direct impacts to rock/rubble communities since no dredging or blasting would occur.

4.7.2 Alternative 1

The majority of benthic habitat proposed for dredging is categorized as rock/rubble (see Section 3.7). These rock/rubble habitats are characterized by two types; scattered rock/rubble with live bottom (i.e. coral), and scattered rock/rubble with algae/sponges (Figures 6 and 11). In most areas, scattered rubble remains from previous dredging activities. Therefore, all project elements would directly impact rock/rubble habitats. The majority of these habitats proposed for dredging have already been dredged at some time in the past and have successfully recovered from past disturbances.

To implement Alternative 1, approximately 123.5 acres of combined rock/rubble habitat would be impacted (Table 17). Of those habitats, 120.5 acres lie within previously dredged areas, and only 3.0 acres lie outside previously dredged areas. Rock/rubble live bottom habitats composed 51.7 acres of the area to be impacted. All of the rock/rubble live bottom acreage impacted by Alternative 1 has been impacted previously by earlier dredging activity within the Port. An additional 68.8 acres of rock/rubble with algae/sponge habitat has been previously dredged and would again be impacted by Alternative 1. Three acres of new rock/rubble with sponge/algae habitat impacts would occur with the implementation of Alternative 1.

Table 17 Dredging Impacts on Rock/Rubble Communities for Alternative 1

	Impacts (ac)						
Habitat Type and Current Dredge Status	**Component**						
	1C	**2A**	**3B**	**4**	**5A**	**6**	**Total**
Rock/rubble with live bottom- new impacts, not previously dredged	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Rock/rubble with live bottom, previously dredged and recolonized	**51.7**	0.0	0.0	0.0	0.0	0.0	**51.7**
Rock/rubble with algae/sponges- new impacts, not previously dredged	0.0	**0.6**	**0.9**	0.0	**1.5**	0.0	**3.0**
Rock/rubble with algae/sponges, previously dredged and recolonized	**41.3**	0.0	**25.2**	0.0	**2.3**	0.0	**68.8**

Direct impacts to rock/rubble communities would result from the removal of benthic organisms and dredged material that contains benthic infauna. In some of the more diverse habitats, live bottom with interspersed hermatypic corals and gorgonians may be destroyed (see Section 3.7). However, in deeper areas within the Port, or where fine silt and silty sand are dominant, these habitats may be of very low quality for infauna or benthos, and play a minimal role in terms of primary and secondary productivity in the project area.

Impacts to populations of epibenthic fauna and benthic infauna would be temporary, as long as the areas remained viable aquatic habitat for re-colonization following dredging. Field research indicates that within several weeks, colonization by opportunistic species will take place. Their numbers would increase for several months, before the historic fauna once again becomes established. This is anticipated within two years. Algae, sponge, and soft coral colonies may take several years to become established, assuming conditions remain conducive to the recruitment of such taxa.

4.7.3 Alternative 2 (Recommended Plan)

Rock/rubble impacts associated with Alternative 2 would be identical to those of Alternative 1 (Figure 12, Table 18).

Table 18 Dredging Impacts on Rock/Rubble Communities for Alternative 2

Habitat Type and Current Dredge Status	Impacts (ac)					
	Component					
	1C	2A	3B	4	5A	Total
Rock/rubble with live bottom- new impacts, not previously dredged	0.00	0.0	0.0	0.0	0.0	0.0
Rock/rubble with live bottom, previously dredged and recolonized	**51.7**	0.0	0.0	0.0	0.0	**51.7**
Rock/rubble with algae/sponges- new impacts, not previously dredged	0.0	**0.6**	**0.9**	0.0	**1.5**	**3.0**
Rock/rubble w/ algae/sponges, previously dredged and recolonized	**41.3**	0.0	**25.2**	0.0	**2.3**	**68.8**

4.8 Essential Fish Habitat

4.8.1 No-Action Alternative

The No-Action Alternative would not have any direct impact on EFH since no dredging or blasting would occur.

4.8.2 Alternative 1

EFH present in the project area include seagrass beds, hardbottoms, reefs, and algae (including beds of the red alga *Laurencia* sp.), and the water column (Table 19). With the exception of the water column habitat, anticipated loss of these habitats due to project implementation is quantified in Sections 4.3 through 4.6. The EFH Assessment can be found in Appendix F. Significant decreases in EFH, particularly high-quality habitat and those designated as HAPC, could affect populations of managed fish and invertebrate species. Section 3.8 addresses the various habitat affiliations of managed fish and invertebrate species in southeast Florida and further details are provided in Appendix F.

Table 19 Incidental Impacts to Essential Fish Habitats

Component	Essential Fish Habitats Impacted
1C	Water Column, Hardbottom, Reefs, Algae
2A	Water Column, Algae
3B	Water Column, Seagrass Beds
4	None
5A	Water Column, Seagrass Beds
6	Water Column, Seagrass Beds

The most obvious direct impact of Alternative 1 on managed species in all habitats would be the potential for mortality and/or injury of individuals through the dredging and/or blasting processes. Species in any and all of the project area's habitats are susceptible. Fishes and invertebrates are at risk at any life-history stage.

Blasting would also have a direct impact on managed fish species residing in/migrating through the harbor and associated waterways. Previous studies (USACE 1996b; O' Keefe and Young 1984; Keevin and Hempen 1997; Young 1991) have addressed the impacts of blasting on fishes. Fishes with air bladders are particularly more susceptible to the effects of blasting than aquatic taxa without air bladders [e.g. shrimp, crabs, etc. (Keevin and Hempen 1997)]. Small fishes are the most likely to be impacted.

Dredging and blasting may also have more subtle effects observable only at the population level rather than at the individual level. For example, dredging/blasting activities, particularly in linear corridors (such as Government Cut and Fisherman's Channel) may temporarily alter migration patterns of species that require utilization of both inshore and offshore habitats through ontogeny. This is a particular concern for species that travel along shorelines and bulkheads. Therefore the dredging of berths and littoral zone habitats is anticipated to have greater effects. These impacts may result in displacement of individuals or disjuncture in the life cycles of managed species.

Impacts to the water column may have localized effects on marine and estuarine species. The water column is a habitat used for foraging, spawning, and migration by both managed species and organisms consumed by managed species. Water quality concerns are of particular importance in the maintenance of this important habitat. During dredging in substrates comprising coarser materials and rock, water quality impacts would be expected to be minimal. However, where silt and/or silty sand are to be dredged, short-term water quality impacts are expected to occur primarily due to temporarily increased levels of turbidity. Resuspended materials may interfere with the diversity and concentration of phytoplankton and zooplankton, and therefore could affect foraging success and patterns of schooling fishes and other grazers that comprise prey for managed species. Foraging patterns would be expected to return to normal upon cessation of dredging activities.

Impacts to EFH result in the loss of substrates used by managed species for spawning, nursery, foraging, and migratory/temporary habitats. The most critical losses of EFH would be those areas additionally designated as HAPC such as seagrass beds, algal beds, hardbottom, and reefs. Coastal inlets are HAPC for shrimps, red drum, and grouper. These species prefer estuarine inshore habitats such as seagrass beds for portions off their life history requirements. Medium and high profile reefs are also considered HAPC for grouper, and the hardbottom existing in 5 to 30 meters of depth off of Miami-Dade County is listed as HAPC for corals and coral reefs (SAFMC 1998b).

Significant impacts to EFH-HAPC within the areas proposed for dredging under Alternative 1 would include removal of seagrass and hardbottom/reef habitats. Seagrass beds are an important part of the Biscayne Bay ecosystem due to their proximity to reef and hardbottom habitats. Their function is closely coupled with reefs to provide life-stage-specific habitat for certain managed species. Seagrass habitat directly adjacent to the existing Port's channels are subjected to daily man-made and natural disturbances that make it a less optimal habitat for managed species relative to the surrounding area. Nevertheless, loss of these two habitats (hardbottom/reef and seagrasses) will result in a loss of habitat likely used by species of the Snapper-Grouper Complex; such as blue stripe grunts, French grunts, mahogany snapper, yellowtail snapper, and red grouper. Managed crustaceans including pink shrimp and spiny lobster found in nearby mangrove habitats at Virginia Key also likely use grassbeds for foraging during some life stages.

4.8.3 Alternative 2 (Recommended Plan)

Alternative 2 would have similar impacts to EFH as Alternative 1. However, the acreage of direct and indirect impacts would be reduced within the water column and seagrass beds (7.9 acres) with the exclusion of Component 6. The minimization of seagrass impacts under this alternative is especially significant given the fact that impacts are limited only to the perimeter of Fisherman’s Channel and the Fisher Island Turning Basin and don’t alter higher quality seagrass beds located away from the existing channel edge.

4.9 Protected Species

4.9.1 Marine Vegetation

4.9.1.1 Johnson’s Seagrass

4.9.1.1.1 No-Action Alternative

The No-Action Alternative would not affect Johnson's seagrass.

4.9.1.1.2 Alternative 1

Alternative 1 would have no effect on Johnson's seagrass. This species is not found in the project footprint.

4.9.1.1.3 Alternative 2 (Recommended Plan)

Alternative 2 would have no effect on Johnson's seagrass. This species is not found in the project footprint. The NMFS issued a Biological Opinion (Appendix H) concluding that the proposed action is "not likely to jeopardize the existence of Johnson's seagrass nor destroy or adversely modify critical habitat".

4.9.2 Marine Mammals

4.9.2.1 West Indian Manatee

4.9.2.1.1 No-Action Alternative

The No-Action Alternative would have no effect on the West Indian manatee.

4.9.2.1.2 Alternative 1

Alternative 1 could impact the West Indian manatee. Given the large numbers of manatees in the area, any loss of seagrass represents a loss of foraging habitat for manatees. A substantial amount of seagrass (33.8 acres) would be lost with the implementation of Alternative 1. Dredging and construction activities in the area may also temporarily alter behavior and migration routes of manatees. Care should be taken in winter months to assure that migration routes of manatees remain open and that dredging activities do not disturb the animals using this area. Any disturbance of manatees would be considered harassment of a marine mammal under the MMPA of 1972.

The highest potential for direct impacts to threatened and endangered marine mammal species may result from the use of explosives to break/dislodge rock substrates in the Government Cut and Fisherman's Channel. Both the pressure and noise associated with blasting can injure marine mammals.

4.9.2.1.3 Alternative 2 (Recommended Plan)

Alternative 2 could impact the West Indian manatee. Given the large numbers of manatees in the area, any loss of seagrass represents a loss of foraging habitat for manatees. Some seagrass (7.9 acres) would be lost with the implementation of Alternative 2. Dredging and construction activities in the area may also temporarily alter behavior and migration routes of manatees. Care should be taken in winter months to assure that migration routes of manatees remain open and that dredging activities do not disturb the animals using this area.

The highest potential for direct impacts to threatened and endangered marine mammal species may result from the use of explosives to break/dislodge rock substrates in the Government Cut and Fisherman's Channel. Both the pressure and noise associated with blasting can injure marine mammals.

A Biological Assessment (BA) was prepared and submitted to FWS, and an ESA Section 7 consultation was initiated (Appendix H). It is the USACE's determination that impacts associated with Alternative 2 would not adversely affect the West Indian manatee. The USACE has coordinated with FWS and NMFS to determine an appropriate safety zone for the West Indian manatee during any blasting operations through the ESA and has received "no effect" Biological Opinions from both agencies (Appendix H; Appendix K).

4.9.2.2 North Atlantic Right Whale

4.9.2.2.1 No-Action Alternative

The No-Action Alternative would have no effect on the North Atlantic right whale.

4.9.2.2.2 Alternative 1

Alternative 1 would have no effect on the North Atlantic right whale. Due to the scarcity of the right whale in the project area and unlikelihood of encountering a northern right whale, it is anticipated that project construction will not have any effect on the whale.

4.9.2.2.3 Alternative 2 (Recommended Plan)

Alternative 2 would have no effect on the North Atlantic right whale. Due to the scarcity of the right whale in the project area and unlikelihood of encountering a northern right whale, it is anticipated that project construction will not have any effect on the whale.

4.9.2.3 Bottlenose Dolphin

4.9.2.3.1 No Action Alternative

The No-Action Alternative would have no effect on the Bottlenose dolphin.

4.9.2.2.2 Alternative 1

Alternative 1 may have an effect on bottlenose dolphins in the area of any blasts fired to break rock during construction of the project. It is likely that any effect on dolphins outside of the proposed safety radius will be in the form of a Temporary Threshold Shift (TTS). Due to the use of a safety zone, the USACE does not believe that any dolphin will be killed or injured. However, because the proposed action may harass bottlenose dolphins by causing a TTS, the USACE has submitted a request for an "incidental take" authorization from the NMFS. Section 101 (a)(5) of the MMPA allows the incidental (but not intentional) taking of marine mammals upon request if the taking will (1) have a negligible impact on the species or stock(s); and (2) not have an immitigable adverse impact on the availability of the species or stock(s) for subsistence uses.

4.9.2.3.3 Alternative 2

Alternative 2 may have an effect on bottlenose dolphins in the area of any blasts fired to break rock during construction of the project. It is likely that any effect on dolphins outside of the proposed safety radius will be in the form of a TTS. Due to the use of a safety zone, the USACE does not believe that any dolphin will be killed or injured. However, because the proposed action may harass bottlenose dolphins by causing a TTS, the USACE has submitted a request for an "incidental take" authorization from the NMFS. Section 101 (a)(5) of the MMPA allows the incidental (but not intentional) taking of marine mammals upon request if the taking will (1) have a negligible impact on the species or stock(s); and (2) not have an immitigable adverse impact on the availability of the species or stock(s) for subsistence uses.

4.9.2.4 Sperm Whale

4.9.2.4.1 No Action Alternative

The No-Action Alternative would have no effect on the sperm whale.

4.9.2.4.2 Alternative 1

Alternative 1 may have an effect on endangered sperm whales in the vicinity of the outer reef in the entrance channel when blasts are fired to break rock during construction of the channel extension portion of the project. It is likely that any effect on sperm whales outside of the proposed safety radius will be in the form of a TTS. Due to the use of a safety zone, the USACE does not believe that any whale will be killed or injured. However, because the proposed action may harass sperm whales by causing a TTS, the USACE has submitted a request for an "incidental take" authorization from the NMFS. Section 101 (a)(5) of the MMPA allows the incidental (but not intentional) taking of marine mammals upon request if the taking will (1) have a negligible impact on the species or stock(s); and (2) not have an immitigable adverse impact on the availability of the species or stock(s) for subsistence uses.

The sperm whale is listed as an endangered species under the ESA and may be affected by the proposed action; the USACE initiated formal consultation with the NMFS under Section 7 of the Endangered Species Act. A Biological Assessment was submitted to the NMFS. Based on this information, NMFS issued a "no effect" Biological Opinion for the proposed project (Appendix H).

4.9.2.4.3 Alternative 2

Alternative 2 may have an effect on endangered sperm whales in the vicinity of the outer reef in the entrance channel when blasts are fired to break rock during construction of the channel extension portion of the project. It is likely that any effect on sperm whales outside of the proposed safety radius will be in the form of a TTS. Due to the use of a safety zone, the USACE does not believe that any whale will be killed or injured. However, because the proposed action may harass sperm whales by causing a TTS, the USACE has submitted a request for an "incidental take" authorization from the NMFS. Section 101 (a)(5) of the MMPA allows the incidental (but not intentional) taking of marine mammals upon request if the taking will (1) have a negligible impact on the species or stock(s); and (2) not have an immitigable adverse impact on the availability of the species or stock(s) for subsistence uses.

The sperm whale is listed as an endangered species under the ESA and may be affected by the proposed action; the USACE initiated formal consultation with the NMFS under Section 7 of the Endangered Species Act. A Biological Assessment was submitted to the NMFS. Based on this information, NMFS issued a "no effect" Biological Opinion for the proposed project (Appendix H).

4.9.2.5 Humpback Whale

4.9.2.5.1 No Action Alternative

The No-Action Alternative would have no effect on humpback whale.

4.9.2.5.2 Alternative 1

Alternative 1 may have an effect on endangered humpback whales in the vicinity of the outer reef in the entrance channel when blasts are fired to break rock during construction of the channel extension portion of the project. It is likely that any effect on humpback whales outside of the proposed safety radius will be in the form of a TTS. Due to the use of a safety zone, the USACE does not believe that any whale will be killed or injured. However, because the proposed action may harass humpback whales by causing a TTS, the USACE has submitted a request for an "incidental take" authorization from the NMFS. Section 101 (a)(5) of the MMPA allows the incidental (but not intentional) taking of marine mammals upon request if the taking will (1) have a negligible impact on the species or stock(s); and (2) not have an immitigable adverse impact on the availability of the species or stock(s) for subsistence uses.

The humpback whale is listed as an endangered species under the ESA and may be affected by the proposed action; the USACE initiated formal consultation with the NMFS under Section 7 of the Endangered Species Act. A Biological Assessment was submitted to the NMFS. Based on this information, NMFS issued a "no effect" Biological Opinion for the proposed project (Appendix H).

4.9.2.5.3 Alternative 2

Alternative 2 may have an effect on endangered humpback whales in the vicinity of the outer reef in the entrance channel when blasts are fired to break rock during construction of the channel extension portion of the project. It is likely that any effect on sperm whales outside of the proposed safety radius will be in the form of a TTS. Due to the use of a safety zone, the USACE does not believe that any whale will be killed or injured. However, because the proposed action may harass humpback whales by causing a TTS, the USACE has submitted a request for an "incidental take" authorization from the NMFS. Section 101 (a)(5) of the MMPA allows the incidental (but not intentional) taking of marine mammals upon request if the taking will (1) have a negligible impact on the species or stock(s); and (2) not have an immitigable adverse impact on the availability of the species or stock(s) for subsistence uses.

The humpback whale is listed as an endangered species under the ESA and may be affected by the proposed action; the USACE initiated formal consultation with the NMFS under Section 7 of the Endangered Species Act. A Biological Assessment was submitted to the NMFS. Based on this information, NMFS issued a "no effect" Biological Opinion for the proposed project (Appendix H).

4.9.2.6 Fin Whale

4.9.2.6.1 No Action Alternative

The No-Action Alternative would have no effect on the fin whale.

4.9.2.6.2 Alternative 1

Alternative 1 would have no effect on the fin whale. Due to the scarcity of the fin whale in the project area and unlikelihood of encountering a fin whale, it is anticipated that project construction will not have any effect on the whale. Based on this information, NMFS issued a "no effect" Biological Opinion for the proposed project (Appendix H).

4.9.2.6.3 Alternative 2

Alternative 1 would have no effect on the fin whale. Due to the scarcity of the fin whale in the project area and unlikelihood of encountering a fin whale, it is anticipated that project construction will not have any effect on the whale. Based on this information, NMFS issued a "no effect" Biological Opinion for the proposed project (Appendix H).

4.9.2.7 Sei Whale

4.9.2.7.1 No Action Alternative

The No-Action Alternative would have no effect on the sei whale.

4.9.2.7.2 Alternative 1

Alternative 1 would have no effect on the sei whale. Due to the scarcity of the sei whale in the project area and unlikelihood of encountering a sei whale, it is anticipated that project construction will not have any effect on the whale. Based on this information, NMFS issued a "no effect" Biological Opinion for the proposed project (Appendix H).

4.9.2.7.3 Alternative 2

Alternative 2 would have no effect on the sei whale. Due to the scarcity of the sei whale in the project area and unlikelihood of encountering a sei whale, it is anticipated that project construction will not have any effect on the whale. Based on this information, NMFS issued a "no effect" Biological Opinion for the proposed project (Appendix H).

4.9.2.8 Blue Whale

4.9.2.8.1 No Action Alternative

The No-Action Alternative would have no effect on the blue whale.

4.9.2.8.2 Alternative 1

Alternative 1 would have no effect on the blue whale. Due to the scarcity of the blue whale in the project area and unlikelihood of encountering a blue whale, it is anticipated that project construction will not have any effect on the whale. Based on this information, NMFS issued a "no effect" Biological Opinion for the proposed project (Appendix H).

4.9.2.8.3 Alternative 2

Alternative 2 would have no effect on the blue whale. Due to the scarcity of the blue whale in the project area and unlikelihood of encountering a blue whale, it is anticipated that project construction will not have any effect on the whale. Based on this information, NMFS issued a "no effect" Biological Opinion for the proposed project (Appendix H).

4.9.3 Sea Turtles

4.9.3.1 No-Action Alternative

The No-Action Alternative would have no impact on sea turtles.

4.9.3.2 Alternative 1

Alternative 1 would not have a significant adverse impact on listed sea turtle species. However, since beaches of Miami Beach and Virginia Key provide important nesting areas for three sea turtle species, the project area comprises important resources for turtles. Removal of sections of hardbottom, reef, and seagrass habitats would eliminate potential foraging habitat for juvenile sea turtles. Also, dredge activities and associated disturbances offshore may interrupt the movement of turtles swimming toward or away from nesting beaches. The highest potential impact to sea turtles may be the use of explosives.

4.9.3.3 Alternative 2 (Recommended Plan)

Alternative 2 would not have a significant adverse impact on listed sea turtle species. However, since beaches of Miami Beach and Virginia Key provide important nesting areas for three sea turtle species, the project area comprises important resources for turtles. Removal of sections of hardbottom, reef, and seagrass habitats would eliminate potential foraging habitat for juvenile sea turtles; however, seagrass impacts with Alternative 2 (7.9 acres) are substantially less than for Alternative 1. Also, dredge activities and associated disturbances offshore may interrupt the movement of turtles swimming toward or away from nesting beaches. The highest potential impact to sea turtles may be the use of explosives to remove areas of rock at the east end of the Entrance Channel.

A Biological Assessment (BA) was prepared and submitted to NMFS initiating consultation under Section 7 of the ESA (Appendix H). NMFS issued a Biological Opinion (Appendix H) and determined that sea turtles would not likely be affected by the proposed action.

4.9.4 American Crocodile

4.9.4.1 No-Action Alternative

The No-Action Alternative would have no effect on the American crocodile.

4.9.4.2 Alternative 1

Alternative 1 would have no effect on the American crocodile. While the crocodile has been observed as far north as Crandon Park, Bill Baggs State Recreation Area, and Snapper Creek in Biscayne Bay, the species is generally shy and avoids contact with humans and areas of activity, such as heavily used channels and waterways.

4.9.4.3 Alternative 2 (Recommended Plan)

Alternative 2 would have no effect on the American crocodile. While the crocodile has been observed as far north as Crandon Park, Bill Baggs State Recreation Area, and Snapper Creek in Biscayne Bay, the species is generally shy and avoids contact with humans and areas of activity, such as heavily used channels and waterways.

A Biological Assessment (BA) was prepared and submitted to FWS and an ESA Section 7 consultation was initiated (Appendix H). The FWS subsequently determined that the American crocodile is not likely to be affected by the proposed action (Appendix K).

4.9.5 Piping Plover

4.9.5.1 No-Action Alternative

The No-Action Alternative would have no effect on the piping plover.

4.9.5.2 Alternative 1

Alternative 1 would have no effect on the piping plover. Although the piping plover overwinters in south Florida, there are no records of the species in the project area.

4.9.5.3 Alternative 2 (Recommended Plan)

Alternative 2 would have no effect on the piping plover. Although the piping plover overwinters in south Florida, there are no records of the species in the project area.

4.9.6 Least Tern

4.9.6.1 No-Action Alternative

The No-Action Alternative would have no impact on the least tern.

4.9.6.2 Alternative 1

Alternative 1 would have no effect on the least terns. Although the species is found in south Florida, there are no records of the species occurring within the project area.

4.9.6.3 Alternative 2 (Recommended Plan)

Alternative 1 would have no effect on the least terns. Although the species is found in south Florida, there are no records of the species occurring within the project area.

4.10 Other Areas of Special Concern

4.10.1 Manatee Protection Areas

4.10.1.1 No-Action Alternative

The No-Action Alternative would not have any impact on designated Manatee Protection Zones.

4.10.1.2 Alternative 1

Alternative 1 would not have any significant impact on designated Manatee Protection Zones. Component 6, which would relocate the western end of Dodge Island Cut, would have a direct impact on the Essential Manatee Habitat. Although portions of the Port southwest of Dodge Island have been designated by DERM as Essential Manatee Habitat, neither construction activities nor post-construction operations would have a significant adverse effect. See Appendix K.

4.10.1.3 Alternative 2 (Recommended Plan)

Alternative 2 would not have any significant impact on designated Manatee Protection Zones. Although portions of the Port southwest of Dodge Island have been designated by DERM as Essential Manatee Habitat, neither construction activities nor post-construction operations would have a significant adverse effect. See appendix K.

4.10.2 Bill Sadowski Critical Wildlife Area

4.10.2.1 No-Action Alternative

The No-Action Alternative would not have any impact on the BSCWA.

4.10.2.2 Alternative 1

Alternative 1 would have no direct impact on the BSCWA. The proposed project is in the vicinity of the BSCWA, but it is contained within Port-owned lands and does not intrude upon the BSCWA. According to information from Florida Fish & Wildlife Conservation Commission (FFWCC) and Florida Department of Environmental Protection (FDEP) staff, the BSCWA was established in 1990 and then was amended in 1993 to reflect the boundaries of the Virginia Key No Entry Manatee Protection Zone. However, there are a number of problems with the legal description used to identify the BSCWA area including longitude references that do not exist; longitude references that do not coincide with the corresponding location description; coordinates which are not taken to a consistent level of specificity; and points and bearings which do not define a closed area. As a result, the existing CWA description does not meet the Florida Administrative Code (FAC) provision that the *area shall be described ... in sufficient specificity as to permit identification.*

The Port is currently surveying and defining the southern boundary of the Port, as part of the resolution of other issues. As part of that process, a Specific Purpose survey located the boundary between City of Miami and the Port properties will be prepared. The minimum distance from the existing channel toe and the boundary is greater than 250 feet. The proposed project extends the existing channel 100 feet to the south and the maximum anticipated slope impact extends 78.25 feet from the new channel toe to top of slope. The worst-case scenario of the NW corner of the BSCWA coinciding with the maximum extension of the channel (178.25 feet (100.0 + 78.25) continues to place the proposed project within Port owned lands (178.25 feet < 200 feet), outside of the BSCWA. The Port formally contacted the State to resolve this issue.

Indirect impacts to seagrass beds adjacent to Fisherman's Channel would not extend into the BSCWA. Turbidity levels during construction would comply with the Section 401 Water Quality Certification.

4.10.2.3 Alternative 2 (Recommended Plan)

Alternative 2 would have no direct impact on the BSCWA as with Alternative 1. Indirect impacts to seagrass beds adjacent to Fisherman's Channel would not extend into the BSCWA. Turbidity levels during construction would comply with the Section 401 Water Quality Certification.

4.10.3 Biscayne Bay Aquatic Preserve

4.10.3.1 No-Action Alternative

The No-Action Alternative would not have any impact on the Biscayne Bay Aquatic Preserve.

4.10.3.2 Alternative 1

Alternative 1 would not significantly impact the Biscayne Bay Aquatic Preserve. Proposed activities are predominately within the existing authorized Federal Channel, and widening activities are minor and adjacent to the existing channel.

4.10.3.3 Alternative 2 (Recommended Plan)

Alternative 2 would not significantly impact the Biscayne Bay Aquatic Preserve. Proposed activities are predominately within the existing authorized Federal Channel, and widening activities are minor and adjacent to the existing channel.

4.11 Air Quality

4.11.1 No-Action Alternative

The No-Action Alternative would have no impact on air quality in the region. No construction activities would occur with this alternative, and no increase in air emissions would occur.

4.11.2 Alternative 1

Short-term impacts from dredge emissions and other construction equipment associated with all of the action alternatives would occur with Alternative 1, but the alternative would not significantly impact air quality. No air quality permits would be required. Because the project is located within an attainment area, U.S. Environmental Protection Agency's general conformity rule to implement Section 176 (c) of the Clean Air Act does not apply, and a conformity statement should not be required.

During construction of any disposal dikes and associated haul roads with upland disposal, dust could be generated. The contractor would be required to control dust through periodically wetting dust prone work areas or though application of an approved dust retardant agent.

4.11.3 Alternative 2 (Recommended Plan)

Short-term impacts from dredge emissions and other construction equipment would occur with Alternative 2, but the alternative would not significantly impact air quality. No air quality permits would be required. Because the project is located within an attainment area, U.S. Environmental Protection Agency's general conformity rule to implement Section 176 (c) of the Clean Air Act does not apply, and a conformity statement should not be required.

During construction of any disposal dikes and associated haul roads with upland disposal, dust could be generated. The contractor would be required to control dust through periodically wetting dust prone work areas or though application of an approved dust retardant agent.

4.12 Noise

4.12.1 No-Action Alternative

The No-Action Alternative would have no impact on noise levels. No construction activities or additional sources of ambient noise would occur due to this alternative.

4.12.2 Alternative 1

Alternative 1 is not expected to have a significant impact to noise levels. Additional noise sources with the alternative would not be noticeable in the current ambient noise levels of the Port from existing and future highway, jet flight path, ship traffic, as well as normal Port activities.

With the construction activities of the proposed action, there would be a slight and temporary increase in noise levels. Construction equipment would be properly maintained to minimize the effects of the noise and the distance of the activity from residential areas would also reduce any noise impacts associated with construction. Excavation of rock formations would be coordinated with local regulations regarding noise and vibration levels.

4.12.3 Alternative 2 (Recommended Plan)

Alternative 2 is not expected to have a significant impact to noise levels. Additional noise sources with the alternative would not be noticeable in the current ambient noise levels of the Port from existing and future highway, jet flight path, ship traffic, as well as normal Port activities.

With the construction activities of the proposed action, there would be a slight and temporary increase in noise levels. Construction equipment would be properly maintained to minimize the effects of the noise and the distance of the activity from residential areas would also reduce any noise impacts associated with construction. Excavation of rock formations would be coordinated with local regulations regarding noise and vibration levels.

4.13 Utilities

4.13.1 No-Action Alternative

No impacts to utilities would occur with the No-Action Alternative.

4.13.2 Alternative 1

Alternative 1 would impact utility crossings. The WASD force sewer main in the submarine crossing within Component 2 leading from Miami Beach to Fisher Island would require relocation.

Additionally, the WASD water main in the submarine crossing within Component 5 leading from Fisher Island to Lummus Island would also require relocation.

The USACE estimates that design and construction would cost approximately $4.6 million for both the sewer force main and the water main.

The FP&L's two transmission lines in the submarine crossing within Component 5, leading from Lummus Island to areas south of Component 5,should have been relocated under the previously authorized phase I deepening. Relocation will occur as part of the phase II deepening under a new Project Cooperation Agreement with Miami-Dade County Seaport Department. As such the FP&L transmission lines are part of the without project condition and not included in this proposed project.

Coordination with the appropriate utility companies would be conducted by the USACE and the Port to ensure all relocations are completed prior to dredging activities near those areas.

4.13.3 Alternative 2 (Recommended Plan)

Alternative 2 would impact utility crossings. The WASD force sewer main in the submarine crossing within Component 2 leading from Miami Beach to Fisher Island would require relocation.

Additionally, the WASD water main in the submarine crossing within Component 5 leading from Fisher Island to Lummus Island would also require relocation. The USACE estimates that design and construction would cost approximately $4.6 million for both the sewer force main and the water main.

The FP&L's two transmission lines in the submarine crossing within Component 5, leading from Lummus Island, to areas south of Component 5, should have been relocated under the previously authorized phase I deepening. Relocation will occur as part of the phase II deepening under a new Project Cooperation Agreement with Miami-Dade County Seaport Department. As such the FP&L transmission lines are part of the without project condition and not included in this proposed project.

Coordination with the appropriate utility companies would be conducted by the USACE and the Port to ensure all relocations are completed prior to dredging activities near those areas.

4.14 Hazardous, Toxic, and Radioactive Materials

4.14.1 No-Action Alternative

The No-Action Alternative would have no impact to hazardous, toxic, or radioactive material sources within the project area.

4.14.2 Alternative 1

Alternative 1 would have no impact to hazardous, toxic, or radioactive material sources within the project area. No potential sources of contamination have been identified in the project area, and no new sources of hazardous, toxic, or radioactive material would occur with the alternative construction or implementation. Sediments and materials to be excavated during construction have been evaluated and approved for offshore disposal.

4.14.3 Alternative 2 (Recommended Plan)

Alternative 2 would have no impact to hazardous, toxic, or radioactive material sources within the project area. No potential sources of contamination have been identified in the project area, and no new sources of hazardous, toxic, or radioactive material would occur with the alternative construction or implementation. Sediments and materials to be excavated during construction have been evaluated and approved for offshore disposal.

4.15 Economic Factors

4.15.1 No-Action Alternative

The No-Action Alternative would have significant negative national and regional economic impacts. By doing nothing, the transportation savings associated with the proposed improvements would be lost. Goods and services produced by U.S. businesses would be less competitive with foreign goods and services. U.S. citizens would pay more for goods and services than they need to pay. From a regional perspective, there are income and employment impacts. Doing nothing would result in a significant loss of cargo business at the Port due to the Port's inability to efficiently handle the new industry standard deep draft cargo vessels, which results in an increased cost of doing business. Business loss is expected to occur both in incremental declines in growth (as lines increasingly deploy vessels to other ports with deeper draft channels and feeder lines begin to relocate), and in large declines in existing business if the Port loses one of its three main operators.

There are short-term and long-term consequences of the No-Action Alternative. In the short-term, the increased costs would be passed on to consumers, and businesses would reduce their production and lay off workers, increasing local unemployment. In the long-term, Miami-based businesses would become less competitive with foreign sources of goods and services and would move to regions where the cost of business is less due to more efficient ports, resulting in significantly more unemployment and income losses for the Miami region.

4.15.2 Alternative 1

Channel widening comprises widening the seaward portion of the Entrance Channel from 500 feet to 800 feet, dredging the widener between Buoys #13 and #15, and widening Fisherman's Channel approximately 100 feet to the south. The purpose of channel widening is to increase safety, reduce damages, reduce delays, and avoid increases in tug assist costs for the Post-Panamax vessels that are expected to call in the future. Ships have grounded at the entrance due to currents. Existing conditions allow surging that prevents cargo vessels at berth from discharging or loading cargo when a vessel passes.

In the without-project condition, as Post-Panamax vessels begin to call, grounding frequency and associated safety reduction and incurred damages would increase. Surging caused by passing vessels would worsen. The Post-Panamax vessels would require extra tug assistance. In the with-project condition, groundings would be significantly reduced. Surging caused by passing vessels would be lessened. Post-Panamax vessels would require less tug assistance. Benefits attributable to channel widening include; (1) reduced damages, (2) reduced delays (vessels holding until grounded vessel is removed and less interruption to discharging vessels), (3) increase in navigation safety, and (4) reduction in tug assist costs.

The Fisher Island Turning Basin is not large enough for the expected Post-Panamax container vessels to turn in either with or without project conditions. Without the Fisher Island Turning Basin Extension measure, these vessels can turn in the previously authorized 42-foot deep Lummus Island Turning Basin, but extending the Fisher Island Turning Basin would provide a closer place to turn for the larger vessels. Therefore, this measure would provide more flexibility in allocating turning basin use among vessels, leading to timesaving efficiencies.

Panamax and future-calling Post-Panamax container vessels arriving to or departing from the Port cannot fully load because of current channel depths. In the without-project condition, this light loading of vessels would sustain current transportation costs. Deepening the channel would allow vessels to more fully load, increasing efficiency. Benefits to deepening are reduced transportation costs resulting from the partial or full elimination of light loading.

4.15.3 Alternative 2 (Recommended Plan)

Channel widening comprises widening the seaward portion of the Entrance Channel from 500 feet to 800 feet, dredging the widener between Buoys #13 and #15, and widening Fisherman's Channel approximately 100 feet to the south. The purpose of channel widening is to increase safety, reduce damages, reduce delays, and avoid increases in tug assist costs for the Post-Panamax vessels that are expected to call in the future. Ships have grounded at the entrance due to currents. Existing conditions allow surging that prevents cargo vessels at berth from discharging or loading cargo when a vessel passes.

In the without-project condition, as Post-Panamax vessels begin to call, grounding frequency and associated safety reduction and incurred damages would increase. Surging caused by passing vessels would worsen. The Post-Panamax vessels would require extra tug assistance. In the with-project condition, groundings would be significantly reduced. Surging caused by passing vessels would be lessened. Post-Panamax vessels would require less tug assistance. Benefits attributable to channel widening include; (1) reduced damages, (2) reduced delays (vessels holding until grounded vessel is removed and less interruption to discharging vessels), (3) increase in navigation safety, and (4) reduction in tug assist costs.

The Fisher Island Turning Basin is not large enough for the expected Post-Panamax container vessels to turn in either with or without project conditions. Without the Fisher Island Turning Basin Extension measure, these vessels can turn in the previously authorized 42-foot deep Lummus Island Turning Basin, but extending the Fisher Island Turning Basin would provide a closer place to turn for the larger vessels. Therefore, this measure would provide more flexibility in allocating turning basin use among vessels, leading to timesaving efficiencies.

Panamax and future-calling Post-Panamax container vessels arriving to or departing from the Port cannot fully load because of current channel depths. In the without-project condition, this light loading of vessels would sustain current transportation costs. Deepening the channel would allow vessels to more fully load, increasing efficiency. Benefits to deepening are reduced transportation costs resulting from the partial or full elimination of light loading.

4.16 Land Use

4.16.1 No-Action Alternative

The No-Action Alternative would not require changes in land use. Port expansion and associated facilities would likely occur on compatible land use.

4.16.2 Alternative 1

Alternative 1 would not require changes in land use. Port expansion and associated facilities would likely occur on compatible land use.

4.16.3 Alternative 2 (Recommended Plan)

Alternative 2 would not require changes in land use. Port expansion and associated facilities would likely occur on compatible land use.

4.17 Recreation

4.17.1 No-Action Alternative

The No-Action Alternative would have no impact on recreational resources in the area.

4.17.2 Alternative 1

Impacts to recreational activities with Alternative 1 would be minor. Temporary minor impacts may occur to recreational boat traffic during construction of the mitigation sites in areas adjacent to the Port. No impacts would occur with normal project operations.

4.17.3 Alternative 2 (Recommended Plan)

Impacts to recreational activities with Alternative 2 would be minor. Temporary minor impacts may occur to recreational boat traffic during construction of the mitigation sites in areas adjacent to the Port. No impacts would occur with normal project operations.

4.18 Aesthetics

4.18.1 No-Action Alternative

The No-Action Alternative would have no impact on aesthetic resources in the area.

4.18.2 Alternative 1

Impacts to aesthetic resources with Alternative 1 would be minor. Temporary aesthetic impacts would occur due to construction activities. Construction equipment including dredges, dredge pipes, loaders, scrapers, dump trucks, etc. would be visible to the public. Temporary aesthetic impacts due to construction of staging areas, access roads, and associated construction-related amenities would also occur. No impacts would occur with normal project operations.

4.18.3 Alternative 2 (Recommended Plan)

Impacts to aesthetic resources with Alternative 2 would be minor. Temporary aesthetic impacts would occur due to construction activities. Construction equipment including dredges, dredge pipes, loaders, scrapers, dump trucks, etc. would be visible to the public. Temporary aesthetic impacts due to construction of staging areas, access roads, and associated construction-related amenities would also occur. No impacts would occur with normal project operations.

4.19 Cultural Resources

4.19.1 No-Action Alternative

The No-Action Alternative would have no impact on cultural resources in the area.

4.19.2 Alternative 1

Alternative 1 would have no effect on cultural resources. A remote sensing survey was conducted within the project boundaries as requested by SHPO. No historic properties were located within the project area (Watts 2002). A concurrence letter from SHPO, indicating that the proposed project would have no effect on any historic properties eligible for listings in the National Register of Historic Places, was received in April 2002 (Appendix I). If the USACE constructs its reef mitigation sites in localities currently not permitted by DERM, then the USACE will coordinate the placement of this material with SHPO.

4.19.3 Alternative 2 (Recommended Plan)

Alternative 2 would have no effect on cultural resources. A remote sensing survey was conducted within the project boundaries of the Port as requested by SHPO. No historic properties were located within the project area (Watts 2002). A concurrence letter from SHPO, indicating that the proposed project would have no effect on any historic properties eligible for listings in the National Register of Historic Places, was received in April 2002 (Appendix I). If the USACE constructs its reef mitigation sites in localities currently not permitted by DERM, then the USACE will coordinate the placement of this material with SHPO.

4.20 Cumulative Impacts

Cumulative impacts are the impacts on the environment resulting from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions (40 CFR 1508.7). The proposed project would provide long-term benefits, which would outweigh any short-term environmental losses. The cumulative impact of navigation improvements would be to improve the local economy, provide increased navigation and safety, and enhance the overall quality of the human environment.

4.20.1 Historic Natural Resource Impacts

4.20.1.1 Past Activities, 1970-Present

The Port has been operating from its current location at Dodge Island since approximately 1946. Dredging to accommodate and expand Port operations occurred throughout the 1960s. With the adoption of NEPA in 1969 and the Clean Water Act (CWA) in 1972, impacts to area natural resources resulting from navigation improvements were evaluated as part of the Federal permitting process. Since that time, two major Federal permitting actions are on record for Port expansion and navigation improvements. They are the Port Expansion Project of 1980 and the Channel Deepening Project of 1991. Prior to 1980, the last Federally authorized navigation project at the Port occurred in 1968. That project involved widening of the Entrance Channel to 500 feet and deepening of that channel and other channels and basins around the Port to depths of 36 to 38 feet (USACE 1991).

4.20.1.2 Port Expansion Project of 1980

On April 23, 1979, immediately following adoption of the Port's 1979 Master Development Plan by the Miami-Dade County Commission, an application was made to the USACE for dredging and filling activities to expand the Port. The application request included deepening of Fishermen's Channel, widening of the Dodge Island Turning Basin, creation of the Lummus Island Turning Basin and filling for creation of additional land area at Lummus Island. A Federal permit was issued on October 6, 1980. A state permit from the Florida Department of Environmental Regulation (FDER) was issued for the same project on July 11, 1980. Table 20 summarizes the permit contents. In 1986, FDER "reissued" their permit with additional deepening of Fisherman's Channel and widening of the Dodge Island Turning Basin. The USACE issued a permit for this work in 1988. In the meantime, a modification had been made to the original USACE permit to change the scope of required mitigation. All of the mitigation work required by the permits was completed by 1994 although some of the authorized construction work remains unfinished at this time (Fielland 2001).

Submerged natural resource communities impacted by the 1980 expansion project within Biscayne Bay may have included hardbottom, seagrasses, and unvegetated bottom although the impact acreages were not specified in the permits. Required mitigation on the original permit included 251 acres of seagrass habitat creation. A FWS report on the project states that the Port was "required to mitigate for the loss of 251 acres of shallow water and marine grassbeds by planting seagrasses" implying that the 251 acreage figure represented the project impact as well as the required mitigation (USACE 1989). After the seagrass mitigation project proved largely unsuccessful (USACE 1989; Fonseca et al. 1998), the mitigation requirements were revised in a 1988 USACE permit modification to include 15 acres of mangrove habitat restoration and other habitat creation (spoil islands and artificial reefs) of unspecified acreage.

4.20.1.3 Channel Deepening Project of 1991

On October 31, 1991, both the USACE and the FDEP issued permits for the Channel Deepening Project. On February 6, 1992, DERM, the local environmental permitting authority, also issued a permit for the project. This project was designed to meet the needs of increased numbers and sizes of vessels using the Port. The project focused on deepening shipping channels leading into the Port including Government Cut, the Entrance Channel, and Fisher Island Turning Basin. The project impacted 4.92 acres of hardbottom habitat and 94.0 acres of rock/rubble habitat. To offset these impacts the permits included 15.91 acres of artificial reef creation, 94.0 acres of rock/rubble habitat creation, and an unspecified amount of mangrove wetlands restoration.

The State of Florida Department of Environmental Protection and Miami-Dade County entered into a Consent Order on May 7, 2002 to address the damage to low- to moderate-density sea grasses outside of the permitted dredging area. This Order requires the Port of Miami to undertake a mitigation project at the Oleta River State Park in North Miami. The plan includes 1) restoration of 42.5 acres of red mangrove swamp, tidal streams, and tidal pools; 2) enhancement of approximately 20 acres of tidal red mangrove habitat; 3) and creation and installation of bilingual environmental education signs within the Park. This mitigation work addresses the Department of Environmental Resources Management (DERM) Notice of Violation as well.

Table 20 Natural Resource Impact and Mitigation History of Navigational Improvements

Permitting Agency	Permit Numbers and Dates[1]	Final Permitted Navigation Improvements	Acreage Impacts		Mitigation[3]		
1980 Expansion Project							
USACE	No. 79B-0623 Issue Date: 10/6/80 Mod Date: 6/16/81 Mod Date: 3/9/88 Mod Date: 9/2/88 Mod Date: 2/8/93 Mod Date: 9/25/01 Mod Date: 11/26/01	1. Deepening of Fisherman's Channel to 42 feet 2. Creation of Fisher Island Turning Basin of 1,600 foot diameter and 42 feet in depth 3. Deepening of Dodge Island Turning Basin and intervening channel to Fisher Island Turning Basin to 36.5 feet and widening of Dodge Island Turning Basin to 1,600-foot diameter 4. Landside expansion (filling of Lummus Island) 5. Blasting	Not specified		Seagrass habitat creation; Biscayne Bay;	Complete; less than 10% successful; alternative mitigation provided	140.0
					Mangrove wetlands restoration - Oleta River State Park;	Complete	15.0
					Hardbottom Habitat creation (artificial reefs); various locations;	Complete	NR[2]
					Spoil island habitat enhancement; various locations;	Complete	NR[2]
					Shoreline habitat enhancement (stabilization); var. loc.;	Complete	NR[2]
FDER	No. 13-19502 Issue Date: 7/11/80 No. 131106409 Issue Date: 3/7/86 Mod Date: 5/22/86 Mod Date: 9/1/94 Mod Date: 12/30/94 Mod Date: 6/10/02	(same as above without Blasting)	Not specified		Seagrass habitat creation	Complete; less than 10% successful; alternative mitigation provided	140.0
					Mangrove wetlands restoration	Complete	15.0
DERM	No. CC94-290 Issue Date: 9/4/95 No. CC 98-405 Issue Date: 2/3/99	Deepening of portions of Lummus Island and Fisher Island Turning Basins to 42 feet	Not specified		None required	None required	

[1] Permit Issuance ("Issue") and Modification ("Mod.") Dates – only those modifications affecting impact acreage and/or mitigation acreage are listed here.
[2] NR = not reported in permit.
[3] Acreage of mitigation represents the final amount of mitigation acreage approved and carried out as of the latest permit modification

Table 20 Continued

Permitting Agency	Permit Numbers and Dates[1]	Final Permitted Navigation Improvements	Acreage Impacts		Acreage Mitigation[3]		
1991 Deepening Project							
			Type	**Acres**	**Type**	**Status**	**Acres**
USACE	No. 199101030 (IP-DM) Issue Date: 10/31/91 Mod Date: 5/17/93 Mod Date: 9/13/93 Mod Date: 1/27/95 Mod Date: 2/16/98 Mod Date: 5/22/02	1. Deepening of Fisher Island Turning Basin and widener to 42 feet 2. Deepening of Entrance Channel, Bar Cut, Government Cut- and widener to 44 feet	Hardbottom	4.92	Mangrove wetlands restoration; Biscayne Bay canals;	complete	NR[2]
			Channel bottom rock/ rubble	94.0			
FDER	No. 131982259 Issue Date: 10/30/91 Mod Date: 9/22/92 Mod Date: 11/29/93 Mod. Date: 1/28/94 Mod Date: 3/22/94 Mod. Date: 5/24/95 Mod Date: 4/8/97	(Same as above)	Hardbottom	4.92	Hardbottom creation (artificial reef habitat)	Complete	15.91
					Mangrove wetlands restoration	Complete	NR
			Channel bottom rock/ rubble	94.0	Channel bottom rock rubble; In channel; complete	Complete	94
DERM	No. CC91-191 Issue Date: 2/6/92 Mod Date: 2/3/95	(Same as above)	Hardbottom	4.86	Hardbottom creation (artificial reef habitat)	Complete	15.91
			Channel bottom rock/ rubble	94.0	Channel bottom rock rubble	Complete	94.0

[1] Permit Issuance ("Issue") and Modification ("Mod.") Dates – only those modifications affecting impact acreage and/or mitigation acreage are listed here.
[2] NR = not reported in permit.
[3] Acreage of mitigation represents the final amount of mitigation acreage approved and carried out as of the latest permit modification

4.20.1.4 *Other Minor Activities*

A permit to fill the previously dredged northwest corner of Dodge Island was issued on July 23, 1992 by the USACE [Permit Number 199200151(IP-RP)]. They required creation of 0.4 acre of limestone boulder shoreline revetment habitat as mitigation for installation of the bulkhead. The USACE made reference to compliance with the local jurisdictional permit issued by DERM (CC92-175) with respect to the mitigation requirement.

Two additional activities were permitted by the USACE but had no impacts for which mitigation was required:

- Filling of the "NOAA" docking slip consisting of 6.2 acres of previously dredged area [Permit No. 199406346(IP-DS)] issued May 21, 1997 (although the USACE did not specifically require mitigation for this project, state and local jurisdictions did require creation of up to 2,929 cubic yards of shoreline riprap as mitigation for bulkhead installation pursuant to FDEP permit number 132605579 and DERM permit number CC94-339), and,

- Miami ODMDS [Permit No. 199301155(IP-DSG)] issued on October 12, 1994.

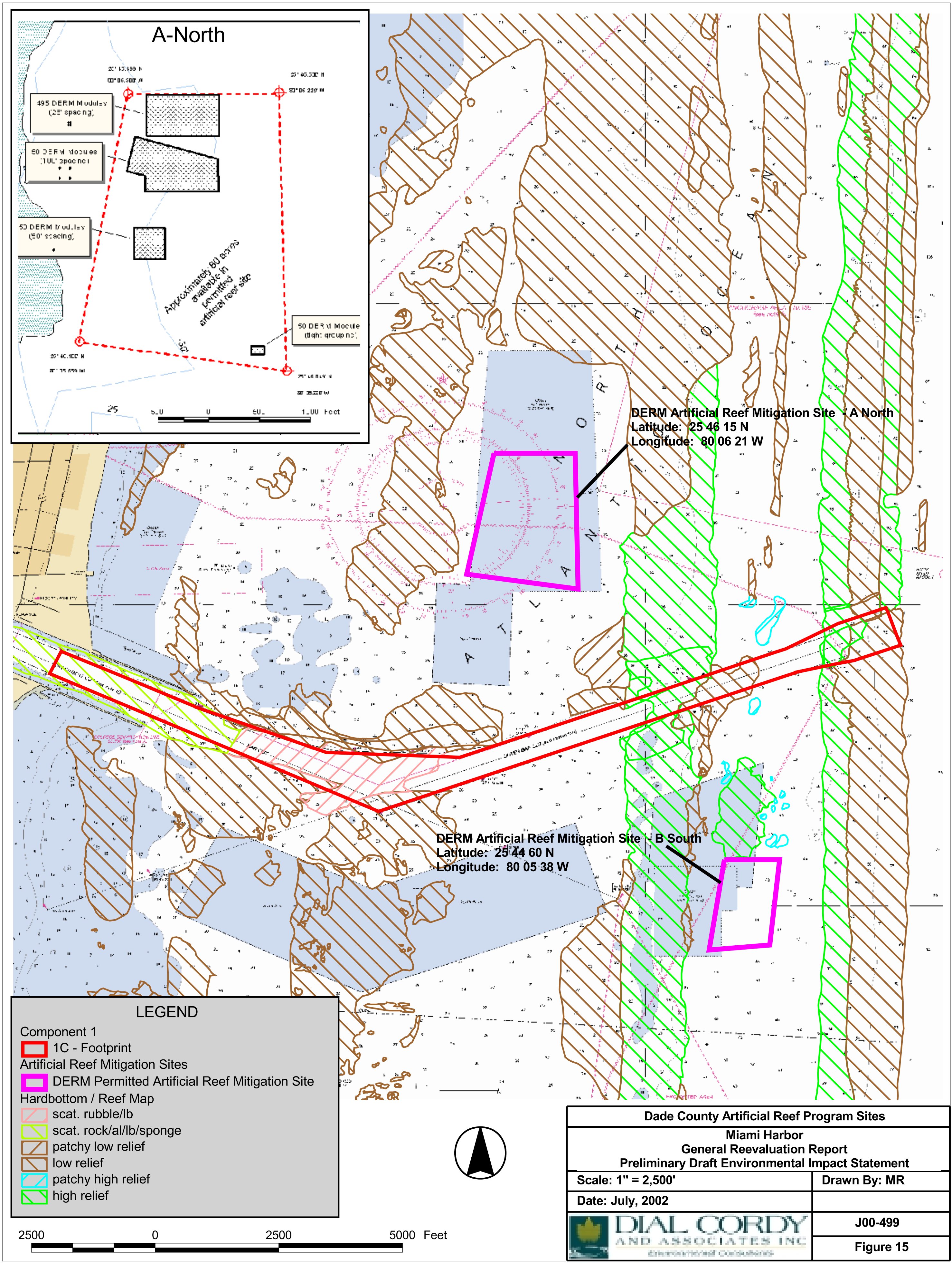
4.20.1.5 *Impacts Summary for Past Activities*

Table 20 summarizes permitted natural resource impacts from the two known major Port expansion/improvement projects, the 1980 expansion and the 1991 deepening. Unfortunately, records of the impact acreages for the 1980 expansion project have not been located and may not exist at all. Therefore, it is not possible at this time to determine the correct cumulative impact acreages for individual habitat types from past permitted activities. It is known, however, that the required mitigation to offset those impacts was completed successfully (Fielland 2001; USACE 2000). Figures 15 and 16 provide locations of the mitigation sites presented in Table 20.

4.20.2 Current Natural Resource Impacts

4.20.2.1 *Current Proposed Miami Harbor Navigational Improvements*

Table 21 summarizes the proposed navigational improvements for the Recommended Plan and projected impact estimates available at this time. The proposed improvements would impact an estimated total surface area of 415.6 acres including 7.9 acres of seagrass habitat, 49.4 acres of hardbottom/reef habitat, 123.5 acres of rock/rubble habitat and 236.4 acres of unvegetated bottom.


A-North
495 DERM Modules (25' spacing)
50 DERM Modules (100' spacing)
50 DERM Modules (50' spacing)
50 DERM Module (tight grouping)
Approximately 60 acres available in permitted artificial reef site
1,000 Feet
DERM Artificial Reef Mitigation Site - A North
Latitude: 25 46 15 N
Longitude: 80 06 21 W
DERM Artificial Reef Mitigation Site - B South
Latitude: 25 44 60 N
Longitude: 80 05 38 W
ATLANTIC OCEAN
LEGEND
Component 1
1C - Footprint
Artificial Reef Mitigation Sites
DERM Permitted Artificial Reef Mitigation Site
Hardbottom / Reef Map
scat. rubble/lb
scat. rock/al/lb/sponge
patchy low relief
low relief
patchy high relief
high relief
2500
0
2500
5000
Feet
Dade County Artificial Reef Program Sites
Miami Harbor
General Reevaluation Report
Preliminary Draft Environmental Impact Statement
Scale: 1" = 2,500'
Drawn By: MR
Date: July, 2002
DIAL CORDY AND ASSOCIATES INC
J00-499
Figure 15

4.20.2.2 Direct and Indirect Natural Resource Impacts

As summarized in Table 21, the estimated natural resource impacts to the Port area resulting from the current proposed navigational improvements include:

- 7.9 acres of seagrass habitat (New impacts; 0.2 acres direct and 7.7 acres indirect)
- 49.4 acres of hardbottom/reef habitat (3.3 acres new impacts)
- 123.5 acres of rock/rubble habitat (Previously impacted)
- 236.4 acres of unvegetated bottom (23.3 acres new impacts)

4.20.3 Future Natural Resource Impacts

The 1999 Port Master Development Plan contains recommended plans for Port expansion and maintenance through the year 2015 (Miami-Dade County 1999c). This is the best source for listing and quantifying anticipated Port needs for the foreseeable future. Activities that may involve work in the water and therefore have the potential for natural resource impacts include the following:

- Dodge Island Turning Basin and Cut Expansions
- Filling of southwest corner of Dodge Island
- Filling of northwest corner of Dodge Island near Terminals 1 through 5
- Filling of northeast corner of Dodge Island to create new Terminal 19
- Construction of a Maritime Park (location not finalized at this point)
- Design and construct tunnel connecting Watson Island to Dodge Island

Some future activities can be specifically stated (e.g., filling of southwest corner of Dodge Island) while others are only conceptual at this stage (e.g., construction of a Maritime Park). Impact acreages for specific habitats that can be quantified at this time appear in Table 22.

Table 21 Summary of Recommended Plan Impacts

	Footprint Area	Seagrass Acres		Unvegetated Bottom Acres		Rock Rubble w/ Algal Sponge Community Acres		Rock/Rubble w/ Live Bottom Acres		Low Relief Hardbottom/Reef Reef Acres		High Relief Hardbottom/Reef Acres	
		Direct (New)	Side Slope Equilibration (Previous)	New	Previous	New	Previous	New	Previous	New	Previous	New	Previous
Component 1C	210.6	0	0	66.9	1.3	41.3	0	51.7	0	28.1	0.6	18.0	2.7
Component 2A	0.6	0	0	0	0	0	0.6	0	0	0	0	0	0
Component 3B	50.5	0	0.1	19.1	5.3	25.2	0.9	0	0	0	0	0	0
Component 4	49.6*	0	0	0	0	0	0	0	0	0	0	0	0
Component 5A	153.8	0.2	7.6	127.1	16.7	2.3	1.5	0	0	0	0	0	0
Totals	415.6	7.9		236.4		71.8		51.7		28.7		20.7	

*No impacts

Table 22 Summary of Future Planned Navigational Improvements to Miami Harbor

NAVIGATIONAL IMPROVEMENT	PRELIMINARY IMPACT ESTIMATES (AC)		
	Seagrass	**Unvegetated Bottom**	**Total Surface Area**
Dodge Island Turning Basin Expansion Dodge Island Cut Expansion, Filling of S.W. Dodge Island	16.8	8.6	25.4
Filling of N.W. Dodge Island	0	<2.0**	<2.0
Filling of N.E. Dodge Island	0	<1.5	<1.5
Totals	16.8	12.1	28.9

Note: This table is limited to planned improvements for which estimated impact acreage information was available at the time of this report.

** Acreage figures and habitat types are estimates based on aerial photographs.

4.20.4 Overview of Cumulative Impacts

The full picture of natural resource impacts at the Port is appropriately viewed over the 45-year timeframe of Port activity covered in this report (1970 – 2015). Since the advent of NEPA in 1969, the CWA in 1972 and other Federal actions such as the "no net loss" of habitat initiative (1989), increasing focus on the adverse natural resource impacts of certain human activities has caused a careful and due consideration of the extent of and alternatives to those impacts. The decisions of city and county officials in the mid-1940s to keep the Port operation focused within the downtown area and expand on existing facilities rather than to relocate it to an entirely new area was a fortunate one from a natural resource standpoint. It resulted in relocation and expansion of the Port area directly adjacent to its previous site along Biscayne Boulevard, an area that had already been significantly altered by dredging. For this reason, the location and configuration of the Port has resulted in notable cumulative impacts on a local scale but minimal cumulative impacts on a regional scale over the long-term. Future planned improvements are focused on the best use of existing facilities and would therefore continue this trend.

Direct natural resource impacts associated with known past permitted, current proposed, and future planned navigational and improvements at the Port are summarized in Table 23. The total surface area is approximately 800 acres, about 69 percent (552 acres) of which involves some type of significant natural community (i.e., other than unvegetated). The past permitting impacts, totaling perhaps 349.9 acres, have been offset through mitigation. Mitigation would also be required to offset the unavoidable impacts of current proposed and future planned improvements as well.

Table 23 Cumulative Natural Resource Impacts

	IMPACT ESTIMATES (AC)			
HABITAT	**Past Permitted**	**Current Proposed**	**Future Planned**	**Total**
Seagrass	251.0*	7.9	16.8	275.7
Hardbottom/Reef	4.9	49.4 (3.3 N)	0	54.3
Rock/Rubble	94.0	123.5 (P)	0	217.5
Unvegetated	NR**	236.4	12.1	248.5
Total Acres Impacted	349.9	417.2	28.9	796.0

*Based on U.S. Fish and Wildlife Service statement in Appendix EIS-IV of USACE 1989. This number is considered to be a conservative estimate of seagrass impacts.
**NR = not reported. Acreage impact for this habitat was either not present or, if present, was not reported.
N = new impacts
P = previously impacted

Current proposed impacts consist of 7.9 acres of seagrass (7.7 acres impacted by side slope equilibration); 49.4 acres of hardbottom/reef (3.3 acres new impacts, 46.1 acres of previously impacted reef); 123.5 acres of previously impacted rock/rubble habitat and 236.4 acres of unvegetated bottom (23.3 acres new impacts, 213.1 acres of previously impacted unvegetated bottom). Though future impacts are unknown at this time, projected impacts are estimated at 22.8 acres of seagrass and 3.5 acres of unvegetated bottom. These improvements together involve about 25 percent of the cumulative impacts to significant natural resource communities.

While past impacts have been significant, impacts for currently proposed activities have been minimized and the probability of success for proposed mitigation measures are high.

With successful mitigation for currently proposed projects and minimal future impacts projected, cumulative impacts from past, present, and future Port expansion are considered adverse, but not significant. Of the 48.3 acres of resources impacted from past and currently proposed activities, over 55 percent are considered temporary in nature and involve dredging previously dredged and mitigated areas.

4.21 Unavoidable Adverse Impacts

Extensive plan formulation, plan revision, and plan refinement have avoided impacts to the environment, whenever possible, and minimized impacts to the environment to the greatest extent possible while still meeting the project need and purpose (Table 2). Efforts have been made to include all stakeholders in the planning process to assist the USACE in minimizing environmental impacts. There are several unavoidable environmental impacts of the proposed project to the natural environment.

There are two areas within the project that would have an impact on several species of seagrasses. These areas are located in Fisher Island Turning Basin and along the south side of Fisherman's Channel. The total acreage associated with all aspects of the project's impacts to the seagrasses is approximately 7.9 acres.

In addition, there would be some impacts to hardbottom communities within the confines of the Entrance Channel. Project impacts total approximately 49.4 acres for hardbottom/reef, of which 46.1 acres has been previously dredged.

4.22 Irreversible and Irretrievable Commitments of Resources

An irreversible commitment of resources is one in which the ability to use and/or enjoy the resource is lost forever. Energy used during construction activities would be an irreversible loss. Irreversible loss of resources in certain areas due to widening and deepening of project elements would occur; however it is proposed to mitigate for those unavoidable losses by restoring seagrass beds and through artificial reef construction.

An irretrievable commitment of resources is one in which, due to decisions to manage the resource for another purpose, opportunities to use or enjoy the resource as they presently exist are lost for a period of time. Irretrievable resource impacts would occur with the loss of seagrass and hardbottom communities. Seagrass impacts would be mitigated by the restoration of similar habitat north of the impact area by filling in borrow holes associated with creation of the Julia Tuttle Causeway. The impacts to hardbottom communities would be mitigated at the permitted artificial reef sites.

4.23 The Relationship Between Local Short-Term Uses of Man's Environment and Maintenance of Long-Term Productivity

Long-term productivity in the form of enhanced and increased use of the Port would result from implementation of this project. The natural resource impacts associated with local use of the Port area are expected to be offset via a combination of on-site avoidance and minimization activities and mitigation. Some of the existing rock/rubble habitat in the channels, for example, would be temporarily impacted during construction but then would be left to recover, recommitting the productivity of this area over the long-term. In addition, new mitigation sites would commit previously non-productive areas to long-term natural resource productivity.

4.24 Energy Requirements and Conservation

The energy requirements for this project would be confined to fuel for dredges, labor transportation and other construction equipment. The No-Action Alternative would eliminate these requirements, but would allow a continuation of and possible increase in navigational safety and economic problems.

4.25 Natural or Depletable Resources

No depletable resources would be used other than fossil fuels to power equipment and produce materials or equipment needed for dredging, disposal site construction, and pipeline construction.

4.26 Scientific Resources

The mitigation as proposed is planned to compensate for impacts. Monitoring of the mitigation areas would provide scientific information regarding the newly created and restored habitat areas and associated species.

4.27 Native Americans

No Native American community or any tribal lands are known to exist within the project or mitigation areas, therefore the project should not adversely impact Native Americans or any tribal lands.

4.28 Reuse and Conservation Potential

Reuse and conservation of material generated as a result of the Port's dredging program would be accomplished by placement of material into the dredge holes in Biscayne Bay to create seagrass beds for mitigation. Dredged rock and coarse material would also be used for artificial reef creation in designated permitted sites.

4.29 Indirect Effects

The Recommended Plan would have substantial positive regional and Federal economic impacts. Indirect effects would occur from implementation of the Recommended Plan from side slope equilibration that would affect 7.7 acres of seagrass beds.

4.30 Compatibility With Federal, State, and Local Objectives

The State Clearinghouse responded to scoping with comments and concerns from FDEP and the FFWCC. The letter concluded that “Based on the information contained in the notice of intent and the enclosed comments provided by our reviewing agencies, we have determined that the referenced project is, at this stage, consistent with the Florida Coastal Management Program (FCMP). The letter also indicated that the SFRPC has identified goals and policies in its Strategic Policy Plan that may apply to the project (Appendix B). A Coastal Zone Management Plan Consistency Determination was completed and is included in Appendix D, and the State determined that the proposed project is consistent with the Florida Coastal Management Program (Appendix N).

4.31 Conflicts and Controversy

It is anticipated that there will be controversy regarding the level of impacts to natural resources and the means to mitigate for those impacts.

4.32 Uncertain, Unique, or Unknown Risks

Uncertainty in re-establishment of seagrasses exists. Monitoring and mitigation is proposed to compensate for the uncertainty. Less uncertainty exists relative to mitigation proposed for hardbottom/reef impacts and as such, no increases in mitigation ratios are proposed. If cutterhead dredging is used, additional impacts to hardbottom reefs would occur, but the extent is unknown. Pre- and post-construction monitoring would be performed to accurately determine those impacts and coordination with the resource agencies would determine appropriate mitigation. Some uncertainty also exists with potential effects of blasting on marine mammals and fish species.

4.33 Precedent and Principle for Future Actions

The proposed action does not establish any precedent for further improvements at the Port.

4.34 Environmental Commitments

Environmental commitments include:

- Implement best management practices for construction and include incentives in the RFP for minimizing environmental impacts
- Abide by requirements of endangered species consultation
- Comply with the blasting plan
- Follow requirements of the State Water Quality Certification
- Mitigate as proposed
- Conduct monitoring of mitigation sites according to agreements with the resource agencies.

5.0 MITIGATION FOR ADVERSE IMPACTS

This section outlines the preferred options for providing compensatory mitigation for unavoidable impacts to seagrass and offshore hardbottom/reef habitats impacted by implementation of Alternative 2 (Recommended Plan) considered in this document (see Appendix J for additional details). Mitigation is proposed for seagrass and hardbottom/reef habitats where new construction or dredging is proposed. All of these habitat types are considered EFH by the SAFMC and NMFS (SAFMC 1998). Mitigation is not proposed for dredging the rubble and unvegetated bottom types within the channel since dredging was previously performed in the channel and recovery is expected to be rapid. Over 25 mitigation options ranging from significant tidal and mangrove habitat restoration in south Biscayne Bay to restoring seagrass habitat in north Biscayne Bay were considered for mitigating seagrass impacts. Based on detailed analysis and significant agency coordination, restoring seagrass habitat in north Biscayne Bay was the preferred option. Artificial reef construction using dredged rock from the entrance channel was the only option considered to meet mitigation requirements for impacts to hardbottom/reef habitat. A summary of the preferred mitigation options is provided below. The Mitigation Plan found in Appendix J includes a revised review of mitigation options evaluated, agency requirements, the preferred plan and a review of the effectiveness of preferred restoration options. Additional site-specific documentation is available in Appendix L.

5.1 Mitigation Plan

Seagrass Impacts and Mitigation

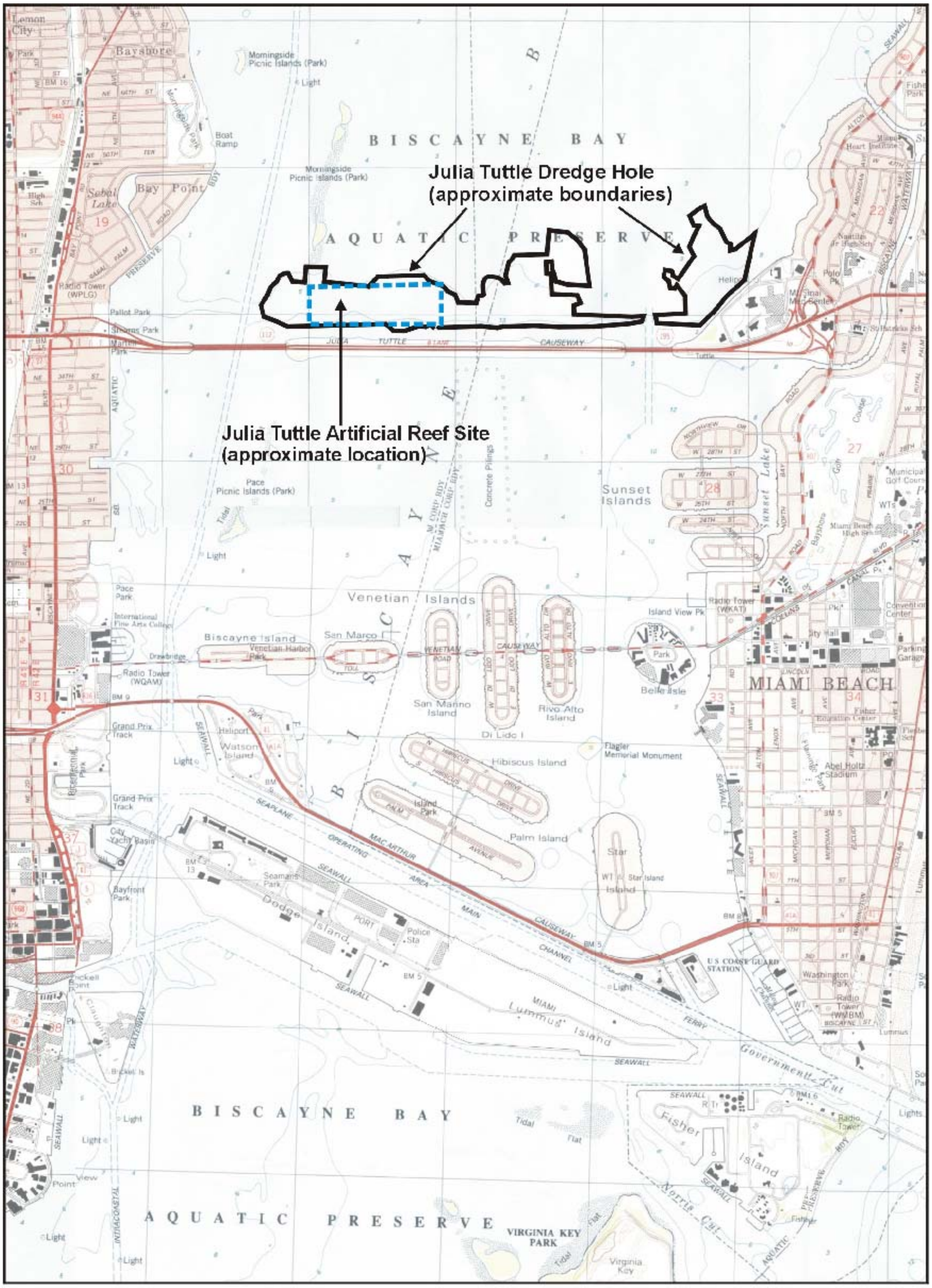
Direct impacts to seagrass communities would be restricted to the widening of Fisherman's Channel and the Fisher Island Turning Basin and would include the permanent loss of 0.2 acre of mixed beds of seagrass. Approximately 7.7 acres of indirect losses would occur from the natural equilibration of the side slopes based on the methodology described in Appendix G. Based upon coordination with the resource agencies and comments received on the DEIS, restoration of approximately 24 acres of seagrass beds is proposed as compensation for unavoidable impacts.

In order to replace local seagrass functions and values, restoration will be implemented within Biscayne Bay, preferably in areas where seagrass once occurred and is now absent due to past anthropogenic activities such as dredging. Seagrass habitat will be restored by filling approximately 24 acres of old borrow areas located in the Julia Tuttle dredge hole, the proposed seagrass mitigation area North Biscayne Bay (Figure 16). Evaluations of the areas within the dredge hole were conducted in June 2002, July 2003, and October 2003 to determine the most appropriate site for seagrass mitigation within the proposed seagrass mitigation area. An approximately 24-acre site, known as the east central dredge hole, appears to be the most suitable mitigation area. The mitigation plan presented in the DEIS has been revised based on the results of the subsequent surveys of the proposed mitigation site. A conceptual approach is included in Appendix J.

Hardbottom Impacts and Mitigation

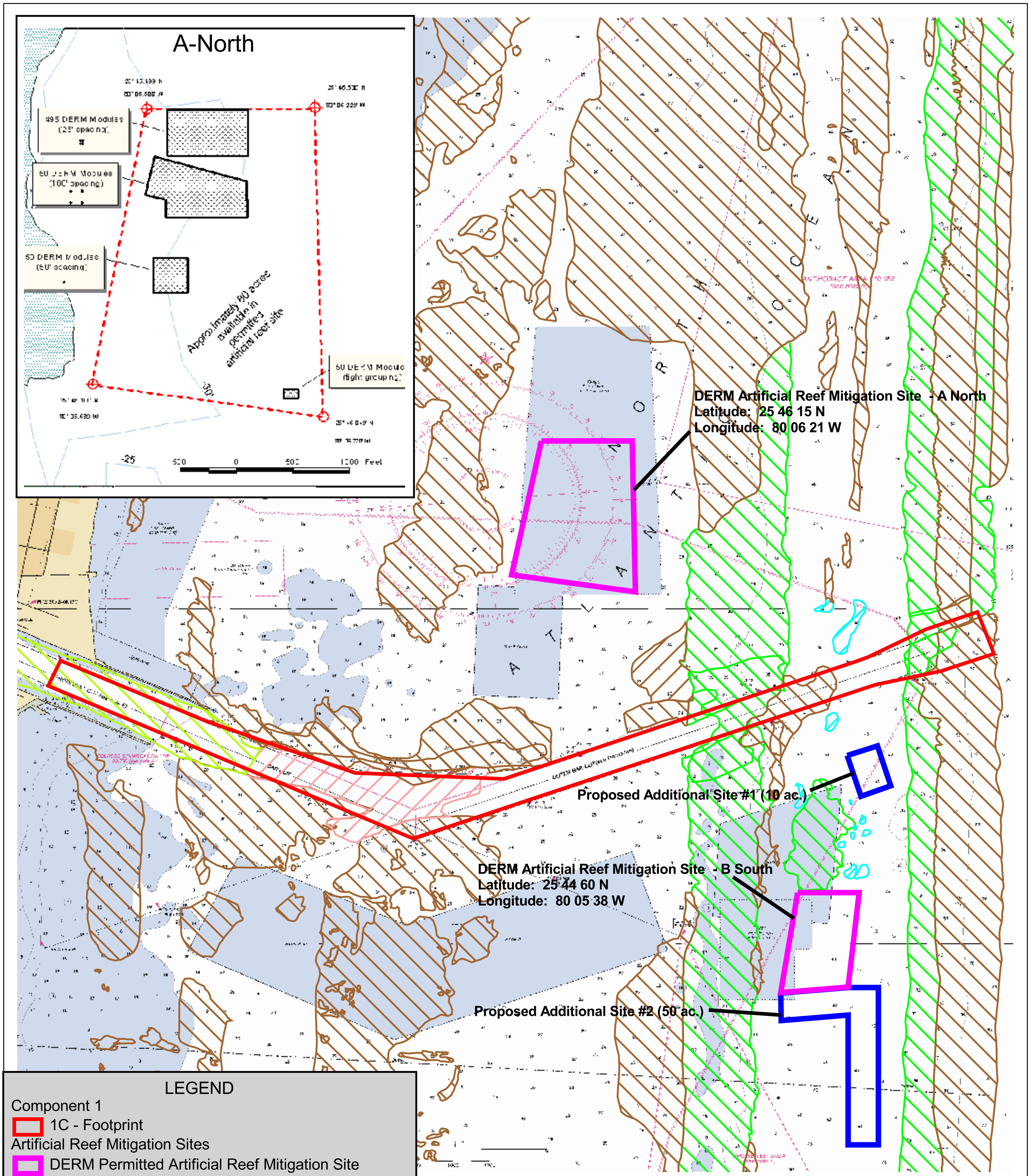
New impacts to low relief hardbottom/reef and high relief hardbottom/reef total 0.6 acre and 2.7 acres, respectively. Based on the Habitat Equivalency Analyses (HEA) calculations, direct impacts to hardbottom/reef would require the creation of artificial reef habitat at an effective mitigation ratio of 2:1 for high relief hardbottom/reef habitat and an effective mitigation ratio of 1.3:1 for low relief hardbottom/reef habitat. Mitigation reefs would be constructed in two different designs, to reflect the differences in the habitat structure of the two types of hardbottom/reef habitat to be impacted. The proposed mitigation would be type-for-type, to reflect the ecological differences between the different reef types impacted. A total of 0.8 acre of low relief-low complexity (LRLC) reef would be required to mitigate for the new low relief reef and previously impacted hardbottom habitat. A total of 5.4 acres of high relief-high complexity (HRHC) reef would be required to mitigate for the high relief impact. Reefs would be constructed at proposed artificial reef sites to be managed by DERM (Figure 17).

Limestone rock excavated from the Entrance Channel would be used in reef construction. Artificial reef construction will be conducted at one or two of the sites located south of the entrance channel identified in Appendix L. The material would be deployed in a shore-parallel orientation typical of natural reefs. This reef design would have a vertical relief of approximately 3-5 feet and rocks would be deployed to provide the maximum structural complexity and to provide refugia for cryptic and reclusive species. As interstitial sand patches associated with reef habitat are thought to be important in the ecological function of the reef habitat, the reef footprint would contain approximately 20 percent open sand surface. Temporary buoys delineating the deployment strip would mark areas for deployment. Corner buoys for the sites shall be placed using DGPS with sub-meter accuracy. Natural limestone provides an ideal substrate for the establishment of a fouling community and colonization by the common reef community species. HRHC reefs are intended to provide persistent habitat with higher complexity and habitat diversity than LRLC hardbottom or reefs.



Source: Port of Miami

Proposed Seagrass Restoration Area	
Miami Harbor General Reevaluation Report Final Environmental Impact Statement	
Scale: NTS	Drawn By: MR
Date: Sept, 2003	
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J00-499
	Figure 16



LEGEND

Component 1

- 1C - Footprint

Artificial Reef Mitigation Sites

- DERM Permitted Artificial Reef Mitigation Site
- Proposed Additional Artificial Reef Mitigation Site

Hardbottom / Reef Map

- scat. rubble/lb
- scat. rock/al/lb/sponge
- patchy low relief
- low relief
- patchy high relief
- high relief

2500 0 2500 5000 Feet

Miami-Dade County Artificial Reef Program Sites	
Miami Harbor General Reevaluation Report Final Environmental Impact Statement	
Scale: 1" = 2,500'	Drawn By: MR
Date: Sept, 2003	
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J00-499
	Figure 17

LRLC reefs would have a vertical relief of 1 to 2 feet and would be placed inshore of, and shallower than, HRHC reefs. It is recognized that the LRLC reefs may be periodically buried by shifting sands, like the low relief natural reefs they are intended to mimic. This does limit their habitat value to some extent, but it has been suggested (albeit without much empirical evidence) that this sort of ephemeral, low relief habitat may be particularly important in supporting the recruitment and post settlement survival of juvenile fishes. Dredged limestone rock placement should provide LRLC habitat. To provide interstitial sand habitat, approximately 20 percent of the LRLC reef footprint shall be open sand. Deployment sites would be delineated as outlined above for HRHC reefs.

Construction of mitigation reefs would take place during dredging of the Entrance Channel and Fisherman's Channel, as rock material suitable for reef building is excavated from these channels .

The monitoring program for the mitigation reefs would consist of both physical and biological components. Physical monitoring would assess the degree of settling of the reef materials, and biological monitoring would assess populations of algae, invertebrates, and fishes, as compared with concurrent control sampling of natural reefs. Monitoring would be conducted annually in the summer months. In order to supplement quantitative monitoring efforts and provide a permanent record of reef conditions and biota, each sampling effort would include representative video transects of the mitigation reefs.

6.0 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

Compliance with Federal Statutes, Executive Orders, and polices have been considered for the three project alternatives. The following sections describe the various requirements and the compliance status for each of the alternatives.

6.1 National Environmental Policy Act of 1969

Environmental information on the project has been compiled and this Environmental Impact Statement (EIS) was prepared. The project is in full compliance with the National Environmental Policy Act.

6.2 Endangered Species Act of 1973

Consultation was initiated with NMFS and FWS upon submittal of Biological Assessments (Appendix H). A Biological Opinion dated February 26, 2003 was received from the National Marine Fisheries Service concerning species under their jurisdiction, and a concurrence with the USACE finding of not likely to adversely affect species under FWS jurisdiction was included in the Final CAR dated June 17, 2003 (Appendix K).

6.3 Fish and Wildlife Coordination Act of 1958

This project has been coordinated with the FWS. The Final CAR was received from FWS on June 17, 2003 (Appendix K). This project is in full compliance with the Act.

6.4 National Historic Preservation Act Of 1966

The Archeology and Historic Preservation Act (PL 93-291), and Executive Order 11593 have been complied with. Archival research and field investigations have been conducted for the proposed channel realignment and for new disposal areas. Concurrence of compliance with this Act has been received from the State Historic Preservation Officer. Impacts to any resources included in or eligible for inclusion in the National Register of Historic Places would be avoided. If the USACE constructs its reef mitigation sites in localities currently not permitted by DERM, then the USACE will coordinate the placement of this material with SHPO.

6.5 Clean Water Act of 1972

The project will be in compliance with this Act. A Section 401 Water Quality Certification will be obtained prior to construction. All state water quality standards will be met. A Section 404(b)(1) evaluation is required for this action and is included in Appendix C.

6.6 Clean Air Act of 1972

The short-term impacts from dredge emissions and other construction equipment associated with the project would not significantly impact air quality. No air quality permits would be required for this project. Miami-Dade County is designated as an attainment area for Federal air quality standards under the Clean Air Act. Because the project is located within an attainment area, EPA's General Conformity Rule to implement Section 176(c) of the Clean Air Act does not apply and a conformity determination is not required.

6.7 Coastal Zone Management Act of 1972

A Federal consistency determination in accordance with 15 CFR 930 Subpart C is included in this report as Appendix D. The State of Florida reviewed the DEIS and on May 14, 2003, determined that the proposed project is in compliance with the Florida Coastal Management Program (Appendix D).

6.8 Farmland Protection Policy Act of 1981

No prime or unique farmland would be impacted by implementation of this project. This Act is not applicable.

6.9 Wild and Scenic River Act of 1968

No designated Wild and Scenic River reaches would be affected by project related activities. This Act is not applicable.

6.10 Marine Mammal Protection Act of 1972

The USACE has initiated consultation with NMFS and FWS under the Marine Mammal Protection Act of 1972. A Small Take Authorization (STA) application will be submitted in the near future for blasting activities conducted in the Jacksonville District. After issuance of the STA, a Letter of Authorization will be requested to authorize the take of marine mammals associated with the use of blasting as a construction technique at Miami Harbor.

6.11 Estuary Protection Act of 1968

No designated estuary would be affected by project activities. This Act is not applicable.

6.12 Federal Water Project Recreation Act

The principles of the Federal Water Project Recreation Act, (Public Law 89-72) as amended, do not apply to this project.

6.13 Fishery Conservation and Management Act of 1976

The project has been coordinated with NMFS and is in compliance with the Act.

6.14 Submerged Lands Act of 1953

The project would occur on submerged lands of the State of Florida. The project has been coordinated with the State and is in compliance with the Act.

6.15 Coastal Barrier Resources Act (CBRA) and Coastal Barrier Improvement Act (CBIA) of 1990

The proposed action has been coordinated with the FWS under the CBRA and CBIA and is in compliance with the Acts.

6.16 Rivers and Harbors Act of 1899

The proposed work would not obstruct navigable waters of the United States. The proposed action has been subject to the public notice, public hearing, and other evaluations normally conducted for activities subject to the Act. The project is in full compliance.

6.17 Anadromous Fish Conservation Act

Anadromous fish species would not be affected. The project has been coordinated with the NMFS and is in compliance with the Act.

6.18 Migratory Bird Treaty Act and Migratory Bird Conservation Act

No migratory birds would be affected by project activities. The project is in compliance with these Acts.

6.19 Marine Protection, Research and Sanctuaries Act

The term "dumping" as defined in the Act [3(33 U.S.C. 1402) (f)] does not apply to the placement of material for a purpose other than disposal (i.e. placement of rock material as an artificial reef or the construction of artificial reefs as mitigation). Therefore, the Marine Protection, Research and Sanctuaries Act, does not apply to this project as currently proposed, however if any of the dredged material is disposed in the ODMDS, then this act will apply. Concurrence from EPA under Section 103 of the Act would be required along with any required testing of the material for suitability for ocean dumping. More information on the ODMDS site can be found in the Preliminary Assessment, Dredged Material Management Plan in Appendix E to the General Reevaluation Report. The disposal activities addressed in this EIS have been evaluated under Section 404 of the Clean Water Act.

6.20 Magnuson-Stevens Fishery Conservation And Management Act

An EFH assessment describing existing EFH and potential impacts to EFH with project implementation was prepared and submitted to NMFS with the DEIS. Therefore, the project is in compliance with this Act.

6.21 E.O. 11990, Protection of Wetlands

No wetlands would be affected by project activities. This project is in compliance with the goals of this Executive Order.

6.22 E.O. 13089, Coral Reef Protection

The proposed action would affect United States coral reef ecosystems as defined in the Executive Order. Precautions would be implemented during construction to minimize impacts. Artificial reefs would be constructed to mitigate for any reef impacts associated with dredging activities. Therefore, the project is in compliance with the goals of this Executive Order.

6.23 E.O. 11988, Flood Plain Management

The project is in the base flood plain (100-year flood) and has to be evaluated in accordance with this Executive Order. The project is in compliance.

6.24 E.O. 12898 Environmental Justice

The purpose of the proposed action is to provide increased safety, efficiency and lower costs for navigation while protecting the environment. Existing Port facilities are not easily accessible to some larger vessels that must await favorable tidal conditions, because of depth limitations in parts of the channel, and other large vessels can only use the channel if they are "light-loaded." The proposed activity would not (a) exclude persons from participation in, (b) deny persons the benefits of, or (c) subject persons to discrimination because of their race, color or national origin, nor would the proposed action adversely impact "subsistence consumption of fish and wildlife." The proposed action would benefit shipping and the general economy including minority and low-income populations.

7.0 PUBLIC INVOLVEMENT

7.1 Scoping and Agency Coordination

In accordance with the National Environmental Policy Act (NEPA), an information letter was sent to interested parties on January 6, 2000. In addition, all parties were invited to participate in the plan formulation process by identifying any additional concerns on issues, studies needed, alternatives, procedures, and other matters related to the project. A local, state, and Federal resource agency meeting was held on March 13, 2000, to determine the areas of coverage for an environmental baseline resource survey. A meeting followed on November 1, 2000, with those resource agencies to review preliminary results. Appendix A and Appendix B include all documents associated with scoping including comments received from various stakeholders during the scoping process. A Notice of Intent (NOI) was published in the Federal Register (Volume 66, No. 167:45290) on August 28, 2001 informing the public of the USACE's intent to prepare a Draft EIS.

A Notice of Availability (NOA) was published in the Federal Register (Volume 68, No. 80:20386-20387) on April 25, 2003 to advertise the release of the Draft EIS for public review and comment. A public meeting was held on May 6, 2003 at the Port of Miami to present the results of the Draft GRR and Draft EIS and to give the public an opportunity to express their views and furnish specific data to support their views for consideration in preparing the final report. Written comments from commenting federal, state, and local government agencies, various private and non-profit organizations and individuals are included in Appendix N along with the official responses from the USACE.

Federal agencies involved included the USACE, the U.S. Coast Guard (USCG), the Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service (FWS), and the National Marine Fisheries Service (NMFS). State agencies included the Florida Department of Environmental Protection (FDEP), Florida Fish and Wildlife Conservation Commission (FFWCC), State Historic Preservation Office (SHPO), and the Florida Department of Transportation (FDOT). Local agencies included Miami-Dade County Department of Environmental Resources Management (DERM), South Florida Regional Planning Council (SFRPC), and the City of Miami. Non-Government Organizations/Institutions included the Pilots and the Biscayne Bay Regional Coordination Team (formerly the Biscayne Bay Partnership Initiative).

7.2 List of Recipients

See Appendix M.

7.3 Comments Received and Response

Comments received regarding the Draft EIS have been fully addressed and are included in Appendix N of this document.

8.0 LIST OF PREPARERS

Name	Affiliation	Role
Terri Jordan	Biologist, Planning Division, Jacksonville District USACE	Document Preparation and Review
James McAdams	Environmental Engineer, Planning Division, Jacksonville District USACE	Document Supervision/ Document Review
Richard Powell	Engineer, Planning Division, Jacksonville District USACE	Engineering Support Document Review
Robert King	Economist, Planning Division, Jacksonville District USACE	Economics Support
Rene Perez	Engineer, Project Management, Jacksonville District USACE	Project Coordination Document Review
Steve Dial	Marine Biologist, Dial Cordy and Associates Inc.	EIS Project Principal Mitigation Plan/Impact Analysis/Document Preparation and Review
Lee Swain	Ecologist, Dial Cordy and Associates Inc.	EIS Project Manager Document Preparation and Review
Kelley Grimm	Ecologist, Dial Cordy and Associates Inc.	Document Preparation
Jason Evert	Ecologist, Dial Cordy and Associates Inc.	Biological Assessment Preparation
Jason Croop	Marine Biologist, Dial Cordy and Associates Inc.	Impact Assessment/Essential Fish Habitat Assessment
Mike Rice	GIS Specialist, Dial Cordy and Associates Inc.	GIS Analysis/Impact Analysis
Annette Taylor	Aquatic Biologist, Dial Cordy and Associates Inc.	Technical Editor
Becky Hope	Environmental Manager, Port of Miami	Document Review
Amy Kimball-Murley	Planner, Curtis & Kimball Company	Document Review
Pat McNeese	Biologist, Consultant to the Port of Miami; Pat McNeese Consulting	Cumulative Impact Analysis/Document Preparation and Review
Nancy Case O'Bourke	Engineer, Shaw Engineering, Inc.	Document Review

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