ENVIRONMENTAL ASSESSMENT

FOR

FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS

NAVAL AIR STATION KEY WEST

APRIL 2003

UNITED STATES NAVY

EXECUTIVE SUMMARY

DESCRIPTION OF THE PROPOSED ACTION

The Navy proposes to modernize ship and aircraft support functions and facilities at the Naval Air Station (NAS) Key West including Boca Chica and Truman Harbor. The Navy needs to undertake such modernization to meet ongoing and new training readiness requirements. By making improvements to existing facilities, the Navy intends to build redundancy into east coast training locations and infrastructure support capability so that operational units can better achieve unit level, intermediate, or advanced qualifications at the most effective and efficient operations tempo (OPSTEMPO) and personnel tempo (PERSTEMPO).

The proposed projects would improve existing aircraft and ship support by providing modern facilities designed for twenty-first century ships and aircraft. Improvements at Boca Chica would provide modern re-fueling capability and aircraft traffic control. Improvements at Truman Annex would provide modern ship berthing facilities, limited repair capability, force protection and improvements to navigational safety. Projected and planned replacement aircraft and crews would benefit from the Boca Chica improvements. Increased port visits at Truman Annex, by Naval ships are anticipated because the berthing and mooring will be designed to accommodate both cruisers and destroyers in addition to those ships that already visit (frigates, minesweepers, etc.), and the Annex would be able to accommodate more than one ship at a time.

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

The EA focuses on potential impacts to land and water resources of the alternatives associated with the Proposed Action. Alternatives associated with the Proposed Action include a Preferred Alternative, a Full-Support Alternative, and the No-Action Alternative.

Implementation of the Preferred Alternative would have no significant long-term or short-term impact on land use, public health and safety or utilities and public services. The Preferred Alternative would be consistent with and beneficial to the existing land uses at Truman Annex and Boca Chica. The Preferred Alternative would not significantly increase the risk from explosives, aircraft accident potential, or environmental contamination at Truman Annex and Boca Chica. The Preferred Alternative would impact no wetlands, nor would landside construction projects directly disturb protected species at NAS Key West.

Construction activity contained in the Preferred Alternative would have no significant impact on inland water resources or important geologic or soil resources. The components of the Preferred Alternative would not directly impact inshore ground or surface water resources at NAS Key West. Waterway (channel) usage at Key West would increase if the Preferred Alternative results in greater visitation from Naval afloat units.

Impacts to bathymetry and sediment quality from the dredging aspects of the Preferred Alternative would be insignificant. Impacts of the Preferred Alternative would be insignificant because the Navy would follow the terms and conditions of the joint Environmental Resource Permit, and the Preferred Alternative is limited both spatially and temporally. No significant impacts to sensitive benthic communities should occur because these marine resources will be avoided during routine dredging

operations. Turbidity and sedimentation will be limited spatially and temporally and insignificantly affect water quality and marine resources.

Routine dredging operations associated with the Preferred Alternative would result in no substantial adverse effects to Essential Fish Habitat (EFH), no adverse effect to marine turtles and manatees, and no take of marine mammals. If hopper dredging is used, then Navy will comply with the terms of the National Marine Fisheries Service (NMFS) Biological Opinion issued to the US Army Corps of Engineers for dredging in the Southeast United States. A beneficial impact to local benthic resources regarding turbidity and sedimentation may occur due to dredging and removal of large amounts of fine sediments that have accumulated in the Ship Channel, turning basin, and Truman Harbor and are now resuspended each time large vessels enter and leave port. An additional beneficial effect to benthic communities may be realized by filling the quarry pits at the proposed dredged material placement site to depths that would allow seagrasses to colonize and provide habitat for fishes and benthic organisms. The Preferred Alternative and the cumulative impact on marine resources resulting from the incremental impact of the Preferred Alternative when added to other past, present, and reasonably foreseeable future actions are not likely to significantly affect marine resources.

One landside component of the Preferred Alternative may occur within an important archeological site near Fort Zachary Taylor State Park (Fort). Consequently, impacts to existing cultural resources are possible. While complete archeological resources present at the site are unknown, limited excavation is proposed at the Fort under the Preferred Alternative. The Navy will attempt to avoid such sites during this excavation. If Navy conducts excavation in an archaeologically significant site, Navy will initiate provisions under the National Historic Preservation Act (NHPA).

No significant changes in air quality, off-base noise exposure or accident potential zones (APZ) are expected to result directly from the Preferred Alternative. Facilities improvements at Boca Chica may result in somewhat increased aircraft operations with resultant emissions, but air quality indicators should remain below threshold limits. No increases in off-base noise exposure or APZs from aircraft operations that may occur as a result of the Preferred Alternative are anticipated. Using predicted annual aircraft operations (e.g., flight tracks and their projected usage), projected noise levels and APZs from the anticipated increase in future aircraft use have been developed in a noise study. The Navy anticipates no increase in noise contours or APZs from aircraft operations in overland areas, since military air traffic would be directed away from Key West land areas. To the extent noise contours and APZs of the Preferred Alternative differ from existing noise contours and APZs, the changes are a positive impact as they largely cause these footprints to move over water and away from the community.

Although the Preferred Alternative would likely result in a small increase in military and civilian workers, and increased visitation by Fleet unit personnel, projected increases in use of public utilities will not overburden existing utilities and public services. Although the Preferred Alternative would likely result in an economic benefit to the city, the change in socioeconomic conditions at NAS Key West and the local community would not be significant. Land uses would stay the same. Housing populations are expected to increase only minimally, as are school populations and traffic. No other socioeconomic status change in the area is expected.

The Full Support Alternative would allow additional flexibility to operational commanders in providing nearly the equivalent of home basing for visiting aircraft and homeport husbanding for visiting ships but at greater environmental cost to accomplish it. The Navy expects there may be greater impacts resulting from the Full Support Alternative, including: potential impacts to wetlands from construction; and noise and safety footprints from aircraft activity.

The No-Action Alternative would provide less ship and aircraft support over time as facilities deteriorate while allowing continued marine water quality impacts as ship movements resuspend fine sediments in the Main Ship Channel and turning basin.

TABLE OF CONTENTS

Section Page

CHAPTER 1 INTRODUCTION..... 1
1.1 BACKGROUND..... 1
1.2 PROPOSED ACTION..... 5
1.3 RELEVANT ISSUES..... 7
CHAPTER 2 DESCRIPTION OF THE PROPOSED ACTION AND OTHER ALTERNATIVES..... 10
2.1 DESCRIPTION OF THE PROPOSED ACTION..... 10
2.2 ALTERNATIVES..... 13
CHAPTER 3 AFFFECTED ENVIRONMENT..... 23
3.1 LAND USE..... 23
3.2 GEOLOGY, SOILS AND TOPOGRAPHY..... 24
3.3 BIOLOGICAL RESOURCES..... 27
3.4 WATER RESOURCES – LANDSIDE/MARINE..... 53
3.5 CULTURAL RESOURCES..... 57
3.6 AIR QUALITY..... 58
3.7 PUBLIC HEALTH AND SAFETY..... 59
3.8 UTILITIES AND PUBLIC SERVICES..... 63
3.9 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE..... 66
3.10 NOISE/AICUZ..... 70
CHAPTER 4 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES..... 90
4.1 LAND USE..... 90
4.2 TOPOGRAPHY, GEOLOGY, SOILS, AND MARINE SEDIMENTS..... 91
4.3 BIOLOGICAL RESOURCES..... 93
4.4 WATER RESOURCES..... 104
4.5 CULTURAL RESOURCES..... 107
4.6 AIR QUALITY..... 109
4.7 PUBLIC HEALTH AND SAFETY..... 110
4.8 UTILITIES AND PUBLIC SERVICES..... 111
4.9 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE..... 114
4.10 NOISE/AICUZ..... 115
CHAPTER 5 CUMULATIVE IMPACTS AND OTHER CONSIDERATIONS..... 118
5.1 POTENTIAL CUMULATIVE IMPACTS..... 118
5.2 POTENTIAL CULULATIVE IMPACTS FROM DREDGING..... 118
CHAPTER 6 REFERENCES CITED..... 120
CHAPTER 7 LIST OF PREPARERS..... 131

APPENDICES

A Diver Survey Associated with the Environmental Assessment for Fleet Support and Infrastructure Improvements NAS Key West, Florida, Continental Shelf Associates, Inc. August 12, 2002.
B South Atlantic Division Corps of Engineers, Hopper Dredging Protocol for Atlantic Coast, FY 98 – FY 03; Endangered Species Act-Section 7 Consultation Biological Opinion, U.S. Army Corps of Engineers, South Atlantic Division
C Florida Fish and Wildlife Conservation Commission, Bureau of Protected Species Management Standard Manatee Construction Conditions, June 2001.

D Florida Keys National Marine Sanctuary No Anchor Zone Locations

E Letters Received From Agencies

1. United States Department of the Interior, Fish and Wildlife Service, January 30, 2003.
2. Florida Fish and Wildlife Conservation Commission, January 31, 2003.
3. Florida Department of Transportation, February 11, 2003.
4. South Florida Water Management District, February 13, 2003.
5. Florida Department of Environmental Protection, Office of Intergovernmental Programs, February 25, 2003.
6. Florida Department of Environmental Protection, February 25, 2003 (Memorandum).
7. Florida Keys National Marine Sanctuary, with Attachment A, March 14, 2003.
8. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, March 19, 2003.
9. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, March 28, 2003.
10. Department of the Navy, Key West Naval Air Facility, April 4, 2003.
11. United States Department of the Interior, Fish and Wildlife Service, South Florida Ecological Services Office, April 9, 2003.

F Sediment Quality For Samples Collected In Truman Harbor, The Turning Basin and Main Ship Channel Collected 13 to 15 September 2003 By Continental Shelf Associates, Inc.

LIST OF ACRONYMS AND ABBREVIATIONS

ACSC	Area of Critical State Concern
AICUZ	Air Installations Compatible Use Zone
AIMD	Aircraft Intermediate Maintenance Department
AT/FP	Anti-Terrorism Force Protection
APZ	Accident Potential Zone
ARGs	Amphibious Ready Groups
AST	Aboveground Storage Tank
BG	Battle Group
BRAC 95	Base Realignment and Closure Commission of 1995
CAA	Clean Air Act
C	Celsius
CCCL	Coastal Construction Control Line
CEQ	Council on Environmental Quality
CES	City Electric System
CFFC	Commander Fleet Forces Command
City	City of Key West
cm	centimeter
CNR	Composite Noise Rating
COMLANTFLT	Commander Atlantic Fleet
CRM	Cultural Resource Manager
CVBG	Carrier Battlegroup
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DDT	Dichlorodiphenyltrichloroehtane
DERA	Defense Environmental Restoration Account
Det	Detachment
DOD	Department of Defense
DON	Department of Navy
DNL	Day-Night Average Sound Level
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESQD	Explosive Safety Quantity Distance
EW	Electronic Warfare
FCMP	Florida Coastal Management Program
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FDNR	Florida Department of Natural Resources
FEMA	Federal Emergency Management Agency
FFWCC	Florida Fish and Wildlife Conservation Commission
FKAA	Florida Keys Aqueduct Authority
FMPs	Fishery Management Plans
FKNMS	Florida Keys National Marine Sanctuary
FMRI	Florida Marine Research Institute
FNAI	Florida Natural Areas Inventory
FONSI	Finding of No Significant Impact
Fort	Fort Zachary Taylor State Park
ft	feet/foot
GMFMC	Gulf of Mexico Fishery Management Council
GOMEX	Gulf of Mexico
gpd	gallons per day
HAPC	Habitat Areas of Particular Concern
IDTC	Inter-deployment Training Cycle
IRP	Installation Restoration Program
JIATF	Joint Interagency Task Force

LIST OF ACRONYMS AND ABBREVIATIONS (continued)	
KES	Keys Energy Services
km	kilometer
m	meters
METL	Mission Essential Task List
MEU	Marine Expeditionary Units
mgd	million gallons per day
mg/l	milligrams per liter
MLW	Mean Low Water
MMPA	Marine Mammal Protection Act
MSL	Mean Sea Level
MWR	Morale, Welfare, and Recreation
NAAQS	National Ambient Air Quality Standards
NAF	Naval Air Facility
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
NAWCAD Det	Naval Air Warfare Detachment
NEPA	National Environmental Policy Act
NEX	Naval Exchange
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
OFW	Outstanding Florida Waters
OMI	Operations Management International
OPAREAS	operating areas
OPCEN	Operations Center
OPFOR	opposition forces
OPNAVINST	Naval Operations Instruction
OPSTEMPO	operations tempo
OWWO	Oily Water and Waste Oil
PAH	polycyclic aromatic hydrocarbon
PCB	Polychlorinated Biphenyl
PERSTEMPO	personnel tempo
ppt	parts per thousand
RATCF	Radar and Air Traffic Control Facility
SAFMC	South Atlantic Fishery Management Council
SHPO	State Historic Preservation Office
SIMA	Shore Intermediate Maintenance Activity
sq	square
SWMU	Solid Waste Management Unit
TACTS	Tactical Aircrew Combat Training System
TSP	Total suspended particles
USACOE	United States Army Corps of Engineers
USASFUOS	U.S. Army Special Forces Underwater Operations School
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USNS	United States Naval Ship
UST	underground storage tanks
VCAPES	Virginia Capes
WMEC	Coast Guard Medium Endurance Cutters
WWTP	Waste Water Treatment Plant

LIST OF TABLES

Table		Page
1-1	Annual Support Provided by NAS Key West: Aircraft Squadrons	3
1-2	Typical Annual Support Provided by NAS Key West: Ships (1997-2001)	4
2-1	Preferred Alternative Components	12
2-2	Full Support Alternative Project Components, Including Components of the Preferred Alternative	14
3-1	Threatened and Endangered Species and Species of Special Concern Reported on or Near Boca Chica and Truman Annex	29
3-2	Invertebrate Species for Which EFH has been Identified in the Ship Channel, Turning basin, Truman Harbor, and Dead End Canals Near Key West, Florida (SAFMC 1998a)	43
3-3	Representative Reef Fish Species for Which EFH has been Identified in the Ship Channel, Turning Basin, Truman Harbor, and Dead End Canals Near Key West, Florida (South Atlantic Fishery Management Council 1998a)	44
3-4	Highly Migratory Species for Which EFH has been Identified in the Ship Channel, Turning Basin, and Truman Harbor Near Key West, Florida (National Marine Fisheries Service 1999a,b; South Atlantic Fisheries Management Council 2001)	45
3-5	Coastal Pelagic Fishes for Which EFH has been Identified in the Ship Channel, Turning Basin, and Truman Harbor near Key West, Florida (SAFMC 1998a)	47
3-6	Marine Turtle Species Known to Occur Within the Florida Keys	48
3-7	Marine Mammal Species Potentially Occurring in Proximity to the Florida Keys	51
3-8	Turbidity Levels Observed During Water Column Profiling	56
3-9	Truman Annex Installation Restoration Sites	60
3-10	Boca Chica Airfield Installation Restoration Sites	62
3-11	Age Breakdown of Permanent Population in Key West	66
3-12	Population by Race in Key West	67
3-13	Employment Profile for the City of Key West	68
3-14	Household Income for City of Key West, Florida	68
4-1	Impact Producing Factors on EFH From Proposed Dredging Project	98
4-2	Results of Elutriate Analyses of Sediments Collected During 13 to 15 September 2002 In the Ship Channel, Turning Basin, and Truman Harbor	106
4-3	NAS Key West Aircraft Operations CY 77, CY 01, and CY 07	116
4-4	Approximate Private Off-Base Land Areas Included in 1977 and 2007 Noise	117

LIST OF ILLUSTRATIONS

Figure		Page
1-1	General Location Map	8
1-2	Boca Chica Airfield Aerial	9
2-1	Preferred Alternative - Projects Locations at Boca Chica Airfield	17
2-2	Truman Harbor AT/FP Security Improvements	18
2-3	Preferred Alternative Mole Pier Improvements at Truman Harbor	19
2-4	Preferred Alternative Landside Projects at Truman Harbor	20
2-5	Key West Channel, Turning Basin, and Harbor Excavation Site	21
2-6	Dredged Material Placement Site Alternative Considered	22
3-1	Truman Annex Land Use	73
3-2	Boca Chica Land Use	74
3-3-1	Bathymetry Survey Ship Channel	75
3-3-2	Bathymetry Survey Cut A	76
3-3-3	Bathymetry Survey Cut B	77
3-3-4	Bathymetry Survey Cut C	78
3-3-5	Bathymetric Survey Truman Harbor	79
3-4	Sediment and Water Column Profiling Sample Locations	80
3-5	Wetlands - Boca Chica Airfield	81
3-6	Protected Species Location – Boca Chica Airfield	82
3-7	Protected Species – Landside Locations at Truman Harbor	83
3-8	Side-Scan Sonar Survey Transects	84
3-9	Diver Video Transects and Ground-Truthing Dive Sites	85
3-10	Benthic Biological Communities	86
3-11	Historical Resources – Truman Annex	87
3-12	Cultural Resources – Boca Chica	88
3-13	NAS Key West Installation Restoration Sites	89

CHAPTER 1

INTRODUCTION

This Environmental Assessment (EA) presents the Proposed Action, Purpose and Need, and alternatives for Fleet shore infrastructure support upgrades and improvements at Naval Air Station (NAS) Key West. This EA evaluates the potential impacts of alternatives to achieve the Proposed Action.

The National Environmental Policy Act (NEPA) requires that Federal agencies consider potential environmental consequences of Proposed Actions and Alternatives in their decision-making process. The intent of NEPA is to protect, restore, or enhance the environment through well-informed Federal decisions. The Council on Environmental Quality (CEQ) was established under NEPA for the purpose of implementing and overseeing Federal policies as they relate to this process. In 1978, the CEQ issued *Regulations for Implementing the Procedural Provisions of the NEPA* (40 CFR § 1500-1508). These regulations specify that an EA be prepared to:

- briefly provide sufficient analysis and evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI);
- aid in an agency's compliance with NEPA when an EIS is deemed unnecessary; and
- facilitate EIS preparation when one is necessary.

This EA has been prepared in accordance with the CEQ Regulations and Naval Operations Instruction (OPNAVINST) 5090.1B Change 3, *Environmental and Natural Resources Training Manual*. The EA will be reviewed to make a determination as to whether a FONSI or an EIS is appropriate.

1.1 BACKGROUND

NAS Key West's mission is to serve as the Navy's premier pilot training facility for transient tactical aviation squadrons, to maintain and operate Fleet support facilities, and to provide services and materials in support of this nation's military activities. NAS Key West provides a number of benefits to Fleet readiness. Current assets at Key West allow the Navy to prepare and train individuals as well as aircraft and ships for deployment. With the proposed improvements to NAS Key West, the Navy can improve the overall quality and value of this deployment readiness at minimal cost. Key West's unique location between the Gulf of Mexico and the Atlantic Ocean, coupled with the capacity for upgraded/future technologies, afford the Navy efficient and effective means to support nearby at-sea readiness activities and to provide logistics and maintenance support for ships and aircraft. These support functions will facilitate timely Carrier Battlegroup (CVBG) certification before each overseas deployment.

Navy often uses at-sea operating areas (OPAREAS) in the Southeast Region of the United States (Key West, Gulf of Mexico, and Jacksonville OPAREAS) for Basic , Intermediate , and Advanced CVBG Training. Ideal weather throughout the year allows the Navy to complete necessary readiness requirements (multi-unit and Joint Force readiness evolutions) during fixed training windows. Given its proximity to these OPAREAS, NAS Key West provides an ideal logistics and maintenance location for ships and aircraft. Should a ship or aircraft need emergency repairs while conducting exercises in a nearby OPAREA, NAS Key West can expedite delivery of needed parts and provide a safe haven and "hotel" services at Truman Harbor or the airfield. Thus, ships and aircraft can achieve necessary repairs with minimal time away from training exercises. Additionally, because many aviation-related assets are already in place there, NAS Key West serves as an ideal operating base for opposition and aggressor forces that conduct operations against CVBG assets during readiness exercises. Finally, Key West serves as an ideal location to provide command and control functions for at-sea exercises in the nearby OPAREAS.

NAS Key West comprises 6,389 acres of land distributed in eighteen (18) properties located in the Florida Keys, Monroe County, Florida. With seventeen (17) of the properties located within a seven-mile radius of the Navy airfield on Boca Chica Key, most of NAS Key West lies in the vicinity of the City of Key West (City) (Figure 1-1). Boca Chica encompasses 3,912 acres and consists of an airfield, administrative and industrial facilities, and recreational areas. NAS Key West includes the Truman Annex, consisting of multi-use buildings on about 80 acres of land, plus a 50-acre harbor separated from open water by a 7.6-acre Mole Pier (Figure 1-2). The NAS Command also has responsibilities for housing and personnel support facilities located at Sigsbee Park, Peary Court, Trumbo Point and Truman Annex. NAS Key West also provides and maintains facilities and services for other Navy tenants as well as other Department of Defense (DOD) Services and the United States Coast Guard (USCG).

NAS Key West personnel and facilities support approximately 30 commands and customers, including the Joint Interagency Task Force (JIATF), Joint Southern Reconnaissance Surveillance Operating Center, Fighter Attack Squadron 101 (VFA-106) Detachment (Det[1]), Tactical Aircrew Combat Training System (TACTS[2]), Naval Air Warfare Center Det, Naval Research Laboratory, U.S. Army Special Forces Underwater Operations School (USASFUOS), and the USCG Group Key West. Tenant activities include: the Navy Branch Medical Clinic, Navy Branch Dental Clinic, Human Resources Office, Personnel Support Activity Det, Navy Exchange, Defense Commissary Agency, Family Services Center, Navy Campus, Navy/Marine Corps Relief Society, Naval Computer and Telecommunications Area Master Station Atlantic Det, Foreign Broadcast Information Service, Naval Construction Battalion Unit 402, Navy Weather, Defense Investigative Service, Naval Criminal Investigative Service, and Southern Division, Naval Facilities Engineering Command (NAVFAC). The workforce at NAS Key West comprises approximately 1,081 personnel, of which 385 are military members, 393 civilians, 132 contract workers, and 171 other individuals such as Morale, Welfare and Recreation (MWR) personnel.

NAS Key West Operations

The U.S. Navy's presence in Key West dates to the early 1800s, when a Naval base was established to support the fledgling nation's war on piracy. The base expanded and contracted over the years until World War I, when a Naval Submarine Base and Naval Air Base were commissioned to support the effort to interdict the German Navy. During the period between WWI and WWII, the Navy presence was greatly reduced and facilities were abandoned or sold. Activity at NAS Key West increased at the outbreak of WWII, and it was designated as a NAS. Although the Navy presence in Key West was greatly reduced and consolidated after the war, the Navy retained NAS Key West as a training site. After the Cuban Missile Crisis and during the DOD Cold War build up, the NAS facilities and missions grew. In the last decade, the Station's Atlantic Fleet support missions have changed: various properties have been excessed and homeported aircraft and ship squadrons have been decommissioned or relocated. These downsizing efforts continued with the Base Realignment and Closure Commission determinations of 1995 (BRAC 95).

NAS Key West operations of various annexes.

- Boca Chica. Most of the NAS Key West command and aviation support organizations are located at Boca Chica. Among those organizations are the Naval Atlantic Meteorology Det, the Naval Computer and Telecommunications Battalion Unit (NCTAMSLANT) Det, VFA-106 Det, Naval Construction Battalion Unit Four Zero Two (CBU 402), Aircraft Intermediate Maintenance Department (AIMD) Det, and the TACTS.

[1] Det - – A group of personnel and some organic assets or equipment from an operational unit which deploys from their home base to a location to perform a function or mission.

[2] TACTS – TACTS is a real time air-to-air and air-to-ground electronic video-displayed tracking system that enables as many as 36 aircraft to be engaged in simultaneous missions. The TACTS airspace and instrumentation towers are located in open-ocean waters off Key West. The TACTS equipment was relocated from Homestead Air Reserve Station in 1992 after hurricane Andrew destroyed the station.

Because of continuous ideal weather conditions and local aerial ranges are within minutes of takeoff, the airfield supports transient tactical aviation and training squadron Dets from all over the United States; thus, the airfield is considered one of the Navy's premier pilot training facilities. Historical aircraft operations, which the Navy and community use for planning purposes, are discussed in Section 3.10 NOISE/AICUZ. Aircraft operations at Naval air stations fluctuate over a continuum because they reflect world events, homebased aircraft deployments, aircraft upgrades, introduction of new aircraft, and training needs. Demonstrating that aircraft operations can fluctuate depending on world events and training needs, more recent annual aircraft support data (1997-2001) is shown in Table 1-1. The daily use and monthly summaries from which the information for the table was derived demonstrate the following:

- For the most part, East Coast Navy Fighter Attack Squadrons send six to ten aircraft on a Det and send more than one Det per year. The Fleet Replacement Squadrons (FRSs[3]) often send as many as ten or more Dets per year. The West Coast squadrons tend to send only one Det per year. During final work-ups before a deployment, a squadron may send 12 to 14 aircraft, half of which serve as an aggressor squadron. Navy strike aircraft Dets tend to stay for 12 days.
- Air Force Fighter Squadrons tend to send six to eight aircraft per Det and generally stay for five to 14 days, but may stay longer. Squadrons send from one to four Dets per year.
- Air Guard and Reserve squadron Dets from both services have about six to eight aircraft. They normally send one to two Dets per year and stay from ten to twelve days.
- The Electronic Warfare (EW) squadrons send from two to six aircraft per Det and stay for six to 12 days from four to six times per year.

Table 1-1 Annual Support Provided by NAS Key West: Aircraft Squadrons (1997-2001)

A/C TYPE	VISITING SQUADRON DETS	NUMBER A/C PER SQUADRON	PERSONNEL PER DET	DURATION OF VISIT (days)
STRIKE				
Navy	26	6 to 10	120	12
Air Force	14	6 to 8	100	5 to 14
EW	12	2 to 6	90	6 to 12
HELICOPTER	9	1 to 3	15	3 to 6
TRANSPORT/ MEDICAL	39	1 to 2	25	2 to 5
PILOT TRAINING	23	5 to 16	14	7

- Helicopter squadron Dets usually consist of one to three aircraft and stay for three to six days. Most often these aircraft are from ships operating in the region, with one or two Dets per year originating from their home base.
- The Air Force logistical and medical squadron Dets generally have one or two aircraft and stay two to five days. Naval logistical aircraft Dets are similar in size and length of stay. Medical squadron Dets typically have a full compliment of medical personnel. Logistical and medical squadrons usually send only one Det per year.

[3] FRS – A training squadron with specific type, model and series of aircraft to which aircrews new to the aircraft and aircrews returning to the aircraft from non-flying pilots assignments are sent for familiarization by experienced crews, prior to being assigned to an operational squadron.

- The aviation training squadrons have from five to sixteen aircraft in their Dets, with six the norm, and stay about a week. Since most of these squadrons are homebased at NAS Pensacola, they send four to eight Dets per year.
- On an average day in a busy month (February through June, September and October) NAS Key West will host over 50 aircraft from six to eight different squadrons and 500 personnel who require berthing and other support services from the airfield. As will be presented in following chapters, the operations performed during these visits are within the numbers of aircraft operations used to develop the existing AICUZ which has been used by the Navy and the community in land use planning.

- Trumbo Point Annex: Trumbo Point Annex, including Peary Court, consists of family housing, various support functions such as the Navy harbormaster and oil spill response, and U.S. Coast Guard Group Key West administrative and operational assets. A Naval Air Warfare Det (NAWCAD Det) is also is located at Trumbo Point. The NAWCAD Det conducts research projects involving sonobuoys, lasers, navigational systems, ordnance and various other research. Fleming Key, accessible by a bridge from Trumbo Annex, is the site of the USASFUOS, a magazine area and a closed U.S. Department of Agriculture, Animal & Plant Health Inspection Service (APHIS) Quarantine Station. The Army school trains combat divers, dive supervisors, and dive medical technicians.

- Sigsbee Park: Sigsbee Park Housing Annex is primarily single family housing units and housing support assets, with some MWR facilities.

- Truman Annex. Truman Annex is home to JIATF and its mission as the lead interagency command responsible for the detection and interdiction of illegal drugs. JIATF East now includes U.S. Customs Service, Drug Enforcement Administration, and Federal Bureau of Investigation personnel. Truman Annex also houses Department of Commerce Florida Keys National Marine Sanctuary (FKNMS), and National Oceanic and Atmospheric Administration (NOAA) assets on land excessed as a result of BRAC 95. The Annex supports Atlantic Fleet ships with berthing, freshwater, and occasionally fuel and other support services. In addition, by agreement with the City of Key West, Truman Annex also serves as a cruise ship berth. Table 1-2, which was derived from Navy data and interviews with Coast Guard and Navy personnel as well as others, provides typical ship visits at Truman Annex. Combatants that visit Key West may be enroute to other parts of the globe or operating in the Florida area.

Table 1-2 Typical Annual Support Provided by NAF Key West: Ships (1997-2001)

Ship Type	Visits Per Year		Crew Size	Services*		
	Number	Duration (days)	(average)	Fuel	Water	Electric
U.S. Navy Small Combatant	8	3	316	O	Y	Y
U.S. Navy Mine Warfare	25	2	66	F	Y	Y
USNS	15	3	39	F	Y	Y
U.S. Coast Guard WMEC	8	3	87	O	Y	Y
NOAA	10	2	35	O	Y	Y
U.S. Navy Patrol Boats	5	2	39	F		Y

Ship Type	Visits Per Year		Crew Size	Services*		
	Number	Duration (days)	(average)	Fuel	Water	Electric
Foreign Combatants	5	5	320	O	Y	O
Other Use						
Research Vessels	5	2	25	O	Y	O
U.S. Army	4	4	16	O	Y	O
Cruise Ships	130	8-12 Hours	1,200	N/A	N/A	N/A
* O = Occasionally	F = Frequently	Y = Always	N/A = Not Applicable			

Examination of the summaries from which the information for the table was derived yields the following:

- Navy combatants use NAS Key West to pick up mail, personnel and supplies and as a liberty port while operating independently or as part of a larger force.
- The Mine Warfare ships frequently use NAS Key West as a way point while operating from their home base at Ingleside Texas, and typically more than one ship visits at a time.
- Visiting Coast Guard Medium Endurance Cutters (WMECs) are usually in the area as part of JIATF interdiction patrols, and use NAS Key West for the same purpose as the Mine Warfare ships as well as a local base of operations. They usually patrol for five to ten days and return to NAS Key West for three days.
- Navy Coastal Patrol Ships (PCs) and Coast Guard Patrol Boats (WPBs) usually patrol for three to four days and then return to NAS Key West for two to three days.
- United States Naval Ships (USNSs) visit NAS Key West as part of the JIATF mission as well as other surveillance and oceanographic survey missions.
- Foreign Navy ships use NAS Key West as a liberty port when operating with US Navy ships and while operating independently enroute to South America and the Caribbean.
- Cruise ships berth at Truman Annex when the other city berths are being used. They stay about half a day and require no services. Cruise ship use of Truman Annex is expected to increase to 150 ships per year by 2003.

1.2 PROPOSED ACTION

The Proposed Action is to modernize and update infrastructure and facilities to provide improved or additional capability essential to support and protect modern transient units visiting the NAS Key West. Infrastructure and facilities improvements to support aviation and surface units would include new construction as well as adapting or upgrading existing structures for more modern combatants. The updating, upgrading, maintenance, and construction will insure facilities are able to provide optimum support capability for modern Naval assets.

1.2.1 Purpose and Need for the Proposed Action

The Purpose and Need of the Proposed Action is to modernize and update capability of ship and aircraft support functions and facilities at Key West. Modern support capacity is needed at Key West, and other areas, to allow Commander Atlantic Fleet (COMLANTFLT) to fulfill readiness requirements in what is becoming an increasingly restrictive environment for periods away from homeport and periods at

sea. This would provide adequate Fleet training support, including ship and aircraft support functions and facilities with modern Anti-Terrorism Force Protection (AT/FP), at NAS Key West.

Naval forces achieve deployment readiness by performing those missions they would be expected to perform in a national contingency of time of war. The Navy's shore infrastructure supports readiness by providing logistics and maintenance locations for ships and aircraft, their weapons systems and their operating and support personnel. The Navy's ship and aircraft infrastructure support requirements change over time for several reasons: modernization of the Fleet, new weapons systems are developed and brought into use, battlefield strategies change to better address current and future threats, and personnel and quality of life standards change to ensure retention of the most desirable and qualified personnel. For example, in the last decade PERSTEMPO[4] and OPSTEMPO[5] management has become a key factor influencing the Inter-deployment Training Cycle (IDTC[6]) for battle groups. Included among the many other factors that influence the Navy's readiness are: shortened and expedited training schedules to respond to world events, increased operating and training costs, introduction of new weapons platforms and tactics, technological development changes in protected resources' status and distribution and population growth resulting in encroachment into operating areas.

To successfully execute the Navy and Marine Corps mission and attain the required training readiness levels for deployment, Commander Atlantic Fleet examined training requirements of Carrier Battlegroups, Amphibious Ready Groups (ARGs) and Marine Expeditionary Units (MEUs) requirements in terms of available steaming days, operating areas, airspace, real estate, infrastructure upgrades, outyear funding and technology enhancements. This examination included future platform and weapons capabilities and surge capacity to support concurrent CVBG-ARG/MEU deployment certification. The training study found that from the Basic phase (unit level training events) to the more complex Intermediate and Advanced phases, mobility and maneuver warfare were found to required an assortment of venues with varying degrees of capability and the shore infrastructure to support them.

COMLANTFLT developed a strategy to fully support all phases of readiness development and ensure sustained readiness. To ensure sustained readiness, COMLANTFLT has identified a need for redundancy in support capability near training locations. Such redundancy is required to provide multi-site, multi-dimensional training during fixed-duration training windows. Planned training locations include the Virginia Capes (VACAPES), Cherry Point, Jax, Key West, and Gulf of Mexico (GOMEX) Opareas. Thus, redundancy in support facility locations is also required to support this training. COMLANTFLT will continually evaluate the Navy's training requirements to determine necessary preparedness levels, funding requirements and appropriate investments to ultimately ensure continued sustained readiness.

Implementation of the Proposed Action will improve Atlantic Fleet readiness by adding flexibility and depth to existing resources, reduce readiness impacts caused by the non-availability of a single resource, and provide surge capacity to conduct multi-Task Force and Joint readiness evaluations when required. The Proposed Action takes advantage of existing assets and facilities and implements improvements to those that offer the best readiness support. The end result will reduce undue operational impacts on any one location and promote the benefits of multiple DOD, USN, and community partnerships.

---

[4] PERSTEMPO – The days a sailor or Marine is away from the locale of their home base.

[5] OPSTEMPO – The days an operational unit (e.g., a squadron or ship is operating or away from its homeport.

[6] IDTC – The approximately 18 month period between deployments when a squadron/ship during which the equipment and personnel re-build to readiness level for deployment. The interplay of PERSTEMPO, OPSTEMPO and the IDTC are essential to retaining a volunteer ready Force. For example, a shipyard availability away from the unit homeport would increase both PERSTEMPO and OPSTEMPO during an IDTC. This could result in crewmembers being away from home for the deployment plus another six months while in a shipyard. Also, if during the IDTC work-up, a unit is required to transit long distance for a readiness qualification, the additional transit time increases PERSTEMPO and OPSTEMPO and would reduce homeport days during the IDTC.

By modernizing and making improvements to existing facilities, the Navy intends to optimize its infrastructure support capability so that operational units will have support, and achieve unit, mid-level, or advanced qualifications at the most effective and efficient OPSTEMPO and PERSTEMPO.

Naval units cannot always accomplish required evolutions in the vicinity of their home base because of a variety of factors, e.g., seasonal weather, the lack of available support or assets, or multiple other conditions prevent completing a mission essential task list (METL[7]) requirement within the allotted "window" of opportunity. South Florida, because of its ideal weather conditions, is a premier location for ships and aircraft units home based elsewhere, either to pause while enroute to other locales or to transit to South Florida to meet readiness requirements. Aviation units, because weather or other home-base conditions prevent accomplishing a required evolution, have consistently sent detachments to Key West to achieve readiness qualifications. From the Station's inception as a submarine and air squadron base, NAS Key West has supported these transients by providing fuel, supplies and a location to affect intermediate repairs.

The EA addresses shore facility support improvements at NAF Key West only; other Fleet shore support locations will be discussed in other National Environmental Policy Act documents as those actions are developed and proposed.

1.3 RELEVANT ISSUES

Relevant issues associated with implementation of the Proposed Action include potential impacts to land use; public health and safety, including aircraft noise; biological resources; topography, geology, and soils; water resources; cultural resources; air quality; utilities and public services; and socioeconomics and environmental justice. These resources are addressed in detail in this EA. The evaluation of potential environmental impacts focuses on construction-related effects and operational effects (e.g., air operations and ship movements).

[7] METL – a list of specific operational capabilities, each of which must be satisfactorily completed before a unit is ready for deployment. One of several measures used to determine readiness.

TRUMAN HARBOR

TRUMAN ANNEX

MAGNETIC NORTH

0 6000 12000

SCALE IN FEET

FIGURE 1–1

GENERAL LOCATION MAP

ENVIRONMENTAL ASSESSMENT FOR
FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS
NAS KEY WEST

FILE: 1917/KEYWEST-EA/1917EA-TRUAER.DWG 04/04/03

1-2

MAGNETIC NORTH

0 800 1600

SCALE IN FEET

TRUMAN HARBOR AERIAL

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST

CHAPTER 2

DESCRIPTION OF THE PROPOSED ACTION AND OTHER ALTERNATIVES

2.1 DESCRIPTION OF THE PROPOSED ACTION

The Proposed Action is to modernize and update infrastructure and facilities to provide improved or additional capability essential to support modern transient units visiting at NAS Key West. Infrastructure and facilities improvements to support aviation and surface units would include new construction as well as adapting or upgrading existing structures for more modern combatants. The updating, upgrading, maintenance, and construction will insure facilities are able to provide optimum support capability for modern Naval assets.

2.2 ALTERNATIVES

2.2.1 Preferred Alternative

2.2.1.1 Boca Chica Improvements

Specific activities to be accomplished for air support projects at Boca Chica are: the construction of a Hot Pit Refueling facility, expansion of the Radar and Air Traffic Control Facility (RATCF) Building, and expansion of the TACTS Building A-4082. The airfield project elements are further described on Table 2-1, Preferred Alternative Components, and Figure 2-1.

2.2.1.2 Truman Annex Improvements

Improvements at Truman Annex would require retention of the Mole Pier and adjacent areas and would include new construction, improvements to existing structures, building demolition, and maintenance dredging. Additional readiness support equipment and operating personnel such as harbor craft, target retrievers, or opposition forces (OPFOR) are included within this alternative.

Specific projects related to ship support at Truman Annex Harbor are: repair of Building 284; demolition of Building 261; security improvements including construction of Harbor AT/FP Security Upgrades (Figure 2-2); renovations of Harbor Waterfront Utilities; demolition of the end of the Mole Pier and mooring improvements (Figure 2-3); and maintenance dredging in Truman Harbor, the turning basin outside the Mole Pier, and for the length of the main channel, as necessary (Figure 2-5). The harbor waterfront improvements are further described on Table 2-1**,** Preferred Alternative Components, and Figures 2-3 and 2-4. The Preferred Alternative includes the retention of the Mole Pier and a portion of the waterfront of the Truman Annex (Figure 2-4), which was previously announced as available for reuse under BRAC 95. It is being considered for retention because of the Navy's operational need to, among other things, provide rapid support to Naval units training in nearby operating areas.

2.2.1.3 Maintenance Dredging

The maintenance dredge of the Federal project channel in the waters off Key West would include the main Ship Channel beginning at its southern terminus, extending north and including cuts A, B, and C, the channel widener at cut C known as the turning basin, and Truman Harbor. The proposed maintenance dredge project would allow safe passage of additional types of Navy vessels making port calls to NAS Key West. Draft requirements of cruiser and destroyer class vessels preclude their entrance into Truman Harbor under existing conditions.

The proposed maintenance dredge would be a depth of -34 Mean Low Water (MLW) plus 3 feet (ft) advance maintenance plus 1 ft allowable overdepth. The resulting dredge material volume would be approximately 1,400, 000 cubic yards. The material to be dredged consists of varying proportions of rock rubble, gravel, silt and sand. Federal Acquisition Regulations generally preclude stipulating the type of equipment to be used for a dredging contract to ensure that a company bidding on the project is free to

select their most cost efficient means of performing. Based on previous experience with similar projects, the Navy anticipates that dredging will be either suction cutter-head or clamshell bucket.

The Navy considered a number of dredge material disposal options and placement sites for suitability and availability. The following options were considered, resulting in selection of Rockland Key as the best option for dredged material placement:

- Fleming Key: An upland site on Fleming Key was considered. Although the site is owned by the Navy, dredged material placement at Fleming Key would preclude the reuse of the material due to the adverse socio-economic impacts of transportation to another site. Transportation by dump-truck to remove the total dredge volume would require a truck every ten minutes during each 10-hour weekday for a period of 39 months through narrow City streets. The site contains a hazardous materials storage area that would preclude the disturbance of materials below the soil cap.

- Dead-end Canal: A privately owned upland and dead-end canal site, locally known as the Sub Pens located on North Boca Chica Key was investigated for beneficial use of spoil material. Benthic and marine resources were found within the dead-end canals; thus, this location is not preferable since dredge material would not contribute to marine beneficial use. In addition, restrictive owner-imposed conditions to use of upland areas prohibited the selection of this site.

- Rockland Key: A privately owned site on Rockland Key is the most suitable location for upland containment of dredge material and marine beneficial use. The site contains quarry pits, one of which is connected to tidal waters suitable for placement of material to an elevation of -6 ft to -8 ft MLW to allow colonization of seagrasses in the resultant shallow waters. The size and location of the site will meet the Purpose and Need as the resultant channel dredge depth will accommodate safe passage of Navy ships. A portion of dredged material consisting of beach quality sand would be segregated for future use at Fort Zachary Taylor and other state parks.

2.2.1.4 Retention of Outer Mole and Related Property

The Base Realignment and Closure Commission of 1995 recommended disposal of all property not required to meet operational commitments, including certain portions of Truman Annex. In May 1996, a large portion of Truman Annex was determined excess and the City of Key West made an application for title to the property. A Draft EA for the transfer of the property was completed in 2000, which is incorporated here by reference, and the Navy and the City began the process of negotiating transfer of approximately 53 acres to the City. The City proposed to develop the Mole Pier into cruise ship berthing, the harbor and adjacent area into a marina and the remainder in mixed uses and recreation open space. However, in December 2001, the Navy initiated a reassessment of the operational need for the Truman Harbor properties. This document evaluates the impacts of retaining a portion of the property. The Navy is proposing enhancements at NAS Key West that will enable better support of Fleet readiness. This proposal requires retention of approximately 30 percent of the Truman Annex property. While the Navy will retain the property for Navy use, the Navy also proposes to lease the Outer Mole portion of the property to the City of Key West to allow cruise ships to moor and onload and offload tourists, in the same manner contemplated in the 2000 Draft EA. The Navy will retain priority use of the Outer Mole for occasions when needed for operational requirements. The proposed lease is incorporated herein by reference.

Approximately 32 acres of the Truman Harbor waterfront area considered in the 2000 Draft EA for transfer to the City were determined excess to the Navy's needs and were transferred to the City on November 22, 2002. The remaining 16.1 acre Truman Harbor waterfront area is considered a critical facility and necessary for support of all existing operational requirements, newly-generated AT/FP initiatives, enable optimal use of continental U.S. training locations by COMLANTFLT forces and directly support for CVBG, ARGs, and Marine Expeditionary Units readiness requirements. The facilities are

needed as they play a vital role in supporting the U.S. Atlantic Fleet war fighter readiness. The area includes Building 284 as needed for Septar Boats, as shown on Table 2-1.

Table 2-1 Preferred Alternative Components

Location	Project Name	Scope of Work
Boca Chica Airfield	Hot Pit Refueling Facility Two alternate locations selected: (a) on ramp immediately south of Taxiway A; and (b) on a to be defined area north of Taxiway A.	- Locates direct fueling capability along "flight lines" of airfield - supports quick turnaround of operational aircraft used as opposing forces during CVGB readiness evaluation
Boca Chica Airfield	Radar and Traffic Control Facility Expansion	- 3000 square (sq) ft addition to existing building to the north - provides modern updated air traffic control facilities (new computer & radar consoles) - consolidates the air and surface warning area coordinator ("TARPON") with NAS operations and air traffic control facilities
Boca Chica Airfield	TACTS Building Expansion – Building A-4082	- 3160 sq ft addition to existing building to facilitate new equipment for updated TACTS system. - Adds 150 ft free standing tower located adjacent to the building.
Truman Annex	Repair Building 284; Demolish Building 261; Leave in Place Building 795	- building 284 will house VC-6 transient reconnaissance squadron assets (2 bays) and port services (1 bay) no expansion - Building 284 to house Navy Seaborn Power Target (Septar) boats - general site clean up between buildings 284 and 261 - Building 261 will be demolished; cement slab left in place, utilities capped
Truman Annex	Truman Harbor Waterfront Renovations	- provide ship hotel service at harbor - installation of two mooring dolphin piers - demolishes navigation hazard & installs new bulkhead and fenders at tip of mole - replaces/repositions mooring bollards on mole
Truman Annex	Ship Channel, Outer Turning Basin and Harbor Maintenance Dredging	- dredge to depth -34 ft plus 3 ft advance maintenance plus 1 ft allowable overdepth
Truman Annex	Truman Harbor Anti-Terrorist Force Protection Security Improvements	- construct security fence (Figure 2-2) - construct gatehouse and awning at Mole Pier area - provide additional security personnel - install security lighting - install active/passive vehicle barriers
Truman Annex	Retain 16.1 Acre Mole Pier Area	- previously designated for excessing to City of Key West under BRAC 1995

2.2.2 Lease of Facilities

Since the purpose of the Proposed Action is to enhance existing facilities at Key West and adequate DOD space is available at NAS Key West this alternative does not meet the Purpose and Need. Thus, this alternative was not carried forward for analysis throughout this document.

2.2.3 Alternative Locations

As identified in Section 1.2, COMLANTFLT needs redundancy in available ship and aircraft support capability for training locations along the Eastern and Gulf Coasts of the United States. To accomplish this for these various training locations, the Navy seeks to improve infrastructure support capabilities for CVBG readiness as well as joint training activities at various Naval facilities proximate to these training locations. The Navy is in the process of considering actions at other DOD locations in these areas that improve operational support in appropriate analyses. This EA examines the various levels of improvements that can be made at NAS Key West to support their missions for immediate and foreseeable training needs. The unique geographic location, ideal weather conditions, and proximity to offshore OPAREAS of Key West provide the greatest window of opportunity to meet current readiness requirements, regardless of the season. This EA examines proposed improvements and upgrades to existing Key West Facilities. As proposals for improvements and upgrades to other shore support locations are developed, they will be addressed in other NEPA documents.

2.2.4 Modeling and Simulation

Modeling and simulation often provide excellent preparation for performing an actual event without significant time or resource expenditures. The U.S. Navy considers modeling and simulation an essential element to training. Like all of the DOD Services, the Navy utilizes modeling and simulation to the maximum extent practical for team training and to hone individual and team skills and performance prior to performing an actual readiness evolution. Combat skills are acquired by individuals, teams (e.g. fire support or damage control), units, and battle groups using a building block approach. The building block approach is used because of the individual costs, inherent danger, and potential for a serious catastrophe in acquiring war fighting skills. Individuals, teams, and eventually whole units are guided through a METL, and only after a complete understanding of the action is acquired does the individual or unit move on to a simulation of the actual requirement. After competency with a simulated situation is gained, then the actual operation is performed and measured against the readiness standard. For example, every surface ship is required to demonstrate proficiency in shore fire support with its 5 inch gun. Proficiency requires the ability to fire at a target and engage another target as well. In order to do this, the navigation team must place the ship in the correct position and the gun crew, including the targeting team, must be able to acquire fire on, and destroy both targets in a limited timeframe. The navigation team will begin its training as a team with a review of the requirement, and the process to meet the requirement. At some point along the training continuum, the team will practice their function while tied to the pier as a tactical simulator provides input to the shipboard navigation system (e.g. the radar will display ranges and bearings to a target). Global Positioning System (GPS) coordinates may be provided as may visual range and bearings from a script. Once proficiency with the navigational data from the simulator is mastered the navigation team may be ready to perform their function. The gun crew also will experience a similar build-up to proficiency with a gun simulator, either on the ship or at a training command. When each individual and team has demonstrated their ability to perform their mission, the various functions may then be integrated into a “table top” exercise, where the teams review and integrate their functions. Next the teams may move to a Command Post Exercise (CPX) where each individual is at their appointed battle station and the simulation integrating the functions is performed. Finally, after demonstrating the ability to safely perform shore fire support, the ship may get underway for an actual gun shoot. All DOD Services generally follow this building block approach through no fire/no drop readiness evaluations until the entire system is tested under a realistic scenario.

Maximum use of modeling and simulation is essential to actual safe performance. However, modeling and simulation are no substitute for actual performance and do not provide a sufficient measure to gauge readiness. Therefore, since actual mission performance is required, facilities to support this

activity are required. Modeling and simulation are not considered reasonable alternatives to facilities improvements for direct Fleet support and are not examined further.

2.2.5 Full Support Services Alternative

The Full Support Alternative provides maximum capability at the Boca Chica Airfield and Truman Annex to support Naval units (Table 2-2). As such, in addition to the maintenance, repair, renovation, and upgrade described in the Preferred Alternative, this alternative would add hangar space and support facility buildings at the Boca Chica Airfield and would provide significant maintenance and pier side services at Truman Annex, e.g., refueling capability and Shore Intermediate Maintenance Activity (SIMA) support. The Full Support Alternative would provide nearly the equivalent of homebasing for visiting aircraft and homeport husbanding resources and support services for visiting ships. Should the Full Support Alternative be implemented, the capability and capacity to provide such services and the frequency of units utilizing those improved services would be such that the Navy would possibly have homebased aircraft at the airfield and homeported ships at Truman Annex. And, although the use agreement with the city for the Mole Pier would likely continue, availability as a cruise berth would likely be greatly reduced. When the Navy looked at the potential capability that the Full Services Support Alternative would provide, it was determined that unless ships were homeported in Key West or additional classes of ships could use the facilities, the full support infrastructure would be underutilized. When the Navy considered a construction dredge to support larger ships, i.e., amphibious assault ships, a larger width of the channel was considered. It was determined that the required increases in width would not meet the need for minimization of marine impacts.

Table 2-2 Full Support Alternative Project Components, Including Components of the Preferred Alternative.

Location	Project Name	Scope of Work
Boca Chica	Hot Pit Refueling Facility	- Locates direct fueling capability along "flight lines" of airfield - supports quick turnaround of operational aircraft used as opposing forces during CVGB readiness evaluation
Boca Chica	Radar and Traffic Control Facility Expansion	- 3000 sq ft addition to existing building to the north - provides modern updated air traffic control facilities (new computer & radar consoles) - consolidates "TARPON", the air and surface warning area coordinator with NAS operations and air traffic control facilities
Boca Chica	TACTS Building Expansion – Building A-4082	- 3160 sq ft addition to existing building to facilitate new equipment for updated TACTS system. - Adds 150 ft free standing tower located adjacent to the building.
Boca Chica	**Aircraft Intermediate Maintenance Det (expansion of AIMD)**	- Provides expanded aircraft repair capabilities
Boca Chica	**New hanger construction**	- Provides modern Type I hanger for permanently based aircraft squadron
Boca Chica	**Drone launch facility**	- Provides drone launch pads as well as a testing and handling building
Boca Chica	**Operations center (OPCEN)**	- Provides new OPCEN for TARPON and drone operations

Location	Project Name	Scope of Work
Truman Annex	Repair Building 284; Demolish Building 261; Leave in Place Building 795	- building 284 will house VC-6 transient reconnaissance squadron assets (2 bays) and port services (1 bay) no expansion - Building 284 to house Navy Seaborn Power Target (Septar) boats - general site clean up between buildings 284 and 261 - Building 261 will be demolished; cement slab left in place, utilities capped
Truman Annex	Truman Harbor Waterfront Renovations	- provides ship hoteling at harbor - installs of two mooring dolphin piers - demolishes navigation hazard & installs new bulkhead and fenders at tip of mole - replace/reposition mooring bollards on mole
Truman Annex	Ship Channel, Outer Turning Basin and Harbor Maintenance Dredging	- dredge to depth -34 ft plus 3 ft advance maintenance plus 1ft allowable overdepth
Truman Annex	Truman Harbor Anti-Terrorist Force Protection Security Improvements	- construct security fence (Figure 2-2) - construct gatehouse and awning at Mole Pier area - additional security personnel - install security lighting - install active/passive vehicle barriers
Truman Annex	Retain 16.1 Acre Mole Pier Area	- previously designated for excessing to City of Key West under BRAC 1995
Truman Annex	**Construction of fuel tank and related piping**	- Allows transient ships to fuel while berthed at Mole Pier
Truman Annex	**Construction of OWWO pre-treatment facility and related piping**	- Provides ships with pier-side bilge pumps and pretreatment prior to discharge to city treatment plant
Truman Annex	**Ship Intermediate Maintenance Activity**	- Provides maintenance facility to support repairs beyond ship's capability

Significant additional readiness operating personnel and support equipment such as large horsepower tugs, harbor craft, target and simulators craft, and torpedo retrievers, and OPFOR squadrons would be required to support the utilization needed to justify this resource investment and are included within this alternative. Specific activities or projects for Full Support are: the expansion of Aircraft Intermediate Maintenance Det; construction of a New Hanger; construction of a Drone Launch Facility; construction of fuel storage and Related Piping; Oily Water and Waste Oil (OWWO) Pretreatment Facility and Related Piping; and construction of Ship Intermediate Maintenance Activity (Table 2-3).

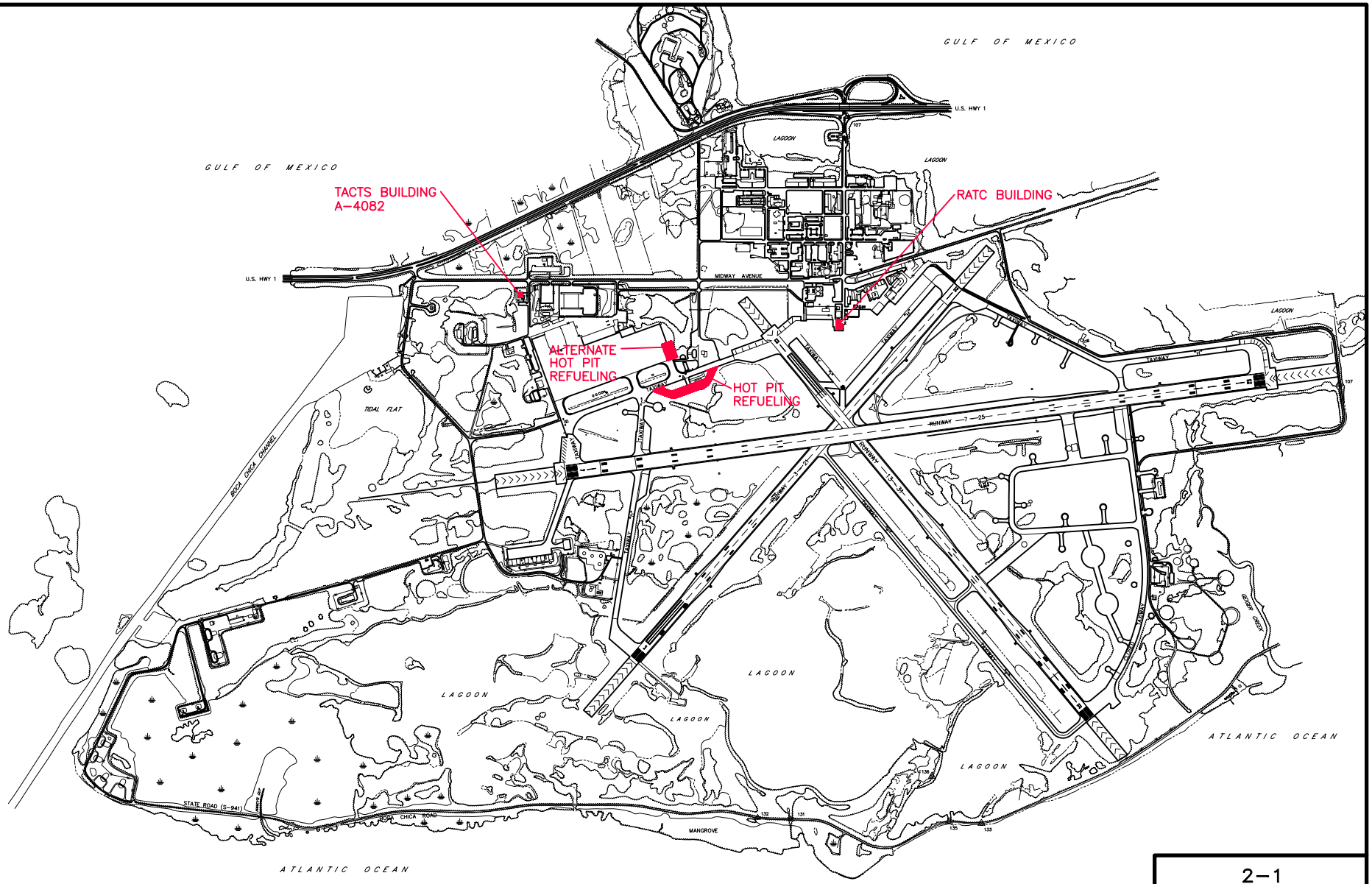
While the Full Support Alternative would be desirable and would allow additional flexibility to operational commanders, it would require a significant financial investment at greater environmental cost to accomplish.

2.2.6 No-Action Alternative

This alternative would continue current levels of ship and aircraft support at NAS Key West, without any of the facilities upgrades, renovations, maintenance, or repair activities described in the Preferred Alternative. The No-Action Alternative would provide less support over time as ships and aircraft become increasingly more modern and the existing facilities continue to deteriorate or become

outmoded. This alternative would not support the Navy's readiness requirement. NAS Key West supports unit readiness by providing vital host port support to visiting units. The City of Key West owns the East Key and boat ramp at Truman Harbor and plans to build a marina. The No-Action Alternative would not fulfill the Navy's Purpose and Need. The No-Action Alternative is carried through the EA to provide a baseline from which potential impacts of the Preferred and Full-Support Alternatives can be compared.

FILE: 1917/KEY WEST-EA/1917EA-BOANX.DWG 04/10/03



2-1

PREFERRED ALTERNATIVE – PROJECT LOCATIONS AT BOCA CHICA AIRFIELD

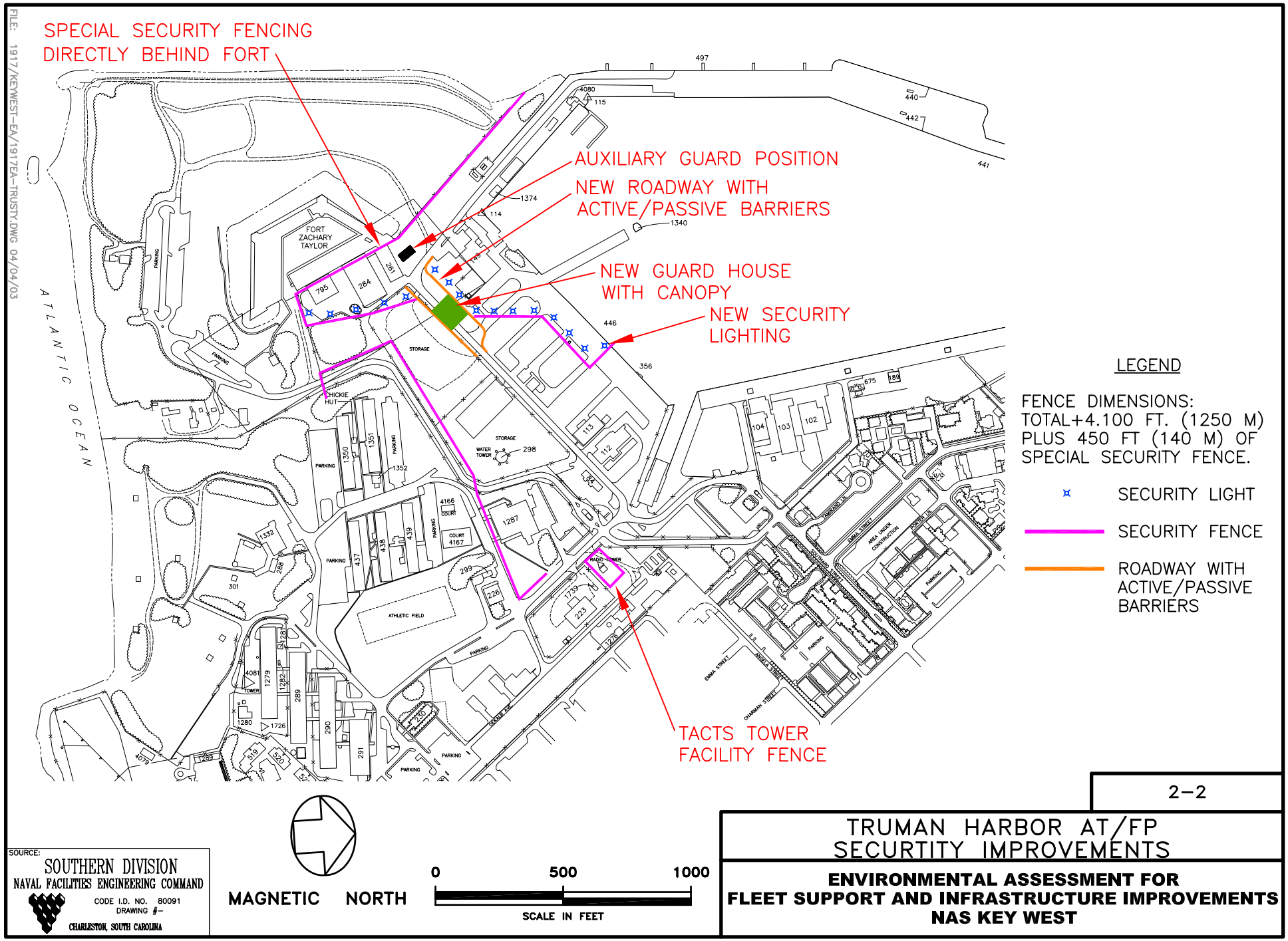
ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST

MAGNETIC NORTH

0 2000 4000

SCALE IN FEET

SOURCE:
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CODE I.D. NO. 80091
DRAWING #-
CHARLESTON, SOUTH CAROLINA



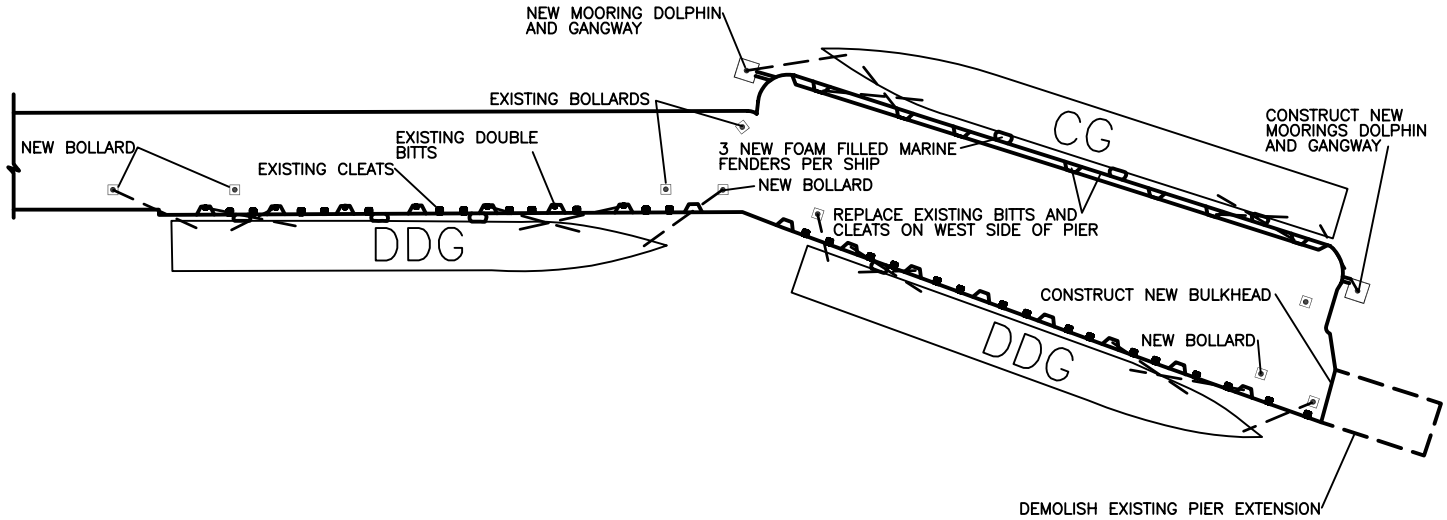
2-2

SOURCE:
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CODE I.D. NO. 80091
DRAWING #-
CHARLESTON, SOUTH CAROLINA

TRUMAN HARBOR AT/FP SECURITY IMPROVEMENTS

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST

FILE: 1917/KEYWEST-EA/MOLEPIER.DWG 04/04/03



0 200 400

SCALE IN FEET

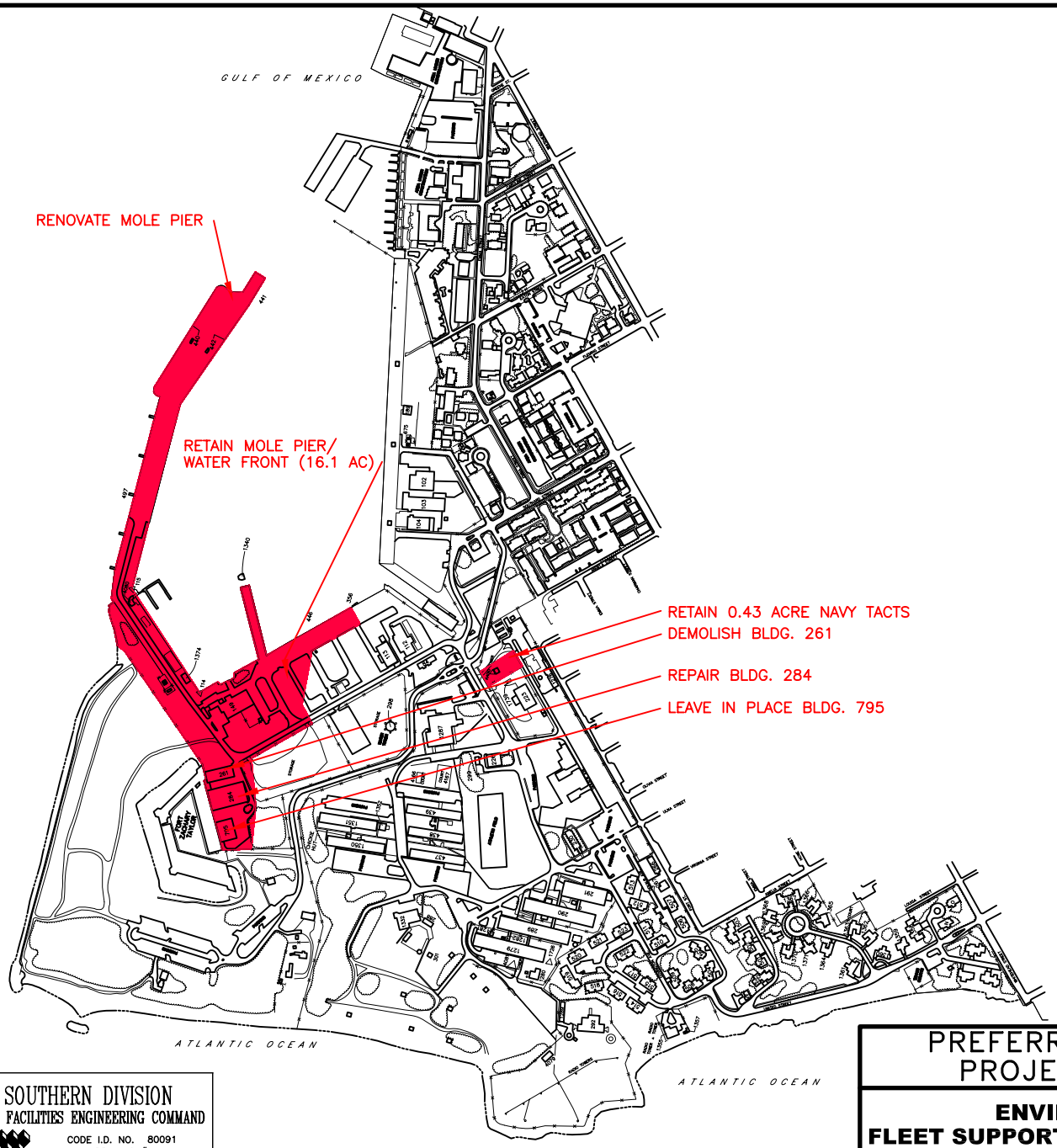
SOURCE:
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CODE I.D. NO. 80091
DRAWING #-
CHARLESTON, SOUTH CAROLINA

2-3

PREFERRED ALTERNATIVE MOLE PIER IMPROVEMENTS AT TRUMAN HARBOR

ENVIRONMENTAL ASSESSMENT FOR INCREASED FLEET TRAINING NAS KEY WEST

FILE: 1917/KEYWEST-EA/1917EA-REPAIR.DWG 04/04/03



MAGNETIC NORTH

0 800 1600

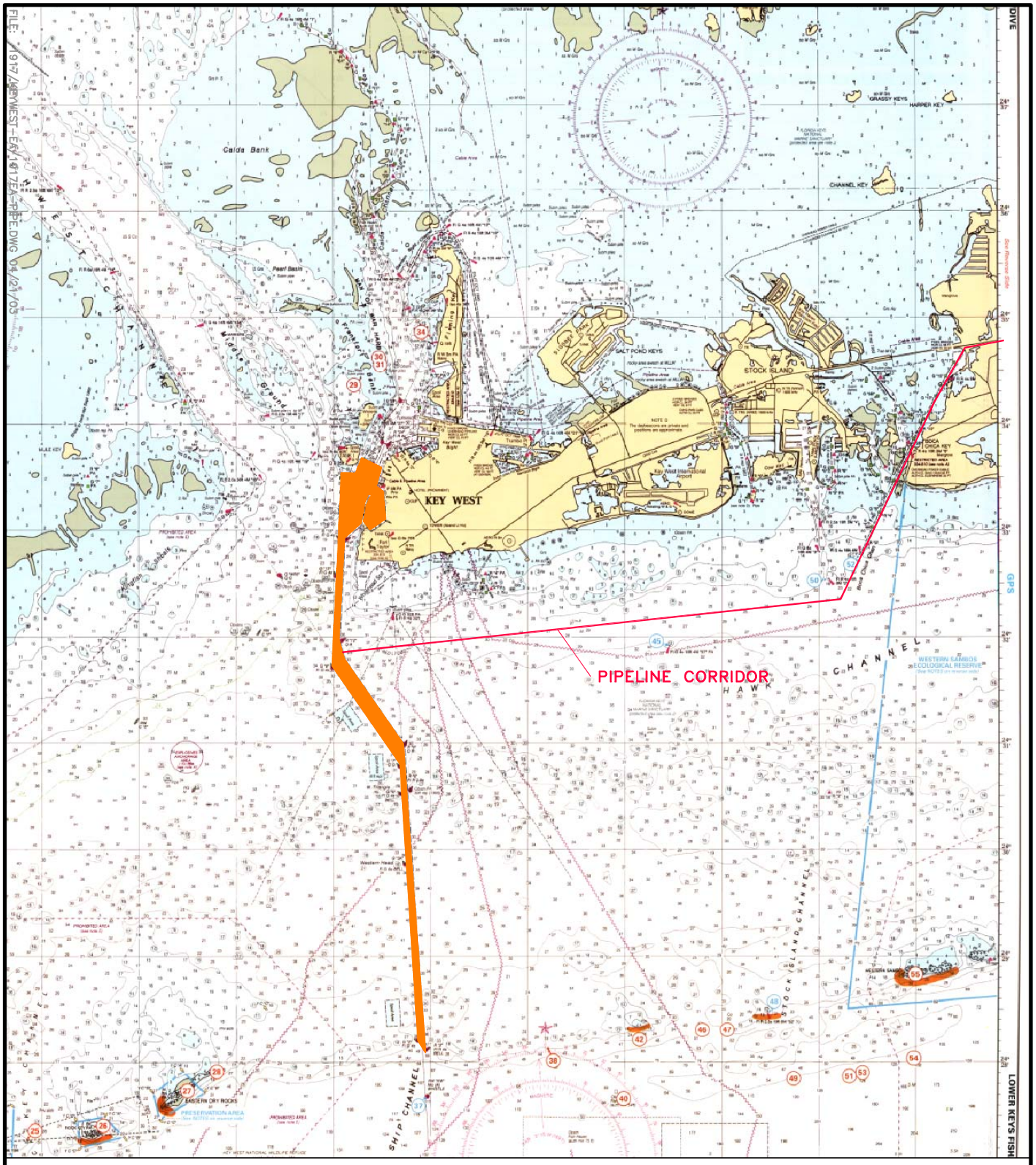
SCALE IN FEET

SOURCE:
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CODE I.D. NO. 80091
DRAWING #-
CHARLESTON, SOUTH CAROLINA

FIGURE 2-4

PREFERRED ALTERNATIVE LANDSIDE PROJECTS AT TRUMAN HARBOR

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMNETS NAS KEY WEST



MAGNETIC NORTH

0 8000 16000

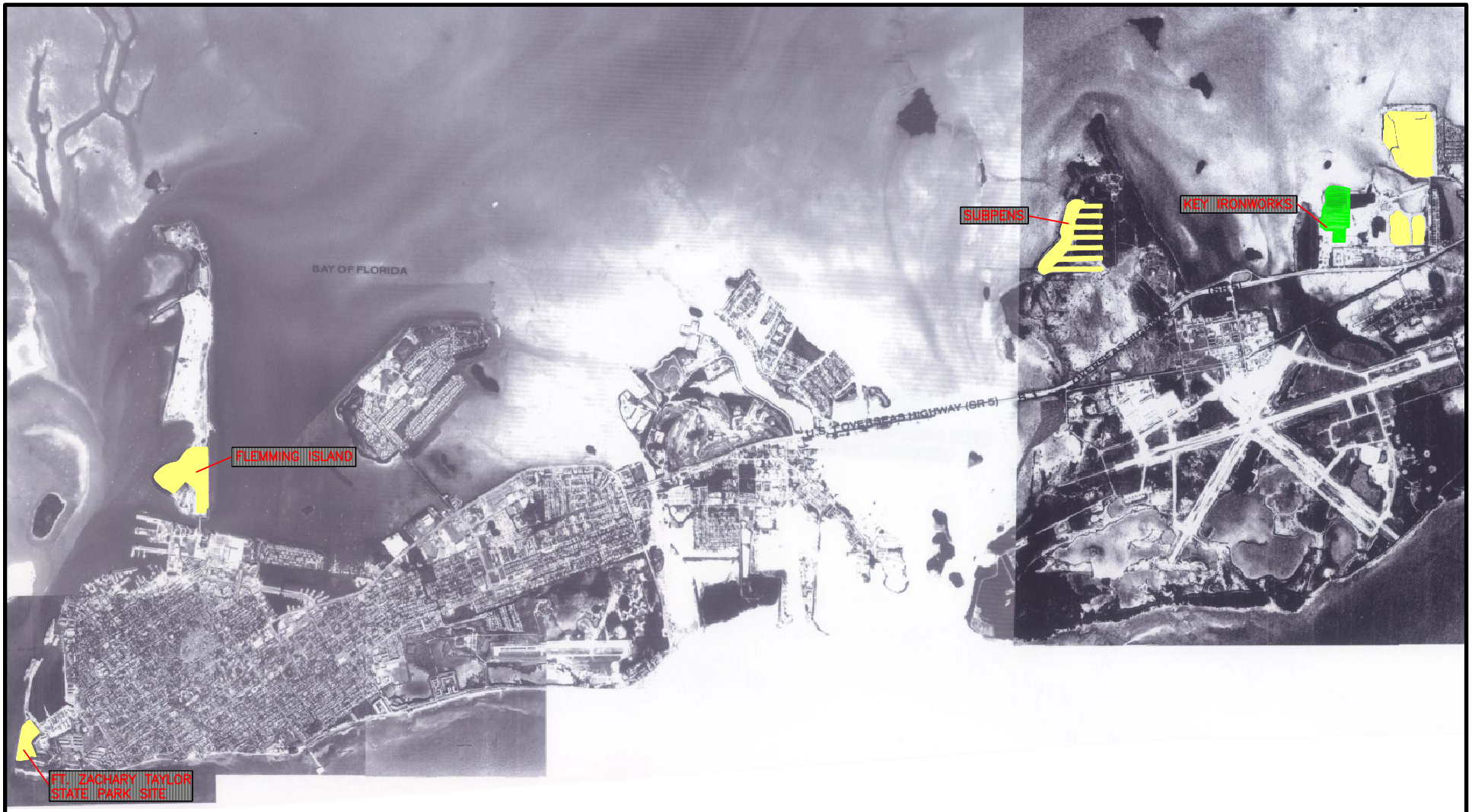
SCALE IN FEET

FIGURE 2–5

KEY WEST CHANNEL, TURNING BASIN, AND HARBOR EXCAVATION SITE

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST

FILE: 1917/KEYWEST-EA/ALLDREDGE3.DWG 04/04/03



LEGEND

SELECTED SITE

SITES CONSIDERED AND REJECTED

0 5000 10000

SCALE IN FEET

FIGURE 2-6

DREDGED MATERIAL PLACEMENT SITE ALTERNATIVE CONSIDERED

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST

CHAPTER 3

AFFECTED ENVIRONMENT

3.1 LAND USE

3.1.1 Definition of Resource

Land use comprises the natural conditions and/or human-modified activities occurring at a particular location. Human-modified land use categories are used to differentiate the various uses of land. Management plans and zoning regulations determine the type and extent of land use allowable in specific areas and are often intended to protect specially designated or environmentally sensitive areas. In the vicinity of military airfields, land use and development are also affected by specific safety criteria associated with aircraft operations and explosives handling as defined in *NAVFAC P-80 Facility Planning Factor Criteria for Navy and Marine Corps Shore Installations, Appendix E – Airfield Safety Clearances and NAVSEA OP-05, Explosives Safety Standards*. These criteria are discussed in detail in Section 3.2 (Public Health and Safety), and also referenced in this section as they relate to land use patterns. For purposes of this analysis, the region of influence (ROI) for land use includes the Truman Annex and Boca Chica.

3.1.2 Existing Conditions

City of Key West

The Island of Key West totals approximately 4,500 acres most of which is highly developed. Major land uses are residential, institutional/public land, and military property. Very little land is vacant and developable (U.S. Navy 2002b). The following description is excerpted from the Southeast Regional Aviation Plan (U.S. Navy 2002a).

- Military property in the City of Key West encompasses Dredgers Key, Sigsbee Park, Fleming Key, and Trumbo Point, including Peary Court housing and Truman Annex. In total, approximately 25 percent of the land area is under control of the NAS Key West.
- Residential use areas generally lie across the breadth of the central portion of the island with highly concentrated residential use mostly in the central section and extending into the northeastern portion. The City also has small western and southern residential sections which are considered historic and are the oldest part of Key West City. In total approximately 20 percent of land use is residential.
- The Commercial district lies in two parts. The main commercial district follows the Overseas Highway along the northeast shore of the City, stopping at the historical district. Another commercial area lies within the mixed use/historic district and is centered along Duval Street, and generally extends from the waterfront at Mallory Square to White Street. In total, nearly 10 percent of land use is commercial.
- Public/Institutional uses, including city and county offices, are scattered around the city. Fort Zachary Taylor, a State park, lies on the southernmost tip of the island adjacent to Truman Annex. The International Airport lies on the southeastern portion of the island. In total, almost 19 percent of land use is considered public and institutional.
- The remaining area, approximately 25 percent, of the City lies in vacant land, undeveloped natural land, planned redevelopment, and other mixed uses.

Truman Annex

Major land uses at the Truman Annex include Operations, Community Facilities, Maintenance Facilities, Housing, Administration, and the Waterfront/Pier Areas (Figure 3-1). The Truman Waterfront area consists of about 45 acres of land, including the Mole Pier. The 7.6 acre Mole Pier includes the pier facilities (breakwater, berthing wharf, electrical distribution line, sanitary sewer line, waste distribution line, pipeline, telephone lines, street lighting, paved roads) and two buildings totaling 1,679 square ft. The significant amount of infrastructure at the pier was constructed as part of a 1986 improvement plan to

ready the basin to homeport a surface attack Fleet. The plan was never carried out (U.S. Navy 1997). The 38 acre Truman Waterfront portion (without the Mole Pier) has ten storage buildings with about 74,867 square ft and nine other buildings (about 50,000 square ft, including a bomb shelter, dining facilities, a fire station, port operations building, and a Navy Exchange [NEX] branch). The Truman waterfront commands almost a mile (1.6 kilometer [km]) of deepwater harbor waterfront, and must remain a port in perpetuity (Key West Gov. 2000b) (Figure 3-1).

The Mole Pier currently is used to berth cruise ships and military vessels. The City has a license with the Navy to provide cruise ship berthing at the outer Mole Pier. In 2001, 104 cruise ships docked there. An estimated 135 to 140 are expected in 2002 (Sullivan 2002). Berthing uses have also been granted to the inner Mole berths. Also, the only access to the Fort is through Truman Annex (U.S. Navy 2000b).

As a result of the BRAC 95 review, the Navy initially identified nearly 60 acres of property at Truman Annex as not being essential to readiness. The Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), the State of Flordia and the city of Key West identified parcels for use and plans were developed to transfer ownership. In 2002, the Atlantic Fleet identified a possible need to retain approximately 30 percent of the 53 plus acres proposed for transfer to the city. The 16 acres the Navy proposes to retain include the Mole Pier and some buildings previously used for ship maintenance. The Navy is proceeding with transferring slightly more than 32 acres on the east side of the harbor for use as parkland and a marina by the City. Under the proposal, the Navy will maintain joint use privileges with the city for cruise ship berthing at the outer Mole Pier.

Three distinctive land use patterns surround the Truman Annex: the Truman Annex Planned Unit Development, a private community separated from the facility by a fence, Bahama Village, a historically-important residential and commercial area separated from the facility by a fence, and the Fort, a National Historic Place and State park which includes a beach, picnic area, and public restrooms.

Monroe County

Unincorporated areas of Monroe County in the vicinity of the Boca Chica Airfield include a small undeveloped area bordering the NAS Key West to the north, an industrial section facing the NAS Key West across the Overseas Highway to the northeast, and a small high density residential area on Geiger Key to the east. The small surrounding Keys are all undeveloped conservation and agriculture areas (U.S. Navy 2002a).

Boca Chica

This is the primary site of the NAS Key West station operations, administration and supply functions. Operations are the dominant land uses (runways, taxiways, and parking aprons). Additionally, there are more than 2,000 undeveloped acres of wetlands and other natural areas. In addition to airfield operations, Boca Chica supports security, supply, weapons, a fuel farm, administration, public works, MWR facilities, and visitors' quarters (U.S. Navy 2002b) (Figure 3-2). Tactical aircraft squadrons, primarily carrier type aircraft dominate the aircraft loading, but there are no permanently assigned squadrons. The only permanent station aircraft include three helicopters and a C-12 station aircraft (U.S. Navy 2002a).

3.2 GEOLOGY, SOILS AND TOPOGRAPHY

3.2.1 Definition of Resource

Geological resources are defined as the geology, soils, and topography of a given area. The geology of an area includes bedrock materials, mineral deposits, and fossil remains. The principal geological factors influencing stability of structures are soil stability and seismic properties. Soil structure, elasticity, strength, shrink-swell potential, and erodibility all determine the soil's capacity to support structures and facilities. Soils typically are described in terms of their type, slope, physical characteristics, such as drainage and permeabilities. Topography incorporates the physiographic or surface features of an area and is usually described with respect to elevation, slope, aspect, and landforms. Bathymetry is the water depth relative to sea level. Depth value may be either negative or positive, but should all be

understood to be negative. Elevations (topography) are the corresponding terminology for above sea level and are positive. Depths are almost always derived indirectly by measuring the time required for a signal to travel from a transmitter, to the bottom, and back to a receiver. This travel time is then converted to a depth based on a variety of estimations of the signal speed through the water column. This may vary based on salinity, temperature, and other factors. Unless specifically stated, 1500 meters (m) per second of time for a two-way (surface-to-bottom-to-surface) travel-time is commonly used.

3.2.2 Existing Conditions – Landside

3.2.2.1 Geology

The Florida Keys are assigned to the Gold Coast-Florida Bay District where Pleistocene limestone and limestone cap rocks are prevalent. This province has also been referred to as the southern zone of the coastal lowlands or the Florida Plateau. This eustatically formed archipelago is then subdivided into three island groups of limestone or carbonate sand and mud: 1) Coral Reef Keys, the northern linear island chain of coral rock with a living coral reef offshore; 2) Oolitic Keys or "western Keys," the southern chain of east-west aligned Keys (including the Key West Area) of oolitic limestone with Pleistocene and Holocene coral reef tracts to the southeast and south; and 3) Dry Tortugas, shoals, and islands of bioclastic carbonate sand and mud (DON 1986).

All of the Lower Keys are composed of Miami oolite. These formations are soft, white to yellow, stratified to massive, cross-bedded and are constituted of pure calcium carbonate which may contain shall fragments and minor quartz sand. Its major constituents are tiny oolids, which are spherical calcareous grains with concentric structure and cemented to form Oolitic rock (DON 2002).

Key Largo Limestone underlies the Miami Oolite on all of the Lower Keys. Its major constituents are the cemented remains of ancient coral reefs and a subsidiary amount of fossils or coral, shell algae and echinids. Unconsolidated to consolidated Miocene sediments of the Tamiami, Hawthorn, and Tampa formations, Oligocene Suwannee Limestone, and Eocene Avon Park Formation underlie recent Pleistocene deposits. The Pleistocene Miami Limestone is about 100,000 years old. The oolitic facies of this formation overlie the Key Largo Limestone Formation. This formation probably originated as an east-west mound of unstable oolite in a high-energy environment at the shelf margin where sediments were stirred up and deposited over the southern portion of the active reef (DON 2002).

Key West is located in an inactive seismic zone. There are no plate boundaries where earth movement would be expected near the site. Hence, the area is seismically stable, with a very low earthquake risk and an even lower probability that a seismic event would cause severe damage. From 1800 to 1985, no seismic events were recorded (DON 1986).

In January 1880, Cuba was the center of two strong earthquakes that sent severe shock waves through the town of Key West, Florida. The tremors occurred at 11 p.m. on January 22nd and at 4 a.m. on the 23rd. At Buelta Abajo and San Christobal, Cuba, many buildings were thrown down and some people were killed [United States Geological Survey (USGS) 2002].

3.2.2.2 Soils

The original soils in the Key West area are mostly entisols, dominated by level, very poorly drained organic soils underlain by limestone (Atlas of Florida 1996, as in DON 2002). There are six soil types found at Boca Chica.

Matecumbe muck, occasionally flooded, is described as moderately well drained. It has a seasonal high water table at a depth of 1.5 to 3.0 ft during the wet periods of most years. Permeability is rapid.

Islamorada muck, tidal is described as very poorly drained. The season high water table is at or near the surface during much of the year. The permeability is rapid.

Key Largo muck, tidal is described as very poorly drained. The seasonal high water table is at or near the surface during much of the year. The permeability is rapid.

Odorthents – Urban land complex are soils that are moderately well drained. They have a seasonal high water table at a depth of 2 to 4 ft during the wet periods of most years. The permeability is variable.

Cudjoe marl, tidal is a poorly drained soil. The seasonal high water table is within a depth of 6 inches during the wet periods of most years. The permeability is moderate or moderately rapid.

Saddlebunch marl, occasionally flooded, is a soil that is somewhat poorly drained. It has a seasonal high water table at a depth of 6 to 12 inches during the wet periods of most years. The permeability is moderate or moderately rapid [United States Department of Agriculture (USDA) 1995].

The soils of the Truman Annex are urban land soil type. The drainage and permeability are variable. Soils on the Navy property were created from material dredged from the Ship Channel and Key West Harbor. Two types of marine sediments occur at the site. Sandy sediments, which predominate along outer side of the Mole Pier and on Truman Beach at the south end of the Mole Pier, are composed primarily of calcareous (i.e., calcium carbonate) remains of algae, corals, and other invertebrates. Lime mud, which is predominant in Truman Harbor, is composed almost exclusively of very fine calcium carbonate particles derived from calcareous algae. These very fine white sediments are easily suspended by currents and turbulence and give the normally clear local waters their chalky appearance when sustained high winds generate waves and turbulence (DON 2000).

3.2.2.3 Topography

The topography at Boca Chica is flat with elevations averaging 4 to 5 ft above Mean Sea Level (MSL). The airfield elevation (highest point of the runway system) at Boca Chica is 6 ft above MSL. Large interior areas at Boca Chica range from 0 to 2 ft below sea level and flood frequently.

The Truman Annex is located on the west end of the island of Key West adjacent to the main Ship Channel. The elevation on Truman Annex ranges between 5 and 10 ft above MSL (DON 2002).

3.2.3 Existing Conditions – Marine

3.2.3.1 Bathymetry

Bathymetry contouring of the Ship Channel and turning basin was performed based on data collected by Foresight Surveyors, Inc. under task order contract to the U.S. Army Corps of Engineers (USACOE) (Foresight Surveyors, Inc. 2001). The results of this analysis are presented in Figures 3-3-1 to 3-3-4. Depths in the Main Ship Channel range from about 32 ft to greater than 40 ft (Figure 3-3-1). The depth less than 34 ft occurred along the sides of the north end of the Main Ship Channel. Depths in the next portion of the Ship Channel toward Key West (Cut A) range from less than 34 ft to over 40 ft. Depths in the center of the channel are generally greater than 35 ft (Figure 3-3-2). In the next section of the channel toward Key West (Cut B), water depths in the channel were greater than 35 ft (Figure 3-3-3). In the basin outside of the Truman Annex Harbor (Cut C), water depths were typically greater than 35 ft (Figure 3-3-4).

A contour plot of the depths in Truman Harbor was developed based on preliminary bathymetric data collected by Continental Shelf Associates, Inc. Water depths in the center of the harbor were greater than 35 ft (Figure 3-3-5). Shallower areas were observed along the eastern and southern boundaries of the harbor. Near the entrance of the harbor, depths of less than 34 ft were observed.

3.2.3.2 Sediment Quality

Sediment grain size was analyzed by Law Engineering and Environmental Services, Inc. for samples collected by Continental Shelf Associates, Inc. 13 to 15 September 2002 at 14 stations located

within Truman Harbor, the turning basin, and the Main Ship Channel (Figure 3-4). Samples from Truman Harbor (KW02-1 and KW02-2) and the northwest corner of the turning basin (KW02-3) were dominated by fine-grained sediments. Coarse-grained sediments predominated in the Main Ship Channel except at a sharp turn in the channel (KW02-10 and KW02-11) where fine-grained sediments had accumulated.

Overall, sediments in the project area were free of contaminants. This was substantiated by analyses performed on the sediment samples collected by Continental Shelf Associates, Inc. at the 14 stations located within Truman Harbor, the turning basin, and the Main Ship Channel. PPB Environmental Laboratories, Inc. analyzed the samples for trace metals, cyanide, and ammonia. Harbor Branch Environmental Laboratories, Inc. analyzed the samples for organic pollutants, oil and grease, and total organic carbon. Trace metal concentrations varied primarily with grain size and did not reflect toxic levels. Concentrations of organic pollutants were not detected in the samples. A low concentration of oil and grease was detected at one station within Truman Harbor. Total organic carbon levels were low, as were levels of cyanide and ammonia in the sediment samples. The overall high sediment quality observed by Continental Shelf Associates, Inc. was supported by previous sediment data reported by Sandra Walters Consultants, Inc. (1999). Results of these analyses are presented in Appendix F.

3.3 BIOLOGICAL RESOURCES

3.3.1 Definition of Resource

Biological resources include living, native, or naturalized plant and animal species and the natural communities within which they occur. A natural community is defined as a distinct and reoccurring assemblage of populations of plants, animals, fungi, and microorganisms naturally associated with each other and the physical environment [Florida Natural Areas Inventory (FNAI) and Florida Department of Natural Resources (FDNR) 1986]. For purposes of this EA, biological resources of terrestrial and marine natural communities are divided into four major categories: vegetation, wetlands, wildlife, and threatened or endangered species.

Terrestrial resources are natural upland communities dominated by plants which are not adapted to anaerobic soil condition imposed by saturation or inundation for more than 10% of the growing season (FNAI 1991).

Marine resources are sub-tidal, inter-tidal, and supra-tidal zones of the sea, landward to the point at which seawater becomes significantly diluted with freshwater inflow from the land (FNAI 1991).

Vegetation is the plant component of terrestrial, wetland, and marine natural communities. Vegetation is used to predominantly define the terrestrial natural community.

Wetlands are subject to Federal regulatory authority under Section 404 of the Clean Water Act (CWA), Section 10 of the Rivers and Harbors Act, and Executive Order (EO) 1990, *Protection of Wetlands*. Jurisdictional wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (USACOE 1987). Areas meeting the Federal wetland definition are under the jurisdiction of the USACOE. Wetlands generally include estuary's, freshwater and tidally-influenced swamps, marshes, bogs, and similar areas. For this EA, the discussion of the affected environment for vegetation and wetlands includes only those areas potentially subject to ground disturbance.

Wildlife includes all vertebrate animals with the exception of those identified as threatened or endangered. Wildlife includes fish, amphibians, reptiles, birds, and mammals.

Endangered species are those species in danger of extinction through all or a significant portion of their range. Threatened species are those species that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range. Threatened or endangered species are defined by the U.S. Fish and Wildlife Service (USFWS) and are protected under the Federal

Endangered Species Act (ESA). State-listed endangered, threatened or special concern species are designated by the Florida Fish and Wildlife Conservation Commission (FFWCC).

3.3.2 Existing Conditions - Landside

3.3.2.1 Vegetation

The Boca Chica location contains approximately 2,500 acres of undeveloped land within the 3,912 acre facility. The FNAI conducted investigations of natural communities between December 1992 and November 1993 at NAS Key West. Two upland natural communities were identified by FNAI, Coastal Berm, and Beach Dune system located along the southern portion of the key in the area known as Old Boca Chica Road Coast.

The vegetation of the Coastal Berm consists of a number of halophytic and psammophytic plant species occurring along the edges of shallow lagoons. Small patches of Coastal Berm appear as low ridges or hammocks covering rocky storm-deposited marl and shell ridges. They support a wide variety of xeric thorn scrub species (FNAI 1994). Coastal Berms are vegetated with over 84 plant species, including blolly (*Guapira discolor)*, gumbo limbo (*Bursera simaruba)*, poisonwood (*Metopium toxiferum),* seagrape (*Coccoloba uvifera)*, and Spanish stopper (*Eugenia foetida*) (USFWS 1999).

The Beach Dune community is characterized as a sandy beach (inter-tidal) dune (upland) system. There are four small areas of this community with a sandy beach but none have well developed dunes or dune vegetation. Typical dune vegetation in this area contains wax myrtle (*Myrica cerifera)*, live oak (*Quercus virginiana)*, and sea grape (*Coccoloba uvifera)*. Maintained grass lawns and non-native landscape vegetation cover the pervious areas at high use facility areas of the airfield. Upland vegetation at the Truman Annex property consists of primarily maintained grass lawns and non-native landscape vegetation. Scattered trees are present on the property, most of which are Australian pine (*Casuarina equisetifolia)*. Certain species of trees on the property are protected by the City of Key West tree protection ordinance (Article XIV, City of Key West Land Development Regulations) including coconut palm (*Cocus nucifera)*, mahogany (*Swietenia mahogany)*, and strangler fig (*Ficus aurea)* (DON 2000). No natural communities remain on the intensively developed Navy holdings (DON 2000). No intact native natural communities remain on the Truman Annex.

3.3.2.2 Wetlands

The Boca Chica location contains two (2) wetland natural communities: Tidal Swamp and Coastal Rock Barren (FNAI 1994 as in DON 2002). Tidal Swamps are dominated by red mangrove *(Rhizophora mangle)*, black mangrove *(Avicennia nitida)*, white mangrove (*Laguncularia racemosa)*, and buttonwood (*Conocarpus erectus)*. The tidally influenced wetlands occur between Runways 7 and 3 and between Runways 3 and 31. Extreme variations in tree height density and degree of canopy closure occur in response to hypo-saline and hyper-saline water conditions. Similarly, the diversity of associated herbaceous plant species varies from site to site.

The Coastal Rock Barren community is dominated by buttonwood of varying height and density. The community takes a wide range of forms due to substrate variations in rock and marl content. Typical herbaceous understory plants include sea ox-eye daisey (*Borrichea frutescens)* and sea purslane (*Sesuvium portulacastrum)*. Coastal Rock Barren occurs at Boca Chica in the perimeter zone, wetland areas between Runways 7 and 3, and between Runways 3 and 31.

Wetland communities have been mapped on Boca Chica by the U.S. Fish and Wildlife Service National Wetland Inventory using the Cowardin Classification System (Cowardin 1979) (Figure 3-5). Wetland communities do not occur on the Truman Annex. A created shell substrate beach containing Australian pines occurs at the south and the Mole Pier area. A sandy beach dune community occurs on the southern edge of the Truman Annex property.

3.3.2.3 Wildlife

Wildlife typical of Boca Chica are generally associated with natural terrestrial communities and wetlands. Coastal Berm associations typically contain six-lined racerunner (*Cnemidophorus sexlineatus)*, kestrel (*Falco spavarius)*, red-winged blackbird (*Agelaius phoeniceus)*, Savannah sparrow (*Passerculus sandwichensis)*, cotton mouse (*Peromyscus gossypinus)*, raccoon (*Procyon lotor)*, and a variety of wintering and migratory passerine and wading birds.

The Beach Dune community is typically associated with six-lined racerunner, kestrel, red-winged blackbird, savannah sparrow, cotton mouse, raccoon, nesting sea turtles, ghost crabs, and a variety of wading birds.

Tidal Swamp Wetland communities are typically inhabitated by mangrove water snake *(Natrix fasciata),* brown pelican (*Pelecanus occidentalis)*, white ibis (*Eudocimus albus)*, osprey (*Pandion halietus)*, prairie warbler (*Dendroica discolor)*, mangrove cuckoo (*Coccyzus minor)*, and a variety of fish species such as mangrove snapper (*Lutjanus griseus)*, and mutton snapper (*Lutjanus analis)*.

The Coastal Rock Barren of Boca Chica typically contains white crowned pigeon (*Columba leucocephala)*, mangrove cuckoo, black whiskered vireo (*Vireo altiloquus)*, osprey, and Cuban bat (*Melitis melitis)*.

The Truman Annex property is devoid of native terrestrial communities supporting wildlife habitat. Ubiquitous wildlife common to the Lower Florida Keys may be found on the Truman Annex such as the raccoon and passerine birds.

3.3.2.4 Threatened or Endangered Species

A literature survey was conducted to determine reported occurrences of Federal or State-listed species at the Boca Chica and Truman Annex sites. Nineteen Federal or State-listed animal species have been reported to occur at the two (2) NAS Key West facilities (Figures 3-6 and 3-7). Table 3-1 summarizes the results by location and community type. Two Federally listed animal species were reported on Boca Chica; the eastern indigo snake (*Drymarchon corais cooperi)* and the Lower Keys marsh rabbit (*Sylvilagas palustris hefneri)* (Figure 3-6).

No Federally listed plant species were reported on the sites. Sixteen State-listed endangered or threatened plants were reported on Boca Chica and Truman Annex.

TABLE 3-1 Threatened and Endangered Species and Species of Special Concern Reported at or Near Boca Chica and Truman Annex

Scientific Name	Common Name	Current Status		Community Type	Location of Occurrence	Reported By
		USFWS	FFWC			
Birds						
Athene cunicularia floridana	Florida burrowing owl	N	SSC		Truman Annex	1
Charadrius melodus	Piping plover	T	T	Beaches, mud flats, and sand flats	Winters in Monroe County	4
Columba leucocephala	White-Crowned Pigeon	N	T	Coastal rock barren Rockland hammock Tidal swamp	Boca Chica Key	1, CZR
Egretta caerulea	Little Blue Heron	N	SSC	Lagoons and Tidal swamps and lagoons	Boca Chica Key	1, 3
Egretta rufescens	Reddish Egret	N	SSC	Tidal swamps Rockland Hammock	Old Boca Chica Coast road	1, 3
Egretta Thula	Snowy Egret	N	SSC	Lagoons and Tidal swamp	Old Boca Chica Coast road	1, 3
Egretta Tricolor	Tricolored Heron	N	SSC	Lagoons and Tidal swamps	Old Boca Chica Coast road	1, 3

Scientific Name	Common Name	Current Status		Community Type	Location of Occurrence	Reported By
		USFWS	FFWC			
Eudocimus albus	White Ibis	N	SSC	Ponds and Tidal swamps	Old Boca Chica Coast road	1, 3
Haliaeetus leucocephalus	Bald Eagle	T	T	Tidal swamp Coastal rock barren	Active nesting platform 100-yards west to fuel tank area – Boca Chica Key	1, 3
Pandion haliaetus	Osprey	N	SSC	Rockland hammock Coastal rock barren, Coastal berm	Nesting on platform near weapons depot SW Boca Chica Key	1,2
Sterna antillarum	Least Tern	N	T	Sandy or pebbly beaches	Truman Annex Nesting on roof of Bldgs. 102, 103, 104, 112, & 113; Boca Chica Key; Boca Chica NAS building A931	1, 2, 3
Sterna dougallii	Roseate Tern	N	T	Coastal rock barren	Truman Annex building 289	1, 2, 3
Charadrius alexandrinus	Southeastern Snowy Plover	UR	T	Outer beaches, Sandbars		3
Pelecanus occidentialis carolinensis	Eastern Brown Pelican	N	SSC	Tidal Swamp Coastal rock barren Offshore islands, docks, fishing piers	Boca Chica Key	1, 3
Reptiles						
Drymarchon corais couperi	Eastern Indigo Snake	T	T	Hammock	Boca Chica Key	1, 3
Eumeces egregius egregius	Florida Keys Mole Skink	N	SSC	Coastal rock barren Rockland hammock	Boca Chica Key	1, 3
Fishes						
Menidia conchorum	Key Silverside	N	SSC	Marine lagoon Tidal creek	Boca Chica Key	1
Mammals						
Sylvilagas Palustris hefneri	Lower Keys Marsh Rabbit	E	E	Coastal rock barren, Coastal berm	Boca Chica Key	1
Oryzomys palustris natotor	Silver rice rat	E	E	Salt marsh	Possibly extripated from Boca Chica Key	4
Plants						
Argusia gnaphalodes	Sea lavender	N	E	Beach dune	Fort	1
Argythamnia blodgettii	Blodgett's Wild-Mercury	N	E	Rockland hammock	Boca Chica Key south weapons hammock	1
Byrsonima lucida	Locustberry	N	T	Coastal rock barren	Boca Chica Key south and north weapons hammock	1
Chamaesyce porteriana var porteriana	Porter's Broad-Leaved Spurge	N	E	Coastal rock barren	Boca Chica Key south and north weapons hammock	1

Scientific Name	Common Name	Current Status		Community Type	Location of Occurrence	Reported By
		USFWS	FFWC			
Chamaesyce porteriana var scoparia	Porter's Broom Spurge	N	E	Coastal rock barren	Boca Chica Key south and north weapons hammock	1
Cordia sebestena	Geiger Tree	N	E	Rockland hammock Sand dunes	Boca Chica Key north weapons hammock	1, 3
Crossopetalum rhacoma	Rhacoma	N	E	Coastal rock barren Rockland hammock	Boca Chica Key south and north weapons hammock; east of AIMD building	1
Gossypim hirsutum	Wild Cotton	N	E	Rockland hammock	Boca Chica Key south and north weapons hammock	1
Hippomane mancinella	Manchineel	N	E	Rockland hammock	Boca Chica Key south weapons hammock	1, 3
Jacquinia keyensis	Joewood	N	T	Coastal rock barren Coastal berm Rockland hammock	Boca Chica Key south and north weapons hammock; Boca Chica Airfield; near AIMD building	1
Pteris bahamensis	Bahama Brake	N	T	Rockland hammock	Boca Chica Airfield; near AIMD building	1
Swietenia Mahogoni	West Indies Mahogany	N	E	Rockland hammock	Boca Chica Key south and north weapons hammock	1, 3
Thrinax morrisii	Brittle Thatch Palm	N	E	Rockland hammock Coastal rock barren Coastal berm	Boca Chica Key south and north weapons hammock	1, 3
Thrinax radiata	Florida Thatch Palm	N	E	Rockland hammock Coastal rock barren Coastal berm	Rockland Key hammock	1, 3
Tillandsia Flexuosa	Banded Wild Palm	N	E	Rockland hammock	Boca Chica Key south and north weapons hammock	1, 3
Vanilla Barbellata	Worm-Vine Orchid	N	E	Coastal rock barren	Boca Chica Key south and north weapons hammock	1, 3

Notes: N = Not Listed, E = Endangered, T = Threatened, SSC = Species of Special Concern, UR = Under Review

Source: 1 - Florida Natural Areas Inventory 1994. Ecological survey of U.S. Navy Property in the Lower Keys, Monroe County, Florida, Volumes 1 and 2, The Nature Conservancy.

2 - Department of the Navy Southern Division NAVFAC 2002. Environmental Assessment for Disposal and Reuse of Truman Waterfront, NAS Key West, Florida.

3 - Department of the Navy Southern Division NAVFAC 1986. Draft Environmental Impact Statement United States Navy Gulf Coast Strategic Homeporting; Volume VIII Key West, Florida.

4 - U.S. Department of Interior, Fish and Wildlife Service letter dated January 30, 2003 to D.J. Molzan reporting "listed species known to occur within the project area" with reference to the South Florida Multi-Species Recovery Plan.

The bald eagle is listed by the State as threatened. It was proposed for delisting by the U.S. Fish and Wildlife Service in 1999. The decision was delayed, however, until they determine how the

species will be managed after delisting. The bald eagle reported at Boca Chica in 1994 (FNAI 1994) was also reported as maintaining an active nest on a man-made elevated platform 100 yards west of the fuel storage area (U.S. Navy 2002b).

Bald eagles are considered a water-dependant species typically found near estuaries, large lakes, reservoirs, major rivers and some seacoast habitats. Their distribution is influenced by the availability of suitable nest and perch sites near large, open waterbodies, typically with high amounts of water-to-land edge. Throughout their range, bald eagles demonstrate a remarkable ability to tolerate perturbations to their habitat. Their adaptability to a variety of habitat conditions makes generalizations about habitat requirements and nesting behavior difficult. Though variable, eagles have basic habitat requirements that must be met in order to successfully reproduce and survive (USFWS 1999).

In extreme southwest Florida eagles nest in black (*Avicennia germinans)* and red mangroves *(Rhizophora mangle)*, half of which are snags. Nest trees in South Florida are smaller and shorter than reported elsewhere; however, comparatively they are the largest trees available. The small size of nest trees in South Florida relative to other nest sites throughout the eagle's range is due to the naturally smaller stature of *Pinus elliottii, P. taeda, P. palustris, and P. clausa* in South Florida, and the lack of pines in extreme southern Florida (USFWS 1999).

In southern peninsular Florida, bald eagles breed and nest during the temperate winter. Contrary to changes in habitat use exhibited by northern bald eagle populations, eagles in the south do not substantially alter habitat use throughout the year. Some adults may remain in and defend their nesting territory outside of the breeding season, use or defend portions of their territory, or disperse and congregate at predictable food sources such as landfills. Of those adults that do not maintain territories throughout the year, most are not thought to leave the State. Conversely, following fledging, many juvenile eagles disperse north and summer from along the Atlantic Coast west to the Appalachian Mountains and north as far as Canada (USFWS 1999).

The osprey (*Pandion haliaetus)* is designated as a State Species of Special Concern only in Monroe County. Ospreys are known to nest on Truman Annex; an active nest was located approximately 300 ft (91 m) south of Truman Waterfront on the old water tower. Should the water tower be demolished, the activity should be performed outside the breeding season to mitigate any impacts. Ospreys nesting on poles or platforms next to roads or residences are habituated to vehicular traffic and other human activities. However, ospreys that nest in mangroves on uninhabited, backcountry islands in the Lower Keys (primarily within the two national wildlife refuges) are substantially less tolerant of human disturbance. Ospreys in these areas commonly nest less than 4 ft (1.2 m) above normal high tide and are easily disturbed by boaters. Some of the lowest nests can be overwashed at high tide by boat and personal watercraft wakes. Frequent and prolonged human disturbance in these backcountry habitats can lead to nest abandonment or otherwise negatively affect reproductive success of ospreys (USFWS and FDNR 1992 as in DON 2000).

The Least tern (*Sterna antillarum)* is a State-listed threatened species. Colonies of least terns nest annually on the roofs of five buildings on the Truman Waterfront property (Buildings 102, 103, 104, 112, and 113), as well as seven other buildings located at Truman Annex (Schuetz 1998; as in DON 2000). Least terns typically nest on beaches, open sandy or graveled areas, and flat-topped, gravel roofs, but they are opportunistic and have been known to nest on dredge spoil, highway easements, rock pits, roadside shoulders, and parking lots (U.S. Navy 1998; NOAA 1996). Approximately 75 percent of terns nesting in the Lower Florida Keys nest on roofs. The terns prefer the rooftops with the most gravel and no overhanging tree limbs, which can provide access to predators (primarily raccoons). In recent years, few terns have nested on tops of Buildings 102, 103, and 104 due to the paucity of gravel elsewhere. The terns typically nest from mid-April to late August.

The Roseate tern (*Sterna dougallii dougallii)* is a State-listed threatened species which sometimes nest with least terns, but prefer shell/sand beaches, broken coral heaps, and eroded limestone in open or sparsely vegetated areas. Roseate terns have been reported from Sunset (formerly Tank) Island and Wisteria Island (two spoil islands in Key West Harbor) and Molasses Reef Dry Rocks.

At NAS Key West, roseate terns are known to nest on rooftops, usually with the largest least tern nesting colonies (DON 2000). Threats to the least and roseate tern populations include loss of suitable nesting sites due to development, disturbance of nest sites by humans, and predation of eggs by raccoons and black rats. Although rooftops may provide some isolation from human disturbance and predators, they may present other potential hazards, including flooding (common on flat roofs) and falls by young that cannot fly (NOAA 1996 as in DON 2000).

The Snowy plover (*Charadrius alexandrinus)* is listed as threatened by the State. Snowy plovers are primarily found on sand beaches, though they also forage on nearby mud flats, especially after breeding season. They also spend time on dune systems, coastal lagoons, inland steppes, sand deserts, tidal flats, dry salt flats, and large sandy rivers and lakes where there is little vegetation (Richards 1988).

The piping plover (*Charadrius melodus)* is a small, migratory shorebird that breeds only in three geographic regions of North America: on sandy beaches along the Atlantic Ocean, on sandy shorelines throughout the Great Lakes, and on riverine systems and prairie wetlands of the Northern Great Plains. The Great Lakes population is Federally listed as endangered, whereas the Atlantic Coast and Great Plains populations are Federally listed as threatened. Though this species does not breed in Florida, individuals from the three breeding populations winter in Florida. The Atlantic Coast birds use Florida's Atlantic and Gulf of Mexico coastlines in the winter. Until recently, the Great Lakes and Great Plains populations were observed along the Gulf Coast shoreline. In 1997, piping plovers from the Great Lakes population were sighted in Georgia. Birds from all three breeding populations have been observed in the Florida Keys (USFWS 1999).

The white-crowned pigeon (*Columba leucocephala)* is a State-listed threatened species. The white-crowned pigeon resembles a common pigeon in size and shape. Its habitat is chiefly mangroves fringing land masses, mangrove islands and tropical forests inland of the mangroves. Nesting colonies are usually on small islets which offer maximum protection from land predators. Nests are placed well up in mangroves, one to a tree. The species is dependent on arboreal fruit as a major food source where it feeds in the tree canopies (Pritchard 1978).

The eastern brown pelican (*Pelecanus occidentalis carolinensis)* is a State-listed Species of Special Concern due to its recovery from the effects on thinning egg shells as a result of dichlorodiphenyltrichloroehtane (DDT) pesticide contamination. In the Florida Keys, brown pelicans nest primarily in mangrove trees from 2 to 35 ft above high tide line. Nesting is confined to coastal islands of Florida, sometimes near human habitation. Feeding occurs in shallow estuarine waters but birds are seen as far as 20-40 miles off-shore (Pritchard 1978).

The eastern indigo snake (*Drymarchon corais couperi)* is thought to be widely distributed in South Florida. Given their preference for upland habitats, eastern indigos are not commonly found in great numbers in the wetland complexes of the Everglades region, even though they are found in pinelands, tropical hardwood hammocks, and mangrove forests in extreme South Florida (USFWS 1999).

In the Florida Keys, they have been collected from Big Pine and Middle Torch Keys, and are reliably reported from Big Torch, Little Torch, Summerland, Cudjoe, Sugarloaf and Boca Chica Keys. In extreme South Florida (the Everglades and Florida Keys), eastern indigo snakes are found in tropical hardwood hammocks, pine rocklands, freshwater marshes, abandoned agricultural land, coastal prairie, mangrove swamps, and human-altered habitats. It is suspected that they prefer hammocks and pine forests, since most observations occur there and use of these areas is disproportionate compared to the relatively small total area of these habitats (USFWS 1999).

The Lower Keys marsh rabbit (*Sylvilagus palustris hefneri)* is habitat specific, depending upon a transition zone of grasses and sedges for feeding, shelter, and nesting. Normally, marsh rabbits are restricted to relatively undisturbed wetlands. This species primarily occurs in the grassy marshes and prairies of the Lower Keys; which are transitional areas similar in form and species composition to communities interspersed throughout mangrove forests of mainland Florida. These wetland communities

lie in the middle of the salinity gradient in the Lower Keys. Major vegetative species include grasses – key grass (*Monanthochloe littoralis), fimbristylis (Fimbristylis castaneasea)*; succulent herbs – sea ox-eye daisy (*Borrichia frutescens), saltwort (Batis maritime), glasswort (Salicornia virginica)*; sedges – (*Cyperus* spp.); and sparse tree cover – buttonwood (*Conocarpus erectus)* and cat claw (*Pithecellobium guadalupense)*.

Lower Keys marsh rabbits also use marshes at the freshwater end of this salinity gradient. Freshwater marsh areas are dominated by sedges like sawgrass *(Cladium jamiacense)*, with succulent herbs like seashore dropseed (*Sporobolus virginicus)* and grasses like cordgrass (*Spartina* spp.). Freshwater marshes are found in depressions in the interior of only a few islands, primarily in the Lower Keys. During the wet season these areas can accumulate standing water.

Marsh rabbits also use coastal berm habitat, which is a relatively rare habitat consisting of a vegetated high ridge of storm-deposited sand and shell. Coastal berm habitat in the Lower Keys is often disturbed as on Boca Chica (USFWS 1999). Lower Keys marsh rabbits prefer areas with high amounts of clump grass, ground cover, and sea ox-eye daisy present, areas closer to other existing marsh rabbit populations, and areas close to large bodies of water (USFWS 1999).

The silver rice rat inhabits primarily salt marsh, though it formerly occurred in a fresh water marsh on Cudjoe Key. It uses frequently flooded intertidal areas vegetated with mangroves (*Rhizophora mangle* and *Avicennia germinans*) for foraging and traveling; occasionally flooded salt marsh flats with low grassy vegetation (*Distichlis spicata, Batis maritime,* and *Sporobolus virginicus)* for foraging and nesting; and elevated areas flooded only by the highest tides and vegetated by grasses (*Distichlis* and *Sporobolus)*, sea oxeye (*Borrichia frutescens)*, and buttonwood (*Conocarpus erectus)* for nesting.

3.3.3 Existing Conditions – Marine Resource

3.3.3.1 Benthic Biological Resources

Overview

Benthic marine communities in the Key West and Lower Keys areas have been described and summarized extensively by marine scientists (Vaughn 1914; Marszalek et al. 1977; Odum et al. 1982; Zieman 1982; Schomer and Drew 1982; Jaap 1984; Wheaton and Jaap 1988; Shinn et al. 1989; Jaap and Hallock 1990; Phillips and Thompson 1990). Schomer and Drew (1982) comprehensively characterized the ecology of the Keys area along with Florida Bay and the Everglades. The Florida Keys marine ecosystems also were extensively described in the Final Management Plan and EIS for the FKNMS (NOAA 1996). In addition, compilation and synthesis of information on the biology, geology, oceanography, ecology, and history of the Florida Keys were undertaken by Chiappone (1996a) and provides a detailed view of the Florida Keys marine habitat.

Hard bottom communities occur from intertidal depths out to the shelf edge in the Florida Keys, although hermatypic or reef-building stony corals are generally limited to water depths of less than approximately 150 ft. There are three general shallow-water hard bottom types occurring in the Key West area and throughout the Lower Keys: 1) nearshore hard bottom, 2) patch reefs, and 3) platform margin reefs (Jaap 1984; Florida Marine Research Institute [FMRI] 2000). Approximately 25 percent of the bottom habitat mapped in the FKNMS has been identified as hard bottom (FMRI 2000).

Nearshore hard bottom communities typically occur within a few miles of shore at depths from 3 to 13 ft and have relatively low relief. They may be colonized by a high diversity of octocorals, stony corals, and sponges in areas of moderate to high water flow such as in channels or cuts. In sheltered areas adjacent to the north or south sides of landmasses, there may be minimal water movement and higher rates of sedimentation and the hard bottom community may be dominated by various species of algae, with percent cover often exceeding 75 percent (Chiappone and Sullivan 1994).

Patch reefs occur between the shoreline and outer reef line at water depths ranging from approximately 13 ft to nearly 40 ft, and may have heights of up to 23 ft above the surrounding seafloor. Many patch reefs occur throughout Hawk Channel off Boca Chica Key and Key West in the Lower Keys.

Large, mature patch reefs are dominated by the massive stony coral species *Colpophyllia natans*, *Diploria* spp., *Montastrea annularis*, *M. cavernosa*, and *Siderastrea siderea* as well as various species of sponges, octocorals, bryozoans, and ascidians (Jones 1977; Jaap 1984).

Platform margin reefs (bank reefs) occur parallel to shore along the south side of Hawk Channel (FMRI 2000). Platform margin reefs include many of the classically described reef habitats including back reef, reef flat, shallow spur and groove, drowned spur and groove, and fore reef terrace (Shinn et al. 1977; Jaap et al. 1988; Shinn et al. 1989). Well-developed platform margin reefs in the Lower Keys include Looe Key; Eastern, Middle, and Western Sambo; Eastern Dry Rocks; Sand Key; and Rock Key. They typically lack a well-developed *Acropora palmata* reef flat, common in Upper Keys bank reefs, and are characterized by shallow high-relief spur and groove communities. Most reef habitat in the Lower Keys consists of a low-relief community occurring at depths of approximately 16 to 30 ft, and a relict or drowned spur and groove community with low-profile spurs at depths of 33 to 82 ft (Shinn et al. 1989). These reefs occur seaward of and between well-developed shallow spur and groove reefs in the Lower Keys.

Soft or unconsolidated sediment communities can include calcareous sand or mud bottom with or without seagrasses or algae, and rubble-bottom areas, typically associated with platform margin reef flats. These areas of unconsolidated sediments cover a large majority of the bottom within the FKNMS, and comprise an estimated 70 percent of the total benthic habitat mapped by FMRI and NOAA staff (FMRI 2000). Soft bottom habitats can support diverse infaunal assemblages including, polychaete worms, bivalves, gastropods, and crustaceans. Additionally, these areas may contain many epifaunal echinoderm species such as seastars, sea cucumbers, and echinoids.

Calcareous mud bottom may be found in areas of high turbidity or with minimal water circulation. The substrate may have varying amounts of sand intermixed with silt- and clay-sized particles, and seagrass and algae may or may not be present. Sand bottom areas are found in locations with wave activity or high tidal flow. If water movement is not excessive, seagrasses and calcareous green algal communities can be dense, yielding greater than 75 percent cover (Chiappone 1996b).

Seagrasses in the Florida Keys include manatee grass (*Syringodium filiforme*), shoal grass (*Halodule wrightii*), turtle grass (*Thalassia testudinum*), paddle grass (*Halophila decipiens*), and star grass (*Halophila engelmanni*). Seagrass beds are generally found in somewhat protected waters, with seagrass distribution influenced by light, sediment thickness, and wave surge or exposure (Zieman 1982). Manatee grass, shoal grass, and turtle grass may all be found at depths ranging from approximately intertidal to 33 ft, often occurring in mixed beds. Shoal grass typically will tolerate greater exposure than the others, growing at the shallowest depths. Turtle grass will form thick beds at depths up to 33 ft. Manatee grass also will grow within this depth range but will often be found in beds at depths up to 49 ft (Zieman 1982).

Rubble-bottom areas are typically associated with the platform margin reef flats but can also occur in areas of high water flow and wave activity near shorelines or in tidal channels. Rubble can range from gravel-size up to >4 inch diameter, depending on water flow rates or wave energy.

3.3.3.1.1 Project Area Benthic Resources

Biological resources surveys were conducted by Continental Shelf Associates, Inc. to characterize the benthic habitat and communities within the vicinity of the project area (Figures 3-8 and 3-9). Side-scan sonar data, diver observations, towed and diver-held videocamera data and still photographs were collected to assist in describing the project area. Data were collected from Truman Annex Harbor, the adjacent turning basin (Cut C), and the Key West Ship Channel (Cuts B and A, and the Main Ship Channel). Also surveyed were areas adjacent to the Ship Channel extending out 1,000 ft on each side, and a 1,000-ft wide potential dredge pipeline route along the north side of Hawk Channel extending from Cut B east to Boca Chica Channel. Diver tows and bounce dives were also conducted up Boca Chica Channel and at the proposed dredged material placement site in the quarry pits of a privately owned site on Rockland Key.

3.3.3.1.2 Truman Annex Harbor

A diver survey was conducted along the east side of Truman Annex Harbor, across the center of the basin, and along a section of the inside of the Mole Pier. Along the edges of the harbor, the bottom was a combination of silty sediments and small amounts of scattered rock or concrete rubble ranging from approximately 0.5 to 3 ft in diameter. Small amounts of other anthropogenic debris were also observed, including sections of steel reinforcement rod, wire rope, a wheelchair, and a bicycle. Sediments away from the harbor edges were entirely fine materials, with a thickness of up to at least 2 ft, and with occasional small mounds and burrows. Observed biota associated with the bottom included unidentified hermit crabs and very small stony coral recruits on several of the larger rubble pieces. Macroinfaunal samples collected in 1986 (DON 1986) from stations within Truman Harbor showed lower densities and species richness than from a station outside of the mouth of the harbor, although diversity values were relatively high at all stations. This was not unexpected due to a recent dredging of Truman Harbor and indicated the area was re-colonizing at a rapid rate.

The seawalls/bulkheads and rock base along the eastern side of the harbor were colonized by a few silt-covered sponges near the harbor bottom, and by encrusting sponges, bryozoans, and ascidians at water depths of less than approximately 20 ft. Relatively low densities of stony corals, octocorals, and larger sponges were attached to the walls at water depths of less than 8 ft. Although not directly observed during the diver survey, a seagrass community composed predominantly of *T. testudinum* has been documented in shallow water at the southwestern corner of the harbor (pers. comm., L. MacLaughlin, FKNMS).

3.3.3.1.3 Turning Basin and Ship Channel

Within the turning basin immediately west of the Truman Annex Harbor, the bottom ranged from fine silty sediments to rubble ranging from <1 inch up to 2 ft diameter to exposed hard bottom. An area of fine sediments was located in the northwest corner of the basin, as indicated by bathymetric profiles showing water depths as shallow as -31 ft. Northern and southern sections of the turning basin were characterized by heavily biofouled rubble, often in waves and mounds up to 2 ft in height. There were also intermittent areas of exposed hard substrate with a silty sand veneer. Epibiota included unidentified red algae, hydroids, various species of sponges, and occasional octocoral colonies (Figure 3-10).

The central area of the turning basin, adjacent to the Mole Pier and extending north of the entrance to Truman Harbor and nearly to the western edge of the turning basin, was composed of mixtures of large rubble and gravel-sized rock fragments. There was minimal biofouling of the substrate material and only a very thin layer of fine sediments visible. Depressions several feet deep were observed along with waves and piles of rubble. The bottom appeared to be heavily impacted by ship propeller and thruster wash during ship docking procedures. There were also areas of exposed bare rock with parallel scars in the form of three (3) to six (6) inch high ridges and troughs observed throughout this area, probably created during the last dredging project.

Observations made by Fourqurean (1999) during a survey of benthic communities within the Key West Harbor were similar to CSA's survey results. Within the turning basin adjacent to Truman Harbor, he observed bottom types ranging from muddy sand to rubble over rock bottom, with a rolling topography and minimal amounts of flora and fauna.

The western edge of the turning basin consists of a vertical wall approximately 5 ft in height colonized by stony corals (*Dichocoenia stokesi, Diploria strigosa, Favia fragum, M. cavernosa, Oculina diffusa, S. sidereal, Siderastrea radians,* and *Stephanocoenia michelinii*), octocorals, sponges, hydroids, and tunicates. Macroalgae, including *Caulerpa* sp., *Halimeda* sp., and *Penicillus* sp., pen shells (*Pinna* sp.), long-spine urchins (*Diadema antilarum)*, and spiny lobsters (*Panulirus argus)* were also noted along these vertical walls (FKNMS 18 December 2002 survey).

The area to the west of the turning basin consisted of a shallower platform at 20 to 25 ft water depth colonized by macroalgae, octocorals, and sponges, with occasional stony coral colonies. This area seemed to have more exposed hard bottom to the south with higher numbers of stony corals, octocorals, and sponges, while the area to the north was predominantly sand- and silt-covered hard bottom with primarily red and green algal species. Observed species included the sponges *Cinachyra alloclada*, *Ircinia campana*, *I. strobilina*, *Placospongia melobesioides*, *Pseudaxinella lunaecharta*, and *Spheciospongia vesparium*, the octocorals *Erythropodium caribaeorum*, *Eunicea* sp., *Muricea* sp., and *Pseudoplexaura* sp., and the stony corals *M. cavernosa*, *Diploria* sp., *O. diffusa*, and *S. siderea*. Descriptions of the benthic communities in this area by Fourqurean (1999) were also consistent with these observations.

The seafloor north of the turning basin and east of Tank Island is predominantly sand-covered with red algae, large numbers of sponges, hydroids, ascidians, occasional octocorals, and rock rubble. Epifaunal density decreased in the vicinity of the northern edge of the turning basin with sponges being smaller and less abundant and less biofouling on the rock rubble.

The bottom within the channel at the northern end of Cut B was composed of gravel-sized rock fragments and larger rubble over a hard substrate, with hydroids, red algae, and small sponges. Approximately one third of the distance down this cut to the south, there was an increase in the amount of gravel-sized rubble, accumulated in waves ranging up to 3 ft in height. There was also a significant amount of debris, including large numbers of bottles, line, cables, broken lobster traps, and other small unidentified objects.

The vertical walls along the channel edges at the northern end of Cut B range in height from approximately 2 to 3 ft up to 8 ft. The walls are colonized by hydroids; several species of tunicates; encrusting, branching and massive sponges; and occasional small scleractinian corals. Faunal abundance is highest near the upper edges of the wall with very low biotal cover near the bottom. Tunicates species include *Eudistoma* sp. and *Didemnum* sp. and other unidentified encrusting species. Sponges include *Amphimedon compressa, Aplysina* sp., *Callyspongia vaginalis, Cinachyra* sp., *Lotrochota birotulata, I. Strobilina, S. vesparium,* and several unidentified species. Scleractinian corals are not abundant on the walls, with small colonies of the branching coral *O. diffusa* and occasional small *S. radians* and *S. siderea* recruits. Most of the scleractinian corals have diameters of less than 10 centimeter (cm). The fouling soft coral *Carejoa riisei* is relatively abundant along the upper sections of the wall on the western side of the channel. Other epifauna include long-spine urchins (*D. antillarum)*, pencil urchins (*Eucidaris tribuloides)*, and small spiny lobsters (*P. argus).*

The rock surface extending from the top of the walls away from the channel is more heavily colonized with sponges, scleractinian corals, tunicates, and macroalgae. Sponge and tunicate species are similar to those observed on the vertical rock face. Scleractinian corals include *M. annularis, M. cavernosa, O. diffusa, Porites astreoides, S. radians, S. siderea, and Solenastrea bournoni.*

At the midpoint of Cut B, the ridge and groove features observed in the rock bottom in the turning basin were highly visible running across the channel, with red algae attached to the ridges. Epibiota increased at the southern end of the cut, with the dominant cover an unidentified species of red turf-like algae, along with increasing numbers of sponges and small octocorals (*Eunicea* sp.). An area of clayey sediments also was observed at the southern end of the cut. Overall, this section of the channel seemed to be highly disturbed by ship traffic, with a predominantly rubble-covered bottom.

An area of low-relief hard bottom was observed immediately to the west of the channel in Cut B. It was colonized by macroalgae, sponges, octocorals, and stony corals, with a species composition similar to the area west of the turning basin. Further to the west and southwest of the channel, sediments graded into sand with macroalgae and the seagrass *H. decipiens*. To the east of the Cut B channel, the bottom ranged from low-relief hard bottom (with algae, small sponges, and octocorals) to sand bottom.

Cut A, which extends to the south-southeast a distance of approximately 1 mile from the southern end of Cut B, has a width of at least 800 ft, as compared to the 300 ft widths of Cut B and the

Main Ship Channel. Sediments within Cut A ranged from shell fragments and gravel-sized rubble to a coarse sand to a crusty, clayey surface with softer underlying sediments. The shell fragments were often observed in waves up to 4 to 5 ft in height, particularly at the junction of Cut A and the Main Ship Channel. There were no significant attached epibiota along this segment of the channel, due to the predominantly sandy to shelly substrate.

Cut A was bordered on both sides by areas of predominantly silty sand sediments with bioturbation, consisting of small patterned burrows. Small patches of green algae, including *Caulerpa mexicana* and *Udotea* sp., along with the seagrass *H. decipiens*, were observed by divers at a site approximately 900 ft northeast of the channel. An area of rubble was also observed northeast of the northern end of this cut.

The Main Ship Channel, extending south from Cut A to the reef line at the southern edge of Hawk Channel, contained sediments ranging from shell fragments in waves up to 6 ft in height to silty sand with small sand ripples. The shell waves were observed at the junction with Cut A and extended to the south approximately two-thirds of a mile, where the substrate became more of a silty sand with smaller waves. No attached epibiota were observed within this northern segment. Water depths along the central segment of the Ship Channel near the center of Hawk Channel dropped to greater than 40 ft and then decreased to 35 ft toward the southern end of the channel. Sediments in the southern section of the channel were composed of fine to coarse carbonate sand and shell fragments in waves from 1 to 2 ft in height. As with Cut A and the northern segment of the Main Ship Channel, there was a minimal amount of epibiota in this area with small amounts of macroalgae, the seagrass *S. filiforme*, and occasional seastars (*Luidia* sp.). Stony corals, octocorals, and sponges were observed at the southern end of the channel at depths of greater than 45 ft, where the channel passes over a low-relief reef community.

The Main Ship Channel was bordered by sediments similar to those observed along Cut A, containing patches of the green algae *Avrainvillea* sp., *Halimeda incrassata*, and *Udotea* sp. and the seagrasses *S. filiforme* and *T. testudinum*. Extensive areas of this seagrass/calcareous algae habitat may occur along both sides of the channel approximately 1 mi north of its southern end. Areas of low-relief hard bottom with sediment veneers were also noted at a few locations along the channel. These areas had small sponges, octocorals, and small stony corals attached to exposed rock substrate.

Distinct patch reefs flanked the edges of the Main Ship Channel, especially at the northern end, where at least 10 distinct reef structures were found within 1,000 ft of the channel. Dives were made on seven patch reefs adjacent to the northern end of the Main Ship Channel and two patch reefs at the southern end. The structures to the north rose up to 20 ft above the surrounding seafloor, were colonized primarily by various stony coral species and sponges, and were covered with a layer of silt from base to crest. *C. natans*, *M. cavernosa*, *O. diffusa*, and *S. siderea* were the more abundant stony corals observed on these features. Surrounding sediments were fairly fine with a layer of silt over a mixture of silty sand and shell.

Two patch reefs adjacent to the southern end of the channel, which were ground-truthed by divers, were smaller in height and diameter, at approximately 6 to 9 ft height by less than 100 ft diameter. These patch reefs were colonized by a more diverse population of stony corals, octocorals, and sponges, most of which appeared healthy. Neither the reef structures nor the attached fauna were coated with significant amounts of silt. Surrounding sediments were fine- to medium-grained sand with minimal amounts of fines.

3.3.3.1.4 Proposed Dredge Pipeline Route

The bottom along a potential 1,000-ft wide corridor surveyed from the southern end of Cut B east to an area off the southern end of Boca Chica Channel consisted primarily of silty sand to coarse sand with shell fragments. Observed biota included several species of green algae, including *Avrainvillea* sp., *Caulerpa prolifera*, *Halimeda* sp., *Penicillus* spp., *Rhipocephalus* sp., and *Udotea* sp., and the seagrasses *H. decipiens*, *S. filiforme*, and *T. testudinum*. These algae were found in various size

patches, with low to high algal percent cover, which extended from a few meters to more than several hundred meters along the diver transect. Seagrasses formed a relatively minor component of these algal patches, occurring at low densities or not at all. A few patch reefs were detected from the side-scan sonar data within the 1,000-ft wide corridor, and diver ground-truthing of one reef showed a silt-covered structure with a relief of approximately 11 ft above the surrounding seafloor. It was colonized primarily by the stony corals *M. cavernosa*, *O. diffusa*, *S. siderea*, and *S. bournoni* and various species of sponges, including *I. birotulata*, *I. campana*, and *P. melobesioides*.

A diver tow also was conducted up the axis of Boca Chica Channel to its northern extent at the Navy marina. From near the southern edge of Boca Chica Key to the south, the bottom was primarily silty sand with patches of the algae *Avrainvillea* sp., *Caulerpa* spp., *Halimeda* sp., *Penicillus* spp., and *Udotea* sp. Patches of *T. testudinum* were observed south of the channel, along the eastern edge, and outside the eastern side of the channel in densities ranging from low to high, however, the deeper central portions of the southern end of the marked channel appeared generally devoid of seagrasses.

From near the southern end of Boca Chica Key up the channel axis to the north, the channel was cut through rock, with vertical rock faces along the channel edge. The vertical eastern wall of the channel was colonized by stony corals, sponges, and macroalgae from the southern end of Boca Chica Key north to channel marker 14. Coral species included *D. stokesi, Diploria clivosa, F. fragum, M. cavernosa, Montastrea faveolata, O. diffusa, P. astreoides, P. porites, S. radians, S. siderea, and S. michelinii.*

The channel bottom was a mixture of patchy hard bottom and sand and rubble substrates. Scattered stony corals (*C. natans*, *D. stokesi*, *F. fragum, M. cavernosa*, *Porites* spp., *S. radians, S. siderea, S. bournoni,* and *S. michelini*), octocorals (*Briareum asbestinum, Eunicea* sp., *Muricea* sp., *Plexaurella* sp., *Pseudopterogorgia* sp. and *Pterogorgia* sp.), and sponges (*I. campana* and *S. vesparium*), were observed along the bottom, especially within patches of hard bottom. Seagrasses and macroalgae *(Caulerpa* sp., *Halimeda* sp., *Laurencia* sp., and *Udotea* sp. also were observed on slightly elevated “hummocks” of sandy substrate as well as scattered within hard bottom areas.

3.3.3.1.5 Rockland Key Placement Site

Water depths in the western rock pit ranged from 35 to 40 ft along the southwestern, western, and northern sides to approximately 28 to 29 ft near the middle. There is a shallow sill around the periphery of the western pit to a depth of about 1 to 1.5 ft at which point the wall drops vertically to approximately 30 ft depths. There is a shoal in the southeastern corner with depths ranging from 25 ft to as shallow as 3 ft that is colonized with seagrasses. Underwater visibility during survey dives in the pit ranged from about 15 to 25 ft, and the water had a slightly green tint. Sediments are predominantly silty with deposits of *Thalassia testudinum* detritus along the bottom at the southern edge. Along both the eastern and western sides of the pit, there are large piles of bundles of from six to eight tires that have been cemented together in linear arrays. A truck frame is positioned on top of the tires on the western side of the pit.

At water depths of from approximately 20 to 28 ft, small patches of the green algae *Penicillus* sp. are present, with the density increasing with decreasing water depths. At depths of less than 12 ft, small patches of the seagrass *H. wrightii* were observed at low densities. The shallow area in the southeastern corner of the western pit extends approximately 200 ft east-west by 120 ft north-south with depths ranging from 3 to 12 ft. The seagrass *T. testudinum* occurs within this area at depths of less than 6 ft, and *H. Wrightii* and *S. filiforme* were observed out to 12 ft water depths. *T. testudinum* also occurs in patchy distribution along the shallow sill surrounding the pit at higher densities in the shallow waters to the north.

The vertical walls of the western pit are colonized by various algal species down to depths of about 15 ft. These include *Acetabularia* sp., *Penicillus* sp., *Caulerpa sertularioides*, *Halimeda* sp., *Udotea* sp., and an unidentified green filamentous algal species (*Cladophora* sp.), which covered the majority of the surface of the walls. Invertebrate species observed on the walls include the sponges *S. vesparium*,

C. vaginalis, and unidentified encrusting sponges, large numbers of flame scallops (*Lima scabra*), the bryozoan *Bugula* sp., the anemone *Bartholomea annulata*, and the spider crab *Mithrax spinosissimus*. Upsidedown jellyfish (*Cassiopea xamachana*), horseshoe crabs (*Limulus polyphemus*), and portunid crabs were observed on the silty bottom of the western rock pit.

Configuration of the eastern rock pit is similar to that of the western pit, except that it has no direct connection to adjacent open water. While man-made berms separate the eastern pit from open water, there appears to be tidal exchange through the porous limestone. The pit encompasses 11.67 acres of open water, with a depth range to about 40 ft. The eastern rock pit exhibits biological resources similar to those found in the western pit.

3.3.3.2 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801-1882) established regional Fishery Management Councils and mandated that Fishery Management Plans (FMPs) be developed to responsibly manage exploited fish and invertebrate species in Federal waters of the United States. When Congress reauthorized this act in 1996 as the Sustainable Fisheries Act, several reforms and changes were made. One change was to charge the National Marine Fisheries Service (NMFS) with designating and conserving Essential Fish Habitat (EFH) for species managed under existing FMPs. This was intended to minimize, to the extent practicable, any adverse effects on habitat caused by fishing or non-fishing activities, and to identify other actions that encourage conservation and enhancement of such habitat.

EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" [16 U.S.C. § 1801(10)]. The EFH Final Rule summarizing EFH regulations (50 CFR Part 600) outlines additional interpretation of the EFH definition. "Waters", as used previously, include "aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include aquatic areas historically used by fish where appropriate." "Substrate" includes "sediment, hard bottom, structures underlying the waters, and associated biological communities." "Necessary" is defined as "the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem." "Fish" includes "finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds," while "spawning, breeding, feeding or growth to maturity" cover the complete life cycle of those species of interest.

The South Atlantic Fishery Management Council (SAFMC) is the management council that has jurisdiction over fisheries in Federal waters of the Key West project area. The SAFMC has produced several FMPs for single and mixed species groups that include *Sargassum* algae, invertebrates, and fishes. All of these FMPs, including those for shrimps, spiny lobster, and corals, coral reefs and live/hard bottom, reef fishes, and coastal migratory pelagics, were recently amended in a single document (SAFMC 1998a) to address EFH. A separate FMP describing EFH for pelagic *Sargassum* in the South Atlantic was prepared in late 1998 (SAFMC 1998b). Another invertebrate, the stone crab, was included in the EFH description below because of its importance to local fisheries. The SAFMC has not produced a separate FMP for stone crab because the primary fishing areas are in Gulf of Mexico waters (Florida Bay and along Florida's southwest coast). The Gulf of Mexico Fishery Management Council (GMFMC) included stone crab in it's EFH amendment (GMFMC 1998). In addition to the FMPs prepared by the SAFMC, a FMP covering Highly Migratory Species (tunas, billfishes, sharks, and swordfish) was prepared by the Highly Migratory Species Management Unit, Office of Sustainable Fisheries, National Marine Fisheries Service (NMFS 1999a). This FMP includes descriptions of EFH for sharks, swordfish, and tunas (NMFS 1999a) whereas another FMP for Atlantic billfish was amended to include EFH designations (NMFS 1999b). Two additional highly migratory species, wahoo and dolphin, have been recently covered in a separate draft FMP (SAFMC 2001).

The queen conch (*Strombus gigas)* is not managed by the SAFMC or the GMFMC; however, the FFWCC is managing its recovery in the waters of the Florida Keys. Commercial harvest of queen conch was closed in 1975 followed by recreational closure in 1985, and in 1986, the ban was extended to include Federal waters. There is no formal EFH description applicable for queen conch to Florida Keys

waters. Nevertheless, because of the importance of queen conch recovery in the project area, it is included in the following EFH assessment along with the Federally managed species.

Within EFH designated for some species or species groups, Habitat Areas of Particular Concern (HAPC) also are identified. HAPCs either play important roles in the life history (e.g., spawning) of Federally managed fish species or are especially vulnerable to degradation from fishing or other human activities. In many cases HAPCs represent areas where detailed structure and function information is available within the larger EFH. Descriptions of EFH and HAPCs for the aforementioned FMPs and key managed species or species groups are given below.

3.3.3.2.1 Fishery Resources

Fishery resources in the Key West area for which EFH has been described are discussed in this section. The project area includes the Ship Channel, turning basin, Truman Harbor, Hawk Channel, Boca Chica Channel, and dredge disposal site at the quarry pits of a privately owned site on Rockland Key. Characteristics of these sites were discussed in detail in Chapter 2. EFH summaries presented below were tabulated for key Federally managed species based on information in the previously mentioned FMPs as well as general review documents by Alevizon and Bannerot (1990), Chiappone and Sluka (1996), and the NOAA (1996). HAPCs for managed species are identified where applicable based on FMP information. Species or species groups with EFH in the project area are as follows:

- *Sargassum*
- Corals, Coral Reefs, and Live/Hard Bottom
- Queen Conch
- Penaeid and Rock Shrimps
- Spiny Lobster
- Stone Crab
- Reef Fishes (Snapper-Grouper Management Unit)
- Highly Migratory Fishes
- Coastal Pelagic Fishes

Sargassum

The brown alga *Sargassum* floats at the sea surface, often forming large mats. These accumulations attract numerous small fishes and invertebrates that form mobile epipelagic assemblages (Dooley 1972). Large fishes, particularly billfishes, dolphin, tunas, and wahoo, associate with *Sargassum* mats in search of prey and shelter (SAFMC 1998a,b). EFH for *Sargassum* is simply shelf waters and the Gulf Stream. No table entry was made for *Sargassum*. Drifting mats of the alga will certainly occur in the Ship Channel, turning basin, and Truman Harbor depending on prevailing winds and water currents.

Coral, Coral Reefs, and Live/Hard Bottom

EFH for reef building stony corals reach peak cover along the Florida reef tract that borders the Florida Keys (SAFMC 1998a). This area extends from nearshore areas to 30 m water depths in areas where salinity is consistently above 30 parts per thousand (ppt) and water temperatures range from 15 to 35º celsius (C). Coral, coral reefs, and live/hard bottom habitats were not included in the EFH tables. Much of the area adjacent to the Ship Channel, Key West Harbor, Boca Chica Channel, and particularly in Hawk Channel, includes patch reefs and hard bottom (Marszalek et al. 1977; Jaap 1984; Shinn et al. 1989). Additional information on corals, coral reefs, and live/hard bottom may be found in Section 3.3.3.1.

Soft corals under this category include *Antipatharia* (black corals), octocorals (sea fans), and Pennatulacea (sea pens and sea pansies). EFH for *Antipatharia* includes rough, hard, exposed, stable substrate offshore in high salinity (30 to 35 ppt) waters in depths exceeding 18 m not restricted by light penetration. Due to the shallow depth of this project, no antipatharians are expected. EFH for octocorals includes rough, hard, exposed, stable substrate in subtidal to outer shelf depths within a wide range of salinity and light penetration throughout the project area. Octocorals occur on hard bottom throughout the

Ship Channel, turning basin, Boca Chica Channel, and Truman Harbor. EFH for Pennatulacea includes muddy, silty bottoms in subtidal to outer shelf depths within a range of salinity and light penetration. It is unlikely that any Pennatulacea will occur in the project area.

Habitat Areas of Particular Concern

HAPCs for coral, coral reefs, and live/hard bottom habitats of the Florida Keys include the Florida Reef Tract and Hawk Channel.

Queen Conch

Queen conch primarily inhabit back-reef zones, shallow hard bottom, seagrass, and coarse sedimentary habitats of the Florida Keys (Glazer and Kidney 2003). Several sprawning populations exist in the Keys, and a large concentration of spawning adults is found in the back reef and hard bottom areas from Eastern Dry Rocks to Looe Key reef. Conch are distributed in two zones: one inshore and one offshore. The inshore group rarely reproduces, whereas the offshore group is reproductively active. Spawning occurs from March through October with peak activity from April to July. Planktonic larvae are retained by local circulation, and the populations are primarily self-recruiting (Glazer 2001).

Habitat Areas of Particular Concern

HAPCs for queen conch exist in two areas relative to the proposed project: the hard bottom areas adjacent to Ship Channel Entrance, and off the Fort and Boca Chica. Of the estimated 28,000 conch in the spawning stock that occurs from Eastern Dry Rocks to Looe Key during 2001, about 18,000 were found in the region extending from Eastern Dry Rocks to Eastern Sambo. This region, by far, represents the greatest reproductive output of Florida's conch population, and any project-related impacts, particularly elevated turbidity, could impact planktonic larvae and newly settled individuals (Robert Glazer, FFWCC, pers. comm. 2003). The southern portion of the Ship Channel would be close to intersecting this area. In addition, juvenile and non-reproducing adult conch are common in the hard bottom areas from the Fort through Boca Chica and to the other side of Key West Harbor (Robert Glazer, FFWCC pers. comm. 2003).

Penaeid and Rock Shrimps

The only commercial penaeid shrimp known to occur in the lower Florida Keys is the pink shrimp (*Penaeus duorarum*) (SAFMC 1998a). EFH for pink shrimp includes seagrass and soft bottom habitats. Offshore soft bottom habitats where spawning and growth to maturity take place are important as EFH (Table 3-2). The most productive pink shrimp area in the region is the Tortugas shrimp grounds north of Dry Tortugas. This species may occur in the Ship Channel, turning basin, Truman Harbor, Hawk Channel, Boca Chical Channel, and the quarry pits on Rockland Key.

Rock shrimp (*Sicyonia brevirostris*) EFH consists of offshore terrigeneous and biogenic soft bottoms in water depths ranging from 18 to 182 m deep with maximum occurrence and abundance between 34 and 55 m. The Gulf Stream current is considered important in transporting rock shrimp larvae (SAFMC 1998a). Table 3-2 provides a description of EFH for rock shrimp in the Key West area. Adults would only be expected to occur near the seaward extent of the Ship Channel, whereas planktonic larvae may be found in the water column throughout the project area.

Habitat Areas of Particular Concern

Areas considered HAPCs for pink shrimp are inshore nursery grounds, particularly seagrass beds. No HAPC was identified for rock shrimp.

Table 3-2 Invertebrate Species for Which EFH has been Identified in the Ship Channel, Turning basin, Truman Harbor, and Dead End Canals Near Key West, Florida (SAFMC 1998a).

Species	Life Stages	Habitat
Queen conch *(Strombus gigas)*	Adults; Juveniles; Larvae	Back-Reef Zones; Rubble-Sand; Coarse Sand; Pelagic
Pink shrimp (*Penaeus dourarum*)	Adults; Juveniles; Larvae	Soft Bottom; Seagrass; Pelagic
Rock shrimp (*Sicyonia brevirostris*)	Adults; Juveniles; Larvae	Soft Bottom (18 to 180 m); Pelagic
Stone crab (*Menippe mercenaria*)	Adults; Juveniles; Larvae	Hard Bottom; Seagrass; Mangrove; Sponges; Macroalgae; Pelagic
Spiny lobster (*Panulirus argus*)	Adults; Juveniles; Larvae	Hard Bottom; Seagrass; Mangrove; Sponges; Macroalgae; Pelagic

Spiny Lobster

Spiny lobster (*Panulirus argus*) is very important economically to the Florida Keys. Both commercial and recreational interests benefit from healthy spiny lobster populations. Spiny lobster EFH consists of hard bottom, coral reefs, crevices, cracks, and other structured bottom in shelf waters (Table 3-2). Juvenile habitat is in nearshore waters and ranges in type from massive sponges, mangrove roots, and seagrass meadows to soft bottom with macroalgal clumps. The Gulf Stream provides an important mode of transport for early life history stages of spiny lobster.

Habitat Areas of Particular Concern

HAPCs for spiny lobster include coral/hard bottom habitat from Jupiter Inlet, Florida to the Dry Tortugas, Florida.

Stone Crab

All life stages of the stone crab (*Menippe mercenaria*) occur in the project area, however, highest densities of adult stone crab exist north of the project area in Florida Bay. EFH for adult stone crab includes seagrass meadows, hard bottom, rock ledges, channel margins, and coral heads (GMFMC 1998). Adults construct burrows and prefer areas with hard packed sand with scattered hard bottom covered with algae, soft corals, and sponges. Juveniles do not burrow but are found in seagrass, shell hash, sponges, and other structurally complex benthic habitats. Larvae are planktonic and grow fastest in warm (> 30º C), high salinity (> 30 ppt) waters. Table 3-2 describes EFH for the Key West project area.

Habitat Areas of Particular Concern

The GMFMC did not identify any particular HAPC for stone crab, but did include Florida Bay (a primary habitat for adult stone crab) as an HAPC (GMFMC 1998).

Reef Fishes (Snapper-Grouper Management Unit)

The SAFMC Snapper-Grouper Management Unit consists of 73 species from 10 families (SAFMC 1983; 1998a). Members of this management unit inhabit reefs and hard bottom areas as adults and are very important components of commercial and recreational fisheries of the area. Because of their affinity for hard bottom and reefs, members of the Snapper-Grouper Management Unit are collectively referred to as reef fishes. Although snappers (Lutjanidae) and groupers (Serranidae) are the most valuable members of the group, species from other families including grunts (Haemulidae), jacks (Carangidae), porgies (Sparidae), spadefishes (Ephippidae), temperate basses (Percichthyidae), tilefishes (Malacanthidae), triggerfishes (Balistidae), and wrasses (Labridae) are also represented. Other reef fishes, not managed by SAFMC but important to the ornamental or aquarium trade, occur in the Key

West area and include angelfishes (Pomacanthidae), butterflyfishes (Chaetodontidae), gobies (Gobiidae), jawfishes (Opistognathidae), and wrasses. Most reef fishes (and invertebrates) have a two-phase life cycle that greatly influences habitat use by individuals throughout their development. The early phase of the life cycle consists of planktonic or demersal eggs and planktonic larvae capable of considerable spatial transport by currents, tides, and winds. This transport can be advective or retentive. The second phase begins when larvae settle to the seafloor and begin life as benthic juveniles inhabiting shallow water habitats such as patch reefs, seagrass beds, mangroves, and other structurally complex features. As these young individuals grow, they gradually migrate offshore to adult habitat where they develop to maturity. EFH descriptions for representative reef fishes are given in Table 3-3. Because young stages of many of these species use nearshore habitats (Lindeman et al. 2000), all areas including the Ship Channel, turning basin, Truman Harbor, Hawk Channel, Boca Chica Channel, and quarry pits at Rockland Key encompass EFH for some species or life stage.

Habitat Areas of Particular Concern

HAPCs described for the Snapper-Grouper Management Unit include high-relief offshore areas where spawning occurs and localities of known spawning aggregations. In addition, nearshore mangrove habitat; seagrass habitat; coral, coral reef, and hard/live bottom habitats; pelagic and benthic *Sargassum*; and artificial reefs encompass HAPCs for reef fishes.

Table 3-3 Representative Reef Fish Species for Which EFH has been Identified in the Ship Channel, Turning Basin, Truman Harbor, and Dead End Canals Near Key West, Florida (SAFMC 1998a).

Species	Life Stages	Habitat
Jewfish (*Epinephelus itajara*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Mangrove; Water Column
Red grouper (*Epinephelus morio*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column
Nassau grouper (*Epinephelus striatus*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column
Black grouper (*Mycteroperca bonaci*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column
Gag (*Mycteroperca microlepis*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column
Mutton snapper (*Lutjanus analis*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column
Schoolmaster (*Lutjanus apodus*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Mangrove; Water Column
Blackfin snapper (*Lutjanus bucanella*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column
Red snapper (*Lutjanus campechanus*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Soft Bottom; Water Column
Gray snapper (*Lutjanus griseus*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Mangrove; Water Column
Dog snapper (*Lutjanus jocu*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Mangrove; Water Column
Mahogany snapper (*Lutjanus mahogoni*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column
Lane snapper (*Lutjanus synagris*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Mangrove; Water Column
Vermilion snapper (*Rhomboplites aurorubens*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column

Species	Life Stages	Habitat
Yellowtail snapper (*Ocyurus chrysurus*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column
Greater amberjack (*Seriola dumerili*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column
Almaco jack (*Seriola rivoliana*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column
Gray triggerfish (*Balistes capriscus*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column
Queen triggerfish (*Balistes vetula*)	Adults; Juveniles; Larvae; Eggs	Hard Bottom; Seagrass; Water Column

Highly Migratory Species

Many highly migratory species including sharks (Orectolobidae, Lamnidae, Carcharhinidae, and Sphyrnidae), dolphin (*Coryphaena hippurus*), wahoo (*Acanthocybium solanderi*), tunas (*Thunnus* spp. and *Katsuwonus pelamis*), swordfish (*Xiphias gladius*), and billfishes (Istiophoridae) may occur in the Key West area because of the proximity of the Gulf Stream current. Several shark species frequent the Gulfstream, shelf, and shallow waters of the area. Swordfish and bluefin tuna (*Thunnus thynnus*) migrate through the Florida Straits and into the eastern Gulf of Mexico to spawn (NMFS 1999a). *Sargassum* is important habitat for various life stages of the swordfish and tunas. Blue marlin (*Makaira nigricans*) and white marlin (*Tetrapturus albidus*) occur offshore of the Florida Keys. Table 3-4 lists the sharks, dolphin, wahoo, tunas, swordfish, and billfishes with EFH in the Key West area.

For many of these species, specific information is limited. With the exception of pelagic larval stages, most billfishes, dolphin, swordfish, tuna, and wahoo would only be expected to occur near the seaward extent of the Ship Channel. Some of the coastal sharks, especially bull (*Carcharhinus leucas*), blacktip (*C. limbatus*), bonnethead (*Sphyrna tiburo*), lemon (*Negaprion brevirostris*), and nurse (*Ginglymostoma cirratum*) would be expected to occur throughout the Ship Channel, turning basin, Truman Harbor, Hawk Channel, and Boca Chica Channel.

Habitat Areas of Particular Concern

HAPCs have not been designated by NMFS (1999a,b) for members of the highly migratory species groups.

Table 3-4 Highly Migratory Species for Which EFH has been Identified in the Ship Channel, Turning Basin, and Truman Harbor Near Key West, Florida (NMFS 1999a,b; South Atlantic Fisheries Management Council 2001).

Species	Life Stages	Habitat
SHARKS		
Nurse shark (*Ginglymostoma cirratum*)	Adults; Late Juveniles/Subadults; Neonates/Early Juveniles	Pelagic; Hard Bottom
Longfin mako shark (*Isurus paucus*)	Adults; Late Juveniles/Subadults; Neonates/Early Juveniles	Oceanic
Oceanic whitetip shark (*Carcharhinus longimanus*)	Late Juveniles/Subadults	Oceanic
Blacknose shark (*Carcharhinus acronotus*)	Adults; Late Juveniles/Subadults	Pelagic
Spinner shark (*Carcharhinus brevipinna*)	Adults; Neonates/Early Juveniles	Pelagic

Species	Life Stages	Habitat
Silky shark (*Carcharhinus falciformis*)	Adults; Late Juveniles/Subadults; Neonates/Early Juveniles	Pelagic
Bull shark (*Carcharhinus leucas*)	Adults; Late Juveniles/Subadults; Neonates/Early Juveniles	Pelagic; Estuaries; Bays
Blacktip shark (*Carcharhinus limbatus*)	Adults; Late Juveniles/Subadults; Neonates/Early Juveniles	Pelagic
Night shark (*Carcharhinus signatus*)	Adults; Late Juveniles/Subadults; Neonates/Early Juveniles	Pelagic
Dusky shark (*Carcharhinus obscurus*)	Neonates/Early Juveniles; Late Juveniles/Subadults	Pelagic
Caribbean reef shark (*Carcharhinus perezi*)	Adults; Late Juveniles/Subadults	Pelagic
Sandbar shark (*Carcharhinus plumbeus*)	Adults; Late Juveniles/Subadults; Neonates/Early Juveniles	Pelagic
Tiger shark (*Galeocerdo cuvier*)	Adults; Late Juveniles/Subadults	Pelagic
Lemon shark (*Negaprion brevirostris*)	Adults; Late Juveniles/Subadults; Neonates/Early Juveniles	Mangrove; Sand Flats; Pelagic
Scalloped hammerhead (*Sphyrna lewini*)	Adults; Late Juveniles/Subadults	Pelagic
Great hammerhead (*Sphyrna mokarran*)	Adults; Late Juveniles/Subadults	Pelagic
DOLPHIN AND WAHOO		
Dolphin (*Coryphaena hippurus*)	Adults; Subadults; Juveniles; Larvae; Eggs (spawning area)	Pelagic; *Sargassum*
Wahoo (*Acanthocybium solanderi*)	Adults; Subadults; Juveniles; Larvae; Eggs (spawning area)	Pelagic; *Sargassum*
TUNA		
Skipjack tuna (*Katsuwonus pelamis*)	Adults; Larvae; Eggs (spawning area)	Pelagic; *Sargassum*
Yellowfin tuna (*Thunnus albacares*)	Adults; Larvae; Eggs (spawning area)	Pelagic; *Sargassum*
Blackfin tuna (*Thunnus atlanticus*)	Adults; Larvae; Eggs (spawning area)	Pelagic; *Sargassum*
Bluefin tuna (*Thunnus thynnus*)	Adults; Larvae; Eggs (spawning area)	Pelagic; *Sargassum*
SWORDFISH		
Swordfish (*Xiphias gladius*)	Subadults; Juveniles; Larvae; Eggs (spawning area)	Pelagic
BILLFISHES		
Blue marlin (*Makaira nigricans*)	Adults; Subadults; Juveniles; Larvae; Eggs	Pelagic
White marlin (*Tetrapturus albidus*)	Adults; Subadults; Juveniles	Pelagic
Longbill spearfish (*Tetrapturus pfluegeri*)	Adults	Pelagic
Atlantic sailfish (*Istiophorus platypterus*)	Adults; Subadults; Juveniles; Larvae; Eggs (spawning area)	Pelagic

Coastal Pelagic Fishes

The Coastal Pelagic Management Unit includes cobia (*Rachycentron canadum*), cero mackerel (*Scomberomorus regalis*), king mackerel (*S. cavalla*), Spanish mackerel (*S. maculatus*), and little tunny (*Euthynnus alletteratus*) (SAFMC 1998a). All of these species occur in waters of the project area and all are important to local fisheries. Coastal pelagic species are migratory water column dwellers, however, most species have some affinity for man-made and natural structures. Sandy bottoms, shoal areas, and hard bottom features occurring from the surf zone to the shelf break encompass EFH for coastal pelagic fishes. Passes, high-salinity bays, and *Sargassum* rafts are also important for various life stages of coastal pelagic fishes. All of these species would be expected in the Ship Channel, turning basin, Truman Harbor, Hawk Channel, and Boca Chica Channel. A species account of EFH for these species in the Florida Keys is given in Table 3-5.

Other species not considered under the FMP but important to recreational fisheries and therefore the local economy are bonefish (*Albula vulpes*), permit (*Trachinotus falcatus*), and tarpon (*Megalops atlanticus*). Bonefish inhabit shallow sand flats throughout the Keys. Like bonefish, permit occur in shallow water but also congregate around deeper natural and artificial reefs as well. Tarpon are found on flats, in deeper channels, around bridges, and most inshore habitats in the Keys.

Habitat Areas of Particular Concern

For coastal pelagic fishes, HAPCs generally include shelf waters inshore of the Gulf Stream. Specifically in the Florida Keys, the “Hump” off Islamorada, the “Marathon Hump”, and the” Wall” were all identified as HAPCs for coastal pelagic fishes.

Table 3-5 Coastal Pelagic Fishes for Which EFH has been Identified in the Ship Channel, Turning Basin, and Truman Harbor Near Key West, Florida (SAFMC 1998a).

Species	Life Stages	Habitat
COASTAL PELAGIC FISHES		
Cobia (*Rachycentron canadum*)	Adults; Subadults; Juveniles; Larvae; Eggs	Pelagic; Hard Bottom
Cero (*Scomberomorus regalis*)	Adults; Subadults; Juveniles; Larvae; Eggs	Pelagic; Hard Bottom
King mackerel (*Scomberomorus cavalla*)	Adults; Subadults; Juveniles; Larvae; Eggs	Pelagic; Hard Bottom
Spanish mackerel (*Scomberomorus maculatus*)	Adults; Subadults; Juveniles; Larvae; Eggs	Pelagic; Hard Bottom
Little tunny (*Euthynnus alletteratus*)	Adults; Subadults; Juveniles; Larvae; Eggs	Pelagic; Hard Bottom

3.3.3.3 Federally Endangered or Threatened Marine Turtles

Five marine turtle species are known to occur within the waters of the Florida Keys. In order of abundance, they are loggerhead, green, and hawksbill turtles, and occasionally Kemp's ridley and leatherback turtles (McClellan 1996; NOAA 1996; FFWCC, Florida Marine Research Institute 2000; M. Bressette 2002, unpublished data, Florida Power & Light Company (FPL), Jensen Beach, Florida (Table 3-6). Historic survey data suggest that shallow seagrass beds and hard bottom areas in the Florida Keys, including the project area, are important year-round habitats for loggerhead, green, and hawksbill turtles, and sightings of these species within these habitats are common (McClellan 1996).

Table 3-6 Marine Turtle Species Known to Occur Within the Florida Keys. Species are Listed in Order of Local Relative Abundance (from: FFWCC, Florida Marine Research Institute [FMRI] 2000).

Common and Scientific Names	Status[a]	Life Stages Present	Seasonal Presence	Nesting Season
Loggerhead turtle (*Caretta caretta*)	T	Adults, subadults, juveniles, and hatchlings	Year-round (most abundant during spring and fall migrations)	April - August
Green turtle (*Chelonia mydas*)	T/E[b]	Adults, subadults, juveniles, and hatchlings	Year-round	June-August
Hawksbill turtle (*Eretmochelys imbricata*)	E	Adults, subadults, juveniles, and hatchlings	Year-round	Variable[c]
Kemp's ridley turtle (*Lepidochelys kempii*)	E	Juveniles and subadults	Year-round (most abundant during spring and fall migrations)	(no nesting in area)
Leatherback turtle (*Dermochelys coriacea*)	E	Adults, subadults, juveniles, hatchlings	March-October	(no nesting in area)

[a] Status: E = endangered, T = threatened under the ESA of 1973.

[b] Green turtles are listed as threatened except in Florida, where breeding populations are listed as endangered. Due to inability to distinguish between the two populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters.

[C] Hawksbill turtle nesting in the Keys has been reported within the months of November, December, March, June, and July (Wilmers and Wilmers, 1999).

All marine turtles are protected under the ESA of 1973. Kemp's ridleys and leatherbacks are endangered, and loggerheads are threatened. Atlantic green turtles also are threatened, except for the Florida breeding population, which is endangered. Due to inability to distinguish between the latter two populations away from the nesting beach, Atlantic green turtles are considered endangered wherever they occur in U.S. waters (NMFS and U.S. Fish and Wildlife Service [USFWS] 1991).

Loggerhead, green, and hawksbill turtles are known to nest on beaches or dunes within the Keys, including the Marquesas and surrounding islands, and the Dry Tortugas (NOAA 1996; Wilmers and Wilmers 1999). However, based on an analysis of 1979 to 1992 marine turtle nesting data, Monroe County (including the Keys) accounted for only a relatively small percentage (0.2 percent) of the documented marine turtle nests (for all species) within Florida during this period (Meylan et al. 1995).

Loggerhead Turtle

The loggerhead turtle (*Caretta caretta*) occurs throughout tropical, subtropical, and temperate waters of the Atlantic, Pacific, and Indian Oceans (Dodd 1988; Marquez 1990; Ernst et al. 1994). In the western Atlantic, it is found in estuarine, coastal, and shelf waters from South America to Newfoundland. Adult and subadult loggerhead turtles are generalist carnivores, feeding primarily on benthic crustaceans (particularly crabs) and mollusks (Dodd 1988).

Loggerhead turtles are present year-round in Florida waters, with peak abundance during spring and fall migrations. They are the most common marine turtle observed in the Keys, including both adult and subadult individuals (McClellan 1996; NOAA 1996; FFWCC, FMRI 2000; M. Bressette 2002, unpublished data, FPL, Jensen Beach, FL; M. Hall 2003; pers. comm., Save-a-Turtle).

The loggerhead turtle is the only marine turtle species regularly utilizing local sandy beaches for nesting. Nesting activities have been reported throughout the Keys as far as the Dry Tortugas, including sandy beaches around Key West (FFWCC, FMRI 2001). Nesting activity in the area has been

recorded within the Florida Keys National Wildlife Refuge (FKNWR) between April and August, with peak activity from May through July (Wilmers and Wilmers 1999). Two successful loggerhead turtle nests were recorded on beaches within the Fort (Key West) during 2002, and two on other Key West beaches during 2001 (Pat Wells 2003, unpublished data, FMRI, Windley Key, FL). Hatchling loggerheads swim offshore and begin a pelagic existence within *Sargassum* rafts, drifting in current gyres for several years (Marine Turtle Expert Working Group 1996a). At approximately 40 to 60 cm carapace length, juveniles and subadults move into nearshore and estuarine areas, where they become benthic feeders for a decade or more prior to maturing and making reproductive migrations (Carr 1987).

Green Turtle

The green turtle (*Chelonia mydas*) has a circumglobal distribution in tropical and subtropical waters (Marquez 1990; Ernst et al. 1994). The species is made up of several distinct populations. In the U.S., green turtles (part of the Atlantic green turtle population) occur in Caribbean waters around the U.S. Virgin Islands and Puerto Rico and along the mainland coast from Texas to Massachusetts (NMFS and USFWS 1991).

Green turtles occur throughout the Keys (NOAA 1996). Nearshore and inner shelf waters of the Keys provide crucial developmental foraging habitats for juvenile and subadult green turtles. Most commonly, these foraging habitats comprise seagrass and algae beds, though small green turtles also may be found over coral reefs, worm reefs, and exposed rocky bottoms. Data suggest that some foraging habitats may only support certain size classes of green turtles and that the turtles apparently move among various foraging habitats as they grow (NMFS and USFWS 1991; Burke et al. 1992). Subadult green turtles are commonly observed on seagrass beds shoreward of the Florida Reef Tract, including those adjacent to the project area (M. Hall 2003, pers. comm., Save-a-Turtle).

Primary nesting sites in U.S. Atlantic waters are high-energy beaches along the east coast of Florida, primarily during July and August, with additional sites in the U.S. Virgin Islands and Puerto Rico (NMFS and USFWS 1991; Hirth 1997). Few nesting sites have been identified within the Keys (Meylan et al. 1995; Wilmers and Wilmers 1999). These include Boca Grande Key, Sawyer Key, the Marquesas Islands, and the Dry Tortugas. Nesting activity has been recorded from June through August, with peak activity between June and July (Wilmers and Wilmers 1999).

Hawksbill Turtle

The hawksbill turtle (*Eretmochelys imbricata)* occurs in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans (Marquez 1990; Ernst et al. 1994). In the western Atlantic, hawksbills are generally found in clear tropical waters near coral reefs, including the southeast Florida coast, Florida Keys, Bahamas, Caribbean, and southwestern Gulf of Mexico (NMFS and USFWS 1993). Within the Keys, hawksbills are relatively common and are probably year-round residents, including adult, subadult, and juvenile life stages (B. Brost 2002, personal communication, FMRI, St. Petersburg, FL). Subadult hawksbills are found mostly year-round on shallow, offshore reef formations off the Lower Keys, including those in proximity to the project area such as the Eastern Dry Rocks (M. Hall 2003, pers. comm., Save-a-Turtle).

Nesting areas for hawksbills in the Atlantic are found in south Florida, Puerto Rico, and the U.S. Virgin Islands. Within the continental U.S., nesting beaches are considered rare and restricted to the southern coasts of Florida from Palm Beach to Dade and Monroe Counties, including the Keys (Meylan 1992; NMFS and USFWS 1993; Wilmers and Wilmers 1999). Nesting within the FKNWR during 1999 was recorded on Woman Key and the Marquesas Islands, west of Key West. Hawksbill nesting along the east Florida coast occurs between June and September (B. Brost 2002, pers. comm.). However, hawksbill nesting in the Keys appears to be not restricted to summer months only, with nests reported in November, December, March, June, and July (Wilmers and Wilmers 1999).

Adult hawksbills typically are associated with coral reefs and exposed hard bottom areas, where they forage on invertebrates, primarily sponges. Hatchlings are pelagic, drifting with *Sargassum* rafts. Juveniles shift to a benthic foraging existence in shallow waters, progressively moving to deep waters as they grow (Meylan 1988; Ernst et al. 1994).

Kemp's Ridley Turtle

The Kemp's ridley (*Lepidochelys kempii*) is the smallest and most endangered of the marine turtles. Its distribution includes the Gulf of Mexico and the southeast U.S. coast, though some individuals have been found as far north as Nova Scotia and Newfoundland (Marquez 1990; Ernst et al. 1994; Marine Turtle Expert Working Group 1996b). Adult Kemp's ridleys are found almost exclusively in the Gulf of Mexico, primarily on the inner shelf (Byles 1988). Sightings of this species in the Keys are considered rare (NOAA 1996).

Kemp's ridleys found in southern Florida are primarily juveniles and subadults that use waters of the inner shelf as developmental habitat, though adult-sized individuals also are found occasionally (Schmid and Ogren 1992). Kemp's ridleys move through the Keys and Florida Straits northward along the east coast with the Gulf Stream in spring to feed in productive, inner shelf waters between Georgia and New England (NMFS and USFWS 1992). These migrants then move southward with the onset of cool temperatures in late fall and winter (Lutcavage and Musick 1985). Recent evidence suggests that these migrants may return to the Gulf of Mexico to nest on Mexican beaches (Witzell 1998).

Nesting of Kemp's ridleys occurs almost entirely at Rancho Nuevo beach, Tamaulipas, Mexico, where 95% of the nests are laid along 60 km of beach (NMFS and USFWS 1992; Weber 1995; Marine Turtle Expert Working Group 2000). In the U.S., nesting occurs infrequently on Padre and Mustang Islands in south Texas and in a few other Gulf of Mexico locations (Marine Turtle Expert Working Group 2000).

After emerging, Kemp's ridley hatchlings swim offshore to inhabit *Sargassum* mats and drift lines associated with convergences, eddies, and rings. Hatchlings feed at the surface and are dispersed widely by Gulf and Atlantic surface currents. After reaching a size of about 20 to 60 cm carapace length, juveniles enter shallow coastal waters and become benthic carnivores (Marine Turtle Expert Working Group 2000).

Post-pelagic (juvenile, subadult, and adult) Kemp's ridleys feed primarily on portunid crabs, but also occasionally eat mollusks, shrimps, dead fishes, and vegetation (Mortimer 1982; Lutcavage and Musick 1985; Shaver 1991; NMFS and USFWS 1992; Burke et al. 1993; Werner and Landry 1994).

Leatherback Turtle

The leatherback turtle (*Dermochelys coriacea*) is a circumglobal species that is currently subdivided into two subspecies. The Atlantic subspecies, *D.c. coriacea,* inhabits waters of the western Atlantic from Newfoundland to northern Argentina. The leatherback is the largest living turtle (Eckert 1995), and with its unique deep-diving abilities (Eckert et al. 1986) and wide-ranging migrations, is considered the most pelagic of the marine turtles (Marquez 1990; Ernst et al. 1994).

Adult leatherback turtles reportedly occur throughout the Florida Keys, though their presence in this area is considered somewhat uncommon (NOAA 1996). Historic data suggest that leatherbacks may utilize inner shelf waters during periods of local thermal fronts that concentrate food resources (Thompson and Huang 1993).

Leatherbacks nest on coarse-grained, high-energy beaches in tropical latitudes (Eckert 1995). Florida is the only location in the continental U.S. where significant leatherback nesting occurs. However, there are no records of successful leatherback nests in the Keys (NOAA 1996). Because of the cryptic behavior of hatchling and/or juvenile leatherback turtles, very little is known of the pelagic distribution of these life stages.

Leatherbacks feed in the water column, primarily on cnidarians (medusae, siphonophores) and tunicates (salps, pyrosomas) (Eckert 1995). The turtles are sometimes observed in association with jellyfishes, but actual feeding behavior has been documented only occasionally (Grant et al. 1996). Foraging has been observed at the surface, but considering their well developed deep-diving capabilities, they are also likely to occur at depth (Eckert 1995).

3.3.3.4 Marine Mammals

Although current distributional data suggest that a total of 27 marine mammal species may occur off the Florida Keys (Table 3-7), the project area is generally inhabited by only two to three species of marine mammals: common bottlenose dolphin (*Tursiops truncatus*), Atlantic spotted dolphin (*Stenella frontalis*), and Florida manatee (*Trichechus manatus latirostris*). All marine mammals are protected under the Marine Mammal Protection Act of 1972 (MMPA).

Table 3-7 Marine Mammal Species Potentially Occurring in Proximity to the Florida Keys (current scientific and International Whaling Commission [IWC] common names adopted) (from National Audubon Society 2002).

Scientific Name	Common Name	Status[a]	Presence[b]
ORDER CETACEA	WHALES AND DOLPHINS		
Suborder Mysticeti	**Baleen whales**		
Family Balaenidae	Right and bowhead whales		
Eubalaena glacialis	North Atlantic right whale	E, S	O
Family Balaenopteridae	Rorquals		
Balaenoptera musculus	Blue whale	E, S	O
Balaenoptera edeni	Bryde's whale	None	O
Balaenoptera acutorostrata	Common minke whale	None	O
Balaenoptera physalus	Fin whale	E, S	O
Megaptera novaeangliae	Humpback whale	E, S	O
Balaenoptera borealis	Sei whale	E, S	O
Suborder Odontoceti	**Toothed whales**		
Family Physeteridae	Sperm whales		
Kogia simus	Dwarf sperm whale	None	O
Kogia breviceps	Pygmy sperm whale	None	O
Physeter macrocephalus	Sperm whale	E, S	O
Family Ziphiidae	Beaked whales		
Mesoplodon densirostris	Blainville's beaked whale	S	O
Ziphius cavirostris	Cuvier's beaked whale	S	O
Mesoplodon europaeus	Gervais' beaked whale	S	O
Mesoplodon mirus	True's beaked whale	S	O
Family Delphinidae	Dolphins and relatives		
Stenella frontalis	Atlantic spotted dolphin	None	X
Tursiops truncatus	Common bottlenose dolphin	None	X
Stenella clymene	Clymene dolphin	None	O
Pseudorca crassidens	False killer whale	None	O
Orcinus orca	Killer whale	None	O
Stenella attenuata	Pantropical spotted dolphin	None	O
Feresa attenuata	Pygmy killer whale	None	O
Grampus griseus	Risso's dolphin	None	O
Steno bredanensis	Rough-toothed dolphin	None	O
Globicephala macrorhynchus	Short-finned pilot whale	S	O
Stenella longirostris	Spinner dolphin	None	O
Stenella coeruleoalba	Striped dolphin	None	O
ORDER SIRENIA	MANATEES AND DUGONGS		
Trichechus manatus latirostris	Florida manatee	E, S	O

[a] **Status**: All marine mammals are protected under the Marine Mammal Protection Act of 1972 (MMPA) E = endangered under the ESA of 1973; S = strategic stock under the MMPA of 1972, as indicated by Waring et al. (1999).

[b] **Presence within the Project Area:** (X) presence likely during at least some season; (O) presence possible but unlikely due to geographic range, preference for deeper waters, or uncommon occurrence.

3.3.3.4.1 Federally Endangered Florida Manatee

The West Indian manatee is one of the most endangered marine mammals in coastal waters of the U.S. It is Federally listed as an endangered species under the ESA and is further protected as a strategic, or depleted stock under the MMPA. Despite concerted research, it has not been possible to develop a reliable estimate of manatee abundance in Florida. The highest single-day count of manatees from an aerial survey is 1,856 animals in January 1992 (Ackerman 1995).

In the southeastern U.S., manatees are limited primarily to Florida and Georgia. This group constitutes a separate subspecies known as the Florida manatee (*Trichechus manatus latirostris*) that can be divided into four regional populations (USFWS 2002). Florida manatees of the Atlantic Region range from Nassau County south through the Florida Keys, including Key West. Usually the manatee is a cold-intolerant species and requires warm water temperatures generally above 20°C. Nearly all manatees winter in peninsular Florida and during warmer months expand their range north along the eastern U.S. and Gulf of Mexico coasts.

Federally endangered manatees inhabit both saltwater and freshwater of sufficient depth (1.5 to usually less than 6 m) throughout their range. They are frequently found in fresh or brackish waters of canals, rivers, and estuarine habitats, but also frequent saltwater bays and other marine environments. On occasion, manatees have been observed as much as 6 km off the Florida coast (USFWS 1996). Although the Florida Manatee has been listed as being present in the project area by the USFWS, they have not conducted site specific census surveys to verify the presence of this species. (Appendix E.7) Within the lower Keys, including Key West, sightings of manatees are generally uncommon and usually consist of single to few individuals (J. Balade 2002, pers. comm., USFWS, St. Petersburg, FL). Based on low relative densities of manatees in the Lower Keys, the presence of this species in the project area is considered unlikely or rare.

Manatees prefer to feed on submergent, natant (floating), and emergent vegetation. Therefore, temporal and spatial movements of manatees often may be correlated with the distribution and seasonality of seagrasses and vascular freshwater and brackish aquatic vegetation (NOAA 1996). Under the ESA, there are no listings of critical habitat for manatees in the Keys, including the project area.

3.3.3.4.2 Common Bottlenose Dolphin

The most common non-listed marine mammal occurring on the Florida Keys inner shelf is the common bottlenose dolphin (*Tursiops truncatus*), which may be present year-round (MAR, Inc. 1982; Hansen 1986; McClellan 1996). Bottlenose dolphins are distributed worldwide in temperate and tropical inshore waters. Bottlenose dolphins in the western Atlantic range from Nova Scotia to Venezuela (Waring et al., 1999). Along the U.S. Atlantic coast, there are two distinct stocks based on two ecotypes: a coastal, warm water ecotype and a deepwater ecotype (Duffield et al. 1983; Duffield 1986; Mead and Potter 1995). The two forms differ in distribution, morphometrics, parasite loads, prey, and DNA markers (Mead and Potter 1995; Hoelzel et al. 1998). Bottlenose dolphins present within inner shelf waters of the project area would most likely represent the shallow water ecotype, although this area may include numerous localized, resident stocks (Blaylock and Hoggard 1994; Waring et al. 1999). They normally occur in relatively small group sizes, but also may be found in groups of up to several hundred individuals. As reported by McClellan (1996), group sizes of bottlenose dolphins in the project area average 5.85 individuals, similar to mean group sizes reported for other groups along the central and southeast Florida coasts. During this survey program, bottlenose dolphins were sighted throughout the Keys survey area from the reef tract to offshore deeper waters during all months. Within inner shelf and mid-shelf waters off east Florida, including the study area, bottlenose dolphins feed primarily on fishes, and to a much lesser degree on cephalopods (squids), crustaceans (primarily shrimps), and xiphosurans (horseshoe crabs) (Barros and Odell 1990; Barros 1993). Mating and calving occur from February to May. The calving interval is two (2) to three (3) years.

3.3.3.4.3 Atlantic Spotted Dolphin

Also potentially occurring in inner shelf waters, though perhaps more commonly offshore of the Keys reef tract, is the Atlantic spotted dolphin (*Stenella frontalis*). Atlantic spotted dolphins range from New Jersey to Venezuela, primarily in warm temperate and tropical waters. This species normally inhabits the outer shelf and slope, though southern populations occasionally come into mid-shelf and inner shelf waters (Waring et al. 1999). Favored prey includes herrings, anchovies, and jacks. Mating has been observed in July, with calves born offshore. Atlantic spotted dolphins often occur in groups of up to 50 individuals.

3.4 WATER RESOURCES

3.4.1 Definition of Resources

Water resources include surface and subsurface water. Surface water includes all lakes, ponds, rivers, and streams within a defined area or watershed. Subsurface water, commonly referred as groundwater, is typically found in areas known as aquifers. Aquifers are areas of mostly high porosity soil where water can be stored between soil particles and within soil pore spaces. Groundwater is typically recharged during precipitation events and is withdrawn for domestic, agricultural, and industrial purposes. Marine environment refers to offshore, high salinity waters, and are further defined by prevailing currents, harbor flushing hydraulics, and tidal variations. The CWA of 1972 is the primary Federal law that protects the nation's waters, including lakes, rivers, aquifers, and coastal areas. The primary objective of the CWA is to restore and maintain the integrity of the nation's waters.

3.4.2 Existing Conditions - Landside

As a result of topography and geologic factors, excess rainfall has not created an extensive natural drainage system in the Florida Keys. Rainfall runoff from much of Key West is carried directly to the adjacent marine waters either by overland flow or storm drains which service approximately half of the island. Much of the rainfall, however, percolates directly into the soil and porous limestone bedrock. Extreme rainfall events produce relatively minor, short-term flooding effects as compared to storm surge flooding. As a result, there are not surface fresh waters of concern in the Key West area (DON 1986) including Boca Chica.

The Biscayne Aquifer (commonly referred to as the Surficial Aquifer), and the Floridan Aquifer (a confined artesian aquifer), are the two main aquifers that underlie the Florida Keys. The Biscayne Aquifer is the primary system, and is considered one of the most productive and permeable in the world. However, because of its excessive chloride content in the Florida Keys, the Biscayne Aquifer is a nonpotable water source, although water from the aquifer is used for numerous other nonpotable water uses. The freshwater lens averages 5 ft (1.5 m) below the center western half of Key West. The lens contains 20 to 30 million gallons (75.7 to 113.5 million liters) of freshwater depending on the season. The layer of freshwater beneath Key West is subject to salt water intrusion through the porous Key Largo limestone formation underlying the less porous Miami Oolite limestone formation which forms the Key West Island. The freshwater is also exposed to pollution from exfiltrating sewer lines leading from the sewer system to Hawk Channel. No known source of potable artesian water exists in Key West (DON 2002).

Existing groundwater quality data have not been identified. However, the groundwater is highly mineralized as a result of the sea water freely moving in and out of the porous Miami Oolite and underlying Key Largo limestone of Key West and Boca Chica (DON 1983).

Records of surface water quality have not been identified for Boca Chica or Truman Annex. Active use of the Naval facilities have likely generated vehicle-related substances (oil and grease, rubber tire dust, etc.) on parking areas; fertilizers and herbicides on grassy areas; fuel and maintenance solvents near refueling equipment and repair shops; and other surface contaminants.

Potable water for Key West is obtained from the Florida City well field. The Florida Keys Aqueduct Authority (FKAA) was created in 1937 and is the sole provider of potable water to the Florida Keys serving 42,237 customers within Monroe County. Potable water is transported to the Keys through a 130 mile transmission pipeline with an additional 649 miles of distribution pipelines.

Between 1980 and 1983, the FKAA constructed a new, larger diameter transmission pipeline from Florida City to Sugarloaf Key. In 1998 and 1999, this new pipeline was extended to Cow Key Channel between Stock Island and Key West. This pipeline, which replaced the original 18 inch diameter pipeline built by the U.S. Navy in 1940, is 36 inches in diameter from Florida City to Tavernier, 30 inches in diameter from Tavernier to Marathon, 24 inches in diameter from Marathon to Cow Key Channel and finally continues into the city of Key West through the original 18 inch diameter pipeline. This new pipeline provides increased water flow from Florida City into the Keys, with daily pumpage increased from a maximum of 6 million gallons per day (mgd) in 1980 to the current 16.24 mgd average currently.

The Federal Emergency Management Agency (FEMA) defines floodplains as areas subject to a one percent or greater change of flooding in any given year. Floodplains are low, relatively flat areas adjoining inland and coastal waters. The entire NAS Key West is within a floodplain and susceptible to storm surge flooding. The 100-year storm and 500-year storm tidal surges are estimated to be 8 ft MSL and 12 ft MSL, respectively. The potential for strong currents and wave action compounds the flood hazard. About 86 percent of the island below 5 ft (1.5 meter) elevation is subject to flooding from lesser storm surges about once every 15 years (DON 2002).

Most of Key West and the entire Truman Annex property is within the 100-year floodplain and susceptible to storm surge flooding. The potential for strong currents and wave action compounds the flood hazard. Storm waves can approach from either the Atlantic Ocean or the Gulf of Mexico. During a 100-year storm surge, the shoreline of Key West could experience waves with crest elevations as high as 12 ft (3.6 m) above sea level at the National Geodetic Vertical Datum (NGVD). The 10 year Stillwater flood elevation is 3.9 ft (1.2 m) NGVD. About 86 percent of the island below 5 ft (1.5 meter) elevation is subject to flooding from lesser surges about once every 15 years (DON 2000). At Boca Chica the 10-year Stillwater flood elevation is 8.9 ft NGVD and the wave crest elevation is 13.8 ft NGVD (FEMA 2002). The Boca Chica Airfield contains open water drainage lagoons receiving runoff from developed areas.

3.4.3 Existing Conditions – Marine

Water quality in the Florida Keys has been an important issue for some time. The State of Florida designated the waters surrounding the Keys as Outstanding Florida Waters (OFW) and an Area of Critical State Concern (ACSC). The regulatory significance of this designation is that the FDEP cannot issue permits for 1) direct pollutant discharges to OFW that would lower ambient (existing) water quality, or 2) indirect discharges that would significantly degrade the OFW. In addition, permits for new dredging and filling must be clearly in the public interest.

Jones and Boyer (2002) stated that turbidity is probably the second most important determinant of ecosystem health in the Florida Keys. Low-density carbonate sediments in the Keys are fine grained and, consequently, are easily resuspended, rapidly transported, and have a high light scattering potential. Presence of these sediments in the water column, as indicated by turbidity, affects filter-feeding organisms by clogging their filter feeding apparatus. Light levels are also reduced, which affects the health of seagrasses and corals. Jones and Boyer (2002) indicated that there are strong onshore-offshore gradients in turbidity levels. High nearshore turbidities are most probably the result of wave action resuspending sediments into the shallow water column.

There are a number of external sources that affect the water quality, including turbidity of the Sanctuary (NOAA 1996). These include Florida Bay, Biscayne Bay, the boundary currents of the region, and the canal system operated by the South Florida Water Management District. Local transport is generally westward in the nearshore areas, which bring suspended solid from the external sources to the Lower Keys. In addition, tidal currents and storms are responsible for movement of water from Florida Bay and the Gulf of Mexico, and this water exchange affects turbidity levels in the Lower Keys. Another

source of turbidity is stormwater runoff, which introduces sediments into the marine environment. Increased nutrient levels from domestic wastewater are thought to introduce nutrients into the nearshore waters, which in turn increases concentrations of phytoplankton in the water column and consequently increases turbidity.

In response to concerns raised regarding the effects that cruise ships passing through the Ship Channel into Key West Harbor have on turbidity, Sandra Walters Consultants, Inc. (1999) conducted a literature search and interviewed coastal scientists. It was concluded that Key West Harbor and the Ship Channel are very well flushed and turbidity plumes that occur due to propeller washings of passing cruise ships are dispersed within hours by tidal exchange. In addition, it was concluded that turbidity generated by ship activities in Key West Harbor and the Ship Channel could not be distinguished from natural background turbidity generated as a result of natural weather and tidal conditions.

A distinct turbidity plume associated with a cruise ship passing through the Ship Channel toward Key West was observed during a survey conducted by Continental Shelf Associates, Inc. on 15 September 2002 (Table 3-8). This plume was carried away from the Ship Channel by local currents and presumably dispersed downcurrent of the Ship Channel. Wettstein (2000) reported that there is evidence of a turbidity problem relative to movements of large vessels. This evidence includes measurements of turbidity created by ship thrusters during docking maneuvers, visual observations of cruise ship-generated turbidity plumes and visual observations of seagrass and bottom damage from anchoring. Wettstein also reports that measurements of ship-generated turbidity are orders of magnitude greater than measurements of background turbidity, and that these turbidity events last from one to several hours. Data collected by FDEP at the outer mole supported the conclusions of Wettstein concerning higher turbidity levels in ship-generated plumes compared to background conditions. Average turbidities within the plumes were an order of magnitude greater than turbidities observed at background stations. PPB Environmental Laboratories, Inc. and Water & Air Research, Inc. (2002) showed that there is some correlation of elevated turbidity levels at the end of the Mole Pier and possibly across the turning basin adjacent to Tank Island with ship arrivals and departures. These turbidity plumes that are associated with ship arrivals and departures appear to dissipate more quickly than weather-generated turbidity.

Table 3-8 Turbidity Levels Observed During Water Column Profiling Conducted by Continental Shelf Associates, Inc. on 15 September 2002 at Sampling Stations Located Within Truman Harbor, Turning Basin, and Main Ship Channel.

Station	*Depth*		Turbidity (NTU)
	(m)	(ft)	
KW02-1	0.3	1	0.7
	4.9	16	0.6
	9.4	31	1.0
KW02-2	0.3	1	0.7
	4.9	16	0.6
	10.1	33	0.5
KW02-3	0.3	1	1.6
	4.9	16	1.5
	9.8	32	1.4
KW02-4	0.3	1	2.8
	4.9	16	1.3
	9.8	32	1.8

Station	*Depth*		Turbidity (NTU)
	(m)	(ft)	
KW02-5	0.3	1	3.8
	4.9	16	2.7
	10.1	33	0.9
KW02-6	0.3	1	3.1
	4.9	16	1.9
	9.8	32	2.7
KW02-7	0.3	1	2.1
	4.9	16	1.7
	9.8	32	1.9
KW02-8	0.3	1	2.1
	4.9	16	2.7
	9.8	32	2.4
KW02-9	0.3	1	1.4
	4.9	16	1.4
	9.8	32	1.8
KW02-10	0.3	1	64.8*
	4.9	16	65.2*
	9.8	32	64.6*
KW02-11	0.3	1	2.6
	4.9	16	1.6
	9.8	32	2.9
KW02-12	0.3	1	57.0*
	4.9	16	49.6*
	9.8	32	49.0*
KW02-13	0.3	1	2.1
	4.9	16	1.6
	10.1	33	2.6
KW02-14	0.3	1	0.8
	4.9	16	0.5
	10.1	33	1.5

* Turbidity plume associated with passage of cruise ship through the Main Ship Channel.

3.4.4 Coastal Zone

The Coastal Zone Management Act (CZMA) requires Federal facilities to carry out activities in a manner consistent with the State's approved coastal zone management program to the maximum extent practicable. The Florida Coastal Management Program (FCMP) was approved by the NOAA in 1981. The FCMP employs 23 Florida Statutes, which are administered by eleven (11) State agencies and four (4) of the five (5) State water management districts. The FCMP is designed to ensure the wise use and protection of the State's water, cultural, historical, and biological resources; minimize the State's vulnerability to coastal hazards; ensure compliance with the State's growth management laws; protect the State's transportation system; and protect the State's proprietary interest as the owner of sovereign submerged lands (Florida Department of Community Affairs) [FDCA] 1999). In addition, coastal zones

are regulated by the Florida Department of Environmental Protection (FDEP) under the Florida Coastal Zone Protection Act of 1985. Under this program, permits are required for any erosion control devices, excavations, or erection of structures within the Coastal Construction Control Line (CCCL). Within the Coastal Building Zone, 1,500 ft of the CCCL, storm resistant structures are required. NAS Key West properties are affected by CCCL restrictions and the Coastal Building Zone because they are on barrier islands directly adjacent to the Atlantic Ocean and/or Florida Bay. The Florida Key National Marine Sanctuary and Protection Act of 1990 (Public Law 101-605) and the National Marine Sanctuaries Act of 1972 (16 U.S.C. 1-131 et.seq. as amended) are administered by FKNMS. This important resource management program, existing Keys-wide, is responsible for marine resource protection within the project area.

3.5 CULTURAL RESOURCES

3.5.1 Definition of Resource

Cultural resources include prehistoric resources, traditional cultural properties, and historic resources. Prehistoric resources are physical properties resulting from human activities that predate written records and are generally identified as archaeological sites. Prehistoric resources can include village sites, temporary camps, lithic scatters, roasting pits/hearths, milling features, petroglyphs, rock features, and burials. Traditional cultural properties can include archeological resources, buildings, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans or other groups consider essential for the continuance of cultures. Historic resources include resources that postdate the advent of written records in a region. Significant cultural resources are defined as those resources that meet one or more criteria for eligibility for nomination of the resource to the National Register of Historic Places (NRHP).

Cultural resources are protected primarily through the NHPA of 1966, the Archaeological and Historic Preservation Act of 1974, the American Indian Religious Freedom Act of 1978, the Archaeological Resources Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990. Section 106 of the NHPA and its implementing regulations require Federal agencies to consider the effects of their actions on properties listed or eligible for listing in the NRHP. Implementation policies for procedures on Navy properties under NEPA are described in OPNAVINST 5090.1B Chapter 23. The FKNMS Draft Management Plan/EIS, Volume 1 Management Plan contains an action plan for implementing management strategies for submerged cultural resources within sanctuary waters.

3.5.2 Existing Conditions

Surveys of archeological and historic resources were conducted at NAS Key West in the mid-1990's. *An Architectural Inventory – NAS Key West, Key West, Florida,* (Inventory) was completed by the USACOE, Mobile District, in 1995, and *Archaeological Survey of Key West NAS, Monroe County, Florida,* (Survey) was completed by Brockington and Associates, Inc., in 1997. The purpose of the Archaeological Survey was to identify and locate all prehistoric and historic archaeological sites on government-owned lands at NAS Key West and to evaluate them to determine their eligibility for listing on the NRHP. This survey was conducted in compliance with Section 110 of the NHPA.

The Fort, a Civil War-era Fort listed on the NRHP, is located directly adjacent to the southwest boundary of the Truman Annex property (Figure 3-11). The Fort, listed as Site 8MO206 by the State Historic Preservation Office (SHPO), is located on State property.

The survey identified one area on Truman Annex with a high potential for containing significant intact archaeological deposits. This site, located adjacent to the east side of the Fort, consists of a sand coverface (an earthen cover over the brick face of the Fort) constructed on the landward side of the Fort during the Civil War to help protect the Fort. The coverface has been completely filled over and is entirely within Navy property. The limited Archaeological Survey did not locate any intact archaeological deposits or features in the coverface area, but archival information indicates that a nineteenth century military midden debris may be present below the surface of the coverface. Therefore,

as a result of this investigation, the boundary of Site 8MO206 was expanded to incorporate the subsurface coverface area. The boundary of the site includes approximately 4 acres of the Truman Annex property.

Whitehead Spit, another site with high archaeological potential, was identified within Truman Annex. The site is also referred to as the "antenna field" after the large antennas which are presently located there. The site is also an environmental restoration site known as IR-1 Antenna Field. Although no subsurface archaeological investigations were conducted at this site because of the contamination found under the old landfill site, two 8 inch (20.3 cm) cannonballs were discovered during previous excavations of the area as part of clean-up efforts. These finds support archival evidence that this area has high potential for nineteenth century archaeological deposits.

The remainder of the Truman Annex is considered to have very low potential for containing significant intact archaeological deposits due to the extensive filling that created the land (Brockington and Associates 1997).

The architectural inventory located and evaluated all buildings and structures built prior to 1947 and/or associated with major historical Cold War era events to determine their eligibility for listing on the NRHP. The inventory identified 14 historic buildings or structures. Based on the findings of the architectural inventory, three of the buildings/structures (Figure 3-11) are considered eligible for listing on the NRHP: Building 292, the Seminole Battery and Underground Bunker (Building 283) and the Old Quay Wall. The Seminole Battery was constructed as part of the Fort in 1889 in response to the Spanish-American War. The Underground Bunker is believed to have been designated a fallout shelter and/or command center bunker during the Cuban Missile Crisis. The Old Quay Wall is a seawall that is believed to have marked the shoreline at the time it was built at the turn of the century (City of Key West 1997a, as in DON 2000). The Seminole Battery property (approximately 3.46 acres [1.4 hectare {ha}]) was removed in 1999 from the surplus property designation (DON 2000).

The Archeological Survey identifies three existing archaeological resources of Boca Chica Key (Figure 3-12). Site 8MO1448 is an underwater archaeological site consisting of a Spanish shipwreck. The submerged wreck is located off the southwestern tip of Boca Chica Key, at the edge of Boca Chica Channel. The wreck was tentatively identified as a small sixteenth century Spanish coastal vessel of an unidentified type. An early twentieth century fishing vessel is also located nearby. The underwater site is potentially eligible for listing in the NRHP and the goal of management of the site is in situ preservation of the remains.

Site 8MO1477 consists of a small coral rock mound, measuring one meter high and about 5 m in diameter. The small mound is similar to descriptions of burial mounds previously recorded on Boca Chica but not longer exist. It is possible that the mound is simply a push pile from World War II runway construction. The site could also be a shallow well from the late nineteenth or early twentieth century. The site is recommended potentially eligible for the NHRP.

Site 8MO1478 is located on the western side of Boca Chica Key immediately north of the weapons facility. The site is late nineteenth century or early twentieth century historic house site. The most prominent feature at this site is a semi-subterranean concrete cistern, measuring approximately two meters by two meters. Two distinctive midden areas occur containing whole bottles and oyster and conch shells on the surface. The site is recommended by the Archaeological Survey as eligible for the NRHP.

3.6 AIR QUALITY

3.6.1 Definition of Resource

Air quality by definition is the quality of the air over a given area, taking into consideration both natural and human-influenced factors. In general, air quality is managed by State, regional, and/or local air quality regulatory agencies. These agencies must enforce the Federal standards under the Clean Air Act (CAA) of 1990, as amended, but may also elect to implement more stringent regulations.

Air quality in a given location is measured by the concentrations of various pollutants, as defined by the *National Ambient Air Quality Standards* (NAAQS). The NAAQS establish six criteria pollutants that pose the greatest threat to air quality and human health, and list acceptable concentration levels for each pollutant. The six pollutants are ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, lead, and particulate matter less than 10 microns in diameter. Areas that are under or meet the levels for criteria pollutants are designated as attainment areas, while those that exceed the levels are designated as non-attainment and then subject to stringent controls until the NAAQS are met.

Pollutant concentrations are determined by the type and amount of pollutants in the atmosphere, the size and topography of the air basin, and the meteorological conditions related to the prevailing climate.

The CAA requires Title V operating permits for nearly all sources of significant air emissions. The permits generally are issued by a State regulatory agency and encompass all detailed requirements governing air emissions from the source and related activities such as monitoring, record keeping, and reporting. Before commencing activities at any military installation, permit compliance and paperwork issues should be identified and managed to ensure compliance with the installation Title V permit.

3.6.2 Existing Conditions

Air quality in the Florida Keys is generally excellent. Low intensity development combined with the limited number of point sources of pollution has resulted in low pollutant loads. The pollutant loads that are generated are quickly dispersed by sea breezes.

The entire State of Florida is considered to be in attainment status, which includes Monroe County, the city of Key West, and NAS Key West (FDEP 2000). Currently, pollutant emissions are under the levels established by the NAAQS for criteria pollutants. Therefore, a general conformity applicability analysis is not required for this action.

Until 1999, the air quality in Key West was monitored by the Department of Environmental Protection – Marathon Branch Office with support from the Bureau of Air Monitoring and Mobile Sources (FDEP 2000). However, only total suspended particles (TSP) and particulate matter with a diameter of 10 microns (PM-10) were monitored; other pollutants were not monitored because of lack of industry in the area, budget shortfalls, and a small total population (Edds 2002). In 1999, quarterly monitoring showed that PM-10 levels were well below Federal limits of 63 µg/m³ (PM-10 levels of 54µg/m³, 30 µg/m³, 25 µg/m³, and 24 µg/m³). In 1997, TSP levels were at an average mean of 29 µg/m³, well below Federal limits of 50 µg/m³ (FDEP 1997, FDEP 1999).

Emissions from NAS Key West are well below the Title V (major source) thresholds for all regulated pollutants. All facilities (including Boca Chica and Truman Annex) are designated as minor sources (Ruzich 1999). A general conformity applicability analysis is therefore not required.

3.7 PUBLIC HEALTH AND SAFETY

3.7.1 Definition of Resource

This section includes a description of issues that could potentially affect safety of personnel at NAS Key West. Specifically, safety issues associated with explosives and environmental contamination are addressed. In addition, as required by EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, each safety issue is considered to determine if children may suffer disproportionately from environmental health risks and safety risks. EO 13045 was passed in 1997 to help ensure that Federal agencies' policies, programs, activities, and standards address environmental health risks and safety risks to children. For purposes of this EA, the Region of Influence (ROI) for public health and safety is defined as Boca Chica and Truman Annex area.

3.7.1.1 Explosives Safety

Explosives Safety NAVSEA OP-05, *Explosives Safety Standards*, defines distances to be maintained between explosive storage areas and between explosives and other types of facilities to protect humans from the possible sabotage or accidental detonation of explosives. The size of a hazard zone or Explosive Safety Quantity Distance (ESQD) arc depends on the net explosive weight and quantity of explosives stored or handled at a specific location. Land use within the ESQD arcs for non-ordnance related functions is severely restricted in order to maintain personnel safety and minimize the potential for damage to other facilities in the event of an explosion.

3.7.1.2 Installation Restoration

To facilitate the investigation and cleanup of contaminated sites at military bases, the DOD has developed the Installation Restoration Program (IRP). The IRP is a process by which sites and facilities are identified and characterized and existing contamination is contained, removed, and disposed of to allow for future beneficial use of the sites. The Department of Navy (DON) has conducted an aggressive program to locate and remediate former disposal sites that resulted in a threat to the environment of human health and safety. Within the Navy, this work is accomplished under a centrally administered Defense Environmental Restoration Account (DERA). As with the public sector's Brownfields Program, the DOD's goal is not only to remove or reduce the threat to the environment and humans, but also to return these properties to such a condition that they might be utilized to their highest and best use. Therefore, the potential effect of any project on a DERA site must be considered before implementing the action. In those instances where implementation of the Preferred Alternative is deemed necessary, site cleanup is accelerated or mitigation measures implemented to ensure the proposal does not hinder remediation.

3.7.2 Existing Conditions

3.7.2.1 Explosives Safety

ESQD arcs generated by visiting ships at Truman Annex and visiting aircraft at Boca Chica do not encumber any public or inhabited areas.

3.7.2.2 Installation Restoration

Truman Annex

At Truman Annex, nine sites are within the DERA program (Figure 3-13). Six are refuse or hazardous waste-related sites, one was contaminated with lead, one with petroleum-related products, and one was contaminated from underground storage tanks (UST) (Sanders 2002). A summary of each site follows in Table 3-9.

Table 3-9 Truman Annex Installation Restoration Sites

Site/Site No.	Function	Use Period	Contaminants	Current Action
IR -1 Refuse Disposal Area	General Waste Disposal, Open Burning	WWI through Cold War	Refuse, paint, solvents, thinners, Polychlorinted byphenyls (PCBs) and Polycyclic Aromatic Hydrocarbon (PAHs)	Monitoring groundwater quarterly

Site/Site No.	Function	Use Period	Contaminants	Current Action
IR-2 Transformer Oil Disposal Area Building 795	Site where off-line transformers were drained and disposed of	Mid-1950s through 1970	PCB	Investigation showed concentration of PCBs below action levels. Final Decision Document 1997
IR-3 Former DDT Mixing Area	Pesticide mixing area	Early 1940s through early 1970s	DDT, other pesticides cadmium	Soil removal in 1995. Asphalt cap decided as final remediation in 1998. Decision Document issued April 1999.
IR-21 Seminole Battery	Battery, then used for servicing vehicles	Civil War through at least late 1950s	Oils, cleaning agents, solvents, fuels, metals	Land Use Controls implemented in 1998, soil removal in 1999. Use of site not allowed.
DRMO Waste Storage Area	Metal debris, boats, fuel trucks, vehicles, refugee debris	WWI through Cold War	Oil, gasoline, PAHs, heavy metals	Soil removed in 1999. Final Decision Document in June 2002
Buildings 102, 103, and 104	Submarine support and general maintenance	WWI through Cold War	UST contamination	Soil removal in 1999. Final Decision Document in June 2002
Former Building 136	Plate and Mold shop, Ship maintenance	WWII through Cold War	Oil, gasoline, PAHs, heavy metals	Soil removal in 1999. Final Decision Document in June 2002
Building 223	Equipment repair and Hazardous Waste Storage Area	WWII through early 1990s	Oil, gasoline, PAHs, heavy metals, arsenic	Soil removal in 1999. Final Decision Document in June 2002
Building 189	Retail store adjacent to fuel line	WWII through early 1990s	Oil, gasoline, PAHs	Air sparging and soil vapor extraction. Site Rehabilitation Completion Order August 2001

Source: Sanders 2002, Glover 2002, DON 1997, DON 1999, DON 2000

Boca Chica

At Boca Chica Airfield, eleven sites are within the DERA program (Figure 3-13). Seven sites are petroleum-related contaminations, two are former disposal sites, and one was used to mix pesticides, while the other was the site of a tar spill (Sanders 2002). A summary of each site follows in Table 3-10.

Table 3-10 Boca Chica Airfield Installation Restoration Sites

Site	Function	Use Period	Contaminants	Current Action
Sold Waste Management Unit (SWMU)-1 Open Disposal Area	General waste disposal, open burning	WWI through Cold War	Refuse, paint, solvents, thinners, heavy metals, PCBs, PAHs	Soil removal in 1996 and 2001 through 2003, vegetation and wildlife monitoring
SWMU-2 (DDT) Mixing Area	Pesticide shop and mixing area	WWII through Cold War	Pesticides and heavy metals	Annual monitoring of groundwater, vegetation, sediment, and fish
SWMU-3 Firefighting Training Area	Firefighting training	Information Not Available	Organics, metals, pesticides	Soil removal in 1995, No Further Action Necessary. Land Use Controls Implemented
SWMU-4 AIMD Building 980	Aircraft electronics maintenance support	1960s through late 1980s	Organics, metals, pesticides	Liquid waste drums and surrounding soil removed in December 1989, No Further Action Necessary. Land Use Controls Implemented
SWMU-5 AIMD Sand-Blasting Area Building A-990	Parts sand blast area	Early 1970s until 1995	Phenol	Surface water and sediment annually monitored, groundwater contamination is below action levels
SWMU-9 Jet Engine Test Cell	Test repaired jet engines	1969 through present	Fuel leak in 1989, 1992 lube oil spill dichloroethene (DCE) and benzene plumes in soil	1993 product recovery and soil removal. 2001 oxygen release compound (ORC) and hydrogen release compound (HRC). More injections being considered.
Tar Tank Spill	Asphalt mixing	WWII through early 1990s	Aboveground Storage Tank (AST) base with more than 50 gallons (189 liters) of an unknown tar-like substance Samples show no substances above action levels	Resource Conservation and Recovery Act (RCRA) Facilities Assessment document under preparation
Blast Media Disposal Area	Blast media disposal	Early 1970s through mid-1990s	Black Beauty grit	2002 Field investigations found minimal contamination, No-Further Action order expected
Truck Fill Stand	Fill tanker trucks for aircraft refueling	Active facility	Two fuel spills in 2000	A 2001 site assessment and product and soil removal Remedial Action Plan Addendum being decided

Site	Function	Use Period	Contaminants	Current Action
Flying Club Site	Four aviation gas ASTs	1950s through late 1960s	Petroleum contamination	1999 Soil removal, 2002 air sparging implemented
Tank Farm	Petroleum storage	1942 to present	Petroleum spills and contamination	Soil removal and groundwater monitoring, No Further Action Order 1999

Source: Glover 2002, Sanders 2002, DON 1998a, DON 1998b

3.8 UTILITIES AND PUBLIC SERVICES

3.8.1 Definition of Resource

This section discusses the utilities and public services at NAS Key West that could potentially be affected by the Preferred Alternative. Utilities discussed in this analysis include electrical power, potable water, sanitary sewer systems, stormwater drainage, and solid waste management. The ROI includes the Truman Annex and Boca Chica.

3.8.2 Existing Conditions

3.8.2.1 Electric Power

City of Key West

The City of Key West's electricity is provided by Keys Energy Services (KES), once called City Electric System (CES). CES began in 1943 by providing service only to Key West Island, but now serves from Key West northward to the Seven Mile Bridge. Peak daily energy usage in Key West is 134 megawatt hours, and increases by an average annual rate of one percent (Finigan 2002). In 2001, total consumption was 300,008 megawatt hours (Weitzel 2002). The island is connected to the mainland Florida transmission grid through a 61-mile long 138 kilovolt transmission line. The line extends up the Overseas Highway (KES 2002).

Truman Annex and Boca Chica

The U.S. Navy owns and maintains its own electrical distribution facilities, supplied with power by KES. Approximately nine percent of KES total power supply is used by the Navy (Weitzel 2002).

3.8.2.2 Potable Water

City of Key West

Key West's potable water is provided by the FKAA, and comes from the Biscayne Aquifer in Florida City, Florida. The FKAA was created in 1937 and is the sole provider of potable water to the Florida Keys serving 42,237 customers within Monroe County. Potable water is transported to the Keys through a 130-mile transmission pipeline with an additional 649 miles of distribution pipelines.

The Navy built the 18-inch water main in 1939 to service the Key West area, and in 1976 gave control to the FKAA, on the condition that Navy water demand is met. Between 1980 and 1983, the FKAA constructed a new, larger diameter transmission pipeline from Florida City to Sugarloaf Key. In 1998 and 1999, this new pipeline was extended to Cow Key Channel between Stock Island and Key West. This pipeline, which replaced the original Navy pipeline, is 36 inches in diameter from Florida City to Tavernier, 30 inches in diameter from Tavernier to Marathon, 24 inches in diameter from Marathon to Cow Key Channel and finally continues into the city of Key West through the original 18 inch diameter pipeline. This new pipeline provides increased water flow from Florida City into the Keys, with daily pumpage increased from a maximum of 6 mgd in 1980 to a 1997 average daily consumption of 14.49 mgd and the current 16.24 mgd average.

Water storage tanks on Stock Island and Key West Island hold enough water for seven days of no water service. In accordance with the 1976 agreement, the FKAA must provide the Navy with a minimum guaranteed capacity of 2.4 mgd [9.08 million liters per day (mld)] (Ruzich 2002).

Truman Annex

The FKAA provides water directly to the Navy's pumping station and water storage tank located within the Truman Annex boundaries. Operation and maintenance of the pumping station and distribution lines to Truman Annex are currently the responsibility of the Navy. From the pumping station, water is distributed through an eight-inch water main along Emma Street and enters the site north of Angela Street. Because water meters gauge the whole Truman Annex site, total water consumption for the waterfront can not be measured. Daily usage in May 2002 was 0.20 mgd for Truman Annex (Ruzich 2002). Water usage at the waterfront is believed to represent a very small percentage of the overall consumption (U.S. Navy 2000b).

Boca Chica

Naval water needs at the Airfield are tapped directly from the aqueduct at the Airfield. Water is stored in tanks on the base, with a storage capacity of 1.7 mgd in the administrative/personnel area and 0.8 mgd in the hanger area, for a total capacity of 2.5 mgd. NAS Key West uses hydro-pneumatic tanks and pumps to distribute water, and present water demand is 0.16 mgd (Ruzich 2002).

3.8.2.3 Sanitary Sewer

City of Key West

Operations Management International (OMI) is contracted by the City of Key West for sewage and wastewater treatment. Currently, wastewater is pumped through 20 sewage lift stations into the Key West Southernmost Wastewater Treatment Plant (Southernmost) on Fleming Key. There 4.3 mgd of wastewater are treated with extended aeration biological nutrient removal (Boyce 2002). The plant frequently manages to lower nutrient levels from 20 milligrams per liter (mg/l) of total nitrogen to 4 mg/l, and 6 mg/l of total phosphorus down to less then 1.0 mg/l. These levels are marginally higher then the levels determined by the FDEP for advanced wastewater treatment.

Until September 2001, the treated wastewater was then discharged into the Atlantic Ocean through the Hawk channel. Now, 100 percent of the wastewater is discharged through a deep-injection well, which insures that the Southernmost plant is not contributing to nearshore water quality problems. The well discharges the treated water over 3,000 ft below ground, into a cavernous limestone rock formation that contains a salinity-level equal to the surrounding seawater (OMI 2002).

Truman Annex

The aggregation of Navy areas within the city makes the NAS the single largest wastewater customer, currently contributing almost 20 percent of the system's total wastewater flow to the Southernmost treatment plant (U.S. Navy 2000b). Contract rights for the Navy say it can contribute up to 23 percent of the city's WWTP capacity (Ruzich 2002). The Truman Annex, including the Truman Waterfront Property, is divided into three separate sewage systems. The system serving the Waterfront is separate from the remaining two. The wastewater generated in the Annex is pumped to lift station "A", and then to the Southernmost plant. Daily flow for September of 2002 was 0.22 mgd from Truman Annex (Ruzich 2002).

Boca Chica

Boca Chica Airfield has a Navy-owned Waste Water Treatment Plant (WWTP), permitted for 0.4 mgd and currently having flows of 0.1 mgd. The Boca Chica WWTP effluent goes to six shallow injection wells at the plant site (Ruzich 2002).

3.8.2.4 Stormwater Drainage

City of Key West

Stormwater has been a large problem for the City of Key West in the past. Main stormwater facilities are mini-collection systems that have caused drainage problems (U.S. Navy 2000b). The City hired OMI in 1995 to perform cleaning and spot repair. Now, the system is cleaned about three times per year with problematic areas handled more often.

Truman Annex

The stormwater collection system at the Truman Annex dates back to World War II, and includes five drainage basins, four of which flow into the harbor basin. The fifth drainage basin flows southwest towards the Fort (U.S. Navy 2000b).

The Truman Annex discharges runoff to two outfalls along the east quay and five outfalls near the mouth of the harbor. There are no water retention/detention facilities. They require quarterly water quality monitoring per National Pollutant Discharge Emission Standards (NPDES) regulations.

Boca Chica

Boca Chica Airfield has an extensive storm water system, however, because of flat topography and basically land elevation only a few feet above sea level, the system has performance problems. The system consists of inlet boxes, pipes, culverts, drainage ditches, lagoons, outfalls into the water and natural waterways. Currently, the Navy is applying for permits to restore the drainage system, including removal of mangrove trees that are choking the system (Ruzich 2002).

3.8.2.5 Solid Waste Management

City of Key West

The City operates the Southernmost Waste to Energy Facility on Stock Island, rated at 150 tons per day, to incinerate solid waste with the exception of metal, concrete, asphalt, and dirt. The ash is disposed in a Federally-approved monofill site in central Florida.

In 2001 the facility received 56,159 tons of waste. This includes all combustible waste from Navy properties. Prior to 2001, yearly amounts of waste were slightly less. Average waste material incinerated is about 137 tons per day average, with a 150-tons-per-day peak (Havens 2002).

Recycling of non-combustible waste is handled by private contractors (U.S. Navy 2000a). C&D Hauling currently handles the City's construction and demolition recycling (Key West Gov. 2000b). Curbside collection of solid waste and recyclables is contracted to Waste Management, Inc, who collects the City's ferrous metal and white good recycling (discarded household appliances). Waste Management, Inc. also hauls and disposes of ash generated by the incinerator.

The Utilities Department is preparing for a retrofit of the treatment facility that includes pollution control technology and insures the plant's operational ability for the future. It will also comply with the Federal and State new CAA guidelines, which Florida adopted in 2001. The facility has a FDEP-approved Final Control Plan date of 1 March 2004 (Havens 2002).

Truman Annex and Boca Chica

The NAS contributed 2,743.35 tons of incinerated solid waste in 2001 (Havens 2002). Waste collected at the NAS is transported to the treatment facility where a $140/ton tipping fee is charged (U.S. Navy 2000a). This includes housing and industrial waste, but not waste from the Commissary and NEX, which report to separate offices. Waste quantities do not included construction and demolition waste generated and disposed of by contractors (U.S. Navy 2000a).

NAS Key West is not subject to a county reporting requirement. However, in order to comply with local regulations, the NAS Key West voluntarily submits waste management information to the county as specified in the regulations (U.S. Navy 2000a).

3.9 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

3.9.1 Definition of Resource

Socioeconomics comprise the basic attributes of population and economic activity within a particular area or ROI and typically encompasses population, employment and income, and industrial/commercial growth. Impacts on these fundamental socioeconomic resources can also influence other components, such as the provision of public services.

In 1994, EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was issued to focus attention of Federal agencies on human health and environmental conditions in minority and low-income communities. The EO also aims to ensure that disproportionately high and adverse human health or environmental effects on these communities are identified and addressed. For the purposes of this EA, the ROI for socioeconomics is defined as communities in the vicinity of the NAS Key West, including Bahama Village, Old Town, and New Town, and communities in the vicinity of the Boca Chica Airfield.

3.9.2 Existing Conditions

Population and Housing

Key West's permanent population has increased very little over the past 20 years. In 1980, the total year-round population was 24,292. In 1990, this population increased two percent to 24,832, and increase of 540 people. In 2000 it increased three percent to reach 25,478, or 646 people (Chamber of Commerce, 2000). Table 3-11 breaks down the ages present in that population. Key West's main business is tourism, whose yearly influx increases the population living in Key West by around 50 percent (Chamber of Commerce 2002).

Table 3-11 Age Breakdown of Permanent Population in Key West

Age	Percentage
0-19	17.8%
20-34	24.6%
35-44	19.2%
45-54	16.9%
55-64	9.8%
65-74	6.3%
75+	5.4%
Median age	38.9

Source: U.S. Census, 2000a

A major factor on the younger-aged population of the City of Key West is the NAS Key West, whose military and dependent personnel comprises around 27 percent of the total population in the area (Chamber of Commerce 2000, Schultz 2002). Forty-four percent of the total population is aged 20-44, the majority age group for military personnel (U.S. Census 2000c).

Population on the NAS Key West is 6,770. Active-duty personnel (officers and enlisted) on base number 1,500. There are 4,000 family members, 70 Reservists, and 1,200 civilians contracted there also (Schultz 2002). Military population has fluctuated during the past decades, as military cutbacks and base closing and reopening took place. For example, during the 1970s, the air squadrons previously stationed at NAS Key West were decommissioned or moved elsewhere. This resulted in a reduction of nearly 10,000 personnel. Currently, NAS Key West supports many other activities, including Tactical Aircrew Training System, the JIATF East, a contingent of the U.S. Coast Guard, and the U.S. Army Special Forces Underwater Training School (U.S. Navy 2001).

The number of housing units increased from 1990 to 2000. In 1990, there were 12,221 housing units and in 2000 there were 13,306, an increase of 1,085 (U.S. Census 2000c). Eighty-three

percent (11,016) of those housing units were occupied year round; the rest vacant, for sale or rent, or were seasonably used. Fifty-four percent (5,995) of the housing units were rented (Key West Gov. 2000a). There are two distinguishing characteristics of housing in Key West according to the Planning Department of the Key West City Government and the 2000 U.S. Census.

- Age: Only 17 percent of all housing units in the City were built after 1970, with 28 percent being built before 1939.
- Cost: The median value of owner-occupied housing in 2000 was $265,800 compared to Florida State average of $105,500. Median gross monthly rent was $899 in contrast to the State average of $641. This illustrates how the City was named the fourth most expensive housing marking in the US in 1994.

The City of Key West is broken up into three main areas, "Old Town", "New Town", and "Bahama Village" (U.S. Navy 1997). Old Town is the original Key West City and is recognized both locally and nationally as the Key West Historic District. It encompasses approximately 190 blocks, containing mostly residential neighborhoods. The main commercial, tourist, and, entertainment corridor in the city, Duval Street, is located here. New Town is situated east of Old Town, with the largest concentration of single families. Population growth has been stronger in New Town as most of the larger housing projects have occurred here in the past 17 years. Most of the homes were built here after 1950 (U.S. Navy 1997). The area's two largest apartment complexes are also located here. Bahama Village, actually 22 blocks located in Old Town, houses the majority of the African American population on the island. In response to the deteriorating physical conditions and general decline of the neighborhood, the Key West began a community redevelopment project, including revitalization of neighborhood commercial and housing areas, while maintaining the historic, cultural, and spiritual nature of Bahama Village. However, the urban renewal has allowed market pressures to escalate real estate prices, beyond what the neighborhood's long-time residents can afford (U.S. Navy 1997). Table 3-12 shows the racial demographics present in the City of Key West.

Table 3-12 Population by Race in Key West

Race	Percentage (%)
White	71.4
African American	8.8
Hispanic	16.5
Other	3.3

Source: Chamber of Commerce 2000

NAS Key West has 1,151 housing units at Sigsbee, Trumbo, Peary Court, and Truman Annexes. The divisions are: 600 family housing units, 230 Permanent Party (previously called bachelor's housing), 15 visitors' quarters, and four housing units that have been diverted to the fire station's use. Boca Chica Airfield contained a small amount of bachelor's quarters, which have now been converted to visitors' quarters (Bervaldi 2002).

3.9.2.2 Economy, Employment, and Income

The economy and employment in the City of Key West focuses on two areas, retail trade and services, because the city's main income is tourism (Chamber of Commerce 2002).

Key West is building up its cruise port facilities, which started in 1984 when Mallory Dock was improved to make it a full cruise ship docking facility. The Port of Key West now consists of three docking facilities, Mallory Square Dock, Pier B, and the Navy Mole Pier. In fiscal year 2000, 416 cruise ships docked in the Port of Key West, debarking 656,866 passengers who spent $4,058,687. Almost 100 cruise ships docked at the Navy Mole Pier alone (Sullivan 2002). The year 2001 showed a 3.4 percent increase in passengers, bringing in 678,980 people to the City. One hundred and four cruise ships docked at the Mole Pier in 2001. The City of Key West supports the largest cruise ports in Florida; Miami, Port Everglades, and Port Command all have two through five day itineraries that make a call at Key

West (Florida State 2002). Four years ago the City received grants for infrastructure improvements, site security and access, landscaping and beautification of the harborfront and the first phase of the harbor walk (Key West Gov. 2000b).

Table 3-13 shows the employment sectors and number of jobs in each sector for 1990 and 2000.

Table 3-13 Employment Profile for the City of Key West

Industry Jobs	1990	2000	Change Over Decade	Percentage Change over Decade (%)
Agriculture, forestry, fisheries, mining	296	319	23	7.2
Construction	865	1,123	258	23.0
Manufacturing	365	231	-134	-58.0
Transport, Community, Utilities	939	694	-245	-35.3
Wholesale Trade	224	251	27	10.8
Retail Trade	3,787	1,612	-2175	-134.9
Public Administration	1,154	1,375	221	16.1
Entertainment and Recreation	1,507	3,716	2209	59.4
Educational, Health Services	1,383	1,627	244	15.0
Finance, Insurance, Real Estate	718	917	199	21.7
Other Services	1,286	1,912	626	32.7
Total	**12,524**	**13,777**	**1253**	**9.1**

Source: U.S. Census 1990 and 2000b

The components of the service sector that recorded the most growth were directly related to tourism and an increasing population base, such as real estate, construction, and amusement and recreation.

The overall unemployment rate has stayed relatively stable over from 1990-2000, with the highest rate in 1992 at 4.6 percent and the lowest in 2000 with 2 percent (U.S. Dept. of Labor 2002). The number of employed people showed an increase over the past decade, from 12,524 in 1990 to 13,777 in 2001.

Income in the City of Key West has historically mirrored State and national trends, with household incomes increasing in the past decade.

Table 3-14 Household Income for City of Key West, Florida

Income Range	1990	2000	Percentage Change
Less than $15,000	2,246	1,494	-33%
$15,000 to $24,999	2,241	1,317	-41%
$25,000 to $34,999	1,970	1,482	-25%
$35,000 to $49,999	1,854	1,936	4%
$50,000 to $74,999	1,352	2,314	71%
$75,000 to $99,999	363	1,134	212%
$100,000 to $149,999	233	756	224%
$150,000 and over	166	586	253%
Median Household Income	**$28,126**	**$43,021**	**53%**

Source: U.S. Navy 1997; U.S. Census 2000c

In reviewing the growth of household incomes, the largest gains were in those earning $75,000 and up. Only households earning less than $34,999 showed declines.

3.9.2.3 Transportation

Key West is connected to mainland Florida by U.S. 1, the "Overseas Highway", which travels over 100 miles from Key Largo to Key West, the westernmost of the small islands. Key West International Airport carries regular schedules for several major air carriers, including US Airways, ComAir (Delta), and American Eagle Airlines. Most flights are routed through the Miami International Airport, although some smaller airlines and charter flights come from other cities in Florida and Bahamas. The Key West Airport is located about 180 miles from Miami International Airport (Key West Airport 2001).

The overall roadway system of the City is a network of narrow streets, a limited local bus system, "Conch" tour trams, local taxi and limousine service, and local recreational boating. The compact urban character, level terrain, climate, short distance between destinations, and overall number of tourists result in a significant amount of travel by foot, bicycle, and motor scooters.

Most of the primary destination points are in the western part of the City and along the commercial district along North Roosevelt Boulevard. Since most of the City's residents live along the eastern side of the island and many employees who work in the City downtown live on other Keys, travel patterns are heavily oriented westward during the AM peak hours and eastward during the PM peak hour.

Southard Street alone provides unrestricted access to the Truman Waterfront property. Public access limitations prohibit the use of other roadways within the base for through-traffic. The Navy has an easement for and maintains plans to use Eaton Street to access Truman Harbor and the Truman Annex as needed. Boca Chica Airfield can be reached from Highway 1, and from various roads on the northern side of the field.

3.9.2.4 Community Services, Facilities, and Schools

There are 35 places of worship in the City of Key West: 33 churches and 2 synagogues (Chamber of Commerce 2000).

The City runs several community facilities for the public, as well as summer sports leagues and tutorial opportunities. Sports fields, nature parks, pools, and beach parks are a few of the types of facilities it has (Key West Gov. 2002).

There are three fire stations scattered around the city employing 60 firefighters and two police stations housing Bureaus of Administration and Support Services, Patrol Services, Criminal Investigations, Community Affairs, and Professional Standards (Key West Gov. 2002).

At NAS Key West, community facilities include the Navy Exchange and Commissary in Sigsbee, with two mini-marts located at Trumbo and Boca Chica. Boca Chica and Sigsbee also house commercial gasoline stations. MWR has two pools at Trumbo, softball fields, volleyball courts, tennis courts, a gym and running track scattered across the NAS as well as other smaller facilities. NAS Key West also has one childcare facility, one family center, one teen center, a fire station and medical clinic.

There are 12 public and private schools in Key West, with the largest being Key West High School with 1,339 students (U.S. Dept. of Education 2002). The public schools are part of the Monroe County public school system, and are funded by county property taxes. Monroe County spends more per student than any other county in Florida, meaning it receives less per student from governmental funds (U.S. Navy 1997).

The schools in Key West echo the population demographics with white children numbering at least half of every school's enrollment in the 2000-2001 school year. There are no schools in the immediate vicinity of the Truman Annex, though Mary Immaculate Star of the Sea private school is only a few blocks away. There are no schools in the vicinity of the Boca Chica Airfield.

3.9.2.5 Maritime Community

The Maritime community of the Key West area includes marinas, charter dive and fishing boat, private vessels, rental boat operators, ferry services to and from Ft. Meyers and Dry Tortugas, commercial fishing fleets, tow/salvage operators, tug and barge operations, pilot services, treasure hunters, and cruise ships. Tourism related to water sports includes, fishing, coral reef snorkeling and diving, thrill craft, sightseeing vessels, and pleasure cruising craft.

3.10 NOISE/AICUZ

The Air Installations Compatible Use Zone (AICUZ) Program was established in the early 1970s by the DOD to balance the need for aircraft operations with community concern over aircraft noise and accident potential. The goals of the program are to protect the health, safety, and welfare of those living and working near military air installations while preserving the military flying mission. The AICUZ study analyzes aircraft noise, accident potential, land-use compatibility, and operational procedures and provides recommendations for compatible development near air installations. Federal, state, regional, and local governments are encouraged to adopt guidelines promoting compatible development.

The AICUZ Program defines the accident potential zones (APZs) and noise zones that represent the minimum acceptable area where land-use controls are needed to protect the health, safety, and welfare of those living near the installation and to preserve the military flying mission. Although ultimate control over land use and development in the vicinity of military facilities is the responsibility of local governments, the Navy makes recommendations, through its AICUZ Program, that localities adopt programs, policies, and regulations to promote compatible development where appropriate and feasible near Naval and Marine Corps air installations. Such land-use recommendations by the Navy are intended to serve as guidelines; they are based on the assumption that noise-sensitive uses (e.g., houses, churches, hospitals, amphitheaters, etc.) should be located outside the high-noise zones and that people-intensive uses (e.g., regional shopping malls, theaters, etc.) should not be located in APZs. The purpose of the Navy's land-use recommendations is not to preclude productive use of land around Naval and Marine Corps air installations but to recommend best uses of the land that are protective of human health, safety, and welfare. The Navy's recommendations can be implemented by ensuring development restrictions are placed on noise-sensitive uses in high-noise zones and on people-intensive uses in APZs, as well as fair disclosure in real estate transactions and the use of sound-attenuating construction.

Under the AICUZ Program, the noise zones are identified as the area between the calculated noise contours, based on the number of operations that occur on an average annual day or average busy day. The noise zones are delineated according to the following noise levels: less than 65 Day-Night Average Sound Level (DNL), 65 to 70 DNL, 70 to 75 DNL, and greater than 75 DNL. The number and type of airfield operations are also used as the basis for identifying APZs around an airfield. APZs are areas where an aircraft mishap is most likely to occur if one occurs, and, based on historical data, follow departure, arrival, and pattern flight tracks on and near the airfield runways. The Navy recommends to local planning agencies that certain developments be excluded from these areas to protect the community if a mishap were to occur. APZs include three restricted areas, with the areas nearest the runways having the most restrictions. These areas, the Clear Zone, APZ 1, and APZ 2, are defined below.

- *Clear Zone.* The Clear Zone extends 3,000 feet beyond the end of the runway; it masures 1,500 feet wide at the end of the runway and 2,284 feet wide at its outer edge.

- *APZ 1.* APZ 1 extends 5,000 feet beyond the Clear Zone, with a width of 3,000 feet at its outer edge. APZ 1 is typically rectangular, although it may curve to conform to the predominant flight track.

- *APZ 2.* APZ 2 extends 7,000 feet beyond APZ 1, with a width of 3,000 feet.

This zone is typically rectangular, although it, too, may conform to the curve of the predominant flight track.

The Navy applies APZs to predominant arrival, departure, and pattern flight tracks normally exceeding 5,000 annual flight operations. A straight-in approach or a straight-out departure will result in straight APZs along the extended runway centerline. However, if the flight track curves, so will the APZ. Compound APZs result when APZs from different predominant flight tracks overlap. At airfields where FCLP is a major activity APZ 2 from the arrival and departure ends of the flight track pattern may extend to form a closed loop.

Noise contours and APZs at Boca Chica Airfield were last prepared and published in 1977. The 1977 AICUZ study was adopted by local planning authorities and has been used since then to provide guidance for proposed development. In the mid-to-late 1970s, NAS Key West was home base to nine squadrons of RA-5C Vigilante aircraft, and served as the main East Coast Air combat training base for the F-4 Phantom as well as various other aircraft. In 1977 there were 52 aircraft based at Key West (30-RA-5C, 9-F-4J, 6-A-4E/TA-4J, 1-TA-3B, 2-US-2B, 3-SH3G, 1-EC-121M). In contrast, today there are no aircraft based at Key West.

In 1977 there were some 85,000 air operations, with 400 operations per day used in noise modeling (200 operations of RA-5C, 160 operations of F-4 and 40 operations of other aircraft). Ninety percent of the modeled operations were during the “acoustic day” (0700 to 2200 hours) and 10 percent during the “acoustic night” (2200 to 0700). The RA-5C and the F-4J were the dominant aircraft in terms of numbers of operations and noise generation. In 2001, there were 60,800 operations with the predominance of those being F/A-18 C/Ds and F-14s operating between 0700 and 2200.

The 1977 AICUZ shows 4,756 acres of land and water within the off-base portion of Noise Zone 3; 13,731 acres of land and water are within the off-base portion of Noise Zone 2. During the 1980s, the Navy purchased numerous undeveloped pieces of property totaling 617 acres in the off base AICUZ area to the east of the airfield to prevent further encroachment.

Over the years, aircraft operations at Key West have occasionally fluctuated across a wide range from year to year because of multiple factors including changes in aircraft models, homebasing, deployment schedules and world events. More recent aircraft operations data suggest while projected aircraft operation numbers more closely resemble recent aircraft operations, the noise and safety footprints of projected operations will more closely represent the historical noise and safety footprints.. Since 1977, many improvements have been made in airfield noise modeling and environmental noise predictions. The 1977 AICUZ noise contours were based on the Composite Noise Rating (CNR) metric that is no longer used in airfield noise studies. The DNL metric has become the standard metric for assessing aircraft noise and provides a reliable measure of community annoyance with aircraft noise. The DNL metric was adopted for use by both FAA and DOD for airport noise studies in the late 1970s. While CNR is not directly comparable to DNL measure, the Noise Zone 2 and Noise Zone 3 boundaries are generally comparable to DNL contours in land use planning. The DNL metric includes a 10 dB penalty for nighttime operations (10:00 p.m. to 7:00 a.m.) because people are more sensitive to noise during normal sleeping hours, when ambient noise levels are lower and also takes into account increased noise transmission over water, which previous methodologies did not. The DNL metric provides a more accurate depiction of noise exposure than was available in earlier studies, resulting in differences in shape and coverage of the contours. Aircraft also were replaced as improvements were made. Although aircraft operations have fluctuated from year to year with recent data suggesting lower fluctuations in operations, the 1977 Navy AICUZ has consistently served as the Navy baseline for planning purposes, and thus, is used for comparison in determining impacts of each of the alternatives.

Similarly, the criteria and methodology used to develop the 1977 APZs differ from those currently used by the Navy to develop APZs. As with comparisons between CNR and DNL noise contours, the differences in APZ criteria and methodology preclude direct comparison between the 1977 APZs and 2007 APZs. Aircraft also were replaced as improvements were made. Although aircraft operations have fluctuated from year to year with recent data suggesting lower fluctuations in operations,

the noise contours and APZs developed in the 1977 Navy AICUZ have consistently served as the Navy baseline for planning purposes, and thus, is used for comparison in determining impacts of each of the alternatives.

FILE: 1917/KEYWEST-EA/1917EA-TRULAND2.DWG 04/04/03

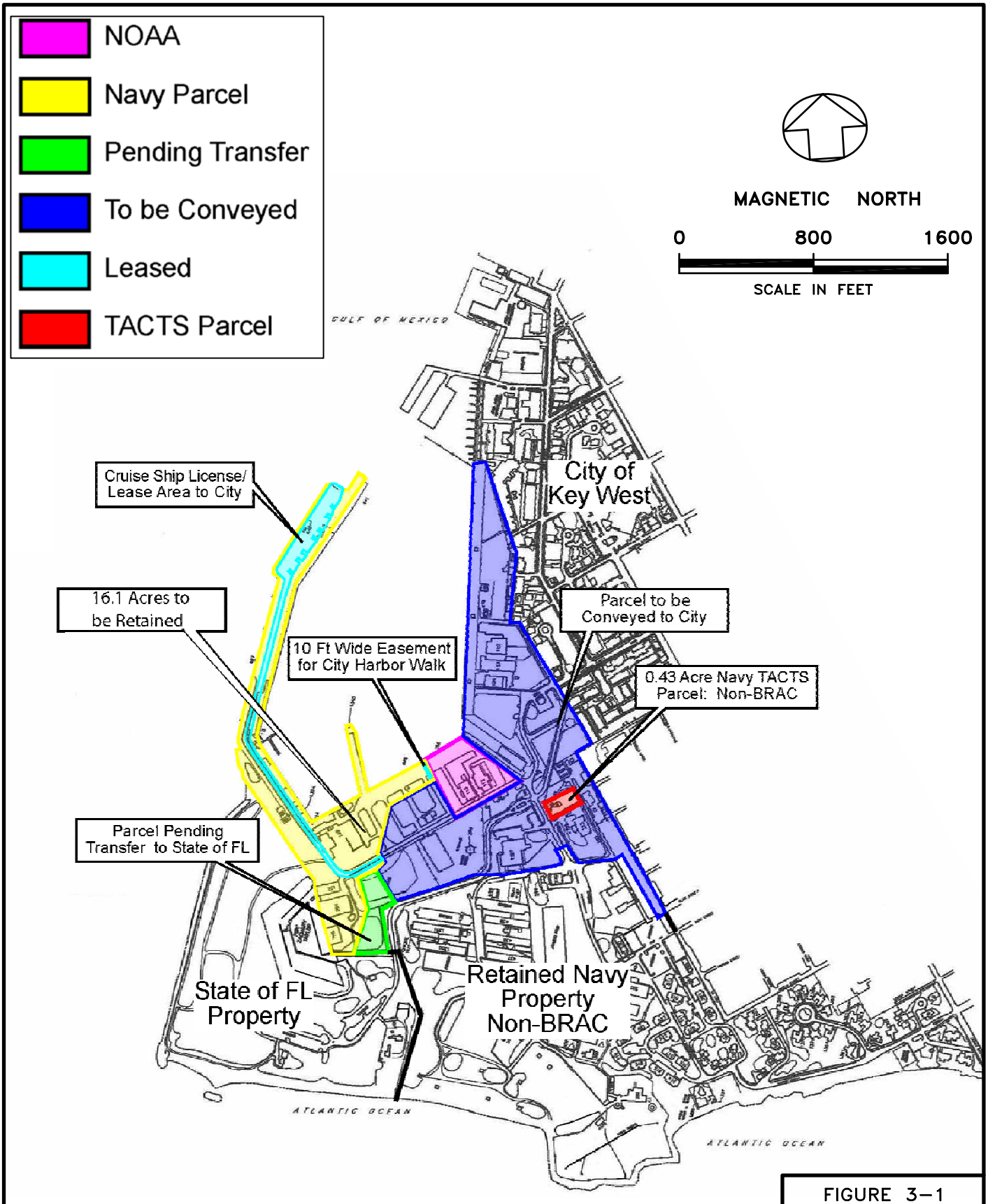


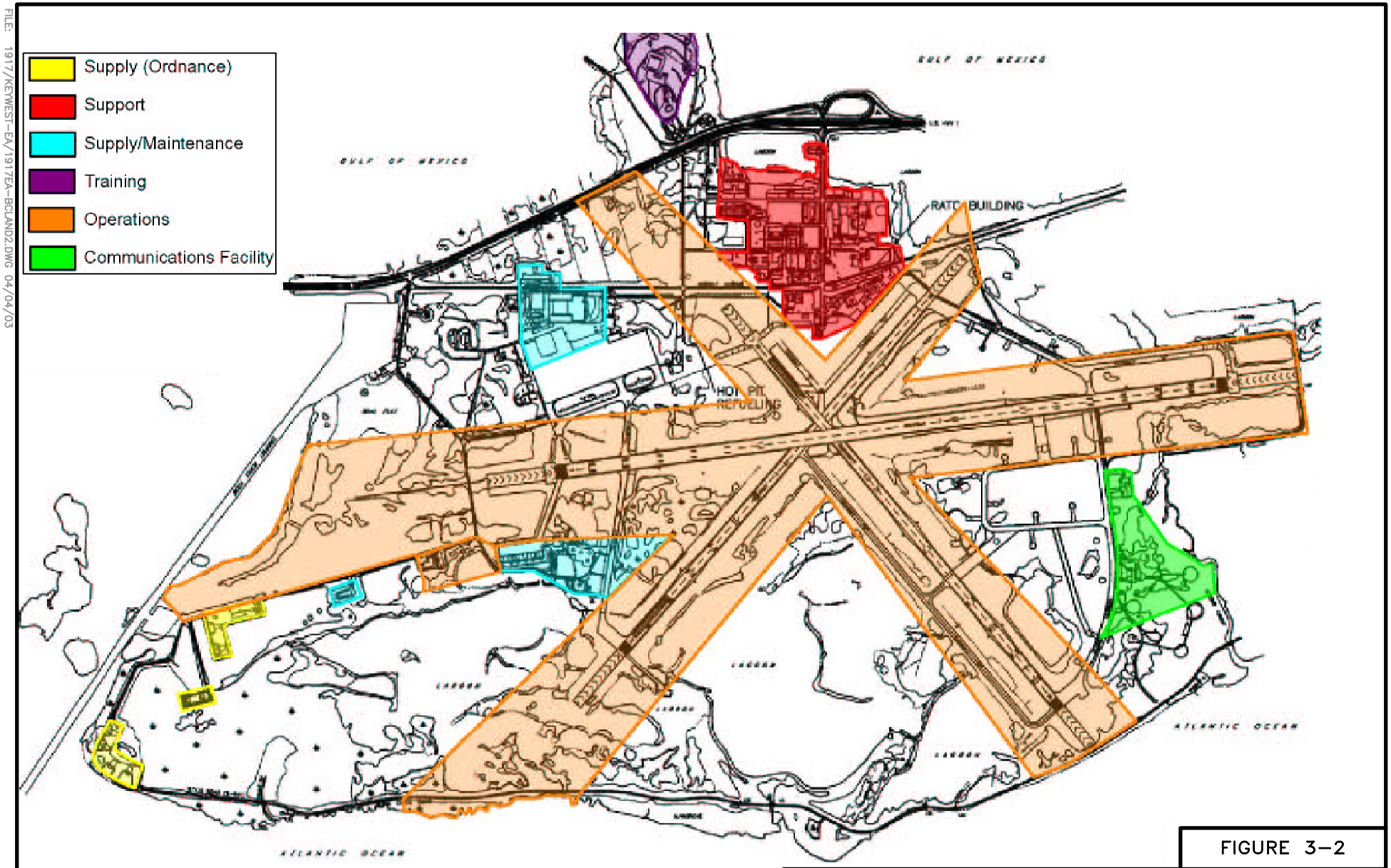
FIGURE 3–1

TRUMAN ANNEX LAND USE

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST

SOURCE:
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CODE I.D. NO. 80091
DRAWING #–
CHARLESTON, SOUTH CAROLINA

FILE: 1917/KEYWEST-EA/1917EA-BCLAND2.DWG 04/04/03

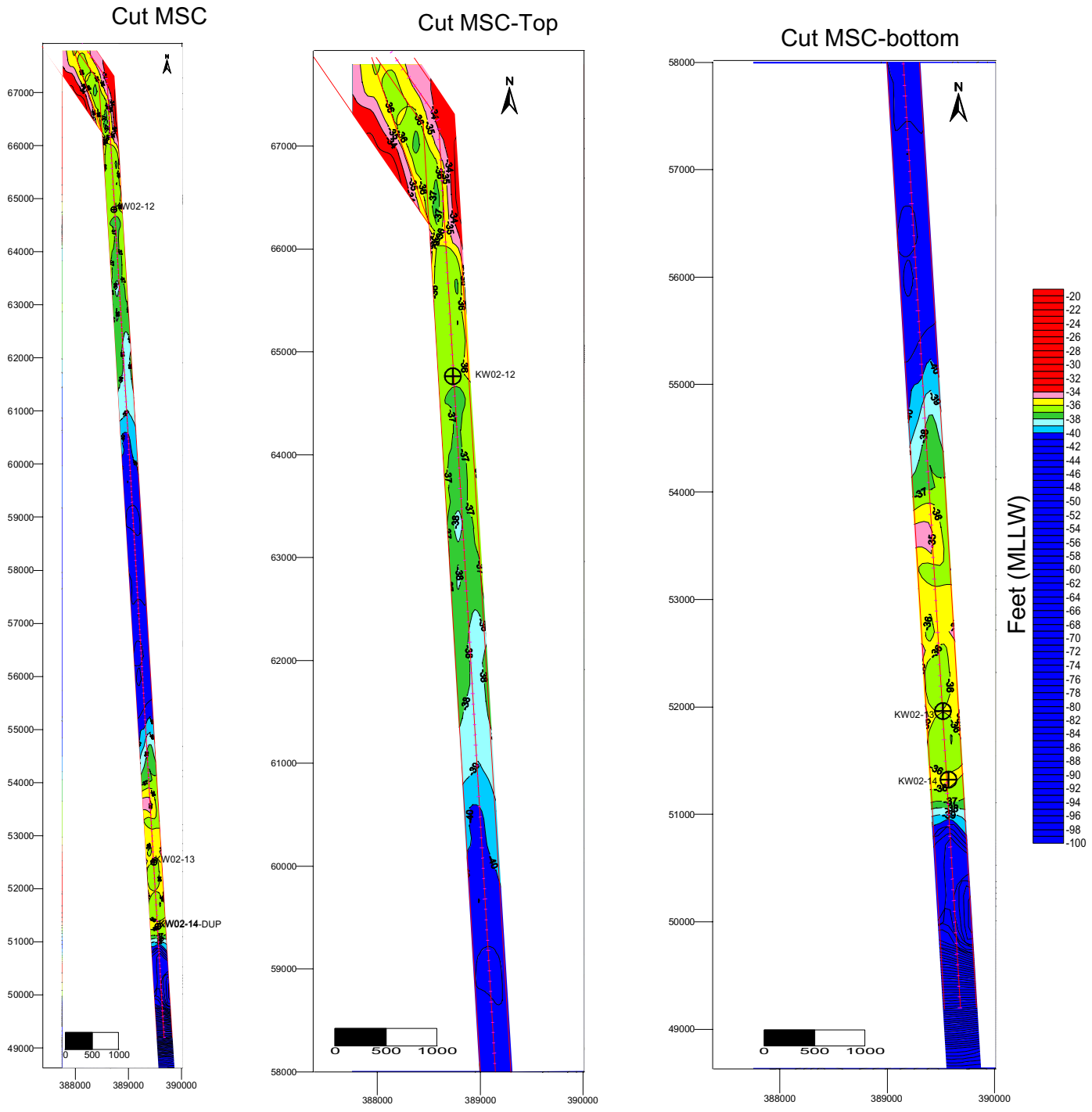


SOURCE:
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CODE I.D. NO. 80091
DRAWING #-
CHARLESTON, SOUTH CAROLINA

FIGURE 3-2

BOCA CHICA LAND USE

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST



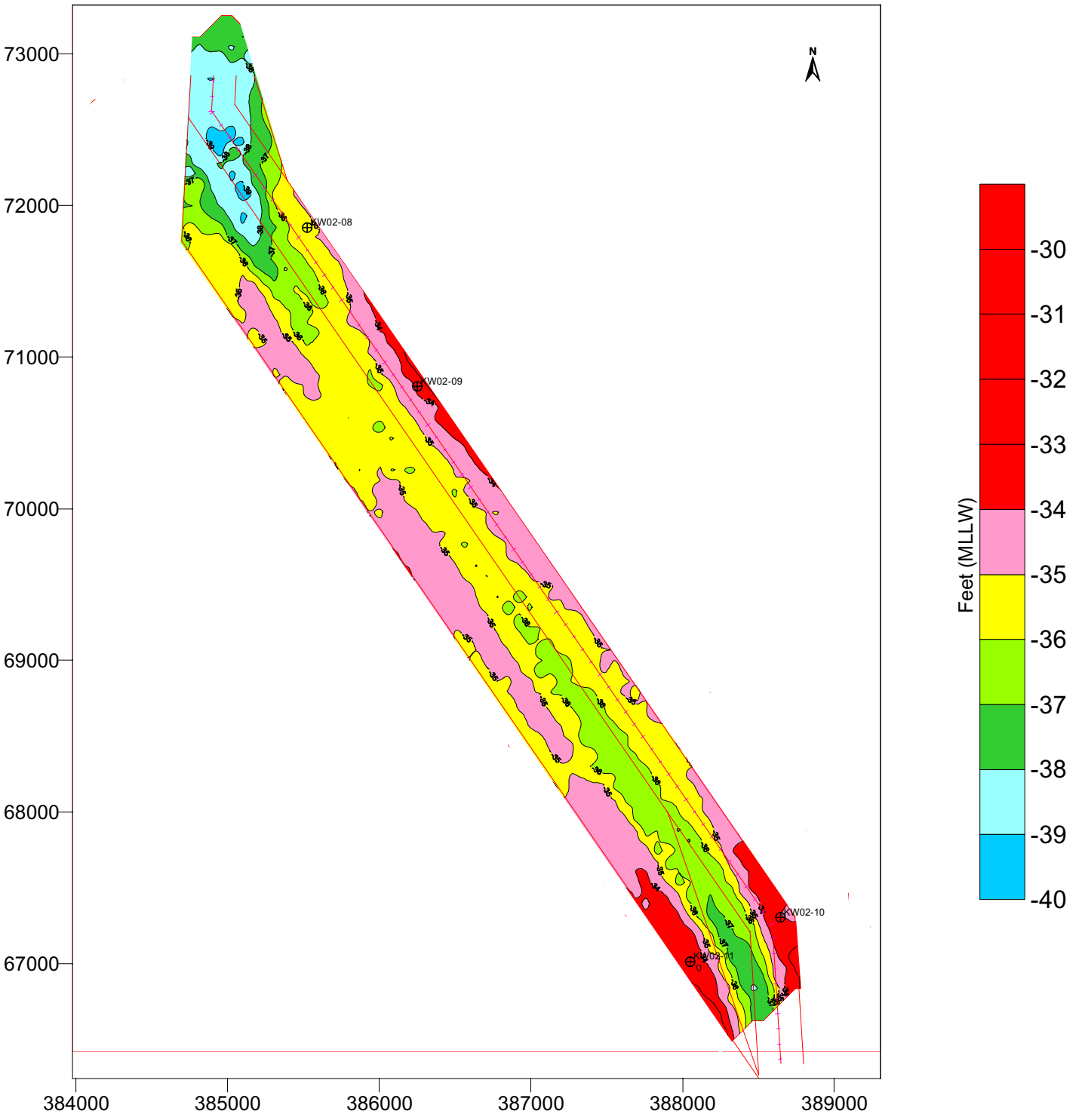
MAGNETIC NORTH

FIGURE 3-3-1

BATHYMETRY SURVEY SHIP CHANNEL

ENVIRONMENTAL ASSESSMENT FOR
FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS
NAS KEY WEST

Cut A



MAGNETIC NORTH

0 500 1000

FIGURE 3-3-2

BATHYMETRY SURVEY CUT A

ENVIRONMENTAL ASSESSMENT FOR
FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS
NAS KEY WEST

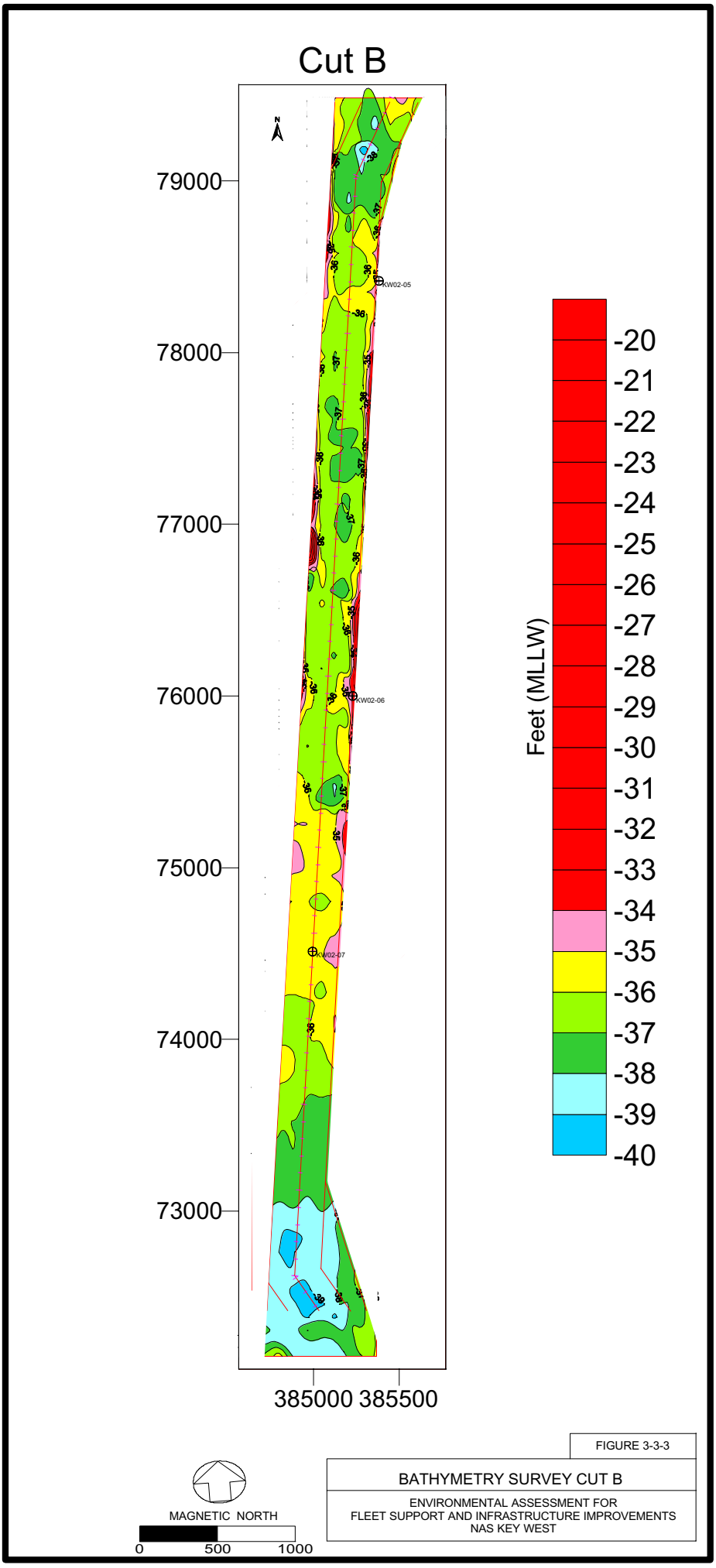
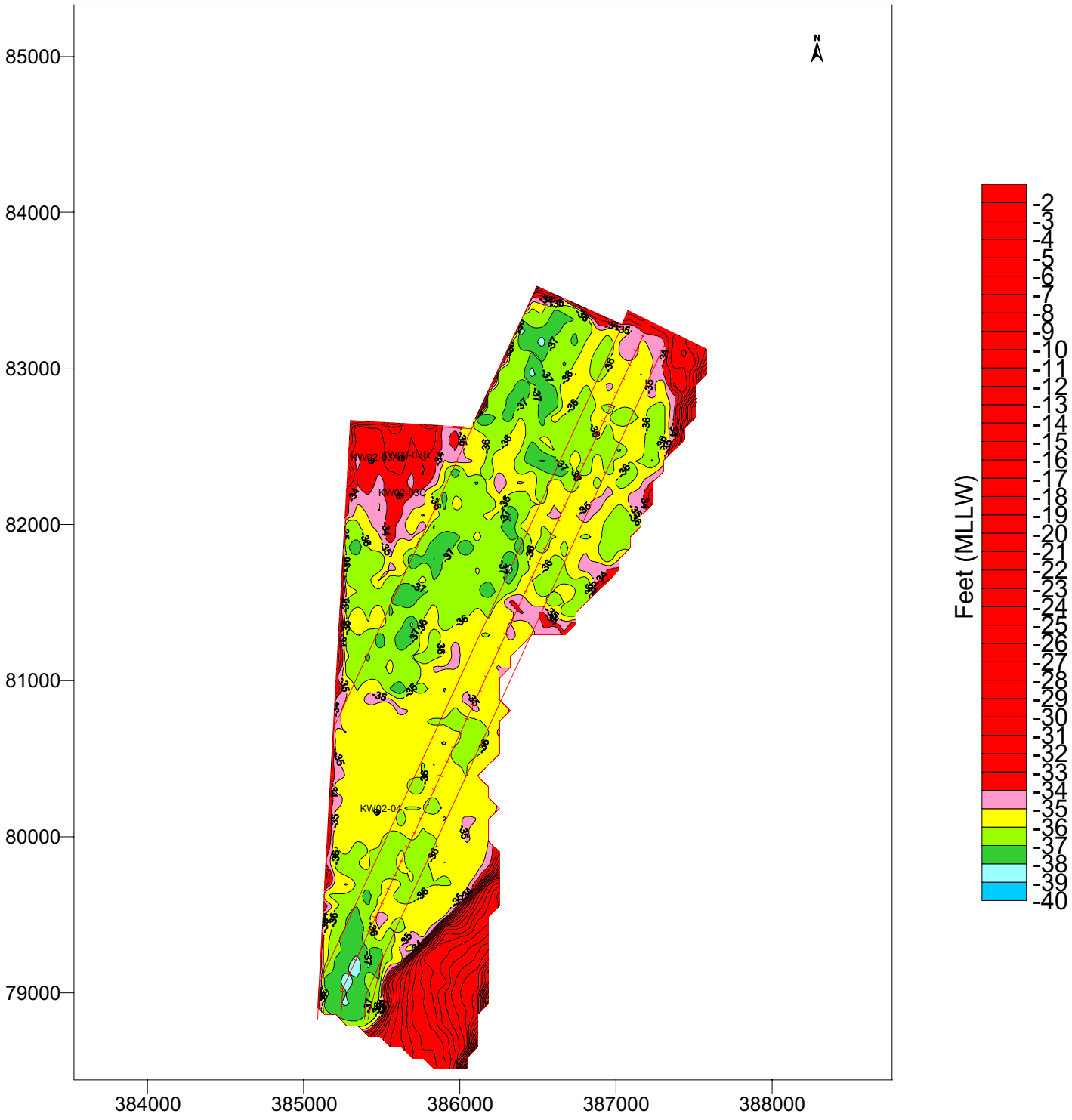


FIGURE 3-3-3

BATHYMETRY SURVEY CUT B

ENVIRONMENTAL ASSESSMENT FOR
FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS
NAS KEY WEST

Cut C



MAGNETIC NORTH

0 500 1000

FIGURE 3-3-4

BATHYMETRY SURVEY CUT C

ENVIRONMENTAL ASSESSMENT FOR
FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS
NAS KEY WEST

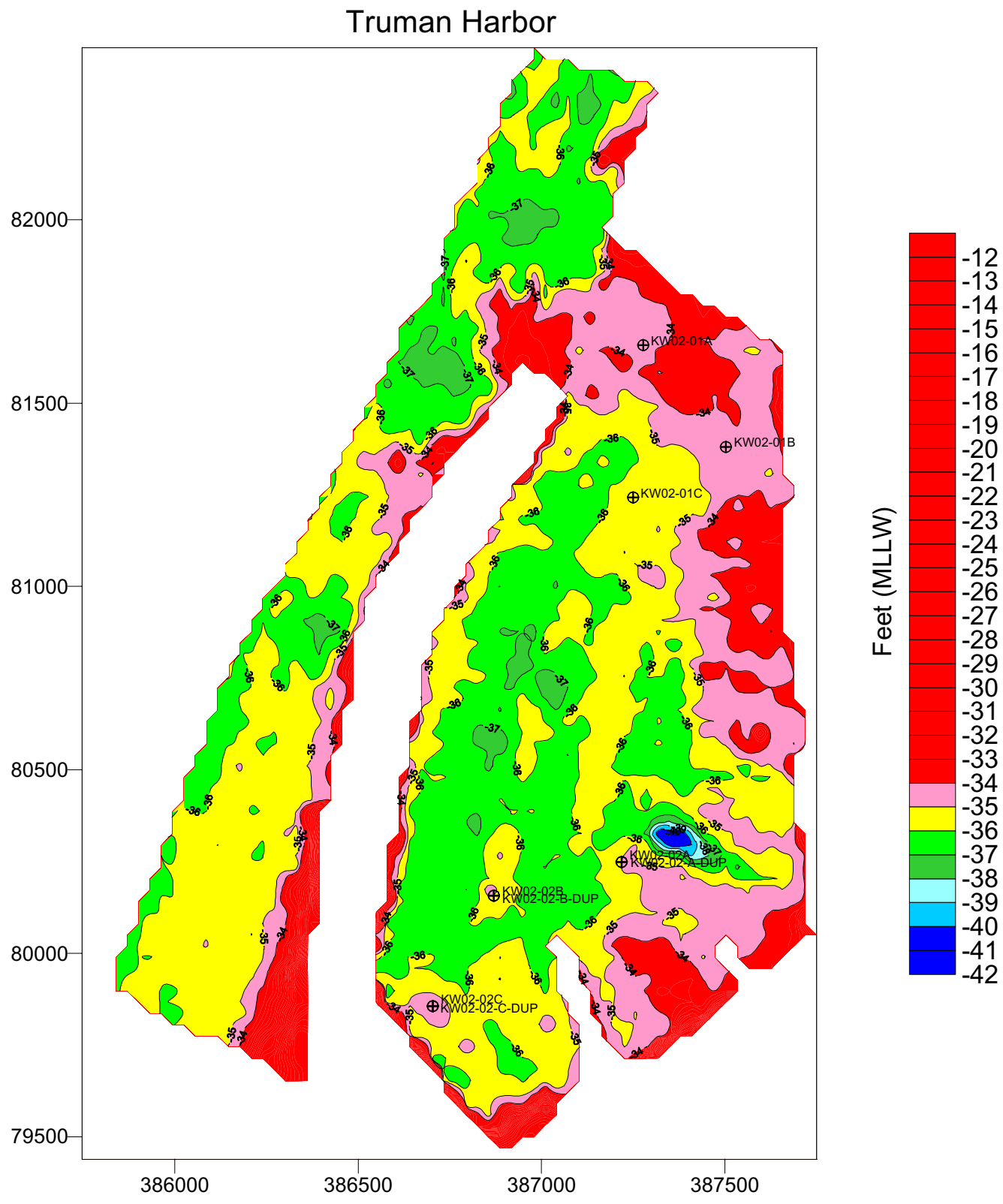


FIGURE 3-3-5

BATHYMETRY SURVEY TRUMAN HARBOR

ENVIRONMENTAL ASSESSMENT FOR
FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS
NAS KEY WEST

FILE: 1917/KEYWEST-EA/1917FIG3-4.DWG 04/04/03

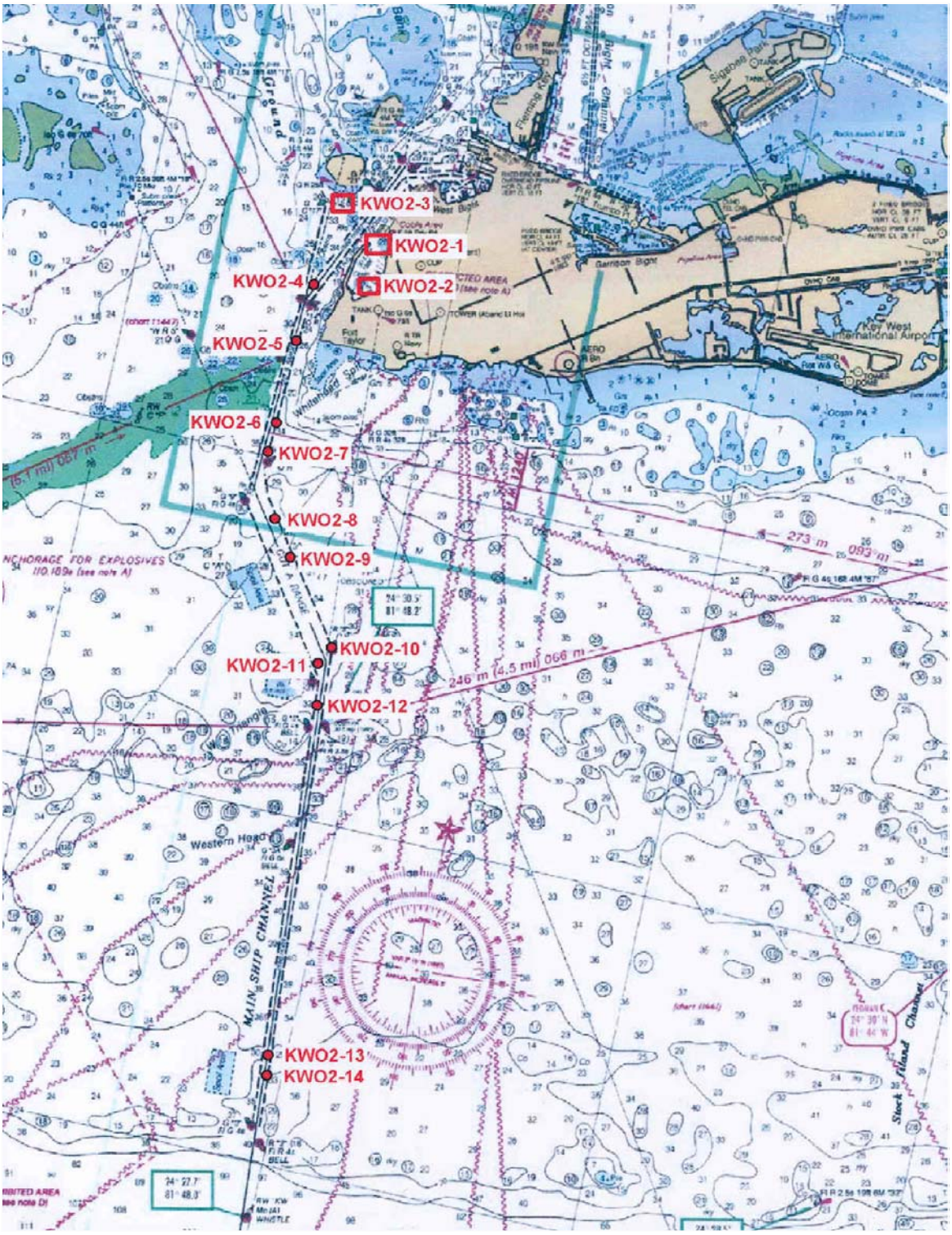
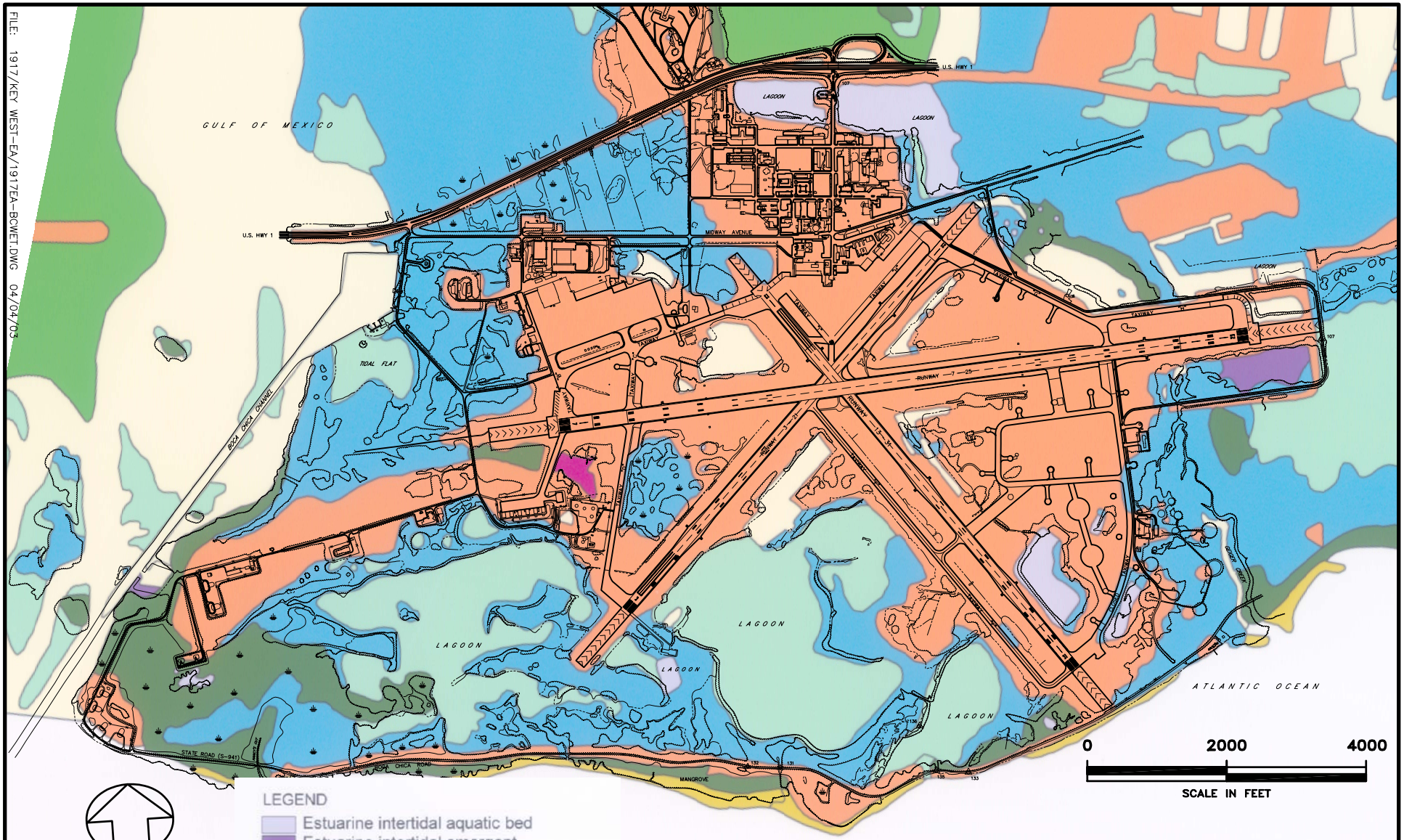


FIGURE 3-4

SEDIMENT AND WATER COLUMN PROFILING SAMPLE LOCATIONS

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST



SOURCE: NATIONAL WETLANDS INVENTORY, DATED FEB 1984

SOURCE:
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CODE I.D. NO. 80091
DRAWING #-
CHARLESTON, SOUTH CAROLINA

FIGURE 3-5

WETLANDS – BOCA CHICA AIRFIELD

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST

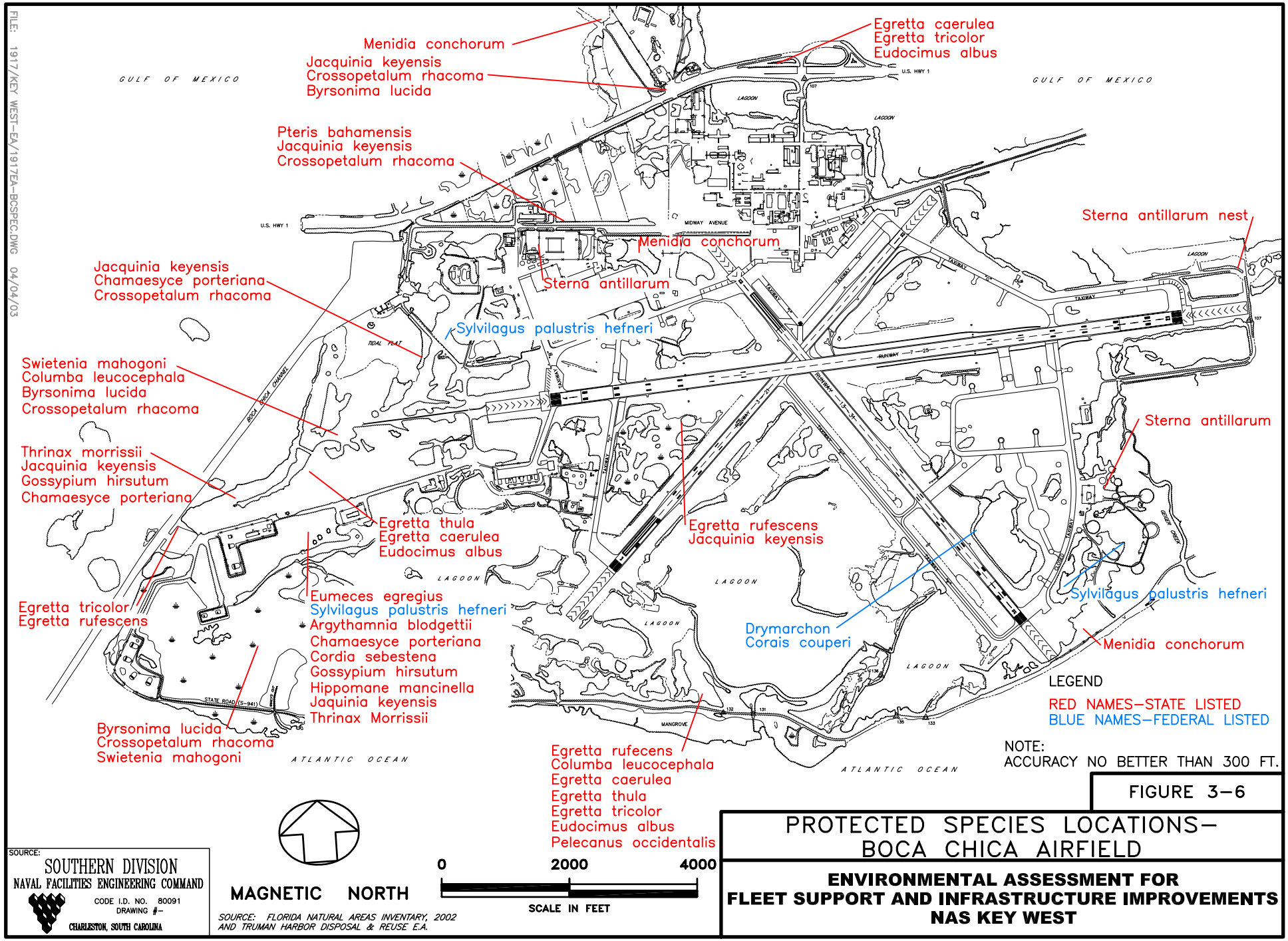


FIGURE 3-6

PROTECTED SPECIES LOCATIONS- BOCA CHICA AIRFIELD

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST

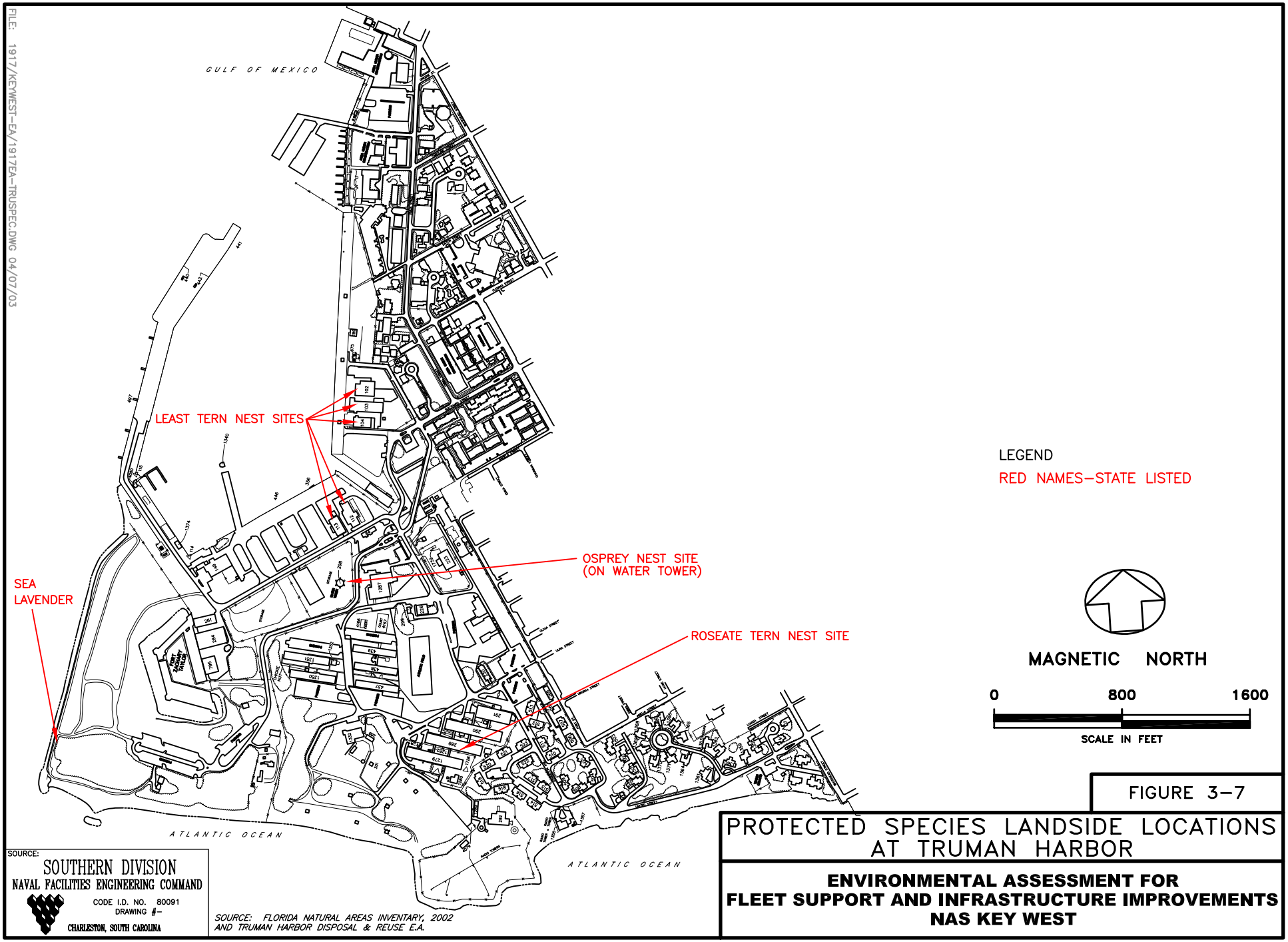
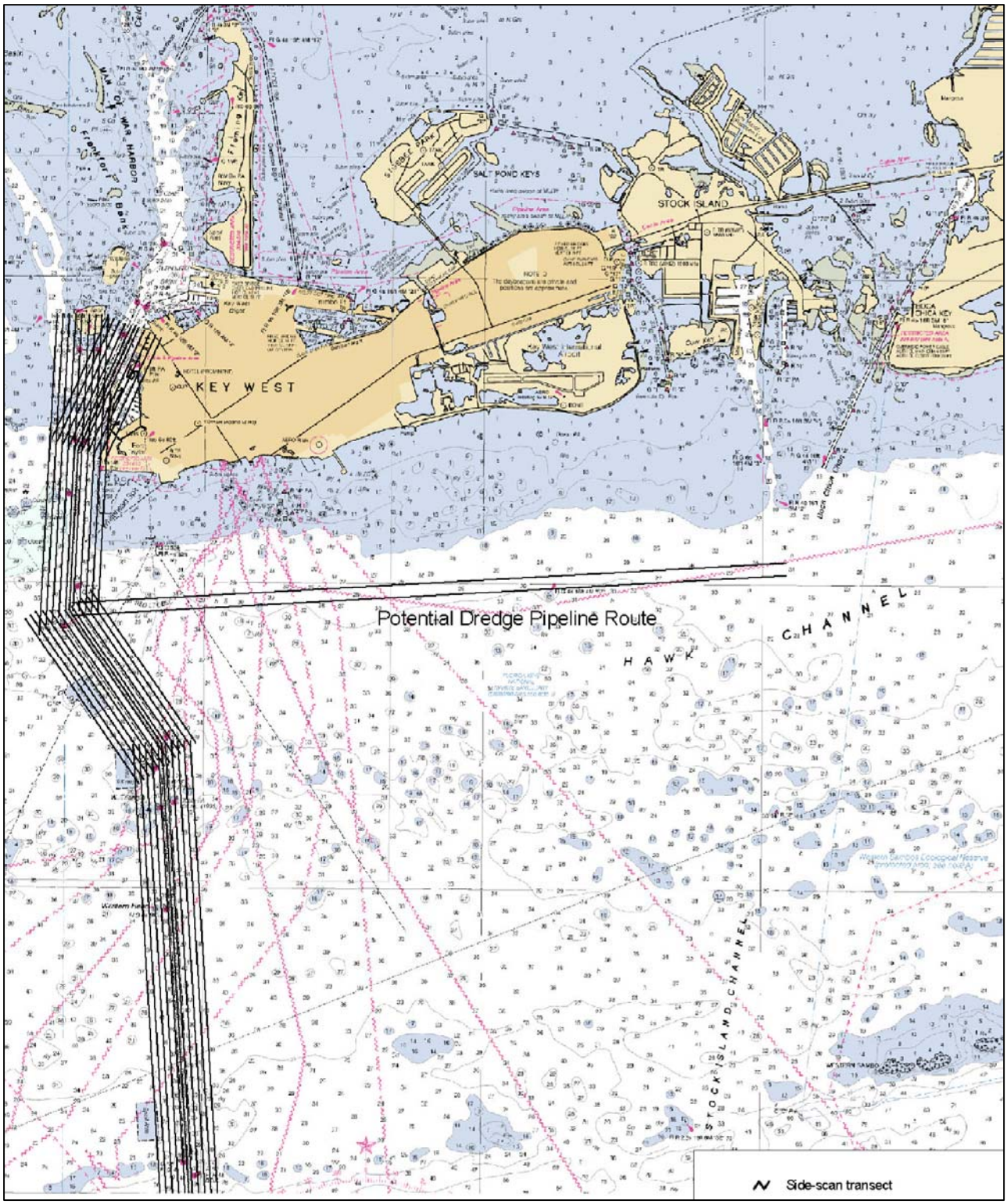


FIGURE 3–7

PROTECTED SPECIES LANDSIDE LOCATIONS AT TRUMAN HARBOR

ENVIRONMENTAL ASSESSMENT FOR
FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS
NAS KEY WEST

FILE: 1917/KEYWEST-EA/1917FIG3-8.DWG 04/04/03



MAGNETIC NORTH

0 6000 12000

SCALE IN FEET

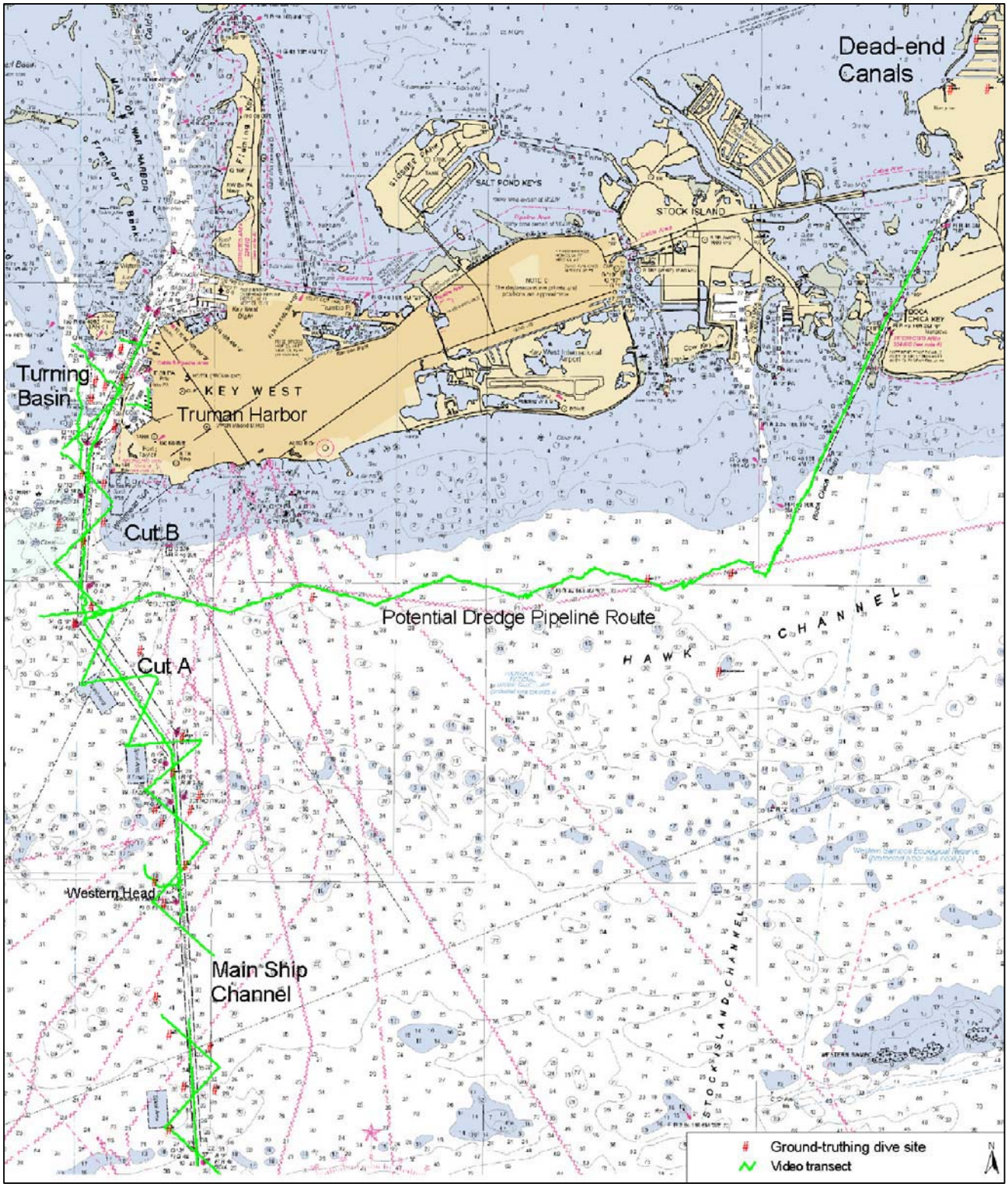
SURVEY DATES: OCTOBER 16TH–18TH AND 21ST–23RD, 2002

FIGURE 3–8

SIDE–SCAN SONAR SURVEY TRANSECTS

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST

FILE: 1917/KEYWEST-EA/1917FIG3-9.DWG 04/04/03



MAGNETIC NORTH

0 6000 12000

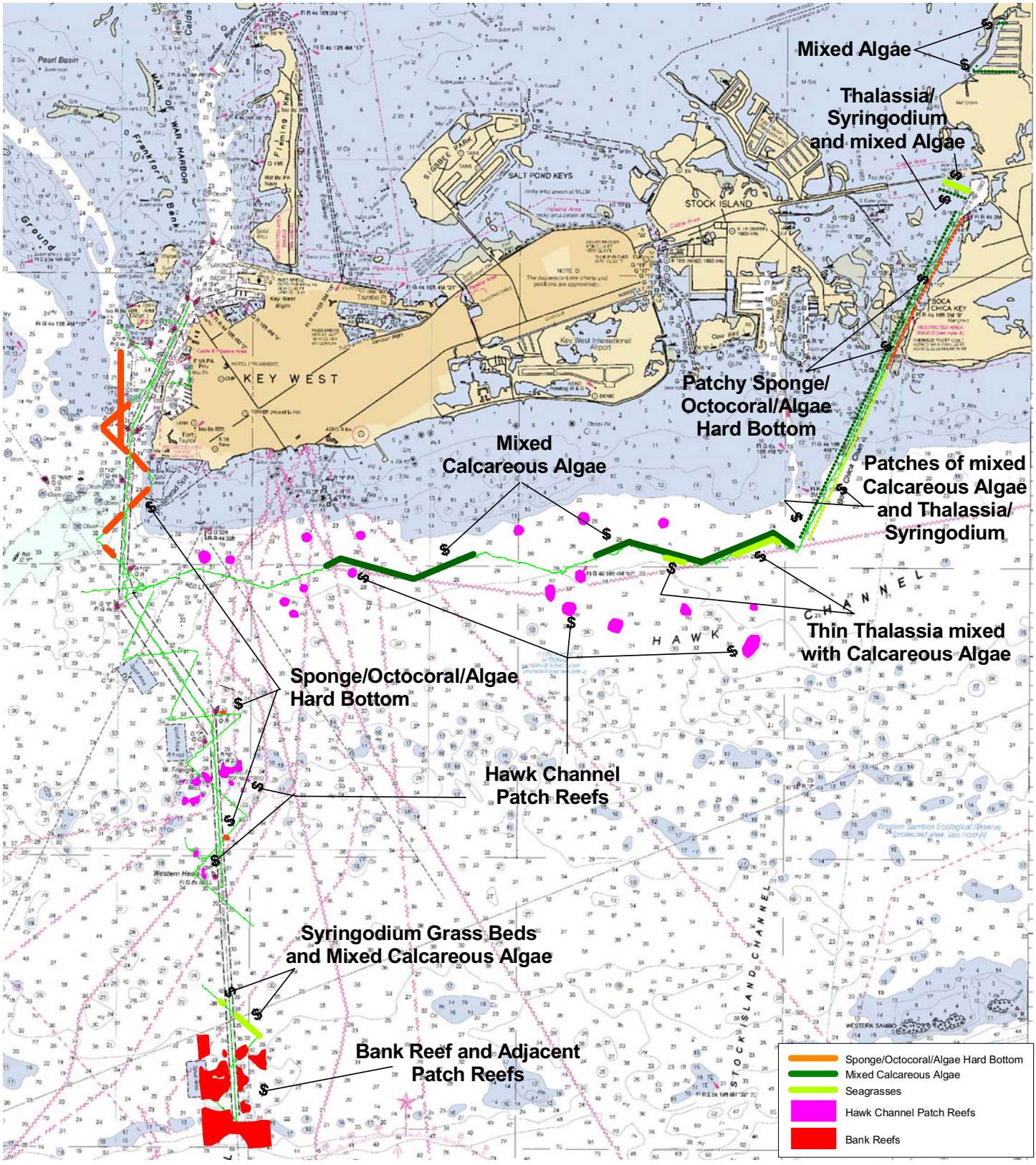
SCALE IN FEET

SURVEY DATES: 31 OCTOBER THRU 04 NOVEMBER 2002

FIGURE 3-9

DIVER VIDEO TRANSECTS AND GROUND-TRUTHING DIVE SITES

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST



MAGNETIC NORTH

0 2500 5000 7500 10000 Feet

SURVEY DATES: 31 OCTOBER TO 4 NOVEMBER 2002

FIGURE 3-10

BENTHIC BIOLOGICAL COMMUNITIES

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST

FILE: 1917/KEYWEST-EA/1917EA-TRUHIST.DWG 04/04/03

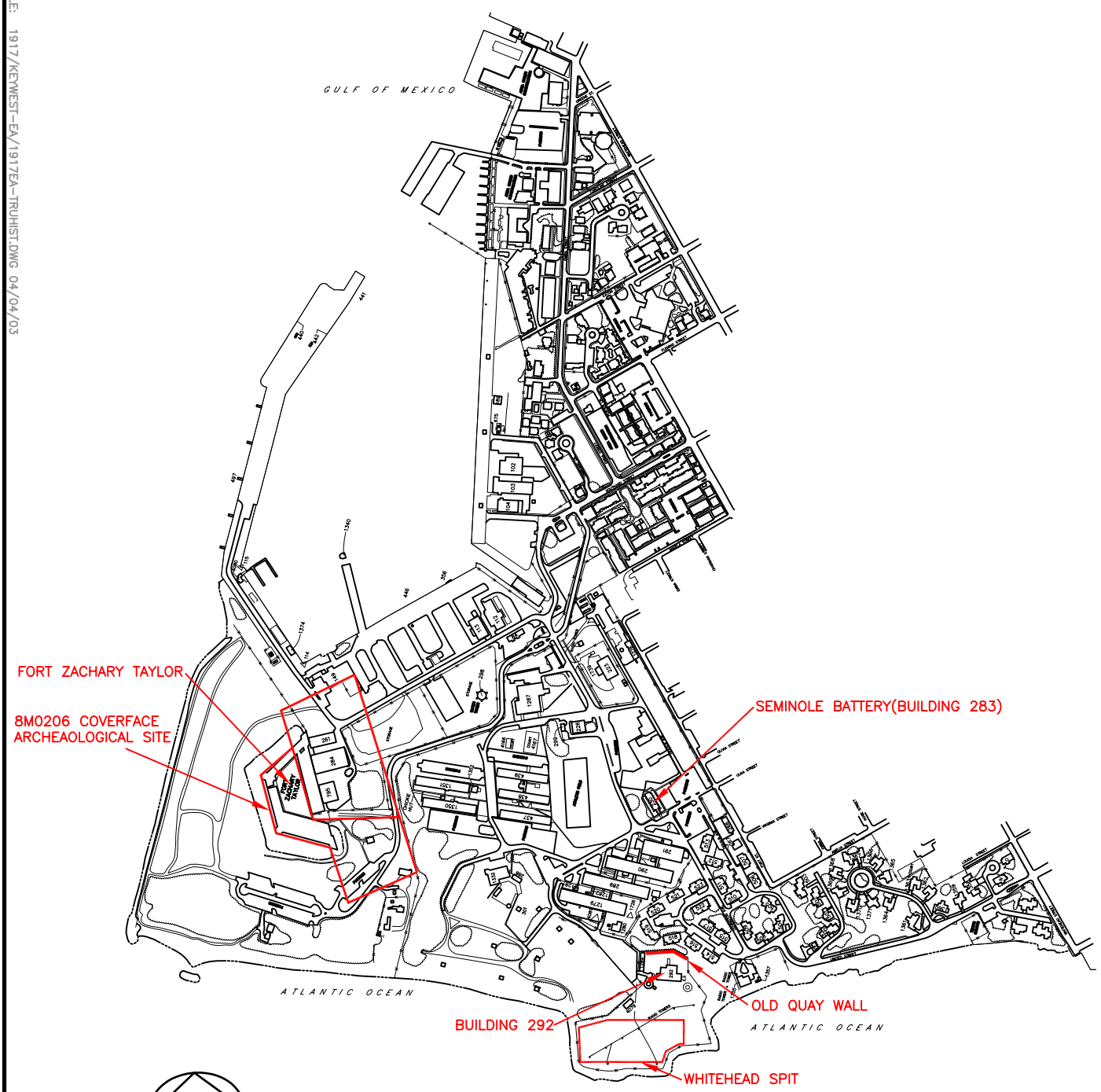


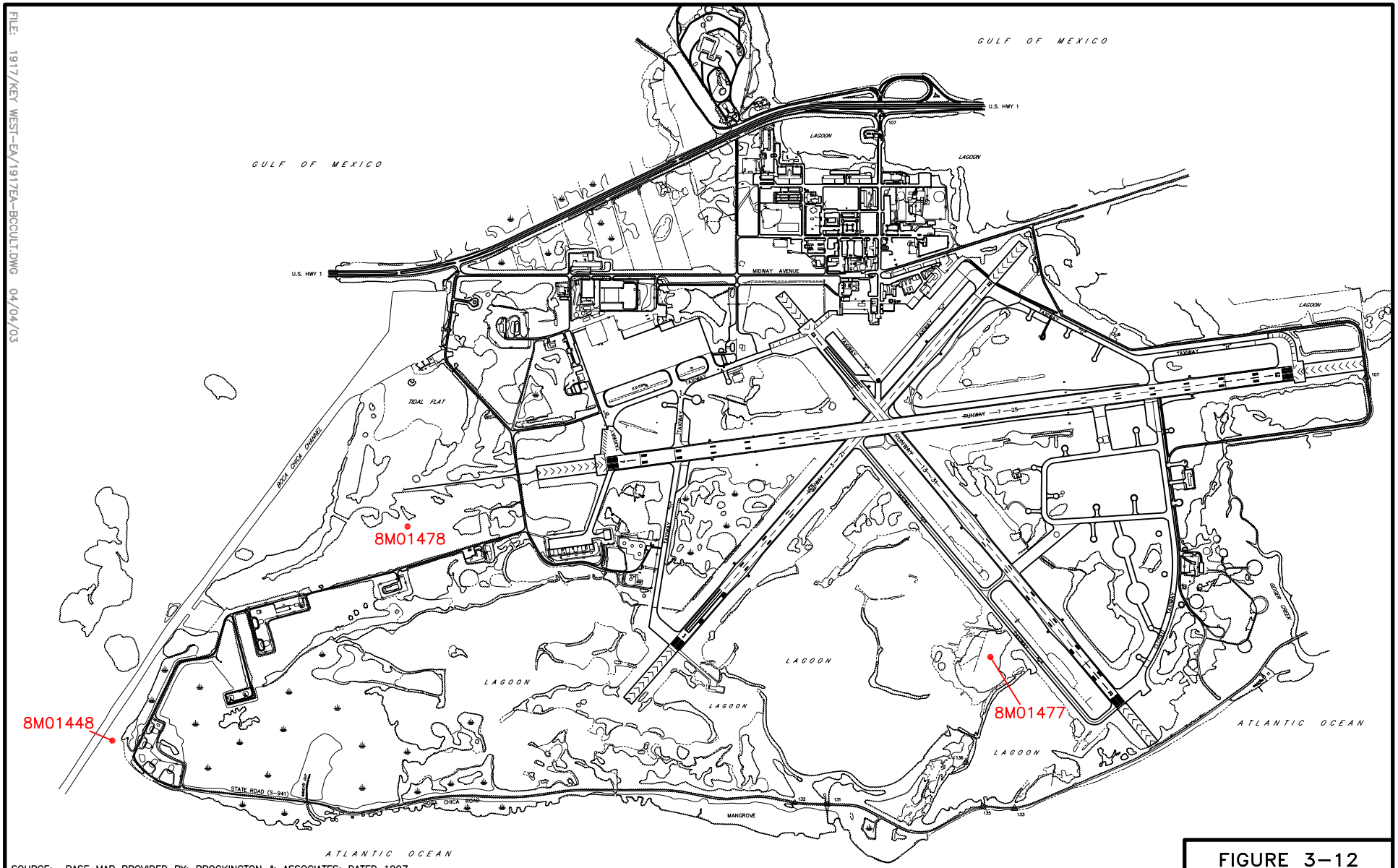
FIGURE 3-11

SOURCE: BASE MAP PROVIDED BY; BROCKINGTON & ASSOCIATES; DATED 1997

SOURCE:
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CODE I.D. NO. 80091
DRAWING #-
CHARLESTON, SOUTH CAROLINA

HISTORIC RESOURCES -TRUMAN ANNEX

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST



SOURCE: BASE MAP PROVIDED BY; BROCKINGTON & ASSOCIATES; DATED 1997

MAGNETIC NORTH

0 2000 4000

SCALE IN FEET

SOURCE:
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CODE I.D. NO. 80091
DRAWING #-
CHARLESTON, SOUTH CAROLINA

FIGURE 3-12

CULTURAL RESOURCES – BOCA CHICA

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST

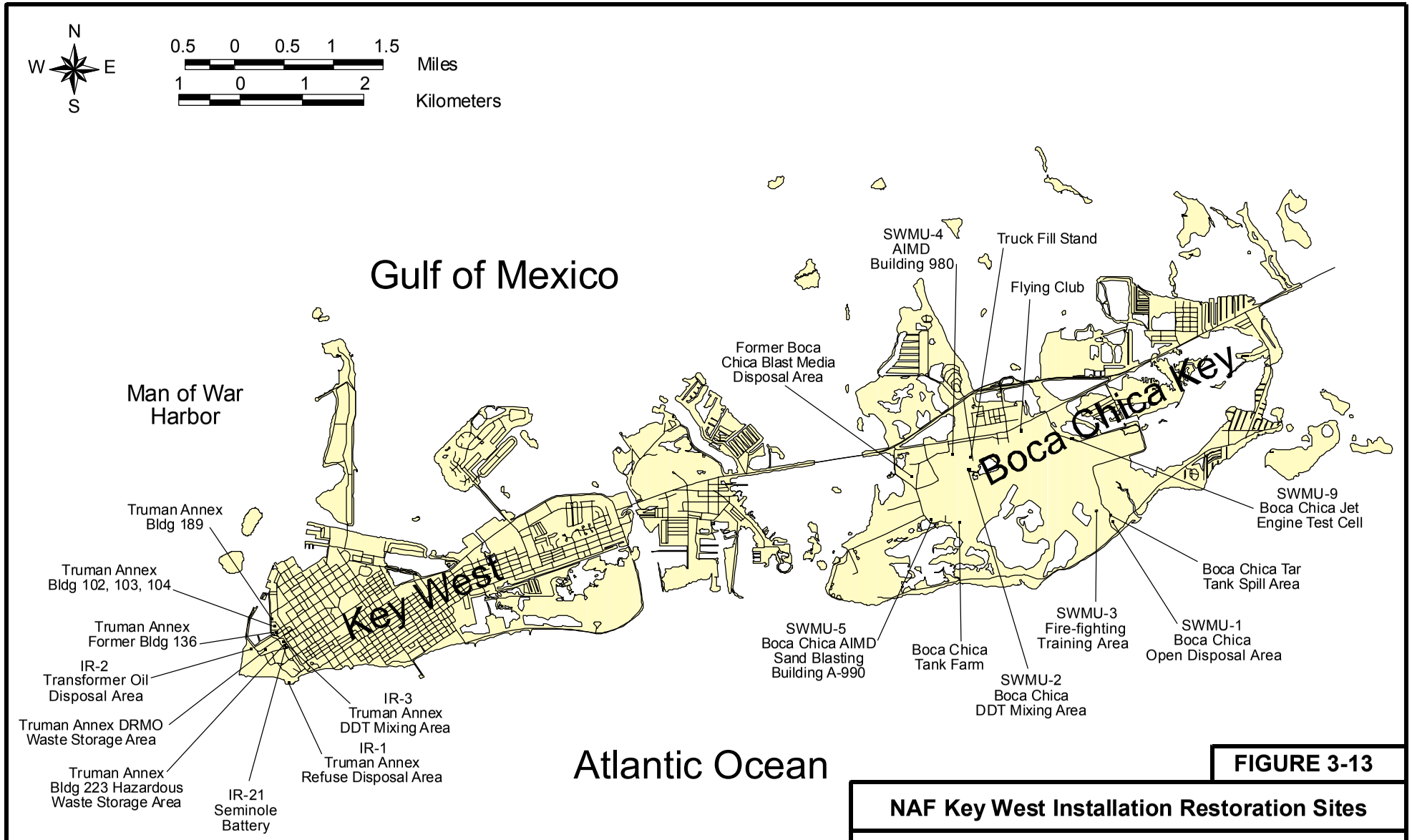


FIGURE 3-13

NAF Key West Installation Restoration Sites

ENVIRONMENTAL ASSESSMENT FOR FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS NAS KEY WEST

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

Chapter 4 discusses in detail the environmental consequences of the Preferred Alternative, Full Support Alternative, and No Action Alternative.

4.1 LAND USE

4.1.1 Approach to Analysis

Significance of potential land use impacts is based on the level of land use sensitivity in areas affected by the alternatives. In general, land use impacts would be significant if they would: 1) be inconsistent or in non-compliance with applicable land use plans or policies, 2) preclude the viability of an existing land use activity, 3) preclude continued use or occupation of an area, 4) conflict with planning criteria established to ensure the safety and protection of human life and property, or 5) be incompatible with adjacent or vicinity land use to the extent that public health or safety is threatened**.** Because the action alternatives are contained within Boca Chica and Truman Annex and does not include new missions, the potential impacts would be limited to the airfield, Truman Annex and the local environs.

4.1.2 Preferred Alternative

4.1.2.1 Boca Chica

Implementation of the Preferred Alternative at Boca Chica would support the NAS Key West mission and would be consistent with the existing land uses at the airfield. The proposed projects were designed to be compatible with existing NAS land use planning policies and airfield and ordinance safety guidelines. The proposed air traffic control building and radar upgrade, the TACTS building expansion, the hot pit refueling facility and the dredge material storage operation are consistent with modern DOD airfield support services. Therefore, implementation of the Preferred Alternative would result in beneficial impacts on airfield land use.

4.1.2.2 Truman Annex

The proposed retention of the Mole Pier property, pier repairs, utilities upgrades, craft maintenance facilities and security improvements are consistent with the historic use of the Truman harbor area to support Navy ships and would better equip the annex for future uses. The Navy is considering a lease agreement with the City of Key West for continued mooring of cruise ships when the pier is not being utilized for DOD requirements. Therefore, implementation of the Preferred Alternative would result in beneficial impacts for NAS Key West land use.

4.1.3 Full Support Alternative

The Full Support alternative includes all components of the Preferred Alternative. Consequently, land use impacts associated with the Preferred Alternative would also result from implementation of the Full Support alternative. Considered below are only those project components of the Full Support alternative not found in the Preferred Alternative.

4.1.3.1 Boca Chica

Implementation of the Full Support Alternative at Boca Chica, i.e., AIMD expansion, new hanger, OPCEN Expansion and Drone Launch Facility, is not expected to create additional flight operations or alter the existing land use as a DOD airfield greater than the Preferred Alternative, and would be consistent with the existing land uses at the airfield. The proposed projects were designed to be compatible with existing Station land use planning policies and ordnance and airfield safety guidelines. The AIMD expansion, new drone launch facility, new hanger construction, and new OPCEN are also part

of modern DOD airfield support services. Therefore, implementation of the full support services would result in beneficial impacts on NAS Key West land use.

4.1.3.2 Truman Annex

The repair of various buildings, harbor renovations, maintenance of the channel and piers as well as Truman Harbor would allow greater use of the Truman Annex by a wider variety of vessels. The construction of Ship Intermediate Maintenance Activity workshops and OWWO pretreatment facilities for waste treatment would greatly increase the capacity to serve ships utilizing the piers. The use agreement with the City of Key West for mooring cruise ships when the pier is not being utilized for DOD requirements would continue.

4.1.4 No-Action Alternative

Under the No-Action Alternative, the Mole Pier area of Truman Annex would likely be conveyed to the City of Key West for expanded use as port facilities. Multi-use development of the BRAC 95 excessed property, including the Mole Pier would be consistent with the description provided in *Environmental Assessment for Disposal and Reuse of Truman Waterfront* (2000) but inconsistent with this EA Preferred Alternative. Since there would be no change in land use (i.e., use of the Mole Pier for cruise ship berthing would continue) or ownership, the No-Action Alternative would impact only Navy ship berthing at Truman Annex.

The No-Action alternative also would not result in any of the facilities improvements at Boca Chica, and some types of Naval vessels proposed under the Preferred Alternative would not be able to enter the Port. This would mean that the NAS would continue to provide support to visiting aircrews just as it currently supports them.

4.2 TOPOGRAPHY, GEOLOGY, SOILS, AND MARINE SEDIMENTS

4.2.1 Approach to Analysis

In this section, the potential impacts to topography, geology, and soils resulting from the Preferred Alternative and the alternatives are evaluated. Of concern are the protection of valuable geologic features, the minimization of soil erosion, and the situating of facilities away from potential geological hazards. Usually, geologic resource impacts can be avoided or minimized if proper construction techniques, erosion control measures, and structural engineering components are incorporated into the project design.

4.2.2 Landside

4.2.2.1 Preferred Alternative

4.2.2.1.1 Boca Chica

The RATCF building expansion, the TACTS building expansion, and the proposed hot pit refueling station are located on urban land and udorthent soils; therefore neither project would disturb important geologic or soil resources. Furthermore, minimal topographic change would be necessary to complete the components of the Preferred Alternative. Construction would take place on urban land and paved surface, and soil disturbance associated with construction activity would be short-term. TACTS supports training out at sea with no impact on land.

4.2.2.1.2 Truman Annex

The Truman Annex is located on urban land soil; therefore, the demolition of building 261, the repair of buildings 284, and the AT/FP security upgrades would not disturb important geologic or soil resources. Most soil disturbance would result from the construction of a 120 m^2 gatehouse and approximately 1,390 m of security fencing. Minimal topographic change would be necessary to complete the project components. All construction would take place on urban land and paved surface, and soil disturbance associated with construction activity would be short-term. Due to the proximity of the building

to Fort Zachary Taylor cultural resources, construction will follow specific procedures as discussed in Section 4.5.2.2.

4.2.2.2 Full Support Alternative

The Full Support Alternative includes all components of the Preferred Alternative. Consequently, soil and geological impacts associated with the Preferred Alternative would also result from the implementation of the Full Support Alternative. Considered below are only those project components of the Full Support Alternative not found in the Preferred Alternative.

4.2.2.2.1 Boca Chica

Construction of the drone launch facilities at the Hawk Missile site would occur on previously disturbed upland soils and Cudjoe soils, a common Florida Keys soil type. The size of the facility is undefined but it is likely that impacts to important geologic and soil resources resulting from project implementation would be short-term and minimal. Cudjoe soils have 0 to 1 percent slopes, therefore little grading would be necessary to alter topography. Similarly, minimal impacts would likely result from the expansion of the AIMD building. The AIMD building itself sits on urban soil and is surrounded by Cudjoe soils.

Size and location information for the new hanger and OPCEN are not currently defined. However, due to the lack of significant geologic and soil features on Boca Chica, the construction of these facilities would likely create no significant impact.

4.2.2.2.2 Truman Annex

The impacts to topography, geology and soils resulting from the implementation of the Full Support Alternative would be equivalent to those impacts resulting from the Preferred Alternative. All landside projects would occur on previously disturbed uplands, with no significant loss to important geologic and soil resources expected to occur.

4.2.2.3 No-Action

Under the No-Action alternative, proposed construction activities at Boca Chica and Truman Harbor would not occur, therefore, the current topography, geology and soils resources would remain unchanged. No significant impacts to topography, geology or soils would occur as a result of implementation of the No-Action alternative.

4.2.3 Marine

4.2.3.1 Bathymetry

4.2.3.1.1 Preferred Alternative

Under the Preferred Alternative, maintenance dredging would occur. Maintenance dredging of the channel would be to a depth of –34 ft MLW plus 3 ft advance maintenance plus 1 ft allowable overdepth. Dredged material would be placed in uplands and in two quarry pits at a privately owned site on Rockland Key.

4.2.3.1.2 Full Support Alternative

Impacts to bathymetry resulting from implementation of the Full Support Alternative would be equivalent to those impacts resulting from the Preferred Alternative because an increased Ship Channel width was not considered for analysis.

4.2.3.1.3 No-Action

Under the No-Action alternative, proposed dredging activities in the Ship Channel, turning basin and Truman Harbor would not occur. Depth changes described under the Preferred Alternative therefore would not occur.

4.2.3.2 Sediment Quality

4.2.3.2.1 Preferred Alternative

Under the Preferred Alternative, maintenance dredging would occur. Maintenance dredging of the channel would be to a depth of -34 ft MLW plus 3 ft advance maintenance plus 1 ft allowable overdepth. Loose sediment will be removed from the dredged areas. The sediments in the area are currently lacking in contaminants. The chemical quality of the sediments is not anticipated to be degraded as a result of the Preferred Alternative.

Dredged material will be placed in uplands and two quarry pits at Rockland Key. As the material proposed for placement is free of chemical contamination, sediment quality in the quarry pits is not anticipated to be degraded. The quality of the dredged material is therefore suitable for beneficial reuse.

4.2.3.2.2 Full Support Alternative

Impacts of sediment quality resulting from implementation of the Full Support alternative would be equivalent to those impacts resulting from the Preferred Alternative.

4.2.3.2.3 No-Action

Under the No-Action Alternative, proposed dredging activities in the Ship Channel, turning basin and Truman Harbor would not occur. Depth changes described under the Preferred Alternative therefore would not occur.

4.3 BIOLOGICAL RESOURCES

4.3.1 Approach to Analysis

In this section, potential impacts to biological resources resulting from the alternatives are evaluated. Evaluations consider importance of the resource from commercial, recreational, ecological, and scientific standpoints; the occurrence of the resource in the area of the proposed activities relative to occurrence in the region; the sensitivity of the resource to the proposed activities; and the duration of potential impacts.

4.3.2 Terrestrial/Wetland

4.3.2.1 Preferred Alternative

4.3.2.1.1 Boca Chica

The Preferred Alternative includes three projects located on Boca Chica Airfield, none of which would impact existing vegetation or wetland resources. The first project, the expansion of the air traffic control building, would occur on previously disturbed or paved upland areas. Two alternate locations for a Hot Pit Refueling Station are being considered north and south of Taxiway A (Figure 2-1). Should the project construction boundaries involve vegetated surfaces, including wetland areas, all necessary environmental resource permit application elements will be defined and coordinated with Federal and State permitting agencies to fully comply with requirements. The third project is an expansion of the TACTS building that will occur on previously cleared and filled land around the existing facility where construction of a load/unload ramp, a 150 ft tall tower, relocation of fencing and approach pavement, and parking area are proposed. Because no sensitive wetland or biotic community habitats would be disturbed, no mitigation would be required. Construction activities at the Boca Chica Airfield would be short-term and restricted to previously disturbed uplands; therefore, it is unlikely that any long-

term terrestrial ecological impacts would result from construction activity. Potential indirect impacts to wetlands adjacent to the flight lines due to hot pit refueling spills or accidents may occur. Sufficient pollution prevention plans and cleanup response methods are in place to mitigate the potential indirect impacts.

No protected species are found in the vicinity of project areas, so no affect to protected species are expected. While flight operations show a slight increase from 60,800 operations in CY 2001 to 61,402 operations in CY 2007, these levels are within the CY 1977 baseline 85,000 operations and are not significantly different than the 1977 AICUZ. The air and noise effects will not create adverse consequences to wildlife.

4.3.2.1.2 Truman Annex

Truman Annex is developed land lacking any significant landside wetlands or other biological communities. Consequently impacts resulting from the implementation of the Preferred Alternative would primarily be centered on the marine environment.

4.3.2.2 Full Support Alternative

The Full Support Alternative includes all components of the Preferred Alternative. Consequently, ecological impacts associated with the Preferred Alternative would also result from the implementation of the Full Support Alternative. Considered below are only those project components of the Full Support Alternative not found in the Preferred Alternative.

4.3.2.2.1 Boca Chica

One component of the Full Support Alternative is the construction of drone launch facilities at the currently inactive Hawk Missile Site located on the northern end of Boca Chica Key. The construction for this project would occur in an upland area, therefore wetland impacts would be insignificant. However, project related road improvements would likely require the filling of jurisdictional wetlands. Also, indirect effects of construction activity and facility operations could impact the tidal estuarine wetlands that surround the site. Furthermore, though much of the Hawk Missile Site is previously disturbed, bald eagles may sometimes perch on the towers and the Lower Keys marsh rabbit and silver rice rat may occasionally transit the area. In addition, several threatened and endangered bird species are located to the north of the facility. It is possible that launch operations would act as a long-term disturbance to these communities, which may require consultation with appropriate federal agencies. Protected species occurrences recorded north of the Hawk Missile site include: tricolor heron (*Egretta trigolor)* a State-listed species of special concern, little blue heron *(Egretta caerulea)* a State-listed species of special concern, white ibis *(Eudocimus albus)* a State-listed species of special concern and bald eagle *(Haliaeetus leucocephalus)* a Federally listed threatened species.

Though currently undefined, the AIMD building expansion and renovation may disturb the intertidal estuarine wetlands that border the facility. Depending on the acreage of wetland disturbed by construction activities, mitigation may be required. Three State-listed plant species, rhacoma (*Crossopetalum rhacoma),* joewood *(Jacquinia keyensis),* and bahama brake *(Pteris bahamensis)* are also found in close proximity to the AIMD building, potentially restricting construction activities.

Size and location information for the new hanger and operation center are not currently defined. Impacts resulting from construction of these facilities would likely be insignificant, unless further project definition places these facilities near important biological communities.

4.3.2.2.2 Truman Annex

The terrestrial impacts resulting from the implementation of the Full Support Alternative would be equivalent to those impacts resulting from the Preferred Alternative. All landside projects would occur

on previously disturbed uplands and it is unlikely that any sensitive vegetation or wildlife communities would be disturbed.

4.3.2.3 No-Action Alternative

Under the No-Action alternative, proposed construction activities at Boca Chica Airfield and Truman Harbor would not occur, therefore, the current animal and vegetation communities would remain unaltered. No significant impacts to wetland and marine resources would result from implementing the No-Action alternative.

4.3.3 Marine

4.3.3.1 Benthic Communities

The proposed maintenance dredging of the Ship Channel, outer turning basin and Truman Harbor, as well as the Mole Pier improvement activities to add mooring dolphins and remove the tip for navigational safety would require Federal authorization under Section 10 of the Rivers and Harbor Act and Section 404 of the CWA. The USACOE and the EPA would review permit applications to ensure that the proposed activities conform to Section 404(b)(1) guidelines.

The proposed dredging and Mole Pier improvements would occur within waters of the FKNMS. Section 312 of the National Marine Sanctuaries Act of 1972 prohibits removal of, injury to, or possession of coral or live rock. The Preferred Alternative would be conducted in a manner consistent with the FKNMS Water Quality Action Plan and FKNMS Management Plan, Volume I. The FKNMS may provide authorization of the Section 404 permit issued by the USACOE. The FKNMS would assist in the identification and implementation of benthic resource protection strategies and assist in benthic resource relocations when all other methods to avoid or minimize dredge-related impacts are ruled out.

It is important to note the distinction between routine dredging operations and accidents that could occur during dredging activities. The Navy will have all of the necessary planning in place prior to implementation of the Preferred Alternative to avoid accidents such as anchor damage, cable damage, fuel spills, pipeline breaks, pipeline movement during storm events, or vessel groundings. Furthermore, regulatory agencies will specify legal requirements that will need to be met by the dredge contractor and Navy for routine dreging operations and accidents. Specifically, these requirements will come in the form of:

- "Recommended Special Conditions" from the NOAA, FKNMS;
- "Special Conditions" as part of the Environmental Resources Permit from the FDEP;
- "Essential Fish Habitat Conservation Recommendations" from the NMFS, Habitat Conservation Division; and
- "Special Conditions" associated with the USACOE Section 404 permit authorizing dredging.

These recommendations and special conditions as above will be incorporated into and made a part of the Section 404 permit. The Navy will be fully committed to these requirements, including a mitigation strategy that would address mitigation actions based on impacts that could occur from accidents. As part of the mitigation strategy, monitoring protocols will be designed in cooperation with these regulatory agencies to ensure detection and assessment of impacts that could occur from unlikely accidents. Based on monitoring results, appropriate restoration may be agreed to between the Navy and regulatory agencies.

4.3.3.1.1 Preferred Alternative

Seafloor Disturbance

No significant impacts should occur from seafloor disturbance because benthic resources will be avoided during routine dredging operations. Disturbance of benthic communities could occur through accidental impacts from the dredge cutterhead or suctionhead during dredging operations. Damage to these communities could also occur due to vessel groundings and misplaced anchors, anchor cables, spuds, or dredge pipeline. Under the Preferred Alternative, Truman Annex Harbor, the adjacent turning basin, and the Ship Channel will be dredged, with the dredged material pumped through a pipeline extending from Cut B east to Boca Chica Channel. The pipeline will then be extended up Boca Chica Channel and under the highway to a privately owned site on Rockland Key, north of U.S. Highway 1. Benthic communities that could be impacted include mixed algal/sponge/coral hard bottom areas west of the turning basin and Cut B, on top of the vertical walls along each side of the northern section of Cut B, adjacent to the Main Ship Channel, and within Boca Chica Channel; patch reefs near the Main Ship Channel and along the dredge pipeline route; and various seagrass communities along Cut B, the Main Ship Channel, and the dredge pipeline route in Hawk Channel and Boca Chica Channel.

These benthic communities would be especially susceptible to contact with cutterheads or other sediment removal equipment. Anchors or spuds could crush hard bottom and patch reef organisms and disturb seagrass beds by either being misplaced or dragged across these communities. Anchor cables could also break loose hard bottom and patch reef fauna and uproot seagrasses as the dredge repositions during operations. The pipeline could also impact seagrass beds and hard bottom communities if placed in the wrong locations. Vessel groundings during pipeline placement and positioning activities could also impact shallow water coral, hard bottom, and seagrass communities.

All of the previously discussed impacts to benthic communities are considered accidental and not part of the proposed routine dredging activities. Methods to reduce the possibility of these accidental impacts occurring include the delineation of all sensitive resources adjacent to the project area and establishment of buffer areas in which no anchor or cable placement would be allowed. Prior to placement of the dredge pipeline, a corridor would be delineated to avoid seagrass areas, patch reefs, and emergent hard bottom communities. The pipeline would then be deployed within this corridor with direct diver observations of the procedure. In sections of the Boca Chica Channel where stony coral colonies may be unavoidable, the pipeline may be floated over sensitive resources, placed on soft sediments away from resources, or as a final option, coral colonies may be relocated.

Turbidity/Sedimentation

Turbidity and sedimentation are both associated with dredging projects. Turbidity impacts can cause decreased photosynthesis and productivity in benthic communities. Heavy levels of sedimentation can often be more detrimental, by totally covering seagrasses and preventing photosynthesis, clogging filter-feeding organisms such as sponges, or causing corals to spend large amounts of energy producing mucous to clear the sediment from their surfaces. High sedimentation can also reduce coral recruitment by covering potential substrate and burying juvenile corals. Turbidity and sedimentation impacts to the benthic community are also dependent on tides, currents, wind, and local weather conditions. Due to variability in water flow over the course of the day, specific locations will not be exposed to high levels of turbidity and sedimentation for extended periods of time. Levels of turbidity also decrease significantly with distance from the source, lowering the possibility of adverse impacts to benthic communities. Patch reefs, hard bottom communities, and seagrass beds in the project vicinity are also adapted to conditions of increased turbidity as evidenced by the significant decline in water clarity associated with only marginal increases in wind speed during passage of weather systems. Most of the dredging of fine materials will take place in Truman Harbor and the vicinity of the turning basin where typical turbidity levels are higher than in the vicinity of the bank reefs south of Hawk Channel. However, fine sediments are also present in the Ship Channel as is evidenced in sediment samples collected from two locations at the southern end of Cut A, which had silt/clay fractions ranging from 43 percent to 59 percent. Sediments adjacent to patch reefs near the southern end of the Ship Channel are of coarser grain size and should therefore produce lower levels of turbidity and sedimentation during dredging operations.

As part of routine dredging operations, turbidity at the material placement site in the western quarry pit on Rockland Key will be eliminated by anchoring primary and secondary turbidity curtains across the single opening to this basin, effectively sealing it off from adjacent seagrass communities outside the mixing zone. If the curtains fail, a weir system would be constructed to control release of turbid water from the canals. Dredged material pumping rates will also be adjusted to avoid turbidity impacts to these communities. Turbidity will be contained in the eastern quarry pit by the encapsulating berm.

Some levels of turbidity and sedimentation will occur at the dredging site; however, they will be limited temporally and spatially and are considered to be insignificant impacts under routine dredging conditions. Removal of sediments from the Ship Channel, turning basin, and harbor may provide a benefit to benthic resources as a result of less resuspension and redeposition of sediments during any large vessel operations.

4.3.3.1.2 Full Support Alternative

Impacts to benthic communities under the Full Support Alternative will be the same as those described previously for the Preferred Alternative, except that there will be the potential for accidental fuel spills. Under the Full Support Alternative, there will be an increase in dockside fuel facilities and refueling of Navy vessels. Refueling operations are not expected to result in the release of fuel into the marine environment. However, in the unlikely event of an accidental fuel spill, there could be impacts to planktonic larvae of corals and other benthic invertebrates. An accidental fuel spill also could impact adjacent shallow water seagrass communities.

To evaluate the fate of potential accidental fuel spills within Truman Harbor, NOAA/HAZMAT's oil weathering model ADIOS Version 2 was run. Assumptions were a 10 bbl spill of diesel fuel oil into water with a salinity of 35 ppt; wave height of 0.6 m (2 ft); and wind speed of 30 mph. For a scenario of a water temperature at the low end of the range observed in the Florida Keys (16°C), 49 percent would evaporate, 37percent would be dispersed, and 14 percent would remain on the sea surface after 12 h. For a scenario of warm water (30°C) at the upper end of the range observed in nearshore waters of the Florida Keys, 63 percent would evaporate, 27 percent would be dispersed, and 10 percent would remain on the sea surface after 12 h.

It is likely that such accidental spills from refueling operations in Truman Harbor would rapidly evaporate and disperse and have little impact to the overall water quality of the Lower Keys. To mitigate any potential water quality impacts, the Navy has implemented a Facilities Response Plan (FRP) and Spill Prevention Control and Countermeasure (SPCC) plan at Key West Naval facilities that would minimize any impacts from such accidental spills.

4.3.3.1.3 No-Action

Under the No Action Alternative, there would be no additional effects to benthic communities in the project area.

4.3.3.2 Essential Fish Habitat

Potential effects that could occur in areas of routine dredging operations to managed species and species groups and their EFH are discussed in this section and summarized in Table 4-1 according to the impact producing factors of seafloor disturbance, turbidity, and entrainment. Given the small areas affected relative to the entire region, the project may adversely affect but is unlikely to have a substantial adverse effect on EFH. As explained in Section 4.3.3.1, the Navy will coordinate with regulatory agencies to determine protective requirements that will be incorporated into the USACOE Section 404 permit to address routine dredging operations and accidents. The Navy is fully committed to these requirements and to any appropriate mitigation strategy to address impacts to EFH from accidents.

Table 4-1 Impact Producing Factors on EFH From Proposed Dredging Project.
(Aeas associated with dreding include Main Ship Channel, turning basin, Truman Harbor, pipeline route, and placement site.)

Species Group	Seafloor Disturbance	Turbidity	Entrainment
Sargassum Algae[1]	None expected	Potential mortality/ feeding impairment of associated juvenile fishes	None expected
Coral, Coral Reefs, and Hard/Live Bottom[2]	Detachment of individual colonies; direct physical damage	Suffocation of polyps and tissue	None expected
Queen Conch[5]	Adult habitat loss	Potential mortality of early lfe stages	Juveniles and adults susceptible
Penaeid and Rock Shrimps	None expected	Potential mortality of early life stages	All life stages susceptible
Spiny Lobster[2]	Adult and juvenile habitat loss	Potential mortality of early life stages	All life stages susceptible
Stone Crab[3]	None expected	Potential mortality of early life stages	All life stages susceptible
Coastal Sharks[4]	Adult and juvenile habitat loss (nurse sharks)	None expected	None expected
Highly Migratory Species[4]	None expected	Potential mortality/ feeding impairment of early life stages	Larvae and eggs susceptible
Reef Fishes (Snapper-Grouper Management Unit)[2]	Adult and juvenile habitat loss	Potential mortality/ feeding impairment of early life stages	Larvae and eggs susceptible
Coastal Migratory Pelagic Fishes[2]	None expected	Potential mortality/ feeding impairment of early life stages	Larvae and eggs susceptible

[1]-South Atlantic Fishery Management Council 1998b

[2]-South Atlantic Fishery Management Council 1998a

[3]-Gulf of Mexico Fishery Management Council 1998

[4]-NMFS 1999a

[5]-Robert Glazer (Florida Fish and Wildlife Conservation Commission pers. comm. 2003)

4.3.3.2.1 Preferred Alternative

Seafloor Disturbance

Seafloor disturbance is caused by direct mechanical contact of the dredge cutterhead, suctionhead, or dredging support vessels with seafloor habitats. Anchors, cables, and spuds used to moor dredge barges also can cause seafloor disturbance. These dredging activities could damage but are not likely to have a substantial adverse effect on EFH in and adjacent to the project area. For the Preferred Alternative, the most sensitive benthic habitats occur outside of the Ship Channel, particularly in Hawk Channel and on top of the vertical walls adjacent to the northern section of Cut B and the western edge of the turning basin. Patch reefs, hard bottom communities, and seagrass beds are present in several areas just outside the Ship Channel. These habitats are susceptible to impacts from anchor placement and cable sweeping associated with clamshell excavator and cutter head dredges. Anchors used to position the dredge can crush patch reefs and hard bottom habitats and dislodge larger coral heads. Cables connecting anchors to the dredge also may shear off or otherwise damage organisms attached to hard substrate. In addition to hard bottom impacts, seagrasses can be uprooted or otherwise damaged by anchor placement and cable sweep. Precautions to avoid or lessen the severity of physical disturbance of substrates adjacent to the project area by dredges and attendant equipment will be made. All excavation (regardless of dredge type) will be restricted to the existing Ship Channel, turning basin, and Truman Harbor. Field verified habitat maps will be used to minimize impacts to sensitive habitats outside of these project areas. Buffer zones will be established adjacent to the vertical walls on the western side of the turning basin. Anchor placement and cable sweep impacts will be avoided by careful

placement of anchors during all operations. Divers will be used to assist in the placement of anchors, cables, and spuds in the vicinity of sensitive marine resources. No-anchor zones may be established around known sensitive marine resources (Appendix D). As mentioned above, precautions to avoid or lessen the severity of physical disturbance of substrates adjacent to the project area by dredges and attendant equipment will be made.

Under a cutterhead scenario, a pipeline would be used to transport the dredged material to the placement site and would be a potential source for seafloor disturbance. The pipeline activities may adversely affect, but are not likely to have a substantial adverse effect on EFH in and adjacent to the project area. Pipeline that settles on and is anchored to the bottom could damage seagrass beds, coral heads, and other hard bottom habitats along the Ship Channel, Hawk Channel, and Boca Chica Channel. In areas of sensitive marine resources along Hawk Channel and Boca Chica Channel, the dredge pipeline will be either selectively positioned on the bottom to avoid the resources or floated over/around them.

Under a hopper dredge scenario, seafloor disturbance would be restricted primarily to the dredge drag head which is the only component of a hopper dredge that makes contact with the seafloor. During routine dredging operations associated with the project, the drag head should only contact seafloor areas within the specified dredge footprint. If improperly placed, the drag head may adversely affect seagrasses, coral heads, and other hard bottom habitats.

Turbidity

Suspended sediment will be associated with all dredge types throughout the project area. Turbidity will occur at the dredge site and dredge material placement site. There are more opportunities for turbidity plumes to form when transferring material to and from hopper barges, but other methods also will generate turbidity. Duration and extent of dredge-caused turbidity plumes will depend on local currents, tides, and winds. Although increased turbidity is expected to be temporary and localized, several detrimental effects of turbidity have been documented for fishes and invertebrates. One invertebrate that may be susceptible to elevated turbidity is queen conch. Increases in suspended silt near the southern end of the Ship Channel could affect larval and newly settled stages during the March to October spawning season. Some examples of effects on fishes are given below (see Section 4.3.4.1 for a summary of impacts to corals and other benthic assemblages). Fishes are primarily visual feeders and when turbidity reduces light penetration, the individual's reactive distance decreases (Vinyard and O'Brien 1976). Light scattering caused by suspended sediment also can affect a visual predator's ability to perceive and capture prey (Benfield and Minello 1996). Some fishes have demonstrated the ability to capture prey at various turbidity levels, but density of prey and light penetration are important factors (Boehlert and Morgan 1985; Grecay and Targett 1996). Some species will actively avoid or be attracted to turbid water. Experiments with kawakawa (*Euthynnus affinis*) and yellowfin tuna (*Thunnus albacares*) demonstrated that these species would actively avoid experimental turbidity clouds, but also would swim directly through them during some trials (Barry 1978).

Gill cavities can be clogged by suspended sediment preventing normal respiration and mechanically affecting food gathering in planktivorous species (Bruton 1985). High suspended sediment levels generated by storms have contributed to the death of nearshore and offshore fishes by clogging gill cavities and eroding gill lamellae (Robins 1957). High concentrations of fine sediments can coat the gill respiratory surfaces and prevent gas exchange (Wilber and Clarke 2001).

Consequences of such impacts to fishes depend on age or life stage of the fish (Lindeman 1997). Early life stages will be less resilient to direct effects of turbidity than adults. Ultimately, effects on young individuals will be reflected in later life stages as reduced fecundity, low growth rates, and year class depression. Understanding and predicting effects of suspended sediments on fishes require some information on the range and variation of turbidity levels found at a project site prior to dredging (Wilber and Clarke 2001). Spatial and temporal extents of turbidity plumes from dredging operations are expected to be limited; however, the activities may adversely affect but are not likely to have a substantial adverse effect on EFH in the dredging area.

The proposed disposal site at the quarry pits on Rockland Key will be enclosed by temporary turbidity curtains that will completely seal the area and prevent suspended sediment from returning to open waters. This measure will assure water quality standards are met during the dredged material placement.

Entrainment

Entrainment of adult fishes by hydraulic dredging has been reported for several projects (Larson and Moehl 1988; McGraw and Armstrong 1988). The most comprehensive study of fish entrainment took place in Grays Harbor, WA during a 10 year period when 27 fish taxa were entrained (McGraw and Armstrong 1988). Most entrained fishes were demersal species such as flatfishes, sand lance, and sculpin; however, three pelagic species (anchovy, herring, and smelt) were recorded. Entrainment rates for the pelagic species were very low, ranging from 1 to 18 fishes/1,000 CY (McGraw and Armstrong 1988). Comparisons between relative numbers of entrained fishes with numbers captured by trawling showed that some pelagic species were avoiding the dredge. Another entrainment study conducted near the mouth of the Columbia River, WA reported 14 fish taxa entrained at an average rate of 0.008 to 0.341 fishes/CY (Larson and Moehl 1988). Few fishes occurring offshore of Key West should become entrained because the dredge's suction field exists near the bottom and most species have sufficient mobility to avoid the suction field. Federally managed adult fishes, pink and rock shrimps, lobsters, and stone crabs, would be susceptible to entrainment. Adult queen conch (managed by the FFWCC) also would be subject to entrainment. Entrainment will be difficult to avoid for very small organisms, such as, eggs, larvae, and juveniles of fishes and invertebrates that may come into contract with the dredge's suction field. Entrainment by cutterhead or hopper dredge may adversely affect but is unlikely to have a substantial adverse effect on managed species and species groups and their EFH.

4.3.3.2.2 Full Support Alternative

Refueling Operations

Impacts to EFH under the Full Support Alternative will be the same as those described previously for the Preferred Alternative, except that there may be the potential for accidental fuel spills. Under the Full Support Alternative, there will be an increase in dockside fuel facilities and refueling of Navy vessels. Refueling operations are not expected to result in the release of fuel into the marine environment. However, in the unlikely event of an accidental fuel spill, there may be impacts to EFH. Based on the results of the oil weather modeling and mitigation presented in Section 4.3.3.1.2, it is likely that spills from refueling operations in Truman Harbor would rapidly evaporate and disperse and have little impacts to EFH.

4.3.3.2.3 No-Action

Under this alternative there will be no additional effects on EFH in the project area.

4.3.3.3 Federally Endangered or Threatened Marine Turtles

Potential effects that could occur in areas of routine dredging operations to marine turtles are discussed in this section according to the impact producing factors of entrainment, habitat loss or modification, turbidity, and dredge-related vessel collisions. All marine turtle species that inhabit waters near Key West are listed as endangered or threatened species under the ESA. This analysis of impacts to marine turtles takes into account their protected status under the ESA. Species most likely to occur in the project area include, in order of relative abundance, loggerhead, green, and hawksbill turtles. As per consultation pursuant to Section 7 of the ESA with the NMFS Protected Species Division (see Biological Opinion in Appendix B), the USACOE has a permit to take marine turtle species using hopper dredges, which is not likely to jeopardize the continued existence of any marine turtle species. As per Navy consultation with the NMSF Protected Species Division, use of a cutterhead dredge is not likely to adversely affect marine turtle species, or their critical habitat, under the purview of NMFS (Appendix E.9). The Navy anticipates initiating Section 7 consultation with the USFWS regarding marine turtles on land. As explained in Section 4.3.3.1, the Navy will coordinate protective measures for marine turtles that will

be incorporated into the USACOE Section 404 permit to address routine dredging operations and accidents.

4.3.3.3.1 Preferred Alternative

Entrainment

The main potential effect of dredging on marine turtles is physical injury or death caused by entrainment when a turtle feeding or resting on the seafloor is contacted by the dredge head. Two types of dredges may be used during the proposed Key West harbor and Ship Channel dredging operation: cutterhead and hopper dredge. Cutterhead dredges are considered unlikely to kill or injure turtles because they encounter a smaller area of seafloor per unit time, allowing more opportunity for turtles to escape (Palermo 1990). Therefore, the use of cutterhead dredge equipment is not likely to adversely affect marine turtles in the project area as per consultation pursuant to Section 7 of the ESA with the NMFS Protected Species Division (see NMFS letter in Appendix E).

Hopper dredges pose the greatest risk to marine turtles (Dickerson 1990; NMFS 1997). Numerous marine turtle injuries and mortalities have been documented during hopper dredging projects along Florida's east coast (Studt 1987; Dickerson et al. 1992; Slay 1995) and in the southeastern U.S. in recent years (NMFS 1996, 1997). Nevertheless, dredging has not to date been implicated as a major cause of impact to marine turtle populations in the region (NMFS 1996). Chelonid marine turtles (loggerhead, green, hawksbill, and Kemp's ridley) are considered to be at most risk from dredging activities because of their relatively shallow (generally 15 m or less), benthic feeding habits (Dickerson et al. 1992; NMFS 1996). These species also are known to spend periods of time resting on the seafloor. Loggerheads are the most abundant marine turtles in the Keys, including the Key West project area, and along the southeast U.S. coast. Consequently, loggerheads have been the species most frequently entrained during U.S. hopper dredging operations, possibly accounting for up to 86 percent of the total (Reine et al. 1998). However, relatively high densities of green and hawksbill turtles in the Keys may increase the probability of "takes" of these two species within the project area. Leatherback turtles are uncommon within inner shelf waters of the Keys, and are unlikely to be affected by dredging because they are pelagic (water column) feeders and are not known to rest on the seafloor (NMFS 1996).

There has been considerable research into designing modified hopper dredges with turtle deflectors that reduce the likelihood of entraining sea turtles (Studt 1987; Berry 1990; Dickerson et al. 1992; Banks and Alexander 1994; U.S. Army Corps of Engineers 1999). These include marine turtle-deflecting dragheads, and inflow and overflow screens. Further, the provisions of the current NMFS Biological Opinion regarding hopper dredging operations for the U.S. Atlantic coast are applicable and valid for activities associated with the Preferred Alternative (Appendix B). In the event hopper dredges are utilized for this project, the NMFS Biological Opinion may require dredge operators to employ trained, marine turtle observers to oversee dredging operations and report all marine turtle takes (herein defined as harassment, captures, or deaths). This Biological Opinion also permits an annual incidental take, by injury or mortality, of 35 loggerheads, seven Kemp's ridleys, seven green turtles, and two hawksbills from hopper dredge activities permitted by the USACOE in the Southeast United States.. According to the NMFS, as stated in the Biological Opinion, this annual take level is not likely to jeopardize the continued existence of any marine turtle species.

Habitat Loss or Modification

Per Appendix E.4 and Appendix E.9, no designated critical habitat is found in the project area. Juvenile and subadult loggerhead, green, hawksbill, and perhaps Kemp's ridley turtles use inner shelf waters of the Keys as developmental habitat, foraging on benthic organisms on both hard and solf bottom substrates. Sandy beaches in select areas of the Keys, including areas around Truman Annex, serve as nesting habitat for marine turtles (Section 3.3.3.3). When areas to be dredged or receive dredge spoil have significant concentrations of benthic resources (such as seagrass and algal beds), these activities can reduce overall food availability both by removing potential food items and destroying or modifying these habitats (NMFS 1996). Resulting from the biological resources surveys conducted by CSA and described in Section 3.3.3.1 indicate only few isolated areas within the proposed dredge footprint that contain significant concentrations of these benthic resources. Additionally, there are no

plans to alter beaches in the project area, so marine turtle nesting habitat would not be affected. Overall, habitat loss or modification resulting from activities associated with proposed project activities is expected to be localized and not likely to adversely affect marine turtle populations in the project area.

Turbidity

Marine turtles in and near the project area may encounter turbid water associated with the dredge turbidity mixing zone, or plume, during dredging operations that could temporarily interfere with feeding. However, due to the limited areal extent and transient occurrence of the plume, turbidity is considered not likely to adversely affect turtle behavior or survival.

Dredge-Related Vessel Collisions

There is no direct evidence of dredge vessel collisions with marine turtles (of any life stage) in the Keys. However, due to the aforementioned increase in dredge, and dredge support and construction vessel traffic through the project area associated with the Preferred Alternative, there is a chance of collision between these vessels and marine turtles. The risk would vary depending upon location, vessel speed, and visibility. As discussed in Section 3.3.3.3, most marine turtles are distributed within nearshore waters and waters of the continental shelf, and all life stages (hatchling, juvenile or subadult, and adult) may be present within the project area. During the hatching season, it is believed that hatchling turtles leave their nesting beaches and swim offshore to areas of water mass convergence. Small and juvenile turtles in these areas, especially within patchesof floating *Sargassum*, may be difficult to spot from a moving vessel. Adult turtles are generally visible at the surface during periods of daylight and clear visibility. They may also be very difficult to spot from a moving vessel when resting below the water surface, and during nighttime and periods of inclement weather. Further, the Sea Turtle Stranding and Salvage Network (NMFS, Southeast Fisheries Science Center) maintains detailed records that indicate wounds consistent with vessel strikes (S. Epperly 2001, pers. comm., NMFS, Southeast Fisheries Science Center, Miami, FL). Despite this, a vessel collision is unlikely. Adult and subadult, and perhaps juvenile turtles are capable of avoiding moving dredge related vessels, especially when these vessels operate within these limited areas at slow to relatively slow speeds. Impacts from collisions are, consequently, not likely to adversely affect marine turtles within the project area.

4.3.3.3.2 Full Support Alternative

Impacts to marine turtles under the Full Support Alternative will be the same as those described previously for the Preferred Alternative, except that there would be the potential for accidental fuel spills. Under the Full Support Alternative, there will be an increase in dockside fuel facilities and refueling of Navy vessels. Refueling operations are not expected to result in the release of fuel into the marine environment. However, in the unlikely event of an accidental fuel spill, there may be potential impacts to marine turtles. Based on the results of the oil weather modeling and mitigation presented in Section 4.3.3.1.2, it is likely that spills from refueling operations in Truman Harbor would rapidly evaporate and disperse and have little impacts to marine turtles.

4.3.3.3.3 No-Action Alternative

Dredging activities described in the Preferred Alternative, would not occur with the No-Action Alternative. Therefore, there would be no additional potential impacts to marine turtles in the project area with the No-Action Alternative.

4.3.3.4 Marine Mammals

Potential effects that could occur in areas of routine dredging operations to marine mammals are discussed in this section according to the impact producing factors of entrainment, habitat loss or modification, turbidity, and dredge-related vessel collisions. All marine mammal species in U.S. waters and high seas are protected under the MMPA, which prohibits all nonpermitted 'takes' of any marine mammal (within the MMPA, 'take' means to harass, hunt, capture, or kill). Species most likely to occur in the project area include, in order to relative abundance, common bottlenose dolphin, Atlantic spotted dolphin, and the manatee. The manatee also is listed as an endangered species under the ESA. Based

on the best scientific information available, dredging activities are unlikely to result in the harassment, injury, or mortality of marine mammals inhabitating the project area (Ken Hollingshead 2003, pers. comm., NMFS, Silver Spring MD). As per Navy consultation pursuant to Section 7 of the ESA, the NMFS concurs with this determination that "the proposed activity will not likely adversely affect endangered and threatened species, or their critical habitat, under the purview of the NOAA Fisheries" (all listed cetaceans but excluding the manatee) (see NMFS letter in Appendix E.9). The Navy anticipates initiating ESA Section 7 consultation with the USFWS regarding manatees.

4.3.3.4.1 Preferred Alternative

Entrainment

Marine mammals are unlikely to be taken (i.e., harassed or killed) by dredging because they generally do not rest on the bottom and can easily avoid contact with dredging equipment. Cetaceans most likely to be found in inner shelf waters around the Keys, the common bottlenose dolphin and Atlantic spotted dolphin, are agile swimmers that are presumed capable of avoiding physical injury during dredging. Manatees, though generally slow, sluggish swimmers, also are presumed capable of avoiding dredge equipment.

Hopper dredges pose a much greater risk for manatees. The USACOE's Section 404 Permit will incorporate appropriate FFWCC manatee protection construction conditions (Appendix C). Additionally, the conservation recommendations provided by the current NMFS Biological Opinion for marine turtles regarding hopper dredging operations for the U.S. Atlantic coast will also protect the manatees. Dredging activities associated with the preferred alternative are not likely to adversely affect manatees under the Endangered Species Act. The Navy anticipates initiating ESA Section 7 consultation with the USFWS regarding potential affect of dredging activities on manatees.

Habitat Loss or Modification

There is no designated critical habitat for manatees in the project area. Manatees use near coastal, inner shelf waters of the Keys as foraging habitat, feeding on seagrasses and other aquatic vegetation (Section 3.3.3.4.1). Therefore, when areas to be dredged or receive dredge spoil include significant concentrations of these resources, such activities can reduce food availability to manatees both by removing potential food items and destroying or altering these benthic feeding habitats (NMFS 1996). Referencing the USFWS response to the USACOE public notice regarding the proposed project (Appendix E.9), "seagrass beds exist in the project area and will be impacted by this project. However, the project is not located in designated critical habitat for the manatee; therefore, no modification to critical habitat will result from the proposal". Overall, habitat loss or modification resulting from the project is expected to be localized and not likely to adversely affect marine mammals, including manatees, in the project area.

Turbidity

Marine mammals in and near the project area (bottlenose dolphins, occasional Atlantic spotted dolphins, and only rarely, manatees) may encounter turbid water associated with the dredge turbidity mixing zone, or plume, during dredging operations. This area of turbidity could temporarily interfere with feeding or other activities, but animals could easily move out of affected areas. Due to the limited spatial extent and transient occurrence of the plume, turbidity is not expected to result in a take (i.e., harassment or mortality or marine mammals, including manatees.

Dredge-Related Vessel Collisions

There is no direct evidence of dredge, and dredge support and construction vessel collisions with marine mammals in the Keys. Dredge-related vessel speeds within the harbor and turning basin areas of the project area will be low. Dredge-related vessel speeds in the outer Ship Channel will be generally faster, though it is expected that cetaceans can easily maneuver clear of approaching dredge vessels within this area. Though manatees are vulnerable to vessel strikes, there have been no reports of vessel-related deaths to manatees within the Lower Keys in more than 27 years (USFWS 1996; Andrew Gude 2003, pers. comm., USFWS, Big Pine Key, FL). Per the FFWCC, Standard Manatee Construction Conditions, June 2001 (Appendix C) would be incorporated into the dredge permit, and the Navy would comply with current manatee protection construction conditions that specify vessel operating

speeds within the project area (Appendix C). Based on the relatively low numbers of manatees within the Lower Keys, including the project area, and the low vessel speeds maintained by dredge-related vessels within the inner Ship Channel and harbor areas, the Navy does not anticipate any ship collisions. Thus, the Navy does not expect any effect to marine mammals, including manatees, from ship collisions.

4.3.3.4.2 Full Support Alternative

Impacts to marine mammals under the Full Support Alternative would be the same as those described previously for the Preferred Alternative, except that there will be the potential for accidental fuel spills. Under the Full Support Alternative, there would be an increase in dockside fuel facilities and refueling of Navy vessels. Refueling operations are not expected to result in the release of fuel into the marine environment. However, in the unlikely event of an accidental fuel spill, there may be impacts to marine mammals. Based on the results of the oil weather modeling and mitigation presented in Section 4.3.3.1.2, it is likely that spills from refueling operations in Truman Harbor would rapidly evaporate and disperse and have little impacts to marine mammals of the Lower Keys.

4.3.3.4.3 No-Action

Dredging activities described for the Preferred Alternative, would not occur with the No-Action Alternative. Therefore, there would be no additional potential impacts to marine mammals in the project area with the No-Action Alternative.

4.4 WATER RESOURCES

4.4.1 Approach to Analysis

In this section, the potential impacts to water resources resulting from the alternatives are evaluated. Of concern are the protection of the public water supply, maintenance of unique hydrologic features and the avoidance of increased flood hazard. Also, care must be taken to avoid violating established laws or regulations pertaining to water resources.

4.4.2 Landside

4.4.2.1 Preferred Alternative

4.4.2.1.1 Boca Chica

The Hot Pit Refueling Station will require surface water management modifications to current airfield systems. The ERP application for the project will define the surface water management plan and fully comply with Federal and State permit conditions to manage the surface water runoff for the project. The other components of the Preferred Alternative would not directly impact water resources at Boca Chica Key. Project components are above ground construction activities that would not involve temporary or long-term changes in surface or ground water usage. Expansion of the TACTS building will require the relocation of an existing sewage lift station and minor increases in impervious surfaces. The Preferred Alternative is not expected to alter stormwater discharge location, volume or intensity, as construction activities would occur primarily on paved surface, and little increase in impervious surface area is expected.

Implementation of the Preferred Alternative increases aircraft support functions at the Boca Chica Airfield. However, this does not necessarily mean an increase in actual visitation by aircraft squadrons. Future squadron use, projected 61,402 operations by CY2007, will not result in an adverse increase in water use based upon current capacity. Under the Preferred Alternative, all applicable construction permits related to stormwater discharge would be obtained, and best management practices for stormwater pollution prevention would be implemented.

4.4.2.1.2 Truman Annex

The landside components of the Preferred Alternative would not directly impact water resources at Truman Harbor Annex. The demolition and renovation project components are above

ground construction activities that would not involve temporary or long-term changes in surface or ground water. Implementing the AT/FP project component would result in a small increase in impervious surface associated with the construction of the firing position (approximately 175 m^2) and the guardhouse (120 m^2). Though the increase in impervious surface does decrease the capacity for groundwater infiltration, the Preferred Alternative is not expected to significantly alter stormwater discharge volume or intensity,

Implementation of the Preferred Alternative increases ship support capabilities at Truman Harbor. Based on the current water supply capacity the projected 15 percent increase in ship visitation will not have a significant effect.

4.4.2.2 Full Support Alternative

The Full Support Alternative includes all components of the Preferred Alternative. Considered below are only those project components of the Full Support Alternative not found in the Preferred Alternative.

4.4.2.2.1 Boca Chica

The expansion of the AIMD building contained in the Full Support Alternative is currently undefined, therefore, the actual size of the expansion is not known. However, the AIMD building is located near estuarine wetlands limiting the area available for construction without environmental permits. Should an area of tidal wetlands of any size be directly impacted by construction, an Environmental Resource Permit application must be prepared for authorization by the USACOE and the FDEP. Such a permit approval would require a protected species impact assessment and wetland mitigation plan. Such a mitigation plan may include requirements to offset indirect or operational impacts as well. If the AIMD expansion is large enough, an increase in impervious surface area is possible, and with it, the loss of wetland functions such as pollutant filtration and flood attenuation.

Direct impacts to surface and ground water resources are not likely to result from the construction of the drone launch facilities at the Hawk Missile Site, though indirect impacts mediated through changes in local hydrology are possible. Construction activity at the site would require an increase in impervious surface area, thereby indirectly impacting water resources by increasing storm water runoff to adjacent wetlands. Similarly, road construction necessary for the launch facility could require the filling and paving of wetlands near the site, resulting in more storm water runoff and a decrease in the water quality maintenance associated with wetlands. Environmental Resource permitting requirements as described above would be necessary should any tidal wetlands be impacted. Long-term impacts resulting from drone launch operations are possible as well, and could potentially degrade adjacent wetlands.

Size and location information for the new hanger and OPCEN are not currently defined. Impacts resulting from construction of these facilities would likely be insignificant, unless further project definition places these facilities near important water resources.

4.4.2.2.2 Truman Annex

The impacts to water resources resulting from the implementation of the Full Support Alternative would be equivalent to those impacts resulting from the Preferred Alternative. All landside construction projects are located on previously disturbed uplands with no temporary or long-term alteration in loss water resources likely to occur.

4.4.2.3 No-Action

Under the No-Action alternative, proposed construction activities at Boca Chica Airfield and Truman Harbor would not occur; therefore, the current water resources would remain unchanged and no significant impacts to water resources would occur.

4.4.3 Marine

4.4.3.1 Preferred Alternative

As the quality of sediments to be dredged is good, with no indication of pollutants (Sections 3.2.3.2), the only impact to marine water quality from the Proposed Action in the Ship Channel, turning basin, and Truman Harbor would be temporary and insignificant increases in turbidity from dredging operations. To evaluate the potential introduction of chemical contaminants into the water column as a result of resuspension of sediments during dredging operations, elutriate analyses were conducted on sediment samples collected in the Ship Channel, turning basin, and Truman Harbor. These samples were collected by Continental Shelf Associates, Inc. and analyzed by PPB Environmental Laboratories, Inc. Results indicated that resuspension of sediments during dredging operations in the Ship Channel, turning basin, and Truman Harbor will not have a significant impact on water quality (Table 4-2).

Table 4-2 Results of Elutriate Analyses of Sediments Collected During 13 to 15 September 2002 in the Ship Channel, Turning Basin, and Truman Harbor.

Parameter	Units	Detection Limit	KW02-1	KW02-2	KW02-3	KW02-5
Total Organic Carbon	mg/L	2.00	5.75	4.40	7.72	53.8
Cyanide	mg/L	0.004	BDL	BDL	BDL	BDL
Ammonia	mg/L		1.03	0.604	0.827	3.07
Arsenic	µg/L		14.7	5.99	11.9	9.69
Cadmium	µg/L	0.50	BDL	BDL	BDL	BDL
Chromium	µg/L	0.80	BDL	BDL	BDL	BDL
Copper	µg/L	2.5	BDL	BDL	BDL	BDL
Lead	µg/L	2.5	BDL	BDL	BDL	BDL
Mercury	µg/L	0.20	BDL	BDL	BDL	BDL
Nickel	µg/L	2.0	BDL	BDL	BDL	5.3 I
Silver	µg/L	1.0	BDL	BDL	BDL	BDL
Zinc	µg/L	10	BDL	BDL	BDL	10.9 I

BDL = below detection limit.

Dredging also is planned in conjunction with improvements to the Mole Pier. This effort entails dredging to -33 ft plus 2 ft overdredge around the northern tip of the Mole Pier, and a total dredge volume of 3,000 cubic yards is estimated to be removed. This dredging would have a temporary effect on water quality within the mixing zone around the dredging activities. This effect would be increased turbidity within the mixing zone. Because State regulations require that turbidity does not exceed background levels outside of the mixing zone for dredging activities in Outstanding Florida Waters, dredging operations will be conducted to ensure that these regulations are not violated.

State of Florida water quality regulations require that water quality standards not be violated during dredging operations, and these standards state that, for Outstanding Florida Waters, turbidity outside the mixing zone shall not exceed background. The FDEP has determined that waters adjacent to Truman Harbor are classified as OFW. Any activities in OFW's must be in the public interest and must meet stringent water quality criteria pursuant to Sections 62-4.242(2) and 63-302.700, Florida Administrative Code (FAC). Docking facilities must also comply with additional water quality criteria specified in the South Florida Water Management District's Basis of Review. A mixing zone variance may be requested for this Navy project as a condition to the Environmental Resource Permit.

Turbidity impacts could occur but are unlikely in the vicinity of the Rockland Key quarry placement site, where the dredged material will be placed. Containment of turbid waters will be accomplished by anchoring primary and secondary turbidity curtains across the single opening to this basin, effectively sealing it off from adjacent seagrass communities outside the mixing zone. If the curtains fail, a weir system would be constructed to control release of turbid water from the canals. Dredged material pumping rates will also be adjusted to avoid turbidity impacts to these communities.

4.4.3.2 Full Support Alternative

This alternative would be subject to the same potential marine water quality impacts as described for the Preferred Alternative (Section 4.4.3.1). In addition to the activities associated with the Preferred Alternative, this alternative includes refueling operations at Truman Harbor. Although spills from refueling operations are not expected, small accidental spills from refueling activities could degrade marine water quality. Section 4.3.3.1.2 presents NOAA/HAZMAT's oil weathering model ADIOS Version 2 and shows that spills from refueling operations would rapidly evaporate and disperse. To mitigate any potential water quality impacts, the Navy has a Facilities Response Plan (FRP) and Spill Prevention Control and Countermeasure (SPCC) plan that would minimize any impacts from such accidental spills.

4.4.3.3 No-Action

Dredging activities described in the Preferred Alternative and Full Support Alternative scenarios would not occur with the No-Action Alternative. Therefore, there would be no potential impacts to marine water quality within the project area under the No-Action Alternative.

4.4.4 Coastal Zone
4.4.4.1 Preferred Alternative

The FDEP (Florida State Clearinghouse) has determined that the Preferred Alternative is consistent to the maximum extent practicable with the FCMP, Chapter 380FS, ACSC and Chapter 163, Part II, Local Government Comprehensive Planning and Land Development. (Appendix E)

4.4.4.2 Full Support Alternative

Additional elements of the full support alternative may require additional consultation with FDEP to ensure that the Full Support Alternative is consistent to the maximum extent practicable with the FCMP.

4.4.4.3 No Action Alternative

The No Action alternative would not require additional consultation with FDEP to ensure that the Full Support Alternative is consistent to the maximum extent practicable with the FCMP.

4.5 CULTURAL RESOURCES
4.5.1 Approach to Analysis

New construction, rehabilitation of existing structures, and street lighting must be appropriately designed to avoid or minimize adverse impacts to any historic properties listed, or which satisfy the criteria of eligibility for listing (36 CFR 60.4), in the NRHP. Analysis of potential impacts to cultural resources considers first the potential for presence of such resources and then the potential for: 1) physically altering, damaging, or destroying all or part of a resource, 2) altering characteristics of the surrounding environment that contribute to resource significance, 3) introducing visual, audible, or atmospheric elements that are out of character with the property or alter its setting, or 4) neglecting the resource to the extent that it deteriorates or is destroyed.

4.5.2 Preferred Alternative
4.5.2.1 Boca Chica

Neither the expansion of the RATCF building, the expansion of the TACTS building, nor the construction at either alternate location for the Hot Pit Refueling Station would occur near existing historic or archeological resources. All construction activities related to the Preferred Alternative would occur on previously disturbed areas. Site 8M01448, the submerged wreck, is near the dredge conveyance pipeline location in Boca Chica Channel. Avoidance of impacts to this submerged resource site is possible by

floating the pipeline along the east side of the channel and over or around the site thereby avoiding disruption of vessel navigation, avoiding anchor placement on the site, and informing the dredge contractor of the location through a diver familiar with the site. Because no SHPO eligible archeological or historic sites would be affected, impacts to historic and archeological resources resulting from the implementation of the Preferred Alternative would not be significant.

4.5.2.2 Truman Annex

Buildings 261 and 284 are not eligible for listing in the NRHP (USACOE 1995). These old warehouses were built during World War II era as temporary structures. The DON issued on 14 May 1993, a Programatic Agreement signed by all branches where in all parties agreed that such structures as Buldings 261 and 284 were not constructed for permanent use and were intended to be demolished. Consequently, Buildings 261 and 284 do not fall under the protection of the NHPA of 1966 as amended (Personal Communication - Don Couch 2002).

The landside components of the Preferred Alternative may occur within an important archeological site (designated as Site 8M0206 by Florida SHPO) which includes the Fort and a four acre coverface located to the east of the Fort. First, the Building 261 slated for demolition, and Building 284, proposed for renovation, are located on the landward side of the Fort on the sand coverface. Second, under the Truman Harbor AT/FP project, a 120 m^2 guard house, a firing position, a roadway, and approximately 1,390 m of fencing would be constructed within the archeological site. The demolition of building 261 would remove a nonhistoric structure adjacent to Fort Zachary Taylor and allow more of the Fort to be viewed by the public, while the renovation of Buildings 284 would mostly consist of internal repairs, and would not include significant ground disturbance; therefore, it is unlikely that either activity would have a significant affect on existing cultural resources. The implementation of the AT/FP project would call for some earthwork within Site 8M0260, and, consequently, impacts to existing cultural resources are possible. Brockington and Associates, Inc. (1997) conducted an archeological investigation of the sand coverface. The authors concluded that the complete archeological resources present at the site are unknown and suggested Phase II testing before surface and subsurface disturbance to the site. In accordance with the requirements of the NHPA of 1966, 36CFR 800 (NHPA), and the Native American Graves Repatriation Act (NAGPRA) the contractor, or their subcontractors will initiate the provisions of NHPA, subpart b, section 800.3 “The Section 106 Process”, in the event inadvertant finds are made during the execution of the project. If an inadvertent find of archeological resources, human remains or Native American (NA) funerary object occurs, the contractor (or any subcontractor working on the project) shall immediately stop work in the immediate vicinity of the find, notify the project manager, and the Navy Public works Cultural Resource Manager (CRM). The CRM must promptly consult with the SHPO to set up assessment and protection procedures during the remaining construction process. The contractor should follow the above procedures during site clearing, stripping, foundation or site excavations, site utility cuts and site drainage ditching. The construction work at the site of the archeological resource find shall not recommence until such time as the Section 106 consultation concludes or otherwise permits recommencement. If Native American resources are encountered the appropriate State Tribal Historic Preservation Officer shall also be contacted to determine the procedures to follow to protect these NA resources.

Project components related to the Truman Harbor waterfront and channel dredging are not located near important historical and archeological sites, and no significant impacts to cultural resources would likely result.

4.5.3 Full Support Alternative

The Full Support Alternative includes all components of the Preferred Alternative. Considered below are only those project components of the Full Support Alternative not found in the Preferred Alternative.

4.5.3.1 Boca Chica

Neither the expansion of the AIMD building nor the construction of the drone launch facility would occur near existing historic or archeological resources. All construction activities related to the Preferred Alternative would occur on previously disturbed areas. Because no Florida SHPO eligible archeological or historic sites would be affected, impacts to historic and archeological resources resulting from the implementation of the Preferred Alternative would not be significant.

Size and location information for the new hanger and OPCEN are not currently defined. However, due to the lack of significant cultural resources at Boca Chica, the construction of these facilities would likely create no significant impact.

4.5.3.2 Truman Annex

Components of the Full Support Alternative not already discussed under the Preferred Alternative would involve infrastructure and ship support improvements at the Mole Pier. It is unlikely that activities centered on the pier would negatively impact and existing archeological or historical resources due to the absence of such resources in the project area.

4.5.4 No-Action Alternative

Under the No-Action alternative, proposed construction activities at Boca Chica and Truman Harbor would not occur; therefore, the current historical and archeological resources would remain unchanged and no significant impacts would occur.

4.6 AIR QUALITY

4.6.1 Approach to Analysis

Air quality impacts would be significant if emissions associated with alternatives would: 1) increase ambient air pollution concentrations above the NAAQS, 2) contribute to an existing violation of the NAAQS, or 3) interfere with or delay timely attainment of the NAAQS.

The FDEP, Division of Air Resource Management regulates air quality under its Regulations for the Control of Atmospheric Pollution.

No CAA general conformity determination would be required for the proposed projects, as the Federal requirement is only applicable in areas designated as non-attainment areas under the CAA, as amended.

4.6.2 Preferred Alternative

Implementation of the Preferred Alternative for the Boca Chica facility would not significantly affect air quality at the NAS or within the AQCR in the vicinity of the NAS. Construction activities would result in minor, temporary increases in criteria pollutant emissions from construction-related vehicles (volatile organic compounds [VOCs], carbon monoxide [CO], nitrogen oxides [NO_x], and sulfur oxides [SO_x], etc…). However, as stated above, Key West is well under the levels for pollutants of the NAAQS, and an increase to Boca Chica's pollution emission levels due to facility modernization is not expected to exceed them.

Implementation of the Preferred Alternative for the Truman Annex facility and pier would not significantly affect air quality at the NAS or within the AQCR in the vicinity of the NAS. Construction activities would result in minor, temporary increases in criteria pollutant emissions from construction-related vehicles. However, Key West is well under the levels of pollutants of the NAAQS, and any increase to Truman Annex's air pollution emissions due to facility modernization is not expected to exceed them.

4.6.3 Full Support Alternative

The Full Support alternative includes all components of the Preferred Alternative. Consequently, Air Quality impacts associated with the Preferred Alternative would also result from implementation of the Full Support alternative. Considered below are only those project components of the Full Support alternative not found in the Preferred Alternative.

4.6.3.1 Airfield Improvements and Truman Annex

Implementation of the Full Support Alternative at Boca Chica would not significantly affect air quality. Construction activities AIMD, Hanger, Drone Launch and OPCEN would result in additional minor, temporary increases in criteria pollutant emissions from construction-related vehicles. However, as previously noted, Key West is well under the levels for pollutants of the NAAQS, and an increase to Boca Chica's pollution emission levels due to facility modernization and upgrades is not expected to exceed them.

Implementation of the Fuel tank and piping, OWWO facility and SIMA at Truman Annex would not significantly affect air quality. Construction activities would result in minor, temporary increases in criteria pollutant emissions from construction–related vehicles. However, Key West is well under the levels for pollutants of the NAAQS, and in increase to Truman Annex's pollution emission levels due to facility modernization is not expected to exceed them.

4.6.4 No-Action Alternative

Under the No-Action Alternative, proposed construction activities at the airfield and Truman Annex would not occur, nor would ship or aircraft visits increase. Baseline air quality conditions would remain unchanged. Therefore, no significant impacts to air quality would occur as a result of implementation of the No-Action alternative.

4.7 PUBLIC HEALTH AND SAFETY

4.7.1 Approach to Analysis

This section evaluates potential impacts to public health and safety as a result of implementation of the Preferred Alternative or alternatives. Impacts would occur if the Preferred Alternative or alternatives would significantly increase safety and health risks associated with explosives safety, aircraft accident potential or environmental contamination to the public and/or military personnel.

4.7.2 Preferred Alternative

4.7.2.1 Boca Chica

Under the Preferred Alternative, there would be no significant increases in risk from explosives or accident potential. Because of the proximity of the alternate locations for the Hot Pit Refueling project to the existing and operational Truck Fill Stand (Stand), and the potential for undiscovered contaminated soil to exist at the site, excavation and construction personnel would need to be made aware of the potential safety issues and take adequate precautions before proceeding with the work.

4.7.2.2 Truman Annex

Security and utility improvements at Truman Annex would not result in additional ESQD arcs being generated at Truman Annex. An increase in Navy ships berthing at Truman Annex would increase the number of days per year that an ESQD arc is generated by a ship.

4.7.3 Full Support Alternative

The Full Support alternative includes all components of the Preferred Alternative. Consequently, safety impacts associated with the Preferred Alternative would also result from implementation of the Full Support alternative. Considered below are only those project components of the Full Support alternative not found in the Preferred Alternative.

4.7.3.1 Boca Chica

The full support alternative would result in an additional 850 ft ESQD arc located around the drone launch facility. The drone launch facility would have to be sited in a location where the arc would not violate any safety criteria. For example, repair facilities, administrative spaces or other occupied areas could not be within the ESQD arc of the drone launch area. The other facilities within this alternative would also need to be sited to meet airfield safety criteria.

4.7.3.2 Truman Annex

The location, construction and operation of the fuel tank and related piping would need to be in accordance with fire safety directives.

4.7.4 No-Action Alternative

Under the No-Action alternative, airfield and explosive safety criteria at the airfield would continue as they are and ESQD arcs would be generated at Truman Annex consistent with the number of Navy ship visit days. Since there would be no change in existing conditions, the No-Action alternative would not result in significant adverse impacts on public health and safety.

4.8 UTILITIES AND PUBLIC SERVICES

4.8.1 Approach to Analysis

This section evaluates potential impacts to utilities and public services associated with implementation of the alternatives. Impacts to utilities and public services would occur if implementation of the Preferred Alternative or alternatives would result in the use of a substantial proportion of the remaining utility system capacity, reach or exceed the current capacity of the utility system, or require development of facilities and utility sources beyond those existing or currently planned.

4.8.2 Preferred Alternative

The Preferred Alternative could result in a possible increase of 150 military and civilian workers; with families this could add nearly 500 people to the local population permanently stationed personnel. This is about a seven percent increase in NAS personnel and dependents, and a two percent increase to total Key West population. For the purpose of a meaningful comparison, and to account for a potential increase in ship visits or visiting squadrons, an increase of 15 percent has been added to current utility usage, to account for an annual anticipated increase of 15 to 25 small combatant ship visits.

Electric Power

Current energy usage for NAS Key West is 27,001 megawatt hours per year, or nine percent of the total Key West yearly consumption of 300,008 megawatt hours (Weitzel 2002). With a 15 percent increase, total energy use for NAS Key West including Boca Chica and Truman Annex would increase by slightly more than 4,000 megawatt hours to 31,051 megawatt hours per year; an increase of one percent of total Key West consumption. Current peak demand is 134 megawatt for the entire Key West electrical system, and KES peak capability is 200 megawatt hours. Navy contribution to peak demand is proportionate to its use, i.e. less than 10 percent. Approximately 60 percent of the electrical power is imported from the mainland, and 40 percent is generated on the island.

While there is enough current capacity at KES to supply electricity for 15 percent increase in Navy use, the transformer that services the Truman Annex would need to be upgraded if there is an increase in peak demand of over six megawatts from current amounts (Finigan 2002).

Potable Water

Current potable water usage for Truman Annex is 0.20 mgd, and for Boca Chica, 0.16 mgd (Ruzich 2002). With a 15 percent increase, total demand for Truman Annex would increase by 30,000 gallons per day to 0.23 mgd and Boca Chica's demand would rise by 24,000 gpd to 0.184 mgd for a total increase of .054 mgd. Current Key West average water demand is 14.7 mgd, and the water treatment plant design capacity is 22 mgd, meaning that there is sufficient capacity for a 15 percent increase in the Truman Annex/Boca Chica requirements (U.S. Navy 2000b). Since there is sufficient capacity and no requirement to upgrade transmission mains, there would be no significant impacts to the water system from implementing the Preferred Alternative.

Sanitary Sewer

Current Sanitation/Wastewater flow from NAS Key West is 0.82 mgd, or 19 percent of total Key West flow (Weitzel 2002). After a 15 percent increase of 123,000, 0.95 mgd would be contributed by the aggregate of NAS facilities in the city.

Currently, Truman Annex alone accounts for 0.22 mgd of wastewater with a possible increase of 33,000 gpd to 0.25 mgd if the 15 percent increase is realized. The Southernmost Plant , a City owned facility which services all Navy property within the City of Key West except for Boca Chica, currently is treating 4.3 mgd and has a 10.0 mgd wastewater capacity. An increase of even 123,000 gpd is well within the Navy's contract of up to 23 percent of the 10.0 mgd capacity (OMI 2002). Existing wastewater and sanitary connections might have to be updated or repaired and new ones built, but on the whole the system is adequate to service even a potential 15 percent increase from all NAS areas within Key West.

Boca Chica would rise from current 0.1 mgd by 15,000 gpd to 0.125 mgd with the upgrade (Ruzich 2002). Since the Navy owned Boca Chica plant is operating at 0.10 mgd, an increase of 15 percent at Boca Chica would result in 15,000 gpd, which is well within the 0.4 mgd capacity of the plant.

Stormwater Drainage

There will be minimal increase in pavement or other impervious surfaces with the Preferred Alternative, thus stormwater runoff would not significantly increase.

Solid Waste Management

The solid waste contribution by the NAS was 2,743 tons in 2001 (Havens 2002). A 15 percent increase in solid waste would result in the NAS contributing 3,155 tons per year.

The Solid-Waste-to-Energy Facility is rated at 54,750 tons per year and currently handles 39,055 tons per year. Therefore, it would be able to handle a Navy increase 15 percent of solid waste. The tipping charge the Navy pays per ton of solid waste is $140 per ton, an increase of 400 plus tons would cost less than $60,000 per year (U.S. Navy 2000a).

4.8.3 Full Support Alternative

The Full Support Alternative could result in a possible increase of 300 military and civilian workers; with families this could add nearly 800 people to the local population. This is about a 12 percent increase in personnel and dependents, and a three percent increase for total Key West population. For the purpose of a meaningful comparison, and to account for a potential increase in ship visits or visiting squadrons, or an extension of the duration of ship or squadron visits, an increase of 30 percent has been added to current utility usage, to show possible demands if the full support services projects were completed.

Electric Power

Current electricity demands for NAS Key West are 27,001 megawatt hours per year, or nine percent of the total Key West consumption (Weitzel 2002). With a 30 percent increase, total demand for the NAS would increase to 35,101 megawatt hours per year; an increase of two percent of total Key West consumption. Since current demand is less than 70 percent of current capacity, there is enough current capacity at KES to supply the two percent increase that would result from the Full Support Alternative.

Potable Water

Current potable water demand for Truman Annex is 0.2 mgd, and for Boca Chica, 0.16 mgd (U.S. Navy 2000b). With a 30 percent increase, total demand for Truman Annex would increase by 60,000 gpd to 0.26 mgd and Boca Chica's demand would rise by 48,000 gpd to 0.21 mgd. With the current Key West average water demand of 14.7 mgd, and the water treatment plant design capacity at 22 mgd, there is sufficient capacity for a 30 per cent increase approximately 100,000 gpd in the Truman Annex/Boca Chica requirements (U.S. Navy 2000b).

Sanitary Sewer

Current Sanitation/Wastewater demands for NAS Key West are 0.82 mgd, or 19 percent of total City of Key West contributions. After 30 percent increase, 1.07 mgd, or 25 percent of total wastewater load, would be contributed by the NAS properties to the city treatment plant.

Currently, Truman Annex alone accounts for 0.22 mgd of wastewater with a possible increase of 60,000 gpd to 0.29 mgd, if the 30 percent increase were realized. Boca Chica has a current wastewater usage of 0.10 mgd, with a possible increase to .13 mgd, if the 30 percent increase were realized. The Southernmost Wastewater Treatment Plant is treating 4.3 mgd and has a 10.0 mgd wastewater treatment capacity. An increase of even 250,000 gpd is well within the Navy's contract of up to 23 percent of the 10.0 mgd capacity (Operations Management Interntaional 2002). Existing wastewater and sanitary connections might have to be updated or repaired and new ones built, but on the whole the system is adequate to service a 30 percent increase in Navy wastewater flow.

Since the Navy owned Boca Chica plant is operating at .10 mgd, an increase of 30 percent at Boca Chica would result in 30,000 gpd, which is well within the .4 mgd capacity of the plant.

Stormwater Drainage

There would likely be an increase in pavement (airfields, parking lots) with the full support services upgrade. As such, stormwater would increase due to the upgrade.

Solid Waste Management

The solid waste contribution by the NAS was 2,743 tons in 2001 (Havens 2002). With a proposed 30 percent increase, NAS solid waste amounts could reach 3,566 tons per year.

The Solid-Waste-to-Energy Facility is rated at 54,750 tons per year, and currently handles 39,055 tons per year. Therefore, it would be able to handle the increase of 820 plus tons per year of solid waste from a 30 per cent increase. At the current cost is $140 per ton, this would cost less than $115,000 per year (U.S. Navy 2000a).

4.8.4 No-Action Alternative

The No Action Alternative would maintain the status quo of current utility demands for the NAS. There would be no increase due to a larger workforce using the Truman Annex or Boca Chica Annex.

4.9 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

4.9.1 Approach to Analysis

Socioeconomic impacts would be considered significant if implementation of alternatives resulted in a substantial shift in population trends, or notably affected regional employment, spending and earning patterns, or community resources. Social scientists generally consider socioeconomic impacts as significant if there is a substantial shift in population trends, or regional employment, spending and earning patterns, or community resources are notably affected. Similarly, three criteria are used to assess the significance of impacts to minority and low income communities: 1) there must be one or more populations within the ROI, 2) there must be adverse (or significant) impacts from the Preferred Alternative; and 3) the environmental justice populations within the ROI must bear a disproportionate burden of those adverse impacts. If any of these criteria are not met, then impacts with respect to environmental justice would not be significant.

4.9.2 Preferred Alternative

4.9.2.1 Boca Chica Improvements and Truman Annex Improvements

There would be beneficial impacts to socioeconomic factors with the implementation of the Preferred Alternative. While the additional workers would come from other locations as well as the local commuting area, the total population is anticipated to be less than a two percent increase in overall population and housing populations would not increase significantly. The economic effect of an increase of approximately 220 military and civilian salaries would have some beneficial effect on the local economy. Further, since the proposal would allow for the City's continued use of the outer mole for cruise lines to make port calls and the Navy's occasional use, the Navy's proposal would add additional benefit to the economy (e.g., six Navy ships for 63 days would bring an additional minimum of 2.3 million dollars in sailor spending). Additionally, an annual increase of 15 to 25 small combatant ships would make port calls, resulting in additional local spending. These ship purchases and crew spending would have a positive economic effect on the local economy.

The increase of approximately 220 military and civilian jobs resulting from the proposal would not have a significant effect on commuter traffic hours. Most of the personnel would either live on the base on which they work or travel in a direction opposite to the rush hour traffic flow. More than half of the vehicles would be commuting between military housing areas and employment sites and the other vehicles would be commuting between private housing areas throughout the Lower Keys.

The increase in school age population from the increase in military and civilian jobs as a result of the proposal is expected to be in the range of 75 to 125 students throughout the Lower Keys. The school systems are expected to accommodate this small increase.

The construction and operation of the Preferred Alternative projects would occur within the high security environment of Truman Annex and Boca Chica Airfield, which would prohibit access by unauthorized personnel. Most project impacts would be contained to the station and implementation of the projects would not result in disproportionate impacts to Bahama Village, to minority or low income populations, and no potential health or safety impacts to children would occur.

4.9.2.2 Maritime Community

Dredge operations would create short-term adverse impacts to the Maritime Community resulting from impeded navigation during channel and harbor dredging and in areas where pipelines are floated to avoid submerged resources. Long-term positive benefits would result from improved navigation within the Ship Channel, the outer turning basin, and the Truman Harbor. Short-term turbidity impacts during dredge operations would occur within limited mixing zones. Certain long-term reduction in turbidity would occur as the result of dredging removal of silt from the channel, outer turning basin, and Truman Harbor.

4.9.3 Full Support Alternative

The Full Support alternative includes all components of the Preferred Alternative. Consequently, socioeconomic impacts associated with the Preferred Alternative would also result from implementation of the Full Support alternative. Considered below are only those project components of the Full Support alternative not found in the Preferred Alternative.

4.9.3.1 Airfield and Truman Annex Improvements

While the additional workers would come from other locations as well as the local commuting area, the total population increase is anticipated to be less than a four percent increase in the overall population. Thus, there would be some impacts to socioeconomic factors with the implementation of the full support alternative. While land uses would stay the same and although no additional housing units are needed, lower enlisted rates now sharing houses would be required to return to living in barracks that do not meet the current Navy barracks standards of a separate room and shared bath per two occupants.

An increase of 300 military and civilian salaries would benefit the local and regional economy. WRONG. As with the Preferred Alternative, the Navy's and the City's use of the Mole pier would be mutually beneficial.

The construction and operation of the additional projects in the Full Support alternative also would occur within the high security environment of Truman Annex and Boca Chica Airfield, which would prohibit access by unauthorized personnel. As with the Preferred Alternative, most project impacts would be contained within the NAS and implementation of the projects would not result in disproportionate impacts to Bahama Village and to minority or low income populations, and no potential health or safety impacts to children would occur.

4.9.4 No-Action Alternative

Under the No-Action alternative, proposed construction activities at the NAS would not occur. Baseline conditions would remain unchanged. Therefore, no significant impacts to socioeconomics or environmental justice would occur as a result of implementation of the No-Action alternative.

4.10 NOISE/AICUZ

4.10.1 Preferred Alternative

The projected number of aircraft operations as a result of the Preferred Alternative will fall well below the number of operations used in the existing AICUZ study, which the Navy issued in 1977. It is projected that there will be approximately 13,500 fewer aircraft operations in CY07 than occurred in 1977 (61,402 in 2007 vs. 85,000 in 1977). By way of comparison, the total number of air operationsfor CY01 was 60,800.

Aircraft operations by aircraft type and time of day for 1977, 2001 and 2007 are presented in Table 4-3. As shown in the table, the 1977 operations greatly exceeded the actual 2001 operations and the projected 2007 operations. Although the overall total numbers of operations are similar for 2001 and 2007, the subtotals by types of aircraft are significantly different. F/A-18C/D aircraft account for over one-third of the total number of operations at NAS Key West and account for the most operations by aircraft type in 2001. The second highest number of operations by aircraft type are F-14 operations. The Navy's inventory of F-14 aircraft, and some older model F/A-18C/D aircraft, are being retired and replaced by the F/A-18E/F. The transition to the F/A-18E/F will be completed by 2007. In all, 187 F-14 and F/A-18C/D aircraft will eventually be replaced with 162 F/A-18E/F aircraft. Consequently, as reflected in Table 4-3, the number of F/A-18E/F operations significantly increase by CY07, though overall operations will remain well below the 1977 AICUZ level. As the new aircraft fully enters service, overall F/A-18 C/D and E/F aircraft operations increase 15 percent for CY07 over CY01. Other notable changes between CY01 and CY07 include an increase in Orange Air, E-2/C-2, and training aircraft operations. Approximately six percent of all operations (3,925 operations) under the Preferred Alternative would be night operations

(conducted between 2200 and 0700), and of these, roughly forty percent would be conducted by F/A-18 C/D or E/F aircraft (1,539 operations). F/A-18C/D and E/F aircraft are the most dominant aircraft in terms of number of operations and noise impact for both CY01 and CY07. In contrast, the RA-5C and F-4J were the dominant aircraft in terms of number of operations and noise impact in 1977 and approximately ten percent of all operations (8,500) were conducted at night.

Table 4-3 NAS KEY WEST AIRCRAFT OPERATIONS CY 1977, CY 01, and CY 07

Aircraft Type	CY 1977 Operations	CY 01 Operations	CY 07 Operations
Strike			
F/A-18 C/D		22,262	14150
F/A-18 E/F		3,912	15,953
F-16		1,269	1,060
F-15		1,845	960
F-14		12,648	0
F-5		924	486
A-10		76	0
AV-8		36	600
Orange Air		474	3,489
RA-5C	42,500		
F-4	34,000		
A-4	5,950		
Electronic/Surveillance			
E/A-6		132	200
E-2/C-2		9,997	12,968
EC-121M	1,100		
Transport	900	4,502	5,478
Pilot Training		2,129	5,286
Helicopters	550	594	772
Total	85,000	60,800	61,402

Source: U.S. Navy 2003

The CY07 NAS Key West 65 DNL contour, comparable to the beginning of Noise Zone 2 in the 1977 AICUZ study, as developed by Wyle Laboratories extends approximately 3 miles to the north of NAS Key West over water and U.S. Route 1. The 65 DNL contour also extends about 5 miles to the southwest and portions of the 65 DNL contour include all of Geiger Key, East Rockland Key, and most of Big Coppitt Key. As noted in Section 3.10 of Chapter 3, there are some land use controls recommended within the 65 DNL noise contour. The 75 DNL contour, comparable to the beginning of Noise Zone 3 in AICUZ studies, extends off base impacting portions of Geiger Key and East Rockland Key to the east and to the west, a small portion of Stock Island near Boca Chica Channel. As noted in Section 3.10 of Chapter 3, there are additional land use controls recommended within the 75 DNL noise contour.

The 1977 CNR 2 contour (the beginning of Noise Zone 2) extends to the southwest and over portions of Cow Key, and Stock Island. To the east, the CNR 2 contour includes all of Geiger Key, East Rockland Key, Big Coppitt Key and Shark Key. The CNR 3 contour (the beginning of Noise Zone 3) extends off base covering portions of Geiger Key, Big Coppitt Key and East Rockland Key to the East and a small portion of Stock Island to the West near Boca Chica Channel.

There would be a decrease in off-base noise exposure in Noise Zone 2 between the 1977 AICUZ and the projected 2007 noise contours for some areas. Land areas previously included in Noise Zone 2 would be reduced to the North and East of the airfield on Big Coppitt Key and Shark Key. These areas are largely developed, although some undeveloped property exists. Some areas covered by the 2007 noise contours are increased over the largely developed areas of Raccoon Key, Stock Island and a small area in Key West at the end of the Key West International airport runway. There would be a decrease in off-base noise exposure in Noise Zone 3 on Big Coppitt Key, East Rockland Key, Geiger Key and Boca Chica Key to the North and East and a slight expansion of noise contours slightly to the West, including small portions on the edges of Stock Island and Raccoon Key. A comparison of the approximate off-base land areas included in Noise Zones 2 and 3 are shown in Table 4-4 below.

Table 4-4 Approximate Private Off-Base Land Areas Included in 1977 and 2007 Noise

	Land Area 1977 (acres)	Land Area 2007 (acres)
	Developed/Undeveloped	Developed/Undeveloped
Noise Zone 2 & 3	599/894	1937
Purchased in 1980s		617
Totals	1493	1320

APZs were calculated for CY 07 operations at NAS Key West. By CY 07, the Navy will have transitioned from the F-14 to the F/A-18 E/F and all runways have Clear Zones. APZs I and II center on runways 13-31 and 40-25, and additionally for runway 13-31, the entire field carrier landing practice [FCLP] pattern. The projected APZs would impact portions of Raccoon Key to the west and Big Coppitt, East Rockland, Geiger, and Saddlebunch Keys to the east. The inclusion of larger portions of Geiger Key and East Rockland Key that are projected under the CY 07 APZs as opposed to the 1977 APZs are due in large part to the differences in the APZ criteria and methodology as discussed in Chapter 3.

This difference in 1977 and 2002 APZ criteria precludes an equal direct comparison. However, because of the differences in the criteria, the potential CY 07 APZs do include larger portions of Geiger Key and East Rockland Key than those of 1977.

The Navy will continue to work with the City of Key West to plan for compatible land use development within the projected noise zones and APZs under the Preferred Alternative.

4.10.2 Full Support Alternative

The Full Support alternative would likely result in very minor changes from the noise contours or APZs projected for CY07 under the Preferred Alternative. As noted in Chapter 2, under the Full Support Alternative, the projected increase in available support services would likely result in homebasing one or two aircraft squadrons at the NAS. Under Navy hombasing criteria, the most likely squadrons to be homebased at the NAS would be non-tactical support aircraft such as the E-2 or C-2. The homebasing of one or two squadrons of E-2 or C-2 aircraft have the potential to affect only minor changes because they are relatively quiet in comparison to the F-18 C/D and F/A-18 E/F aircraft, which are the dominant aircraft for noise impacts and which are already addressed in the projected 2007 noise contours.

4.10.3 No-Action Alternative

Under the No-Action alternative, the proposed construction activities at NAS Key West would not occur. This would result in no change to the baseline.

CHAPTER 5

CUMULATIVE IMPACTS AND OTHER CONSIDERATIONS

5.1 POTENTIAL CUMULATIVE IMPACTS

CEQ regulations stipulate that the cumulative effects analysis within an EA should consider the potential environmental impacts resulting from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). CEQ guidance in considering cumulative effects involves defining the scope of the other actions and their interrelationship with the Preferred Alternative. The scope must consider geographical and temporal overlaps among the Preferred Alternative and other actions. It must also evaluate the nature of the interactions at the time of overlap.

Cumulative effects can be either positive or negative. They are most likely to result when a relationship or synergism exists between the Preferred Alternative and other actions expected to occur in a similar location or during a similar time period. Actions overlapping or in close proximity to the Preferred Alternative would be expected to have more potential for a relationship than those more geographically separated.

On-Going and Reasonably Foreseeable Actions

No projects with the potential to interact with the implementation of the Preferred Alternative that could result in cumulative effects have been identified in the form of NEPA documentation. The goal of the Preferred Alternative and the Full Support alternative is to increase airfield operational capability, efficiency, and capacity. The Navy is planning to prepare NEPA documentation for a proposal to improve airfield safety at Boca Chica Airfield. Other future-year development proposals (FYDP), i.e. those identified across the Federal budget planning cycle, for NAS Key West consist of repair and rehabilitation projects for existing facilities. The projects require documentation in the form of Categorical Exclusions which exclude environmental impacts for most categories. No new mission requirements or major facility construction in support of new mission requirements have been identified. No other planned projects, either dependent on the Preferred Alternative or a part of the action have been identified with the potential for cumulative environmental effects when combined with potential impacts of the Preferred Alternative. The City of Key West is also developing tentative plans to build a marina in the Truman Harbor using excessed Navy property. To support the City's plans, Navy will reconfigure the restricted waters designation in Truman Harbor so "other" than military vessels can use these currently restricted waters. Navy will review and approve proposed projects to ensure that Navy interests are safeguarded while allowing the City to maximize the use of the excessed property.

Implementation of the Preferred Alternative and FYDP repair projects would result in more efficient use of the Navy facilities at Truman Annex and Boca Chica and could result in more efficient land use at NAS Key West. The improvements and FYDP repair projects are consistent with Navy planning policies, and all project components are sited to be compatible with existing land use, ordnance and airfield safety guidelines as well as Navy facility siting and construction guidance. While the Navy's action should not have any significant impact on the City's plan to develop a marina in Truman Harbor, the City's development and lease of tourist support services on the Mole Pier, e.g., bicycle rentals and other kiosks, will not occur. The number of additional Navy vessels will be insignificant in comparison to non-Navy traffic, and the Navy's dredging proposal should actually improve navigation for such non-Navy vessels.

5.2 POTENTIAL CUMULATIVE IMPACTS FROM DREDGING

The Navy will have all of the necessary planning in place prior to implementation of the Preferred Alternative to avoid accidents such as anchor damage, cable damage, fuel spills, pipeline

breaks, pipeline movement during storm events, or vessel groundings. Furthermore, regulatory agencies will specify legal requirements that will need to be met by the dredge contractor and Navy for routine operations and accidents. Specifically, these requirements will come in the form of special conditions to the FDEP and USACOE permits, including consideration of EFH conservation recommendations from NMFS and recommended special conditions from FKNMS.

As part of the mitigation strategy, monitoring protocols will be designed in cooperation with these regulatory agencies to ensure detection and assessment of impacts that could occur from unlikely accidents. Based on monitoring results, appropriate restoration or compensation would be agreed to between the Navy and regulatory agencies.

Impacts to sensitive benthic marine resources may be minimized by the delineation of resources adjacent to the project area and establishment of buffer areas where no anchor, cable, or pipeline may be placed. Dredge anchors, cables, and pipelines will be deployed with direct diver observation. Use of spuds to anchor barges will minimize damage to benthic resources from by anchors and swinging anchor cables. Where seagrass, stony coral colonies, and hard bottom communities are located within Hawk Channel and Boca Chica Channel, the pipeline will be diverted and routed around or be floated over the resources. Stony corals of suitable size may be relocated to FKNMS restoration sites.

Conditions will be created at the quarry pits at a privately owned site on Rockland Key for establishment of benthic communities, including seagrasses. Suitable dredged material will be placed in the pits to depths that will allow seagrass to colonize in shallow water conditions. This creation will provide suitable habitat for a larger area of seagrass. Turbidity at the placement site will be controlled by temporary, primary, and secondary turbidity curtains at the western basin opening to attenuate the release of turbid waters from the site. Dredged material pumping rates would be adjusted to minimize turbidity impacts to benthic communities. Any further required mitigation would be performed in close coordination with FKNMS.

Avoidance and minimization of impacts to marine mammals and turtles may require dredge operators to employ trained observers to oversee dredging operations and to report sitings and takes in accordance with permits and incidental take authorizations (Appendix B). Dredge operators and ship operators would comply with current manatee protection conditions that specify vessel operating speeds within the project area to mitigate potential vessel collisions.

CHAPTER 6

REFERENCES CITED

Ackerman, B.B. 1995. Aerial surveys of manatees: A summary and progress report, pp. 13-33. In: T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.), Population biology of the Florida manatee. National Biological Service Information and Technical Report Number 1. 289 pp.

Alevizon, W.S. and S.P. Bannerot. 1990. Fish communities and fisheries biology, pp. 231-265. In: N.W. Phillips and K.S. Larson (eds.), Synthesis of available geological, chemical, socioeconomic, and cultural resource information for the south Florida area. U.S. Department of the Interior, Minerals Management Service, Atlantic OCS Region. OCS Study MMS 90-0019.

Banks, G.E. and M.P. Alexander. 1994. Development and evaluation of a sea turtle-deflecting hopper dredge draghead. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, Miscellaneous Paper HL-94-5.

Barros, N.B. 1993. Feeding ecology and foraging strategies of bottlenose dolphins on the central east coast of Florida. Ph.D. Dissertation, University of Miami. 328 pp.

Barros, N.B. and D.K. Odell. 1990. Food habits of bottlenose dolphins in the southeastern United States, pp. 309-328. In: S. Leatherwood and R.R. Reeves (eds.), The Bottlenose Dolphin. Academic Press, Inc., San Diego, CA.

Barry, M. 1978. Behavioral response of yellowfin tuna, *Thunnus albacares*, and kawakawa, *Euthynnus affinis*, to turbidity. U.S. Department of Commerce, NOAA, Environmental Research Laboratories, Pacific Marine Environmental Laboratory, Seattle, WA. Deep Ocean Mining Environmental Study (DOMES), Unpublished Manuscript Number 31. National Technical Information Service No. PB-297. 106 pp.

Benfield, M.C. and T.J. Minello. 1996. Relative effects of turbidity and light intensity on reactive distance and feeding of an estuarine fish. Environmental Biology of Fishes 46:211-216.

Berry, S.A. 1990. Canaveral Harbor Entrance Channel operational measures to protect sea turtles, pp. 49-52. In: D.D. Dickerson and D.A. Nelson (comps.), Proceedings of the National Workshop on Methods to Minimize Dredging Impacts on Sea Turtles, Jacksonville, FL. U.S. Army Engineer Waterways Experiment Station, Environmental Effects Laboratory, Vicksburg, MS. Miscellaneous Paper EL-90-5.

Bervaldi, C. 2002. Personal Interview. Housing Management Specialist, Key West NAS Housing Department. 18 Sept. 2002.

Blaylock, R.A. and W. Hoggard. 1994. Preliminary estimates of bottlenose dolphin abundance in southern U.S. Atlantic and Gulf of Mexico continental shelf waters. NOAA Technical Memorandum NMFS-SEFSC-356. 10 pp.

Boehlert, G.W. and J.B. Morgan. 1985. Turbidity enhances feeding abilities of larval Pacific herring, *Clupea harengus pallasi*. Hydrobiologia 123:161-170.

Boyce, G. 2002. Personal Interview. Operations Manager, Southernmost Wastewater Treatment Plant. 20 Sept. 2002.

Brockington & Associates. 1997. Archeological Survey of Key West NAS, Monroe County, Florida.

Bruton, M.N. 1985. The effects of suspensoids on fish. Hydrobiologia 125:221-241.

Burke, V.J., S.J. Morreale, P. Logan, and E.A. Standora. 1992. Diet of green turtles (*Chelonia mydas*) in the waters of Long Island, New York, pp. 140-142. In: M. Salmon and J. Wyneken (eds.), Proceedings of the Eleventh Annual Workshop on Sea Turtle Biology and Conservation. NOAA Technical Memorandum, NMFS-SEFC-302.

Burke, V.J., E.A. Standora, and S.J. Morreale. 1993. Diet of juvenile Kemp's ridley and loggerhead sea turtles from Long Island, New York. Copeia:1,176-1,180.

Byles, R.A. 1988. Satellite telemetry of Kemp's ridley sea turtle, *Lepidochelys kempii*, in the Gulf of Mexico. National Fish and Wildlife Foundation. 40 pp.

Carr, A. 1987. New perspectives on the pelagic stage of sea turtle development. Conservation Biology 1:103-121.

Chamber of Commerce. 2000. *Key West and Monroe County Demographics.* The Chamber of Commerce, Key West, Florida.

Chamber of Commerce. 2002. Personal Interview. The Chamber of Commerce Key West, Florida. 30 Sept. 2002.

Chiappone, M. 1996a. Site characterization for the Florida Keys National Marine Sanctuary and environs. Volumes 1-10. The Nature Conservancy, Florida-Caribbean Science Center, University of Miami. 63 pp.

Chiappone, M. and K.M. Sullivan. 1994. Patterns of coral abundance defining nearshore hard bottom communities of the Florida Keys. Fla. Sci. 57(3):108-125.

Chiappone, M. and R. Sluka. 1996. Fish and fisheries. Volume 6: Site characterization for the Florida Keys National Marine Sanctuary and environs. The Nature Conservancy, Florida and Caribbean Marine Conservation Science Center, University of Miami. 149 pp.

Couch, D. 2002. Personal communication. Assistant Historic Preservation Officer, Cultural Resources Branch, Environmental Operations Division, SOUTHNAVFACENGCOM, Charleston, South Carolina.

Cowardin, L.M., Carter, V., and LaRoe, E.T. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior Fish and Wildlife Service, Washington D.C.

Department of the Navy (DON). 1986. Draft environmental impact statement, United States Navy Gulf Coast Strategic Homeporting, Appendix VIII, Key West, Florida. NAVFAC, Southern Division, Charleston, South Carolina.

Department of the Navy (DON). 2000. Environmental Assessment for Disposal and Reuse of Truman Waterfront NAS Key West, Florida. NAVFAC, Southern Division, Charleston, South Carolina.

Department of the Navy (DON). 2002. Integrated Natural Resources Management Plan for the Naval Air Facility Key West, Florida. NAVFAC, Southern Division, Charleston, South Carolina.

Dickerson, D.D. 1990. Workgroup 1 Summary. In: D.D. Dickerson and D.A. Nelson (comps.), Proceedings of the National Workshop on Methods to Minimize Dredging Impacts on Sea Turtles, Jacksonville, FL. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. Miscellaneous Paper EL-90-5. 89 pp.

Dickerson, D.D., D.A. Nelson, M. Wolff, and L. Manners. 1992. Summary of dredging impacts on sea turtles: King's Bay, Georgia and Cape Canaveral, Florida, pp. 148-151. In: M. Salmon and J. Wyneken (comps.), Proceedings of the Eleventh Annual Workshop on Sea Turtle Biology and Conservation, Jekyll Island, GA. NOAA Technical Memorandum NMFS-SEFSC-302.

Dodd, C.K., Jr. 1988. Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta* (Linnaeus 1758). U.S. Fish and Wildlife Service Biological Report 88(4). 110 pp.

Dooley, J.K. 1972. Fishes associated with the pelagic *Sargassum* complex, with a discussion of the *Sargassum* community. Contr. Mar. Sci. 16:1-32.

Duffield, D.A. 1986. Investigations of genetic variability in stocks of bottlenose dolphins (*Tursiops truncatus*). NMFS, Southeast Fisheries Commission, Contract Number NA83-GA-00036. 53 pp.

Duffield, D.A., S.H. Ridgway, and L.H. Cornell. 1983. Hematology distinguishes coastal and offshore forms of dolphins (*Tursiops*). Canadian Journal of Zoology 61:930-933.

Eckert, S.A., D.W. Nellis, K.L. Eckert, and G.L. Kooyman. 1986. Diving patterns of two leatherback sea turtles (*Dermochelys coriacea*) during internesting intervals at Sandy Point, St. Croix, U.S. Virgin Islands. Herpetologica 42(3):381-388.

Eckert, K.L. 1995. Leatherback sea turtle, *Dermochelys coriacea*. In: P.T. Plotkin (ed.), NMFS and U.S. Fish and Wildlife Service status reviews for sea turtles listed under the ESA of 1973, Silver Spring, MD.

Edds, J. 2002. Personal Interview. Section Supervisor of Marathon Branch Office, Air Resource Management. FDEP, Air Resource Management Division. 14 Nov. 2002.

Ernst, C., J. Lovich, and R. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institute Press, Washington, DC. 578 pp.

Federal Emergency Management Agency (FEMA). 2002. Flood Insurance Study, Monroe County, Florida and Incorporated Areas.

Finigan, Dale 2002. Personal Interview and email correspondence. Keys Energy Service, Director of Engineering. 9 Oct. 2002.

Florida Department of Environmental Protection (FDEP). 1997. *Quick Look Reports: Comparison of Air Quality Data with the National Ambient Air Quality Standards 1997.* FDEP, Air Resource Management Division.

Florida Department of Environmental Protection (FDEP). 1999. *Quick Look Reports: EPA Aerometric Information Retrieval System 1999.* FDEP, Air Resource Management Division.

Florida Department of Community Affairs (FDCA). 1999. Federal Consistency: Intergovernmental Coordination and Review, Revised November 29.

Florida Department of Environmental Protection (FDEP). 2000. *Air Monitoring Report*. FDEP, Air Resource Management Division.

Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute (FFWCC, FMRI). 2000. Atlas of Marine Resources, R.O. Flamm, L.I. Ward, and M. White, (eds.), Version 1.3.

Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute (FFWCC, FMRI). 2001. Reported nesting activity of the loggerhead turtle, *Caretta caretta*, in Florida, 1993-2000. Data Summary Date: 29 January 2001. Unpublished dataset.

Florida Marine Research Institute (FMRI). 2000. Benthic habitats of the Florida Keys. FMRI Technical Report TR-4. 53 pp.

Florida Natural Areas Inventory (FNAI). 1991. Matrix of Habitats and Distribution by County of Rare/Endangered Species in Florida.

Florida Natural Areas Inventory (FNAI). 1994. Ecological Survey of U.S. Navy Property in the Lower Keys, Monroe County, Florida, Volumes 1 and 2, the Nature Conservancy, Arlington, VA.

Florida Natural Areas Inventory and Florida Department of Natural Resources (FNAI and FDNR). 1986. Appendix Four: Guide to Natural Communities of Florida.

Florida State. 2002. *Visitor Floridian Government Business.*

Foresight Surveyors, Inc. 2001. Project Condition Survey 8, 12, 17, 30, and 34-Foot Project, Main Ship Channel Through Key West Bight and Northwest Channel. U.S. Army Corps of Engineers, Jacksonville District.

Fourqurean, J.W. 1999. Key West Harbor benthic community survey. Preliminary report for Sandra Walters Consultants, Inc. 69 pp.

Glazer, R.A. 2001. Queen conch stock restoration. Report to Florida Fish and Wildlife Conservation Commission, 7 p.

Glazer, R.A. and J.A. Kidney. 2003. Habitat Associations of Adult Queen Conch (*Stromeus gigas L.)* in an unfished Florida Keys back-reef: Applications to Essential Fish Habitat. Bull. Mar. Sci. (in press).

Glover, B. 2002. Personal Interview. Petroleum Remediation Project Manager for Southern Division Naval Facilities. 1 Oct. 2002.

Grant, G., H. Malpass, and J. Beasley. 1996. Correlation of leatherback turtle and jellyfish occurrence. Herp. Re. 27(3):123-125.

Grecay, P.A. and T.E. Targett. 1996. Spatial patterns in conditions and feeding of juvenile weakfish in Delaware Bay. Transactions of the American Fisheries Society 125(5):803-805.

Gulf of Mexico Fishery Management Council (GMFMC). 1998. Generic amendment for addressing Essential Fish Habitat requirements in the following Fishery Management Plans of the Gulf of Mexico: Shrimp fishery of the Gulf of Mexico, United States Waters, red drum fishery of the Gulf of Mexico, reef fishery of the Gulf of Mexico, coastal migratory resources (mackerels) in the Gulf of Mexico and South Atlantic, stone crab fishery of the Gulf of Mexico, spiny lobster fishery of the Gulf of Mexico and South Atlantic, and coral

and coral reefs of the Gulf of Mexico. Gulf of Mexico Fishery Management Council, Tampa, Florida. 238 pp. + apps.

Hansen, L.J. 1986. Dolphin aerial survey data from Florida waters, April 1969-February 1971. NOAA/NMFS/SEFC/Miami Lab, CRD ML-86-52. 28 pp.

Havens, R.B. 2002. Personal interview and email correspondence. Southernmost Wastewater Treatment Plant Manager, Key West, Florida. 15 Sept. 2002.

Hirth, H.F. 1997. Synopsis of the biological data on the green turtle *Chelonia mydas* (Linnaeus, 1758). U.S. Fish and Wildlife Service Biological Report 97(1). 120 pp.

Hoelzel, A.R., C.W. Potter, and P.B. Best. 1998. Genetic differentiation between parapatric "nearshore" and "offshore" populations of the bottlenose dolphin. Proceedings of the Royal Society of London 265:1,177-1,183.

Jaap, W.C. 1984. The ecology of the south Florida coral reefs: A community profile. U.S. Fish and Wildlife Service. FWS/OBS-82/08. 138 pp.

Jaap, W.C. and P. Hallock. 1990. Coral reefs, pp. 97-116. In: N.W. Phillips and K.S. Larson (eds.), Synthesis of available biological, geological, chemical, socioeconomic, and cultural resource information for the South Florida area. Continental Shelf Associates, Inc., Jupiter, Florida. OCS Study MMS 90-0019.

Jaap, W.C. and S.C. Halas, and R.G. Mueller. 1988. Community dynamics of stony corals (Milleporina and Scleractinia) at Key Largo National Marine Sanctuary, Florida, during 1981-1986. Proceedings of the Sixth International Coral Reef Symposium 2:237-243.

Jones, J.A. 1977. Morphology and development of South Florida patch reefs. Proceedings of the Third International Coral Reef Symposium 2:231-235.

Jones, R.D. and J.N. Boyer. 2002. FY2001 Annual Report of the Water Quality Monitoring Project for the Water Quality Protection Program in the Florida Keys National Marine Sanctuary. Southeast Environmental Research Center, Florida International University, Miami, FL. Technical Report # T181. U.S. Environmental Protection Agency Contract # X994627-94-0.

Keys Energy Service (KES). 2002. *Transmission and Distribution*. Keys Energy Service.

Key West Airport 2001. *EYW – Key West Airport, Key West, Florida.*

Key West Gov. 2000a. *Key West Facts*. The City Government of Key West, Florida. Department of Planning.

Key West Gov. 2000b. *Port Operations.* The City Government of Key West, Florida. Department of Port Operations.

Key West Gov. 2002a. *Parks and Recreation*. Department of Parks and Recreation, the City Government of Key West, Florida.

Larson, K.W. and C.E. Moehl. 1988. Entrainment of anadromous fish by hopper dredge at the mouth of the Columbia River, pp. 102-112. In: C.A. Simenstad (ed.), Effects of Dredging on Anadromous Pacific Coast Fishes, Workshop Proceedings, University of Washington Sea Grant.

Lindeman, K.C. 1997. Development of grunts and snappers of southeast Florida: Cross-shelf distributions and effects of beach management alternatives. Ph.D. Dissertation, University of Miami, Coral Gables, FL. 419 pp.

Lindeman, K.C., R. Pugliese, G.T. Waugh, and J.S. Ault. 2000. Developmental patterns within a multispecies reef fishery: Management applications for essential fish habitats and protected areas. Bull. Mar. Sci. 66(3):929-956.

Lutcavage, M. and J.A. Musick. 1985. Aspects of the biology of sea turtles in Virginia. Copeia (2):449-456.

MAR, Inc. 1982. Aerial surveys to estimate size of populations of bottlenosed dolphins in the Key West, Florida area. U.S. Department of Commerce, NMFS, Southeast Fisheries Center. Technical Report No. 299. 8 pp.

Marine Turtle Expert Working Group. 1996a. Status of the loggerhead turtle population (*Caretta caretta*) in the western North Atlantic. 50 pp.

Marine Turtle Expert Working Group. 1996b. Kemp's ridley sea turtle *(Lepidochelys kempii*) status report. 49 pp.

Marine Turtle Expert Working Group. 2000. Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SEFSC-444. 115 pp.

Marquez, R.M. 1990. Sea Turtles of the World. FAO Species Catalogue, Volume 11. FAO, Rome. 81 pp.

Marszalek, D.S., G. Babashoff, Jr., M.R. Noel, and D.R. Worley. 1977. Reef distribution in south Florida. Proceedings of the 3rd International Coral Reef Symposium Miami, FL 2:223-229.

McClellan, D.B. 1996. Aerial surveys for sea turtles, marine mammals, and vessel activity along the southeast Florida coast, 1992-1996. NOAA Technical Memorandum NMFS-SEFSC-390. 42 pp.

McGraw, K.A. and D.A. Armstrong. 1988. Fish entrainment by dredges in Grays Harbor, Washington, pp. 113-131. In: C.A. Simenstad (ed.), Effects of Dredging on Anadromous Pacific Coast Fishes, Workshop Proceedings, University of Washington Sea Grant.

Mead, J.G. and C.W. Potter. 1995. Recognizing two populations of the bottlenose dolphin (*Tursiops truncatus*) off the Atlantic coast of North America: Morphologic and ecologic considerations. International Biological Research Institute Reports 5:31-43.

Meylan, A. 1988. Spongivory in hawksbill turtles: A diet of glass. Science 239:393-395.

Meylan, A. 1992. Hawksbill Turtle *Eretmochelys imbricata*, pp. 95-99. In: P. Moler (ed.), Rare and Endangered Biota of Florida. University Press of Florida, Gainesville, FL.

Meylan, A., B. Schroeder, and A. Mosier. 1995. Marine turtle nesting activity in the State of Florida, 1979-1992, pp. 83. In: K.A. Bjorndal, A.B. Bolten, D.A. Johnson, and P.J. Eliazar (comps.), Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation, Hilton Head, SC. U.S. Department of Commerce, NOAA, NMFS, Southeast Fisheries Science Center, Miami, FL.

Mortimer, J.A. 1982. Feeding ecology of sea turtles, pp. 103-109. In: K.A. Bjorndal (ed.), Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, DC.

National Marine Fisheries Service (NMFS). 1996. ESA, Section 7 Consultation, Biological Opinion, Channel Maintenance Dredging Using a Hopper Dredge, November 1996.

National Marine Fisheries Service (NMFS). 1999b. Amendment 1 to the Atlantic Billfish Fishery Management Plan. NMFS Division of Highly Migratory Species, Office of Sustainable Fisheries, Silver Spring, MD.

National Marine Fisheries Service (NMFS). 1997. ESA, Section 7 Consultation, Biological Opinion, The Continued Hopper Dredging of Channels and Borrow Areas in the Southeastern United States, October 1997.

National Marine Fisheries Service (NMFS). 1999a. Fishery Management Plan for Atlantic tunas, swordfish, and sharks, Volume II. NMFS Division of Highly Migratory Species, Office of Sustainable Fisheries, Silver Spring, MD. 302 pp.

National Audubon Society (NMFS). 2002. National Audubon Society Guide to Marine Mammals of the World. Alfred A. Knopf, New York. 527 pp.

National Marine Fisheries Service and U.S. Fish and Wildlife Service (NMFS and USFWS). 1991. Recovery Plan for U.S. population of Atlantic green turtle. NMFS, Washington, DC. 52 pp.

National Marine Fisheries Service and U.S. Fish and Wildlife Service (NMFS and USFWS). 1992. Recovery Plan for the Kemp's ridley sea turtle (*Lepidochelys kempii*). NMFS, St. Petersburg, FL. 40 pp.

National Marine Fisheries Service and U.S. Fish and Wildlife Service (NMFS and USFWS). 1993. Recovery Plan for hawksbill turtles in the U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico. NMFS, St. Petersburg, FL. 47 pp.

National Oceanic and Atmospheric Administration (NOAA). 1996. Florida Keys National Marine Sanctuary, Final Management Plan/Environmental Impact Statement. 3 Vols. U.S. Department of Commerce, NOAA, National Ocean Service, Office of Ocean and Coastal Resource Management, Sanctuaries and Reserves Division.

Odum, W.E., C.C. McIvor, and T.J. Smith III. 1982. The ecology of the mangroves of south Florida: A community profile. U.S. Fish and Wildlife Service Report FWS/OBS-81/24. 144 pp.

Operations Management International (OMI). 2002. *Operations Management International: The Key West Project*.

Palermo, M.R. 1990. Workgroup 2 Summary, pp. 76-80. In: D.D. Dickerson and D.A. Nelson (comps.), Proceedings of the National Workshop on Methods to Minimize Dredging Impacts on Sea Turtles, Jacksonville, FL, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, Miscellaneous Paper EL-90-5.

Phillips, N.W. and M.J. Thompson. 1990. Offshore benthic communities, pp. 155-193. In: N.W. Phillips and K.S. Larson (eds.), Synthesis of available biological, geological, chemical, socioeconomic, and cultural resource information for the south Florida area. Continental Shelf Associates, Inc., Jupiter, Florida. OCS Study MMS 90-0019.

PPB Environmental Labs, Inc. and Water and Air Research, Inc. 2002. Key West Harbor Turbidity Monitoring for September 2001. Delivery Order 0079, Contract DAWC-17-97-D.

Pritchard, P. 1978. Rare and Endangered Biota of Florida, Volume Two, Birds.

Reine, K.J., D.D. Dickerson, and D.G. Clarke. 1998. Environmental Windows Associated with Dredging Operations. U.S. Army Corps of Engineer Research and Development Center, Vicksburg, MS. Dredging Operations and Environmental Research Technical Notes Collection (TN DOER-E2). 14 pp.

Richards, A. 1988. Shorebirds: A Complete Guide to Their Behavior and Migration. W.H. Smith Publishers, Inc., New York City.

Robins, C.R. 1957. Effects of storms on the shallow-water fish fauna of southern Florida with records of fishes from Florida. Bulletin of Marine Science in the Gulf and Caribbean 7(3):266-275.

Ruzich, R. 1999. Notice of Title V Permit Status of NAS Key West. NAS Key West Public Works, Engineering Director. 1999.

Ruzich, R. 2002. Personal communication in Nov. 2002.

Sanders, J. 2002. Personal Interview. Installation Restoration Manager, Southern Division NAVFAC. 26 Sept. 2002.

Sandra Walters Consultants, Inc. 1999. Summary of research on impacts of ships and turbidity in Key West Harbor. A report prepared for the Key West Bar Pilots Association, Inc. 3 pp. + app.

Schmid, J.R. and L.H. Ogren. 1992. Subadult Kemp's ridley sea turtles in the southeastern U.S.: Results of long-term tagging studies, pp. 102-103. In: M. Salmon and J. Wyneken (comps.), Proceedings of the Eleventh Annual Workshop on Sea Turtle Biology and Conservation, NOAA Technical Memorandum NMFS-SEFSC-302.

Schomer, N.S. and R.D. Drew. 1982. An ecological characterization of the lower Everglades, Florida Bay, and the Florida Keys. U.S. Fish and Wildlife Service, Office of Biological Services, Washington, DC. FWS/OBS-82/58.1. 246 pp.

Schultz, M. 2002. Personal Interview. NAS Key West Public Affairs Office, JO2. 27 Sept. 2002.

Shaver, D.J. 1991. Feeding ecology of wild and headstarted Kemp's ridley sea turtles in south Texas waters. Journal of Herpetology 25(3):327-334.

Shinn, E.A., J.H. Hudson, R.B. Halley, and B. Lidz. 1977. Topographic control and accumulation rate of some Halocene coral reefs: South Florida and the Dry Tortugas. Proceedings of the Third International Coral Reef Symposium 2:1-7.

Shinn, E.A., B.H. Lidz, J.L. Kindinger, J.H. Hudson, and R.B. Halley. 1989. Reefs of Florida and the Dry Tortugas. A guide to modern carbonate environments of the Florida Keys and Dry Tortugas. U.S. Geological Survey, St. Petersburg, FL. 53 pp.

Slay, C.K. 1995. Sea turtle mortality related to dredging activities in the southeastern U.S.: 1991. In: J.I. Richardson and T.H. Richardson (comps.), Proceedings of the Twelfth Annual Workshop on Sea Turtle Biology and Conservation, Jekyll Island, GA. NOAA Technical Memorandum NMFS-SEFSC - 361. Pp.132-133.

South Atlantic Fishery Management Council (SAFMC). 1983. Source document for the snapper grouper fishery of the South Atlantic Region. South Atlantic Fishery Management Council, Charleston, SC.

South Atlantic Fishery Management Council (SAFMC). 1998a. Comprehensive amendment addressing Essential Fish Habitat in Fishery Management Plans of the South Atlantic Region. South Atlantic Fishery Management Council, Charleston, SC.

South Atlantic Fishery Management Council (SAFMC). 1998b. Final Fishery Management Plan for pelagic *Sargassum* habitat of the South Atlantic Region. South Atlantic Fishery Management Council, Charleston, SC.

South Atlantic Fishery Management Council (SAFMC). 2001. Fishery Management Plan for the dolphin and wahoo fishery of the Atlantic, Caribbean, and Gulf of Mexico. Including a draft environmental impact statement, regulatory impact review, initial regulatory flexibility analysis, and social impact assessment/fishery impact statement. In cooperation with the New England Fishery Management Council, Mid-Atlantic Fishery Management Council, Caribbean Fishery Management Council, and Gulf of Mexico Fishery Management Council. Pursuant to NOAA Award Number NA17FC1053.

Studt, J.F. 1987. Amelioration of maintenance dredging impacts on sea turtles, Canaveral Harbor, Florida, pp. 55-58. In: W. Witzell (ed.), Ecology of East Florida Sea Turtles, Proceedings of the Cape Canaveral, Florida Sea Turtle Workshop, Miami, FL. NOAA Technical Report NMFS 53.

Sullivan, L. 2002. Personal Interview and email correspondence. NAS Key West Harbor Pilot. 16 Sept. 2002.

Thompson, N.B. and H. Huang. 1993. Leatherback turtles in southeast U.S. waters. NOAA Technical Memorandum NMFS-SEFSC-318. 11 pp.

United States Army Corps of Engineers (USACOE). 1987. Corps of Engineers Wetland Delineation Manual, Waterways Experiment Station, Mississippi, Technical Report Y-87-1.

United States Army Corps of Engineers (USACOE). 1995. An Architectural Inventory, NAS Key West, Key West, Florida.

United States Army Corps of Engineers (USACOE). 1999. Hopper Dredge Sea Turtle Deflector Draghead and Operational Requirements.

United States Census. 2000a. *Profile of General Demographic Characteristics: 2000.* Geographic Area: Key West city, Florida.

United States Census. 2000b. *Profile of Selected Economic Characteristics: 2000.* Geographic Area: Key West city, Florida.

United States Census. 2000c. *Profile of Selected Housing Characteristics: 2000.* Geographic Area: Key West city, Florida.

United States Census. 1990. *Labor Force Status and Employment Characteristics: 1990.* Geographic Area: Key West city, Florida.

United States Department of Agriculture (USDA). 1995. Soil Survey of Monroe County, Keys Area, Florida.

United States Department of Education. 2002. National Center for Education Statistics, Office of Educational Research and Improvement. U.S. Department of Education. For school year 2000-2001.

United States Department of Labor. 2002. *Monroe County Unemployment Statistics; Key West Unemployment Statistics.* Bureau of Labor Statistics.

United States Fish and Wildlife Service (USFWS). 1996. Florida Manatee Recovery Plan (*Trichechus manatus latirostris*), Second Revision. Florida Manatee Recovery Team for the U.S. Fish and Wildlife Service, Southeast Region, Atlanta, GA. Approved January 29, 1996.

United States Fish and Wildlife Service (USFWS). 1999. South Florida Multi-Species Recovery Plan, Atlanta, Georgia. 2172 pp.

United States Fish and Wildlife Service (USFWS). 2002. Endangered and Threatened Wildlife and Plants; Final Rule to Establish Thirteen Additional Manatee Protection Areas in Florida. Federal Register 50 CFR Part 17. November 8, 2002. 67(217):68,450-68,489.

United States Geological Survey (USGS). 2002. National Earthquake Information Center, World Data Center for Seismology, Denver, Colorado.

U.S. Navy 1997. *Key West NAS Base Reuse Plan*. Bermello, Ajamil. Partners Inc., Key West, Florida. 3 Oct. 1997

U.S. Navy 2000a. *Solid Waste Management Plan*. Southern Division NAVFAC, Naval Complex, Key West, Florida. March 2000.

U.S. Navy 2000b. *Final Environmental Assessment for Disposal and Reuse of Truman Waterfront*. Southern Division NAVFAC, Naval Complex, Key West, Florida. Nov. 2000.

U.S. Navy 2001. *NAS Key West Florida*. U.S. Navy Homepage.

U.S. Navy 2002a. *Southeast Regional Aviation Plan*. Southern Division NAVFAC, Naval Complex, Key West, Florida.

U.S. Navy 2002b. *Integrated Natural Resources Management Plan for Naval Air Facility Key West, Florida*. Southern Division NAVFAC, Naval Complex, Key West, Florida. March 2002.

U.S. Navy 2003. *Draft CY07 Summary Document Naval Air Facility Key West, FL*. Southern Division NAVFAC, Naval Complex, Key West, Florida. February 2003.

Vaughn, T.W. 1914. The building of the Marquesas and Tortugas atolls and a sketch of the geologic history of the Florida reef tract. Papers from the Tortugas Laboratory of the Carnegie Institution of Washington 5:55-67.

Vinyard, G.L. and J.W. O'Brien. 1976. Effects of light and turbidity on the reactive distance of bluegill (*Lepomis macrochirus*). Journal of the Fisheries Research Board of Canada 33:2,845-2,849.

Waring, G.T., D.L. Palka, P.J. Clapham, S. Swartz, M. Rossman, T. Cole, L.J. Hansen, K.D. Bisack, K. Mullin, R.S. Wells, D.K. Odell, and N.B. Barros. 1999. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments - 1999. NOAA Technical Memorandum NMFS-NEFSC. 200 pp.

Weber, M. 1995. Kemp's ridley sea turtle, *Lepidochelys kempii*. In: P.T. Plotkin (ed.), NMFS and U.S. Fish and Wildlife Service Status Reviews for Sea Turtles Listed under the ESA of 1973, Silver Spring, MD.

Weitzel, C. 2002. Email correspondence. Keys Energy Service employee. 30 Sept. 2002.

Werner, S.A. and A.M. Landry, Jr. 1994. Feeding ecology of wild and head started Kemp's ridley sea turtles (*Lepidochelys kempii*), pp. 163. In: K.A. Bjorndal, A.B. Bolten, D.A. Johnson, and P.J. Eliazar (comps.), Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-351.

Wettstein, F. 2000. Notes on Key West Harbor Turbidity Study, 11 April 2000. Attachment to letter dated 14 March 2003 from Mr. Billy D. Causey to Mr. James M. Hudgens.

Wheaton, J.L. and W.C. Jaap. 1988. Corals and other prominent benthic Cnidaria of Looe Key National Marine Sanctuary. Florida Marine Research Institute Publication 43:1-25.

Wilber, D.H. and D.G. Clarke. 2001. Biological effects of suspended sediments: A review of suspended sediment impacts on fish and shellfish with relation to dredging activities in estuaries. North American Journal of Fisheries Management 21(4):855-875.

Wilmers, T. and E. Wilmers. 1999. Survey of nesting sea turtles in Key West National Wildlife Refuge, 1999: Distribution, productivity, population size, and management recommendations. Unpublished report to the U.S. Fish and Wildlife Service, Florida Keys National Wildlife Refuge Office. 32 pp.

Witzell, W.N. 1998. Long-term tag returns from juvenile Kemp's ridley turtles. Marine Turtle Newsletter 79:20.

Wyle Laboratories. 2003. *Draft Aircraft Noise Study for Forecast CY07 Conditions at NAS Key West.*

Zieman, J.C. 1982. The ecology of the seagrasses of South Florida: A community profile. U.S. Fish and Wildlife Service, Office of Biological Services, Washington, DC. FWS/OBS-82/25. 150 pp.

CHAPTER 7

LIST OF PREPARERS

The Navy liaison associated with this EA document is:

Will Sloger, Code ES12/WS
United States Department of the Navy
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
P.O. Box 190010
North Charleston, South Carolina 29406
(843) 820-5797

The following CZR Incorporated team members contributed to preparation of this EA:

CZR Incorporated
1061 East Indiantown Road, Suite 100
Jupiter, Florida 33477-5143

Name	Role	Years of Related Experience
CZR Incorporated		
James M. Hudgens	Project Director	33
Samuel E. Wiley	Project Manager	15
Mark Grippo	Biologist	1
Continental Shelf Associates, Inc.		
Frederick B. Ayer, II	Project Director	29
Keith D. Spring	Project Manager, Benthos	27
David B. Snyder	Essential Fish Habitat	25
Stephen T. Viada	Marine Turtles, Marine Mammals	25
Alan D. Hart	Sediment and Water Quality	30
Richard M. Hammer	Marine Technical Review	32
The Environmental Company		
Chuck Maguire	Project Manager	30

APPENDIX A

DIVER SURVEY ASSOCIATED WITH
THE ENVIRONMENTAL ASSESSMENT FOR
FLEET SUPPORT AND INFRASTRUCTURE IMPROVEMENTS
NAF KEY WEST, FLORIDA
CONTINENTAL SHELF ASSOCIATES, INC.
AUGUST 12, 2002

APPENDIX A

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1

2.0 METHODS 1

3.0 RESULTS 1

4.0 SUMMARY 5

APPENDIX: REPRESENTATIVE PHOTOGRAPHS A-1

LIST OF FIGURES

Figure **Page**

1 Location of channel survey area relative to Key West 2

2 Position of diver survey lines, bathymetry lines, and patch reefs relative to the two survey areas 3

3 Diver survey transect along cable crossing in Key West Harbor 4

1.0 INTRODUCTION

Continental Shelf Associates, Inc. (CSA) staff were requested to make a site visit to assess substrate composition at shoal areas within Reach 2 at the seaward end of the Key West Harbor Ship Channel, located approximately 4 nmi south of Key West, Florida (**Figure 1**). This area is just north of the reef tract on the south side of Hawk Channel. This site visit was initiated due to the concern that these areas within the channel with water depths less than 35 ft mean low water may have been hard bottom substrate left in place during the original channel dredging project.

2.0 METHODS

CSA staff reviewed the bathymetry profiles for the channel area from the September 2001 United States Army Corps of Engineers (USACE) bathymetry survey and selected areas in the channel within Reach 2 that had depths of less than 35 ft. Two areas were delineated during this data review, with the southern section extending approximately 925 ft along the channel axis and the northern segment running approximately 675 ft along the channel axis (**Figure 2**). Endpoints and midpoints were plotted for each of these areas on the USACE drawings, and the X/Y coordinates (NAD 83, Florida, East Zone) were recorded and then converted to latitude and longitude (WGS 84).

A CSA dive team utilized the 42-ft vessel MYSTERIOSO, chartered out of Key West, to conduct the survey on 31 July 2002. A buoy was deployed at specific locations within the two areas of concern using a differential global positioning system. Divers collected video data and still photographs at these locations. A thin stainless steel probe 2.75 ft in length was used to determine minimum sediment thickness within the channel over rock or rock rubble during each dive. Divers also located and collected video data along an underwater cable route extending from Tank Island east to Key West (**Figure 3**).

3.0 RESULTS

The CSA dive team traveled to Key West on the afternoon of 30 July and departed the dock at 08:50 h on 31 July 2002. Sea conditions at the site were excellent with flat seas and underwater visibility exceeding 80 ft. Upon arriving at the southern survey area, a buoy was deployed at the south end of the area. Divers entered the water and collected underwater video, still photographs, and surficial sediment thickness data at the site. This procedure was repeated at additional specific locations within Reach 2 (**Figure 2**).

Bottom substrate within the areas of concern delineated from the USACE bathymetry survey drawings consisted of coarse sand sediments with sand ripples. Sand ripples, or sand waves, had heights of approximately 0.5 to 1 ft and wavelengths from 3 to 6 ft (**Appendix**, **Photographs 1**, **5**, **6**, **7**, and **8**). These areas of coarse sand with sand ripples extended up the channel within the two delineated areas and were restricted to the approximate centerline region of the channel. No zones of exposed hard bottom were observed within the two shoal areas delineated within the channel. The bottom within the channel along either side of the center axis consisted either of fine sand (with no sand ripples) or areas of rock rubble. Outside the channel boundaries at the southern end of Area 1, the bottom consisted of low relief hard bottom and rock rubble with associated octocorals, sponges, and other encrusting fauna (**Appendix**, **Photographs 3** and **4**). Along the western edge of the channel, several distinct small patch reefs were observed that had a vertical relief of up to 4 ft and contained stony corals as well as octocorals and sponges. These patch reefs were all located outside of the channel boundaries.

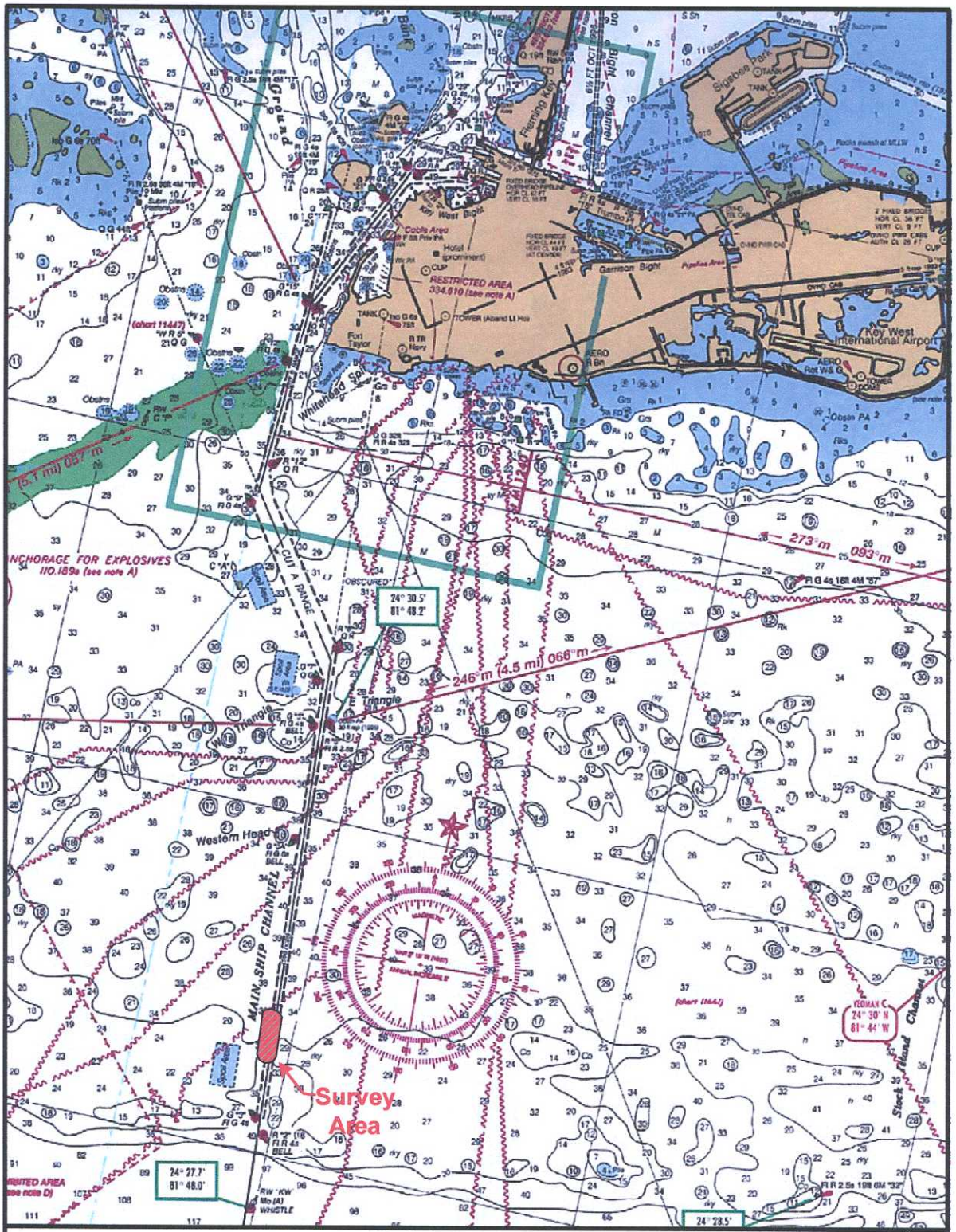


Figure 1. Location of channel survey area relative to Key West.

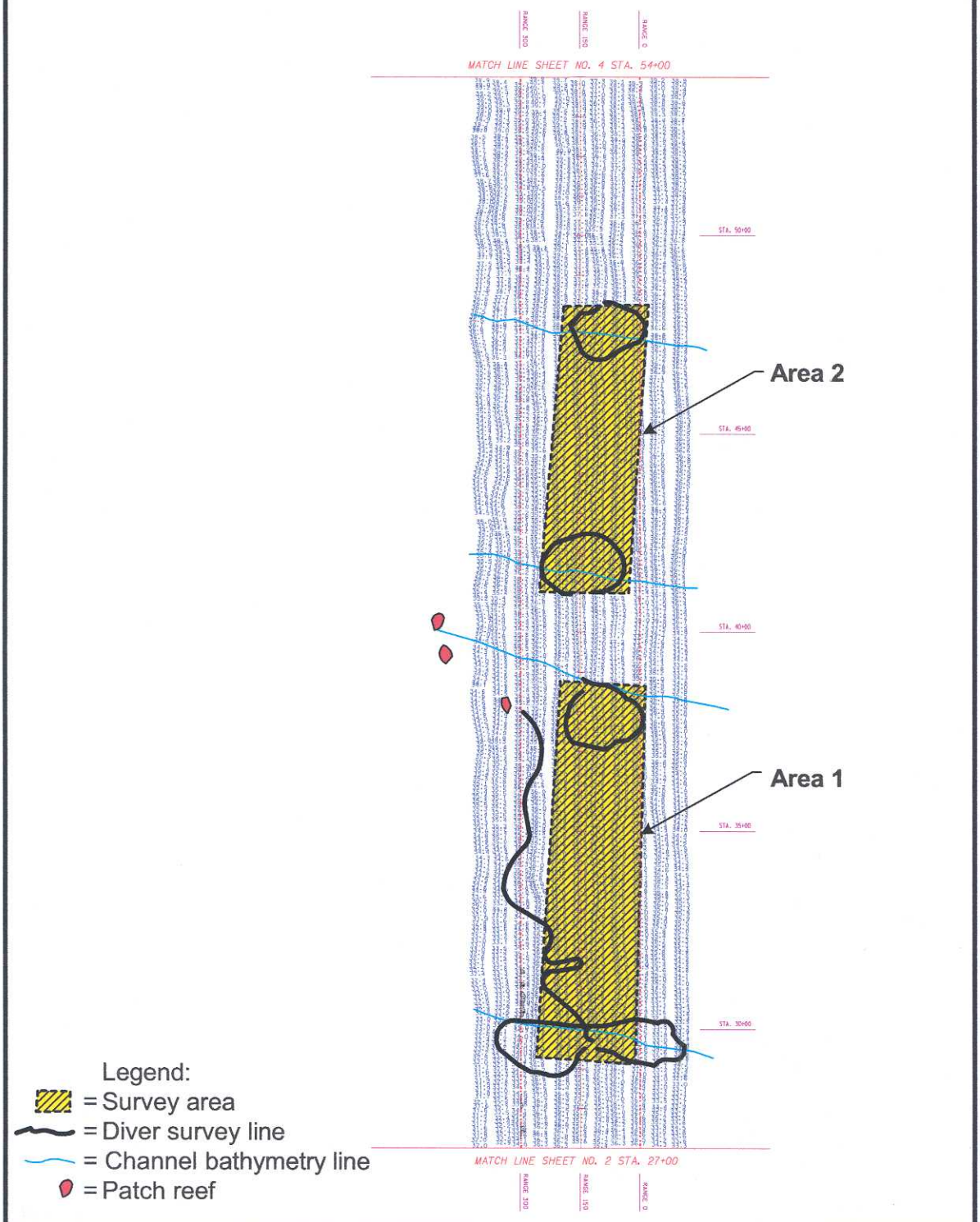


Figure 2. Position of diver survey lines, bathymetry lines, and patch reefs relative to the two survey areas.

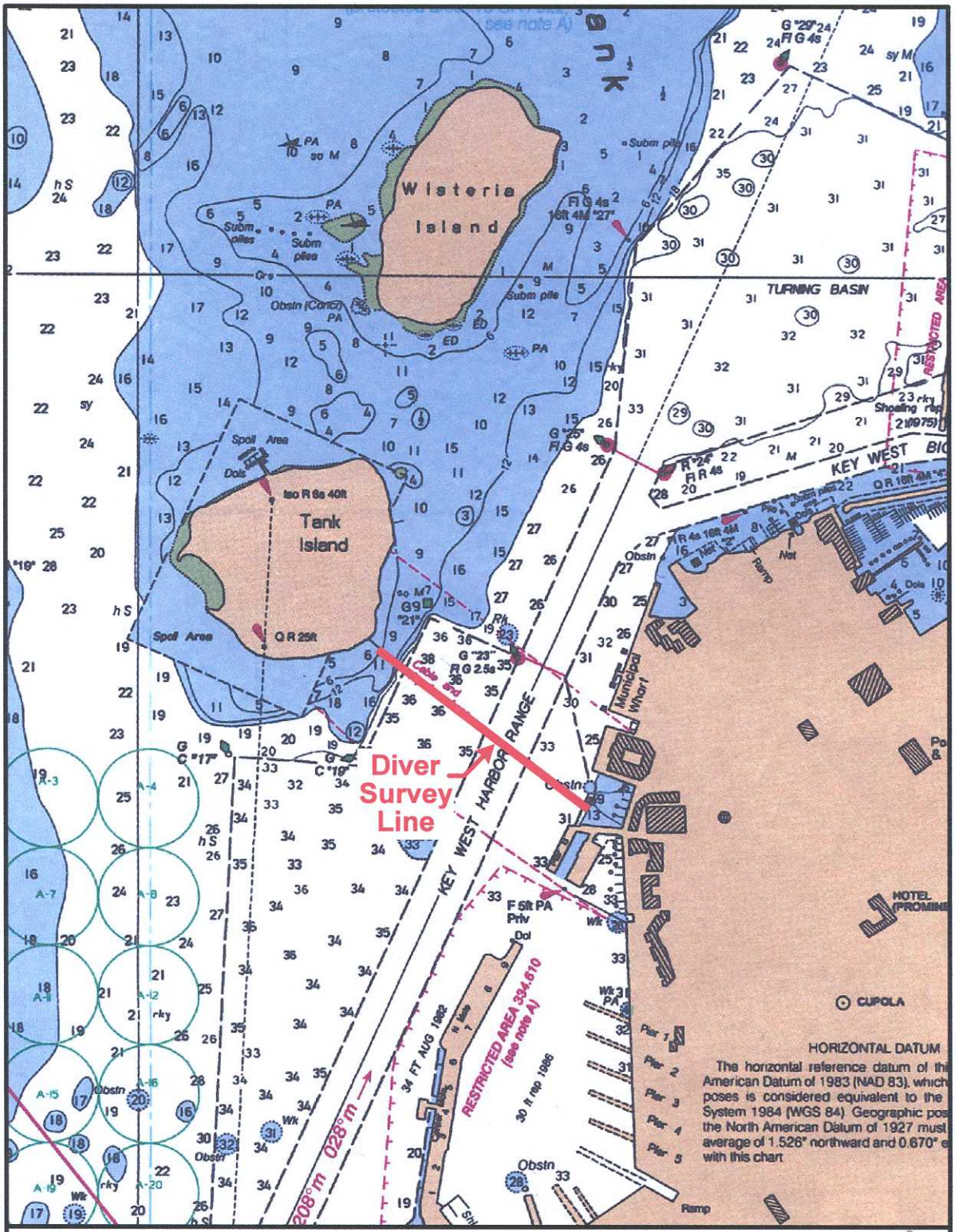


Figure 3. Diver survey transect along cable crossing in Key West Harbor.

Probes made into the coarse sediments along the channel centerline generally indicated a sediment depth of at least 2.75 ft over hard bottom or rock rubble (**Appendix**, **Photographs 2** and **5**). Probes into sediments closer to the edges of the channel indicated 0.5 to 1.5 ft of sediment over rock or rock rubble.

Due to the flat sea conditions, the survey team used the vessel's depth finder to run bathymetric lines across the channel at specific locations to determine whether the water depth trends were the same as noted during the USACE survey. Cross-channel profiles run at the north and south ends of each of the two areas indicated the channel centerline ranged from 1 to 3 ft shallower than areas along the channel edges, which were within the range defined during the USACE bathymetric survey. Divers also were able to directly view this shoaling along the center of the channel due to excellent underwater visibility.

It seemed somewhat unusual for relatively steep sand ripples to occur only in the center of the channel, as the normal tidal currents and recent wave activity could not support their height and wavelength. It also did not seem likely that under natural conditions they should only occur in the center of the channel, as sandy sediments also were present along the channel edges. One potential cause of both this shoaling and the maintenance of the steep sand ripples may be the somewhat regular usage of the ship channel by cruise ships and other large vessels. It is postulated that their deeper draft and thus closer proximity to the bottom is creating a higher current velocity along the channel bottom during their passage. The deeper draft also brings their propellers closer to the bottom, with the propeller wash suspending and removing fine sediments from along the channel centerline, while leaving finer sediments intact along the channel edges. This combination may be creating and maintaining these steep sand ripples.

Divers also collected video data and coordinates from along an underwater cable route across Key West Harbor. The line extended from the southeast corner of Tank Island toward the southeast and made landfall at Key West in the vicinity of the cruise ship dock (**Figure 3**). The line was marked at both ends by signs indicating a cable crossing area. The lines were covered by a flexible concrete mat, which rose from approximately 1 to 3 ft above the surrounding bottom. In many locations along the line, the concrete mat was distorted or "wrinkled," and at several sites it was folded back over on itself. These areas of disturbed mat surface were more prevalent closer to the cruise ship dock and could be due to high water flow rates from ship thrusters during docking procedures.

4.0 SUMMARY

Divers performed a survey within shoal areas at the southern seaward end of the ship channel into Key West Harbor. The bottom in these shoal areas consisted primarily of coarse sediments with sand ripples, which had heights of approximately 0.5 to 1 ft and wavelengths from 3 to 6 ft. Areas of coarse sediments were confined primarily to the channel centerline, with areas of fine sand bottom or rock rubble observed to either side. Sediment probes in these shoal areas indicated a sediment thickness of at least 2.75 ft. It is postulated these areas of coarse sediments and sand ripples may be created and maintained by cruise ship and other large vessel traffic.

A diver survey also was conducted along an underwater cable route across Key West Harbor. Cable lines were covered by a flexible concrete mat, which rose from approximately 1 to 3 ft above the surrounding sand bottom. In many locations the mat was displaced laterally, and at several sites it was folded back over on itself, presumably due to cruise ship thruster wash during docking activities.

APPENDIX

REPRESENTATIVE PHOTOGRAPHS

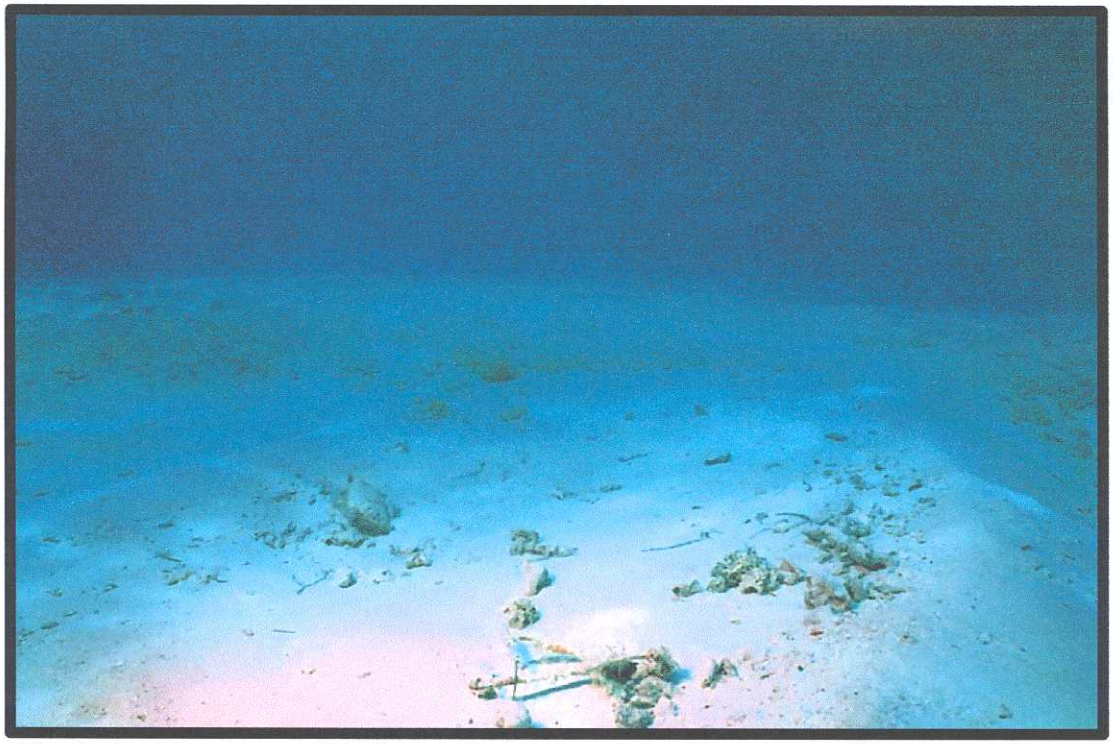


Photo 1 - Coarse sand bottom with shell and coralline algal rubble at southern end of Area 1.

Photo 2 - CSA diver probing sediment thickness in area of coarse sand at center of channel at southern end of Area 1.

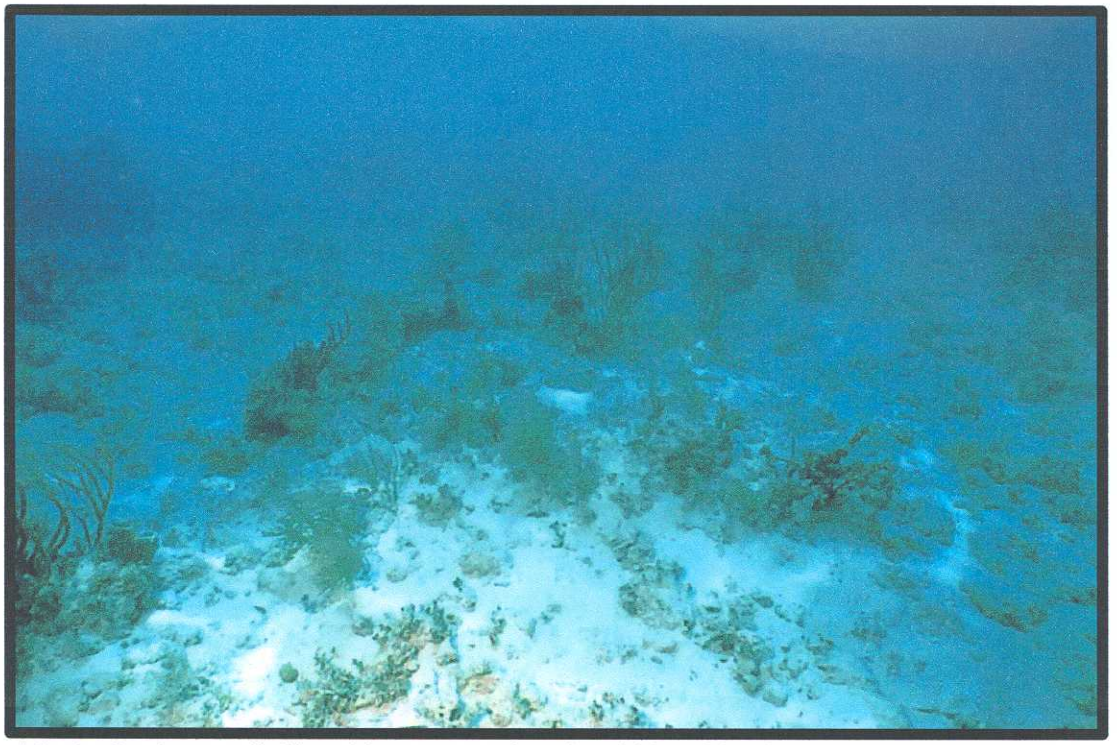


Photo 3 - Low relief hard bottom and rock rubble with algae, octocorals, and sponges east of ship channel at southern end of Area 1.

Photo 4 - A hogfish (*Lachnolaimus maximus*) in hard bottom and rock rubble area to the east of the ship channel in Area 1.

Photo 5 - CSA diver probing bottom to determine sediment thickness in the trough of a sand ripple at the northern end of Area 2.

Photo 6 - Coarse sand and shell rubble bottom with sand ripples at the northern end of Area 2.

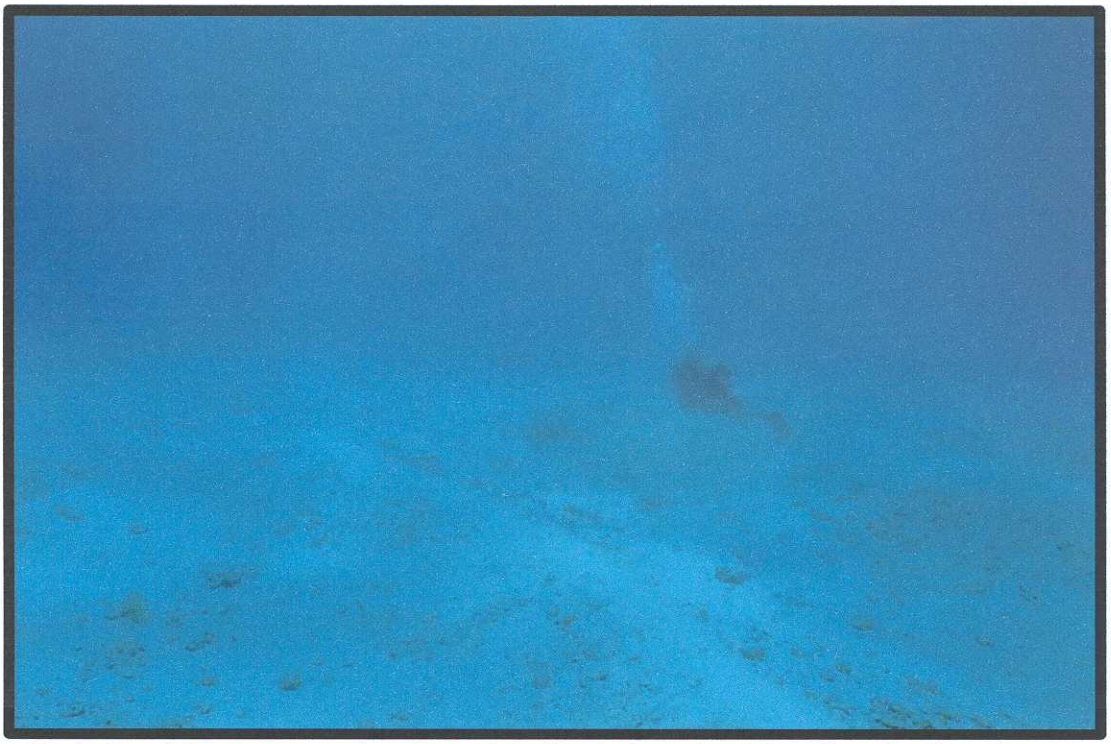


Photo 7 - CSA diver digging down into the bottom to determine depth and composition of sediments at the northern end of Area 2.

Photo 8 - Coarse sand and rubble bottom with abandoned lobster trap line at the northern end of Area 2.

APPENDIX B

SOUTH ATLANTIC DIVISION CORPS OF ENGINEERS
HOPPER DREDGING PROTOCOL FOR ATLANTIC COAST
FY 98 – FY 03

ENDANGERED SPECIES ACT – SECTION 7
CONSULTATION
BIOLOGICAL OPINION
U.S. ARMY CORPS OF ENGINEERS
SOUTH ATLANTIC DIVISION

APPENDIX B

South Atlantic Division Corps of Engineers Hopper Dredging Protocol for Atlantic Coast, FY 98 - FY 03

1. Sea turtle deflecting dragheads will be used at all times.

2. Districts will inspect sea turtle deflecting dragheads systems to ensure that they are fully operational, prior to initiation of work.

3. Districts will ensure that draghead operators know how to properly use the sea turtle deflecting system.

4. Maintenance dredging at Savannah, Brunswick and Kings Bay Harbors must be restricted to 15 December through the end of March. Maintenance dredging at Charleston and Wilmington Harbors must be restricted to 1 December through the end of March where the sea turtle deflecting draghead system can not be used effectively. Dredging may begin as soon as mid-November in those portions of the Wilmington and Charleston Harbor channels where the sea turtle deflecting draghead can be used effectively. All Districts will cooperate to ensure that their scheduling of hopper dredging contracts, does not interfere with this Division priority work area.

5. Sea turtle observers, inflow screens and overflow screens will be used during all dredging operations, except for the months of January and February, which are optional. Variations from this provision may be granted by Division, but must be justified from a technical perspective.

6. All sea turtle takes will be reported promptly to SAD-ET-CO/PD and posted at usace.sad.turtle newsgroup on the Internet.

7. If two sea turtle takes occur within 24 hours, you should immediately notify the Division POC so that he can initiate reconsultation with National Marine Fisheries Service.

8. If a third take occurs on the project the district will cease operations and notify the South Atlantic Division. Continuation of dredging will occur only after cleared by Division. Upon taking three turtles, District will develop a risk assessment along with an appropriate risk management plan, and submit that to Division for assessment. Generally relative abundance and relocation trawling would be an integral part of a risk assessment and management plan. Should a total take of 5 sea turtles occur, for whatever reason, all work will be terminated unless other prior agreements had been reached with Division.

9. If a total of two endangered species of sea turtles are taken during a project, work will be suspended until further guidance from Division has been received.

10. Arrangements will be made for appropriate observation of all species of whales. The hopper dredge must not get closer than 750 yards of a right whale. Jacksonville and Savannah Districts will contribute their share of funding for the Right Whale Early Warning System early enough in the year to ensure that this is not a cause for delay in the program.

11. From Jacksonville District north through Wilmington District, sea turtle observers will also be responsible for monitoring takes of shortnose sturgeon. All takes of shortnose sturgeon must be reported to Division. Should a total take of three shortnose sturgeons occur, District will terminate hopper dredging until further guidance has been received from Division.

R. L. VanAntwerp
Brigadier General, U.S. Army
Division Engineer
South Atlantic Division, Corps of Engineers
Room 313, 77 Forshyth St., S.W.
Atlanta, Georgia 30355-6801

Dear Brigadier General VanAntwerp;

Enclosed is the regional biological opinion concerning the use of hopper dredges in channels and borrow areas along the Southeast U.S. Atlantic coast. This biological opinion amends the regional opinion conducted in 1995, and supersedes the interim biological opinion issued on April 9, 1997. The opinion recognizes the efforts of the Corps of Engineer's (COE) South Atlantic Division (SAD) to minimize sea turtle takes through application of new technology such as draghead deflectors, seasonal dredging windows, termination of projects in which high rates of turtle takes are observed, and elevated staff effort to identify and resolve site-specific problems. Despite these major efforts and continuing plans by the COE to improve the effectiveness of the rigid draghead deflector and to resolve dredging schedules to reduce the likelihood of sea turtle interactions, NMFS believes that further sea turtle takes are likely in future years. However, we believe that these takes are not likely to jeopardize the continued existence of any species. An annual incidental take, by injury or mortality of 35 loggerheads 7 Kemp's ridleys, 7 green turtles, 2 hawksbills, and 5 shortnose sturgeon is listed in the incidental take statement appended to the enclosed opinion. This annual take level can be monitored over fiscal years to be consistent with project contracts.

I appreciate your continued commitment to reduce sea turtle takes associated with dredging in your Division. COE Division and District staff have facilitated the excellent working relationship that exists between our offices within the SAD. We look forward to continuing these cooperative efforts in sea turtle conservation.

Sincerely,

Hilda Diaz-Soltero
Office Director
Office of Protected Resources

Endangered Species Act - Section 7 Consultation

Biological Opinion

Agency: U.S. Army Corps of Engineers, South Atlantic Division

Activity: The continued hopper dredging of channels and borrow areas in the southeastern United States

Consultation Conducted By: National Marine Fisheries Service, Southeast Regional Office

Date Issued:

Background

Hopper dredging in channels and borrow areas along the southeastern coast of the United States during the spring of 1997 resulted in an unanticipated high rate of loggerhead turtle take. The number of takes quickly approached the incidental take level established in the regional biological opinion (BO) issued to the Army Corps of Engineers (COE) on August 25, 1995. A formal consultation considering the take rates as well as the dredging locations and conditions was conducted and an interim biological opinion (IBO) was issued on April 9, 1997 and is incorporated herein by reference. The IBO concluded that continued hopper dredging during the 1997 fiscal year was likely to take additional sea turtles but was not likely to jeopardize the continued existence of any species. The incidental take, by injury or mortality, of seven (7) documented Kemp's ridleys, seven (7) green turtles, two (2) hawksbills, sixteen (16) loggerhead turtles, and five (5) shortnose sturgeon was set pursuant in the IBO. This modification added 15 loggerheads to the annual incidental take level, bringing the 1997 fiscal year total incidental take level to 35 loggerheads.

The history of Endangered Species Act (ESA) Section 7 consultations on the deployment of hopper dredges to maintain the depths of southeastern channels is discussed in the August 25, 1995 BO and is incorporated herein by reference. Although no endangered sea turtles have been taken in any channel dredging projects during the 1997 fiscal year, 28 loggerheads have been taken, including 9 loggerheads taken subsequent to the issuance of the IBO (Table 1).

During 1997, the COE responded to high rates of sea turtle takes by assessing each dredging project, modifying draghead deflectors when apparently necessary, conducting relative abundance surveys and relocation trawling, and ultimately ending a number of projects prior to completion (Kings Bay, Brunswick Harbor, Savannah Harbor, Morehead City).

1991 Biological Opinion

Two hundred twenty-five sea turtle takes, including 22 live turtles, were documented between 1980 and 1990 in the Southeast channels despite limited observer coverage in most channels throughout most of that decade (Table 2a.). Seventy-one of these turtles were taken in four months of dredging in the Canaveral ship channel in 1980, the first year in which observers were required. Twenty-one were observed in over two years of dredging in the Kings Bay Channel in 1987-1989, after observers were first deployed on dredges in that channel. Observers were required on most hopper dredges after 1989. Documented takes of turtles on dredges in Brunswick and other Southeast U.S. channels indicated that sea turtles were vulnerable to hopper dredges in all southeastern channels during warmer months. These observations resulted in the Section 7 consultation that concluded with a BO issued on November 25, 1991.

The November 1991 BO was the first cumulative area consultation between NMFS and COE's South Atlantic Division (SAD) regarding hopper dredging. The BO considered hopper dredging in channels from the Canaveral in Florida through Oregon Inlet, North Carolina. The 1991 BO concluded that continued unrestricted hopper dredging in Southeast U.S. channels could jeopardize the continued existence of listed sea turtles. The Opinion established a reasonable and prudent alternative to unrestricted hopper dredging which prohibited the use of a hopper dredge in the Canaveral ship channel, and from April 1 through November 30 in other southeastern channels north of Canaveral. An incidental take level was established based on assumptions that takes would be significantly reduced due to limited dredging windows, but that water temperatures in some years would result in turtle presence in channels during December and March. Observers were required on dredges equipped with outflow and/or inflow screening in March and December. The presence or absence of turtles in December would determine the further need for observer coverage into January. The documented incidental take of a total of five (5) Kemp's ridley, green, hawksbill or leatherback turtle mortalities in any combination of which no more than two (2) are Kemp's ridley, or fifty (50) loggerhead turtle mortalities was set. The Opinion anticipated that seasonal restrictions on hopper dredging would be adjusted on a channel-by-channel basis as better information on turtle occurrence was collected.

Additionally, the development and testing of a draghead deflector was promoted.

1995 Biological Opinion

Between 1992 and 1995, only 16 sea turtle takes were documented (Table 2b.), including three that were alive when collected during dredging operations in the SAD under the dredging windows established in the November 1991 BO (see above). During that period COE developed a rigid draghead deflector that appeared to be effective during videotaped dredging trials using mock turtles, as well as during experimental dredging associated with trawling in the Canaveral Channel. COE also completed a study of six Southeast channels to determine seasonal abundance and spatial distribution of these turtles. A discussion of the findings can be found in the COE report entitled “Assessment of Sea Turtle Abundance in Six South Atlantic U.S. Channels” (Dickerson et al. 1994), summarized in the 1995 BO. Based on the new information, COE requested expanded dredging windows and observer requirements. NMFS considered their request and developed alternative dredging windows and observer requirements and added requirements for the use of hopper dredges in borrow areas along the east coast.

After 1995, COE districts within the SAD generally required observers in some channels, such as Kings Bay, throughout the winter, beyond the new monitoring windows. SAD hopper dredge projects were initially conducted in the middle of the dredging windows, when nearshore waters were cool. During 1996, only nine sea turtle takes, including one green turtle and eight loggerheads, were documented (Table 2c.). No more than three takes occurred in any project. The new dredging windows and draghead deflector requirements appeared to provide good protection to sea turtles.

Hopper dredging operations contracted for the 1997 fiscal year were planned for early in the calendar year, however a number of operations were not begun until late winter. Beginning on March 2, 1997, loggerhead takes occurred in Kings Bay at rates higher than previously observed. Six turtles were taken in four days of dredging. While consulting with NMFS regarding this unprecedented rate of loggerhead takes, a COE specialist from the Waterways Experiment Station proposed some modifications to the draghead with the potential to reduce sea turtle takes. Relocation trawling was also initiated, beginning March 9,1997; however, as can be seen on Table 2, these efforts did not preclude further sea turtle takes in Kings Bay. Dredging was terminated on March 12, 1997, with only 53 percent of the project completed.

Table 1 lists the sea turtle takes observed in hopper dredges throughout the SAD during 1997, as well as the steps taken by COE to reduce the likelihood of takes. Deflector dragheads were re-engineered to fit specific dredges wherever possible and relocation trawling was initiated. Dredging was terminated prior to completion of projects in Kings Bay, Brunswick Harbor, Savannah Harbor and Charleston Harbor. Consultation was reinitiated to consider the effects of the remaining hopper dredging projects anticipated for the 1997 fiscal year. In addition to those specific projects listed in the resulting April 1997 IBO, dredging at Reach II of the Myrtle Beach dredge disposal area is likely to begin before the fiscal year ends. Despite ongoing dredging at the Oregon Inlet, no sea turtle takes have been documented since May 15.

Proposed Activity

This consultation addresses the use of hopper dredges in channels and borrow areas along the Atlantic portion of COE's SAD within the existing dredging windows (Table 3). Channels dredged by hopper dredges include: Oregon Inlet, Morehead and Wilmington Harbors, Charleston, Port Royal and Savannah harbors, Brunswick, Kings Bay, Jacksonville, St. Augustine and Ponce de Leon inlets, West Palm Beach, Miami and Key west channels. Borrow areas that may be dredged by hopper dredges include areas off of Dade County Florida and Myrtle Beach South Carolina.

Draghead deflectors will be used on all projects and observers will be required at least during those periods identified in Table 3. Year-round observer coverage will likely be required by the COE for most channels, particularly those with histories of high sea turtle catch rates such as Kings Bay. Within the South Atlantic Division, the COE will try to schedule dredging of the highest risk areas (Canaveral, Brunswick, Savannah, and Kings Bay) during periods when nearshore waters are coolest -- after December 15 but well before March. Priority for winter dredging will also be given to areas that have substrates that reduce the efficiency of the deflector (Wilmington Harbor channel, Reach 1 of Myrtle Beach). Completion of all projects during the cold-water months will be attempted when possible.

Listed Species and Critical Habitat

Listed species under the jurisdiction of the NMFS that may occur in channels along the southeastern United States and which may be affected by dredging include:

THREATENED:
(1) the threatened loggerhead turtle - Caretta caretta

ENDANGERED:

(1) the endangered right whale - Eubalaena glacialis
(2) the humpback whale - Megaptera novaeangliae
(3) the endangered/threatened green turtle - Chelonia mydas
(4) the endangered Kemp's ridley turtle - Lepidochelys kempii
(5) the endangered hawksbill turtle - Eretmochelys imbricata
(6) the endangered shortnose sturgeon - Acipenser brevirostrum

Green turtles in U.S. waters are listed as threatened, except for the Florida breeding population which is listed as endangered.

Additional endangered species which are known to occur along the Atlantic coast include the finback (Balaenoptera physalus), the sei (Balaenoptera borealis), and sperm (Physeter macrocephalus) whales and the leatherback sea turtle (Dermochelys coriacea). NMFS has determined that these species are unlikely to be adversely affected by hopper dredging activities.

Information on the biology and distribution of sea turtles can be found in the 1991 and 1995 BOs, which are incorporated by reference. Channel specific information has been collected by COE for channels at Morehead City, Charleston, Savannah, Brunswick, Fernandina and Canaveral, and is presented in detail in COE summary report entitled "Assessment of Sea Turtle Abundance in Six South Atlantic US Channels" (Dickerson et al., 1994) and in the COE Biological Assessment.

There is no significant new information regarding the status of these species that has not been discussed in the BOs that have been incorporated by reference (March 12, 1997 and August 25, 1995).

Assessment of Impacts

The Biological Opinion issued in 1991 contained strict dredging windows that appeared to be very effective at limiting the number of sea turtles taken by hopper dredges during channel maintenance dredging in the Southeast U.S. along the Atlantic coast. Between 1991 and 1995, no more than 8 turtles were taken in any year, and many of those taken were released alive. Studies conducted by the COE (Dickerson et al., 1994) documented turtle distribution and abundance in six channels that suggesting the existing windows were accurate. However, the COE requested expansion of existing windows to lessen the burden of maintenance dredging while testing and further developing a rigid draghead deflector design. The deflector was effective at pushing aside mock turtles when tested during 1994, and preliminary field trials in the Canaveral shipping channel had encouraging results. NMFS considered this new information, presented by the COE in a biological assessment forwarded to NMFS in November 1994. The resulting BO, issued August 25 1995 expanded dredging windows and modified observer requirements.

Only 9 sea turtle takes were documented in 1996, suggesting that the expanded dredging windows and the deflector requirements provided protection to sea turtles that was similar to the previously more-restrictive windows. However, the COE's internal policy resulted in conduct of most of the hopper dredging projects during months when coastal waters were still cold, consistent with the previous dredging. The increased rate of take observed during 1997 and discussed below suggests that the restriction of hopper dredging to months when nearshore waters are cold remains the best method for minimizing sea turtle takes.

Unfortunately, a number of dredging projects contracted for early 1997 in the SAD but not restricted to mid-winter months, were delayed into the Spring. This delay coincided with a unseasonably warm winter, when the waters of Kings Bay reached 60°F in early March. The incidental take of nine loggerheads in Kings Bay over only 11 days of dredging indicated that the nearshore abundance of loggerheads was high, apparently higher than during the late 1980's when observers were first deployed on hopper dredges in Kings Bay.

There were other indicators of high nearshore sea turtle abundance along the Southeast U.S. Atlantic coast during 1997. Commercial shrimp trawling conducted without the use of turtle excluder devices (TEDs) offshore of South Carolina and Georgia between May 15 and July 15 resulted in sea turtle catch rates higher than previously documented. Sixty nine sea turtles were taken in 29 days of shrimping off of South Carolina, including 65 loggerheads, 3 ridleys and 1 leatherback. Forty-six sea turtles were taken in 17 days of towing off of Georgia. The sea turtle catch per unit effort (CPUE) for this operation is about 0.35 turtles per hour of trawling, standardized to 100 feet (30.5 m) of total headrope length fished. The CPUE (same units) for commercial shrimp trawling in the 1970s and 1980s reported by Henwood and Stuntz (1987a) was only 0.0487. Loggerhead turtles were the predominant species reported by Henwood and Stuntz and have also been predominantly observed in this study. They account for most of the increase in overall CPUE. The CPUE for loggerheads alone has been greater than 0.30 turtles per hour, while the value reported in Henwood and Stuntz was 0.0456 turtles per hour. The rates of taking for leatherback and Kemp's ridley turtles in the Atlantic study area have also been higher than anticipated.

The high relative density of sea turtles during 1997 may be due to an unseasonably warm winter or other factors contributing to annual variations in abundance, due to an actual increase in the abundance of benthic immature sea turtles in the loggerhead population, or due to a combination of these factors. Trends in the status of loggerheads are generally identified at the nesting beach, when the most accessible life stage, adult nesting

females, can be counted. Because they mature at 20 to 30 years of age, increases or decreases in the abundance of benthic immature loggerheads as determined by incidental captures in nearshore waters would not be observed for decades. While nesting beach surveys suggest that the South Florida population of loggerheads increased and now appears to be stable, increases have not been apparent on nesting beaches of Georgia and South Carolina. Further work on the development of multi-year in-water sampling sites is needed to identify trends in multiple age-classes of the loggerhead population.

The COE noted that 14 of the 28 takes that occurred during 1997 were on the same dredge, the Eagle. The high rate of takes, particularly on this dredge, suggested that the deflecting draghead was not installed properly or was not being operated properly. Takes occurred in a number of the 1997 dredge projects during clean-up. Ridges left behind after the initial dredging are leveled during clean-up, but the draghead passes over troughs. Takes occurring during clean-up may be difficult to avoid since the draghead deflector must remain hard on the bottom to be effective.

The COE has been conducting meetings between districts within the SAD to discuss the results of assessments of channel conditions and dredge inspections. They have determined that the draghead deflector has not been working properly due to poor education of the dredge operators on its proper use, and due to poor tailoring of the deflector to specific dragheads. Increased efforts to educate dredge operators are planned. Additionally, since fewer than 10 private hopper dredges operate within SAD, engineers that have designed the conceptual deflector will be sent to the dredges to insure that the deflectors are adapted to each draghead and that the operators understand how to use the deflector effectively.

CUMULATIVE EFFECTS

"Cumulative effects" are those effects of future state or private activities, not involving Federal actions, that are reasonably certain to occur within the action area of the Federal action subject to consultation. These are discussed in detail in the biological opinions incorporated by reference.

Conclusion:

NMFS believes that the elevated rate of observed sea turtle takes by dredges in the southeastern United States during March of 1997 was likely due to increased abundance of loggerheads in nearshore waters due to an unseasonably warm winter. There is no way to predict whether similar conditions will be encountered in upcoming seasons. Over the past six years, the COE's SAD has

continuously expressed a commitment to minimize sea turtle takes, and has conducted research and taken repeated steps to further this goal. Repeated termination of dredging operations due to high sea turtle takes during 1997 confirms their commitment to avoid sea turtle takes. Further efforts to educate the dredging industry and recruit their interest and involvement in avoiding sea turtle takes are necessary and are planned by the COE. Additionally, the COE has committed to additional efforts to improve the effectiveness of the deflecting draghead. The sea turtle deflector should be tailored to each hopper dredge draghead and the dredge operators should be fully trained in the operation of the draghead to ensure proper use and improve effectiveness. Improvements in operator and deflector performance are necessary prior to reliance on the draghead as a mechanism for reducing sea turtle takes.

NMFS anticipates that the COE's interest in improving the performance of the deflector, their commitment to limit the use of hopper dredges in channels of high sea turtle abundance during periods when nearshore waters are likely to be cold, and their overall goal of further reducing sea turtle takes during hopper dredge activities will minimize the interactions of hopper dredges with sea turtles. However, annual variation in the abundance of sea turtles in some channels and borrow areas make it likely that sea turtle takes will still occur. Additionally, overall increases in loggerhead and Kemp's ridley populations are anticipated due to TED requirements that have reduced the mortality rates of benthic lifestages of these species. Lastly, in some years high levels of hopper dredging activity may be necessary. For example, termination of projects prior to completion during FY 1997 may result in an increase in the number and length of hopper dredging projects necessary for channel maintenance during FY 1998. Therefore, NMFS believes that up to 35 loggerheads may be taken by injury or mortality, as well as 7 Kemp's ridleys, 7 green turtles, 2 hawksbills, and 5 shortnose sturgeon. These takes are not likely to jeopardize the continued existence of these species and the ongoing commitment by the COE to further minimize takes may reduce the likelihood of sea turtle takes in the future even if nearshore sea turtle abundances increase.

Conservation Recommendations

Pursuant to section 7(a)(1) of the ESA, conservation recommendations are made to assist COE in reducing or eliminating adverse impacts to loggerhead, green, and Kemp's ridley turtles that result from hopper dredging in the southeastern United States. The recommendations made in the 1995 BO are pertinent to this consultation as well, and therefore remain valid. Further recommendations are given below.

- Because of the possibility of annual variation in water temperatures, sea turtle abundance, and hopper dredging demand, NMFS has retained the dredging windows established in the 1995 BO. However, the COE has expressed a commitment to deploy hopper dredges during cold-water periods in channels with high sea turtle abundance or with substrates that render the deflector ineffective. NMFS appreciates the COE's commitment to do this, and recommends that the SAD priority list be finalized and distributed to the Districts and NMFS prior to the initiation of dredging during FY 1998.

- The COE should work with the dredging industry to insure their understanding of the importance of sea turtle conservation and to increase the industry's interest in minimizing sea turtle takes.

- Greater than 50% of the loggerheads taken in North Carolina may be from the northern nesting assemblage of loggerheads. While recent loggerhead nesting beach surveys did not identify a decline in the number of nesting females on beaches north of Cape Canaveral, increases observed in the south Florida nesting assemblage have not been noted. High sea turtle catch rates during only the early weeks of the wood debris clean-up conducted by COE off Cape Fear during 1997, as well as preliminary work conducted in North Carolina, suggest that turtles may be abundant in North Carolina channels primarily during migration into and emigration out of North Carolina inshore waters. The COE should work with the NMFS Beaufort Laboratory and the North Carolina Division of Marine Fisheries to document the movements of sea turtles off North Carolina during spring and fall months. Results from these studies may provide insights into further safe dredging windows to minimize the likelihood of takes of loggerheads from the more vulnerable northern nesting assemblage. Summer windows would reduce the pressure to complete all SAD hopper dredging during cold-water periods.

- The COE should investigate further modifications of the draghead to minimize the need for clean-up. Some method to level the peaks and valleys created by dredging would reduce the amount of time dragheads are removed from the bottom sediments.

Incidental Take Statement

Section 7(b)(4) of the Endangered Species Act (ESA) requires that when a proposed agency action is found to be consistent with section 7(a)(2) of the ESA, and the proposed action may incidentally take individuals of listed species, NMFS will issue a statement that specifies the impact of any incidental taking of endangered or threatened species. It also states that reasonable and prudent measures, and terms and conditions to implement the measures, be provided that are necessary to minimize such impacts. Only incidental taking resulting from the agency action, including incidental takings caused by activities approved by the agency, that are identified in this statement and that comply with the specified reasonable and prudent alternatives, and terms and conditions, are exempt from the takings prohibition of section 9(a), pursuant to section 7 of the ESA.

Based on the high rate of sea turtle takes observed during of 1997, increases in the Kemp's ridley population, possible increases in the benthic lifestages of loggerhead populations, annual variation in nearshore abundance of sea turtles and hopper dredge demands, the NMFS anticipates that hopper dredging in the Southeast U.S. Atlantic area of the SAD may result in the injury or mortality of sea turtles and shortnose sturgeon. Therefore, a low level of incidental take, and terms and conditions necessary to minimize and monitor takes, are established. The annual (by fiscal year) documented incidental take, by injury or mortality, of seven (7) Kemp's ridleys, seven (7) green turtles, two (2) hawksbills, thirty-five (35) loggerhead turtles, and five (5) shortnose sturgeon is set pursuant to section 7(b)(4) of the ESA.

To ensure that the specified levels of take are not exceeded early in any project, COE should reinitiate consultation for any project in which more than one turtle is taken within 24 hours, or once five or more turtles are taken. The Southeast Region, NMFS, will cooperate with COE in the review of such incidents to determine the need for developing further mitigation measures or to terminate the remaining dredging activity.

Section 7(b)(4)(c) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under section 101(a)(5) of the Marine Mammal Protection Act of 1972 (MMPA). Since no incidental take in the Atlantic Region has been authorized under section 101(a)(5) of the MMPA, no statement on incidental take of endangered right whales is provided.

The reasonable and prudent measures that the NMFS believes are necessary to minimize the impact of hopper dredging in channels and borrow areas in the southeastern United States have been discussed with COE. The following terms and conditions are established, in addition to those identified in the 1995 BO, to implement these measures and to document the incidental take should such take occur.

1. The COE's draghead deflector engineer that assistant in this design design should inspect the rigid draghead deflector annually to ensure that the deflector has been tailored appropriately to each draghead. Additionally, the inspector should assess whether the dredge operator appears to be familiar with the operation of the draghead deflector and provide necessary training where appropriate.

2. If the rigid draghead deflector appears to be ineffective in Wilmington Harbor and slows the dredging project such that the amount of time the hopper dredge will be deployed is increased, the deflector should be removed from the draghead for that channel.

3. The COE should develop an educational/training program for dredge operators to increase their understanding of how the draghead deflector works and why it is necessary.

SOUTH ATLANTIC COAST HOPPER DREDGING (Calendar Year 97)

Project	Dredge Period	Approximate Amount of Work Completed	Turtle Takes	Mitigative Measures Taken	Remarks
Kings Bay	3/1/97 to 3/12/97	Removed 437,000 out of 821,000 CY Approximately 53% completed.	L 3/2/97 L 3/4/97 L 3/5/97 L 3/6/97 L 3/6/97 L 3/6/97 L 3/8/97 L 3/8/97 L 3/12/97	Sea turtle deflecting draghead used. Jacksonville Dist. specialist inspected deflector on 3/6/97. Relocation trawling started 3/9/97. Extensive, ongoing consultation with NMFS as takes occurred. All work terminated 3/12/97 due to high take levels even though relocation trawling had become operational.	Water temp. 57 to 58 F. Dredge Eagle 1. Two takes in one batch on 3/6/97 and 3/8/97. Contract required removal of relatively small veneer of material. Most takes occurred through starboard dragarm. Rapidity of takes was a surprise to all concerned.
Brunswick Harbor	2/6/97 to 3/19/97	Removed 975,400 CY. Work stopped at 50% completion.	L 3/9/97	Sea turtle deflecting draghead used. Sea turtle abundance, based on visual observations, prompted termination of work because of potential for unacceptable levels of entrainment.	Water temp 63 F. Dredge RN Weeks. Historic abundance of sea turtles and high levels of entrainment in 1991 was part of the reason for termination of work.
Savannah Harbor	3/4/97 to 3/22/97	Removed about 545,500 CY, or about 52% of what could have been dredged.	L 3/14/97 L 3/22/97 L 3/22/97	Sea turtle deflecting draghead used. Dredging terminated so as not to take any more sea turtles.	Water temp. 63 F. Numerous sea turtles sighted. Dredge Ouachita was 'skimming' high areas to bring depth to acceptable levels quickly before leaving for urgent work in Mississippi River.
Charleston Harbor	3/14/97 to 3/26/97	Bid qty 900,000 CY Req. qty 408,000 CY Removed qty 350,000 CY. About 39% completed.	L 3/19/97 L 3/20/97 L 3/21/97 L 3/25/97 L 3/26/97	WES expert / developer of sea turtle deflecting draghead system, conducted onboard inspection and made recommendations. Some changes to draghead and dredging operation made. Relocation trawling performed.	Water temp. 61 F. Dredge Eagle 1.
Myrtle Beach borrow area (Phase 1)	9/15/96 to 5/13/97	Bid qty 2.5 million CY. Work completed.	L 4/15/97 L 5/04/97 L 5/09/97	Sea turtle deflecting draghead used. Relative abundance trawling on 3/28-29/97, with 12 hours of "nets in water", yielded one loggerhead. Trawling on 5/8 thru 5/13/97 yielded no sea turtles.	This is one of 3 phases / reaches of total project. Part of work in all phases is by pipeline dredge. Total quantity of material to be dredged is about 6 million CY
Morehead City Harbor	4/25/97 to 5/16/97)	About 120,000 CY removed out of about 1,720,000 CY. About 7% of work completed.	L 4/27/97 L 4/30/97 L 5/01/97 L 5/02/97 L 5/15/97 L 5/15/97	Sea turtle deflecting draghead. Relocation trawling began 5/8/97 and continued until termination of dredging. One loggerhead captured on 5/9/97. Nighttime trawling performed 5/10 & 5/11 with no turtles captured. Because of concern over extensive takes, dredging terminated with only 7 % of work done.	Dredge Manhatten Island
Wilmington Harbor (Interior Channels)	2/14/97 to 3/13/97	About 217,300 CY removed. Work completed.	No takes		Dredge McFarland
MOTSU	3/14/97 to 4/3/97	About 60,000 CY. removed. Work completed.	No takes		Dredge McFarland
Wilmington Harbor (Ocean Bar)	4/3/97 to 4/30/97	About 300,000 CY Work completed.	L 4/07/97	Sea turtle deflecting draghead.	Dredge RN Weeks
Dade County Beach (Miami Reach)	3/30/97 7/20/97 (estimate)	About 380,00 of 475,000 CY completed as of 6/6/97.	No takes	Based on past dredging and anecdotal information about sea turtlesin area, takes are not anticipated.	

L = Loggerhead CY = Cubic Yards

Table 2a. Sea turtle takes (includes live, injured and killed) observed on hopper dredges prior to the regional consultation. Observers were not required on all projects until 1989, after which extensive monitoring was required.

Year	Project	Turtle Takes
1980 Total = 71	Canaveral	50 Cc, 3 Cm, 18 Unidentified
1981 Total = 6	Canaveral	3 Cc, 1 Cm, 2 Unidentified
1984/1985 Total = 12	Canaveral	1 Cc, 11 Unidentified
1986 Total = 9	Canaveral	5 Cc
	Kings Bay	1 Cc, 3 Cm
1987 Total = 5	Kings Bay	3 Cc, 1 Cm, 1 Unidentified
1988 Total = 46	Brunswick	1 Cc
	Canaveral	13 Cc, 3 Cm, 18 Unidentified
	Kings Bay	6 Cc, 3 Lk, 2 Cm
1989 Total = 21	Canaveral	9 Cm, 2 Unidentified
	Kings Bay	8 Cc, 1 Cm
	Savannah	1 Cc
1990 Total = 12	Canaveral	3 Cc, 5 Cm
	Kings Bay	4 Cc
1991 Total = 43	Brunswick	20 Cc, 1 Lk, 1 Unidentified
	Charleston	3 Cc
	Kings Bay	1 Cc
	Savannah	17 Cc

Cc = *Caretta caretta*, Loggerhead ; Cm = *Chelonia mydas*, Green turtle; Lk = *Lepidochelys kempi*, Kemp's ridley turtle

Table 2b. Sea turtle takes (includes live, injured and killed) observed on hopper dredges between the November 1991 and the August 1995 Regional Biological Opinion

Year	Project	Turtle Takes
1992 Total = 2	Port Royal, SC	2 Cc
1994 Total = 8	Canaveral	1 Cm
	Morehead City	1 Cc
	Kings Bay	2 Cc
	Savannah	3 Cc, 1 Lk
1995 Total = 6	Canaveral	1 Cc
	Palm Beach	3 Cc, 2 Cm

Cc = *Caretta caretta*, Loggerhead ; Cm = *Chelonia mydas*, Green turtle; Lk = *Lepidochelys kempi*, Kemp's ridley turtle

Table 2c. Sea turtle takes (includes live, injured and killed) observed on hopper dredges after the August 25, 1995 Biological Opinion

Year	Project	Turtle Takes
1996 Total = 9	Morehead City Harbor	1 Cc
	Myrtle Beach (Borrow Area Reach I)	2 Cc
	Kings Bay	1 Cc
	Palm Beach	1 Cc, 1 Cm
	Wilmington Harbor	3 Cc
1997 Total = 28	Brunswick Harbor	1 Cc
	Charleston Harbor	5 Cc
	Kings Bay	9 Cc
	Morehead City Harbor	6 Cc
	Myrtle Beach (Borrow Area Reach 1)	3 Cc
	Savannah Harbor	3 Cc
	Wilmington Harbor (Ocean Bar)	1 Cc

Cc = *Caretta caretta*, Loggerhead ; Cm = *Chelonia mydas*, Green turtle; Lk = *Lepidochelys kempi*, Kemp's ridley turtle

TABLE 3: Current requirements for dredging windows, observer requirements and use of hopper dredges in borrow areas along the east coast established in the August 1995 BO.

AREA		SEA TURTLE MONITORING: NAVIGATION CHANNELS		SEA TURTLE MONITORING: BORROW AREAS	
	WHALE MONITORING	WINDOWS	MONITORING	WINDOWS	MONITORING
North Carolina to Pawleys Island, SC (includes channels at Oregon Inlet, Morehead City and Wilmington)	One observer (daytime coverage) between 1 Dec and 31 Mar. Monitoring by dredge operator and sea turtle observer between 1 Apr and 30 Nov.	Year Round	Two observers (100% monitoring) 1 Apr - 30 Nov	Year Round	One observer (50% monitoring) 1 Apr - 30 Nov
Pawleys Island, SC to Tybee Island, GA (includes channels at Charleston, Port Royal and Savannah)	One observer (daytime coverage) between 1 Dec and 31 Mar. Monitoring by dredge operator and sea turtle observer between 1 Apr and 30 Nov.	1 Nov - 31 May	Two observers (100% monitoring) 1 Nov - 30 Nov and 1 Apr - 31 May	Year Round	One observer (50% monitoring) 1 Apr - 30 Nov
Tybee Island, GA to Titusville, FL (includes channels at Brunswick, Kings Bay, Jacksonville, St. Augustine, and Ponce de Leon Inlet)	Aerial surveys in right whale critical habitat, 1 Dec thru 31 Mar. One observer (daytime coverage) between 1 Dec and 31 Mar.	1 Dec - 15 Apr	Two observers (100% monitoring) 1 Apr - 15 Apr	Year Round	One observer (50% monitoring) 1 Apr - 15 Dec
Titusville, FL to Key West, FL (includes channels at West Palm Beach, Miami and Key West)	Whale observations are not necessary beyond those conducted between monitoring of dredge spoil.	Year Round	Two observers (100% monitoring) year round	Year Round	One observer (50% monitoring) year round

APPENDIX C

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
BUREAU OF PROTECTED SPECIES
MANAGEMENT STANDARD MANATEE CONSTRUCTION CONDITIONS
JUNE 2001

APPENDIX C

Florida Fish and Wildlife Conservation Commission, Bureau of Protected Species Management Standard Manatee Construction Conditions - June 2001

The permittee shall comply with the following manatee protection construction conditions:

a. The permittee shall instruct all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel are responsible for observing water-related activities for the presence of manatee(s).

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act of 1972, The Endangered Species Act of 1973, and the Florida Manatee Sanctuary Act.

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

d. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

e. If manatee(s) are seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet of a manatee. Operation of any equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment. Activities will not resume until the manatee(s) has departed the project area of its own volition.

f. Any collision with and/or injury to a manatee shall be reported immediately to the FWC Hotline at 1-888-404-FWCC. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-232-2580) for north Florida or Vero Beach (1-561-562-3909) in south Florida.

Temporary signs concerning manatees shall be posted prior to and during all construction/dredging activities. All signs are to be removed by the permittee upon completion of the project. A sign measuring at least 3 ft. by 4 ft. which reads *Caution: Manatee Area* will be posted in a location prominently visible to water related construction crews. A second sign should be posted if vessels are associated with the construction, and should be placed visible to the vessel operator. The second sign should be at least 81/2" by 11" which reads *Caution: Manatee Habitat. Idle speed is required if operating a vessel in the construction area. All equipment must be shutdown if a manatee comes within 50 feet of operation. Any collision with and/or injury to a manatee shall be reported immediately to the FWC Hotline at 1-888-404-FWCC. The U.S. Fish and Wildlife Service should also be contacted in Jacksonville (1-904-232-2580) for north Florida or in Vero Beach (1-561-562-3909) for south Florida.*

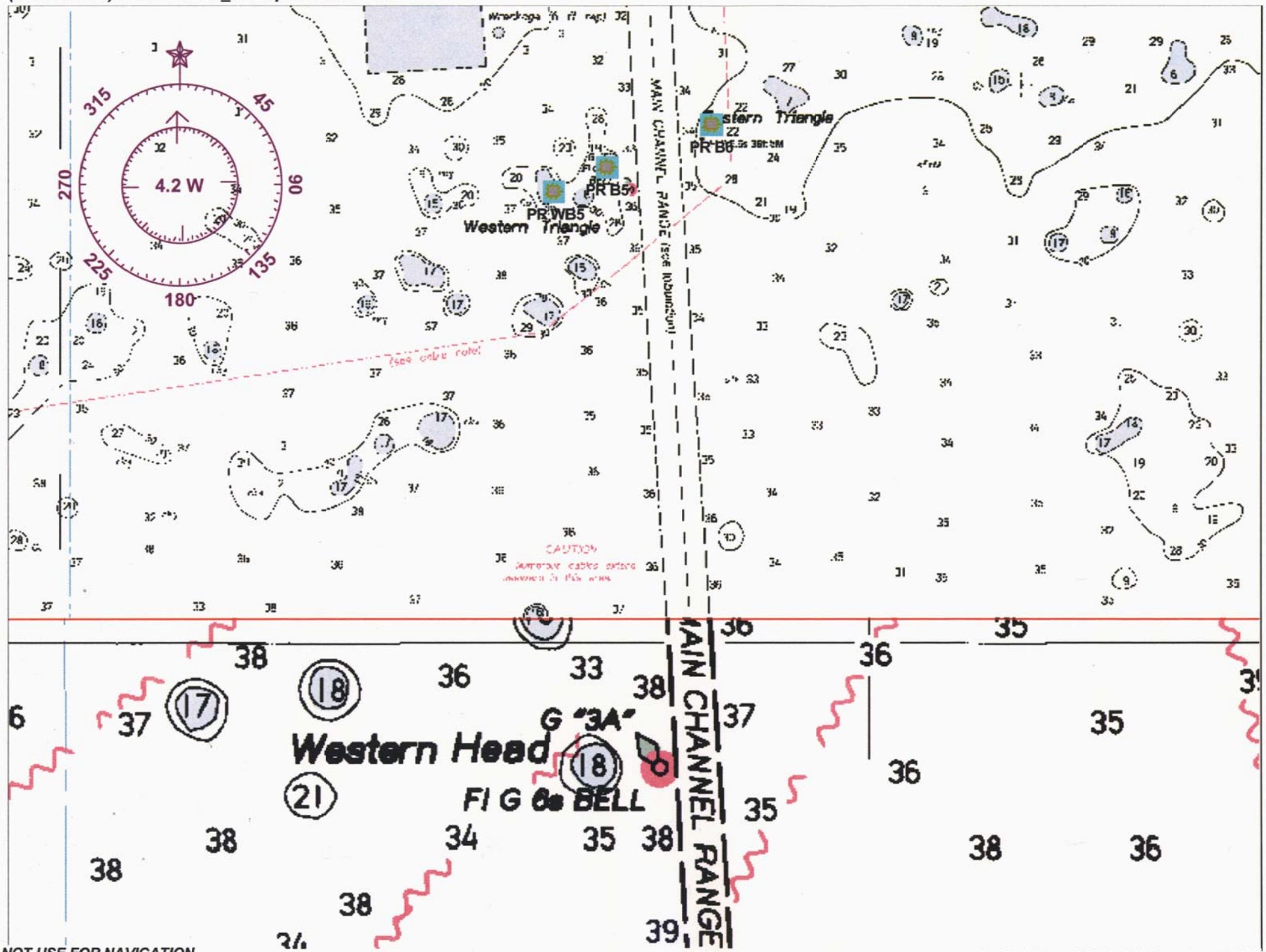
APPENDIX D

FLORIDA KEYS NATIONAL MARINE SANCTUARY
NO ANCHOR ZONE LOCATIONS

Source: Lauri MacLaughlin, NOAA

SUGARLOAF KEY TO KEY WEST - 1 : 32,896

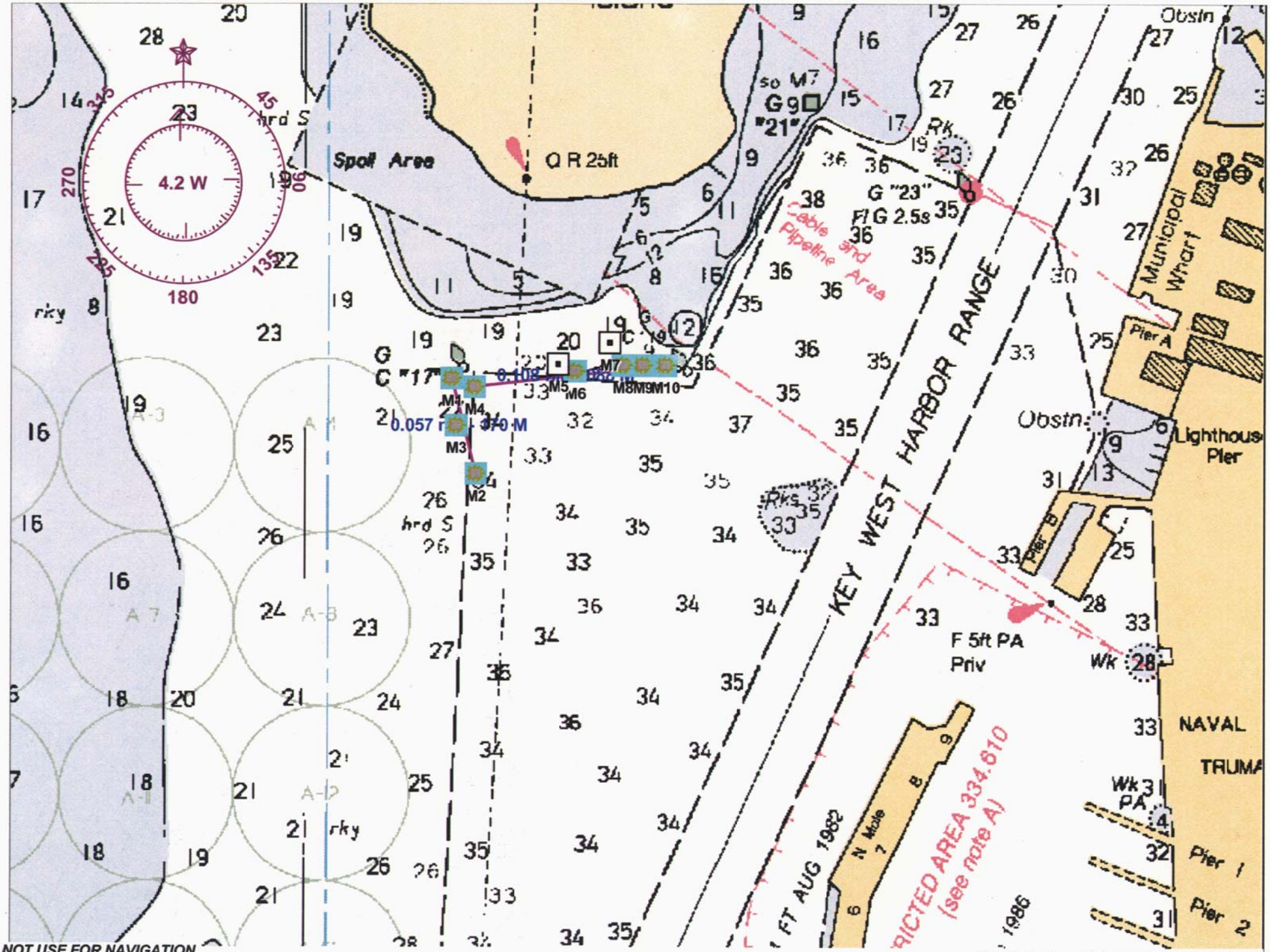
(NOAA Chart) Chart #11445_2 - Depth Units: FEET



DO NOT USE FOR NAVIGATION

KEY WEST HARBOR AND APPROACHES - 1 : 16,448

(NOAA Chart) Chart #11441_1 - Depth Units: FEET



DO NOT USE FOR NAVIGATION

FKNMS NO ANCHOR ZONES

Inital Draft
3/14/03

GPS COORDINATES	RADIUS OF BUFFER AREA	HABITAT TYPE
24° 30.538' N	0.010 nm	PATCH REEF
81° 48.322' W		W-NW of Bell Buoy 5
24° 30.511' N	0.025 nm	PATCH REEF
81° 48.390' W		PR W of Bell Buoy 5
24° 30.587' N	0.025 nm	PATCH REEF
81° 48.198' W		E-NE of Buoy 6
24° 29.830' N	0.037 nm	PATCH REEF
81° 48.298' W		Western Head
24° 28.339' N	0.025 nm	PATCH REEF
81° 48.280' W		S end Main Ship Char
24° 33.4781' N	0.010 nm	Muir wreck
81° 43.1664' W		Boca Chica Channel
24° 33.513 to 24° 33.485' N	10 meter wide	Cut Legde Coral HB
81° 48.908 to 81° 48.906' W	linear 0.057 nm track	KW Turning Basin
24° 33.507 to .517 to .520 to .521 to .520	10 meter wide	Cut Ledge Coral HB
81° 48.894 to .832 to .802 to .790 to .776	linear 0.108 nm track	KW Turning Basin

APPENDIX E

LETTERS RECEIVED
FROM
AGENCIES

United States Department of the Interior

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

January 30, 2003

D. J. Molzan
Department of the Navy
Naval Facilities Engineering Command
Southern Division
Post Office Box 190010
North Charleston, South Carolina 29419-9010

Service Log No.: 4-1-03-TA-266
Project: Naval Air Facility
Key West Modernization
County: Monroe

Dear Mr. Molzan:

Thank you for your letter, dated October 9, 2002, in which you request the Fish and Wildlife Service's (Service) input to identify any significant environmental and socio-economic issues within the realm of our mission that should be addressed in your Environmental Assessment (EA). This letter provides Technical Assistance on the project described below.

PROJECT DESCRIPTION

The Department of the Navy (Navy) is preparing an EA for Fleet shore infrastructure support upgrades and improvements to Naval facilities in and around Key West. The purpose of this work is to provide adequate shore facility support for modern naval assets, allowing the Navy to fulfill its readiness. Proposed projects include: Naval Air Facility (NAF) runway improvements, vegetation removal in the safety areas, drainage improvement throughout the facility; construction of a new operations center in Truman Annex, improvements to maintenance facilities; Truman Harbor security improvements; utility improvements for the mole pier at Truman Harbor; dredging in Truman Harbor; and dredging the Key West turning basin and shipping channel. The action will increase flight operations at NAF and port-calls by naval craft in Truman Harbor. The project locations include NAF Boca Chica Key, Truman Annex, Truman Harbor, Key West turning basin, and the Key West shipping channel, in Key West, Monroe County, Florida.

THREATENED AND ENDANGERED SPECIES

The Service has reviewed the occurrence records in our data base for locations of federally listed threatened and endangered species on or adjacent to your project. Listed species known to occur within the project area include the endangered Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*), the endangered silver rice rat (*Oryzomys palustris natator*), the endangered West Indian manatee (*Trichechus manatus*), the threatened bald eagle (*Haliaeetus leucocephalus)*, the threatened piping plover (*Charadrius melodus*), the threatened roseate tern (*Sterna dougallii dougallii*), the endangered green sea turtle (*Chelonia mydas*), the endangered hawksbill sea turtle (*Eretmochelys imbricata*), the endangered leatherback sea turtle (*Dermochelys coriacea*), and the threatened loggerhead sea turtle (*Caretta caretta*).

The Service has not conducted complete site inspections to verify species. However, we assume that listed species occur in suitable ecological communities and recommend site surveys to determine the presence or absence of listed species. Ecological communities suitable for listed species can be found in the species accounts in the *South Florida Multi-Species Recovery Plan* (1999). This document is available on the internet at *http://verobeach.fws.gov/Programs/Recovery/esvb-recovery.html.*

We have also provided for your consideration two computer links: (1) *http://verobeach.fws.gov/Programs/Permits/Section7.html.* This is a table of species by county that are protected as either threatened or endangered under the Endangered Species Act of 1973 (ESA), as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*) for counties in south Florida. Because this matrix does not include State-listed species, contact the Florida Fish and Wildlife Conservation Commission at 1-800-342-5367 to identify those species potentially present in the vicinity; and (2) *http://migratorybirds.fws.gov/.* This list represents species that the Service is required to protect and conserve under other authorities, such as the Fish and Wildlife Coordination Act, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*) and the Migratory Bird Treaty Act (40 Stat. 755; 16 U.S.C. 701 *et seq.*). A variety of habitats in Monroe County occasionally provide resting, feeding, and nesting sites for a variety of migratory bird species. As a public trust resource, migratory birds must be taken into consideration during project planning and design.

In addition, the Service also responded by letter (enclosed), dated July 15, 2002, to Commander Cotton at the NAF Key West. This letter provided recommendations to the Navy regarding species-specific issues associated with airfield safety clearances and drainage system improvements project.

FISH AND WILDLIFE RESOURCES

Fish and wildlife resources that exist in the project areas include mangrove wetlands, fresh water wetlands, submerged aquatic resources (SARs) such as coral reef community hardbottom, patch reefs, bank reefs, seagrass beds, and algal vegetated shallows. The Service recommends that the EA provide an inventory of affected habitats and associated species, as well as identification of a suite of specific measures which address avoidance, minimization, and mitigation efforts for the various projects.

In addition, we recommend the EA address impacts associated with the dredging project. Avoidance measures addressed can include siting the pipeline, to avoid SAR impacts. Minimization measures can include transplanting hard corals from the dredge sites. Mitigation measures provide the greatest number of options. These include restoration of wetlands, filling of deep water canals so they can support SARs, wetland restoration, exotic vegetation removal, and seagrass and mangrove restoration projects.

Thank you for the opportunity to provide these comments. If you have any questions, please contact Andrew Gude at (305) 872-5563.

Sincerely yours,

James J. Slack
Field Supervisor
South Florida Ecological Services Office

Enclosure

cc:
Corps, Miami, Florida w/enclosure
FWC, Tallahassee, Florida w/enclosure
NMFS, Miami, Florida w/enclosure

STATE CLEARINGHOUSE

User: Bob Hall, , ENVIRONMENTAL PROTECTION

Project Information

Project:	FL200301233325
Description:	U.S. Navy - Proposal for Fleet Support and Infrastructure Improvements - Shore Facility Support at Truman Annex Harbor and Boca Chica Airfield - Naval Air Facility Key West - Key West, Monroe County, Florida.
Keywords:	DoN - Fleet Support - NAF Key West, Monroe Co.
Program:	

Review Comments

Reviewer:	FISH and WILDLIFE COMMISSION
Date:	01/31/2003
Description:	NC by Brian Barnett
Comment Type:	○ Draft ◉ Final

STATE CLEARINGHOUSE

User: Bob Hall, , ENVIRONMENTAL PROTECTION

Project Information

Project:	FL200301233325
Description:	U.S. Navy - Proposal for Fleet Support and Infrastructure Improvements - Shore Facility Support at Truman Annex Harbor and Boca Chica Airfield - Naval Air Facility Key West - Key West, Monroe County, Florida.
Keywords:	DoN - Fleet Support - NAF Key West, Monroe Co.
Program:	

Review Comments

Reviewer:	TRANSPORTATION
Date:	02/11/2003
Description:	The proposed project will not impact any FDOT right-of-way or adjacent areas. Therefore no comments are offered to the State Clearinghouse/Florida Department of Environmental Protection for consideration at this time.
Comment Type:	(•) Draft ( ) Final

STATE CLEARINGHOUSE

User: Bob Hall, , ENVIRONMENTAL PROTECTION

Project Information

Project:	FL200301233325
Description:	U.S. Navy - Proposal for Fleet Support and Infrastructure Improvements - Shore Facility Support at Truman Annex Harbor and Boca Chica Airfield - Naval Air Facility Key West Key West, Monroe County, Florida.
Keywords:	DoN - Fleet Support - NAF Key West, Monroe Co.
Program:	

Review Comments Page: Page 6/7

Reviewer:	SOUTH FLORIDA WMD
Date:	02/13/2003
Description:	A consistency determination cannot be made at this time. Based on staff review of the limited information available at this time, it appears that an ERP will be required for the proposed improvements. However, staff cannot determine at this time if the SFWMD or DEP will be the reviewing agency.
Comment Type:	○ Draft ◉ Final

Jeb Bush
Governor

Department of Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

David B. Struhs
Secretary

February 25, 2003

Mr. Darell Molzan, Division Director
Environmental Planning
Naval Facilities Engineering Command
2155 Eagle Drive
No. Charleston, South Carolina 29406

Re: U.S. Navy Proposal for Fleet Support and Infrastructure Improvements, to Prepare an Environmental Assessment for Shore Facility Support at Truman Annex Harbor and Boca Chica Airfield, Naval Air Facility Key West, Key West, Monroe County, Florida

FL200301233325

Dear Mr. Molzan:

The Florida State Clearinghouse, pursuant to Executive Order 12372, Gubernatorial Executive Order 95-359, the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. §§ 4321, 4331-4335, 4341-4347, as amended, has coordinated the review of the above-referenced notice of intent to prepare an Environmental Assessment (EA) for the proposed project.

The Department of Environmental Protection (DEP) provides comments and concerns related to the potential impacts to environmental resources within the Florida Keys National Marine Sanctuary (FKNMS). Direct and indirect impacts might be caused by methods of construction and placement of spoil materials, as well as from the on-going operation of the various projects. The agency recommends that the applicant continue to coordinate with the Department on viable options and evaluate alternatives that will minimize impacts to resources the agency is charged with protecting. Please see the enclosed comments from DEP.

The South Florida Water Management District (SFWMD) indicates that a consistency determination cannot be made at this time because of the limited amount of information that has been provided. The district states that it appears that an Environmental Resource Permit (ERP) will be required for the proposed improvements. Please see the enclosed comments from SFWMD.

The Florida Department of Transportation (FDOT) states that the proposed project will not impact any FDOT rights-of-way or adjacent areas; therefore, that agency has no recommendations for developing the Environmental Assessment. Please see the enclosed comments from the FDOT.

Based on the information contained in the scoping notification and the comments provided by our reviewing agencies, as summarized above and enclosed, the state has determined that, at this stage, the above-referenced project is consistent with the Florida Coastal Management Program (FCMP). All subsequent environmental documents prepared for this project must be reviewed to determine the project's continued consistency with the FCMP. The state's continued concurrence with the project will be based, in part, on the adequate resolution of issues identified during this and subsequent reviews.

Thank you for the opportunity to review this project. If you have any questions regarding this letter, please contact Mr. Bob Hall at (850) 245-2163.

Sincerely,

Sally B. Mann

Sally B. Mann, Director
Office of Intergovernmental Programs

SBM/rwh
Enclosures
cc: Jim Golden, SFWMD
Sandra Whitmire, DOT
Gordon Romeis, DEP, Ft. Myers

Memorandum

Florida Department of
Environmental Protection

Florida State Clearinghouse

FROM: **Robert W. Hall, Environmental Specialist**
Office of Intergovernmental Programs

DATE: **February 25, 2003**

PROJECT: **U.S. Navy Proposal for Fleet Support and Infrastructure Improvements, to Prepare an Environmental Assessment for Shore Facility Support at Truman Annex Harbor and Boca Chica Airfield, Naval Air Facility Key West, Key West, Monroe County, Florida**

FL200301233325

The Department has reviewed the above-referenced project and offers the following comments and concerns to be evaluated in the Environmental Assessment for this project.

Background

The U.S. Navy proposes to increase fleet support and provide infrastructure improvements and shore facility support at Truman Annex and Boca Chica Airfield of Key West Naval Air Facility. The purpose of the proposed project is to increase training support capacity for Navy and other military branch ship and aircraft detachments. Major project components include maintenance dredging and rehabilitation of the Mole Pier. Waterway and Mole Pier improvements will allow access for more and larger Navy vessels, including cruisers and frigates, and will support up to 150 cruise ship dockings per year. The dredging of 1.4 million cubic yards of fill from Truman Harbor, Key West Harbor and Main Ship Channel will impact approximately 465 acres of previously dredged bottom and will disturb an additional, unknown amount of bottom from anchor damage, pipeline placement and other activities incidental to the dredging. Dredged material will be disposed at upland sites for use in construction and within a rock pit to create 7.2 acres of shallow water marine habitat. Neither permanent nor temporary resource losses have been calculated for lost marine, submerged or wetland resource values attributable to this project.

Potential Impacts

Unavoidable direct damage to benthic communities due to dredge operations at the cutterhead, barge anchors, anchor cables, spuds, dredge pipelines, vessel traffic and pier construction will occur. Turbidity and siltation impacts to benthic communities, including patch reefs and hardbottom types, are expected to be variable. Impacts will decrease with distance from the source, but may be dispersed and perhaps catastrophic with a break in the pipeline, which runs 10 miles from the dredge to disposal sites and consists of several turns, booster pumps and various arrangements for flotation or submersion. Entrainment of marine organisms and submerged cultural resources by hydraulic dredging cannot be avoided. Smaller benthic, cryptic and less mobile species and artifacts such as Civil War era bottles and older artifacts are most susceptible to entrainment. Unavoidable underwater noise, light and visual disturbances during construction operations will adversely affect fish, marine turtles, marine mammals and colonial seabird movements. Such affects as well as collision risks should decrease with the construction completion but may continue as secondary impacts with operation of the facilities improved by the project.

The Navy has submitted and revised a Joint Application for the maintenance dredging and is preparing an Environmental Assessment for the project. The Navy has modified the project design to reduce or avoid many project impacts and has responded to many agency concerns. Comments provided to agency regulatory officers to date have focused on the dredging and disposal elements. Mole pier rehabilitation and operation will generate additional concerns:

- Demolition and construction impacts;
- Operational issues such as vessel pumpout, fueling, ballast water exchange and solid waste and cargo off loading;
  Secondary impacts from additional large ships (turbidity, propwash, collisions, etc.).

Because of these concerns, the Office of Coastal and Aquatic Managed Areas recommends that the Navy conduct at minimum:

Close project coordination with and field approvals of Florida Keys National Marine Sanctuary staff for environmental operations issues such as barge/dredge positioning, pipeline placement, benthic organism transplantation, and decisions on the cessation of activities due to excessive turbidity or sedimentation;
Entrainment avoidance procedures and debris screening for observation of natural and cultural resource impacts;
Implementation of slow vessel traffic speeds for the project area, and for Truman Harbor and the main Ship Channel for large ships after the project;
Implementation of boater education programs;
Implementation of Best Management Practices for port operations (marine sanitation, solid waste management, ballast water, etc.) at the Mole Pier and Truman Harbor;
Long term monitoring of large ship impacts with Key West Harbor and Approaches, including for water borne pollutants, turbidity and aquatic nuisance species.

It is recommended that the above potential impacts to environmental resources be evaluated in the Environmental Assessment and that alternatives for avoiding and minimizing impacts to the resources be thoroughly explored. An Environmental Resource Permit will be required for the work anticipated by this undertaking, and the applicant should continue to work with the Department's Bureau of Coastal and Wetland Resources, the FKNMS staff and other responsible offices of the department, to explore mutually acceptable alternatives.

Questions related to these comments should be referred to Mr. Fritz Wettstein, Lower Region Manager, Florida Keys National Marine Sanctuary, at 305/292-0311. Please contact Bob Hall at 850/245-2168 with questions related to this memorandum.

Mr. James M. Hudgens
President
CZR Incorporated
1601 East Indiantown Road, Suite 100
Jupiter, FL 33477-5143

March 14, 2003

Dear Mr. Hudgens:

The Florida Keys National Marine Sanctuary (FKNMS or Sanctuary) reviewed the Prelimnary Draft Environmental Assessment (EA) that was forwarded to our offices on February 11, 2003.

The EA evaluates the proposal of the United States Department of the Navy (Navy) to maintenance dredge 1,400,000 cubic yards of material from 456.4 acres of submerged bottom in the Key West Harbor Entrance Channel, Truman Annex Harbor and Key West Harbor Turning Basin. The purpose of the proposed dredging is to facilitate national security missions that require vessel access to Key West harbor. Dredge spoil will be transported via a pipeline to a disposal sites at East Rockland Key and on Boca Chica Key. The EA is also meant to apply to the issuance of the Department of Army (DA) Corps of Engineers Section 404 permit for the project.

The issuance of an approval for this project by the FKNMS is also subject to the requirements of NEPA. In the interest of meeting these requirements as efficiently as possible, FKNMS conducted its review of the referenced EA, not as a commenting agency, but with the intent to adopt the document as its own. However, in order for the FKNMS to be able to adopt this document to meet its NEPA requirements, the substantive and general comments outlined in this letter must be addressed. Our technical and specific comments are listed in an attachment to this letter (Attachment A). The following comments are our general and substantive comments.

1. *Subpens Disposal Site References*: The EA includes constant reference to "Supens" and "dead end canals on Boca Chica Key" as the primary dredge spoil disposal site throughout the body of the text. It is our understanding that the submarine pens on Boca Chica Key are no longer under consideration for dredge spoil disposal due to the presence of benthic marine resources and restrictive owner-imposed conditions to use uplands. Reference to this site should be removed and replaced by the selected Rockland Key quarry pit disposal site.

2. *Description of Full Support and No Action Alternatives*: The EA lacks descriptive sections of the other alternatives in Chapter 2, which precludes us from completing our evaluation of the document. Therefore, the comments herein must be considered preliminary and we may have additional comments upon release of the final EA.

3. *Cumulative Impacts and Other Considerations*: The cumulative analysis seems somewhat incomplete in describing the overall impact and effect the project will have on the resources of the FKNMS. Turbidity may be a significant impact due to the proposed request for a variance. Due to the rejection of proposed special conditions designed for the protection of resources adjacent to and within the project site, the FKNMS continues to have concerns regarding direct impacts. However, in light of our recent teleconference, we are confident these issues are being considered in the project planning. Please see our discussion about Physical Impacts in Attachment A.

4. *Storm Contingency Plan*: The stability of the pipeline throughout the duration of the project and especially through hurricane season is of concern to the FKNMS. We are particularly concerned about the stabilization of the dredge pipeline during storm events and hurricane preparedness. We recommend that the EA mention the need for the contractor to prepare a contingency plan for storms, hurricanes and other project malfunctions (e.g. dredge pipe failure).

The FKNMS offers these comments and look forward to reviewing the draft EA. After the draft EA is released, the FKNMS will review it and the DA permit and determine if these documents adequately meet our requirements and address our concerns. Final approval by FKNMS will require review and formal adoption of the Navy's EA (or preparation by FKNMS of a separate or supplemental EA) and finding by FKNMS of no significant impacts.

Sanctuary staff is committed to working with the Navy and the DA to ensure that the impacts to benthic habitats and water quality are minimized and your cooperation is appreciated. Please address any questions you may have concerning the above comments to Lauri MacLaughlin at (305) 852-7717 x27 or Lauri.MacLaughlin@noaa.gov.

Sincerely,

Billy D. Causey
Superintendent

cc: Will Sloger, Ron Demes, United States Department of Navy
Fred Ayer, Keith Spring, CSA
Paul Kruger, Department of Army
Audra Livergood, Jocelyn Karazsia, NOAA National Marine Fisheries Service
Martin Seeling, FDEP Bureau of Beaches and Wetland Resources
Elizabeth Bergh, Florida Department of Environmental Protection
John Armor, Bruce Terrell, National Marine Sanctuary Program
Bill Kruczinski, Fred McManus, EPA
Fritz Wettstein, Florida Keys National Marine Sanctuary
John Halas, Harold Hudson, Florida Keys National Marine Sanctuary

ATTACHMENT A

PRE-RELEASE DRAFT SECTIONS OF EA
Key West Harbor & Ship Channel Dredging
FKNMS Comments and Revisions
3/14/03

SUBSTANTIVE COMMENTS OR ISSUES:

PHYSICAL IMPACTS:
The proposed activities have the potential to adversely impact coral, seagrass, hardbottom habitats, submerged cultural resources, as well as other Sanctuary resources. These impacts are prohibited by FKNMS regulations without prior written approval. Direct and indirect impacts to Sanctuary resources are addressed in two legislative acts protecting the Florida Keys National Marine Sanctuary (FKNMS). Protection measures are set forth in the Florida Keys National Marine Sanctuary and Protection Act of 1990 (Public Law 101-605) and National Marine Sanctuaries Act of 1972 (16 U.S.C. 1431 et seq., as amended).

Section 306 (1) of the NMSA makes it unlawful to destroy, cause the loss of , or injure any sanctuary resource managed under law or regulations for that sanctuary, (16 U.S.C. 1436 (1)).

FKNMS regulations are set forth at 15 CFR Part 922, Subpart P. The removal of, injury to, or possession of coral or live rock is a prohibited activity throughout the Florida Keys National Marine Sanctuary. These regulations are set forth at 15 CFR 922.163 (a)(2). Our regulations further address impacts to shallow marine resources set forth at:

a) 15 CFR 922.163 (a)(3) by prohibiting alteration of, or construction on, the seabed.
b) 15 CFR 922.163 (a)(4)(i) by prohibiting the discharge or deposit of materials or other matter from within the boundary of the Sanctuary
c) 15 CFR 922.163 (a)(5)(i) by prohibiting operations of vessels in such a manner to strike or otherwise injure coral, seagrass, or other immobile organisms, or to cause prop-scarring. The FKNMS has investigated multiple incidents with barge operations and support vessels causing extensive resource injury within the FKNMS and outside, including along the Boca Chica Channel pass.

NO ANCHOR ZONES. Although this is one of the protection strategies suggested by the FKNMS through the comment process and per discussions with the Navy and their contractors (teleconference comm. 3/10/03), it has been resolved that based on existing Sanctuary regulations **there will be noted a general comment that there will be no activities (anchoring, pipeline placement, vessel operations, etc.) conducted in such a manner as to harm corals, patch reefs, seagrass, hardbottom communities or other Sanctuary resources throughout the project area**. It was also agreed that a small number of NO ANCHOR ZONES may be identified initially and that others may be designated as necessary and encountered during the implementation of the project. Therefore, the FKNMS submits these general no anchor or no impact areas due to the

presence of patch reefs along the edges of the dredge footprint of the main ship channel and Key West Harbor Turning Basin.

TABLE 1: NO ANCHOR ZONES

GPS COORDINATES	RADIUS OF BUFFER AREA	HABITAT TYPE
24° 30.538' N 81° 48.322' W	0.010 nm	PATCH REEF W-NW of Bell Buoy 5
24° 30.511' N 81° 48.390' W	0.025 nm	PATCH REEF PR W of Bell Buoy 5
24° 30.587' N 81° 48.198' W	0.025 nm	PATCH REEF E-NE of Buoy 6
24° 29.830' N 81° 48.298' W	0.037 nm	PATCH REEF Western Head
24° 28.339' N 81° 48.280' W	0.025 nm	PATCH REEF S end Main Ship Chanl
24° 33.4781' N 81° 43.1664' W	0.010 nm	MUIR wreck Boca Chica Channel
24° 33.513 to 24° 33.485' N 81° 48.908 to 81° 48.906' W	10 meter wide linear 0.057 nm track	Cut Legde Coral HB KW Turning Basin
24° 33.507 to .517 to .520 to .521 to .520 81° 48.894 to .832 to .802 to .790 to .776	10 meter wide linear 0.108 nm track	Cut Ledge Coral HB KW Turning Basin

** Please see Attachment B for navigation chart representations.

VESSEL GROUNDINGS and DREDGING IMPACTS. Tugs and barges, support vessels and other equipment have the potential to harm sensitive resources (coral reefs, patch reefs, hardbottom and seagrass communities) adjacent to the project site by dragging cables, placement of anchors and vessel grounding during the project activity, mobilization and demobilization. The FKNMS staff members have recorded and investigated multiple cases of such injuries caused by contractors implementing nearshore development projects, beach renourishment projects and marine construction activities. The Boca Chica Channel is especially susceptible to injury due to the shallow depths, narrow widths and the potential use of heavy equipment for the placement and maintenance of the dredge spoil disposal pipeline.

SEDIMENTATION and TURBIDITY

Turbidity levels have heavily impacted corals adjacent to the harbor and ship channel, especially to the west. Ship generated turbidity is clearly differentiated and distinguished from natural background turbidity. Turbidity profiling for Hawks Channel or Boca Chica

Channel has not been addressed. These are important resource areas and are significant due to the dredge spoil disposal pipeline routing. The potential for pipeline breach and the deposition of sediment is a threat to FKNMS resources. Baseline data is necessary for these routes relative to the activity of pipeline placement and should there be a pipeline breach at any point during the dredge operations. Monitoring during and post-construction will help identify problems as they arise, and provide the FKNMS and Key West community with the needed information about the benefits of maintenance dredging.

CLAM SHELL DREDGING. The FKNMS is concerned about the constant reference to clam shell dredging technology and the application of this technique at the project site. There are turbidity and direct disturbance issues related to the use of this technique. The FKNMS recommends that language regarding this technique be toned down throughout the EA, reflect minimized allowed use of the technology, and require use of hydraulic equipment options as the primary dredging tool. This is consistent with recommendations discussed by the Florida Department of Environmental Protection.

STORM AND GENERAL CONTINGENCY PLAN
The project duration extends through hurricane season so this is a critical issue for the FKNMS. Disposal pipeline stability in a storm event is of particular concern to the FKNMS. The FKNMS recommends that the EA mention the need for the contractor to prepare a contingency plan to address storms, hurricanes and project malfunctions (e.g. dredge pipe failure).

TECHNICAL COMMENTS OR ISSUES (NON-SUBSTANTIVE)

CHAPTER 2: DESCRIPTION OF THE PROPOSED ACTION ALTERNATIVE AND OTHER ALTERNATIVES

FULL SUPPORT ALTERNATIVE and NO ACTION ALTERNATIVE. These alternatives have not been adequately defined in the Pre-Release Draft EA (Chapter 2: Description of the Propose Action Alternatives and **Other Alternatives**) for the FKNMS to complete an evaluation of the EA. Therefore, these comments must be considered preliminary and we may have additional comments when the final EA is released.

CHAPTER 3: AFFECTED ENVIRONMENT

FKNMS and Protection Act Reference. Insert citations for, and discussion of, The Florida Keys National Marine Sanctuary and Protection Act of 1990 (Public Law 101-605) and National Marine Sanctuaries Act of 1972 (16 U.S.C. 1431 et seq., as amended),
-> p. 22, Existing Conditions, Biological Resources Section 3.3, last paragraph
This important resource management program existing Keys-wide, is responsible for marine resource protection within the project area. Please refer to your copy of the FKNMS Management Plan, Vol. III, Appendix A; and Vol. I, 15 CFR 922.163 Subpart P (p. 118). The regulations are also presented above in the Physical Impacts section.

- also, add FKNMS or NMSP to the Truman Annex paragraph, p. 3… We believe the reference to National Marine Fisheries Service may be incorrect here.

SUBPENS References Edited. Replace and re-write references to the "dead end canals on Boca Chica" or "Subpens," as the disposal site, to reflect change of disposal site to the Rockland Key, Key Iron Works quarry pit, throughout the document, specifically:
p. 31 (top ¶), p. 35 (bottom ¶), p. 36 (3rd ¶), p. 69 (top ¶ and mid-page 5th ¶), p. 71 (mid-page 4th ¶), p. 72 (mid-page, 4th ¶), p. 73 Table 4.1 (end of title), p. 75 (2nd ¶), p. 77 (3rd ¶), p. 79-80 (bottom, then top), p. 93 (top, mid paragraph), p. 95 (2nd ¶), p. 96 (2nd ¶)].

Hawk Channel & Boca Chica Channel References. Add reference to Hawk's Channel and Boca Chica Channel throughout EA text when discussing project sites and areas included – for example "Truman Harbor, Turning Basin, ship channel." These two channels are also part of the overall project area due to the disposal pipeline and must be included in the descriptions of environment, resources that may be impacted, and resource protection measures.
-> p. 35 (bottom ¶, end 1st sentence),
-> p. 36, add Key West Harbor, Boca Chica Channel to 2nd paragraph, 4th sentence, based on surveys conducted in December; also add Boca Chica Channel to 3rd paragraph 5th sentence (and delete dead end canals) and to 5th paragraph last sentence
-> p. 38, top paragraph, last sentence
-> p. 39, 2nd paragraph, last sentence, add to end
-> p. 41, 1st paragraph, end of 2nd to last sentence
-> p. 71, 4th paragraph, add to end of last sentence
-> p. 73, Table 4.1, add to end of title "and pipeline placement along Hawks Channel, Boca Chica Channel"
-> p. 74 (2nd paragraph, add to end of last sentence)

Turtle Statistics. (p. 41-43, Section 3.3.3.3.) Please enhance your statistics throughout this section. We have a significant transient turtle population in the Lower Keys, such that collisions and injured turtles are a regular occurrence for us. As the project is proposed to start in April and extend for 9 months, it will be starting during the beginning of nesting season (April to September) and extend into the hatchling season (November, late fall). Please include a discussion of the nesting season and address what precautions "will" be implemented in latter sections of the EA.

The prevalence of hawksbills along the local reef tract seemed underplayed. They are routinely encountered during FKNMS staff's offshore management projects in the Lower Keys. Capt. Mike Hall (of Discovery Glass bottom Boat, and the former Save-a-Turtle president) has a particular interest in those residing at Eastern Dry Rocks and has applied for a grant to begin studying them. He is probably a good source for anecdotal (yet quantitative) information on those near the ship channel as he works Eastern Dry Rocks daily.
Additional Information – Local Sources
- Mike Hall, Save-a-Turtle (305-304-2968)
- Pat Wells, DEP nesting beach coordinator for Keys (305-664-2540)

• Tom Wilmers, USFWS Refuge Biologist (305-872-2239)

Another source of statistics that must be considered includes the turtle stranding network, which may provide information about marine collisions with turtle species. The FKNMS considers this an important contact as we find the EA lacking marine life collision information.

• Allen Foley, Turtle Stranding Network managed by Florida Marine Research Institute, St. Petersburg, FL (727-896-8626).

CHAPTER 3: AFFECTED ENVIRONMENT: Existing Conditions – BENTHIC BIOLOGICAL CHARACTERIZATIONS

BENTHIC CHARACTERIZATIONS

Many benthic characterizations and descriptions were left out of the draft text. Please add descriptions of coral and hardbottom resources surveyed during the December and January interagency field surveys, including species lists for corals, octocorals, sponge and algae. Specifically lacking were the following:

Overview/Platform Margin Reefs (bank reefs). Another well developed bank reef in close proximity to the project site, but not mentioned is Rock Key reef (p. 30, 2nd paragraph, 3rd sentence), please add this site.

Truman Annex Harbor. Seagrass community along southwest corner & NOAA docks along southeast seawall not mentioned in text – these are existing conditions that must be mentioned and avoided (p. 31, paragraph 1)

Northwest corner of Turning Basin. Coral, sponge and algal communities exist along cut ledge walls of the original dredge footprint, south and southwest of can buoy #17 ,
-> p. 31, 3rd paragraph and last paragraph, Turning Basin and Ship Channel section
-> p. 32, 1st paragraph, top of page with "north of Turning Basin…."; please make sure that the presence of coral is discussed in this paragraph
** Please reference the FKNMS report for more information, Attachments B & C.

Cut B. Cut B survey findings from January '03: Hardbottom communities bordering cut ledges of the original dredge footprint along east and west sides of Cut B; coral, octocorals, sponge & algal encrusting upper ledges and sides of ledge walls
-> p. 31, 3rd paragraph and last paragraph, Turning Basin and Ship Channel section
-> p. 32, 2nd paragraph, Cut B descriptions; also the 3rd paragraph discussing a hardbottom community west of Cut B should include a list of coral species, sponge, octocorals and macro algae also if possible.
-> p. 71, 4th paragraph, 5th sentence; Direct Disturbance: add "east and west cut ledge walls of the original dredge footprint" to Cut B reference to coral hardbottom benthic communities

Boca Chica Channel. Benthic characterization is not accurate and/or confusing to follow, (p. 33, last paragraph). Please reference the FKNMS report for more information, Attachment C. During December field surveys we observed the following -
-> CORALs: text is completely lacking in the describing the findings of corals encrusting the vertical rock faces and upper ledges of the cut walls bordering the east side of the northern section of the channel

-> the channel bottom is definitely not devoid of seagrass at center – perhaps this final paragraph should be split into two descriptions & paragraphs as the communities observed in the Northern extent of the channel (cut ledges and hardbottom devoid of seagrass) are completely different from the soft sediment, 'hummock' Halimeda hash sandy substrate with corals, octocorals and seagrass moguls characteristic in the southern portion of the channel
-> also, important to note the extent of coral cover along the bottom of the southern end of the channel – octocorals colonization is very prominent and diverse, many isolated stony coral colonies also noted
-> no mention of Muir wreck here, submerged cultural resources here should at least be noted
-> dense seagrass communities at the approach to the channel and seagrass patches encountered intermittently throughout the southern and eastern portion of channel (daymarkers # 2 to 10)

Dead-end Canals. Dead-end or "Subpens" survey findings. (p. 34, 2nd paragraph), no mention of tunicates (ascidians), serpulid worms, mollusks (oysters, mussels, snails), sea anemones, sea cucumbers or corals colonizing the canal walls; no mention of mangrove or turtle grass (*Thalassia testudinum*) fringe along canals; no mention of snapper, mojarra or other fish species present.
-> additionally, uplands adjacent to canals were colonized by Bay Cedar and Joewood

Key Iron Works Rock Pit. Key Iron Works rock pit survey findings are lacking in descriptions of fringing turtle grass along "shallow sill periphery" of the quarry pit, not just on the south and southeastern edges (p. 34, 3rd paragraph, 2nd sentence). No mention of truck chassis with tire piles on western edge (3rd paragraph, last sentence). In addition, decorator crab and *Halodule* were observed on the bottom, center of the quarry (20-25 feet depths). No mention of oysters, anemones or lobster colonizing vertical edges; (5th paragraph). No discussion of the north boundary of the quarry and the shallow wide, sill with dense seagrasses, (*Thalassia* and *Halodule*), macro algae/sponge community and mangrove fringe.

TABLE of EXISTING BENTHIC RESOURCES

The Department of Army Corps of Engineers has requested a preliminary list of GPS coordinates of the areas where impacts from the dredging project must be avoided. The Navy contractors are in need of the list for inclusion in the RFP to go out for bid. It would be very beneficial to many aspects of this project if this section could include a list of coordinates for all sensitive resources (coral, hardbottom and seagrass) recorded and observed during CSA side scan and diver tow surveys (to include those along the pipeline disposal corridor). The list might be presented similar to the FKNMS spreadsheet (Table 1: NO ANCHOR ZONES) and include the following habitats mentioned in the CSA Biological Resource Survey (p. 30-34, Project Area Benthic Resources and Appendix C of the Department of the Navy NAF Joint Application for Environmental Resource Permit):

- PATCH REEFS – mentioned 10 in draft EA, but plotted over 20 on the chart of Figure 3-10 included in the EA, along the ship channel and Hawk's Channel
- Hardbottom communities: sponge, octocorals, macro algae – west and east of Cut B

• Coral Communities bordering cut ledges: Cut B, start/stop coordinates and a swath width (5-10 m) for - 1) East side Northernmost point and Southernmost points surveyed and 2) same for West side, 3) Ft. Zachary Taylor south and 4) west side of Cut B mentioned in EA
• Seagrass Communities south of Stock Island and Key West
Please consider this request to include this list as a Table in the EA. The Sanctuary has included above (Table 1) sites surveyed during the December field surveys and will prepare supplemental lists regarding additional baseline biomarker surveys of patch reefs to be conducted in Spring of 2003.

TURBIDITY
Turbidity impacts could be enhanced with a discussion of Florida Bay mixing, storm water run off and other "upstream" inputs, (pp 50-51). Ship generated turbidity is visually distinguished from natural background turbidity, and is an added stressor to natural systems above and beyond the background and storm event turbidity impacts. This section needs to be refuted by other research and data, (see Attachment D).

Queen Conch Turbidity Impacts. Turbidity impacts on spawning populations of queen conch have not been addressed,
-> p. 37 of EFH analysis,
-> p. 51, 1st paragraph, 3rd sentence
Queen Conch Local Expert: Please contact our local expert about conch impacts
• Bob Glazer, Florida Marine Research Institute, (305-289-2330)

SUBMERGED CULTURAL RESOURCE (SCR)
The Cultural Resource section (3.5) is missing two important references, (p. 52):
-> FKNMS Management & Regulations addressing SCRs should be cited (see 15 CFR 922.163 (a)(9))
-> No mention of public sentiment about SCRs in the turning basin, nor Truman Harbor, Ship Channel or Hawks & Boca Chica Channels – especially bottles, china, pottery
The local public concerns will be dealt with by the FKNMS Lower Region office working with the community. The SHPO Section 106 review is the appropriate process for the EA.

SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE
Maritime Community. Section 3.9 of the EA is lacking a discussion about the maritime industry, (pp. 63-64), a community that will be heavily impacted by the operations of this project. Some of these businesses may benefit from the project while others may feel an impact to the services they provide. For example, it might be appropriate to discuss the management of cruise ship traffic throughout the duration of the project. Other business impacts and hazards may be related to the sections of floating dredge spoil pipeline. The industry includes the following:
-> marinas, charter fleets, private vessels, rental boat operators, ferry services (Ft. Myers, Dry Tortugas), commercial fishing fleets, tow/salvage operators, tug & barge operations (fuel and transient), harbor pilot services, treasure hunters, marine life collectors and, not to mention, cruise ships

-> tourism related to water sports: fishing, coral reef snorkeling/diving, glass bottom tour boats, thrill craft, sightseeing and pleasure cruising craft
-> p. 63, paragraph 1, Transportation: 1) 1st sentence – "the overseas highway travels over **100** miles from Key Largo to Key West…" and 2) there is no mention of marinas & vessel traffic, ferry service, sea planes; also lacking in rental car and rental boat businesses

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

FULL SUPPORT ALTERNATIVE and NO ACTION ALTERNATIVE

These alternatives have not been adequately defined in the Pre-Release Draft EA (Chapter 2: Description of the Propose Action Alternatives and Other Alternatives) for the FKNMS to complete an evaluation of the EA. Therefore, the comments for this section of the EA must be considered preliminary and we may have additional comments when the final EA is released.
-> p. 70, paragraphs 4-6, Full Support Alt., Airfield (4.3.2.2.1.): what are the Hawk Missile Site, AIMD building, and new hanger proposed alternatives?

DREDGE SPOIL DISPOSAL PIPELINE IMPACTS

The FKNMS finds the Chapter 4 text generally lacking in the discussions of the Dredge Disposal Pipeline routing, impacts and overall representation.

Upland Routing of Dredge Spoil Disposal Pipeline

-> p. 66, Land Use (4.1), last sentence and Proposed Action Alternative (4.1.2) not mentioned: lacking in a discussion of the dredge spoil pipeline to be routed via uplands on Boca Chica Key and Rockland Key
-> p.66, please discuss the FKNMS request for upland routing of the of the pipeline beginning at the southwest tip of Boca Chica Key, (to avoid impacts to the extensive benthic marine resources identified along Boca Chica Channel). Please mention why this is not a viable alternative and present the Navy's concerns.
-> In addition, the FKNMS would prefer that the dredge pipeline be floated along the East side of Boca Chica Channel to reduce navigational hazard issues for the heavy boating traffic using the channel.
-> p. 68, Marine Bathymetry, (4.2.3.1) Proposed Action Alternative: lacking in a discussion of impacts to bathymetry resulting from the routing of the dredge spoil disposal pipeline along Hawk's Channel and Boca Chica Channel. Also, if bathymetric surveys were not conducted for these routes, please explain.

DREDGE SPOIL DISPOSAL STOCK PILE SITES

The FKNMS finds the Chapter 4 text generally lacking in the discussions of the Dredge Spoil Upland Disposal Site impacts and representation.
-> p. 68, paragraph 3, Airfield (4.2.2.2.): lacking in a discussion of the dredge spoil disposal site located on uplands on Boca Chica Key
-> p. 68, lacking a paragraph on Ft. Zachary Taylor and discussion of the dredge spoil disposal site(s) located on the premises of this State Park.

-> p. 69, Sediment Quality (4.2.3.2): sediment quality relative to all upland dredge spoil disposal sites (mentioned above) is not addressed here or in the previous Land Use section (4.1)
-> p. 69-70, Biological Resources, Terrestrial/Wetland, Proposed Action Alt., Airfield (4.3.2.1.1.): lacking in a discussion of the dredge spoil disposal site project located on uplands on Boca Chica Key and impacts resulting from this activity.
-> p. 70, lacking a paragraph on Ft. Zachary Taylor and discussion of the dredge spoil disposal site(s) located on the premises of this State Park and impacts resulting from this activity.

DIRECT DISTURBANCE
The FKNMS finds the Marine, Benthic Communities section, (4.3.3.1.), generally lacking in the discussion of several benthic community impacts relating to direct disturbance. These impacts of direct disturbance were discussed above in the Physical Impacts section and below along with specific references for additions to the text body.
Vessel Grounding. Due to the shallow areas where the dredge spoil pipeline will be placed, there needs to be some recognition that vessel groundings are a concern.
Dredge Spoil Disposal Pipeline Impacts.
-> p. 71, Marine, Benthic Communities, Proposed Action Alt., Direct Disturbance, (4.3.3.1.1), 3rd paragraph: the final sentence should be edited to read "…the pipeline may be floated over sensitive resources, imbedded in soft sediments, routed via upland on Boca Chica Key, or as a final option, coral colonies may be relocated."

TURBIDITY/SILTATION
Queen Conch Turbidity Impacts. In the Marine, Benthic Communities, Proposed Action Alternative (4.3.3.1.1), turbidity impacts to spawning populations of queen conch have not been addressed,
-> p. 72, 1ST paragraph, lacking discussion of turbidity impacts to queen conch spawning activity & seasons
-> p. 73, Table 4.1, Matrix lacking Conch and turbidity impacts
Queen Conch Local Expert: Please contact our local about conch spawning impacts
• Bob Glazer, Florida Marine Research Institute, (305-289-2330)
General Turbidity Impacts.
-> p. 72, 2nd paragraph, 5th sentence: lacking mention of the fine sediment material found at the north end of the Main Ship Channel, around the sharp elbow turn and in the vicinity of bell buoy #5 and buoy #7
-> p. 72, lacking a paragraph discussing methods to reduce the possibility of turbidity impacts or methods that might be employed to minimize turbidity impacts – in particular there should be a strategy to minimize or avoid the use of the clam shell methods for dredging as this is not an appropriate alternative for this project site

CONCH EFH
The protected Queen Conch is missing from the Summary Matrix of Impact Producing Factors and Potential Effects on Member of Managed Species Groups and their Habitats (EFH) Expected from Dredging the Ship Channel, Turning Basin, Truman Harbor and

pipeline placement along Hawks Channel, Boca Chica Channel and disposal of dredge spoil at Rockland Key quarry pit,
-> p. 73, Table 4.1: CONCH missing from Matrix, turbidity impacts
-> p. 73, Table 4.1: LOBSTER migration pipeline impacts missing from matrix, under Entrainment?
Queen Conch & Lobster Local Expert: Please contact about conch and lobster impacts
- Bob Glazer, Florida Marine Research Institute, (305-289-2330)

SEAFLOOR DISTURBANCE
Marine, Essential Fish Habitat, Proposed Action Alt. (4.3.3.2.1)
-> p. 74, 3rd paragraph: lacking a full discussion of the precautions or methods that could be employed to avoid or lessen the severity of physical disturbance of substrate adjacent to the project area, such as the establishment of NO ANCHOR ZONES, buffer zones, floating steel cables, diver observations for the placement of anchors, spuds, cables, and disposal pipeline, etc.
** Please refer to the suggestions and precautions provided in the FKNMS comment documents and report, Attachment C.

The FKNMS finds this section generally lacking in the discussion of several benthic community impacts relating to seafloor disturbance. These impacts of direct disturbance are listed below along with specific references for additions to the text body.
Vessel Groundings. Due to the shallow areas where the dredge spoil pipeline will be placed, there needs to be some recognition that vessel groundings are a concern.
-> p. 74, 1st paragraph, 2nd sentence: add reference to the sensitive resources occurring along "Cut B dredge footprint ledge walls and along the northwest dredge footprint ledge walls of the Turning Basin" (as observed during December field surveys), in addition to the Ship Channel walls
-> p. 74, 1st paragraph, 3rd sentence: include "hardbottom communities" in the start of the sentence
-> p. 74, 3rd paragraph: lacking a discussion of the precautions or methods that could be employed to reduce the possibility of vessel groundings, such as routing dredge spoil disposal pipeline along uplands of Boca Chica Key as opposed to along Boca Chica Channel
Dredge Spoil Disposal Pipeline Failure Impacts.
-> p. 74, 2nd paragraph: lacking a discussion of the impacts due to failure from storm or hurricane effects or the mechanical breakdown of the dredge spoil disposal pipeline and the potential for injury that the pipeline poses on the adjacent natural resources
-> p. 74, add discussion about pipeline breach and sedimentation impacts that would occur
-> p. 74, 3rd paragraph: lacking a discussion of the precautions or methods that could be employed to reduce the possibility of storm or hurricane related impacts or mechanical breakdown impacts due to the presence of the dredge spoil disposal pipeline
** Please refer to the suggestions and precautions provided in the FKNMS comment documents and report, Attachment C.
Queen Conch Turbidity Impacts. Turbidity impacts to spawning populations of queen conch have not been addressed in this section,

-> p. 74, 5th or 6th paragraph, lacking a discussion of turbidity impacts to queen conch spawning activity & seasons

Queen Conch Local Expert: Please contact about conch and lobster impacts

- Bob Glazer, Florida Marine Research Institute, (305-289-2330)

-> p. 75, 2nd paragraph: lacking a discussion of methods to reduce the possibility of turbidity impacts or methods that might be employed to minimize turbidity impacts – in particular there should be a strategy to minimize or avoid the use of the clam shell methods for dredging as this is not an appropriate alternative for this project site

Entrainment.

-> p. 75, 3rd paragraph: lacking a discussion of Entrainment at the dredge spoil disposal site on Rockland Key

** Please refer to the suggestions and precautions provided in the FKNMS comment document/report, Attachment C.

-> p. 75, 3rd paragraph: lacking a discussion of Entrainment along the dredge spoil disposal pipeline route, especially with reference to lobster migration patterns

Queen Conch & Lobster Local Expert: Please consult with our local contact on conch and lobster impacts

- Bob Glazer, Florida Marine Research Institute, (305-289-2330)

-> p. 75, 4th paragraph: lacking a discussion of methods that might be employed to minimize entrainment – in particular there should be a strategy to remove invertebrates from the Rockland Key quarry pit, exploring the potential to embed or raise the dredge pipeline to allow for free migration of species, etc.

Cultural Resources. The FKNMS finds this Cultural Resource section (4.5) lacking in a discussion of coordination with the SHPO, (p. 84-85).

-> p. 84, Proposed Action Alt., Airfield (4.5.2.1), 4th paragraph, 3rd sentence: placing the pipeline on the opposite side of Boca Chica Channel (west side) is **not** a preferred alternative for the FKNMS, due to the issues of disrupting navigation through the channel; alternatively we've discussed and agreed on the option to float the pipeline over or around the Muir wreck site by routing it along the east side of Boca Chica Channel and out of the way of vessel traffic navigation patterns; otherwise, the FKNMS preferred alternative of routing the pipeline via uplands from the southwest tip of Boca Chica Key may help to address this issue

The FKNMS will call on the SCR expert who documented the wreck site, to identify and mark the wreck site during the project for the contractor.

CHAPTER 5: CUMULATIVE IMPACTS AND OTHER CONSIDERATIONS

POTENTIAL CUMULATIVE IMPACTS

Benthic Communities, p. 92

The FKNMS suggests that the cumulative impacts section could be enhanced by addressing the potential for overall cumulative effects with reference to turbidity, direct disturbance and generally increasing stressors to an already stressed ecosystem. Discussion here might include the following:

-> the impacts of turbidity generated by this project on coral communities in close proximity

-> the impacts that physical disturbance from activities related to this project might have on coral communities in close proximity
These communities are already dealing with induced stress from poor water quality (sewage, nutrient loading or toxins), storm water run off, coral disease, coral bleaching, vessel groundings and anchoring in addition to existing levels of large vessel generated turbidity. It must be emphasized that every effort to avoid or minimize additional stressors must be employed to reduce the cumulative impacts.
-> p. 92, last paragraph, 1st sentence: It is not accurate to state that "impacts associated with this project on seagrasses and benthic invertebrates and degradation to habitat will be short-lived." Injury to coral and seagrass communities from direct disturbances (anchor damage, cable damage, vessel groundings, and pipeline movement during storm events) and turbidity associated with dredge pipeline breaches have long-term if not devastating and permanent injury effects. Corals may be crushed, buried or overturned resulting in mortality of the colony unless we can respond in a timely fashion to address these impacts. Dredging operations do not have a clean record when it comes to injury to natural resources and multiple cases can be cited involving mass mortality of coral habitats, (NMFS staff have cited several in their comments to the DA Corp of Engineers, FKNMS and FDEP staff have responded to and documented several cases of coral devastation from dredging operations in South Florida – Red Reef Beach renourishment, Sunny Isles beach renourishment & FL Bay/Red Bay Banks).

CONFORMANCE WITH FEDERAL, STATE, AND LOCAL PLANS, POLICIES AND CONTROLS
Federal Laws, Plans, and Programs (5.2.1)
FKNMS finds this section lacking in a discussion about FKNMS regulations that address many of the potential impacts of this project.
-> p. 93, 2nd paragraph: include a discussion of the FKNMS regulations that prohibit injury to coral and benthic communities – please refer to the regulatory action plan within the FKNMS management plan Volume I which prohibits adverse effects to sanctuary resources pursuant to Section 302(8) of the National Marine Sanctuary Act (16 USC ss 1432(8)). Direct impacts are addressed in 15 CFR Part 922 Section 922.163 (p. 118), particularly, subparts (a)(2) injury to coral, (a)(3) alteration of seabed, (a)(4) discharge of materials and (a)(5)(i) operation of vessels in such a manner as to strike or otherwise injure coral, seagrass or other benthic resources (regulations cited above in Physical Impacts section).
-> p. 93, 2nd paragraph, 3rd sentence: reword the sentence to read "The FKNMS may provide authorization [not ~~certification~~] of the Section 404 permit issued by the DA Corps of Engineers." The FKNMS reserves the authority to issue a separate permit if conditions of the Section 404 permit fail to adequately address resource protection concerns identified by the FKNMS in review of the proposed project.
-> p. 93, 2nd paragraph, last sentence: reword the sentence to read "The FKNMS will assist in the identification and implementation of benthic resource protection strategies and assist in benthic resource relocations when all other methods to avoid or minimize dredging-related impacts are ruled out.
-> p. 94, State Regulations (5.2.2): lacking a paragraph discussing the Florida SHPO and coordination with the SHPO.

MEANS TO MITIGATE ADVERSE IMPACTS (5.6)
-> p. 96, 1st paragraph, last sentence: reword the sentence to read "Where stony coral colonies, seagrass and hardbottom communities are located within Hawks Channel and Boca Chica Channel, the pipeline will be diverted, routed around or floated over the resources.
-> p. 96, 1st paragraph: lacking mention of the use of direct diver observations for deployment of dredge platform anchors and cables
-> p. 96, 3rd paragraph, 1st sentence: either the Navy "will" or "will not" require employment of trained observers, this should clarified or removed

This section is lacking many of the mitigation strategies suggested by the FKNMS, such as direct diver observations for dredge anchor and cable placement, establishment of NO ANCHOR ZONES, dredge disposal pipeline anchoring to prevent storm/hurricane induced impacts, upland routing of the dredge disposal pipeline as opposed to routing via Boca Chica Channel, floating dredge cables, etc. Please discuss avoidance and environmental impact minimization strategies that will be employed.
** Please refer to the suggestions and precautions provided in the FKNMS comment documents and report, Attachment C.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, Florida 33702

March 19, 2003

Mr. Paul Kruger
Department of the Army, Corps of Engineers
Miami Regulatory Office
11420 North Kendall Drive, Suite 104
Miami, Florida 33176

Dear Mr. Kruger:

The National Marine Fisheries Service (NOAA Fisheries) has reviewed the **Pre-Release Draft Environmental Assessment for Maintenance Dredging of Key West Channel and Truman Annex Harbor (PRDEA)** dated February 11, 2003. According to the information provided in the PREA, the U.S. Navy proposes to modernize shore infrastructure and facilities to provide improved or additional capacity to support transient units visiting the Naval Air Facility (NAF) Key West in Monroe County, Florida. The Proposed Action Alternative includes maintenance dredging of 1.4 million cubic yards of material from approximately 465 acres of submerged bottom in an existing Federal channel and upgrading of facilities at the Boca Chica Airfield and Truman Annex. The proposed maintenance dredging would involve excavation to a depth -34 feet at mean low water (m.l.w.) plus three feet advance maintenance and one foot of unpaid overdepth. Maintenance dredging is also proposed in Truman Harbor and the turning basin located at Mole Pier. Dredged material would be transported via pipeline through Hawk Channel and Boca Chica Channel to the Key Iron Works rock pit on East Rockland Key where the dredged material would be used to create seagrass habitat. This habitat would be used as mitigation for benthic communities affected by the proposed dredging.

General comments:

NOAA Fisheries is concerned that the project may adversely affect highly important living marine resources for which we have management and stewardship responsibilities. The project area includes areas identified as Essential Fish Habitat (EFH) by the South Atlantic Fishery Management Council (SAFMC), including marine water column, live/hardbottoms, coral and coral reefs, macroalgae, sponge habitat, *Sargassum*, and seagrasses. Managed species associated with the marine water column include eggs and sub-adult brown and pink shrimp; gag and yellowedge grouper; gray, mutton, lane, and schoolmaster snappers; and white grunt. The marine water column and *Sargassum* also have been identified as EFH for pelagic species, including sub-adult/juvenile king and Spanish

mackerel, greater amberjack, cobia, and dolphin. Hardbottom/coral reef habitats have been identified as EFH for juvenile and adult gag and yellowedge groupers, and gray and mutton snappers. Sponge, algae, coral, and hardbottom habitats have been identified as EFH for juvenile and adult spiny lobster. NOAA Fisheries has also identified the marine water column as EFH for highly migratory species including juvenile and adult nurse, lemon, blacktip, great hammerhead, sandbar and bull sharks.

Detailed information on shrimp, the snapper/grouper complex (containing ten families and 73 species), spiny lobster, and other Federally managed fisheries and their EFH is provided in the 1998 generic amendment of the Fishery Management Plans (FMP) for the South Atlantic region prepared by the SAFMC. The 1998 amendment was prepared in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (P.L. 104-297). Finally, in this regard, we note that the SAFMC has designated hardbottom habitat, coral habitats and reefs, seagrass habitat, and *Sargassum* as a Habitat Area of Particular Concern (HAPC) for the snapper/grouper complex. HAPCs are subsets of EFH that are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area.

In addition to serving as EFH for Federally managed species, the marine water column, *Sargassum*, hardbottom, coral, SAV, and shallow nearshore habitats provide nursery, foraging, and refuge habitat for other commercially and recreationally important fish and shellfish. Species such as blue crab, southern flounder, Florida pompano, striped mullet, tarpon, and a variety reef fish and tropical fish are among the many species that utilize these habitats.

Specific comments:

A number of outstanding issues relating to our trust resources need further attention and/or clarification. These include the need for details concerning measures to avoid impacts to seagrasses, hardbottom, coral, and sponge communities located adjacent to the dredge area and within the proposed pipeline corridor, and the need to fully describe proposed mitigation for impacts to EFH. Information concerning planned environmental monitoring and evaluation of cumulative impacts is also needed.

Description of the Proposed Action Alternative and Other Alternatives: The draft and final EA should fully describe the Full Support Alternative and the No Action Alternative in Chapter 2.

No Anchor Zones and Buffer Areas: NOAA Fisheries concurs with the Florida Keys National Marine Sanctuary's (FKNMS) recommendation to establish no anchor zones in order to protect patch reefs located adjacent to the main ship channel and the Key West Harbor Turning Basin. Please refer to the FKNMS' list of GPS coordinates for proposed no anchor zones (Table 1, Attachment A, FKNMS Comments and Revisions, dated March 14, 2003). FKNMS oversight is recommended in order to identify preferred locations for anchor and cable placement.

Dredge Disposal Pipeline Corridor: Figure 3-10 of the PRDEA indicates the presence of seagrass and macroalgal communities as well as scattered patch reefs and hardbottom communities located

within and adjacent to the proposed dredge disposal pipeline corridor through Hawk and Boca Chica Channels. In areas where coral, hardbottom, and seagrass communities occur, we recommend that the pipeline be raised or floated so as to avoid direct contact with these habitats. Burying the pipeline in several places in Hawk Channel is also recommended to allow for the migration of conch and lobster between nearshore habitats and offshore reefs.

Storm Contingency Plan: Because the project period extends into hurricane season, NOAA Fisheries supports the FKNMS' recommendation for the contractor to prepare a contingency plan to address preparations in the event of a severe storm or hurricane. The applicant should ensure that the pipeline is properly stabilized or partially dismantled in order to prevent damage to NOAA trust resources.

EFH Assessment: As noted in our previous comments submitted by letter dated February 12, 2003, in response to public notice #200300203, NOAA Fisheries recommended that an EFH Assessment be conducted. We commend the applicant for providing a thorough EFH Assessment for habitats of managed species that occur within the project area. However, we note that the cumulative effects analysis needs greater detail with regard to possible impacts to EFH.

Mitigation for EFH impacts: A plan to fully compensate for unavoidable adverse impacts to hardbottom, coral, and other sensitive nearshore habitats associated with dredging, positioning of the dredged material disposal pipeline, and use of the proposed dredged material disposal site should be designed and made available to NOAA Fisheries for review prior to final approval. If compensatory mitigation is needed to offset impacts to EFH, then biological monitoring should be undertaken to evaluate the success and effectiveness of efforts to avoid, minimize, and/or compensate for ecological functions and marine resources that may be eliminated or degraded as a result of the project.

We also note, according to the PRDEA, that seagrasses, macroalgae, and several invertebrate species were observed at the proposed dredged material disposal site on East Rockland Key. NOAA Fisheries is concerned that the proposed fill operations may have direct and secondary effects on EFH associated with elevated turbidity levels and sedimentation. We encourage the applicant to work with the FKNMS to design appropriate turbidity control structures that will prevent sediment from escaping into open water.

We also recommend preparation of a detailed mitigation plan for creation of seagrass habitat at the proposed dredged material disposal site on East Rockland Key. If seagrass planting is to be used, we encourage the applicant to follow the site selection criteria outlined in *Guidelines for the Conservation and Restoration of Seagrasses in the United States and Adjacent Waters* (Fonseca, et al. 1998). Please contact NOAA Fisheries if there are questions regarding this publication.

Monitoring of EFH impacts: A plan to monitor for potential adverse impacts to hardbottom, coral and other sensitive nearshore habitats should be prepared and made available to NOAA Fisheries for review prior to final approval.

Turbidity Monitoring: According to the PRDEA, a beneficial impact to local water quality may occur due to the removal of large amounts of sediment from Truman Harbor, the turning basin, and

the ship channel. Sediments in these locations are re-suspended each time a large vessel enters or leaves the port (p. 93). NOAA Fisheries supports the FKNMS' recommendation to conduct pre- and post-construction monitoring of turbidity levels in the ship channel, turning basin, Truman Harbor, and waters adjacent to the project area. At a minimum, Florida state turbidity requirements shall not be exceeded.

Cumulative Impacts: Chapter 5 of the PRDEA notes an expected increase in Naval vessel operations through the Key West ship channel and turning basin with implementation of the Proposed Action Alternative. The PRDEA also states that commercial and recreational vessel traffic in the project area may increase. However, a discussion of the potential for increased cruise ship vessel traffic in the Key West ship channel, Turning Basin, and Key West Harbor is notably absent from the cumulative impacts discussion. In addition, the PREA states that "cumulative impacts directly associated with the dredging are expected to be minor" (p. 93). As previously noted, a more detailed discussion of the potential cumulative impacts of the project on EFH is needed.

Finally, we note that this project area is within known distribution limits of Federally listed threatened and endangered species under the purview of NOAA Fisheries. In accordance with the Endangered Species Act of 1973, as amended, it is the responsibility of the appropriate Federal regulatory agency to review its activities and programs and identify any activity or program that may affect endangered or threatened species or their habitat. Determinations involving species under NOAA Fisheries' jurisdiction should be reported to our Protected Resources Division at the letterhead address. If it is determined that the activities may adversely affect any species listed as endangered or threatened and under our purview, then formal consultation must be initiated.

We appreciate the opportunity to provide comments on this project. Related correspondence should be addressed to the attention of Ms. Audra Livergood at our Miami Office. She may be reached at 11420 North Kendall Drive, Suite #103, Miami, Florida 33176, or by telephone at (786) 263-0028.

Sincerely,

Rickey N. Ruebsamen
Acting Assistant Regional Administrator
Habitat Conservation Division

(LETTERHEAD: UNTIDE STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmosphereic Administration
NATIONAL MARINE FISHERIES SERVICE)

Southeast Regional Office 9721
Executive Center Drive North
St. Petersburg, FL 33702
(727) 570-5312, FAX 570-5517
http://caldera.sero.nmfs.gov

(stamped MAR 28 2003) F/SER3:KPB

Paul Kruger
U.S. Army Corps of Engineers
Regulatory Division
Miami Field Office
Suite 104
11420 North Kendall Drive
Miami, FL 33176-1039

Dear Mr. Kruger:

The National Marine Fisheries Service (NOAA Fisheries) has received a letter dated February 11, 2003, from CZR Incorporated submitted on behalf of the U.S. Army Corps of Engineers' (COE) proposed action and consultation request pursuant to section 7 of the Endangered Species Act (ESA) on the proposed dredging of Key West navigation channels and construction improvements to the existing Naval Air Facility Key West (NAF Key West). Please refer to consultation No. F/SER/2003/00140 in future correspondence on this activity.

The proposed maintenance dredging of the project would significantly deepen the existing channel to allow the safe passage of Navy vessels making port calls to NAF Key West. The channel was last dredged more than 30 years ago. Draft requirements of cruiser and destroyer class vessels preclude their entry into Truman Harbor under the current channel conditions. The proposed action includes maintenance dredging in the following areas as necessary: Truman Harbor; the turning basin outside Mole Pier; and the length of the Federal project channel in the waters off Key West. The proposed maintenance dredging would be to a depth of 34 feet below mean low water, plus 3 feet advance maintenance and 1 foot unpaid overdepth. Approximately 1,400,000 cubic yards of dredged material will be removed from the channels and disposed of offsite.

The type of dredging is expected to be clamshell bucket or pipeline dredging; however, hopper dredge use has not been ruled out for the project (S. Viada, pers. comm. March 4, 2003). Hopper dredging has been previously consulted on under the ESA by NOAA Fisheries.[1] Any incidental take of sea turtles resulting from the operation of hopper dredges by the COE's South Atlantic Division is covered under the Incidental Take Statement of that biological opinion, which covers maintenance dredging of Key West channels. In addition to hopper dredges, clamshell and pipeline dredges may be used to maintain the navigation channels. Pipeline and clamshell dredges are relatively

[1]September 25, 1997 biological opinion to U.S. Army Corps of Engineers, South Atlantic Division, on the continued hopper dredging of channels and borrow areas in the southeastern United States.

stationary, and therefore act on only small areas at any given time. There have never been any reports of sea turtle takes by clamshell or pipeline dredges by dredge observers, Federal agencies, or non-governmental organizations.[2] NOAA Fisheries has no new information that would change the basis of that conclusion. In addition, side-cast dredges have also never been implicated in sea turtle takes.[3]

The level of contaminants present in suspended sediments from the dredge area have been analyzed and the results presented in your draft Environmental Assessment (EA) indicate that the sediments do not contain levels of contaminants that will adversely affect water quality and biota. Likewise, all land-based construction will take place on a paved surface and will not involve any temporary or long-term changes in water quality from increased stormwater and construction site runoff. The only impact to marine water quality would be temporary and insignificant increases in turbidity in the vicinity of the dredging operation. These temporary, localized effects are not expected to adversely affect any protected species under the jurisdiction of NOAA Fisheries.

The Mole Pier currently is used to berth cruise ships and military vessels. Activity at NAF Key West has varied considerable over the years of operation. The project may possibly result in up to a 15 percent increase in the annual naval traffic resulting from the channel dredging and pier modifications (S. Viada, pers. comm. March 4, 2003). The project is not expected to result in increases in non-military vessel traffic. Mole Pier currently berths cruise ships and NOAA research vessels. There is no direct evidence of naval or dredge vessel collisions with marine mammals in the waters of the Florida Keys. Low speeds typical of commercial and naval vessels transiting the inner harbor where the dredging will occur are unlikely to result in collisions with sea turtles and small odontocetes.

The construction improvements at NAF Key West will be either improvements of existing structures or minor new construction. Although some construction will improve the existing support functions at NAF Key West, no changes in aircraft flight patterns are expected from the project; therefore, no increases in noise or emissions from aircraft are expected. The project will require the non-explosive demolition of the tip of Mole Pier to make the necessary modifications to accommodate larger vessels.

Of the listed species under NOAA Fisheries' purview, five species of sea turtles including the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp=s ridley (*Lepidochelys kempii*) may occur in the action area. No designated critical habitat is found in the project area. We concur with your draft determination that the proposed activity will not likely adversely affect endangered and threatened species, or their critical habitat, under the purview of NOAA Fisheries. This concludes consultation

[2]November 25, 1991 biological opinion to the U.S. Army Corps of Engineers on dredging of channels in the southeastern United States form North Carolina through Cape Canaveral, Florida.

[3]March 9, 1999 informal section 7 consultation with the U.S. Army Corps of Engineers, Wilmington District on the use of the sidecast dredges FRY, MERRITT, and SCHWEIZER, and the split-hull hopper dredge CURRITUCK.

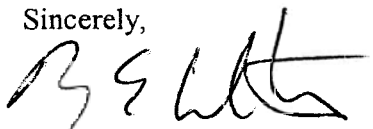
responsibilities under section 7 of the ESA. A new consultation should be initiated if there is a take, new information reveals impacts of the identified activity that may affect listed species or their critical habitat, a new species is listed, the identified activity is subsequently modified, or critical habitat is designated that may be affected by this activity.

Incidental takes of marine mammals are not authorized through the ESA section 7 process. If you believe that bottlenose dolphins may be present in the area of any significant sources of noise or other actions that may result in injury or harassment, an incidental take authorization under Marine Mammal Protection Act (MMPA) Section 101 (a)(5) may be necessary. Please contact Kenneth Hollingshead of our Headquarters Protected Resources staff at (301) 713-2055 for additional information regarding an MMPA take authorization.

The action agency is also reminded that, in addition to its protected species/critical habitat consultation requirements with NOAA Fisheries pursuant to section 7 of the ESA, prior to proceeding with the proposed action the action agency must also consult with NOAA Fisheries' Habitat Conservation Division (HCD) pursuant to the Magnuson-Stevens Fishery Conservation and Management Act's requirements for essential fish habitat (EFH) consultation (16 U.S.C. 1855 (b)(2) and 50 CFR 600.905-.930, subpart K). The action agency should also ensure that the applicant understands the ESA and EFH processes; that ESA and EFH consultations are separate, distinct, and guided by different statutes, goals, and time lines for responding to the action agency; and that the action agency will (and the applicant may) receive separate consultation correspondence on NOAA Fisheries letterhead from HCD regarding their concerns and/or finalizing EFH consultation. Consultation is not complete until EFH and ESA concerns have been addressed to NOAA Fisheries' satisfaction. If you have any questions about EFH consultation for this project, please contact Ms. Jocelyn Karazsia, at (305) 595-8352.

We look forward to our continuing cooperation to conserve our protected resources. If you have any questions regarding this letter, please contact Kyle Baker, fishery biologist, at the number above or via e-mail at Kyle.Baker@noaa.gov.

Sincerely,



Roy E. Crabtree, Ph.D.
Regional Administrator

cc: CSA - Steve Viada; Will Sloger
COE Miami - Paul Kruger
F/SER43 - J. Karazsia; F/PR3

File: 1514.22.f.1 Fl; No: F/SER/2003/00140; O:\SECTION7\INFORMAL\Dredging\COE Key West Channel.wpd

11000
Ser N02/0204
April 4, 2003

Dr. Janet Snyder Mathews
Florida State Historic Preservation Officer
Division of Historic Resources
R. A. Gray Building, 500 S. Bronough Street
Tallahassee, FL 32399-0250

Dear Dr. Mathews:

Subj: FORT ZACHARY TAYLOR PROJECT

We are requesting consultation regarding proposed actions on the Navy property designated as State of Florida Archeological Site file # 8M0206, which is adjacent to the State of Florida's historic Fort Zachary Taylor. The Navy is undertaking a project to renovate building 284, demolish building 261 and install new ornamental perimeter fencing. Future plans for building 795 include renovations similar to building 284 or demolition if the structure is determined excess to our needs. These buildings are not considered eligible for the National Register of Historic Places (per USACOE 1995 and Department of Navy, Naval Air Facility, Programmatic Agreement), but as they are directly adjacent to Fort Taylor structure, our planned projects may impact the aesthetic nature of the fort.

Our plans are forwarded as enclosure (1) and provide detail on the following actions:

1. Demolition of building 261.

2. Installation of a new ornamental fence along both the new property line with the land deeded to the State Park and replacement of existing chain link perimeter fencing.

3. Renovation of building 284. This would include replacing the exterior metal roofing/siding of the structure. The new exterior can have one of three wall finishes which are outlined as option "A", "B" and "C" in enclosure (1). All project options also includes architectural details such as installing round vents to match the historic character of the fort.

4. Minimal disruption to the ground surface is anticipated and contractors will be made aware of concerns of potential subsurface historic resources.

5. Follow on work will include either demolition of building 795 or renovation of the structure architecturally consistent with building 284's exterior design elements.

11000
Ser N02/0204
April 4, 2003

We request your recommendation for one of the options in item #3 above and your concurrence that these projects are in compliance with applicable regulations under your cognizance.

An expeditious review of these fast tracking repair projects is needed as they play a vital role in supporting the U.S Atlantic Fleet war fighter readiness by providing maximum support capacity for all existing operational requirements, newly generated Anti-Terrorism Force Protections initiatives and enabling the optimal use of continental U.S. based training locations and resources for Carrier Battle Groups, Amphibious Ready Groups and Marine Expeditionary Units.

If additional information is required, please feel free to contact me by telephone at (305) 293-2488, email: demesro@naskw.navy.mil, or Mr. Birchard Ohlinger at (305) 293-3143, email: ohlingerbi@naskw.navy.mil.

R. A. DEMES
Business Manager
By direction of the
Commanding Officer

United States Department of the Interior

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

April 9, 2003

John R. Hall
U.S. Army Corps of Engineers
Miami Regulatory Field Office
11420 North Kendall Drive
Miami, Florida 33176

Service Log No.: 4-1-03-I-0721
Application No.: 200300203 (IP-PK)
Dated: January 15, 2003
Applicant: Key West Boca Chica Key Naval Air Facility
County: Monroe

Dear Mr. Hall:

The Fish and Wildlife Service (Service) has reviewed the public notice, plans, maps, and other information provided by the U.S. Army Corps of Engineers (Corps) for the permit application submitted by the Department of the Navy for the proposed maintenance of the Key West Naval Air Facility, located in Monroe County. These comments are provided in accordance with the Fish and Wildlife Coordination Act, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*), and under the provisions of section 7 of the Endangered Species Act (ESA) of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*).

PROJECT DESCRIPTION

On January 15, 2003, the Corps issued a public notice for the proposed Key West Shipping Channel maintenance dredging project (project). The applicant proposes to remove 1,400,000 cubic yards of gravel, silt, and sand from 465.4 acres of submerged bottom in an existing Federal channel. Dredging will not exceed a depth of minus 34 feet at Mean Low Water, plus 3 feet advance maintenance and 1 foot over-dredge. The majority of the spoil material will be used to fill existing dead-end residential canals (sub-pens) on Boca Chica Key. Also, approximately 200,000 cubic yards of spoil will be stored for future use on the Key West Boca Chica Naval Air Facility. A pipeline will transport spoil from the dredge site to the disposal sites. Alternative upland disposal sites have been identified as contingencies, but have not been specifically identified in the public notice.

Benthic habitats that may be impacted by the project include areas of sand, silt, rubble, soft coral, hard coral, patch reef, and seagrass communities. The project is located in Hawk Channel, the Key West Harbor entrance channel, the Truman Annex Bight, and the adjacent turning basin, in Section 1, Township 68 South, Range 24 East, City of Key West, Monroe County, Florida.

THREATENED AND ENDANGERED SPECIES

In the Public Notice, the Corps provided a determination of "may effect, not likely to adversely affect" on any federally listed species. The Service has reviewed the occurrence records in our data base for locations of federally listed threatened and endangered species on or adjacent to the project. Listed species known to occur within the project area include the endangered Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*), the endangered silver rice rat (*Oryzomys palustris natator*), the endangered West Indian manatee (*Trichechus manatus*), the endangered green sea turtle (*Chelonia mydas*), the endangered hawksbill sea turtle (*Eretmochelys imbricata*), the endangered leatherback sea turtle (*Dermochelys coriacea*), the endangered Kemp's Ridley sea turtle (*Lepidochelys kempi*), and the threatened loggerhead sea turtle (*Caretta caretta*).

Lower Keys Marsh Rabbit

The Lower Keys marsh rabbit is known to occur on Boca Chica Key and on the Key West Naval Air Facility. The Lower Keys marsh rabbit is habitat-specific, depending upon a transition zone of grasses and sedges for feeding, shelter, and nesting. This species primarily occurs in the grassy marshes and prairies of the Lower Keys. Key wetland vegetative species include grasses and shrubs (shoregrass [*Monanthochloe littoralis*], saltwort [*Batis maritima*], Virginia glasswort [*Salicornia virginica*], marsh fimbry [*Fimbristylis spadicea*]); succulent herbs (bushy seaside oxeye [*Borrichia frutescens*]); sedges (*Cyperus* spp.); sparse tree cover (buttonwood [*Conocarpus erectus]*), and catclaw [*Pithecellobium unguis-ati*]). Lower Keys marsh rabbits prefer areas with higher amounts of clump grass, ground cover, and bushy seaside oxeye, areas closer to other existing rabbit populations, and areas closer to large bodies of water (Forys 1995). These rabbits spend most of their time in the mid-marsh (bushy seaside oxeye) and high-marsh areas (*Spartina* spp. and marsh fimbry), both of which are used for cover and foraging, while most nesting occurs in the high-marsh area (Forys 1995). Lower Keys marsh rabbits occasionally use low shrub marshes and mangrove communities (red mangrove [*Rhizophora mangle*], black mangrove [*Avicennia germinans*], white mangrove [*Laguncularia racemosa*], and buttonwood) for feeding and as a corridor between patches of transitional habitats. Plant species that are important to the Lower Keys marsh rabbit for cover and nesting include Gulf cordgrass (*Spartina spartinae*), marsh fimbry (*Fimbristylis spathacea*), and sawgrass (*Cladium jamiacense*), all of which can form thick cover for rabbits, and are present within the project area.

Rabbits also use coastal beach berm habitat. Coastal beach berm habitat is a relatively rare habitat in the Keys, and is characterized as a vegetated high ridge of storm-deposited sand and shell. Coastal berms are vegetated with over 84 plant species including beeftree (*Guapira discolor*), gumbo-limbo (*Bursera simaruba*), poisonwood (*Metopium toxiferum*), seagrape (*Coccoloba uvifera*), and Spanish stopper *(Eugenia foetida*). Boca Chica Key contains tracts of coastal berm habitat.

Potential adverse impacts during the project construction phase include disturbance during feeding, loafing, or migration. Heavy equipment may be required to manage the spoil storage and dewatering operation, and the location of the dredge pile may impact marsh rabbit habitat, which could result in harm to marsh rabbits. Lower Keys marsh rabbit critical habitat has not been designated in the project area.

Based on the presence of the Lower Keys marsh rabbit in the area where the dredge spoil is proposed for storage and dewatering, and in the area where it is to be used for fill and to enhance the water quality of the sub-pens, the Service cannot concur with the Corps determination of "may affect, not likely to adversely affect" at this time. To fulfill requirements under the ESA and to better evaluate the potential effects of spoil storage and fill activities as an element of the dredge project, the Service recommends that the Corps submit an Biological Assessment with relevant information detailing effects this proposed action may have on the protected Lower Keys marsh rabbit.

Silver Rice Rat

Based on the availability of suitable habitat and proximity to existing populations, the silver rice rat may occur on Boca Chica Key and on the Key West Naval Air Facility. Historic radiotelemetry and trapping data reveal the use of three topographic zones: low intertidal areas, low salt marsh, and buttonwood transitional salt marsh (Forys and Humphrey 1996). Low intertidal and low salt marsh habitats are used by rice rats during feeding, loafing, and migration activity periods, and swales in the low salt marsh are primary foraging sites (Forys and Humphrey 1996). Buttonwood transitional salt marsh is at a higher elevation than other salt marsh habitats, and is used for foraging and nesting.

Silver rice rat critical habitat has not been designated in the project area but critical habitat elsewhere includes areas containing contiguous mangrove swamps, saltmarsh flats, and buttonwood transition vegetation. The project site has such habitat. The major constituent elements of this critical habitat that require special management considerations or protection are mangrove swamps containing red mangrove, black mangrove, white mangrove, and buttonwood; salt marshes, swales, and adjacent transitional wetlands containing saltwort, Virginia glasswort, saltgrass (*Distichlis spicata*), bushy sea oxeye, keygrass (*Monanthocloe littoralis*), and seashore dropseed (*Sporobolus virginicus*); and fresh water marshes containing cattails (*Typha* spp.), sawgrass, and cordgrass (*Spartina* spp.). These vegetative species may occur in the project area on Boca Chica Key.

Based on the possible presence of the silver rice rat in the area where the dredge spoil is proposed for storage and dewatering, and in the area where it is to be used for fill and to enhance the water quality of the sub-pens, the project may impact silver rice rat habitat, which could result in harm to silver rice rats. At this time, the Service cannot concur with the Corps' determination of "may affect, not likely to adversely affect". To fulfill requirements under the ESA and to better evaluate the potential effects of spoil storage and fill activities as an element of the dredge project, the Service recommends that the Corps submit an Biological Assessment with relevant information leading detailing effects this proposed action may have on the protected silver rice rat.

Manatees

Though manatees are uncommon in the deeper waters of Hawk Channel or the Straits of Florida, they occasionally may migrate through the project area. Although temperatures are suitable for manatees in the Florida Keys and near-shore waters contain vast seagrass beds, low manatee numbers are attributed to the lack of fresh water (Beeler and O'Shea 1988). Manatee travel corridors are ill-defined in the Florida Keys. Manatees generally use the Florida Bay side of the Keys due to the presence of expansive shallow seagrass areas. Manatees occasionally travel up and down Hawk Channel, located south of the project on the Atlantic side of the Keys. Also, manatees in the Florida Keys often use residential and commercial canals and basins, creeks, channels, and boat basins, for travel and feeding. There are no manatee aggregation areas in the Lower Keys.

No watercraft-related manatee mortalities have been documented in the 27 reporting years within this portion of the reach. The nearest watercraft related manatee mortality occurred 51 miles from the project site (Service 2002). Additionally, the applicant proposes to use the *Standard Manatee Protection Construction Conditions* in the project design reducing potential impacts to manatees. The Service concurs with the Corps determination that the project "may affect, but is not likely to adversely affect" the manatee. Seagrass beds exist in the project area and will be impacted by this project. However, the project is not located in designated critical habitat for the manatee; therefore, no adverse modification to critical habitat will result from the proposal.

Turtles

Five species of marine turtles (leatherback, hawksbill, green, loggerhead, and Kemp's Ridley) use the project waters and the various ecological communities for feeding, loafing, and migration, and may use local beaches for nesting. Removing of sections of hardbottom, reef, and seagrass habitats will eliminate potential foraging habitat for sea turtles. Finally, dredge activities and other disturbances (i.e., noise, lights, etc.) may interrupt the movement of turtles swimming toward or swimming away from nesting beaches. **The National Marine Fisheries Service should be consulted regarding effects to sea turtles in open water**.

The Corps has provided a determination that the project "may affect, but is not likely to adversely affect" threatened or endangered marine turtles. Potential adverse impacts during the project construction phase include disturbance of feeding, migrating, or loafing turtles. Heavy equipment will be required to perform the dredging and install the pipeline, and this equipment will have to traverse the distance from the dredge site to the spoil disposal sites, which could result in harm to sea turtles.

The Service has reviewed the proposed action and based on the information provided in the public notice, the Service is not able to concur with the Corps determination at this time. To fulfill requirements under the ESA and to better evaluate the potential effects of increased lighting as an element of the dredge project, as well as dredge lighting, the Service recommends that the Corps submit an Biological Assessment with relevant information leading detailing effects to the sea turtle species. The Corps should also include measures to minimize potential lighting impacts to sea turtle hatchlings.

Summary

After we receive and review the information requested, the Service, in cooperation with your office, will reassess whether formal consultation is required for this proposed project. If formal consultation is required, the regulations governing interagency consultations (50 CFR § 402.14) state that the Service is allowed up to 90 calendar days to conclude formal consultation with your agency and an additional 45 days to prepare our biological opinion.

FISH AND WILDLIFE RESOURCES

Fish and wildlife resources that exist in or near the 465.4 acre dredge project and attendant spoil disposal pipeline include mangrove wetlands, freshwater wetlands, submerged aquatic resources such as coral patch reefs, bank reefs, seagrass beds, algal vegetated shallows, and hardbottom communities containing ocotcorals, sponges, and scattered solitary coral colonies. The Service recommends that the applicant provide a Biological Assessment addressing affected habitats and associated species, as well as identification of specific measures which address avoidance, minimization, and mitigation efforts for the project's direct, indirect, and cumulative impacts to these resources.

Mangrove Habitats

Most undeveloped terrestrial habitats adjoining and within the project area contain fresh and saltwater wetlands dominated by mangrove and other halophytic communities. Mangroves and associated halophytic vegetation represent the largest natural terrestrial habitat within the project boundaries, including several freshwater or brackish wetland areas (also see Lower Keys Marsh Rabbit section above). These habitats comprise either stands of red mangrove (*Rhizophora mangle*) or mixed stands of red mangrove and black mangrove. Major associates include white

mangrove, sea purslane (*Sesuvium maritimum*), sea oxeye daisy, and buttonwood. Mangroves are important for shoreline protection and stabilization. In addition, mangrove habitats provide many important ecological functions, such as providing refugia for juvenile stages of managed fish species, and have been identified as significant resources for seven federally protected species and four federally protected subspecies (Odum and McIvor, 1990). These systems also provide organic matter which forms the basis of a littoral zone marine food web.

Florida mangrove communities are known to support up to 220 species of fishes, 24 species of amphibians and reptiles, 18 species of mammals, and 181 species of birds (Odum, et al, 1982). Managed fish species associated with mangroves during at least one life-cycle phase include pink shrimp (*Farfantepenaeus duorarum*), spiny lobster (*Panulirus argus*), jewfish (*Epinephelus itajara*), gray snapper (*Lutjanus griseus*), black drum (*Pogonias cromis*), red drum (*Sciaenops ocellatus*), and snook (*Centropomus undecimalis*) (SAFMC, 1998b).

Mangrove wetlands in the project area should be examined for the composition, maturity, tidal regime, position in the landscape, and overall functionality. Mangrove resources occurring in and adjacent to the project footprint should be identified and mapped, and associated direct and indirect impacts identified and quantified.

Seagrass Beds

Seagrasses provide many biological, chemical, and physical functions for marine communities. They provide habitat for a myriad of fishes, shrimps, crabs, and other species, and therefore have been designated as Essential Fish Habitat (EFH) by the South Atlantic Fisheries Management Council (SAFMC, 1998b). Some of those species use seagrass meadows for the duration of their life cycles, whereas others use them for only a distinct life-history stage (e.g., as juveniles, for the purpose of refuge). Seagrasses are used as food sources for protected species such as manatees and sea turtles. Epiphytes, using seagrass blades as substrates, provide another primary food source for grazers, which in turn are consumed by larger species (invertebrates and small fishes) foraging in the beds. Seagrasses also provide important ecosystem cycling functions. For example, they produce oxygen, which is released to the water during photosynthesis. In addition, seagrasses absorb some nutrients from the water column. This may help to reduce suspended algae concentrations. Epiphytes, using seagrass blades as a substrate, may sequester additional nutrients from the water column. Again, this may contribute to limiting water-column algae production. Other water quality benefits may also occur as seagrasses and associated epiphytes trap suspended solids from the water-column. Finally, seagrasses stabilize sandy bottoms with roots and rhizomes, and decrease wave action where meadows are dense. These functions increase water clarity which is beneficial to primary production, species interaction, and in the recreational quality of coastal areas.

In southeast Florida, seagrasses are associated with such flora as algae of the genera *Halimeda, Udotea,* and *Penicllus* (Zieman, 1982). Many invertebrate species also utilize seagrass communities. The most obvious inhabitants include the queen conch (*Strombus gigas*), urchins including the long spine urchin (*Diadema antillarum*), nudibranchs, bivalve mollusks, and crustaceans including the spiny lobster (*Panularis argus*), and the blue crab (*Callinectes sapidus*). On shallow seagrass areas, corals and sponges may also occur (Zieman, 1982). 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 and pinfish. Seagrass beds are also important nurseries for many of the fish associated with the snapper-grouper complex (SAFMC, 1998b).

Marine seagrass species occurring in and adjacent to the project footprint should be identified and mapped.

Other Softbottom Habitats

Softbottom areas are defined as areas where hard substrates are covered by more than five inches of sediment, typically sand, mud, clay, or silt. Also, for the purposes of classification in this document, "softbottom habitats" may include those with small-diameter rubble left over from previous dredging events, or may support isolated macroalgae beds. Softbottom areas may provide corridors for reef species to travel between reef lines and these areas may also be important foraging areas for fish species (Jones *et al.*, 1991).

Macroalgal growth is occasionally associated with these communities, particularly where wave action does not disturb sediments and where sufficient light reaches the substrate (i.e., shallow areas of the Atlantic Intracoastal Waterway, or fairly transparent waters offshore). The most abundant species are of the green algae genera *Caulerpa* spp., *Halimeda* spp., and *Codium* spp. during the summer months. This is in contrast to the winter months, where *Dictyota* spp. and *Sargassum* spp. are more common (Courtenay et al., 1974; Florida Atlantic University and Continental Shelf Associates, Inc., 1994).

The benthic infaunal community is generally comprised of polychaetes, mollusks, and various amphipod crustaceans. Species composition and numerical dominance varies according to water depth, light penetration, and other physical characteristics. In inshore waters, such as the Atlantic Intracoastal Waterway, diversity and population density of these taxa are generally higher on the shallow shoals than in deeper waters of the harbor and channel (Messing and Dodge, 1997; Rudolph, 1986). Benthic community monitoring data for the shallow, inshore shelves of the study area indicate that the softbottom community is dominated by several taxa of polychaete

worms, oligochaetes, mollusks, sipunculans, peracarid crustaceans, platyhelminthes, and nemertina, and that species richness is moderately high. Based on studies by Dodge *et al.* (1997) and Rudolph (1986), as many as 370 species of invertebrates exist within the shallow-water benthic community. Rudolph (1986) also determined that species richness was higher near ocean inlets and in seagrass beds.

In offshore softbottom communities, the numerically dominant organisms tend to be polychaete and nematode worms. The Dodge et al. (1991) infaunal study of offshore habitats of Hollywood Beach indicated that the dominant taxa were polychaetes (52 percent), nematodes (14 percent), and crustaceans (9 percent). Invertebrate fauna also utilize this softbottom area and these can include the Florida fighting conch (*Strombus alatus*), milk conch (*Strombus costatus*), king helmet (*Cassia tuberosa*), and the queen helmet (*Cassia madagascariensis*) (Corps, 1996a). This area, since it lies within patch reefs or the bank reef within the study area, may provide a corridor for reef species to travel between reef lines and also be an important foraging area for fish species (Jones et al., 1991).

Softbottom substrates that will be affected by the project occur in previously dredged inshore and offshore channels, previously dredged inshore basins, non-dredged, shallow, inshore areas, and deeper offshore areas adjacent to dredged channels. In the Harbor entrance channel, softbottom habitats are typically located between hardbottom and between rock/rubble habitats, and occasionally support seagrass and macroalgae beds. These typically have a sandy composition. Within the dredged harbor and inshore channels, softbottom habitats develop in channel beds as sediment accumulates from side-slope sloughing or from natural geological processes acting in areas that have consolidated sub-surface rock. Surficial materials in inshore areas are composed of variable amounts of sand, silt, and mud, depending on geology and adjacent land use/habitats. Shallow, inshore, softbottom areas also have variable substrate composition.

Resources of importance in the softbottom habitats in and near the project footprint should be identified and mapped, and direct and indirect impacts to these areas identified.

Rock/Rubble Habitats

Rock/rubble habitats occur among all dredged areas within the project area, and where rock outcrops occur in/near reef habitats. Rock/rubble substrates within the project area may be comprised of either naturally occurring rock outcrops or rubble material that has been left from prior dredging events. These substrates provide structure for use by fishes and motile invertebrates, and may also provide surfaces for attachment of soft corals and sessile organisms, such as sponges. Within much of the entrance channel, rock/rubble cover alternates with softbottom habitats, creating a habitat mosaic with regularly repeating patterns.

The most obvious biological features of most rock/rubble-based habitats are sponges and macroalgae. If water depth/water clarity is appropriate and there is a nearby seed source population, such substrates are conducive for reef-building species. Sponge species associated with this habitat include *Ircinia campana*, *Callyspongia vaginalis*, and *Iotrochota* sp. (possibly *I. birotulata*). Soft corals associated with rock/rubble habitats include those present on adjacent reefs, and include species of 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 small fishes, and larger gamefish species that prey on them. Rock/Rubble habitats resources in and near the project footprint should be identified and mapped, and direct and indirect impacts to these areas identified.

Hardbottom and Reefs

The most prevalent hardbottom and reef zones within and adjacent to the project area include hardbottom zones, nearshore patch reefs, isolated coral heads, and offshore reefs and patch reefs. Depending on distance from shore, these formations may support communities dominated by algae and sponges with interspersed gorgonians and hard corals, and interspersed coral rubble interrupting areas of open sand and possibly seagrass and algal vegetated areas. Additionally, the Key West Harbor, Key West Shipping Channel, and turning basin may have hard corals, soft corals, algae, sponges and other invertebrates attached to the vertical slopes. Channel wall habitats have less coral coverage than channel-bed habitats, but provide significant refugia for reef-associated fishes. Even channel wall habitats not associated with reef lines are significant resources. These may be considered "vertical hard grounds."

Live hardbottom and reef communities of Florida's southeast coast are predictably speciose and have been characterized many times (see Dodge et al., 1991; and Seaman, 1985). Species composition of the nearshore hardground and the three offshore reef tracts depends on depth, distance to shore, exposure to waves and currents, light penetration, and disturbance/dredging regime.

Near shore and offshore low-relief hardbottom are characterized by limestone, rock, or worn coral substrates that contain crevasses, holes, and low-lying ledges that create microhabitat diversity, and thereby can support higher species diversity than unvegetated, softbottom habitats. Low-relief hardbottom habitats are important for organisms such as crustaceans, notably, crabs, spiny lobster, penaeid shrimp, and numerous fishes, including species of the snapper-grouper complex. Several species utilize hardbottom as refugia during juvenile life-history stages, whereas adults of various predatory species use these areas as foraging grounds. Hardbottom fauna may be divided into sessile and motile components. The sessile component contains the primary producers, such as macroalgae; some grazers or first order consumers, planktivores, and filter feeders. Hard corals occupy niches as both producer and consumer. Zooxanthellic algae within coral polyps photosynthesize while the polyps themselves capture planktonic organisms for consumption. Similar to hard corals, tunicates and sponges concentrate carbon that is

typically fixed far offsite. These attached filter-feeding organisms contribute to the organic base by trapping nutrient-rich plankton as it is swept past by wave and wind generated currents. Tunicates, sponges, and hydroids add structure to the bottom, providing shelter from predation for many crustaceans and smaller fishes.

Many commercially important fish and invertebrates, ornamental fish, and motile invertebrates are attracted to hardbottom and reef habitats by the nature of their structure. The numerous crevices, holes, and epibiotic structure provide these organisms with a refuge from larger predatory fish. Structure can also provide barrier to currents and substrate for attaching demersal eggs. In addition to these features, the sessile organisms of the reef provide a large diverse food base on which some fish species feed directly. Others benefit from this indirectly by feeding on invertebrates and other smaller fish that are nurtured by sessile plant material.

Resources of importance in the hardbottom and coral reef habitats in and near the project footprint should be identified and mapped.

Essential Fish Habitat

The community types listed above, with the exception of the upland and supralittoral zones, are considered Essential Fish Habitat (EFH) as described in the Magnuson-Stevens Fishery Conservation and Management Act, as amended by the sustainable Fisheries Act of 1996 (Public Law 104-267). EFH provisions support the management goals of sustainable fisheries. EFH that may be directly or indirectly impacted by beach renourishment projects may include the water column, littoral zone, sublittoral zone, hardbottom, and seagrass habitats. Specific aspects of EFH that may be adversely affected by beach renourishment projects include spawning, foraging, and refuge habitats for managed species such as the snapper/grouper complex, penaeid shrimp, and spiny lobster. The NMFS is the lead agency responsible for the assessment of the possible adverse impacts of the proposed project to EFH.

Summary

In order for the Service to further review the proposed dredging project, the following is requested:

1. A complete discussion of avoidance and minimization efforts for the various terrestrial and benthic habitats, and those employed for the manatee, marsh rabbit, silver rice rat, and sea turtles, including education plans, and conservation measures;
2. Identify and provide habitat evaluations for the alternative upland disposal sites that have been chosen as contingent locations;

3. Arrange for a multi-agency site field visit to identify the resources in the dredge area, pipeline corridor, sub-pens, and upland storage and dewatering sites; and
4. A proposed monitoring and mitigation plan for expected resource impacts.

In addition, we recommend the EA address impacts associated with the dredging project. Avoidance measures addressed can include siting the pipeline, to avoid Submerged aquatic resources impacts. Minimization measures can include transplanting hard corals from the dredge sites. Mitigation measures provide the greatest number of options. These include restoration of wetlands, filling of deep water canals so they can support submerged aquatic resources, wetland restoration, exotic vegetation removal, and seagrass and mangrove restoration projects.

Thank you for the opportunity to provide these comments. If you have any questions, please contact Andrew Gude at 305-872-5563.

Sincerely yours,

Allen D. Webb for

Linda S. Ferrell
Assistant Field Supervisor
South Florida Ecological Services Office

cc:
DEP, Marathon, Florida (Gus Rios)
EPA, Marathon, Florida (Bill Kruczynski)
FKNMS, Marathon, Florida (Billy Causey)
Florida Keys National Wildlife Refuges, Big Pine Key, Florida (Phil Frank)
FWC, Tallahassee, Florida (Robbin Trindell)
FWC (BPSM), Tallahassee, Florida (Mary Duncan)
NMFS, Miami, Florida (Audra Livergood)
Save the Manatee Club, Maitland, Florida (Judith Vallee)
Service, Ecological Services-Jacksonville, Florida (Sandy MacPherson)
Virginia S. Albrecht and Robert Gulley, Washington, D.C.

LITERATURE CITED

Beeler, I.E. and T.J. Oí Shea. 1988. Distribution and mortality of the West Indian manatee(*Trichechus manatus*) in the southeastern United States: a compilation and review ofrecent information. Report prepared by the U.S. Fish and Wildlife Service for the U.S. Army Corps of Engineers. PB 88-207 980/AS. National Technical Information Service; Springfield, Virginia.

Courtenay, W.R., Jr., D.J. Herrema, M.J. Thompson, W.P. Azzinaro, and J. van Montfrans. 1974. Ecological monitoring of beach erosion control projects, Broward County, Florida, and adjacent areas. Technical Memorandum 41, USACE, Ft. Belvoir, Virginia. 88 pp.

Dodge, R.E., S. Hess, C. Messing. 1991. Final Report: Biological Monitoring of the John U. Lloyd Beach Renourishment: 1989. Prepared for Broward County Board of County Commissioners, Erosion Prevention District of the Office of Natural Resource Protection.

Florida Atlantic University and Continental Shelf Associates, Inc. 1994. An assessment of the effects of recurrent *Codium isthmocladum* blooms on the reefs and reef fish populations of Palm Beach and northern Broward Counties, Florida. Final Report for the Florida Marine Fisheries Commission, Tallahassee, Florida. 51 pp. plus appendices.

Forys, E.A. 1995. Metapopulations of marsh rabbits: a population viability analysis of the Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*). Ph.D. Dissertation, University of Florida; Gainesville, Florida.

Forys, E.A. and S.R. Humphrey. 1996. Spatial organization of the endangered Lower Keys marsh rabbit in a highly fragmented environment. Journal of Mammalogy 77:1042-1048.

Jones, G.P., D.J. Ferrell, and P.F. Sale. 1991. Fish Predation and its Impacts on the Invertebrates of Coral Reefs and Adjacent Sediments. In *The Ecology of Fishes on Coral Reefs*. Academic Press Inc. 754pp.

Odum, W.E., and C.C. McIvor. 1990. Mangroves. *In* Ecosystems of Florida. R.L. Myers and J.J. Ewel, editors. 765 pp.

Rudolph, H. 1986. Broward county BAS biological study results. Unpublished report. 26 pp.

Seaman, W., Jr. Ed. 1985. Florida Aquatic Habitat and Fishery Resources. Florida Chapter of American Fisheries Society. 542 pp.

South Atlantic Fishery Management Council (SAFMC). 1998a. Final Comprehensive

Amendment Addressing Essential Fish Habitat in Fishery Management Plans of the South Atlantic Region. Charleston, SC. 142 pp.

South Atlantic Fishery Management Council (SAFMC). 1998b. Final Habitat Plan for the South Atlantic Region: Essential Fish Habitat Requirements for Fishery Management Plans of the South Atlantic Fishery Management Council. Charleston, SC. 408 pp.

Zieman, J.C. 1982. The Ecology of Seagrasses of South Florida: A Community Profile. U.S. Fish and Wildlife Services, Office of Biological Services, Washington, D.C. FWS/OBS-82/25. 158pp,

U.S. Army Corps of Engineers (USACE). 1996a. Coast of Florida Beach Erosion and Storm Effects Study, Region III, Feasibility Report with Final Environmental Impact Statement. Prepared by Gulf Engineers and Consultants, Inc.

U.S. Fish and Wildlife Service. 2002. Geographic Information System database. South Florida Field Office, Vero Beach, Florida.

APPENDIX F

SEDIMENT QUALITY
FOR
SAMPLES COLLECTED IN TRUMAN HARBOR,
THE TURNING BASIN AND MAIN SHIP CHANNEL
COLLECTED 13 TO 15 SEPTEMBER 2003
BY
CONTINENTAL SHELF ASSOCIATES, INC.

Table F-1 **Sediment Grain Size Data for Samples Collected During 13 to 15 September 2002 at 14 Stations Located Within Truman Harbor, the Turning Basin, and the Main Ship Channel.**

STATION	Gravel (%)	Sand (%)	Silt/Clay (%)
KW02-1	0.0	9.4	90.6
KW02-2	1.1	19.2	79.7
KW02-3	0.1	48.3	51.6
KW02-4	39.5	57.6	2.9
KW02-5	4.3	93.4	2.3
KW02-6	35.5	53.3	11.2
KW02-7	29.8	66.6	3.6
KW02-8	2.9	81.3	15.8
KW02-9	0.0	79.5	20.5
KW02-10	0.0	56.9	43.1
KW02-11	0.0	40.7	59.3
KW02-12	29.6	67.6	2.8
KW02-13	0.7	96.5	2.8
KW02-14	0.9	94.8	4.3

Table F-2 **Trace Metal Data for Sediment Samples Collected During 13 to 15 September 2002 at 14 Stations Located Within Truman Harbor, the Turning Basin, and the Main Ship Channel.**

STATION	Aluminum (mg/kg)	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)
KW02-1	1460	6.32	0.12	8.58	10.9	5460	14.3	0.07	3.46	0.068	23.9
KW02-2	1430	8.14	0.29	14.2	63.6	3180	54.0	1.01	3.88	0.163	79.9
KW02-3	1280	3.29	<0.10	5.95	2.13	828	1.92	<0.05	2.78	0.020	7.08
KW02-4	1190	1.54	<0.10	3.88	1.07	2400	1.83	<0.05	2.43	<0.020	4.74
KW02-5	410	1.47	<0.10	3.25	2.02	1060	2.45	<0.05	1.95	<0.020	7.81
KW02-6	515	1.86	<0.10	3.07	0.88	1050	5.82	<0.05	2.01	<0.020	6.73
KW02-7	1190	2.89	<0.10	3.56	1.32	4450	1.64	<0.05	1.00	0.022	6.77
KW02-8	372	2.01	<0.10	3.37	0.70	629	1.06	<0.05	1.06	<0.020	4.00
KW02-9	156	2.24	<0.10	3.07	0.41	511	0.79	<0.05	0.86	<0.020	3.30
KW02-10	438	2.43	<0.10	2.15	0.34	920	0.32	<0.05	0.98	<0.020	1.91
KW02-11	488	2.49	<0.10	4.77	0.99	943	1.26	<0.05	1.33	<0.020	5.00
KW02-12	465	2.12	<0.10	2.92	0.53	740	0.29	<0.05	0.73	<0.020	2.34
KW02-13	73.0	2.06	<0.10	4.96	0.49	192	0.83	<0.05	0.58	<0.020	2.84
KW02-14	69.7	2.16	<0.10	4.18	0.37	150	0.45	<0.05	1.20	<0.020	2.70

Table F-3 **Organic Pollutant Data for Sediment Samples Collected During 13 to 15 September 2002 at 14 Stations Located Within Truman Harbor, the Turning Basin, and the Main Ship Channel.**

Parameter	Units	Detection Limits	Station			
			KW02-1	KW02-2	KW02-3	KW02-5
1-Methylnaphthalene	µg/kg	160	ND	ND	ND	ND
2,2',3,3',4,4',5,5',6-NonaCB	µg/kg	5.0	ND	ND	ND	ND
2,2',3,3',4,4',5-HeptaCB	µg/kg	5.0	ND	ND	ND	ND
2,2',3,3',4,4'-HexaCB	µg/kg	10	ND	ND	ND	ND
2,2',3,4',5-PentaCB	µg/kg	5.0	ND	ND	ND	ND
2,2',3,4,4',5'-HexaCB	µg/kg	5.0	ND	ND	ND	ND
2,2',3,5'-TetraCB	µg/kg	5.0	ND	ND	ND	ND
2,2',4,4',5,5'-HexaCB	µg/kg	10	ND	ND	ND	ND
2,2',4,5'-TetraCB	µg/kg	5.0	ND	ND	ND	ND
2,2',4,5,5'-PentaCB	µg/kg	5.0	ND	ND	ND	ND
2,2',5,5'-TetraCB	µg/kg	5.0	ND	ND	ND	ND
2,2',5-TriCB	µg/kg	5.0	ND	ND	ND	ND
2,3,3',4,4'-PentaCB	µg/kg	10	ND	ND	ND	ND
2,3,4,4',5-PentaCB	µg/kg	5.0	ND	ND	ND	ND
2,3,4,4'-TetraCB	µg/kg	5.0	ND	ND	ND	ND
2,4'-DiCB	µg/kg	5.0	ND	ND	ND	ND
2,4,4'-TriCB	µg/kg	10	ND	ND	ND	ND
2-Methylnaphthalene	µg/kg	160	ND	ND	ND	ND
4,4'-DDD	µg/kg	5.0	ND	ND	ND	ND
4,4'-DDE	µg/kg	5.0	ND	ND	ND	ND
4,4'- DDT	µg/kg	5.0	ND	ND	ND	ND
Acenaphthene	µg/kg	160	ND	ND	ND	ND
Acenaphthylene	µg/kg	160	ND	ND	ND	ND
Aldrin	µg/kg	5.0	ND	ND	ND	ND
Anthracene	µg/kg	160	ND	ND	ND	ND
Aroclor-1016	µg/kg	20	ND	ND	ND	ND
Aroclor-1221	µg/kg	20	ND	ND	ND	ND
Aroclor-1232	µg/kg	20	ND	ND	ND	ND
Aroclor-1242	µg/kg	20	ND	ND	ND	ND
Aroclor-1248	µg/kg	20	ND	ND	ND	ND
Aroclor-1254	µg/kg	20	ND	ND	ND	ND
Aroclor-1260	µg/kg	25	ND	ND	ND	ND
Benzo(a)anthracene	µg/kg	160	ND	ND	ND	ND
Benzo(a)pyrene	µg/kg	160	ND	ND	ND	ND

Parameter	Units	Detection Limits	Station			
			KW02-1	KW02-2	KW02-3	KW02-5
Benzo(b)fluoranthene	µg/kg	160	ND	ND	ND	ND
Benzo(g,h,i)perylene	µg/kg	160	ND	ND	ND	ND
Benzo(k)fluoranthene	µg/kg	160	ND	ND	ND	ND
Chlordane	µg/kg	5.0	ND	ND	ND	ND
Chrysene	µg/kg	160	ND	ND	ND	ND
Dibenz(a,h)anthracene	µg/kg	160	ND	ND	ND	ND
Dibutyltin	µg/kg	16	ND	ND	ND	ND
Dieldrin	µg/kg	5.0	ND	ND	ND	ND
Endosulfan I	µg/kg	5.0	ND	ND	ND	ND
Endosulfan II	µg/kg	5.0	ND	ND	ND	ND
Endosulfan sulfate	µg/kg	5.0	ND	ND	ND	ND
Endrin	µg/kg	5.0	ND	ND	ND	ND
Endrin aldehyde	µg/kg	5.0	ND	ND	ND	ND
Fluoranthene	µg/kg	160	ND	ND	ND	ND
Fluorene	µg/kg	160	ND	ND	ND	ND
Heptachlor	µg/kg	5.0	ND	ND	ND	ND
Heptachlor epoxide	µg/kg	5.0	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	µg/kg	160	ND	ND	ND	ND
Methoxychlor	µg/kg	20	ND	ND	ND	ND
Monobutyltin	µg/kg	16	ND	ND	ND	ND
Naphthalene	µg/kg	160	ND	ND	ND	ND
Phenanthrene	µg/kg	160	ND	ND	ND	ND
Pyrene	µg/kg	160	ND	ND	ND	ND
Toxaphene	µg/kg	50	ND	ND	ND	ND
Tributyltin	µg/kg	16	ND	ND	ND	ND
alpha-BHC	µg/kg	5.0	ND	ND	ND	ND
beta-BHC	µg/kg	5.0	ND	ND	ND	ND
delta-BHC	µg/kg	5.0	ND	ND	ND	ND
gamma-BHC (Lindane)	µg/kg	5.0	ND	ND	ND	ND

ND = Not detected.

Table F-4 **Oil and Grease, Total Organic Carbon, Cyanide, and Ammonia Data for Sediment Samples Collected During 13 to 15 September 2002 at 14 Stations Located Within Truman Harbor, the Turning Basin, and the Main Ship Channel.**

Station	Oil and Grease (mg/kg)	Total Organic Carbon (%)	Cyanide (ug/g)	Ammonia (ug/g)
KW02-1	ND	1.4	0.009	13.5
KW02-2	110	1.2	<0.004	5.80
KW02-3	ND	0.8	<0.004	7.26
KW02-5	ND	0.36	<0.004	20.8

ND = Not detected.

Table F-5 Sediment Data for Samples Collected in Truman Harbor and at Two Turning Basin Stations (Control Stations) as Reported by Sandra Walters Consultants, Inc. (1999).

Parameter	Units	MDL	Station				
			Harbor	Mole Pier	Pier B	Control	Control
Arsenic	mg/kg		1.69	1.32	4.80	1.13	1.76
Barium	mg/kg		8.45	6.06	7.54	6.19	5.88
Cadmium	mg/kg		<1.41	<1.10	2.35	<1.13	<1.18
Lead	mg/kg		48.6	51.2	62.6	47.8	54.1
Chromium	mg/kg		3.52	3.86	4.71	1.69	1.76
Mercury	mg/kg		<0.07	<0.055	<0.047	<0.056	<0.059
Selenium	mg/kg		1.41	<0.055	<0.047	<0.056	1.53
Silver	mg/kg		<1.41	<1.10	<0.94	<1.13	<1.18
Petroleum Range Organics	µg/kg		<4.0	<4.0	<4.0	<4.0	<4.0
Benzene	µg/kg	0.20	BMDL	BMDL	BMDL	BMDL	BMDL
Chlorobenzene	µg/kg	0.20	BMDL	BMDL	BMDL	BMDL	BMDL
1,2-Dichlorobenzene	µg/kg	0.20	BMDL	BMDL	BMDL	BMDL	BMDL
1,3-Dichlorobenzene	µg/kg	0.20	BMDL	BMDL	BMDL	BMDL	BMDL
1,4-Dichlorobenzene	µg/kg	0.20	BMDL	BMDL	BMDL	BMDL	BMDL
Ethylbenzene	µg/kg	0.20	BMDL	BMDL	BMDL	BMDL	BMDL
Toluene	µg/kg	0.20	BMDL	BMDL	BMDL	BMDL	BMDL
Xylenes (total)	µg/kg	0.20	BMDL	BMDL	BMDL	BMDL	BMDL
MTBE	µg/kg	0.20	BMDL	BMDL	BMDL	BMDL	BMDL
Acenaphthene	µg/kg	0.50	BMDL	BMDL	BMDL	BMDL	BMDL
Acenaphthylene	µg/kg	0.50	BMDL	BMDL	BMDL	BMDL	BMDL
Anthracene	µg/kg	1.00	BMDL	BMDL	BMDL	BMDL	BMDL
Benz(a)anthracene	µg/kg	1.00	BMDL	BMDL	BMDL	BMDL	BMDL
Benzo(a)pyrene	µg/kg	2.00	BMDL	BMDL	BMDL	BMDL	BMDL
Benzo(b)fluoranthene	µg/kg	1.25	BMDL	BMDL	BMDL	BMDL	BMDL
Benzo(g,h,i)perylene	µg/kg	2.50	BMDL	BMDL	BMDL	BMDL	BMDL
Benzo(k)fluoranthene	µg/kg	1.25	BMDL	BMDL	BMDL	BMDL	BMDL
Chrysene	µg/kg	2.50	BMDL	BMDL	BMDL	BMDL	BMDL
Dibenzo(a,h)anthracene	µg/kg	1.00	BMDL	BMDL	BMDL	BMDL	BMDL
Fluoranthene	µg/kg	1.00	BMDL	BMDL	BMDL	BMDL	BMDL
Fluorene	µg/kg	0.50	BMDL	BMDL	BMDL	BMDL	BMDL
Indeno(1,2,3-cd)pyrene	µg/kg	0.50	BMDL	BMDL	BMDL	BMDL	BMDL
Naphthalene	µg/kg	0.50	BMDL	BMDL	BMDL	BMDL	BMDL
Phenanthrene	µg/kg	1.00	BMDL	BMDL	BMDL	BMDL	BMDL
Pyrene	µg/kg	1.00	BMDL	BMDL	BMDL	BMDL	BMDL
1-Methyl Naphthalene	µg/kg	0.50	BMDL	BMDL	BMDL	BMDL	BMDL
2-Methyl Naphthalene	µg/kg	0.50	BMDL	BMDL	BMDL	BMDL	BMDL
Total Naphthalenes	µg/kg		BMDL	BMDL	BMDL	BMDL	BMDL
Total PAHs	µg/kg		BMDL	BMDL	BMDL	BMDL	BMDL

MDL=Method detection limit; BMDL = Below method detection limit