APPENDIX A-ECONOMICS

Hernando Beach Navigation Feasibility Study
Economics Appendix

Purpose and Scope

In September 1997, the Jacksonville District, US Army Corps of Engineers, completed a Preliminary Analysis Letter Report that identified a federal interest in improving the navigation channel at Hernando Beach and indicated that feasibility-level studies were warranted. The Hernando Beach Navigation Channel is adjacent to Hernando Beach, Florida, on the Gulf Coast approximately 40 miles north of Tampa. The existing channel was constructed by the developer of the Hernando Beach residential area and is currently maintained by the non-Federal sponsor, the Hernando County Board of County Commissioners.

The feasibility phase was initiated in June 1998, following review and comment from the South Atlantic Division (SAD), US Army Corps of Engineers, and signing of a Feasibility Cost-sharing Agreement (FCSA) with the non-Federal sponsor. This economics appendix presents estimated benefits accruing from an improved navigation channel at Hernando Beach. These economics are sufficient in scope to comply with ER-1105-2-100. The sections that follow describe the existing setting, key inputs and assumptions of the analysis, including methodologies employed, and present estimated benefits.

Problems and Needs

The Hernando Beach Channel serves the community of Hernando Beach, which is a manmade development. Commercial as well as recreational boats use the canals and channel for access to the Gulf of Mexico. The area has a main channel to serve public and commercial facilities located near County Road 595, as well as good-sized access canals to residential property. Commercial fishermen have waterfront property specifically for berthing their boats, storing their equipment, and handling their catch. Several marinas are on the water to serve the public and provide wet and dry boat storage, fuel, water and marine supplies. The Hernando Beach area has a public launching and public area for handling trailered boats. The residential community has a larger number of waterfront homes with deeper and wider canals for access.

The channel from the Gulf of Mexico to the entrance in the Hernando Beach development is nearly three miles long, with a width ranging from 35 to 60 feet, and a depth of 5.5 feet in most of the reach. The channel has several curves and rock in its bottom. Some of the rock in the channel is not at a depth of 5.5 feet. Heavy shoaling and dangerous rock conditions have contributed to a narrow channel. Both commercial and recreational vessels have difficulties passing in the channel or cannot pass at all under certain conditions. The channel curves in several locations, partially or fully obscuring the views along the channel at these locations. Due to the shallow depths, the rock, the narrow

channel width, and the treacherous curve, local commercial and recreational vessel operators have incurred vessel damages and marine incidents.

Improved navigation due to the deepening, widening and straightening of the channel is expected to reduce the vessel damage costs and the number of marine incidents. Furthermore, the shallow channel depths that result during periods of extreme low tide, particularly during the winter months, often impede the ability of commercial vessels, i.e. fishing boats and charter vessels, to operate, resulting in a loss of income.

Existing Traffic

Live bait shrimping is the largest industry in Hernando Beach. It is a major employer, not only for the more than 100 fishermen, but also for dozens of drivers who ship the shrimp and the hundreds of bait shop operators who ultimately sell it. The live bait shrimp industry is the nucleus around which evolves the Florida sports fishing industry. Today a multi-million dollar live bait industry testifies to the pre-eminence of the shrimp as the favorite bait of Florida saltwater anglers.

The production of live bait shrimp along the West Coast is centered on one species, the brown-spotted or pink shrimp, *Penaeus duorarum* (see **Table A-1**). The shallow grass flats off of the coast from Jefferson County to Pasco County (also referred to as the Big Bend region) are fertile grounds for pink shrimp, largely due to state intervention. In 1994, the Florida Marine Fisheries Commission closed to shrimpers a half-million acres in the Big Bend region, roughly the areas within 3 miles of the coastline. The coastline is the nursery area for pink shrimp, so the restrictions have enabled the population to flourish.

Table A-1
Gulf Coast Bait Shrimp Data, 1990-1999

Year	Trips	Pounds	Pounds/Trip
1990	13,718	1,132,711	14.17
1991	12,598	970,932	16.26
1992	13,085	1,064,875	19.58
1993	12,067	1,036,283	17.39
1994	12,943	1,166,733	21.12
1995	12,170	1,175,350	20.54
1996	12,558	1,360,026	24.57
1997	13,747	1,367,618	21.63
1998	13,757	1,607,707	26.85
1999	14,999	1,644,190	25.80

Because this shrimp is nocturnal in habit, the bait shrimping operation is limited to the nighttime. Hernando County is the leading producer of live bait shrimp in Florida (see **Table A-2**). The amount of bait shrimp caught off of the Hernando coast has risen in recent years (see **Table A-3**). In 1999, Hernando County accounted for more than a quarter of the shrimp sold in bait shops around the state – more than 600,000 pounds worth. This shrimp had a retail value of approximately $25 million.

Table A-2
Bait Shrimp Pounds
By County, 1999

County	Lbs.
Hernando	608,240
Miami-Dade	521,870
Citrus	377,441
Pinellas	198,077
Lee	129,993
Monroe	102,306
Pasco	76,511
Levy	45,636
Volusia	44,322

Hernando Beach's unique features have contributed to the growth of the live bait shrimp industry in the area. Hernando Beach's proximity to the prime shrimping areas from Tarpon Springs to Crystal River allows the boats to get back early enough to get the shrimp to bait shops on time. In the summer months, the shrimp operations in Port Richey and Tarpon Springs cease as the shrimp move to deeper water offshore; however, in Hernando Beach shrimpers operate year-round.

Almost all of the shrimp caught off of the Hernando County coast are used for bait. In neighboring Citrus and Pasco counties, the same shrimp are caught for food. The difference in Hernando County is that the shrimp are kept alive for use as bait. A small amount of the shrimp caught off of the Coast of Hernando County is sold as food. In recent years, a growing number of shrimp caught off of the Hernando County coast have been marketed to Asian restaurants as sushi.

In addition to live bait shrimp, stone crabs and grouper are pursued by commercial fishermen in Gulf waters via the Hernando Beach access channel. Charter vessels also operate from Hernando Beach. The charter boats operate on a for-hire basis, transporting sport fisherman into Gulf waters for a day of fishing. Because of the more limited scope

of operations and concerns for confidentiality of financial data, stone crab and grouper vessels, as well as charter vessels were included among the shrimp boats in the accounts of commercial fishing benefits. The ventures were considered similar enough in terms of equipment employed and associated operating costs and revenues to be aggregated with the live bait shrimp operations.

Table A-3
Bait Shrimp Pounds, 1995-1999
Hernando County

Year	Lbs.
1995	436,057
1996	343,783
1997	440,394
1998	450,858
1999	608,240

Commercial Fishing

Bait Shrimp

From information furnished by local fishermen and commercial fishing license data compiled by the Florida Fish & Wildlife Conservation Commission, 52 bait shrimp boats have been identified as operating in the Hernando Beach area. A typical boat is 25 to 46 feet long with a draft between 28 and 52 inches. Unlike the larger shrimp boats that harvest commercial shrimp in deeper waters, bait shrimp boats are typically smaller and have shallower drafts. The trawling rigs are specially designed with rollers so that they can move over low relief obstructions without damaging the equipment. Note that while shallow-draft shrimp boats do not require significant underkeel clearance to navigate safely, current channel conditions provide no clearance in some areas.

Each boat drags 4 trawls, which generally cover a total of about 40 feet of bottom. Their shallow draft makes them unstable in higher seas and they are, therefore, not well suited to commercial shrimping that is done in deeper water where seas are usually rougher. Commercial shrimp boats, on the other hand, could conceivably bait shrimp, except that restricted access into port around low tides significantly reduces nightly production and makes their operation financially prohibitive. The typical boat is a used recreational boat with a fiberglass or wooden hull that has been converted to commercial bait shrimping. Shrimpers generally own their boats and do not carry insurance.

Typical bait shrimp boat operation statistics were compiled from interviews with bait shrimpers currently operating out of Hernando Beach. Based on this study, the typical bait shrimper works 5 days per week, including weekends, on a year-round basis. Production rates run from 1,200 to 2,000 shrimp per hour (excluding 10 percent extra to account for mortality losses in handling). A typical work night would begin at sundown and include 8 hours of trawling and an average of 2 hours round-trip travel time. The wholesale price for shrimp at Hernando Beach is $ 34.00 per thousand live shrimp (delivered). On an average, bait shrimp boats make 250 per year and harvest an average of about 3 million bait shrimp.

The live bait shrimp is a perishable commodity. Because of their delicate nature, shrimp can only be kept alive for up to 24 hours. Mortality rates go up significantly after the first 8 to 12 hours. In order to reduce the mortality rate that adversely affects profits and supply, live bait shrimp must be handled and shipped with the utmost speed and care. Shipping mortalities run much higher in the summer and during periods of molting. It is standard practice for the tank truckers to pick up their shrimp the same morning that the shrimp are caught providing demand is abreast of supply.

It is important to all segments of the live bait industry that the shrimp reaches the sport fisherman's hook as soon as possible. Otherwise high mortalities will thwart expected profits. The live bait tank truck is a vital link between the producer and the angler. Wholesalers operate bait trucks, which contain aerated holding tanks and have regular scheduled routes for pickup and delivery. Bait shrimpers normally figure a 10 percent loss in their harvest in going from the boat to the retailer and therefore get paid $ 34 for each 1,000 live shrimp they supply at dockside. When tides cut off access so that the boats cannot get to the docks, the trucks cannot afford to wait and must continue their route.

The price of bait shrimp increases as the catch passes hands on its way from the Gulf of Mexico to the end of a fisherman's hook. Fishermen who do not own their own boats make $ 16 per 1,000 shrimp caught. That amount is typically split 60-40 between the captain and the mate on board. The boat owner gets $ 34 per 1,000 shrimp when sold to a dealer, who trucks the shrimp to various bait shops. The dealer is typically paid $48 per 1,000 shrimp by the bait shops. The bait shop owners typically sell the shrimp to customers for $ 1.25-1.50 per dozen, which translates to $ 104 to $ 125 per 1,000 shrimp.

Stone Crab

The State of Florida has regulated the stone crab fishery for about 50 years in state waters (within 9 nautical miles from shore). Since 1929, Florida Law has set a season on stone crab. The current season is from October 15 to May 15. Since spawning occurs during the spring and summer months, stone crabbing is prohibited during this period as a conservation measure. A permit system is in effect in the state for Florida Territorial waters that are protected by the Florida Marine Patrol. The market for stone crab claws is

primarily local retail outlets, seafood restaurants, hotels, and specialty food stores in large cities.

Stone crabs are most abundant along the southwest coast of Florida in the Gulf of Mexico. The center of abundance is in the area of the Everglades National Park that has the most productive habitat. However, stone crabs are also harvested from Florida Bay to the Panhandle region of the state, but the landings are small in comparison to the Everglades region. Productivity depends on estuaries and sea grass beds that are abundant along the West Coast and serve as important spawning areas. Habitat of the adult stone crab extends from water depths of 5 to 60 feet. In the Cedar Key Region, comprising Pasco, Hernando, Citrus, Levy, Dixie, and Taylor counties, there are extensive areas of shallow water with sea grass beds having a width of 10 to 15 miles. In that area, the bottom has a very gradual slope with offshore depths changing about one foot per mile. Here stone crabs are being commercially harvested primarily from water depths of 5 to 30 feet. In 1999, more than 34,000 pounds of stone crabs were harvested off-shore of Hernando County, accomplished in 365 vessel outings.

Benefit Evaluation

Information on commercial fishing in the study area came from the following sources:

Interviews with local commercial fishermen.
Commercial statistics from the National Marine Fisheries Institute.
Boat registration data from the Florida Fish & Wildlife Commission.
Fishery Management plans of the Gulf of Mexico, Fishery Management Council.
Information gathered during the course of interviews and review of available information for vessel registration indicates that the existing commercial fleet for Hernando Beach consists of approximately 52 full-time equivalent (FTE) vessels. Of the vessels identified, the majority (90 percent) have been identified as commercial fishing boats, and the remainder are charter fishing operations and commercial passenger vessels or "head boats" employed for party sport fishing, diving, or sightseeing excursions.

The economic constraints that the channel's current depth places on commercial fishermen are manifested in restricted fishing time, vessel damages, and restricted access. The removal of these constraints via deepening of the channel to six feet referenced to mean low low water (MLLW) and widening to a breadth of 75-80 feet would result in benefits to the fishermen in the form of increased annual catch, reduced channel transit times, slightly extended maintenance cycles (i.e., reduced maintenance costs), and reduced vessel damages. The greatest benefits would come from increases in catch.

Based on information assembled from interviews with vessel operators, an estimated 10 to 15 fishing days are lost each year due to restrictive channel conditions. The most significant period for such conditions are in the late fall and winter of each year. Improvements to the Hernando Beach channel would return those lost days to productive use, increasing harvesting opportunities. As stated previously, commercial fisherman

capture 9,600 to 16,000 live shrimp during any given outing. For this analysis, the assumption is made that 13 additional days of fishing result from improved channel conditions, allowing the commercial fisherman to capture 12,500 live shrimp per outing. Therefore, commercial fishermen aspire to operate 263 per year; however, given the current channel configuration only 250 days are possible. Estimates were developed for the value of time per hour for the fishermen from known daily expenses, hours worked and the typical catch. Table A-4 shows the annual cost structure for a typical bait shrimp fisherman. Table A-5 displays the estimation of opportunity cost of time per hour for a typical bait shrimp fisherman's operation. Based on data obtained from bait shrimpers actively shrimping, the average bait shrimper ideally spends about 8 hours a night trawling, which excludes travel to and from the shrimp grounds. Shrimpers have indicated that during periods when shrimp are less abundant they go out even when they know they may not earn enough to cover operating costs. This is so that they can fill, or partially fill, their orders and thus maintain their share of the market. It could be inferred from this that the opportunity cost of labor and management is very low or zero. However, the opportunity cost estimated for this analysis was $ 7.71 as shown in **Table A-5**. According to ER-1105-20-100, the opportunity cost of a time savings (or conversely, delay) that exceeds 15 minutes and is incurred during a transit to work, equals 53.8 percent of the hourly pre-tax wage.

Table A-4
Annual Operating Costs for
for Average Bait Shrimp Fishing Vessel
(less Crew Costs)

Fixed Costs	
Hull Maintenance	$1,195
Interest	$2,938
Insurance	$2,342
Depreciation	$5,300
Other Fixed Costs	$186
Total Fixed Costs	$11,961
Variable Costs	
Fuel	$15,178
Engine Maintenance	$725
Gear Maintenance and Purchases	$2,134
General Boat Repairs	$1,155
Marine Hardware	$1,890
Other Variable Costs	$1,586
Total Variable Costs	$22,668
Annual Operating Costs	$34,629

To assess project benefits resulting from improved conditions, marginal revenues were determined by first estimating the number of additional fishing days per year and the total value of additional catch on those days for a single commercial fisherman. The marginal expenses associated with these extra working days were then subtracted, as was the value of the fisherman's time. No increases in yields beyond the recovery of the lost fishing days were claimed in the analysis. Participation and harvest per fisherman was held constant from the base year of project economic life.

Table A-5
Determination of Opportunity Cost
for Average Bait Shrimp Fisherman

Operating Expenses (1/2 operating cost)	$69.26
Typical Catch (1/2 of 2-person crew)	6,250
Value of Typical Catch (1,000 heads x price)	$212.50
Typical Catch minus Expenses	$143.24
Average Hours Worked per Day	10
Net Earnings Per Hour	$14.32
Opportunity Cost Per Hour (53.8% of wage)	$7.71

The bait shrimp fishery on the West Coast of Florida is one of the few fisheries, however, where an increase in marginal yields or harvest may be possible with efficiencies afforded by navigation improvements. This is due to the resiliency of the marine resource relative to the fishing technology (i.e. a significant portion of the population escapes each night of fishing as the trap systems, nature of the habitat where harvesting occurs, and limitations on harvest time per nightly vessel deployment contribute to a significant escape rate). For the west coast bait shrimp fishery, as long as claimed marginal yields did not exceed the level of error in estimation of the regional segment of the fishery as a whole, the Florida Marine Research Institute (FMRI) has not contested such gains or efficiencies claimed with navigation improvements.

The actual estimates of increased catch were based on the interviews with the fishermen and their reported average catch per day (see **Table A-6**). The per day average was then multiplied by the number of additional fishing days per year with project and the number of affected fishermen to reach the total estimated increase in pounds. The estimated annual increase in revenues is determined by multiplying the marginal catch by price received per pound. The average price received per pound was determined in part from the interviews with the fishermen and from the catch statistics from the National Marine Fisheries Service (NMFS).

Additional commercial benefits accrue as channel improvements reduce the overall transit time for commercial fisherman transiting the Hernando Beach Channel to and from the Gulf. Under current channel conditions, the total transit time is 2 hours (1 hour each way). Vessels currently travel at a slower speed along the 3-mile Hernando Beach Channel, due to its narrow width and unreliable depth. Under improved channel conditions, vessels could increase their speeds (and burn fuel more efficiently), without increasing risk of accidents or vessel damages.
According to information obtained from the fishermen, an estimated 15 minutes could be saved on each transit to and from the Gulf, for a total of 30 minutes per trip. Therefore, commercial fisherman can harvest the same number of live bait shrimp in 9.5 hours with an

improved channel condition, as they currently do in 10 hours. Efficiencies in the value of time under the with the project condition result from a fisherman earning an equivalent income, minus expenses, while expending fewer hours of work. **Table A-7** displays estimated annual time savings benefits accruing to commercial fisherman (250-days working) as a result of the reduced channel transit time.

Table A-6
Determination of Net Income from Additional Fishing Days for Average Bait Shrimp Fishing Vessel

Operating Expenses	$1,179
Additional Working Days	13.00
Additional Catch (in lbs)	1,806
Opportunity Cost of Additional Working Days	$1,002
Value of Additional Catch	$5,525
Value of Additional Catch less Operating Expenses and Opportunity Cost	$3,344
Increase in Net Income for vessel	$3,344

Table A-7
Determination of Reduced Transit Time (Time Savings Value) for Average Bait Shrimp Fishing Vessel

Net Earnings Per Hour	$14.32
Annual Working Days	250
Daily Travel Time Saved (in Hours)	0.5
Value of Time Saved (53.8% of Wage)	$7.71
Annual Time Saved (in Hours)	125.0
Annual Value of Time Saved Per Vessel	$963.31
Increase in Net Income for vessel	$963.31

Historical and existing conditions of Hernando Beach have imposed considerable expenses for maintenance or repair of vessel damages. This has been attributable to physical migration of the channel system and deposition of sediment that sometimes precludes unencumbered passage by various vessels. Under current assumptions for without-project conditions it is anticipated that migration of waterways will continue with seasonal variation and that vessel damages will be incurred during such periods when channel location is relatively unstable. Interviews with commercial interests revealed impacts stemming from difficulties with channel restrictions, including damage and excess maintenance attributable to insufficient depth during channel transit. Some of the influences contributing to variances in costs include:

a) Frequency and/or amount of usage
b) Vessel configuration and operator skill
c) Operating patterns
d) Cost structures relative to operations

Frequency or Amount of Usage - Some commercial fishermen do not subject their vessels to the same frequency or amount of use as other commercial operators. Certain individual vessels may operate an average of less than 200 days per year while operational cycles for others may exceed 300 days per year. The number of hours employed per day may also vary significantly depending on application and physical endurance of the operator(s) and equipment. Variability in the number of days or hours employed could impose a variance in the probability to incur damages.

Vessel Configuration and Operator Skill - Vessel handling and related skills vary according to physical configuration of a given vessel coupled with physical skill and knowledge of the channel characteristics to a particular vessel operator. Many of the commercial vessels operating in the Hernando Beach area are unique, and vary in terms of construction or retrofitting for commercial fishing. Differences in vessel configuration and construction frequently present distinct handling and cost (of repair) characteristics.

Operating Patterns - Operating patterns can vary with requirements for the harvest of a given marine resource. An example involves bait shrimp vessels that typically negotiate the channel at night or in low light conditions. Navigation of the channel under such conditions is generally more difficult and the occurrence of damage more frequent. In addition, bait shrimp vessel operators must attempt to return to landside docks in Hernando Beach for discharge of their catch at a predetermined time. Scheduled deadlines for return transit often do not coincide with the occurrence of adequate tidal advantage (relative to vessel draft and controlling depth). Vessel damage commonly occurs when operators miscalculate the timing of actual tides and/or are forced to assume the risks of transiting the channel with less than ideal minimum clearance. Similarly, fishermen that harvest other marine resources also incur damages stemming from efforts to extend fishing time in the Gulf of Mexico.

Cost Structure Relative to Operations - Operating and maintenance cost structures vary among vessels because of individual resources employed to facilitate repairs. At one end of the spectrum some fishermen perform virtually all repairs themselves often using reconditioned or rebuilt parts and assemblies. Others choose to have their vessels serviced by professional marine mechanics with repairs made strictly according to vessel design specification. Many commercial operators operate between the two extremes or they may vary their approach given the time of year when repairs are required (i.e., to avoid lost downtime during the peak harvest season) or according to available cash flow.

Based on information assembled from interviews with vessel operators and available information for assessment of future channel conditions, it is estimated that the most

significant period for such conditions are in the late fall and winter of each year. Data gathered from vessel repair facilities in the area reveal that the most common repairs undertaken are refurbishment or replacement of propellers and shafts, with some repairs required for components of steering gear or fixed hull fittings (see **Table A-8**). Interviews with local commercial fishermen were conducted and operational cost relationships were developed. Operational relationships that were examined include maintenance and repair cycles and working time lost due to inadequate depth.

Table A-8
Incremental Vessel Repair/ Maintenance Cost
Per Average FTE Vessel

	With Project	Without Project
Hull Maintenance	$728	$1,195
Engine Maintenance	$520	$520
Gear Maintenance and Purchases	$1,847	$1,847
General Boat Repairs	$847	$1,155
Marine Hardware	$1,053	$1,890
Haulout	$144	$288
	$5,139	$6,895
Net Cost Reductions for Repair and Maintenance		$1,756

Table A-9 shows the average benefits per FTE vessel gained under the with project condition from reduced vessel repair and maintenance costs. Larger vessels typically incur more damages and operate under greater time and depth restrictions placed on them due to tides.

Table A-9
Reduced Vessel Repair and Maintenance Costs
Average Annual Equivalents

Normal Maintenance and General Boat Repairs	$5,139
Excessive Maintenance and Repairs Necessitated by Channel Conditions	$6,895
Reduction in Vessel Repair and Maintenance Costs	$1,756
FTE Vessels	52
Annual Vessel Repair and Maintenance Costs Avoided	$91,312

The annual benefits for commercial use of the Hernando Beach channel are summarized in **Table A-10**. Benefits for increased harvests and time saved total $ 173,910 and $ 50,092, respectively, while reductions in vessel damages total $ 91,312. Combined, these savings render total annual benefits of $ 315,314 in support of project justification. As identified in previous discussions, future conditions that would exist without a Federal Project are compared to conditions that are expected to exist with a project to see what changes would occur with the various project depths under consideration. The Hernando Beach channel, however, exhibits no incremental change in its level of benefits beyond the 6-foot channel depth. The commercial vessel fleet, which drafts no more than 4.5 feet, would virtually eliminate all delays due to tide and damages resulting from insufficient clearance. Furthermore, annual benefits are assumed to remain constant over the 50-year project life, as no increases in the commercial vessel fleet or harvested yields were forecast.

Table A-10
Hernando Beach Channel Improvement
Annual Commercial Benefits

Net Income per Vessel	$3,344
Transit Time Savings	$963
Vessel Damage Reduction	$1,756
FTE Vessels	52
Total Net Income Increase with Additional Working Days	$315,314

Recreational Vessel Benefit Evaluation

The analysis of recreational vessel benefits is based on general recreation analysis procedures authorized for USACE-sponsored studies of small harbor projects. Benefits to recreational boaters consist mainly of reduced damages and enhanced recreational experience. Recreational vessel damage reduction benefits associated with the channel deepening alternatives stem from the reduction of accidental hull and propeller damages. They can be quantified by determining the amount of yearly damages and comparing them with annual damages that could be expected under the improved channel conditions. The differences between these figures provide an estimate of the yearly benefits from vessel damage reduction. Enhanced recreational experience benefits would accrue as some boaters would enjoy increased access to the Gulf through Hernando Beach channel due to the increased depth provided by the project; the additional margin of safety provided by the project; and/or the time saved by accessing the Gulf through Hernando Beach instead of using alternative access at or Tarpon Springs or Crystal River.

The benefits of reduced recreational boating damages are summarized in **Table A-11.** Benefits are based on the estimated average value of damages for a boating accident in

Hernando Beach and the estimated number of boating accidents that occur at Hernando Beach due to shoaling conditions each year. Limited information was readily available quantifying the frequency and nature or extent of use of the Hernando Beach channel by private recreational craft. Cursory interviews were conducted with local marina operators in an attempt to determine estimates of the frequency of waterway use. These anecdotal accounts of recreation vessels were verified by a survey conducted in May 2003 by Hernando County Parks and Recreation Department (see **Table A-12**).

The U.S. Coast Guard does not maintain data relating to recreation craft. The Florida Fish and Wildlife Conservation Commission (FFWCC), however, publishes statistics on recreation vessels by county in the state of Florida. While the data gives no indication of the frequency of recreation vessel use, it is a useful source of information regarding boating accidents and vessel registration. In 1999, Hernando County contained 6,657 registered recreation vessels. During the same period, 5 accidents were reported in the county with resultant damages totaling $ 5,400. Statewide, nearly 900,000 recreation vessels are registered for use, of which 1,291 vessels were involved in accidents at a cost of over $ 8.0 million. Related estimates for frequency of operations were also applied to available information on vessel operating parameters to determine costs or expenses (i.e., such as damages) considered to be associated with channel conditions and that could be eliminated or minimized with waterway improvements.

Table A-11
Recreation Vessel Damages Avoided

Estimated Annual Number of Accidents Caused by Channel Conditions	50
Estimated Value of Damages per Accident	$725
Current Estimated Annual Value of Damages	$36,250
Average Annual Recreation Vessel Damage Reduction Benefits	$36,250

Information obtained from local marina owners and specialized marine repair vendors (such as for propeller repair or reconditioning) included estimates of vessel damages based largely on general familiarity with historical or past experience. Investigations with both representatives of marinas and vessel operators indicate that adverse or less than ideal conditions for Hernando Beach prevail generally throughout the year with the most notable adverse conditions occurring after severe weather or storm events and during the late fall or winter months spanning a time period of from four to five months, to as long six months. These anecdotal accounts of accidents and their frequencies served as the basis for estimating recreation damages avoided. According to local experts, vessel accidents attributable to channel conditions occur approximately weekly. With improvements, vessel accidents due to grounding or channel obstructions would be virtually eliminated, or a net reduction of 50 accidents per year. The average damage cost, however, is less than those apparent in the FFWCC data. Propeller damage resulting from grounding or a channel obstruction is the most prevalent occurrence in the

Hernando Beach Channel. Therefore, average propeller repair costs were used as a proxy for the damage value per accident.

The benefits of increased Gulf access and the benefits of reduced travel time to the Gulf would need to be calculated based on the difference in willingness to pay between boating elsewhere (e.g. on the AIWW) and boating on the ocean. Similarly, the willingness to pay for an additional margin of safety would also require extensive survey-based research. Expenditure of federal funds for conducting this type of research is generally not considered appropriate given the scale of the project and the low federal budgetary priority assigned to recreational navigation projects.

Table A-12
Hernando Beach Channel Recreational Boat Survey

Date	Day of Week	No. of Boats	No. of Passengers	Time of Day
9-May-03	Friday	10	28	8:30 A.M. - 9:30 A.M.
10-May-03	Saturday	30	88	9:00 A.M. - 10:00 A.M.
11-May-03	Sunday	25	67	11:45 A.M - 12:45 P.M.
12-May-03	Monday	7	16	3:00 P.M. - 4:00 P.M.
13-May-03	Tuesday	9	16	2:00 P.M. - 3:00 P.M.
14-May-03	Wednesday	6	11	3:00 P.M. - 4:00 P.M.
15-May-03	Thursday	7	13	4:00 P.M. - 5:00 P.M.

Recent experiences with similar studies, however, provide insight into the value of recreational use. An extensive survey was conducted at St. Lucie Inlet, Florida, to determine the value of recreational use. Private use vessel owners were asked for subjective opinions on the value of their recreational experience using St. Lucie Inlet. The unit day value (UDV) method was used for estimating recreation benefits.

Recreational benefits are based on variances for UDVs assessed for waterway conditions unique to St. Lucie Inlet. Unit day values were assessed for Inlet conditions expected to prevail for recreational craft with and without implementation of proposed improvements. Any net increase or decrease in value per user day or occurrence associated with implementation of proposed improvements is deemed either a net benefit or cost, respectively. The derived unit day value differential was an estimated $ 1.05 per user-day or occurrence derived from current point monetary values authorized for studies during fiscal year (FY) 2003. Point estimates for general hunting and fishing were applied to the average number of vessel occupants or boaters estimated to transit the Hernando Beach Channel. The average increase in UDV was applied to estimated vessel activity.

As displayed in **Table A-12**, recreation vessel use was estimated through a survey conducted in May 2003. Each day for one week, at differing daylight hours during the day, recreation vessels were counted as they transited the Hernando Beach Channel. These frequencies and passenger loads were consistent with information provided previously about the frequency and use of the channel by recreation craft. Without giving particular consideration to the seasonality of recreation traffic, this analysis assumes that weekday (M-F) recreation vessels total 60 per day, with an average of 1.8 passengers per vessel. Weekend recreation (Sa-Su) vessels total 225 per day, with an average of 2.8 passengers per vessel. Based on general estimates of the frequency of use and average vessel occupancy as provided in **Table A-13**, the estimated annual benefits for unit day values, which suggest an enhanced recreation experience, total approximately $ 98,280.

Table A-13
Hernando Beach Channel Enhanced Recreation Experience

	Weekday	Weekend	Total
Daily Recreation Vessel	60	225	
Average Passengers per Vessel	1.8	2.8	
Annual Recreation Vessels	15,600	23,400	39,000
Annual Recreation Passengers	28,080	65,520	93,600
Incremental UDV for Improved Channel	$1.05	$1.05	
Annual Enhanced Recreation Experience Benefits	$29,484	$68,796	$98,280

Table A-14 summarizes annual recreation benefits. Benefits for reduced vessel damages total $ 36,250, while enhanced recreation experience benefits total $ 98,280 annually. Combined, these savings render total annual benefits of $ 134,530 in support of project justification.

Table A-14
Hernando Beach Channel Improvement
Annual Recreation Benefits

Annual Recreation Vessel Damage Reduction Benefits	$36,250
Annual Enhanced Recreation Experience Benefits	$98,280
Annual Recreation Benefits	$134,530

Project Benefits Summary

Total project benefits are presented in **Table A-15**. The benefits represent the estimated annual cost savings resulting from an improved Hernando Beach channel. More than 70 percent of the benefits accrue to commercial vessel operators. The annual benefits reflect an interest rate of 5 7/8 percent over a 50-year project life. Benefits for increased net incomes resulting from additional harvest and time savings from reduced transit times total $173,910, and $50,092, respectively. Commercial vessel damage reduction benefits total an estimated $91,312 annually. Benefits also accrue from reductions in recreation vessel damages and enhancements in recreation experience, or $36,250 and $98,280, respectively.

Table A-15
Hernando Beach Channel Improvement
Total Project Benefits

Net Revenues for Additional Working Days	$173,910
Value of Travel Time Saved	$50,092
Net Value of Commercial Vessel Reduced Maintenance and Damages	$91,312
Reductions in Recreation Vessel Damages	$36,250
Enhanced Recreation Experience	$98,280
Total Benefits	$449,844

APPENDIX B-ENGINEERING

HERNANDO BEACH, FLORIDA
SECTION 107 - NAVIGATION STUDY

APPENDIX B
ENGINEERING

Table of Contents

Table of Contents (continued)

LIST OF TABLES
(tables follow text)

LIST OF PLATES
(plates follow tables)

ATTACHMENTS
(attachments follow plates)

HERNANDO BEACH, FLORIDA
APPENDIX B
ENGINEERING

1. General. This appendix presents the discussion of applicable design considerations and construction methods utilized to adequately address the project requirements and to establish a basis for the cost estimates. General requirements for real estate and operation and maintenance are also presented.

2. Recommended Plan. The recommended plan would include construction of a shallow draft navigation channel from Hernando Beach westward approximately 4 miles into the Gulf of Mexico. The channel would be constructed with a bottom width of 80 feet and a project depth of 6.0 feet mean-lower-low-water (MLLW). As per United States Coast Guards requests, a turning basin to accommodate maintenance vessels would be provided at the eastern terminus of the Federal channel. The turning basin would be constructed to a minimum radius of 175 ft. The project plan and location map are shown on Plate B-1. More detailed views of the recommended plan are shown on Plates B-2 through B-5.

A discussion of the plan formulation involved in the selection of the recommended plan is presented in the main portion of this report. All soundings presented in this report are at Mean Lower Low Water.

B. HYDROLOGY AND HYDRAULICS

3. General. The currents and water surface elevations in the vicinity of Hernando Beach are subject to astronomical tides, the effects of winds, upland drainage, and on a more infrequent basis, the effects of waves and storm surges. These factors serve as boundary conditions for the hydraulic forces influencing the smaller scale limits of this study area.

4. Tides. The astronomical tides in the vicinity of Hernando Beach are semi-diurnal, consisting of two high and two low tides every 24 hours. The mean tide range is 2.2 feet.

5. Currents. A large portion of the tidal flow entering and leaving the canal system at Hernando Beach flows through the entrance channel. Current velocities through the entrance channel are at a minimum at times of high and low tides, and are at a maximum during periods approaching the midpoints between tides. In general these currents decrease with distance away from (westward) the junction of the entrance channel to the canal system.

The currents are produced primarily due to changes in water-surface elevation but can be increased (or decreased) by the effects of other astronomical and/or weather phenomenon. During periods of new and full moon the tidal range increases, causing a corresponding increase in the tidal flow through the entrance channel. Surges due to wind and wave setup and decreased barometric pressure from local storms also have the effect of increasing the tidal range, and may cause tides significantly higher than average throughout the project area.

C. GEOTECHNICAL INVESTIGATIONS

6. Subsurface Investigations. As part of the current investigation, a series of 25 borings were drilled in the existing channel and the proposed alternate channel at the Hernando Beach using a CME 45C mounted on a barge. In the alternate channel three borings HBAC00-1, HBAC00-2 and HBAC00-3 were drilled. In the main channel, HBC00-1 to HBC00-14, HBC00-14A, HBC00-14B, HBC00-14C, and HBC00-15 to HBC00-19 were drilled. In addition from these core borings, 104 wash probings were taken to determine the top of the rock.

The coordinates and other pertinent data pertaining to the core borings and wash probings are included in Table B-1 and Table B-2, respectively. Their locations are shown on Plates B-7 through B-9.

7. Materials Encountered. The material encountered consists of unconsolidated sediments and limestone. The unconsolidated material in the alternate channel near the shore consists of poorly graded, fine to medium grained sands with traces of shell. In the outer reaches, silty sand with nonplastic fines was encountered. In the main channel, depending upon the location, poorly graded, fine to medium sized (SP) sands with traces of shell, silty sands (SM) with some nonplastic fines, peat with fine sands (PT), and sandy clay (CL) with medium to low plasticity and with some fine to medium sands were encountered. Depending upon the location and depth, the limestone is soft to moderately hard, jointed, thin to medium bedded, pitted, or vuggy and in the upper depths slightly decomposed or moderately weathered. In some places the limestone has weathered to a saprolite which has harder pieces of limestone intermixed. The core boring logs are included as an attachment to this Appendix.

8. Laboratory Analyses. Representative samples of unconsolidated materials from selected core logs were sent to the Corps of Engineers South Atlantic Division Laboratory. The applicable logs and laboratory reports of gradation curves are included in the attachment to this Appendix.

9. Excavation. With a proposed project depth of -6.0 feet MLLW, plus applicable overdepths, construction of the channel would involve excavation of both unconsolidated materials and rock. The unconsolidated materials and the soft to moderately hard rock could be excavated with a hydraulic excavator or clamshell mounted on a barge.

D. DESIGN AND CONSTRUCTION

10. General. A project location map is shown on Plate B-1. The recommended project plan is shown on Plates B-2 through B-5.

11. Channel Wideners. For safe navigation, channel wideners would be constructed where there would be a significant change in channel alinement. The wideners would be excavated to a project depth of 6.0 feet plus applicable required and allowable overdepths.

12. Turning Basin. For safe navigation, a turning basin, with a minimum radius of 175 feet, would be constructed at the eastern terminus of the federal channel. The entire basin would be excavated to the projected depth of 6.0 feet plus applicable required and allowable overdepths.

13. Side Slopes. For estimating purposes, the average side slope for the proposed excavation was determined to be 1 vertical on 3 horizontal (1V:3H).

14. Overdepths. An additional 1-foot of overdepth would be required where rock is encountered at project depth, and an additional 1-foot of allowable overdepth would be included in the excavation quantities to allow for dredging inaccuracies.

15. Disposal Area. An existing reef development area located approximately 15 miles offshore would be used for placement of all dredged material from the initial construction. The dredge material would be used to create hard bottom habitat in undeveloped portions of the reef development area. A preliminary plan, for illustrative purposes, is shown on Plate B-6. A disposal/hard bottom habitat creation plan, that meets all federal and state criteria, would be developed during preparation of contract plans and specifications in an effort to maximize marine habitat and to establish a maximum elevation for the disposal material.

16. Construction Procedure. For cost estimating purposes, it is anticipated that a mechanical dredging operation would be used for construction of the Hernando Beach channel project.

E. RELOCATIONS

17. General. The project sponsor would be required to assume the costs of all relocations and alterations. No relocations are anticipated for implementation of this project. The project sponsor currently has waterfront property that would be available for use by the contractor during construction.

F. OPERATION AND MAINTENANCE

18. General. The Federal Government would be responsible for operation and maintenance of the navigation improvements proposed in this report upon completion of the construction contract. The Federal Government currently maintains the existing project. The contractor would be responsible for all maintenance during the construction contract.

19. Estimated Annual Cost. For economic purposes, the annual maintenance cost is currently estimated to be about $200,000. This is based on an estimated annual shoaling rate of approximately 27,000 cubic yards with maintenance dredging at 23-year intervals at a cost of $2,000,000. For cost estimating purposes, the maintenance material would be removed by a hydraulic pipeline dredge and pumped to one of the existing mining pits located east of the highway. Currently, the most northwestern pit has been selected as the maintenance disposal area.

20. Navigation Aids. The U.S. Coast Guard would be responsible for providing and maintaining navigation aids. Additional aids to navigation would be required for this project, and the estimated cost is included in the project cost estimate.

G. QUANTITIES AND COST ESTIMATES

21. Summary of Costs. The estimates of first cost for construction of the recommended plan were prepared using M-CACES software and are presented in Table B -3. The estimate includes a narrative, a summary cost, and a detailed cost showing quantity, unit cost, and the amount for contingencies for each cost item. The costs of the non-construction features of the project are also included in the cost estimate.

The costs have been prepared for an effective date of February 2003.

TABLE B-1

HERNANDO BEACH, FLORIDA
CORE BORING LOCATIONS AND DATA

BORING #	X	Y	TOP ELEVATION	BOTTOM ELEVATION	TOTAL DEPTH	DEPTH TO ROCK
CB-HBAC00-1	442028	1513266	-0.90	-15.90	15.0	-2.90
CB-HBAC00-2	440872	1513980	-0.90	-15.90	15.0	-3.40
CB-HBAC00-3	439894	1514490	-3.10	-18.10	15.0	-5.60
CB-HBC00-1	442304	1514679	-2.10	-17.10	15.0	-2.10
CB-HBC00-2	442214	1514578	-2.50	-17.50	15.0	-4.50
CB-HBC00-3	441590	1514582	-1.20	-16.20	15.0	-4.20
CB-HBC00-4	441146	1514988	-4.70	-19.70	15.0	-11.70
CB-HBC00-5	440791	1515293	-1.50	-16.50	15.0	-5.50
CB-HBC00-6	440256	1515498	-3.00	-18.00	15.0	-5.50
CB-HBC00-7	439273	1515201	-0.60	-16.10	15.0	-2.10
CB-HBC00-8	438826	1515001	-2.40	-17.40	15.0	-3.40
CB-HBC00-9	438292	1515206	-0.90	-15.40	15.0	-4.90
CB-HBC00-10	437401	1515514	-5.70	-20.70	15.0	-10.20
CB-HBC00-11	436421	1515823	-3.70	-18.70	15.0	-7.20
CB-HBC00-12	435620	1516131	-1.40	-16.40	15.0	-2.00
CB-HBC00-13	434823	1517044	-3.10	-18.60	15.0	-4.60
CB-HBC00-14	434114	1517957	-3.80	-19.80	15.0	-11.80
CB-HBC00-14A	434078	1517937	-1.90	-13.90	12.0	-9.90
CB-HBC00-14B	434025	1518059	-4.20	-10.20	6.0	-5.00
CB-HBC00-14C	434203	1517957	-5.90	-12.40	6.5	-8.40
CB-HBC00-15	433245	1518745	-3.30	-18.30	15.0	-3.80
CB-HBC00-16	432339	1519584	-4.60	-19.60	15.0	-4.80
CB-HBC00-17	431452	1520397	-0.10	-15.10	15.0	-1.60
CB-HBC00-18	430475	1521110	-3.80	18.80	15.0	-5.80
CB-HBC00-19	429408	1521722	-6.40	-21.40	15.0	-9.40

TABLE B-2

HERNANDO BEACH, FLORIDA
WASH PROBING LOCATIONS AND DATA

Probe Designation	Date	Time	X	Y	Ground Surface Elevation (MLLW)	Rock Elevation (MLLW)
WP-HBC01-1	7-Jun-01	737	442418	1514856	-1.7	-2.3
WP-HBC01-2	7-Jun-01	745	442364	1514786	-1.0	-1.7
WP-HBC01-3	7-Jun-01	755	442230	1514720	0.8	-4.9
WP-HBC01-4	7-Jun-01	1250	442210	1514654	0.8	-6.6
WP-HBC01-5	7-Jun-01	1255	442185	1514501	-1.3	-2.7
WP-HBC01-6	5-Jun-01	1547	442106	1514570	0.0	-4.0
WP-HBC01-7	5-Jun-01	1540	441938	1514559	0.0	-1.8
WP-HBC01-8	5-Jun-01	1535	441763	1514578	-0.5	-1.8
WP-HBC01-9	5-Jun-01	1522	441498	1514675	-0.1	-3.7
WP-HBC01-10	5-Jun-01	1510	441468	1514740	-4.3	-6.5
WP-HBC01-11	5-Jun-01	1500	441370	1514739	0.5	-4.1
WP-HBC01-12	5-Jun-01	1450	441339	1514839	-5.3	-6.0
WP-HBC01-13	5-Jun-01	1440	441243	1514862	-0.3	-2.3
WP-HBC01-14	5-Jun-01	1433	441041	1515053	0.4	-1.5
WP-HBC01-15	5-Jun-01	1426	440925	1515220	0.3	-0.2
WP-HBC01-16	5-Jun-01	1422	440705	1515336	0.7	0.1
WP-HBC01-17	5-Jun-01	1412	440510	1515433	-0.5	-1.5
WP-HBC01-18	5-Jun-01	1406	440438	1515441	0.2	-1.5
WP-HBC01-19	5-Jun-01	1355	440351	1515485	0.4	-0.8
WP-HBC01-20	5-Jun-01	1350	440299	1515455	0.7	-1.4
WP-HBC01-21	6-Jun-01	1140	440133	1515433	0.9	-0.6
WP-HBC01-22	6-Jun-01	1212	440059	1515433	0.4	-1.6
WP-HBC01-23	6-Jun-01	1221	439972	1515378	0.6	-1.4
WP-HBC01-24	6-Jun-01	1232	439873	1515385	0.1	-1.5
WP-HBC01-25	6-Jun-01	1248	439801	1515324	0.4	-0.7
WP-HBC01-26	6-Jun-01	1340	439689	1515280	0.4	-1.6
WP-HBC01-27	6-Jun-01	1345	439712	1515350	0.0	-1.1
WP-HBC01-28	6-Jun-01	1355	439387	1515219	-0.3	-1.8
WP-HBC01-29	6-Jun-01	1400	439090	1515073	-0.3	-3.6
WP-HBC01-30	6-Jun-01	1407	438859	1515133	-5.6	-6.8
WP-HBC01-31	6-Jun-01	1413	438655	1515076	-0.2	-3.3
WP-HBC01-32	6-Jun-01	1425	438557	1515189	-0.4	-1.9
WP-HBC01-33	6-Jun-01	1430	438439	1515153	-0.8	-2.6
WP-HBC01-34	7-Jun-01	810	438196	1515318	-0.4	-3.3
WP-HBC01-35	7-Jun-01	1308	438000	1515316	-0.9	-11.1
WP-HBC01-36	7-Jun-01	1318	437913	1515410	-1.2	-3.8
WP-HBC01-37	7-Jun-01	1324	437795	1515372	-1.5	-4.2
WP-HBC01-38	7-Jun-01	1333	437648	1515484	-0.9	-7.3
WP-HBC01-39	7-Jun-01	1345	437505	1515477	-1.6	-4.0
WP-HBC01-40	7-Jun-01	1357	437274	1515603	-3.0	-7.2
WP-HBC01-41	7-Jun-01	1408	437114	1515601	-0.1	-8.1
WP-HBC01-42	7-Jun-01	1417	436698	1515742	-0.4	-4.6

TABLE B-2

HERNANDO BEACH, FLORIDA

WASH PROBING LOCATIONS AND DATA

WP-HBC01-43	7-Jun-01	1430	436565	1515724	0.0	-6.5
WP-HBC01-44	13-Jun-01	800	436575	1515811	-1.5	-6.3
WP-HBC01-45	13-Jun-01	900	436325	1515936	-5.5	-7.0
WP-HBC01-46	13-Jun-01	943	436030	1516002	-3.8	-6.3
WP-HBC01-47	13-Jun-01	1315	435783	1516066	0.4	-2.3
WP-HBC01-48	13-Jun-01	952	435511	1516237	0.1	-1.2
WP-HBC01-49	13-Jun-01	1305	435398	1516394	0.4	-2.0
WP-HBC01-50	13-Jun-01	1006	435292	1516518	-0.3	-3.2
WP-HBC01-51	13-Jun-01	1300	435208	1516654	-1.1	-2.9
WP-HBC01-52	13-Jun-01	1018	435100	1516738	0.1	-2.8
WP-HBC01-53	13-Jun-01	1253	435046	1516880	-0.4	-1.7
WP-HBC01-54	13-Jun-01	1030	434929	1516948	-0.4	-1.1
WP-HBC01-55	13-Jun-01	1240	434902	1517121	-1.7	-7.5
WP-HBC01-57	13-Jun-01	1058	434732	1517343	-5.0	-5.5
WP-HBC01-58	7-Jun-01	1130	434589	1517407	-1.1	-2.1
WP-HBC01-59	7-Jun-01	1126	434541	1517546	-1.3	-3.7
WP-HBC01-60	7-Jun-01	1115	434425	1517612	-1.3	-3.9
WP-HBC01-61	7-Jun-01	1105	434421	1517762	-4.1	-8.6
WP-HBC01-62	7-Jun-01	1056	434262	1517778	-1.1	-5.8
WP-HBC01-63	7-Jun-01	1052	434179	1517873	-0.9	-3.1
WP-HBC01-64	7-Jun-01	1042	433901	1518155	-1.3	-2.4
WP-HBC01-65	7-Jun-01	1032	433848	1518292	-5.5	-10.3
WP-HBC01-66	7-Jun-01	1019	433763	1518232	-1.2	-4.3
WP-HBC01-67	7-Jun-01	1013	433668	1518323	-1.0	-2.9
WP-HBC01-68	7-Jun-01	1007	433494	1518525	-1.8	-2.6
WP-HBC01-69	7-Jun-01	957	433364	1518602	-1.7	-2.6
WP-HBC01-70	7-Jun-01	951	433193	1518803	-2.1	-3.9
WP-HBC01-71	7-Jun-01	943	433078	1518873	-2.7	-3.5
WP-HBC01-72	7-Jun-01	912	433001	1518976	-1.2	-8.3
WP-HBC01-73	7-Jun-01	907	432874	1519067	-0.9	-4.2
WP-HBC01-74	7-Jun-01	900	432803	1519203	-3.7	-7.6
WP-HBC01-75	7-Jun-01	853	432694	1519248	-1.5	-5.2
WP-HBC01-76	7-Jun-01	846	432608	1519330	-1.8	-2.8
WP-HBC01-77	7-Jun-01	840	432491	1519428	-1.7	-2.4
WP-HBC01-78	7-Jun-01	830	432432	1519583	-5.3	-6.2
WP-HBC01-80	6-Jun-01	1046	432137	1519777	-2.0	-3.0
WP-HBC01-81	6-Jun-01	1038	432084	1519925	-5.1	-7.8
WP-HBC01-82	6-Jun-01	1020	431932	1519937	-3.0	-3.5
WP-HBC01-83	6-Jun-01	1005	431898	1520085	-6.2	-8.9
WP-HBC01-85	6-Jun-01	925	431720	1520230	-5.2	-5.4
WP-HBC01-86	6-Jun-01	917	431542	1520228	-2.5	-5.2
WP-HBC01-87	6-Jun-01	900	431266	1520470	-2.6	-3.8
WP-HBC01-88	6-Jun-01	850	431154	1520605	-5.5	-6.6
WP-HBC01-89	5-Jun-01	1333	430958	1520718	-3.4	-3.9
WP-HBC01-90	5-Jun-01	1325	430756	1520791	-1.8	-4.5
WP-HBC01-91	5-Jun-01	1305	430784	1520904	-5.8	-11.4

TABLE B-2

HERNANDO BEACH, FLORIDA
WASH PROBING LOCATIONS AND DATA

WP-HBC01-92	5-Jun-01	1223	430593	1520937	-2.9	-11.7
WP-HBC01-93	5-Jun-01	1210	430356	1521202	-3.1	-5.9
WP-HBC01-94	5-Jun-01	1205	430280	1521362	-6.8	-7.1
WP-HBC01-95	5-Jun-01	1153	430119	1521346	-3.6	-5.5
WP-HBC01-96	5-Jun-01	1145	430022	1521457	-6.0	-6.7
WP-HBC01-97	5-Jun-01	1133	429877	1521497	-4.7	-5.2
WP-HBC01-98	5-Jun-01	1110	429757	1521602	-5.9	-7.1
WP-HBC01-99	5-Jun-01	1100	429603	1521614	-3.5	-4.4
WP-HBC01-100	13-Jun-01	1116	429544	1521745	-4.8	-5.9
WP-HBC01-101	13-Jun-01	1128	429414	1521831	-4.5	-6.0
WP-HBC01-102	13-Jun-01	1140	429239	1521822	-3.3	-4.3
WP-HBC01-103	13-Jun-01	1200	429176	1521952	-4.4	-4.4
WP-HBC01-104	13-Jun-01	1209	429022	1521947	-3.6	-4.0

Hernando Beach Navigation Study
Revised Final Selected Plan

Designed By: Jacksonville District
Estimated By: Cost Engineering Branch

Prepared By: B. Blake

Preparation Date: 04/07/03
Effective Date of Pricing: 10/01/02

Sales Tax: 7.30%

TABLE B-3

Planning Estimate (Including Profit & Contingency)

Hernando Beach Navigation Study - 3rd Final Selected Plan

References.

1. CESAJ-PD-PN Email of 19 December 2001 providing scope of work for the final selected plan subject navigation study.

2. CESAJ-PD-PN Memorandum dated 18 July 2002 providing scope of work for revised final selected plan subject navigation study. Subsequent Email message of 24 July 2002 from CESAJ-PD-PN/T. Leeser providing further revisions to the selected plan to be included in the revised cost estimate.

3. CESAJ-PD-PN Email of 12 November 2002 requesting to change to the offshore placement location for the final recommended study plan. The requested change is to use the Richardson Reef Site versus the Bendickson Reef Site for offshore disposal of the rock dredge materials. A marked NOAA Coast Chart, No. 11409 Anclote Keys to Crystal River, was provided by CESAJ-PD-PN which indicates the location of both offshore reef sites in order to determine the revised dredge material hauling distances to the new offshore placement site.

4. CESAJ-PD-PN Email of 12 November 2002 requesting cost estimate for the revised Plan. This plan is the same as the Final Recommended Plan above except to change the placement area for the non-rock material (sand, etc.) from the upland lake site to the construction of a beach along the north shore of the first large spoil island located outside the mouth of the inner channel. A design plan and fill quantity for the beach placement area was provided by CESAJ-EN-DL at this time.

5. Team meeting held on 9 January 2003 to finalize the scope of the study plans and the schedule for completion of the draft report. At this time it was decided to include one MCACES cost estimate for the final placement alternative plans and another separate MCACES cost estimate for the Selected Plan.

* - CESAJ-PD-PN Email dated 27 January 2003 providing final design and non-construction cost information for the Selected Plan cost estimate.

** - CESAJ-EN-DL Email dated 4 February 2003 from James McRae requesting another revised Selected Plan cost estimate. During site visit to the project with the local representative of the Florida DEP, it was decided that all dredge material would be required to go to the offshore reef placement verses placement of rock material offshore and non-rock material on the Spoil Island beach. The Study Manager/T. Leeser subsequently notified CESAJ-EN-DL above to revise the final Select Plan based on all materials, rock and non-rock going to the offshore reef site (Richardson Reef).

***- CESAJ-EN-DL Email dated 3 April 2003 from James McRae providing revised Real Estate and PED cost to include in another revised Final Selected Plan MCACES cost estimate.

Scope of Study Plan Alternatives (as per the above references):

1. Quantities by depth of rock, sand, clay, peat, and other materials. All quantities in cubic yards.

Revised Federal Channel dredging quantities (in cubic yards) for the Selected Plan are as follows. This is based on a project depth of 6 feet plus 1 foot required overdepth plus 1 foot allowable overdepth for a total dredging depth of 8 feet.

Depth	Rock	Sand	Clay, Peat, Other Materials	Total
8'	179,000	116,000	3,000	298,000

The quantities were computed using one foot required overdepth (over rock) and one foot allowable overdepth and were provided by CESAJ-CO-OM (Operations-Technical Support Section).

* - Final Select Plan dredging quantities (in cubic yards) as per CESAJ-EN-DL and CESAJ-EN-GG.

Depth	Rock	Sand	Clay, Peat Other Materials	Total
8'	206,000	124,100(a)	3,000(a)	333,000

(a) - The quantity of other material is assumed to be the same as the prior estimate and when combined with the sand material is the total of 127,100 cubic yards of "sediment in the channel" as per CESAJ-EN-GG.

2. Revised Surface Area of Project (per CESAJ-CO-OM).

Total Surface Area = 2,470,758 sq. ft.

* - The Select Plan final channel design includes an additional 4,900lf x 80' width according to CESAJ-EN-DL. This equals 392,000sf additional surface area for the construction dredging requirement.

3. For the initial plan placement of all non-rock (sand, clay, silt, etc.) will be into Little Lake at the Weekiwachee Preserve for habitat creation/mine reclamation.

For the alternative plan the placement of all non-rock material will be for the construction of a recreational beach area along the northern shoreline of the first large spoil island located outside the mouth of the inner channel (Minnow Creek).

* - This is the Selected Plan placement of all non-rock material.

** - The revised Seleted Plan placement of all non-rock material is to the offshore reef placement area at Richardson Reef.

4. For the initial construction plan placement of all non-sand (rock) material will be at Bendickson Artificial Reef (Offshore of Project).

The alternative material placement plan will use the Richardson Reef Site for placement of all non-sand (rock) material.

5. Distances from channel to the Artificial Reef placement area is 19 miles maximum and 16 miles minimum one-way hauling distance.

The distances from the alternative plan channel to the Richardson Reef Site is approximately 16.4 miles maximum and 13.4 miles minimum one-way hauling distance, according to the NOAA Coast Chart provided by CESAJ-PD-PN.

* - The Selected Plan is the use of the Richardson Reef Site for placement of all rock material.

** - The revised Select Plan will place all dredge materials, rock and non-rock at the Richardson Reef Site.

6. Maintenance Dredging

For the initial plan placement will be on the beach at Pederson Park in the Weekiwachee Preserve.

Volume is 27,000 cubic yards per event (sediment only) estimate as a 23 year maintenance cycle. Assume a distance from the shoaled area to the placement area of 4 miles. Assume a surface area of 243,000 sf.

The alternative material placement plan for future maintenance dredging will be on the spoil island beach renourishment site as in the alternative plan construction placement of non-rock material.

* - The Selected Plan future maintenance dredging will use the spoil island beach renourishment for placement.

** - The revised Selected Plan future maintenance dredge will now go back to the Pederson Park beach site at Weekiwaachee Preserve.

7. Plan Assumptions

a. Assume that the rock can be removed with a mechanical dredge without pretreatment or drilling/blasting (according to CESAJ-EN-G/M. Irfan).

b. Maintenance dredging quantities figured using a volume of 27,000 cubic yards per year (according to CESAJ-PD-PN). Events assumed to be once every 23 years.

Estimate Assumptions:

1. Construction dredging of non-rock material and the future maintenance dredging will be accomplished by pipeline dredging using a 14-inch cutter-suction pipeline dredge with boosters which will direct pump the dredged material into the designated upland placement sites.

** - Only the future maintenance dredging will use a 14-inch cutter-suction pipeline dredge with boosters to place the material at the Pederson Park beach placement area.

2. Construction dredging of remaining primarily limerock matereial will be accomplished by mechanical dredging using a 9-CYD hydraulic excavator dredge with 1,000 CYD split-hull scow barges for the dredging and placement of the dredge material at the designated offshore placement site.

** - The rock and non-rock dredging will now all be accomplished using a mechanical dredge and 1,000 CYD split-hull scow barges for placement at the offshore Richardson Reef site. The estimate assumes the same 9-CYD hydraulic excavator dredge will be used to dredge all the material, although the contractor may elect to use another mechanical clamshell dredge for the non-rock material if found to be more efficient and economical.

3. The dredging costs were computed using the Cost Engineering Dredge Estimating Program (CEDEP) in accordance with ER 1110-2-1302.

4. The character of dredge materials and quantities used to compute the dredging unit costs in CEDEP were provided by CESAJ-EN-G/M. Irfan via CESAJ-PD-PN/T. Leeser.

* - The Selected Plan dredge materials and quantities used were provided by CESAJ-EN-GG/M. Irfan and CESAJ-EN-DL/J. McCrae via the above referenced CESAJ-PD-PN Email of 27 January 2003.

5. The dredging unit costs include turbidity monitoring and the dredge disposal shore equipment costs for the pipeline dredge operation. Also the cost for bucket teeth replacement are included for the hydraulic excavator dredge.

Estimate Parameters:

1. Assumed 6.5 percent field O/H and 10 percent G&A on the prime dredging contractor (AA).

2. Assumed 10 percent profit on prime dredging contractor AA.

3. Assumed 1.5 percent contractor bonds on AA.

4. Applied 15 percent contingency for all work which is appropriate for the study level of design.

5. Non-construction costs including Lands/Damages, Environmental Mitigation, and Aids to Navigation included in the estimate were provided by CESAJ-PD-PN. Used $150,000 for PED as per CESAJ-EN-DL and $288,000 for S&A as per CESAJ-CO-CS for the initial construction. Used the percentages provided by CESAJ-PD-PN for the PED and S&A cost associated with the future maintenance dredging.

* - The S&A cost for the Selected Plan is $212,000 as per CESAJ-PD-PN via the above referenced Email of 27 January 2003. Used the previous PED cost provided by CESAJ-EN-DL of $150,000 and the previous percentages for PED and S&A for the future maintenance dredging.

*** - Used the revised PED cost submitted by CESAJ-EN-DL at the above referenced Email of 3 April 2003.

* - Revised Lands and Damages (Real Estate) cost used in the Selected Plan based as per the Draft Real Estate Appendix provided by CESAJ-RE/T. Causey via Email message dated 28 January 2003. The Gross Appraisal cost is subject to final adjustment for the Final Report.

*** - Used the revised Real Estate costs provided by CESAJ-EN-DL at the above referenced Email of 3 April 2003.

6. The Federal Interest Rate used in the estimate for the construction costs is 6.125% as per CESAJ-PD-PN. The estimated costs are in current dollars with no escalation applied.

* - The Select Plan is based on the effective Federal Interest Rate for FY 2003 of 5.875% according to CESAJ-PD-D/B. King Email message of 13 Nov 2002.

Estimated Construction Times:

** - Revised FINAL SELECTED PLAN

Placement of all dredge materials, rock and non-rock material offshore at the Richardson Reef placmement site.

6'+1'+1' Depth = 30 days mob/demob + 130 days construction = 160 days total.

Future Maintenance Dredging (One 23-Year Cycle) with upland placement at the Pederson Park beach placement site at Weekiwachee Preserve.

6' Project Depth = 30 days mob/demob + 18 days construction = 48 days total

U.S. Army Corps of Engineers

PROJECT HBF304: Hernando Beach Navigation Study - Revised Final Selected Plan

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SUMMARY REPORTS

SUMMARY PAGE

No Detailed Estimate...

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

** PROJECT OWNER SUMMARY - Contract **

	QUANTITY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT COST
01 Selected Plan Construction		4,376,537	564,181	4,940,717	
02 Selected Plan Maintenance		853,107	115,285	968,392	
TOTAL Hernando Beach Navigation Study		5,229,644	679,465	5,909,109	

** PROJECT OWNER SUMMARY - Category **

	QUANTITY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT COST
01 Selected Plan Construction					
01- A Construction Cost		3,714,537	557,181	4,271,717	
01- B Non-Construction Cost		662,000	7,000	669,000	
TOTAL Selected Plan Construction		4,376,537	564,181	4,940,717	
02 Selected Plan Maintenance					
02- A Construction Cost		768,565	115,285	883,850	
02- B Non-Construction Cost		84,542	0	84,542	
TOTAL Selected Plan Maintenance		853,107	115,285	968,392	
TOTAL Hernando Beach Navigation Study		5,229,644	679,465	5,909,109	

** PROJECT OWNER SUMMARY - Task **

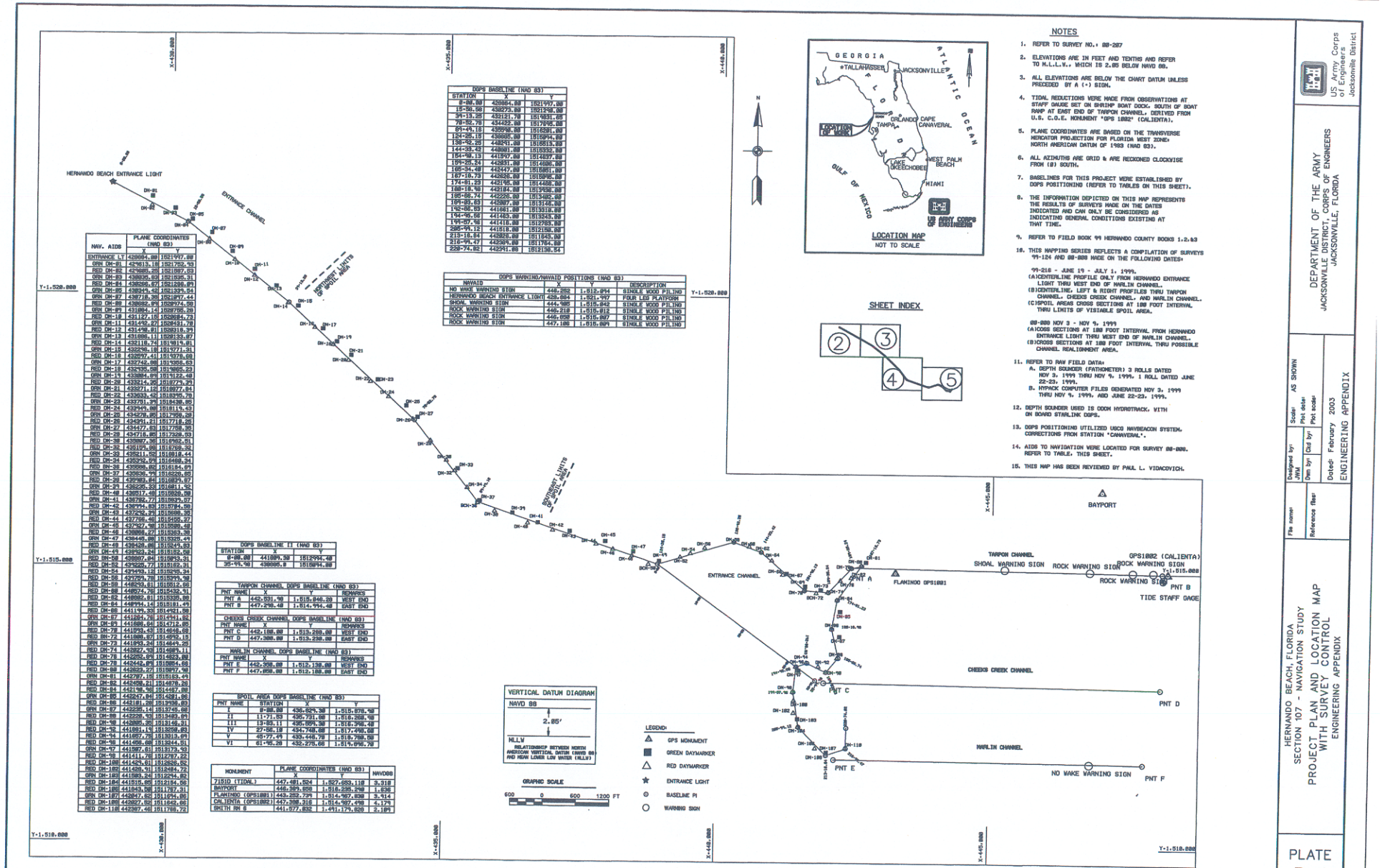
	QUANTITY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT COST
01 Selected Plan Construction						
01- A Construction Cost						
01- A/12 Navigation Ports & Harbors						
01- A/12.02 Harbors						
01- A/12.02.01 Mobiliz and Preparatory Work						
01- A/12.02.01/01 Mechanical Dredge Mob/Demob			294,386	44,158	338,544	
TOTAL Mobiliz and Preparatory Work			294,386	44,158	338,544	
01- A/12.02.15 Mechanical Dredging						
01- A/12.02.15/01 All Material to Richardson Reef	333100.00	CY	3,420,151	513,023	3,933,174	11.81
TOTAL Mechanical Dredging	333100.00	CY	3,420,151	513,023	3,933,174	11.81
TOTAL Harbors			3,714,537	557,181	4,271,717	
TOTAL Navigation Ports & Harbors			3,714,537	557,181	4,271,717	
TOTAL Construction Cost			3,714,537	557,181	4,271,717	
01- B Non-Construction Cost						
01- B/01 Lands and Damages						
01- B/01.01 Real Estate Administration						
01- B/01.01.01 Easement - Temporary Work Area			12,000	3,000	15,000	
01- B/01.01.02 Aquisition/Admin. Cost Federal			6,000	1,500	7,500	
01- B/01.01.03 Aquisition/Admin. Cost Non-Fed.			10,000	2,500	12,500	
TOTAL Real Estate Administration			28,000	7,000	35,000	
TOTAL Lands and Damages			28,000	7,000	35,000	
01- B/02 Aids To Navigation (USCG)			55,000	0	55,000	
01- B/30 Planning, Engineering and Design			347,000	0	347,000	
01- B/31 Construction Management (S&I)			232,000	0	232,000	
TOTAL Non-Construction Cost			662,000	7,000	669,000	
TOTAL Selected Plan Construction			4,376,537	564,181	4,940,717	

** PROJECT OWNER SUMMARY - Task **

	QUANTITY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT COST
02 Selected Plan Maintenance					
02- A Construction Cost					
02- A/12 Navigation Ports & Harbors					
02- A/12.02 Harbors					
02- A/12.02.01 Mobiliz and Preparatory Work					
02- A/12.02.01/02 Pipeline Dredge Mob/Demob		466,893	70,034	536,926	
02- A/12.02.01/03 Disposal Area Shore Equipment		6,765	1,015	7,779	
TOTAL Mobiliz and Preparatory Work		473,657	71,049	544,706	
02- A/12.02.16 Pipeline Dredging					
02- A/12.02.16/01 Shoal Material on Upland Beach	27000.00 CY	255,331	38,300	293,630	10.88
TOTAL Pipeline Dredging	27000.00 CY	255,331	38,300	293,630	10.88
02- A/12.02.20 Disposal Area					
02- A/12.02.20/01 Spreading Material/Const. Beach	0.57 MO	39,577	5,937	45,514	79848.72
TOTAL Disposal Area		39,577	5,937	45,514	
TOTAL Harbors		768,565	115,285	883,850	
TOTAL Navigation Ports & Harbors		768,565	115,285	883,850	
TOTAL Construction Cost		768,565	115,285	883,850	
02- B Non-Construction Cost					
02- B/30 Planning, Engineering and Design		38,428	0	38,428	
02- B/31 Construction Management (S&I)		46,114	0	46,114	
TOTAL Non-Construction Cost		84,542	0	84,542	
TOTAL Selected Plan Maintenance		853,107	115,285	968,392	
TOTAL Hernando Beach Navigation Study		5,229,644	679,465	5,909,109	

No errors detected...

* * * END OF ERROR REPORT * * *



NAV. AIDS	PLANE COORDINATES (NAD 83) X	Y
ENTRANCE LT	428984.88	1521997.88
GRN DM-81	429813.18	1521752.93
RED DM-82	429885.29	1521897.93
GRN DM-83	429839.59	1521935.31
RED DM-84	429988.67	1521986.89
GRN DM-85	430049.48	1522139.54
GRN DM-87	430718.38	1522457.44
RED DM-89	430882.90	1522974.58
GRN DM-91	431084.14	1523795.39
RED DM-93	431127.15	1523884.73
GRN DM-11	431492.27	1524431.78
RED DM-12	431498.81	1524518.39
GRN DM-13	431688.11	1524933.87
RED DM-14	432118.74	1519814.81
GRN DM-15	432296.16	1519771.31
RED DM-16	432697.41	1519778.09
GRN DM-17	432742.08	1519358.63
RED DM-18	432955.58	1519885.23
GRN DM-19	433084.89	1519122.48
RED DM-20	433214.36	1518779.39
GRN DM-21	433271.12	1518877.84
RED DM-22	433633.42	1518395.78
GRN DM-23	433781.39	1518438.85
RED DM-24	433949.88	1518119.43
GRN DM-25	434278.85	1517909.28
RED DM-26	434391.21	1517718.25
GRN DM-27	434477.63	1517788.98
RED DM-28	434716.85	1517328.93
RED DM-30	435867.36	1516962.51
RED DM-32	435109.98	1516789.32
GRN DM-33	435211.52	1516818.44
RED DM-34	435232.09	1516488.34
RED DM-36	435886.82	1516184.01
GRN DM-37	435836.99	1516220.85
RED DM-38	437903.84	1516823.97
GRN DM-39	438230.33	1516811.92
RED DM-40	438517.48	1516930.88
GRN DM-41	438782.77	1516929.67
RED DM-42	438944.63	1515784.98
GRN DM-43	437762.93	1515888.32
RED DM-44	437786.46	1515455.37
GRN DM-45	437927.98	1515588.48
RED DM-46	438868.72	1515353.38
GRN DM-47	438448.88	1515329.43
RED DM-48	439420.86	1515249.83
GRN DM-49	439353.24	1515152.58
RED DM-50	439897.84	1515953.91
RED DM-52	439926.72	1515152.31
RED DM-54	439498.12	1513295.34
RED DM-56	437253.78	1513979.98
RED DM-58	440923.81	1516512.68
RED DM-60	440574.78	1515432.51
RED DM-62	440992.81	1515335.80
RED DM-64	440994.14	1515181.49
RED DM-66	441199.32	1514921.58
GRN DM-67	441251.76	1514741.66
GRN DM-69	441688.84	1514712.65
RED DM-70	441893.43	1514549.68
RED BM-72	441988.87	1514952.15
GRN DM-73	441893.24	1514849.25
RED DM-74	442027.78	1514889.11
RED DM-76	442252.89	1514823.88
RED DM-78	442442.89	1513884.68
RED DM-80	442823.27	1513977.90
GRN DM-81	442787.15	1515153.44
RED DM-82	442458.21	1514678.26
RED DM-84	442138.36	1514467.80
GRN DM-85	442247.84	1514281.96
RED DM-86	442181.28	1513736.83
GRN DM-87	442228.14	1513749.68
RED DM-88	442228.43	1513489.89
RED DM-90	442885.26	1513149.31
RED DM-92	441841.16	1513258.63
RED DM-94	441827.78	1513313.69
RED DM-96	441458.68	1513244.51
RED DM-98	441397.81	1513173.93
RED DM-98	441411.78	1512787.22
RED DM-100	441425.61	1512826.52
RED DM-102	441429.91	1512484.72
GRN DM-103	441583.24	1512264.62
RED DM-104	441515.85	1512154.58
RED DM-106	441843.16	1511787.31
GRN DM-107	442847.62	1511694.86
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RED DM-110	442387.46	1511768.72

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15-36.00	439273.00	1521298.00
39-13.25	437121.70	1519831.00
78-82.78	434222.00	1517695.00
89-45.16	433598.00	1516281.00
124-29.15	430880.00	1516094.00
138-92.25	429241.00	1516815.00
144-33.40	428881.00	1516352.00
154-48.13	427997.00	1514897.00
159-25.24	427231.00	1514686.00
165-34.48	426427.00	1516881.00
167-18.73	426265.00	1518996.00
174-81.23	425765.00	1514468.00
180-18.98	425184.00	1519098.00
185-66.74	424225.00	1513492.00
189-89.63	423997.00	1513746.00
192-66.63	423681.00	1513319.00
194-95.68	421481.00	1513243.00
196-57.18	421418.00	1512783.00
206-94.12	421518.00	1512198.00
213-18.84	420926.00	1511849.00
216-94.47	420340.00	1511784.00
228-74.82	442391.00	1512138.54

NAVAID	X	Y	DESCRIPTION
NO WAKE WARNING SIGN	448.282	1.512.894	SINGLE WOOD PILING
HERNANDO BEACH ENTRANCE LIGHT	429.884	1.521.997	FOUR LEG PLATFORM
SHOAL WARNING SIGN	444.985	1.515.842	SINGLE WOOD PILING
ROCK WARNING SIGN	446.218	1.515.812	SINGLE WOOD PILING
ROCK WARNING SIGN	446.859	1.515.807	SINGLE WOOD PILING
ROCK WARNING SIGN	447.186	1.515.809	SINGLE WOOD PILING

STATION	X	Y
0-00.00	441899.38	1512994.48
35-99.98	439886.8	1510894.88

PNT NAME	X	Y	REMARKS
PNT A	442.931.98	1.515.846.28	WEST END
PNT B	447.298.48	1.514.994.48	EAST END

PNT NAME	X	Y	REMARKS
PNT C	442.186.88	1.513.288.88	WEST END
PNT D	447.388.88	1.513.288.88	EAST END

PNT NAME	X	Y	REMARKS
PNT E	442.958.88	1.512.138.88	WEST END
PNT F	447.858.88	1.512.188.88	EAST END

PNT NAME	STATION	X	Y
I	0-00.00	436.625.38	1.515.878.98
II	11-71.53	435.731.08	1.515.358.78
III	13-93.11	435.509.38	1.515.298.48
IV	27-56.19	434.748.68	1.517.298.68
V	45-77.44	433.448.78	1.518.798.08
VI	61-95.28	432.278.68	1.519.898.78

MONUMENT	PLANE COORDINATES (NAD 83) X	Y	NAVD88
71510 (TIDAL)	447.481.524	1.527.852.118	3.318
BAYPORT	446.389.888	1.516.288.248	1.838
FLAMINGO (GPS1001)	443.252.738	1.514.987.838	3.414
CALIENTA (GPS1002)	447.388.315	1.514.987.498	4.178
SMITH RM 6	441.577.832	1.491.179.628	2.198

VERTICAL DATUM DIAGRAM

NAVD 88

2.85'

MLLW

RELATIONSHIP BETWEEN NORTH AMERICAN VERTICAL DATUM (NAVD 88) AND MEAN LOWER LOW WATER (MLLW)

GRAPHIC SCALE

600 0 600 1200 FT

LEGEND:

- GPS MONUMENT
- GREEN DAYMARKER
- RED DAYMARKER
- ENTRANCE LIGHT
- BASELINE PI
- WARNING SIGN

LOCATION MAP

NOT TO SCALE

SHEET INDEX

2 3 4 5

NOTES

1. REFER TO SURVEY NO.: 98-287
2. ELEVATIONS ARE IN FEET AND TENTHS AND REFER TO M.L.L.W., WHICH IS 2.85 BELOW NAVD 88.
3. ALL ELEVATIONS ARE BELOW THE CHART DATUM UNLESS PRECEDED BY A (+) SIGN.
4. TIDAL REDUCTIONS WERE MADE FROM OBSERVATIONS AT STAFF GAUGE SET ON SHRIMP BOAT DOCK, SOUTH OF BOAT RAMP AT EAST END OF TARPON CHANNEL, DERIVED FROM U.S. C.O.E. MONUMENT "DPS 1882" (CALIENTA).
5. PLANE COORDINATES ARE BASED ON THE TRANSVERSE MERCATOR PROJECTION FOR FLORIDA WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD 83).
6. ALL AZIMUTHS ARE GRID & ARE RECKONED CLOCKWISE FROM (0) SOUTH.
7. BASELINES FOR THIS PROJECT WERE ESTABLISHED BY DOPS POSITIONING (REFER TO TABLES ON THIS SHEET).
8. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS THE RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING GENERAL CONDITIONS EXISTING AT THAT TIME.
9. REFER TO FIELD BOOK 99 HERNANDO COUNTY BOOKS 1,2,&3
10. THIS MAPPING SERIES REFLECTS A COMPILATION OF SURVEYS '99-124 AND 98-888 MADE ON THE FOLLOWING DATES:

    '99-218 - JUNE 19 - JULY 1, 1999.
    (A)CENTERLINE PROFILE ONLY FROM HERNANDO ENTRANCE LIGHT THRU WEST END OF MARLIN CHANNEL.
    (B)CENTERLINE, LEFT & RIGHT PROFILES THRU TARPON CHANNEL, CHEEKS CREEK CHANNEL, AND MARLIN CHANNEL.
    (C)SPOIL AREAS CROSS SECTIONS AT 100 FOOT INTERVAL THRU LIMITS OF VISIABLE SPOIL AREA.

    98-888 NOV 3 - NOV 9, 1999
    (A)CROSS SECTIONS AT 100 FOOT INTERVAL FROM HERNANDO ENTRANCE LIGHT THRU WEST END OF MARLIN CHANNEL.
    (B)CROSS SECTIONS AT 100 FOOT INTERVAL THRU POSSIBLE CHANNEL REALIGNMENT AREA.
11. REFER TO RAW FIELD DATA:
    A. DEPTH SOUNDER (FATHOMETER) 3 ROLLS DATED NOV 3, 1999 THRU NOV 9, 1999. 1 ROLL DATED JUNE 22-23, 1999.
    B. HYPACK COMPUTER FILES GENERATED NOV 3, 1999 THRU NOV 9, 1999, AND JUNE 22-23, 1999.
12. DEPTH SOUNDER USED IS ODOM HYDROTRACK, WITH ON BOARD STARLINK DGPS.
13. DGPS POSITIONING UTILIZED USCG NAVBEACON SYSTEM. CORRECTIONS FROM STATION "CANAVERAL".
14. AIDS TO NAVIGATION WERE LOCATED FOR SURVEY 98-888. REFER TO TABLE, THIS SHEET.
15. THIS MAP HAS BEEN REVIEWED BY PAUL L. VIDACOVICH.

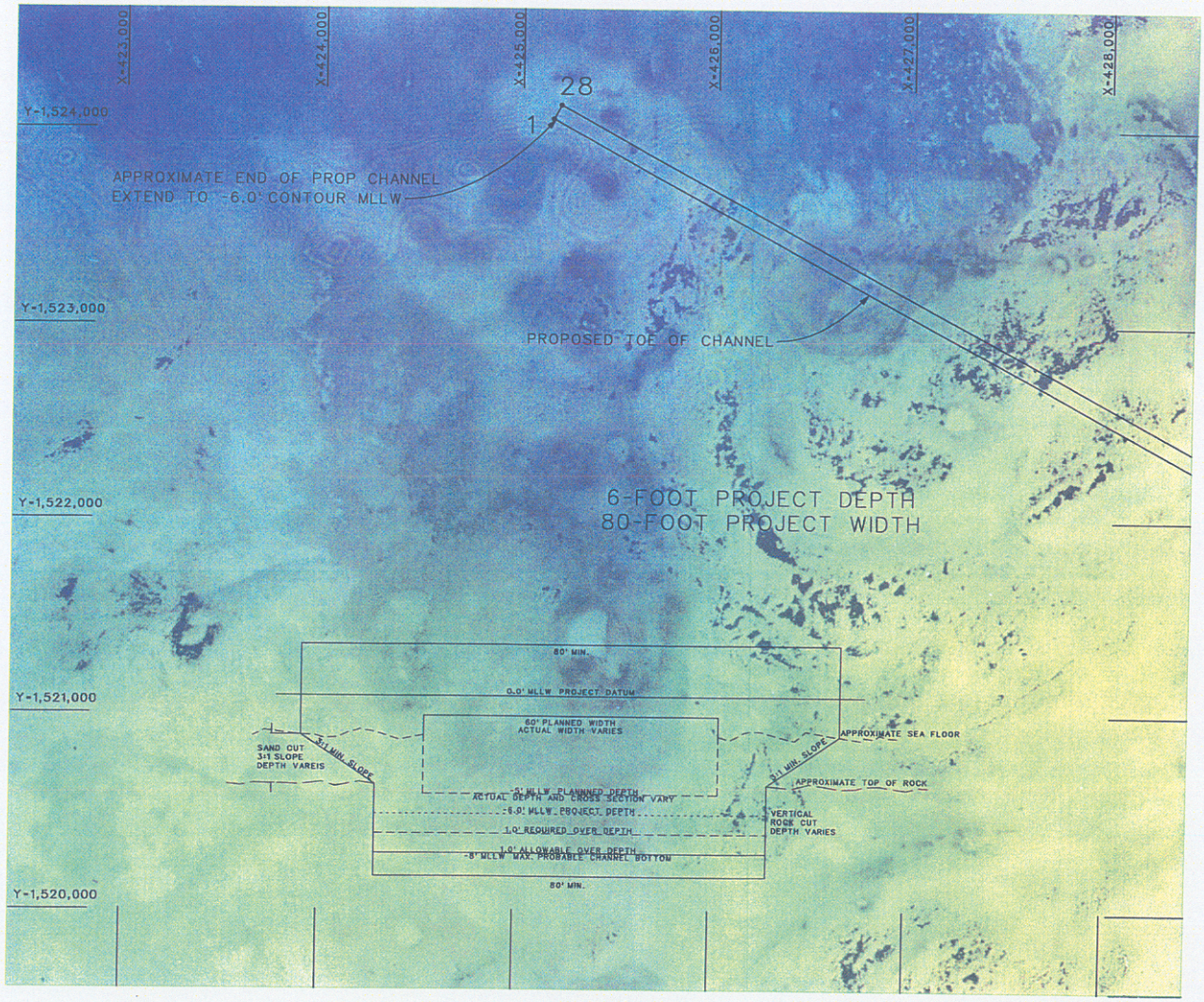
US Army Corps of Engineers
Jacksonville District

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

File name:
Reference files:
Designed by: JWM
Drn. by:
Chd by:
Scale: AS SHOWN
Plot date:
Plot scale:
Dated: February 2003
ENGINEERING APPENDIX

HERNANDO BEACH, FLORIDA
SECTION 107 - NAVIGATION STUDY
PROJECT PLAN AND LOCATION MAP
WITH SURVEY CONTROL
ENGINEERING APPENDIX

PLATE
B-1



CHANNEL COORDINATES		
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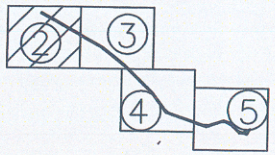
28	425195.84	1524118.38

N

SHEET INDEX



600 300 0 600 1200FT

SCALE: 1"= 600'

US Army Corps of Engineers
Jacksonville District

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

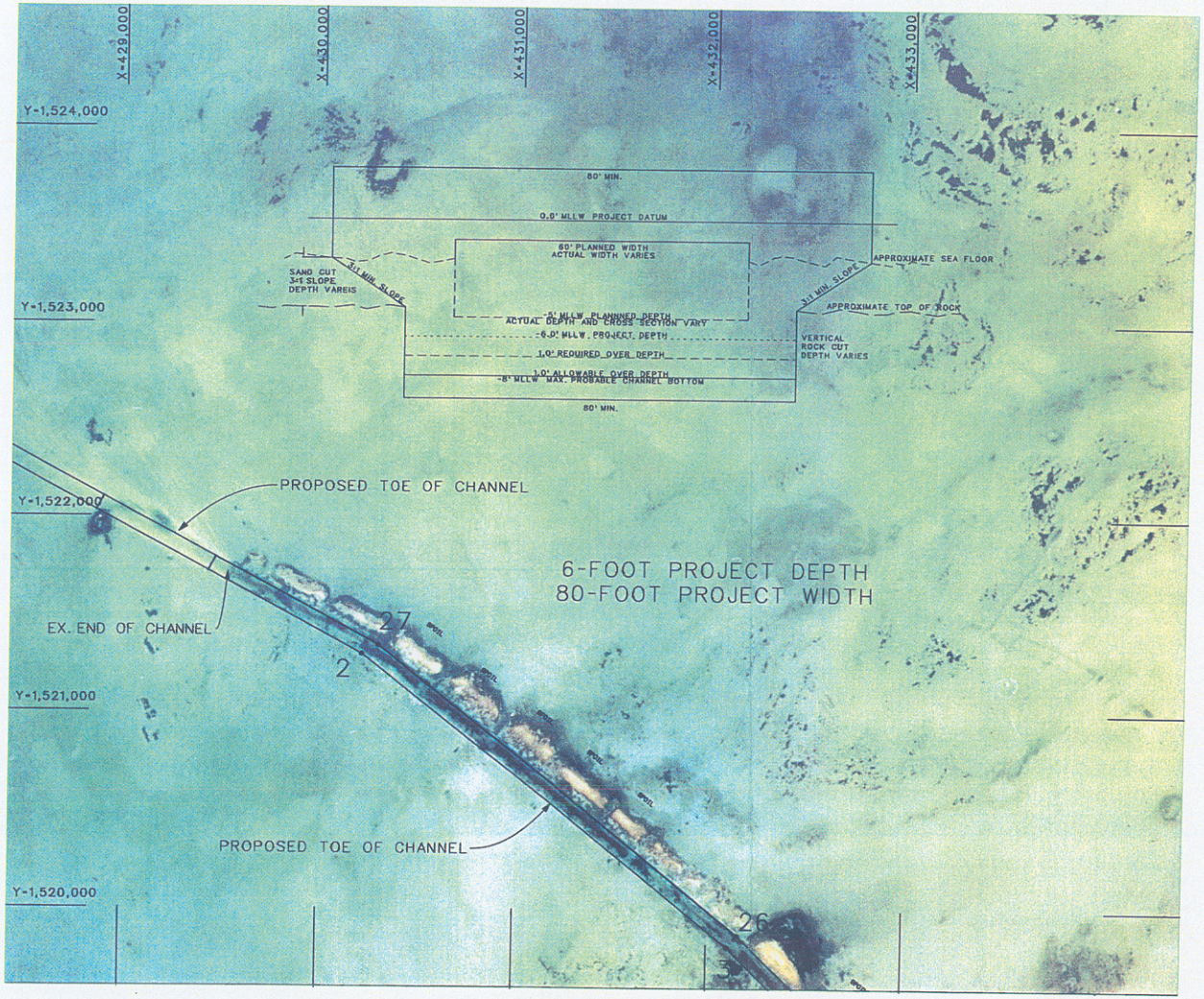
File Name: | Designed by: JWM | Scale: AS SHOWN
Reference files: | Drawn by: | Cad by: | Plot date:
Dated: February 2003 | Plot scale:
ENGINEERING APPENDIX

HERNANDO BEACH, FLORIDA
SECTION 107 - NAVIGATION STUDY

RECOMMENDED PLAN

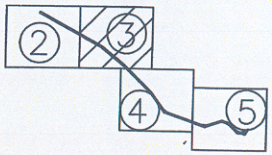
ENGINEERING APPENDIX

PLATE
B-2



CHANNEL COORDINATES		
	X	Y
2	430218.42	1521294.38
3	432106.17	1519815.24
26	432158.68	1519875.72
27	430303.31	1521339.27

SHEET INDEX



600 300 0 600 1200FT

SCALE: 1"= 600'

US Army Corps of Engineers
Jacksonville District

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

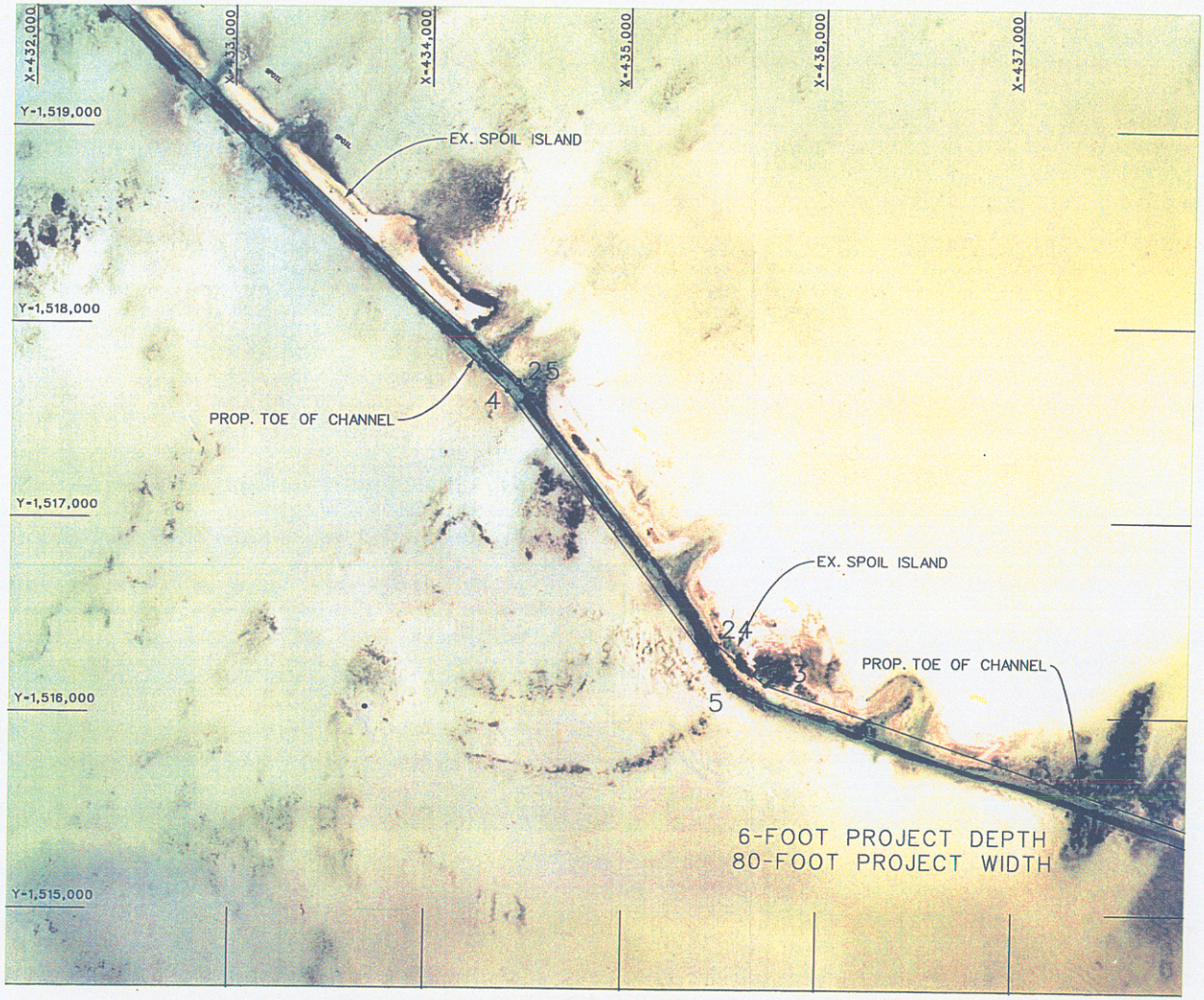
File name:
Designed by: AMM
Drawn by:
Checked by:
Reference files:
Scale: AS SHOWN
Plot date:
Plot scale:
Dated: February 2003
ENGINEERING APPENDIX

HERNANDO BEACH, FLORIDA
SECTION 107 - NAVIGATION STUDY

RECOMMENDED PLAN

ENGINEERING APPENDIX

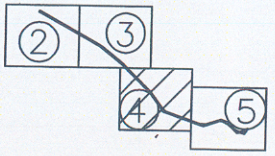
PLATE
B-3



CHANNEL COORDINATES		
	X	Y
4	434390.37	1517656.07
5	435544.92	1516131.97
23	435735.09	1516152.48
24	435475.59	1516360.78
25	434449.62	1517710.22

N

SHEET INDEX



600 300 0 600 1200FT

SCALE: 1"= 600'

US Army Corps of Engineers
Jacksonville District

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

File name:
Reference files:
Designed by: JWM
Drn by:
Chd by:
Scale: AS SHOWN
Plot date:
Plot scale:
Dated: February 2003
ENGINEERING APPENDIX

HERNANDO BEACH, FLORIDA
SECTION 107 - NAVIGATION STUDY
ENGINEERING APPENDIX

RECOMMENDED PLAN

PLATE
B-4