145. The Locally Preferred (LP) plan is the Recommended Plan and includes components that would widen and deepen the Entrance Channel, deepen Government Cut, deepen and widen Fisher Island Turning Basin, relocate the west end of the Main Channel (no dredging involved), and deepen and widen Fisherman's Channel and the Lummus Island Turning Basin. The LP plan, figure 10, consists of five components that would improve Port transit for the existing and future fleets:

a. **Component: 1C:** Widen seaward portion of Cut-1 from 500 to 800 feet and deepen Cut-1 and Cut-2 from a project depth of 44 to 52 feet;

b. **Component 2A:** Add turn widener at the southern intersection of Cut-3 with Fisherman's Channel and deepen to a project depth of 50 feet;

c. **Component 3B:** Increase the Fisher Island Turning Basin from 1200 to 1500 feet. Truncate the northeast section of the turning basin to minimize seagrass impacts. Deepen from a project depth of 42 feet to 50 feet;

d. **Component 4:** Realign the western end of the main channel about 250 feet to the south. The project depth remains at 36 feet no additional dredging required; and

e. **Component 5:** Component 5A – Widen the southern edge of Fisherman's Channel about 100 feet, reduce the Lummus Island (Middle) Turning Basin to a 1500-foot diameter from the currently authorized 1600-foot diameter, and deepen from a project depth of 42 feet to 50 feet.

ESTIMATED COST FOR THE RECOMMENDED PLAN

146. The first cost features for the LP 50-foot plan are shown on **table 21.** The total first cost is about$172,699,000. This cost includes associated non-Federal costs for berthing area dredging, port bulkhead construction, and Real Estate administration costs, and mitigation features. Also includes is utility relocations costs of about $6,396,000. In addition there are post-construction cost for navigation aids, $15,000. There are no additional operations and maintenance costs expected.

Table 21 - Itemized Cost for the LP Plan

Construction Item	Cost:
Dredging --	
Mob & Demob	$2,398,312
Alternative 1C (Cut 1/2 intersection widening)	19,357,198
Alternative 1C (Cut 1)	13,382,089
Alternative 1C (Cut 2)	7,135,279
Alternative 2A (Cut 3 Widener)	311,114
Alternative 3B (Cut 3)	20,320,888
Alternative 5A (Fisherman Channel)	28,881,207
Alternative 5A (Lummus Is. Turning Basin)	26,567,383
Disposal Area (Virginia Key)	647,402
Environmental Mitigation	1,983,292
Mitigation Monitoring (Construction)	120,000
Mitigation Monitoring (Post-Construction)	150,000
Planning, Engineering, and Design	3,930,000
Construction Management (S&I)	11,100,000
Subtotal GNF	$136,284,164
Aids to Navigation	165,300
Lands, Easements, Rights of Way, and Relocations	
Real Estate, Administrative (Federal)	**$12,500**
Utility Relocations	**$6,396,455**
Associated Non-Federal Costs	
Berthing Area Dredging (Alt. 5A)	$7,027,867
Port Bulkhead Construction	22,800,000
Real Estate, Administrative (non-Federal)	12,500
Total Non-Federal Costs	**$29,840,367**
Total Project First Cost	**$172,698,786**

CONSTRUCTION METHODS FOR THE RECOMMENDED PLAN

147. Construction methodology of the project would be determined by the contractor selected by the USACE during the bid process. However, certain assumptions for planning and estimating purposes were made regarding various proposed construction techniques that may be used.

148. The removal of the existing utilities crossing the channel impacted by the new project construction will follow the relocation (installation) of the replacement

utilities as part of the construction dredging for the new project. The existing utilities are a 54" concrete force main crossing Government Cut-2 and a 20" ductile iron water main crossing Fisherman Channel.

149. The installation of the relocation will include cleaning and inspection of the abandoned lines prior to removal. The excavated/removed pipeline and dredged material will be disposed of in a specified offshore disposal location. The relocation of the replacement pipelines will involve the excavation by hydraulic excavator dredge and scow barges of a 100 foot wide open trench following drilling and blasting for the cover area and a 20 foot wide trench for the pipeline placement. New lines are to be the same type pipeline and construction as the original lines.

150. The new lines will then be placed within the trench and covered and compacted with specified backfill material, which will either consist of a portion of the excavation material along with disposal material already located at Virginia Key upland disposal site if needed. This will be accomplished using a small clamshell crane barge with scow barges. The remaining excavation of material not used for backfilling the trenches will be disposed of in a designated offshore location. The new lines will be pressure tested and inspected.

151. Dredged material from widening and deepening of the channel would most likely be excavated using either a hydraulic cutterhead dredge or mechanical excavator with some or all of the material pretreated using blasting or some other method to break the rock prior to dredging. Dredging of rock material could be accomplished using a hydraulic excavator dredge that loads scow barges. Drilling and blasting will be required of most rock in Cut-3 and Fisherman's channel (Components 2A, 3B, 5 and 5A) prior to dredging with the exception of the majority of Cuts 1 –2 (Component 1C) which might be dredged with a 30-inch cutterhead pipeline dredge having rock cutting capability. The rock-hardened cutterhead dredge could pump the rock material to the upland confined disposal facility (CDF) on Virginia Key. The existing channel along the widener at the intersection of Cuts 1 and 2 will require blasting. A hydraulic excavator loading scow barges could then be used to transport the material to the proposed artificial reef locations, figure 9. Dredging of non-rock material could be accomplished using a 30-inch cutter suction pipeline dredge with boosters and placed at the existing upland CDF on Virginia Key.

152. If a mechanical dredge is used, the larger rock material may be removed and segregated for use in constructing the mitigation sites. Larger rock material would be placed on an ocean going bottom-dump barge to be transported to the proposed artificial reef sites for precise placement with an additional clamshell or barge-mounted crane or to the offshore Ocean Dredged Material Disposal Site (ODMDS). Smaller rock material would be placed on a smaller shallow draft barge for placement at the proposed seagrass mitigation site. Disposal of dredged material would be at the proposed seagrass or artificial mitigation sites,

the offshore Ocean Dredged Material Disposal Site (ODMDS), or the existing upland CDF on Virginia Key, figure 9.

ENVIRONMENTAL CONSIDERATIONS

153. Along with economic and technical considerations NEPA requires Federal agencies to employ an interdisciplinary approach in the decision-making process to ensure that unquantified environmental values are also given appropriate consideration. In achieving the goals of providing features to improve navigation and national economic benefits, the impacts to the natural system of South Florida's shorelines, estuaries, benthic communities, fisheries, and associated terrestrial and maritime habitat, including but not limited to, Florida Bay, Biscayne Bay and the coral reef tract have been considered in the formulation process.

154. Extensive plan formulation, plan revision, and plan refinement have avoided impacts to the environment, whenever possible, and minimized impacts to the environment to the greatest extent possible while still meeting the project need and purpose. Efforts have been made to include all stakeholders in the planning process to assist the USACE in minimizing environmental impacts. There are several unavoidable environmental impacts of the proposed project to the natural environment with respect to several species of seagrasses located the in Fisher Island Turning Basin. In addition, there would be some impacts to hardbottom communities within the confines of the Entrance Channel.

155. To compensate for the effects of the action on previously non-dredged habitats, the Corps has proposed the following: (1) mitigate for the removal of 6.3 acres of seagrass at a ratio of 1:1 through the restoration of an 18.6-acre historic dredged borrow site in northern Biscayne Bay (2) mitigate for the removal of 2.7 acres of high-relief coral reef habitat at a ratio of 2:1 through the creation of 5.3 acres of high-complexity, high relief artificial reef habitat, and (3) mitigate for the 0.6 acre of impact to low-relief hardbottom habitat by creating .8 acres of low-relief hardbottom at a 1.3:1 ratio.. The Corps has not proposed compensation for the removal of the biotic communities, which have colonized the channel walls or channel bottom since the last dredging event.

156. As previously mentioned, the proposed action affects seagrass and hardbottom/reef communities and other waters of the United States subject to Section 404 of the Clean Water Act (CWA). A Section 404(b)(1) Evaluation Report has been completed and is included in the EIS (Appendix C) to comply with the CWA. State approval is required for certification of water quality through Section 401 of the CWA and concurrence. A Coastal Zone Management Consistency Determination was prepared by the USACE and will be submitted to the State for concurrence (Appendix D of the EIS).

157. However, the Fish and Wildlife Service (Service) has provided several recommendations in the Coordination Act Report (CAR) concerning blasting, monitoring, and mitigation to further minimize or avoid possible adverse effects of the action on fish and wildlife resources. Specifically, for the permanent removal of 6.3 acres of seagrass and 30.7 acres of low-relief hardbottom, including the temporal lag for the recovery of the invertebrate communities and habitats associated with the channel walls and bottom. The following compensatory mitigation is recommended (1) restore 18.6 acres of seagrass habitat (3:1 ratio) (2) creation of 9.74 acres of low-complexity, low-relief artificial hardbottom habitat (1.3:1 ratio), (3) creation of 5.3 acres of high-relief artificial hardbottom habitat (2:1 ratio). In addition, the development of an environmental monitoring program is recommended to verify that project impacts occurred within the levels anticipated and to ensure that the mitigation areas are performing to levels where habitat replacement values are maintained.

158. The Corps has determined that the project "may affect, but is not likely to adversely affect" the federally endangered West Indian manatee, American crocodile, endangered green, Kemp's ridley, hawksbill and leatherback sea turtles, as well as the threatened loggerhead sea turtle, threatened Johnson's seagrass, and a species proposed for listing (endangered), the smalltooth sawfish.

159. In addition, the Corps has determined that the following whale species may be affected during blasting activities - the endangered humpback fin, sei, blue and sperm whales that are known to occur along the Atlantic coast. The Corps has also determined that designated critical habitat for the West Indian manatee and Johnson's seagrass will not be adversely modified by the proposed action. Since the Corps has agreed to incorporate the *Standard Manatee Protection Construction Conditions* and implement a blasting plan to minimize possible adverse effects to listed marine species using the standard "Navy Diver" protocol, the Service has concurred with the Corps' determination for the two species which fall under the jurisdiction of the Service - the West Indian manatee and the American crocodile. The Corps has initiated consultation with the National Marine Fisheries Service (NMFS) concerning the remaining listed species by submitting a Biological Assessment and is awaiting NMFS' determination. These whale species are also protected by the Marine Mammal Protection Act of 1972 (MMPA), and the Corps has initiated consultation with NMFS concerning impacts to species protected under the MMPA that are found in the project area.

DISPOSAL OPTIONS

160. A study titled "Preliminary Assessment Miami Harbor, Florida" was completed July 1997 and approved by the Major Subordinate Command, August 1997. The study concluded that the recommended disposal plan for Miami Harbor dredged material is the Miami Offshore Dredged Material Disposal Site

(ODMDS). The study indicated that the Miami ODMDS site has capacity for all projected new work and material for the next 20 years and that past disposal in that site involved no problem with the EPA. Appendix E updates the July 1997 Dredged Material Management Plan (DMMP) – "Preliminary Assessment Miami Harbor, Florida" with the current recommended plan disposal options which include the confined disposal facility on Virginia Key, the borrow areas north of the Julia Tuttle causeway, proposed artificial reef sites south of the entrance channel, and the existing ODMDS. The ODMDS (figure 9) site will be used for dredged material not designated for beneficial uses (such as filling borrow areas north of the Julia Tuttle causeway for seagrass mitigation or artificial reef mitigation sites).

161. In addition to the ODMDS disposal of dredged materials would occur at three other disposal sites (figure 9): filling borrow areas north of the Julia Tuttle causeway to provide a seagrass mitigation area, proposed offshore artificial reef areas for impacts to reef habitat, and an existing confined upland disposal area on Virginia Key. The Recommended Plan would impact 0.2 acre of seagrass habitat within the existing channel, 6.1 acres of seagrass habitat outside of the existing channel, 0.6 acre of low relief/hardbottom reef habitat, 28.1 acres of previously dredged low relief/hardbottom reef habitat, 2.7 acres of high relief hardbottom/reef habitat, 18.0 acres of previously dredged high relief hardbottom/reef habitat, 3.0 acres of rock rubble habitat, 51.7 acres of previously dredged rock/rubble habitat, 23.3 acres of unvegetated bottom habitat, and 213.1acres of previously dredged unvegetated bottom habitat. Impacts to marine mammals, sea turtles, and fish species may occur due to loss of habitat and blasting activities associated with project construction activities. The Recommended Plan would cause temporary increases in turbidity; however, these levels would not exceed permitted variance levels outside the mixing zone.

ENVIRONMENTAL MITIGATION

162. Mitigation proposed for seagrass impacts would include restoration of a previously dredged borrow area within northern Biscayne Bay, figure 9. While mitigation proposed to offset new impacts to high and low relief hardbottom/reef habitat, would include creation of artificial reefs within permitted offshore artificial reef sites, if available, or two locations south of the entrance channel shown in figure 9. See draft EIS paragraph 5.0, Mitigation for Adverse Impacts, for details of the proposed mitigation plan.

163. Mitigation for seagrass and hardbottom/reef impacts would be provided through restoration of seagrass beds and creation of artificial reefs. Based upon the extent of impacts and ratios discussed, restoration of approximately 6.3 acres (1:1 ratio) of seagrass beds is proposed as compensation for unavoidable impacts. In order to replace local seagrass functions and values, restoration would be implemented within Biscayne Bay, preferably in areas where seagrass once occurred and is now absent due to past anthropogenic activities such as

dredging. Seagrass habitat would be restored by filling 18.6 acres of old borrow areas located in North Biscayne Bay. The Corps will fill the entire hole to ensure project success, however, banking of the remaining mitigation credit will be requested.

164. New impacts to low relief hardbottom/reef and high relief hardbottom/reef total 0.6 acre and 2.7 acres, respectively. Based on the Habitat Equivalency Analyses (HEA) calculations, direct impacts to hardbottom/reef habitats would require the creation of artificial reef habitat at an effective mitigation ratio of 2:1 for high relief hardbottom/reef habitat and an effective mitigation ratio of 1.3:1 for low relief hardbottom/reef habitat. Mitigation reefs would be constructed in two different designs, to reflect the differences in the habitat structure of the two types of hardbottom/reef habitat to be impacted. The proposed mitigation would be type-for-type, to reflect the ecological differences between the different reef types impacted. A total of 0.8 acre of low relief-low complexity (LRLC) reef would be required to mitigate for the new low relief hardbottom/reef. A total of 5.4 acres of high relief-high complexity (HRHC) reef would be required to mitigate for the high relief impact. Reefs could be constructed at approved artificial reef sites managed by Miami-Dade County Environmental Resources Management (DERM) or at two locations south of the entrance channel shown on figure 9.

165. Responsibility for operation, maintenance, repair, replacement, and rehabilitation of all mitigation areas for the life of the authorized project rests with the Sponsor, the Miami-Dade County Seaport Department. After construction of the reef mitigation features monitoring will occur. The Sponsor will coordinate the monitoring process. As described in the draft EIS, Appendix J, Mitigation Plan, paragraph 4.2.3, Reef Monitoring, the monitoring program for the mitigation reefs will consist of both physical and biological components. Physical monitoring will assess the degree of settling of the reef materials after the first year, and biological monitoring will assess population of algae, invertebrates, and fishes, as compared with concurrent control sampling of natural reefs for three years. Monitoring will be conducted annually in the summer months. In order to provide a permanent record of reef conditions and biota, each sampling effort will include video transects covering representative areas of the mitigation reefs."

166. During the past phase II dredging of the Lummus Island Turning Basin, figure 7, the Port of Miami's contractor dredged outside the permitted area. As a result the State of Florida Department of Environmental Protection and Miami-Dade County entered into a Consent Order on May 7, 2002 to address the damage to low- to moderate-density sea grasses outside of the permitted dredging area. This Order requires the Port of Miami to undertake a mitigation project at the Oleta River State Park in North Miami. The plan includes 1) restoration of 42.5 acres of red mangrove swamp, tidal streams, and tidal pools; 2) enhancement of approximately 20 acres of tidal red mangrove habitat; 3) and creation and installation of bilingual environmental education signs within the

Park. This mitigation work addresses the Department of Environmental Resources Management (DERM) Notice of Violation as well.

ECOSYSTEM RESTORATION ON USING DREDGED MATERIAL (EP-116-2-1)

167. The Planning Guidance Notebook ER 1105-2-100 (USACE, April 2000) page E-69 states that it is Corps policy that studies include an assessment of potential beneficial uses for environmental purposes including fish and wildlife habitat creation, ecosystem restoration and enhancement, and hurricane and storm damage reduction. Three type of beneficial use exist near the project area. Although a majority of dredged material will be disposed of in the ODMDS site as much as possible, the following beneficial use sites will be used:

a. North Biscayne Bay dredge holes were created to provide fill material for previous construction projects. Currently one of the holes that has a 18.6 acre footprint is slated for dredged material disposal. The dredge hole extends to such a depth that anoxic conditions exist, where the hole provides little viable marine habitat. The hole will be filled with 375,000 cy of excavated rock material and capped with 25,000 cy of sandy material. A field visit conducted by the Corps, the Port, and resource agency staff indicated that if the crest of the filled hole could be extended into the photic zone, it would be an ideal site for seagrass recruitment.

b. Planting of the proposed 18.6-acre mitigation site is expected to follow a pattern demonstrated by a three-acre restoration site in North Biscayne Bay that was prepared by Miami-Dade County DERM. Restoration of three-acre borrow area in North Biscayne Bay was completed in the late 1990s. Although no monitoring has been done by DERM since planting of the site, a visual inspection by an agency team in 2002 revealed that seagrass occurs throughout the site and was dominated by *H. wrightii* and *T. testudinum*. Discussions with DERM staff indicate the old borrow area was filled with rubble and sand and planting units of both *H. wrightii* and *T. testudinum* installed. Based on this evidence of success, it is agreed that seagrass restoration in deep dredge holes was a viable option for mitigating seagrass loss in Biscayne Bay.

c. The existing dredged material disposal site located on the north side of Virginia Key is another “beneficial use site”. It is proposed to place beach quality material into the site where it can be offloaded in the future to provide hurricane and storm damage protection for the easterly shoreline of Virginia Key.

d. The third type of beneficial use involves placement of large blasted rock material into reef creation sites located south of the outer channel. Approximately 55,000 cy of rocky material is expected to be placed in these sites.

INCREMENTAL COST ANALYSIS OF MITIGATION PLAN

168. Restoring seagrass beds is an appropriate mitigation strategy due to its high ecological value and declining abundance. Seagrass restoration adds habitat value to unvegetated sand or mud substrates. The addition of seagrass beds increases the productivity and diversity of the unvegetated bottom, which can directly compensate for the historic loss in productivity and diversity.

169. Alternative plans for seagrass mitigation incorporated choices among construction methods and between planting methods. A cost-effectiveness analysis determined that using rock to close the hole and then allowing the seagrass to naturally recolonize resulted in the lowest Average Annual Equivalent (AAE) cost per AAE acre of seagrass. This is the mitigation component costed out in the MCACES presented in the Engineering Appendix. See Appendix F, *Mitigation Plan - Incremental Cost Analysis,* for a detailed discussion of the cost-effectiveness analysis.

FUTURE OPERATIONS AND MAINTENANCE

170. Proposed improvements of the Miami Harbor Federal navigation project consist of multiple elements: deepening the entrance channel from 44 to 52 feet, constructing a 200-foot widener along the easternmost limit of the entrance channel, and several widening and/or deepening modifications to the interior channels and turning basins.

171. Recent sediment budget studies (Dade County Regional Sediment Budget, Coastal Systems International, January 1997; Dade County Evaluation Report, Jacksonville District, COE, October 2001) have been performed along the length of the Dade County Beach Erosion Control project, which extends along the length of the Dade County Atlantic shoreline from northern Sunny Isles southward to Government Cut. These sediment budget studies indicate that the net littoral transport in the vicinity of Government Cut is about 24,000 cy/yr to the south, which represents the maximum potential sediment transport rate into the channel. The most recently calculated sediment budgets conclude that an average of 15,000 cy/yr is deposited in the interior channels, while 9,000 cy/yr is deposited in shoals along the outer reaches of the channel. These values agree closely with observed shoaling rates as determined from dredging records.

172. The proposed widening and deepening of the entrance channel would tend to further decrease any sediment bypassing, but under the existing conditions the

Miami Harbor entrance channel already forms a complete littoral barrier. Examination of the sediment budget for Government Cut shows that the entire volume of southward-directed sediment transport is deposited into the interior and exterior reaches of the channel, and the volume of sediment bypassed across the entrance channel to downdrift beaches is essentially zero. The proposed deepening and widening of the existing project cannot therefore further increase the rate of channel shoaling or decrease the volume of sediment bypassing.

173. Numerical modeling of the proposed channel improvements has been performed, and the results of these simulations show that negligible changes to current velocities and salinity levels will occur throughout the extent of the project as a result of the proposed improvements.

174. Due to the lack of sediment bypassing under the existing conditions, and due to the negligible changes in tidal current velocities as determined by numerical modeling, no significant changes to the existing shoaling rates and patterns of deposition are expected due to construction of the proposed channel improvements at Miami Harbor. There is no additional future operation and maintenance anticipated as part of the proposed project.

INITIAL AND AAEQ COST FOR NED PLAN

175. The initial cost of the NED plan, is about $162,140,000 for IDC calculations as explained on page 100 of the Economics – Appendix A, which does not include $150,000 for post construction mitigation monitoring. The post-construction mitigation monitoring costs of $50,000 per year for the first three years following completion of the project are discounted using the Federal discount rate of 5.875 percent to the base year of the project to obtain the real cost or present worth costs of $133,960, at October 2002 price levels. The itemization of these costs has been displayed in **Table 20**. The interest during construction (IDC) cost is about $21,078,000. The total for the first cost and IDC is about $183,218,000.

176. The estimated annual costs for the recommended plan are based on the AAEQ of the first cost and interest during construction and, the annualization for post-construction costs for mitigation monitoring and annual maintenance for navigation aides. The AAEQ for the first cost is about $10,108,000 and the AAEQ for the IDC is about $1,314,000 for a total of about $11,421,786.

ECONOMIC SUMMARY

177. As shown in **Tables A-90, A-91, A-92** of Economics – Appendix A for the NED plan the AAEQ benefits are about $2,581,000 for channel widening; $1,174,000 for extending Fisher Island's turning basin, and $11,107,000 for deepening the channel to 49 feet. The total AAEQ benefit is about $14,862,000.