October 2002
w/ April 2004 Addendum

SARASOTA COUNTY, FLORIDA HURRICANE AND STORM DAMAGE REDUCTION PROJECT

LIDO KEY

FEASIBILITY REPORT WITH ENVIRONMENTAL ASSESSMENT

U. S. ARMY CORPS OF ENGINEERS
Jacksonville District

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CECW-SAD (1105-2-10a)

22 DEC 2004

SUBJECT: Lido Key, Sarasota County, Florida

THE SECRETARY OF THE ARMY

1. I submit, for transmission to Congress, my report on the study of hurricane and storm damage reduction for Lido Key, Sarasota County, Florida. It is accompanied by the report of the district and division engineers. These reports are in full response to the Resolution, Docket 2458, adopted on 14 September 1995, by the Committee on Transportation and Infrastructure of the House of Representatives. The resolution requested the Secretary of the Army to determine the advisability of providing a hurricane and storm damage reduction project for Lido Key.

2. A shore protection project for Lido Key, Sarasota, Florida, was authorized by Section 101 of the Rivers and Harbors Act of 1970. The project was never completed and was subsequently deauthorized on 1 January 1990 in accordance with the provisions of Section 1001(b)(1) of the Water Resources Development Act (WRDA) of 1986. Section 364(2) of WRDA 1999 reauthorized the project subject to a determination by the Assistant Secretary of the Army (Civil Works) that the project is technically sound, environmentally acceptable, and economically justified. The currently authorized project provides for a 25-foot berm over a 6,200-foot-long (1.2 miles) reach along the shoreline of Lido Key and for periodic nourishment for a 50-year period. The total authorized first cost of the project was $5,200,000, and the authorized average annual cost of periodic nourishment was $602,000.

3. The reporting officers recommend modification of the Lido Key, Sarasota, Florida, shore protection project. The modified project provides for initial construction and periodic nourishment of an 80-foot-wide beach berm at elevation +5 feet National Geodetic Vertical Datum over 1.56 miles of shoreline, with a groin field at the southern limits of the project. Periodic nourishment, accomplished at 5-year intervals, would optimize net benefits over the 50-year period of analysis. The estimated volume of fill for initial project construction is 1,074,700 cubic yards, which includes placement of 614,500 cubic yards for the first nourishment. The source of fill material is three borrow areas located between 7.2 and 9.5 nautical miles offshore.

The project was designed to avoid and minimize adverse environmental effects such that no mitigation is required.

4. Based on October 2004 price levels, the total first cost for construction of the recommended plan is $14,809,000. Based upon the requirements of WRDA 1986, as amended, cost sharing for initial construction will be 62.4 percent Federal and 37.6 percent non-Federal based on shoreline ownership and use. The estimated total Federal first cost of construction is $9,088,000 and the estimated total non-Federal first cost of construction is $5,721,000. Total periodic nourishment costs, stated at October 2004 prices, are estimated to be $63,606,000 over the 50-year period following construction. The ultimate project cost, including initial construction and periodic nourishment, is estimated to be $78,415,000 at October 2004 prices. The average annual cost of future periodic nourishment is estimated to be $1,172,700, based on a Federal discount rate of 5.375 percent and a 50-year period of Federal participation in cost sharing. Cost sharing of periodic nourishment would be in accordance with WRDA 1986, as amended, subject to the availability of appropriations. All costs for operation, maintenance, repair, rehabilitation, and replacement of the recommended project are the responsibility of the non-Federal sponsor.

5. The recommended plan is the national economic development plan. Based on October 2003 prices and a Federal discount rate of 5.625 percent, the estimated average annual cost of the recommended plan is $2,039,800, average annual benefits are $5,060,000, and average annual net benefits are $3,020,200. The project's benefit-to-cost ratio is 2.5 to 1.0.

6. Washington level review indicates that the project is technically sound, environmentally acceptable, and economically justified. The plan conforms with essential elements of the U.S. Water Resources Counsel's Economic and Environmental Principles for Water and Related Land Resources Implementation studies and complies with other administration and legislative policies and guidelines. Also, the views of interested parties, including Federal, State, and local agencies have been considered.

7. The current project is significantly different than the project authorized by Section 364(2) of the WRDA of 1999 and exceeds the maximum project cost allowed by Section 902 of the WRDA of 1986. I concur with the findings, conclusions, and recommendation of the reporting officers. Accordingly, I recommend that the authorized project for hurricane and storm damage reduction for Lido Key, Sarasota County, Florida, be modified generally in accordance with the reporting officers' recommended plan, with such modifications as in the discretion of the Chief of Engineers may be advisable. My recommendation is subject to cost sharing, financing, and other applicable requirements of Federal and State laws and policies, including the WRDA of 1986, as amended, and in accordance with the following local cooperation requirements which the non-Federal sponsor must agree to prior to project implementation:

a. Provide 35 percent of initial project costs assigned to hurricane and storm damage reduction, plus 50 percent of initial project costs assigned to protecting undeveloped public lands, plus 50 percent of initial project costs assigned to recreation, plus 100 percent of initial project costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits; and 50 percent of periodic nourishment costs assigned to hurricane and storm damage reduction, plus 100 percent of periodic nourishment costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits; and as further specified below:

(1) Enter into an agreement which provides, prior to execution of the project cooperation agreement, 25 percent of design costs;

(2) Provide, during the first year of construction, any additional funds needed to cover the non-federal share of design costs;

(3) Provide all lands, easements, and rights-of-way, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the initial construction, periodic nourishment, operation, and maintenance of the project;

(4) Provide, during construction, any additional amounts as are necessary to make its total contribution equal to 35 percent of initial project costs assigned to hurricane and storm damage reduction plus 100 percent of initial project costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits and 50 percent of periodic nourishment costs assigned to hurricane and storm damage reduction plus 100 percent of periodic nourishment costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits;

b. Provide the non-Federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project, in accordance with the cost sharing provisions of the agreement;

c. Do not use Federal funds to meet the non-Federal Sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized;

d. Operate, maintain, repair, replace and rehabilitate the project, or functional portion of the project, including mitigation, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

e. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the Non-Federal Sponsor, now or hereafter, owns or controls for access to the project for the purpose of inspecting, operating, maintaining, repairing, replacing, rehabilitating, or completing the project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Federal Government shall relieve the Non-Federal Sponsor of responsibility to meet the Non-Federal Sponsor's obligations, or to preclude the Federal Government from pursuing any other remedy at law or equity to ensure faithful performance;

f. Hold and save the United States free from all damages arising from the initial construction, periodic nourishment, operation, maintenance, repair, replacement, and rehabilitation of the project and any project-related betterments, except for damages due to the fault or negligence of the United States or its contractors;

g. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the initial construction, periodic nourishment, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the Non-Federal Sponsor with prior specific written direction, in which case the Non-Federal Sponsor shall perform such investigations in accordance with such written direction;

h. Assume, as between the Federal Government and the non-Federal Sponsor, complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the initial construction, periodic nourishment, operation, or maintenance of the project;

i. Agree that, as between the Federal Government and the Non-Federal Sponsor, the Non-Federal Sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, and repair the project in a manner that will not cause liability to arise under CERCLA;

j. For so long as the project remains authorized, the Non-Federal Sponsor shall ensure continued conditions of public ownership and use of the shore upon which the amount of Federal participation is based;

k. Provide and maintain access roads, parking areas, and other public use facilities, open and available to all on equal terms;

l. Prevent obstructions of or encroachments on the project (including prescribing and enforcing regulations to prevent such obstruction or encroachments) which might reduce the level of protection it affords, hinder operation and maintenance or future periodic nourishment, or interfere with its proper function, such as any new developments on project lands or the addition of facilities which would degrade the benefits of the project;

m. Publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the floodplain, and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with protection levels provided by the project;

n. At least twice annually and after storm events, perform surveillance of the beach to determine losses of nourishment material from the project design section and provide the results of such surveillance to the Federal Government;

o. Not less than once each year, inform affected interests of the extent of protection afforded by the project;

p. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence is required, to the extent and in such detail as will properly reflect total costs of construction of the Project, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

q. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5), and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

r. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army", and all applicable Federal

labor standards and requirements, including but not limited to, 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a *et seq.*), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 *et seq.*) and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c *et seq.*) ;

s. Comply with Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), which requires a Non-Federal interest to participate in and comply with applicable Federal floodplain management and flood insurance programs, prepare a flood plain management plan within one year after the date of signing a Project Cooperation Agreement, and implement the plan not later than one year after completion of construction of the project; and,

t. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, necessary for the initial construction, periodic nourishment, operation, and maintenance of the project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

8. The recommendation contained herein reflects the information at this time and current departmental policies governing formulation of individual projects. It does not reflect program and budgeting priorities in the formulation of a national civil works construction program nor the perspective of higher review levels within the executive branch. Consequently, the recommendation may be modified before it is transmitted to the Congress as a proposal for authorization and implementation funding. However, prior to transmittal to the Congress, the sponsor, the State, interested Federal agencies, and other parties will be advised of any significant modifications and will be afforded an opportunity to comment further.

CARL A. STROCK
Lieutenant General, US Army
Chief of Engineers

Errata sheet for Lido Key Feasibility Report, Sarasota County, Florida with EA dated October 2002

Syllabus add the following paragraph:

6. The attached Environmental Assessment (EA) details the comprehensive effort made to scope the project, evaluate all alternatives, and assess impacts. Issues were evaluated in detail and a preferred alternative selected. Environmental effects were evaluated for vegetation, threatened and endangered species, hardgrounds, fish and wildlife resources, essential fish habitat, historic properties, etc. The only mitigation required is to establish a 200-foot buffer zones around hardgrounds near the beach nourishment borrow areas. Additional information can be found in the Environmental Assessment (yellow pages) located at the end of the main report.

Introduction add the following sentence at the end of paragraph 1:

The Environmental Assessment located at the end of this main report details the evaluation of environmental effects on important resources.

Detailed Assessment of Alternative Plans add the following to paragraph 155.

The attached Environmental Assessment (EA) details the comprehensive effort made to evaluate the alternatives and assess impacts. Environmental effects were evaluated for vegetation, threatened and endangered species, hardgrounds, fish and wildlife resources, essential fish habitat, historic properties, etc. See attached EA for more information.

Study Summary add the following to the end of paragraph 200 b.

The attached EA evaluated impacts to the recommended plan and recommended minimal mitigation. A Finding of No Significant Impact has been prepared and signed.

Conclusions add paragraph 211 a.

An EA was prepared (attached to end of the main report) which details the comprehensive effort made to evaluate the alternatives and assess impacts. Environmental effects were evaluated for vegetation, threatened and endangered species, hardgrounds, fish and wildlife resources, essential fish habitat, historic properties, etc. Minimal mitigation requiring the establishment a 200-foot buffer zones around hardgrounds near the beach nourishment borrow areas is proposed. A Finding of No Significant Impact has been prepared and signed.

Recommendations add paragraph 212a.

An EA was prepared (attached to end of the main report) which details the comprehensive effort made to evaluate the alternatives and assess impacts. Minimal mitigation requiring the establishment a 200-foot buffer zones around hardgrounds near the beach nourishment borrow areas is proposed. A Finding of No Significant Impact has been prepared and signed.

CESAJ-PD-PN July 14, 2004

APRIL 2004

TABLE OF CONTENTS

ADDENDUM TO:

SARASOTA COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION PROJECT
LIDO KEY FEASIBILITY REPORT
WITH ENVIRONMENTAL ASSESSMENT DATED OCTOBER 2002

SARASOTA COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION PROJECT
LIDO KEY FEASIBILITY REPORT WITH ENVIRONMENTAL ASSESSMENT

FISCAL YEAR 2003 PERTINENT DATA

PHYSICAL DATA (Project Life = 50 Years)	
Project Length (ft)	8,280
Berm Crest Elevation (ft NGVD)	5
Berm Width Extension from ECL (ft)	80
Foreshore Slope (Berm-MLW)	1 V to 12 H
Nearshore Slope (MLW-existing profile)	1 V to 35 H
Post-placement Erosion Rate (cy/yr)	122,900
Volume of Initial Fill (cy)	1,074,700
Volume of Design Fill (cy)	460,200
Volume of Advance Nourishments (cy)	614,500
Nourishment Interval (yr)	5
FINANCIAL DATA (Interest Rate = 5.625 % October 2002 (FY03) Price Levels)	
INITIAL CONSTRUCTION COSTS (groin and beach)	$14,131,500
INITIAL BEACH FILL CONSTRUCTION COSTS	$10,946,000
EACH FUTURE NOURISHMENT COST	$5.9 – 6.3 million
GROIN CONSTRUCTION	$3,185,500
INTEREST DURING CONSTRUCTION (IDC)	$861,100
ANNUAL PROJECT COSTS	
Interest and Amortization	
Initial Construction (with IDC, & monitoring)	$901,800
Future Beach Fill Nourishment (includes Monitoring costs for construction)	$1,083,800
Groin Maintenance & Inspection (sponsor)	$17,300
Future Beach Monitoring(sponsor)	$12,500
Total Annual Project Costs:	$2,015,400
PRIMARY BENEFITS	
Prevention of Damage to	Reach 2 & Reach 3
Upland Development	$3,763,800
Coastal Armor	$38,400
Backfill	$304,300
Loss of Land	$854,200
Total Annual Project Benefits:	$4,960,700
BENEFIT – TO – COST RATIO	2.5[1]
PROJECT COST SHARING, INITIAL CONSTR.	
Percent (%): Federal	62.4%
Non-Federal	37.6%
Dollars($): Federal	$8,671,900
Non-Federal	$5,459,600

[1] Benefit-To-Cost Ratio includes Interest During Construction

SARASOTA COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION PROJECT
LIDO KEY FEASIBILITY REPORT WITH ENVIRONMENTAL ASSESSMENT

FISCAL YEAR 2004 PERTINENT DATA

PHYSICAL DATA (Project Life = 50 Years)			
Project Length (ft)	8,280		
Berm Crest Elevation (ft NGVD)	5		
Berm Width Extension from ECL (ft)	80		
Foreshore Slope (Berm-MLW)	1 V to 12 H		
Nearshore Slope (MLW-existing profile)	1 V to 35 H		
Post-placement Erosion Rate (cy/yr)	122,900		
Volume of Initial Fill (cy)	1,074,700		
Volume of Design Fill (cy)	460,200		
Volume of Advance Nourishments (cy)	614,500		
Nourishment Interval (yr)	5		
FINANCIAL DATA (Interest Rate = 5.625 % October 2003 (FY04) Price Levels)			
INITIAL CONSTRUCTION COSTS (groin and beach)	$14,428,100		
INITIAL BEACH FILL CONSTRUCTION COSTS	$11,175,700		
EACH FUTURE NOURISHMENT COST	$6.0 – 6.4 million		
GROIN CONSTRUCTION	$3,252,400		
INTEREST DURING CONSTRUCTION (IDC)	$879,200		
ANNUAL PROJECT COSTS			
Interest and Amortization			
Initial Construction (with IDC, & monitoring)	$902,900		
Future Beach Fill Nourishment (includes Monitoring costs for construction)	$1,106,500		
Groin Maintenance & Inspection (sponsor)	$17,800		
Future Beach Monitoring(sponsor	$12,600		
Total Annual Project Costs:	$2,039,800		
PRIMARY BENEFITS:			
Prevention of Damage to	Reach 2 & Reach 3		
Upland Development	$3,839,100		
Coastal Armor	$39,200		
Backfill	$310,400		
Loss of Land	$871,300		
Total Annual Project Benefits:	$5,060,000		
BENEFIT – TO – COST RATIO	2.5[1]		
PROJECT COST SHARING, INITIAL CONSTR.			
Percent (%): Federal	62.4%		
Non-Federal	37.6%		
Dollars($): Federal	$8,853,900		
Non-Federal	$5,574,200		
SECTION 902 ANALYSIS	*Initial Const.*	*Nourishment*	*Total*
Authorized Project Costs (Includes 20%) ($1,000)	6,935	67,743	74,678
Expected Project Costs ($1,000)	15,116	116,288	131,404
Differences	8,181	48,545	56,726

1 Benefit-To-Cost Ratio includes Interest During Construction

ADDENDUM TO:

SARASOTA COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION PROJECT
LIDO KEY FEASIBILITY REPORT
WITH ENVIRONMENTAL ASSESSMENT DATED OCTOBER 2002

This addendum was prepared in response to Headquarters Policy Compliance Review (PCR) dated 06 March 2003. The Feasibility Review Conference (FRC) for this document was held on 23 April 2002 via Internet and telephone conference. The FRC was documented with a PCR dated 03 May 2003; the PCR outlined HQ's concerns and required changes to the document prior to release for public coordination. On 05 November 2002 the pre-coordinated responses to PCR comments were sent to HQ via the South Atlantic Division office along with the Final Report Submittal Package as outlined in Appendix H of ER 1105-2-100. The Division Engineer released his Public Notice for the project on 03 December 2002. On 06 March of 2003 Headquarters conveyed continued concerns (via memorandum) with a number of the District's responses provided in November of 2002. An initial response from the District in September of 2003 dealt with some of the discrepancies in the report, leaving others that still required further coordination. Teleconferences and emails were used to further coordinate needed actions, these transpired in October and December of 2003 and January 2004. This coordination is documented in the 30 April 2004 PCR memorandum found in the Additional Information Appendix to this addendum.

Instead of making the required changes to the main report and supporting appendices, it was agreed upon to generate this addendum in order to capture Headquarters' intent. The following text and tables have been generated to document the results of the Policy Compliance review. Information contained within the main report and appendices reflect information as of October 2002; this addendum updates benefits and costs and incorporates changes as required per the PCR. The Pertinent Data numbers presented at the beginning of this text have all been updated in accordance with the changes reflected in this addendum.

Background

The Lido Key Hurricane and Storm Damage Reduction Study area comprises 2.4 miles of the Lido Key Gulf of Mexico shoreline. The island, approximately 45 miles south of Tampa, is separated from Longboat Key to the north by New Pass and from Siesta Key to the south by Big Sarasota Pass. Sarasota Bay and the Intracoastal Waterway separate Lido Key from the mainland. A hurricane and storm damage reduction project for Lido Key, Florida was authorized by the

December 31, 1970 River and Harbor Act for the mid-section of Lido Key's Gulf of Mexico shoreline and for periodic nourishment on an as-needed basis. Federal participation was limited to an initial period of 10 years. The project was never completed and was subsequently deauthorized in House Document 91-320 on January 1, 1990. Resolution, Docket 2458, adopted September 14, 1995, by the Committee on Transportation and Infrastructure, U.S. House of Representatives, requested the Secretary of the Army to determine the advisability of providing a hurricane and storm damage reduction project for Lido Key. A Reconnaissance Phase Assessment was prepared in January 1997 recommending Federal participation, which lead to the feasibility phase. The project was then authorized once more under Section 364 of the Water Resources Development Act (WRDA) of 1999; this allowed for initial construction of a shore protection project and for periodic renourishment over 50 years of Federal participation. This authorization was contingent upon the Secretary determining that the project is technically sound, environmentally acceptable, and economically justified, as appropriate. That is the purpose of this Feasibility report.

Shoreline Positions Resulting from Long-Term Recession (comment 5b(1) and 6c(2))

Paragraph D-11 of the Economic Appendix should be re-written to read: Future year damages to all susceptible structures is simulated in the storm damage computer program using the existing shoreline as a reference point. As the shoreline position changes with time, damage probability at some time period in the future is referenced to an established existing shoreline position. The protective value of the beach is lost over time to long-term erosion as greater numbers of structures are threatened by storm-induced recession. Under with project conditions, seaward extension of the shoreline (which extends the shoreline further seaward) reduces future susceptibility. Because the model is designed to calculate expected damages on a lot-by-lot basis for both armored and unarmored shoreline, the expected shoreline position for unarmored shoreline is input by reach for each year of the period of analysis. Also included as input to the model is information on the type, location, and protective value of coastal armor for each lot. For lots with no coastal armor, an armor index number of 1 indicates no coastal armor. (See revised Tables D-1 & D-2 below). 32 of the 39 lots shown in Table D-3 have coastal armor under existing conditions. In calculating expected damages for those lots and associated structures, the SDM uses the input value for shoreline position for every year of the period of analysis until it is equal to or less than the armor position specified in Table D-3. At that point, shoreline position is held constant, for each of those 32 lots, at the position specified for the existing coastal armor. Similarly, for the 7 unarmored lots, the SDM uses the input value for shoreline position specified in table D-3 is reached. The model then determines that the armor Type 1 (no armor) will be destroyed by any storm event (as it has a protective value of zero) and the replacement armor (also shown in Table D-3) will be constructed at the specified armor location. For 6 of the 7 lots with no coastal armor, replacement

armor type 3 is specified (20' concrete sheetpile). That type of armor is sufficient to halt all long-term erosion, so the shoreline of the 6 lots is held constant at the armor location specified in table D-3 for the remainder of the period of analysis. For the single vacant lot without existing coastal armor, only loss-of-land damages are calculated. That is the only lot for which the input shoreline position is used without restriction by the SDM in the calculation of expected damages.

Table Add-1 - Revised Table D-1 Storm Damage Input Table for Reach 2

Theoretical Shoreline Position

50	21.2								
2000	21.2	2001	42.2	2002	63.3	2003	84.4	2004	105.5
2005	126.6	2006	147.7	2007	168.8	2008	189.9	2009	211
2010	232.1	2011	253.2	2012	274.3	2013	295.4	2014	316.5
2015	337.6	2016	358.7	2017	379.8	2018	400.9	2019	422
2020	443.1	2021	464.2	2022	485.3	2023	506.4	2024	527.5
2025	548.6	2026	569.7	2027	590.8	2028	611.9	2029	633
2030	654.1	2031	675.2	2032	696.3	2033	717.4	2034	738.5
2035	759.6	2036	780.7	2037	801.8	2038	822.9	2039	844
2040	865.1	2041	886.2	2042	907.3	2043	928.4	2044	949.5
2045	970.6	2046	991.7	2047	1012.8	2048	1033.9	2049	1055

Shoreline-Recession Data

0.005	150
0.0067	144
0.01	139
0.02	132
0.04	123
0.05	120
0.1	106
0.2	98
0.5	84
1	38.5

Coastal Armor Index

Armor Description	Unit Cost	Levels of Protection	Damage Factor	Index Number
Do nothing	$0	0	100%	1
Steel sht/ w/revet.	$1,094	175	10%	2
20' conc. Sht. Pile	$895	150	10%	3
15' conc. Sht. Pile	$619	115	10%	4

The shoreline recession–probability values reported in the economic input tables (D-1 and D-2) were not updated from the time of initial planning to the completion of the Engineering data and final SDM runs, this resulted in a difference from the combined tropical and extra-tropical storm values shown in Table A-21 in the Engineering Appendix. The revised tables for the Economic Appendix are shown below.

Table Add-2 - Revised Table D-2 Storm Damage Input Table for Reach 3

Theoretical Shoreline Position

50	6.3								
2000	6.3	2001	12.4	2002	18.6	2003	24.8	2004	31
2005	37.2	2006	43.4	2007	49.6	2008	55.8	2009	62
2010	68.2	2011	74.4	2012	80.6	2013	86.8	2014	93
2015	99.2	2016	105.4	2107	111.6	2018	117.8	2019	124
2020	130.2	2021	136.4	2022	142.6	2023	148.8	2024	155
2025	161.2	2026	167.4	2027	173.6	2028	179.8	2029	186
2030	192.2	2031	198.4	2032	204.6	2033	210.8	2034	217
2035	223.2	2036	229.4	2037	23536	2038	241.8	2039	248
2040	254.2	2041	260.4	2042	266.6	2043	272.8	2044	279
2045	285.2	2046	291.4	2047	297.6	2048	303.8	2049	310

Shoreline-Recession

Probability	Recession
0.005	228
0.0067	227
0.01	225
0.02	221
0.04	213
0.05	208
0.1	68
0.2	63
0.5	58
1	51

Coastal Armor Index

Armor Description	Unit Cost	Level of Protection	Damage Factor	Index Number
Do nothing	0	0	100%	1
Steel sht/ w/revet.	1094	150	10%	2
20' conc. Sht. Pile	895	125	10%	3
15;' conc. Sht. Pile	619	90	10%	4

Recession Damage Values (comment 5b(3))

Table D-4 of the economic appendix shows a Recession-Damage Relationship as an example. It was noted during the review that for the recession distances between 210 and 380 feet many of the total damage values in the last column do not equal the sum of the other columns for damages to development, backfill, coastal armor, and loss of land. For example, at a distance of 320 feet, the columns total $11,506,709, but the total damages displayed in the last column are $15,803,567. At 360 feet the columns total $20,430,324 but the last column shows a total of $36,349,739, nearly double that value. The recession-damage table has been reviewed and changed due to some columns not summing in the tables. The new tables are the sum of the input damage categories as listed in the tables and is presented in Table Add-3 below.

Damage to Pile-Supported Structures (comment 6a)

Further clarification of the Storm Damage Model's treatment of different structures is included here to provide readers a better picture of how the model works. The Jacksonville District's storm damage model assumes that the full value of structures with slab-on-grade foundations will be realized when erosion reaches the mid-point of the structure. This damage function is used for one and two story structures with slab-on-grade foundations. For pile structure, full value is reached at the landward limit of the structure. This damage function is used for all structures with deeply embedded pile foundations. It is assumed that all structures of more than two stories will have deeply embedded pile foundations. All structures included in the Lido Key damage inventory are constructed at grade, regardless of whether those structures have pile or slab foundations. There are no structures elevated on piles. Damage to the first two floors of pile structures is assumed in the model due to the wave and water level induced impacts. Field verification of post-storm damages is being investigated under an IWR work unit that is currently developing a "national" model for prediction Hurricane and Storm Damage Reduction project benefits.

Accounting For Recurring Damages (comment 6c and 6c(1))

The assumptions for the Storm Damage Model, as outlined on pages D-4 and D-5 of the Economic Appendix should be revised to reflect the fact that the Jacksonville District's storm damage model is used to identify reoccurring damage to structures within the 5-year limit of recession. These structures are subsequently "condemned" (i.e. removed from the storm damage model data base). The SDM is a hybrid of a probabilistic and a life-cycle model. As such, it does not specifically address the question of how many times each structure in the database is likely to be damaged and repaired. Expected damage to each structure for each year of the period of analysis is calculated based on the amount of shoreline recession associated with ten storms with known probabilities of occurrence weighted by those probabilities. Whether or not a given structure is expected to sustain damage from a particular amount of storm-induced recession is a function of the structure's location with respect to the

Table Add-3 – Revised Table D-4

Recession in feet	Development	Backfill	Coastal Armor	Loss of Land	Total Damages
0	0	0	0	0	0
10	0	0	0	8,748	8,748
20	0	0	0	8,748	8,748
30	0	0	0	8,748	8,748
40	0	0	0	8,748	8,748
50	0	0	0	8,748	8,748
60	0	0	0	8,748	8,748
70	0	0	0	8,748	8,748
80	0	0	0	8,748	8,748
90	0	0	0	8,748	8,748
100	0	0	0	8,748	8,748
110	0	0	0	8,748	8,748
120	0	0	0	8,748	8,748
130	0	0	0	8,748	8,748
140	0	0	0	8,748	8,748
150	0	0	0	8,748	8,748
160	0	0	0	8,748	8,748
170	0	4,160	0	8,748	12,908
180	0	24,960	0	8,748	33,708
190	0	45,760	0	8,748	54,508
200	0	66,560	0	8,748	75,308
210	0	1,435,460	92,850	8,748	1,537,058
220	2	1,685,580	52,615	8,748	1,746,945
230	20,091	1,840,280	80,470	8,748	1,949,589
240	195174	1,984,320	80,470	8,748	2,268,712
250	999,791	2,776,020	80,470	8,748	3,865,029
260	3,128,327	2,844,920	108,944	8,748	6,090,939
270	4,925,882	3,008,980	108,944	8,748	8,052,554
280	5,410,379	3,091,270	112,658	8,748	8,623,055
290	5,991,774	3,316,170	161,883	8,748	9,478,575
300	6,535,709	3,492,970	179,783	8,748	10,217,210
310	7,100,071	3,872,570	184,116	8,748	11,165,505
320	7,520,495	3,960,970	196,496	8,748	11,686,709
330	11,637,353	4,279,210	496,496	8,748	16,421,807
340	12,237,599	4,346,810	223,346	8,748	16,816,503
350	14,811,019	4,513,730	223,346	8,748	19,556,843

Table Add-3 (continued)

Recession in feet	Development	Backfill	Coastal Armor	Loss of Land	Total Damages
360	15,624,220	4,556,110	241,246	8,748	20,430,324
370	31,543,635	4,877,210	241,246	8,748	36,670,839
380	42,279,016	5,611,210	281,521	8,748	48,180,495
390	45,064,319	5,729,490	319,706	8,748	51,122,263
400	47,932,257	5,802,290	319,706	8,748	54,063,001
410	50,896,127	5,854,290	319,706	8,748	57,078,871
420	53,859,996	5,906,290	319,706	8,748	60,094,740
430	56,740,017	5,947,890	319,706	8,748	63,016,361
440	59,796,021	5,947,890	319,706	8,748	66,072,365
450	62,579,470	5,947,890	319,706	8,748	68,855,814
460	63,809,925	5,947,890	319,706	8,748	70,086,269
470	65,040,381	5,947,890	319,706	8,748	71,316,725
480	66,270,836	5,947,890	319,706	8,748	72,547,180
490	67,501,291	5,947,890	319,706	8,748	73,777,635
500	68,648,754	5,947,890	319,706	8,748	74,925,098

reference shoreline, the presence of intervening coastal armor, and the protective value of the armor. For reach two, there are only four structures that are not currently protected by coastal armor. It is expected that armor will be constructed to protect those structures by the year 2007 under without project conditions. Even without coastal armor for the first five years of the period of analysis, none of those structures are expected to sustain any damage from a 1-in-10 year probability storm. It is also expected that the new protective armor for those structures will be concrete sheet pile consistent with the existing armor that protects adjacent structures. SDM calculations for reach 2 assume that all structures in the database will be protected by coastal armor sufficient to protect against the 1-in-10 year probability storm event. With the coastal armor in place, 11 of the 25 structures in the reach 2 database are subject to damage by the 1-in-20 year probability storm. An additional 3 structures are subject to damage by the 1-in-100 year probability storm. The total value of the 15 structures subject to damage without a project in reach 2 is $63,078,930 (including only the value of the first two stories for multistory structures). The total value of structures subject to damage without a project in reach 2 (including the total value of multistory structures) is $88,425,490. Similarly, for reach 3 all structures are protected by coastal armor sufficient to protect against the 1-in-5 year probability storm event. All 11 structures in the reach three database are subject to damage by a 1-in-10 year probability storm. The total value of the 11 structures subject to damage without a project in reach 3 is $40,332,305 (including only the value of the first two stories for multistory structures). The total value of structures subject to damage without a project in reach 3 (including the total value of multistory

structures) is $111,843,551. For the total study area, the value of the first two floors of all structures is $103,411,235. The total value of all structures in the study area is $200,269,041. The without project expected annual damages to structures, calculated at $3,763,800, is less than 4 percent of the value of the first two floors and less than 2 percent of the total value of all structures. It is considered reasonable that this amount of damage will be repaired under without project conditions.

Table D-3 of the Economic Appendix has an error in the name of the last column. It should be distance to full value (this is the distance to where full damage of the structure is assumed, for structures with slab on grade it would be ½ the landward distance toward the back of the foundation, for pile supported structures it would be the full distance to the back of the foundation with damages calculated for the first two floors only). Table D-3 has been modified accordingly and is presented as Table Add-4 below.

Land Loss Damages (comment 6d)

The initial set of comments concerning Land Loss Damages dealt with the valuation of nearshore lands. The report (page 52) indicates that land lost to erosion is valued at $24.00 per square foot. This suggests that a one-acre lot away from the beachfront would be valued at over $1 Million. $24 per square foot is the price the land would currently market for under existing conditions; it is the land associated with the lot and there is no data to indicate that the land under the footprint of the building has a different unit cost than land on any side of the building. The entire lot is marketed as nearshore with no distinction on whether or not it is to be used for a building or a sunbathing area. The fact that the land could be used for any number of uses associated with the hotel/condo/residence applies to the reasoning behind the pricing. The value is very much in line, with respect to order of magnitude, with other Federal Shore Protection Projects on the Gulf coast of Florida. A sensitivity analysis to determine the order of magnitude difference between using this nearshore land valuation for storm effects vs. the cost of replacing the material with fill on a cubic yard basis (truck haul) was performed to determine if the land valuation technique is the more conservative approach in determining benefits for this study.

Table Add-4 - Revised Table D-3 Structural Inventory

Name	Value	Lot	Floors	Existing Armor	Replace. Armor	Distances to Armor	Distances to Structure	Distances to Full Value
House	221598	200	2	4	4	170	300	340
Parking	1	300	1	3	3	170	171	172
Condo	14523846	440	10	4	4	280	450	520
Condo	1053740	330	10	4	4	110	260	340
Motel	9929387	590	6	4	4	110	270	290
House	217172	60	2	4	4	170	300	340
House	405162	130	2	4	4	150	320	400
House	171350	120	2	4	4	150	370	400
House	250694	80	2	4	4	150	370	400
House	209382	80	2	4	4	120	380	420
House	293260	80	2	4	4	200	410	450
House	293260	110	2	4	4	210	420	450
House	223525	110	2	4	4	210	420	450
Parking	1	560	2	3	3	150	151	152
B'house	1	160	6	4	4	150	260	280
Pool	1	195	2	4	4	120	121	122
B'house	1	195	2	4	4	120	121	122
Motel	12156190	330	4	3	3	200	260	400
Condo	10103583	220	6	3	3	220	260	450
Condo	132192	220	3	3	3	160	220	370
Condo	1205333	120	2	1	3	240	260	370
Condo	1205333	140	2	1	3	250	260	330
Condo	11984380	140	3	1	3	240	250	330
Condo	5992190	140	2	1	3	240	260	370
Condo	20387210	160	1	3	3	250	300	550
Parking	1	170	1	1	3	190	350	450
Condo	20706578	220	1	3	3	240	350	470
Vacant	1	90	3	1	1	200	300	460
Condo	3064023	220	6	3	3	200	300	460
Condo	2211883	80	2	3	3	40	60	300
Condo	6687204	410	2	3	3	160	200	240
Condo	11606407	230	1	3	3	200	220	260
Condo	16285014	230	12	3	3	150	240	280
Condo	5315730	220	15	3	3	140	230	400
Condo	39531365	220	9	3	3	140	240	290
Condo	7094469	300	11	2	2	10	10	100
Condo	2694397	230	3	1	3	170	220	360
Condo	9311799	220	2	2	2	0	0	150
Condo	8041260	230	4	2	2	40	60	300

*Reaches 2 & 3 combined

This commercial land value of $24 per square foot was compared to the cost to replace that square foot of material (volumetrically) with beach fill. When one foot of shoreline erodes across one foot of beach length (1 square foot), that erosion is spread throughout the profile length; in the case of Lido Key, averaging across the profiles, this results in the loss of approximately 0.8 cubic yards of material per square foot of beach loss. Then, if it is presumed that after a storm event the eroded material would be replaced with a small beach fill (i.e. truck haul), the unit cost associated with the beach fill can be compared to the $24 per square foot assumed in the storm damage model for loss of land. An MCACES cost estimate was prepared to determine the unit cost for a truck haul beach fill utilizing an upland sand source for this area. In this instance the cost of 1 cubic yard for the beach fill would cost $79.60 per cubic yard, or $64 per square foot of beach. This would relate to the 0.8 cubic yards needed for 1 square foot of beach loss. Therefore, the $24 per square foot assumed in the storm damage model is a more conservative estimate than assuming that the eroded land would be replaced with a beach fill.

Residual Damages (comment 6e)

Contents as well as structures are subject to storm damages from inundation and waves in addition to erosion. Stakeholders need to be advised as to the level of protection afforded by the Federal project, and as part of the items of local cooperation they must regularly inform the community. Therefore, the report should clearly explain any damages that were not evaluated so it is understood by the community what protection they are getting. The SDM does not take into account any damages to structure content. This is a benefit that would not likely be realized without the addition of a dune system or the expense of raising the berm elevation above naturally occurring elevations. Without the addition of a dune system, the project design will not provide much protection from inundation. As shown in Table III-10, the 5.0 ft design berm will be overtopped at a 10-year storm event. The design berm is intended to prevent erosion from undermining the structures and to keep the wave energy away from the developments; some inundation damages may still occur to the contents of the structures.

Section 902 Cost Limits (comment 9a)

The final report contains a detailed presentation of a Section 902 limit analysis and concludes that the 902 limits have been exceeded; this is presented in paragraphs 191 and 192 of the main text. However, there is still concern as to whether the appropriate cost has been identified for the limit on periodic nourishment. ER 1165-2-130, paragraph 7.e regarding periodic nourishment states that Federal participation in periodic nourishment may continue throughout the economic life of the project, but a specified period of time up to 50 years after initiation of construction must be recommended in planning reports. Since the original report recommends nourishment in the 50th year following completion of construction, the last cycle of nourishment may occur near or beyond the limit on Federal participation and may require adjustment. The district reviewed the 50th

year renourishment and agreed that it was in error and should not appear in the analysis. The cost estimate for the year 50 renourishment was removed from the MCACES, but the volume of material in year 45 was doubled as a conservative planning estimate in the event that additional material would be required to carry the project to the 50-year life. The revised Section 902 Analysis is provided at the beginning of this addendum in the Pertinent Data Table.

Monitoring Cost (comment 9b)

One of the other changes to the MCACES deals with the monitoring costs associated with the construction of the project. A number of errors were found in the way the numbers for monitoring and O&M were handled. The monitoring that is proposed (Table III-20 of Main Text) in the intervening years 05 through 07 is required through the permitting process, they are considered construction costs since they have to be done in order to stay compliant with the permitting process. The values for monitoring in Table III-20 have 20% contingency included in the estimates. Monitoring for initial construction should be $529,900 prior to contingency, E&D and S&A being applied. Monitoring for each renourishment should be $113,200 prior to contingency, E&D and S&A. Profit and Overhead were also added to these numbers in the revised MCACES estimate. An additional monitoring cycle was inadvertently added to the initial construction MCACES in the report; this has been removed from the costs.

The AAEQ O&M cost of $16,900 in Table III-21 is poorly defined; since the MCACES renourishment costs already have the monitoring included, that cost is included in the AAEQ cost for future renourishment; the O&M cost shown there, actually accounts for periodic surveys and inspections of the groins that are not accounted for in the actual maintenance of the groins (adding required stone). These inspections and periodic surveys have now been added to the groin O&M costs in the pertinent data tables at the beginning of this addendum. The $62,800 in Table III-20 is for the first year after the first renourishment only and is included in the $16,900. After that first year following the first renourishment, there should be enough data to better predict performance for the 5-year cycle. To ensure that a conservative estimate is presented, this $62,800 monitoring is assumed to occur at the midway point of each future renourishment. The revised AAEQ costs can be found in the Pertinent Data Tables at the beginning of this addendum.

In order to compare benefits and costs at the same price level, it is required that the estimate be reproduced at the October 2002 (FY03) price level. However, an estimate at the October 2003 (FY04) price level is also required for HQ's reporting requirements. The revised MCACES are immediately following this Addendum.

Public Access (comment 9c)

The report, as written, does not give evidence that consideration was being given to the sufficiency of access (at street ends or through privately held lands) and parking to provide the general public with adequate access to use the beach areas. ER 1105-2-100, Section E-24d. (3), requires the provision of reasonable public access as a condition of Corps participation in storm damage reduction projects. Reasonable access is defined in ER 1105-2-100 as access points at intervals of approximately every one-half mile or less. The project as authorized in 1970 had characterized the area south of Coolidge Park and Lido Casino as privately owned shorefront, which did not qualify for Federal participation in beach fill. Public access as it relates to project cost sharing has been considered in accordance with ER 1105-2-100. Table III-22 of the Main text displays the cost apportionment analysis developed for the subject study. The sponsor has provided the public access at the locations presented in Figure 1 of this addendum. In February of 2002 the sponsor provided the Corps with their approved permit application for the construction of a public easement near the middle of the reach where the access was a concern. This allowed the District to recalculate the cost sharing for the project. This is what's presented in Table III-22. In addition to the access points, Figure 1 shows the local Trolley Route and stops with respect to the project area. The existing Trolley route allows for stops along the route and provides access to the middle point of the reach. All access points and cost apportionment will be reviewed again prior to the signing of a PCA.

Independent Technical Review (comment 10a)

EC 1165-2-203 specifies that all decision documents (draft or final reports with NEPA documentation) will receive an independent technical review with documentation in a certification and findings, which cites the major issues that were raised and documents how they were resolved, and identifies the technical review team leader and team members. There was a concern over the degree to which ITR comments were addressed in the documentation provided. No responses were documented for the ITR comments on the EA and only 15 of the other 39 comments related to formulation, design and model calibrations had meaningful responses. The A-E's quality certification document for the draft report dated February 2002 is provided, but there is no certification of district working-level ITR of the final documents. It would also be inappropriate for any individual in the district to represent that they have the expertise needed to QA all the technical aspects of a feasibility report. In response to these concerns, it should be noted that the District team members did perform Quality Assurance on the entire report, but that it was poorly documented. Attached to this addendum is an updated ITR package from the consultant along with a certification of review from key District members. The concerns resulting from the ITR were incorporated into the October 2002 document and this updated ITR package is intended to formally close out that ITR.

Items of Non-Federal Cooperation (comment 10b(1))

On page 80 of the main text, the beginning of paragraph 216a(2) should read, "Provide, during the first year of construction, any additional funds needed to cover the non-Federal share of design costs". This change is intended to reflect current policy on payment of additional funds to cover the non-Federal share of PED costs.

Formulation of Project Length (comment 10d)

The project, as described in the report, has a length of 8,280 feet exclusive of the tapers, and a total length of 10,130 feet. The area available to have the most significant long-term shoreline recession is in Reach 2, with significantly less changes in Reach 3 due to it's highly eroded state as shown in Figure A-20 of the engineering appendix. Reach 3 is so severely eroded that that little changes in shoreline position would be noted over the long term due to the shoreline's close proximity to the seawalls. The engineering appendix indicates that the project design accounted for the variation in erosion rates along the shoreline, and provided for the appropriate fill and nourishment quantities. In order to fully comply with Engineering Regulations, an incremental analysis needs to be presented for the project reaches to demonstrate that the optimum project length has been recommended. In addition, a concern was noted that there is no economic evaluation of the recommended tapers to demonstrate that it is more economical to construct them outside of the protected area versus within. This concern is alleviated due to the fact that the tapers are engineering items that reduce the end losses on the beach fill and don't provide any claimed storm damage reduction.

The reaches were originally defined based on the coastal process along the shoreline, not based on their economic value. The delineations can be seen in Figure 2 of this addendum. The reaches of concern are Reaches 2 and 3; Reach 2 extends from the R-35 monument (400 ft north of John Ringling Boulevard) south to R-40; Reach 3 extends from DNR-40 to DNR-43. These reaches are heavily developed with condominiums lining the shoreline. With the relatively short length of all of Lido Key, a large protrubence over a short length (1 mile for Reach 2, 0.5 miles for Reach 3), such as that which would be caused by a SPP construction template, would be subject to very large erosion rates. These accelerated high erosion rates would require large renourishment volumes at a more frequent interval; this is one of the main reasons that the local "band-aid" approaches have not been successful. Reach 2 suffers from a high erosion rate, which has attempted to be addressed by small beach fills in the past. The pumping distance from the borrow area (to the north in the past) makes Reach 2 more economical to place the material (over Reach 3) and then Littoral effects are allowed to move the material down into Reach 3. Aerial photography shows the serious need for material in front of the structures in Reach 3, the narrow beach width in front of these structures provides little room for movement of the shoreline and any accretion that can be found is, in part, due to the large movement of material out of Reach 2 into Reach 3. When looked at from a

volumetric standpoint, Reach 3 suffers from depletion, in volume per foot of beach, on the same order of magnitude as Reach 2. With the narrowed beach width, this results in a lowering of the profile since it can't recede into the seawalls. The Sediment Budget for the area shows a continuous deficit for the areas within the reaches, indicating the need for renourishment.

Starting at the south end of the island, the southern most reach is Reach 4, which lies solely within a park boundary and was not considered due to lack of storm damage benefits. Reach 3, which demonstrates the greatest need for protection, begins with the condominium development immediately to the north of this park and extends 2,745 feet to the north. In order to demonstrate that the total length of beach fill was correctly identified, Reach 3 was broken out and analyzed on it's own merits. Benefits were estimated using the storm damage model for berm widths ranging from 0 to 100 feet on a 20-foot increment. Design volumes and renourishment intervals were re-examined for Reach 3 to generate the associated costs of the different berm widths. This effort was done utilizing planning level volumes and prices that were updated for the purpose of this addendum using existing information. The Economic Analysis has been presented at the interest rate of 5.625% and at October 2002 price levels. The renourishment cycles were estimated using the processes outlined in paragraph 149 of the main text using the same type of analysis shown in Tables III-12 and III-13. Table Add-5 below summarizes the results of this analysis. It demonstrates that the 80-foot berm with a 5-year renourishment interval generates the maximum net benefits for Reach 3.

Table Add-5 - Reach 3 Optimization

EXTENSION	ANNUAL BENEFIT	ANNUAL COST	NET BENEFIT	B/C RATIO
[ft]	[$]	[$]	[$]	
0	2,077,400	1,456,000	621,400	1.4
20	3,010,500	1,478,000	1,532,500	2.0
40	3,119,400	1,490,000	1,629,400	2.1
60	3,579,100	1,507,000	2,072,100	2.4
80	**3,825,600**	**1,525,000**	**2,300,600**	**2.5**
100	3,825,600	1,542,000	2,283,600	2.5

(5.625%, October 2002)

Reach 2 lies immediately to the north of Reach 3; it is 5,535 feet in length. This reach is comprised of condominiums and single-family residences. A large portion of the structures within this reach lie further from the shoreline than those in Reach 3. Structures are an average of 300 feet from the shoreline, compared to 200 feet in Reach 3. The armor in Reach 2 is an average of 180 feet from the shoreline, compared to 145 feet in Reach 3. Adding Reach 2 to the Reach 3 analysis and continuing the 80-foot berm, adds an additional $1,135,100 of average annual benefits to the project. This is achieved with only an additional $386,000 of average annual costs. The cost is based on the additional required

volume for Reach 2 over the 50-year life. This total volume optimized at a 3-year renourishment cycle. This produces an additional $749,100 in Net Benefits, demonstrating that Reach 2 is incrementally justified. This is shown in Table Add-6.

Table Add-6 - Reach 2 Increment Added

BERM EXTENSION [ft]	ANNUAL BENEFIT [$]	ANNUAL COST [$]	NET BENEFIT [$]	B/C RATIO
80	4,960,700	1,911,000	3,049,700	2.6
DIFFERENCE FROM REACH 3 ONLY	1,135,100	386,000	749,100	

(5.625%, October 2002)

In order to fully maximize the beach fill and subsequent renourishments, terminal structures were evaluated for effectiveness on stabilizing the fill. With the relatively short distance covered by this project, and its close proximity to an inlet, end losses from the beach fill are extremely high. The existing sediment budget for this area indicates a 100,000 cy transport rate off the south end of the island. This relatively high transport rate (compared to 17,000 cy for the north end of the island) and the GENESIS shoreline model indicate that a beach fill on this end of the island will experience severe erosion off the end of the project. This will tend to unravel the rest of the project to the north. A terminal groin and a groin field were modeled for end loss effectiveness. The analysis presented in paragraph 171 of the main text demonstrates the cost effectiveness associated with the two options. The groins are not intended to provide any additional storm damage benefits to the project; they are strictly a cost savings to the project. The costs and interest rates were updated for this addendum and are presented in Table Add-7. With a net savings of $292,000, the groin field is the most cost effective solution to the end losses associated with the south end of the project. These savings are realized due to the fact that the groin field will reduce transport off the end of the project by over 50,000 cy per year; with a unit cost of over $5.00 per cubic yard this represents a significant savings to the project over a 50-year life. The reduction in end losses also effects the renourishment cycle; changing the renourishment interval from a 3-year cycle to a 5-year cycle. This reduces the number of mobilizations and further reduces the cost of the project. The groin field will be part of the recommended NED plan.

Table Add-7 - Groin Field Justification

Structure	First Cost of Structure ($)	Annual Cost of Structure* ($)	Reduction in Required Volume** (cy)	Annual Fill Savings ($)	Net Savings ($)
Terminal Groin	1,506,000	102,600	25,800	77,800	-24,800
Groin Field	318,517	207,900	259,000	500,300	292,400

* Includes maintenance

** 3-year renour cycle for Terminal, 5-year for Groin Field

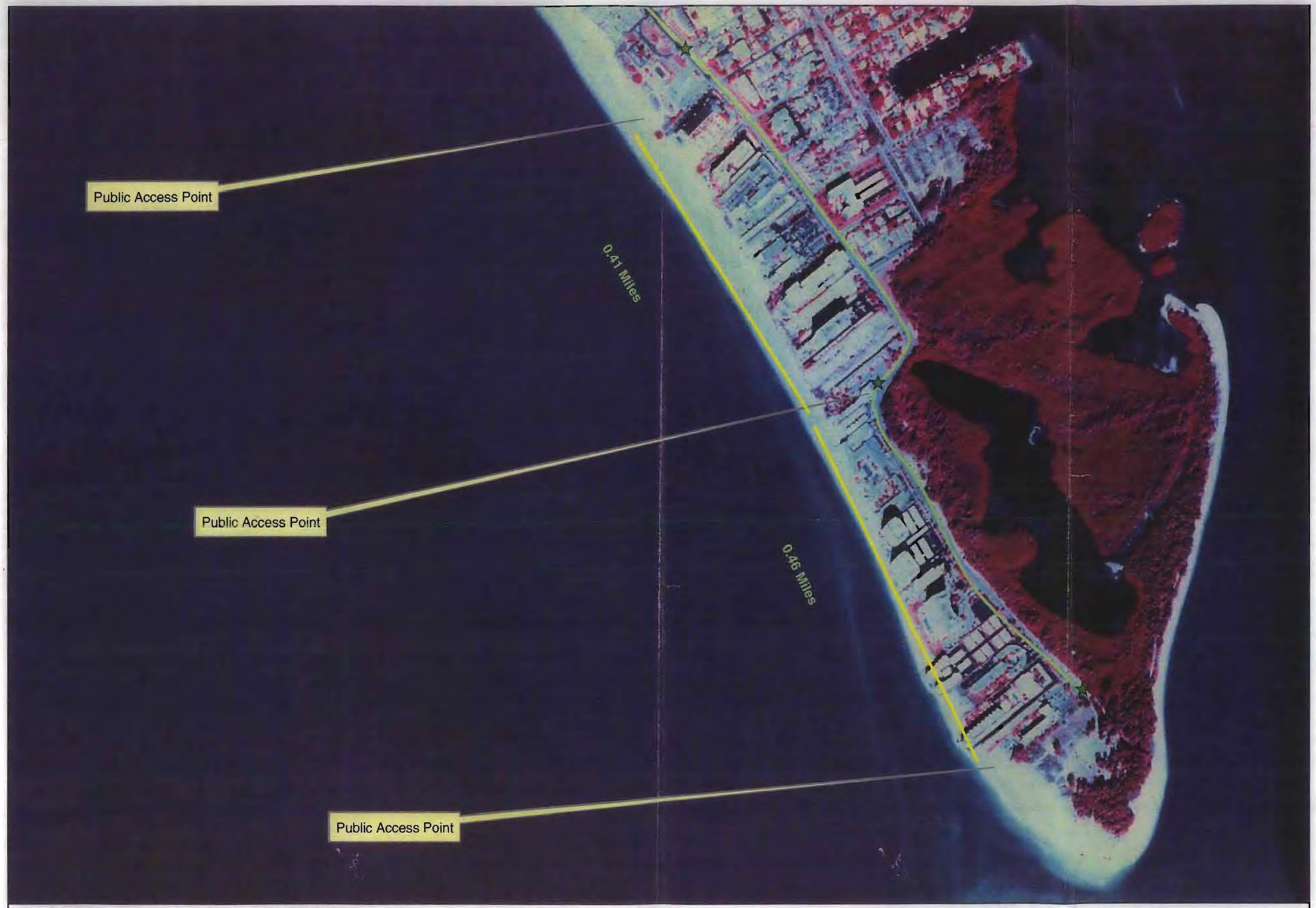
5.625% interest rate over 50 years

The northern terminus of the project experiences littoral movement out of the reach on the order of 30,000 cy per year. This, coupled with the accretional trends in Reach 1 and a larger distance from the inlet, show that terminal structures will not be required on the northern limit of the project.

The tapers at either end of the project are designed based more on engineering data than on economic data, they are built in such a way that the beach fill presents less of a protrubence in the shoreline. The protrubence causes extremely high end losses to a beach fill, the tapers greatly reduce these losses and do present an economic benefit of reducing periodic renourishment volumes, but the design comes from the length/width of the berm, existing bathymetry and shoreline orientation. They are built at the terminus of the Federal project instead of within the project limits, because their reduced width would not provide the same level of storm damage benefits as the design berm. Therefore, benefits are claimed based on the design berm for the project limits, and the tapers go beyond the limits being claimed for benefits since they contribute very little to the storm damage benefits. The placement of a taper on the southern terminus of the project can also be seen as a cost effective engineered solution to end losses. The groin field, if not filled at the time of construction, will be collecting material lost off the end of the design berm until it has reached an equilibrium volume within it's cells. This will cause a reduction in berm volume (therefore benefits) and will require a quicker mobilization for renourishment in order to realize all of the benefits claimed for the project. Filling in those cells at the time of initial construction puts them into equilibrium and will not exacerbate erosion at the end of the design berm. Any benefits to the public park in Reach 4 are merely incidental and are not claimed within the context of this report.

MCACES Cost Estimate (Comment 10e)

The MCACES for the October 2002 report included escalation for out year construction on the renourishments. This has been removed in the current MCACES at the back of this addendum. Any differences noted in future periodic renourishment costs are for the varying distances to future borrow areas. In addition to the changes mentioned under the Monitoring Costs section of this addendum, it should be noted that the estimator has added profit for the prime contractor to the estimate.

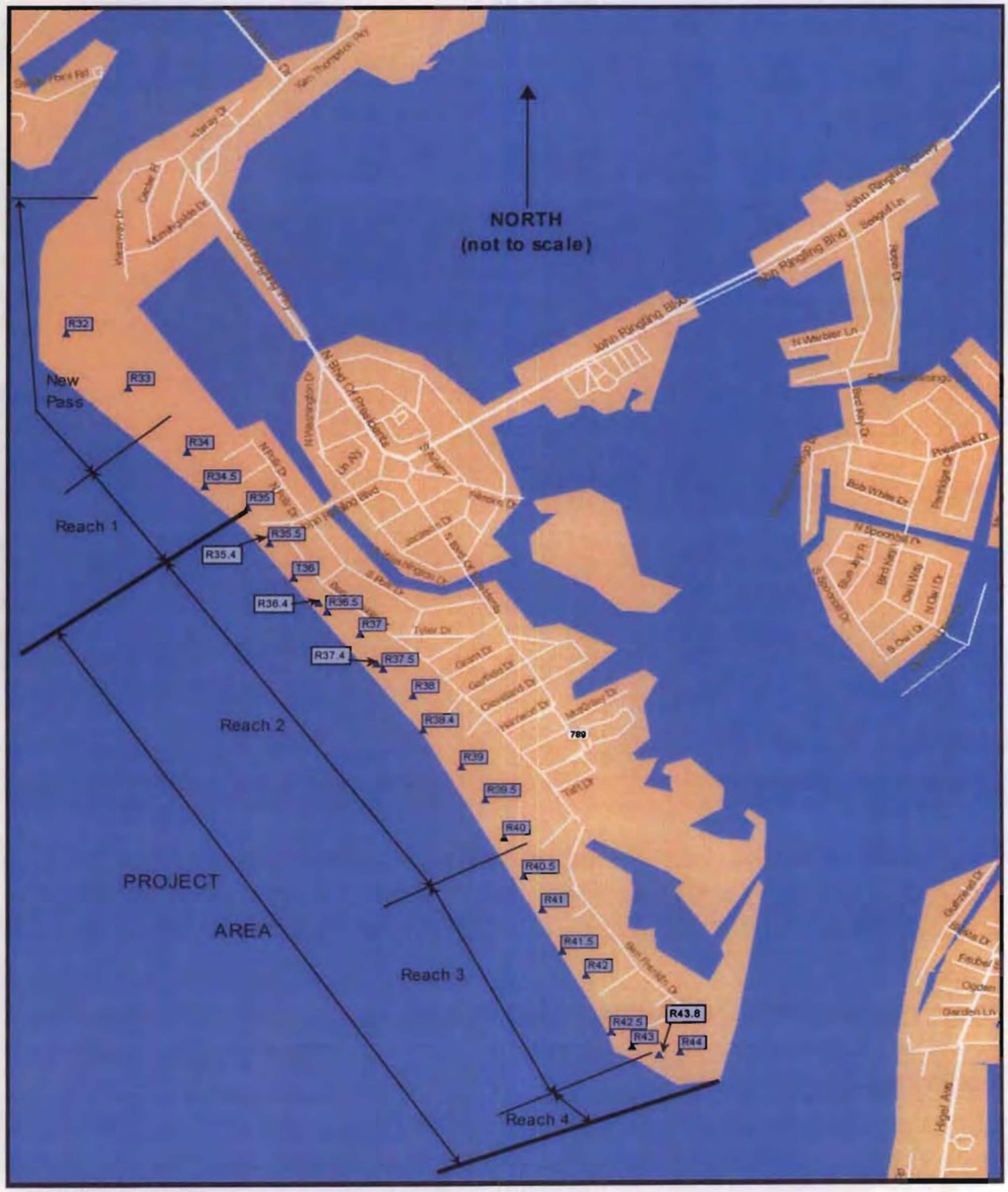


Lido Key HSDR Project
Public Access

Green Line = Trolley Route
Green Star = Trolley Stop

Feet
875 437.5 0 875

Figure 1



NORTH
(not to scale)
New Pass
Reach 1
Reach 2
Reach 3
Reach 4
PROJECT
AREA
R32
R33
R34
R34.5
R35
R35.4
R35.5
T36
R36.4
R36.5
R37
R37.4
R37.5
R38
R38.4
R39
R39.5
R40
R40.5
R41
R41.5
R42
R42.5
R43
R43.8
R44
John Ringling Blvd
Tyler Dr
Taft Dr
Ben Franklin Dr

FIGURE 2

APRIL 2004 ADDENDUM

APPENDIX – ADDITIONAL INFORMATION

NOTE: Content deleted from pubic web site.

TECHNICAL REVIEW CERTIFICATION
FOR

Lido Key Feasibility Report with Draft Environmental Assessment
Sarasota County, Florida, Hurricane and Storm Damage Reduction Project

Certification by A-E:

1. Reference: Sarasota County, Florida, Hurricane and Storm Damage Reduction Project, Lido Key Quality Control Plan

2. The feasibility report with draft environmental assessment for the Lido Key segment of the Sarasota County, Florida, Hurricane and Storm Damage Reduction Project, developed by Taylor Engineering Inc. has been reviewed and coordinated for technical quality by Taylor Engineering Inc. Comments were provided and all parties are in agreement and the appropriate actions taken. Any outstanding issues will be resolved following the Feasibility Review Conference and all appropriate review comments will be incorporated into the final feasibility report. This certification is for the sole and limited purpose of documenting the completion of the ITR process on the draft feasibility report.

REVIEWED BY:

Specialty: Engineering
Independent Technical Review Team Member

Specialty: Environmental
Independent Technical Review Team Member

Specialty: Economics; Engineering
Independent Technical Review Team Leader

CERTIFIED BY:

Date 2-5-02
President, Taylor Engineering Inc.

Date 2-12-02
Chief, Planning Division

CERTIFICATION OF LEGAL REVIEW:

The report for Sarasota County, FL, Hurricane and Storm Damage Reduction Project, Lido Key, including all associated documents required by the National Environmental Policy Act, has been fully reviewed by the Office of Counsel, Jacksonville District and is approved legally sufficient.

Brooks W Moore

Brooks W. Moore
CESAJ-OC

10/31/02
Date

CERTIFICATION OF INDEPENDENT TECHNICAL REVIEW
Lido Key Feasibility Report with Draft Environmental Assessment, Sarasota County, Florida, Hurricane and Storm Damage Reduction Project

Independent Technical Review comments and concerns and their resolution are discussed in the enclosed documents labeled "MEETING MINUTES FOR FINAL ITR CONFERENCE" dated January 2002.

As noted above, all concerns resulting from independent technical review of the project have been mutually resolved and comments incorporated. The report and all associated documents required by the National Environmental Policy Act have been fully reviewed.

Bradd R. Schwichtenberg — Date 4/15/04
Chief, Coastal Navigation Section
Planning Division

Edward H. Hodgens — Date 4/15/04
Chief, Coastal Design Section
Engineering Division

for David L McCullagh — Date 4/15/04
Ivan Acosta
Chief, Special Project Section
Environmental Branch, Planning Division

MEETING MINUTES FOR FINAL ITR CONFERENCE

Lido Key Hurricane and Storm Damage Feasibility Study

Date: 1/11/02

Time: 10:15 – 12:45

Study Team:
Lori Brownell, E.I.
Lisa Heckman
Rajesh Srinivas, Ph.D., P.E.

Review Team:
Steve Schropp, Ph.D.
Terry Hull, P.E.

Notes: Mike Trudnak

Lisa Heckman, Lori Brownell and Rajesh Srinivas presented the significant findings of the study in a PowerPoint presentation and through handouts (see Attachment).

ITR Comment: Check on correct wording of River(s) and Harbor(s) Act.
Response: Correct wording is River and Harbor Act.

ITR Comment: Include a figure showing reach extents
Response: We will include such a figure

ITR Comment: Why is Reach 1 accreting after adjustment for man-made changes?
Response: The engineering appendix does not explain this. We think it is (1) probably a function of shoreline orientation causing a negative longshore transport across this reach and (2) possibly a result of non-exclusion of sand infilling from diffusion of sand placement in Reach 2.

ITR Comment: Handout Table 1: Redundant information in columns 6 and 7 should be combined into one column. Change title to "Reach 2 and 3 Benefits"
Response: We will do that

ITR Comment: Handout Table 7: Change column heading "Annual Cost of Fill Savings" to "Annual Fill Savings".
Response: We will do that

ITR Comment: Handout Table 8: Change column heading "Net Benefit" to "Annual Net Benefit"
Response: We will do that

ITR Comment: Table with Initial Assessment of Alternate Plans: Dunes and Vegetation measure should receive credit for partially meeting (P) all four federal objectives as opposed to receiving no credit (O).
Response: We agree and will revise the table to reflect the comment

ITR Comment: Design and advanced nourishment volumes are inconsistent in the economic and engineering appendices. Project length is also inconsistent in appendices.

ITR Comment: There are discrepancies in toe of equilibrium fill distances shown in figures of sub-appendix A-1 compared to those presented in Table A-25 of the engineering appendix.
Response: In some instances the toe goes off of the figures in sub-appendix A-1; for the others, the software used in the computations picks up the differences between the two surveys to identify the point of closure. This point isn't always visible at the scale shown on the figures.

ITR Comment: Concern about the occurrence of damage to structures in Reach 3. The aerial photo shows two condominiums protruding past the adjacent shoreline; Table D-3 shows the distance to the shoreline is 0 feet and 10 feet for these two condominiums. However, Table D-4A of the old economics appendix shows that damage to structures is estimated to occur after 180 ft of shoreline recession. Does this imply that the fronting seawalls provide enough protection to resist all local erosion?
Response: Yes, the assumption is that local erosion will be halted, but that recession from large storms will have damage impacts.

ITR Comment: Concern expressed whether non–structural measures are reasonably evaluated in the initial assessment of alternatives.
Response: The level of analysis is consistent with previous similar studies and we feel it is adequately addressed. 8 different Non-structural measures were evaluated and found to be lacking.

ITR Comment: The terminal groin alternative is not explicitly evaluated in the engineering appendix. How was Table 7 derived?
Response: The engineering appendix does not document what was done, however, paragraph 171 of the main text provides more insight.

ITR Comment: Groins are only designed for a 20–year storm whereas the project life is 5 years.
Response: The groins are designed to hold the shoreline and reduce renourishment cycles; maintenance on 10 year intervals will help weather any damage experienced by excessive storms.

ITR Comment: Groin maintenance costs should be included in cost analysis.
Response: Groin maintenance has been added to the cost analysis.

ITR Comment: Why is only the 80-ft berm included in the groin analysis?
Response: Because the 80-ft berm provides the best cost-benefit ratio when considering beach fill only (see intermediate assessment) and the benefits remain unchanged when the groins are also considered.

ITR Comment: Why were groins not considered to the north to hold the beach fill?
Response: The engineering appendix suggests that aggravated erosion is not expected at the north end.

ITR Comment: Is sediment bypassing strategy sufficient? Should New Pass dredged materials be placed in Reach 2 to reduce beach fill requirements?
Response: Dredged material has historically been placed in the north end of Reach 2, and although this material can not be counted on for future placement due to O&M funding constraints, it will be taken advantage of with respect to future renourishments.

ITR Comment: The engineering appendix does not document how man-made changes were factored out from observed shoreline and beach volume changes. It is also unclear as to how initial nourishment profile equilibration and other diffusion processes were used in calculating background erosion rates.
Response: The engineering appendix does not document what was done.

ITR Comment: Can background erosion be reduced by straightening the shoreline? Comment made in reference to the sediment transport node in the center of the island as documented in the engineering appendix.
Response: We could look at more dense placement of fill in this area to offset the potential hot spot.

ITR Comment: Include beach monitoring costs.
Response: Beach monitoring costs are included in the evaluation.

ITR Comment: Main report omits benefit to turtle nesting with beach fill. Loss of turtle habitat without beach fill is not mentioned.
Response: Turtle nesting benefits have been mentioned in the report and the EA.

ITR Comment: Table D-4A, pages D17-18 in the old economics appendix. Why does Reach 3 damage decrease by $10M when erosion increases from 380 to 390 feet.
Response: That was in error and has been corrected.

ITR Comment: Table D-4 in the new economics appendix is for Reach 2 only. Should include recession-damage relationship for Reach 3 also or for the combination of Reaches 2 and 3.
Response: That has been corrected.

ITR Comment: Reach delineation is slightly different in engineering and economic appendices.
Response: This has been addressed, breaking out the reaches by engineering processes and lot widths will involve some slight discrepancies.

ITR Comment: Table A-16 only lists beach nourishments till 1996. The text of the engineering appendix mentions a 1998 beach fill and the geotechnical appendix mentions a March 2001 beach fill. Are these accounted for in factoring out manmade effects from beach volume and shoreline changes?
Response: Survey data is from May 2000, the 1998 fill was taken into account, but not the 2001.

ITR Comment: Are the condominiums encroaching on the active beach at the south end of the project area affecting the littoral drift?
Response: The GENESIS model used in the engineering appendix should account for the effects of the condominiums and associated seawalls on the littoral drift.

ITR Comment: Paragraph A-46 says that the sediment budget shown in Figure A-21 accounts for both waves and currents. How was the sediment budget computed — from observed beach volume changes or from modeling wave and current sediment transport?
Response: This was accomplished using hindcast data, bathymetry GENESIS and the REF/DIF model.

ITR Comment: Exposed groins are mentioned repeatedly, but the number and location of groins are unclear.
Response: Table A-17 provides a structural inventory.

ITR Comment: Why are storms from 1968 (Gladys) and 1972 (Agnes), rather than more recent storms, used for SBEACH calibration and verification especially when pre-storm data for these storms were unavailable (page A-65)? Recommend presenting pre- and post-storm profiles for the SBEACH calibration and verification phases.
Response: Paragraph A-60 in the Engineering Appendix addresses this concern.

ITR Comment: What are error estimates for the SBEACH calibration and verification results? Overall, the calibration and verification procedure for SBEACH is questionable for lack of presented data.

Response: The risk and uncertainties inherent in the storm recession values were addressed by using the Empirical Simulation Technique described in the Engineering Appendix.

ITR Comment: Document the magnitude of error in the GENESIS calibration and verification process.
Response: This is addressed in paragraph A-72.

ITR Comment: Present figures showing measured and predicted shoreline changes in the GENESIS calibration and verification sections.
Response: This is presented in Figure A-25.

ITR Comment: Engineering Appendix, Paragraph A-72, Second sentence: "To account for a dredge disposal operation ... profile lines." The meaning of this sentence is unclear. Please explain.
Response: Sentence should read "amount of fill placed, and the associated recession rates..."

ITR Comment: The documentation of the engineering appendix should indicate what/how many combinations of calibration parameters were used in the calibration/verification process to obtain the best-fit calibration parameters.
Response: This documentation is available from sponsor's contractor upon request.

ITR Comment: Page A-77 How did the design arrive at three groins for the groin field?
Response: This has been addressed in A-95 on page A-90.

ITR Comment: There are some concerns about the southern groin. Will it be undermined by erosion due to inlet hydraulics? What are the possible effects of the southern groin on the beach east/northeast of the groin?
Response: Current modeling doesn't indicate any undermining or adverse impacts.

ITR Comment: How are project-induced erosion rates used in cost spreadsheets derived for the beach fill and beach fill with groin alternatives?
Response: GENESIS results in the revised erosion rates, and then these revised rates are used in determining advance nourishment requirements, which effect placement volumes and renourishment cycles.

ITR Comment: Real estate appendix needs a map showing real estate interests.
Response: Currently unavailable.

ITR Comment: There is no detailed MCASES report.
Response: This is included in the Engineering Appendix.

ITR Comments on the Environmental Assessment

1. Page 3, § 1.2. Reference to Figure 1 states that Figure 1 shows project "plan view". Figure 1 only shows project linear limits along the beach. It does not show a "plan view" which would include upland limit, construction or equilibrium toe of fill, and end tapers. Although groins are indicated to be a typical project feature in Figure 3, their locations are not shown in Figure 1 or elsewhere.

Done. A plan view has been included in the EA.

2. Page 6, § 1.7.2.1. Include potential hopper dredge impacts in list of concerns.

Section 1.7.2.1 just summarizes sea turtle concerns. Hopper dredge impacts are discussed in detail in Section 4, Environmental Effects.

3. Page 13, Table 2. Columns 2 ("Preferred Alternative") and 4 ("B – Beach Fill with Periodic Nourishment...") are redundant. Column 2 could be eliminated if the notation "Preferred Alternative" is added to Column 4.

Done.

4. Page 14, Table 2, "Economics" row. The meaning of the terms "Increase in economics" and "Decrease in economics" is not clear. Do they mean an increase or decrease in NED benefits? Clarify these terms.

Clarification was made in Table 2.

5. Page 15, §3.1, ¶1. Sentences 2 and 3 appear contradictory. The first of these states "Most uplands on Lido Key have been developed ..." while the next states "Although undeveloped, a majority of this upland habitat is disturbed." Does the second sentence refer to the park land only? If so, the second sentence could be revised "Although undeveloped, a majority of the upland habitat in the parks is disturbed."

Clarification was made in Section 3.1.

6. Pages 18 & 19, §3.3. This "Threatened and Endangered Species" section does not mention listed shore birds. Although birds are discussed in later sections, the endangered species section appears incomplete without reference to listed shore birds.

Shorebirds are listed in the Threatened and Endangered Species Section 3.3.3 titled, Shorebirds.

7. Page 19, §3.4. This section does not mention nearshore hardbottom near the beach placement area. Were surveys for nearshore hardbottom done? If so, discuss nearshore surveys — when performed, spatial extents.

Section 3.4, last paragraph states that "Aerial photographs of the project area shoreline have no indication of nearshore hardgrounds". This was also confirmed with side-scan sonar surveys and a marine resource survey.

8. Page 20, §3.6. This section states EFH "may be affected". This appears to contradict Table 1 which state there is "no impact" to EFH.

Section 3, Affected Environment, describes the *existing* environmental resources of the area that would be affected if any of the alternatives were implemented. Section 3.6 is describing the EFH and species that may be affected by the project. Table 1 is a summary of Section 4, Environmental Affects, which describes the direct, indirect and cumulative effects of the alternatives.

9. Page 23, §3.15. What types of "underwater survey techniques" were used? Magnetometer? Sidescan? Diver Observation?

Section 3.15 has been revised. Magnetic and acoustic remote sensing investigations were conducted.

10. Page 24, § 4.1. This section refers to "a groin" while other sections refer to a groin field.

Construction of a "groin field" was added to section 4.1. Consistency throughout the EA was made to include the term "groin field".

11. Page 24, §4.2.3. If a "few" seagrasses are present in the borrow area, then a finding of "no impact" appears incorrect.

Section 4.2.3 has been revised to state, "no impacts to vegetation are expected".

12. Page 25, §4.3.3, Other Listed Species. This section contains no discussion of shorebirds and appears to contradict §1.7.2.4 which states that impacts to shorebirds, some of which are listed species, may be "minimized."

Shorebirds are added to the discussion of section 4.3. Detailed discussions of project effects on shorebirds can be found in section 4.3.1 and section 4.5.1.

13. Page 26, §4.3.4. Will the no action alternative result in loss of shorebird habitat?

A statement was added to section 4.3.4 "no action" alternative, which states, " there could be a loss of shorebird nesting habitat".

14. Page 26, §4.4.3. Will dredging be prohibited "beyond" (i.e., outside of) the buffer zone? Dredging is presumably prohibited *within* the buffer zone?

There would be a 200-ft. buffer zone where no dredging would be permitted. This is stated throughout the EA.

15. Page 27, §4.5.1. Previous sections on listed species should reference this section for effects on listed birds.

Shorebird discussions are included in sections 4.3 and 4.5.

16. Page 27, §4.5.1, Infaunal and Benthic Species. This section implies that no long-term adverse effects occur to these species because of their upward mobility through the overlying sand. However, lack of long-term adverse effects is more likely due to ability of these species to recolonize the area rather than their ability to burrow upwards through the sand.

Section 4.5.1 was revised to include discussion of recolonization of burrowing organisms.

17. Page 28, §4.6.1. See comment about §4.4.3. Dredging will likely be prohibited *within* rather than "beyond" the buffer zone.

Section 4.6.1 has been revised to include the statement "a 200-ft. buffer zone where dredging would not be permitted.

18. Page 29, §4.11. This section states that the short-term turbidity increases "would not affect the area's water quality." Although not a long-term effect, turbidity increases do affect water quality. Short-term adverse effects on water quality are described as an unavoidable effect in §4.24.

Section 4.11 has been revised to include potential effects of dredging and turbidity.

CESAJ-PD-PN 20 December 2001

MEMORANDUM FOR Record

SUBJECT: Meeting Minutes for First Independent Technical Review (ITR) Conference on Lido Key Hurricane and Storm Damage Feasibility Report

1. The following documents Taylor Engineering Incorporated's ITR of the subject report. Taylor Engineering Incorporated was contracted to produce and review the report. The study team consisted of Lori Brownell, E.I., Lisa Heckman and Rajesh Srinivas, Ph.D., P.E and the ITR team members were Steve Schropp, Ph.D., Terry Hull, P.E. and Mike Trudnak. Rajesh Srinivas presented the study objective and significant findings. The initial meeting was conducted to familiarize the ITR team with the scope of the study. Draft report was to be provided to the ITR team by 8 January 2002.

2. Project Description:

- Coastal Planning & Engineering (CPE) conducted the engineering and geotechnical appendices of the storm damage reduction feasibility study for Lido Key, Sarasota County, Florida.
- The Jacksonville District Corps of Engineers (COE) prepared the economics, real estate, MCASES cost estimates, and environmental assessment
- Taylor Engineering will produce a draft feasibility report following COE report guidelines.
- Taylor Engineering received a notice to proceed about 15-18 days ago.
- The COE has provided/will provide the following five appendices for Taylor's review:
    - Appendix A: Engineering Evaluation – received 10 days ago
    - Appendix B: Geotechnical – received 7–10 days ago
    - Appendix C: MCASES – received preliminary report
    - Appendix D: Economics – received preliminary report (close to final)
    - Appendix E: Real Estate – not yet received
- The COE has also provided a draft EA
- Taylor will incorporate all significant findings into the main feasibility report
- Taylor will create Appendix F: Pertinent Correspondence.

3. Important Notes:

- Lido Key is separated from Longboat Key to the north by New Pass and separated from Siesta Key to the south by Big Sarasota Pass.

- A few beach nourishments funded by local interests were completed in the past.
- The project area is separated into 5 reaches as described in Table 1.
- Nature of storm damage is characterized as loss of structures, land, armor, and backfill due to beach erosion.
- Project berm elevation is +5 ft NGVD
- Project berm width appears to be 80 feet
- Storm surge elevation is 11-12 ft NGVD determined by ADCIRC

Table 1 Lido Key Reach Characteristics

Reach		Nature of Development	Concerns	Shoreline Change Rates (ft/yr)
New Pass Reach	R-30 to R-33	Undeveloped	New Pass hydrodynamics	-9.5
Reach 1	R-34 to R-35	Minimal development / structures set back	-	+25.6
Reach 2	R-35 to R-40	Developed	Storm damage to structures	-21.1
Reach 3	R-40.5 to R-43	Developed	Storm damage to structures	-6.2
Reach 4	R-43.8 to R-44.5	Undeveloped park	Big Sarasota Pass hydrodynamics	-35.2

- Reach 3 and 4 have heavy shorefront development and are the focus of the storm damage reduction analysis.
- Storm erosion modeling was performed by CPE using SBEACH.
- The following actions were analyzed as storm damage reduction alternatives:
    - No action
    - CCCL establishment
    - Restrict growth
    - Relocate structure
    - Flood proof structures
    - Coordination of land and structures
    - Coastal structures (sea walls, revetments, breakwaters, groins)

Dune construction and vegetation
Beach fill

- The recommended plan, per the engineering appendix, to maximize benefits includes beach fill from R-35 to R-44 and construction of three groins at the southern end to retain the fill.
- We do not know that much about the borrow sites.
- Hardbottom issues are not expected to be applicable for the project

4. Comments from Review Team:

a. Hull: Dune construction should be considered as a wave height reduction measure.

b. Hull: Structural damage is significantly reduced when irnpinging wave heights are reduced to less than 3 feet.

LIDO KEY SHORE PROTECTION
FEASIBILITY STUDY
TECHNICAL REVIEW CONFERENCE
2 MAY, 2001 - AGENDA
ROOM 930

PURPOSE: FOR STUDY TEAM TO PRESENT AVAILABLE DATA AND ASSUMPTIONS TO TECHNICAL REVIEW TEAM. THIS FORUM IS DESIGNED TO BRING OUT ANY PROBLEMS THE STUDY TEAM MAY HAVE OVERLOOKED AND PROVIDES THE ITR TEAM WITH AN IDEA OF WHAT THE DRAFT REPORT WILL CONTAIN.

0930 OPENING REMARKS BY CHARLIE STEVENS

0945 GENERAL DESCRIPTION BY DAN HAUBNER

1000 ENVIRONMENTAL CONCERNS/COORDINATION BY YVONNE HABERER
(with question/answer period)

1030 ARCHAEOLOGICAL CONCERNS/COORDINATION BY TOMMY BIRCHETT
(with question/answer period)

1100 REAL ESTATE REQUIREMENTS BY KEVIN KELLER
(with question/answer period)

1130 LUNCH BREAK

1230 ECONOMIC ANALYSIS BY JOE WILSON
(with question/answer period)

1300 GEOTECHNICAL ANALYSIS BY SPONSOR/BOB ROSS
(with question/answer period)

1330 ENGINEERING ANALYSIS BY MIKE JENKINS
(with question/answer period)

1400 PLAN FORMULATION/NED ANALYSIS BY DAN HAUBNER
(with question/answer period)

1430 CLOSING REMARKS BY CHARLIE STEVENS

1445 COMMENTS FROM SPONSOR

Sido Key Feasibility Report
Independent Technical Review Meeting 5/2/

Name	Office	Telephone
Tracy Leeser	PD-PN	x1043
David Sollenberger	Sarasota/City Mgr	941-954-4102
Dennis Daughters, PE	Sarasota/City Engr	941-954-4180
Rick SPADONI	CPE/Boca Raton	561-391-8102
Mike Jenkins	CPE/Boca Raton	561-391-8102
ED HODGENS	EN-HC	904-232-2427
Brooks Moore	Corps-OC	904-232-1104
John Fox	Corps-OC (Study team)	904-232-1168
Anne Fore	EN-C	904-232-2419
CARL PETERSON	CO	904-232-369
KARL NIXON	RE-S	904-232-2339
MIKE DUPES	PD-EG	904-232-1489
DAN HAUBNER	PD-PN	" " 2798
Yvonne Haberer	PD-EG	(904)232-1701
PAUL STODOLA	PD-EA	904-232-3271
ROBERT ROSS	EN-GG	(904) 232 2930
Rafael Velez	EN-T	904-232-1938
ROB DULANEY	EN-T	904-232-2919
Joe Wilson	PD-D	904 232 2504
Diane Gardiner	RE-A	904-232-2146
Charlie Stevens	DP-I	904-232-2113

MEETING MINUTES FOR ITR CONFERENCE ON LIDO KEY
SHORE PROTECTION FEASIBILITY STUDY
Room 930 of the Jacksonville Federal Building
02 May, 2001

ATTENDEES:

Study Team

Dan Haubner – PD-P
Mike Jenkins – CP&E
Charlie Stevens – DP-I
John Pax – OC
Anne Fore – EN-C
Diane Oxendine – RE
Yvonne Haberer – PD-E
Kevin Keller – RE
Joe Wilson – PD-D
Bob Ross – EN-G
Tommy Birchette – PD-E

Review Team

Rob Dulaney – EN-T
Rafael Velez - EN-T
Paul Stodola - PD-E
Carl Pettijohn – CO
Ed Hodgens – EN-H
Karl Nixon – RE-S
Dan Peck - PD-D
Brooks Moore – OC
Tracy Leeser - PD-P

Sponsor

Dennis Daughters – City of Sarasota
David Sollenberger – City of Sarasota
Rick Spadoni – CP&E

Opening Remarks – Stevens
Gave the sponsor an overview of the ITR process and explained his role in this effort. Discussed current funding stream and started through the milestones. Next major milestone will be the Alternative Formulation Briefing with SAD and HQ late in June.

Introductions were made.

Sponsor and Stevens discussed schedules, authorization process and schedule for upcoming construction.

General Overview – Haubner
A general description of the island was provided for the ITR team, laying out the Key's location with respect to adjacent projects. A review of the project's history through it's original authorization in 1970 up to now was provided.

Leeser – asked why a feasibility study was being done as opposed to a General Reevaluation Report since the project had been previously authorized. The team responded that since the project had been deauthorized in 1990 and a study resolution issued in 1995 a recon (completed in 1997) and feasibility study were being completed to satisfy that 1995 resolution.

Leeser – asked how this effort would effect the fact that the 1970 project has been re-authorized in Section 364 of the Water Resources Development Act (WRDA) of 1999. The team responded that although Congress re-authorized the old project (based on recreation and some Hurricane/Storm Damage Reduction); the law stated that it was re-authorized IF the Secretary found the project to be sound with respect to engineering, economics and the environment. Therefore a decision document would be required for the Secretary to make that decision. Further coordination with SAD and HQ will be required to establish how the process will work with the Office of Management and Budget and the Assistant Secretary's office, since the project is already in WRDA.

Environmental – Haberer
Gave overview of presentation. Discussed April 2000 site visit and literature research that has been conducted up to this point.

Most of the uplands on Lido Key have been developed except for North Lido Public Beach and South Lido Park. Although undeveloped, a majority of this upland habitat is disturbed. Upland vegetation is composed of both exotic and native species including Australian pine, seagrape, and wax myrtle. Plants such as palms, grasses, palmetto, and sea oats can be found on the upper beach, mainly on the north and south ends of the island. Due to development, there is little vegetation found between the shoreline and buildings/seawalls of the proposed project area. Hardground areas and seagrass beds are known to exist nearshore and offshore within the study area. In order to minimize adverse impact to these resources, the study will seek to delineate these areas. CP&E just completed side scan sonar surveys at the offshore borrow areas. Potential hardgrounds were discovered at the edge of borrow areas 6 and 7. Diver verification will be done to confirm what is there.

The Fish and Wildlife Coordination Act Report is being contracted out due to FWS work load. Draft should be complete in August with a final in September.

A Biological Assessment was prepared. The USACE determined that the proposed project may affect nesting sea turtles. A request for formal consultation with FWS was initiated by letter dated April 9, 2001. A Biological Opinion will be forthcoming from FWS.

The Corps will request formal consultation with NMFS for a "may affect" determination for sea turtles due to the possibility of a hopper dredge being used. No designated Critical Habitats in the study area.

Daughters – asked if nesting data is for entire island or project area. The data is for the entire island.

Stodola – concerned with vegetation maps and impacts of covering these with the project. A vegetation map should be produced, no major impacts should occur due to +5 berm elevation. Also asked if the potential hard grounds have been dived. The ground truthing is in the works. It was ask if the divers should cover what's adjacent to these hard grounds and get the data to see what can be avoided. Spadoni answered that the borrow areas were bounded by material availability as well as the hardgrounds and that since the borings didn't cover the additional area outside the identified borrow areas there would be no way to know if the material was available.

Daughters – mentioned that the material to the north of the project limits was placed there from New Pass maintenance; it was quickly vegetated and inhabited and is now accreting. The southern end of the island has still experienced erosion with vegetation falling into the pass.

Archeological - Birchette
Coordination has been initiated and no problems have been encountered.

Real Estate – Keller, Oxendine
Structure and land values were obtained through a field visit. The county's database was evaluated and found to be reliable. Current sales were compared to the appraised values and a factor of 1.15 was obtained. The 1.15 was then applied to the assessed structure value to bring them up to the January 2001 price levels for input into the Storm Damage Model. A similar process was implemented for the land values on $/sq. ft basis for input to the Storm Damage model.

Sponsor questioned what time period was used to arrive at the factor of 1.15. Answer was '99-'00 sales data.

Sponsor noted that several new large hotels will be added to the vicinity and this is expected to increase the structure values and provide an overall economic benefit to the area. Leeser noted that this should be mentioned in the economic appendix to show that the expected increase would help the Benefit to Cost Ratio.

The Real Estate Appendix was briefly discussed. Perpetual Easements would be required for the project. This request has been made known to the sponsor, under the easement the project lands are open to the public and remain so for the life of the Federal project.

If the easement is not obtained, then there will not be any Federal cost sharing for that section of the shoreline; not just what's behind the ECL, but for that entire lot width. The sponsor is not anticipating any problems.

Pax – mentioned that if there are gaps in the design berm, then the benefits start to go away; more people see that they don't have to give the easement and that they will still receive sand by littoral processes and the easements start to unravel. It's possible that at that point court taking would be required. Again, the sponsor is not anticipating any problems. It's important to define the project placement and the ECL so that when these issues arise they are easily definable.

Engineering has these limits laid out and they will be included in the report and provided to the sponsor.

Daughters – why do we need perpetual easements for a 50 year life. Pax pointed out that renourishment is for 50 years, Federal interest could and in some cases has extended past that time frame.

Daughters – do we need easements from public entities. Pax noted that yes, it is the Sponsor's responsibility to ensure the Government can get in to renourish the project.

Daughters – what is the specific purpose of the easement? Is it to provide public access? Pax – it is needed for public access. The owners can still use the beach so long as it does not interfere with the Federal project (some structures). Beach chairs and such will be fine.

Daughters – when will the acquisition take place. Pax – we can not ask the sponsor to acquire these easements until a PCA is signed. The easements will have to be obtained according to established Federal guidelines. The betterments to the lands due to the project should outweigh the easement costs to the land. More information on the acquisitions will be delivered as the report process progresses.

Spadoni – asked if the public easements have ever been modified. Pax stated that it may be possible, but depending on precedence that the lot in question probably would not be cost shared.

Economics – Wilson
Gave an overview of how the engineering data, Real Estate data and physical data is incorporated into the Storm Damage Model (SDM) to generate the anticipated damages based on existing conditions.

Risk and uncertainty was discussed. The uncertainty of model input is estimated and a Monte Carlo distribution is applied to these range of inputs. Therefore, a level of certainty can be applied to the output. This will be the first report done by the Jacksonville District that contains Risk and Uncertainty within the Storm Damage Model output; Broward County was done previously by a consultant.

It is noted that a very thorough presentation on the new SDM is available to the ITR team if they wish to review more of the details.

Geotechnical – Jenkins

1.8 Million CY of material are contained within the existing borrow areas. Quality of material is coarser than native with standard silt quantities (less than 10%). Knowledge of local geology is being utilized for selecting borrow areas; the sites are relatively small but have coarse material with low silt and are spread throughout the project area. Due to funding constraints associated with the Feasibility study only enough material was identified for initial construction.

As far as the 50 year life of the project, more of these same sites are available and will be investigated for future use. New Pass will be utilized as maintenance material to supplement the periodic renourishment and possibly as a borrow source (ebb shoal). Additional sites will be worked into this effort, including Egmont Shoal near Tampa Harbor. Big Sarasota Pass (the inlet bounding the south end of the island) contains several million yards of Beach Quality Material; mostly because the north to south transport off of Lido Key is moved out to this ebb shoal. There is geotechnical data available to support the BQM in the shoal. This shoal has grown significantly in size over the past 20 years and has become an issue with the public on Lido Key and Siesta Key (the island immediately to the south). Due to the very active interest in this ebb shoal it was not used at this point of the study, although it may come to the point where this is the most viable option for future renourishment, if all of the interests can be satisfied. Environmental is checking into the Coastal Barrier Resources Act (CBRA) as it applies to this area.

Big Sarasota Pass – Daughters mentioned that this should be considered as a sand source. It needs to be brought up and discussed within the engineering appendix; the political pressure is the main reason for not using this material. It is BQM.

Stevens – Mentioned that this portion of the main text needed to discuss the Regional Sediment Management initiative that is underway in southwest Florida and how it may effect this project.

Engineering – Jenkins
Project length is 9,100 feet; with tapers it is just over 10,000 feet. This short length comes into play with the design of the project; this short of a project experiences high end losses due to diffusion. The study area has experienced a high historic erosion rate. The island is short, and therefore experiences high diffusion losses at the ends. The south end is extremely erosive and needs to be addressed. The ebb shoal for Sarasota Pass (millions of yards) is directly related to the problems at the south end. This end of the island is not pinned down structurally and is free to move at will.

The volumes used in generating the plan were computed using MHW extensions of the shoreline. (translated equilibrium profiles)

SBEACH was used in determining the recession frequency curves; this was done in conjunction with Empirical Simulation Techniques. The numbers generated were in line with historical predictions and predictions used on other Gulf coast shorelines.

GENESIS was used to determine what the project induced losses would be based on the various alternatives. It was also used for finding a solution to the south end of the island.

Different structural alternatives were determined to be needed to assist the south end of the island. A variety of these were modeled

with a terminal groin and groin fields yielding the best results. These structures are required to maintain the design berm in the most economically efficient manner.

Volumes – 460,000 cy were required for 80' berm; with advance nourishment it totals over 1 Million CY for initial construction.

Peck – wanted to know if the erosion rate for engineering reach 2 was actually –21 feet per year; Jenkins stated that the reach had experienced severe erosion over the last 20 years. Daughters supported the problem area's high erosion rate.

Peck asked why the recession was so much higher in reach 3 than reach 2 when reach 2 had the higher erosion rate. Jenkins stated that the recession (SBEACH) is based on individual storm events instead of yearly trends.

It was mentioned at this time that Lido Key is actually a series of very small islands that were joined together in the 1920's by local interests.

A series of t-head groins had been proposed by other interests for the south end in the past.

Stevens – wants to be sure that CBRA Units are addressed.

Formulation – Haubner
Reach length was discussed; explanations concerning the low development along the north end of the island and an accretive section near the middle island helped determine where the Federal project should begin. Due to the short reach length (9,100 feet) and the problem with diffusion losses at the ends of this short of a project, it was determined that incremental analysis of the reach wouldn't be engineeringly sound.

Stevens - By looking at the vegetation on this slide (north end of project), a good indicator of the natural (historic) shoreline could be the vegetation.

Jenkins - Actually, the whole area was "enhanced" back in the 1920's by Ringling, connecting the series of islands.

Stevens expressed a concern that some structures to the north of the beginning of the study area will be left out and wanted to ensure that the project shouldn't be extended further to the north. The area in question is currently located just north of the accretive nodal point, and with their current location from the shoreline (in excess of 300 feet) it wasn't feasible to include them within the project area. The northern taper will cross into this area.

Haubner continues presentation covering:

Berm width volumes were discussed for each of the alternatives considered (renourishment only, 20', 40', 60', 80' and 100' berms)

Preliminary costs were shown to the group; unit costs and mobilization costs will be looked at closer. Preliminary alternative cost estimates seemed lower than recent work the sponsor had completed of a similar nature.

Renourishment interval calculations were demonstrated for one of the alternatives.

Plan formulation was walked through, showing the average annual cost of each alternative at their respective renourishment interval. These were then compared to the Storm Damage prevention benefits associated with each alternative; the alternative that produced the greatest net benefits was then selected as the National

Economic Development (NED) Plan. This proved to be the 80' berm with a 3 year renourishment interval.

Project induced losses were then discussed with respect to terminal structures at the south end of the island. Modeling showed that over 50,000 cubic yards of material per year could be reduced from the diffusion losses at the south end of the project with a structure. This would directly result in a savings for the project.

Groin optimization was then discussed. The 80' berm was reevaluated with respect to the lower diffusion (project induced) losses and it re-optimized at a 5 year renourishment interval. The average annual savings of 250,000 cy of material (50,000 cy in material savings over a 5 year renourishment interval) was then compared to the average annual cost of various structures of a 50 year life. The groin field turned out to yield the highest cost to savings ratio.
Selected plan – this would be the 80' berm for 9,100 feet with a renourishment interval of 5 years and would include a 3-groin groin field at the south end of the project.

Jenkins – Agreed that the maintenance interval for groin rehab of every 10 years is in line with the design.

The breaking wave height for the groin design was discussed; the wave is depth limited at this point and was on the order of an 8 foot wave with a 13 second period.

Current cost estimates have the groins constructed with granite.

The sponsor asked about the average annual cost of the groins (+$200,000) with respect to maintenance, since they would be responsible for their upkeep. Out of the average annual cost, it was estimated that approximately $20,000 was maintenance and the

rest is the $2.8 million of initial construction over the 50 year life of the project.

Daniel R. Haubner, P.E.
Coastal/Navigation Section
Plan Formulation Branch
Planning Division
Jacksonville District

CESAJ -PD (10-1-7a) 30 April 2004

DOCUMENTATION OF REVIEW FINDINGS

SARASOTA COUNTY FLORIDA, SHORE PROTECTION PROJECT

LIDO KEY

FINAL FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

October 2002

1. BACKGROUND.

a. Location. Lido Key is a 2.5-mile-long coastal barrier island located approximately 45 miles south of Tampa on the gulf coast of Florida.

b. Study Authority. The 1970 River and Harbor Act authorized a beach restoration project for Lido Key. Non-Federal interests constructed the northern half of the plan in 1970, but the project was never completed. The Federal project was de-authorized in WRDA 1986, but it was later re-authorized in Section 364 of WRDA 1999. The project was reanalyzed in this report due to possible cost overrun concerns.

c. Problem. The study determines the optimal hurricane and storm damage reduction features for Lido Key under current conditions, updates cost and benefits estimates, and seeks new authority to design and construct the project due to Section 902 cost limit exceedance.

d. Recommended Plan. The selected plan is to construct a 5-foot elevation, 80-foot-wide storm berm, with tapers at each end, along the developed portion of Lido Key. Initial construction would require placement of approximately 1,074,700 cubic yards (CY) of sand fill, consisting of 460,200 CY of design fill volume and approximately 614,500 CY of sacrificial advance fill. Three borrow areas are located between 7.2 and 9.5 nautical miles offshore. Future nourishment would be provided at about 5-year intervals. Three groins would be constructed along the southern portion of the berm to reduce post-construction erosion losses. The selected plan is the NED plan.

e. Project Costs. The recommended plan has an initial construction cost of $12,632,200 at October 2002 prices. Total periodic nourishment costs are estimated as $52,517,000 (October 2002 prices) over the 50-year period of Federal participation.

f. Project Economics. Without-project annualized expected hurricane and storm damages are estimated at $4,354,500. The recommended plan would reduce expected annual damages by over 99 percent. Based on a 6.125 percent discount rate and a 50-year period of economic

evaluation, annual costs are estimated as $1,954,700 and annual benefits are $4,319,900. Net benefits are $2,365,200 and the BCR is 2.2. All benefits are for hurricane and storm damage reduction.

g. **Cost Apportionment.** Based on current shore ownership, use, and type and incidence of expected benefits, initial construction costs would be apportioned 62.4 percent Federal and 37.6 percent non-Federal. The City of Sarasota would be the non-Federal project sponsor.

2. REVIEW SUMMARY: The HQUSACE review team believes that the District has adequately addressed some of the Policy Compliance Review Comments furnished by memorandum from CECW-PC dated 5 November 2002, however there are still policy issues that remain with regard to the assumed without-project conditions. In particular, the placement of sandy material from the New Pass Channel (5.a), the frequency-recession relationship (5.b), and the accounting of recurring damages (5.c) remain of concern. Specific examples are cited within the HQ assessments to clarify the basis for concerns. These concerns may have potential to impact the analyses of damages and benefits, as well as the formulation. In addition, there is concern regarding the constraints to public access (9.c) as it relates to cost sharing and the documentation of the independent technical review (10.a). These concerns are discussed below.

3. ADMINISTRATION SUPPORT: The draft report does not correctly state Administration policy regarding budgetary and authorization support of hurricane and storm damage reduction projects. Page 2 of the syllabus states: "The current Federal administration policy does not support the initiation of new shore protection/beach erosion control projects because these projects are more properly a state or local responsibility." This statement is not correct. The current Administration has stated that hurricane and storm damage reduction projects will be treated on an equal basis with flood damage reduction and ecosystem restoration projects. Passages such as that quoted should be removed from the report.

OCTOBER 2002

DISCUSSION: HQ noted that current Administration policy supports authorization and funding of shore protection projects on an equal basis with flood damage reduction and ecosystem restoration projects.

REQUIRED ACTION: The draft report will be revised to reflect the current Administration policy.

CESAJ ACTION TAKEN: Concur. Page 2 of the syllabus and the recommendations section of the report has been changed to reflect the Administration's current position on Hurricane and Storm Damage Reduction.

MARCH 2003

HQUSACE TEAM ASSESSMENT: The requested changes have been made. **The HQ review team believes that this concern is resolved.**

4. SAND AND BORROW SOURCES:

a. Insufficient Quantity of Sand. Sufficient quantities of suitable sand borrow for the project have not been identified. Therefore, plan formulation is incomplete. Table A-28, appendix A, indicates that three borrow areas, containing a total of 1.9 million cy of suitable sand, are to be used to construct the project. About 1.1 million CY of sand will be required for the initial construction and about 614,500 CY would be required for each of 10 periodic nourishment events. Therefore, the initial construction and one future nourishment would essentially deplete the three designated borrow areas. Based on current estimates, about 6.1 million CY would be required for the ten nourishments. This estimate is partly based on obtaining sand characteristic similar to the three designated borrow sites. Sand with less suitable characteristics would necessitate that greater quantities be used at perhaps greater frequency. Paragraph B-49, Appendix B, identifies additional possible sand sources; however, no assessment of the suitability of these sources or the costs associated with transport and use of material from these areas is provided. The report needs to demonstrate that the recommended plan is complete by identifying tested sand borrow sources with sufficient quantities to implement the project.

OCTOBER 2002

CESAJ RESPONSE: PD-PN. Concur. Based on existing geotechnical data for the project area, the current borrow areas are indicative of a broader sand resource that comprises a relic dune. There is every indication the there are multi-million cubic yards (well over the 50-year project requirements) of suitable sand available offshore of the project area. The most cost effective borrow sources have been identified in detail for initial construction of the project. Additional geotechnical information will be provided in the revised report to substantiate this claim.

DISCUSSION: The District acknowledged the need to better define the locations and quality of potential sand sources to be used in the future.

REQUIRED ACTION: The draft report will be revised to include additional information on additional sand sources. The economic evaluation will be revised as necessary to reflect any additional costs associated with providing additional sources or longer transportation distances. If there is still uncertainty in the future sources of sand, then the costs of testing and seeking sand need to be included in the project costs.

CESAJ ACTION TAKEN: Concur. The Geotechnical Appendix has been revised to reflect the fact that the borrow sources required for the life of the project are available. This information has been collected and is provided under this reference: Coastal Planning & Engineering, Inc., (1999). Town of Longboat Key, Phase II Offshore Borrow Area Investigation to Locate "White Sand" Sources for Beach Renourishment of Longboat Key, Boca Raton, Florida. This referenced study shows sufficient material within the bounds of the study area and has done reconnaissance level sediment classifications for the potential borrow areas. Cost estimates for renourishment have enough PED costs included to cover the remaining needed testing.

MARCH 2003

HQUSACE TEAM ASSESSMENT: Both the main report and the Geotechnical appendix now demonstrate that sufficient borrow is available within a reasonable haul distance to both build and renourish the project. **The HQ review team believes that this concern is resolved.**

---

b. Continuing Construction Costs. Continuing construction costs may be underestimated. Project economics are based on the cost of nourishment associated with the three designated borrow areas even though we know that sufficient sand to nourish the project over a 50-year period is not available from those areas. This is not appropriate. Project costs may be underestimated if the nourishment frequency must be increased to account for less suitable material or if transport costs are greater than assumed for the three designated borrow sources. ER 1110-2-1407, paragraph 7.b.(2) states that borrow material sources adequate to supply material for the initial construction, advanced nourishment, and periodic nourishment for the period of evaluation (usually 50 years) should be identified and used in developing project costs. Since sufficient borrow with its attendant costs has not been identified, there is more than typical uncertainty in the estimated continuing construction cost used in the economic evaluation. The report should identify sufficient quantities of sand with associated costs to cover all anticipated nourishment requirements for the 50-year period of Federal participation in the proposed project.

OCTOBER 2002

CESAJ RESPONSE: PD-PN. Concur. Reference response to comment 4.a. above.

DISCUSSION: Reference discussion to 4.a above.

REQUIRED ACTION: Reference required action for 4.a above.

CESAJ ACTION TAKEN: See response for item 4.a above.

MARCH 2003

HQUSACE TEAM ASSESSMENT: Reference discussion to 4.a. above. **The HQ review team believes that this issue is resolved.**

---

5. FUTURE WITHOUT PROJECT CONDITION:

a. Use of Sand Dredged from Maintenance of Local Navigation Channels. The most probable future without-project condition does not appear to be reflected in the report. The economic evaluation is based on the assumption that long-term erosion continues unabated at a rate of 21.1 feet annually in reach 2 and 6.3 feet annually in reach 3. However, Table III-4, page 17, documents that sand dredged from New Pass has more or less routinely been placed on the reach 2 shoreline of Lido Key. It is reasonable to assume that such practice would continue in

the future. The economic analysis of without-project damages should reflect the probable continued placement of New Pass dredged sediments on the beach.

OCTOBER 2002

CESAJ RESPONSE : PD-PN. Do not concur. There are no guarantees that the New Pass maintenance material will be placed on Lido Key in future.

DISCUSSION: The District explained that New Pass is a recreational channel with a low budgetary priority. Due to the fact that it is a low budgetary priority the District explained that there is no guarantee that New Pass would be dredged on a consistent basis or that the maintenance material would be placed on the Lido Key shoreline in the future. Therefore, they felt this practice should not be considered as the future without project condition. Historically, New Pass has been dredged on an average every 4 to 5 years for the last 20 years. Approximately 110,000 –120,000 c.y. of material is dredged. The City of Sarasota receives half of the material and expects to receive about 65% of the material in the future. The District also explained that the amount of material received from the maintenance dredging of New Pass is negligible and will have no major impact to the study. After extensive discussion, all agreed that the most probable future without project condition should reflect the continued placement of New Pass dredged material on the Lido Key shoreline.

REQUIRED ACTION: The draft report will be revised. The economic analysis of without-project damages will reflect the probable continued placement of New Pass dredged sediments on the beach. The District will verify the unadjusted erosion rate to determine if there is an impact to the study. If there is a major impact we will reconvene to discuss the matter.

CESAJ ACTION TAKEN: The following pertains to New Pass and its authorization thru Section 107 of the 1960 Rivers and Harbors Act, as amended. New Pass is on the verge of exceeding it's authorized life. As stated in EP 1165-2-1, DIGEST OF WATER RESOURCES POLICIES AND AUTHORITIES, 30 July 1999, Table 2-1 footnote (4) "Also, the Federal share of the total costs (initial implementation costs plus the capitalized value of the future maintenance costs) may not exceed 2.25 times the initial Federal costs or $4.5 million, whichever is greater." A spreadsheet of the expenditures, since construction, for the New Pass project was prepared. The interest rates is provided by the Federal Discount Rates for Project Formulation and Evaluation were applied, as provided in 14 Dec 2000 Economics Guidance Memorandum Number 01-02: Fiscal Year 2001 Interest Rates. The base year used in this evaluation was 1964 since that is when construction was initiated; all the project costs were discounted back to this year.

Using the 1964 interest rate (3.00% (as recommended by ER 1105-2-100, Para F)) provided a present worth value of $3,934,428. This cost includes the anticipated maintenance event scheduled for October 2002; the estimated cost of this event is $1,800,000. The $3.9 million dollars would not allow for additional maintenance events under this scenario. Therefore, without an extension to this authorization, future maintenance events should not be considered part of the future without project conditions.

MARCH 2003

HQUSACE TEAM ASSESSMENT: **The HQ review team believes that the issue is not resolved.** The District's argument that the Federal government will cease maintenance dredging of New Pass after the 2002 is reasonable, given the Federal cost limitation under Section 107. However, the guidance on Section 107 requires that local sponsors continue the maintenance dredging of Section 107 projects once the Federal government's participation ceases. This requirement is noted in Section F-15, paragraph c. of ER 1105-2-100, on page F-12. Therefore, it would seem reasonable for the sponsor to continue dredging the navigation channel at New Pass and placement of the dredged material on the eroding sections of the Lido Key beach under without project conditions in the absence of Federal participation. In the event that non-Federal dredging of the channel is curtailed, it would still seem reasonable for the local interests to place material from other sources along the eroding shoreline as noted in comment 5.b.(4) below rather than taking no action to place beach fill.

SEPTEMBER 2003

CESAJ RESPONSE: Section 107 does not include a specific requirement for the sponsor to maintain the project when Federal participation ends. The City of Sarasota's resolution (there is no PCA) for New Pass, dated 1963, reflects the sponsor's commitments with regard to the project and does not include maintenance of the channel, only the commitment to provide and maintain necessary mooring facilities and utilities. Accordingly, the sponsor has not committed to maintain. ER 1105-2-100 notes that "when Federal participation ceases, the operation and maintenance of the project becomes the responsibility of the sponsor." This does not necessarily translate into an obligation on the part of the sponsor.

DECEMBER 2003

CESAJ RESPONSE: Currently the pass is maintained by the Federal Government at our expense; when Government participation ends, any of the end users for that channel may or may not elect to maintain the inlet. The inlet channel is currently very dynamic, moving and filling with various storm activities, it is not currently maintained by the users even though it can be 5 or more years before the Federal Government is able to dredge. The most likely scenario would involve local boaters traversing the 4 miles south to Big Sarasota Pass which is a much more stable and naturally deep inlet having very little need for maintenance. In addition, the opportunity for obtaining beach quality material from this inlet would rest just as much with town of Longboat Key, or any of the other local communities as it would with Lido Key. The permitting process for dredging the inlet and the mobilization costs, when compared to the volume of material available, would be the largest deterrent for any of these communities. Additional material from enlarging the channel to better utilize mobilization costs would be difficult to justify with the DEP and may have negative impacts with respect to wave focusing on the north end of Lido Key.

Including this as part of the future without project condition would have the potential to greatly effect the Plan Formulation and plan selection. Incorporating 120,000 cy of material into the system every 5 years would add approximately 1.4 cy of sand to every linear foot of the beach per year. That would have some impact on the erosion rate in reach 2 (the historic location for these placements); the project would still be justified (current BCR of 2.2 without recreation benefits), but there is the potential for the NED plan to change. This would cause dramatic changes throughout the report, including public coordination.

HQ: I think that the district needs to explain why it would be unlikely that the community/sponsor of the project would continue to dredge the channel at the end of the Federal participation period. The sponsor should be approached in that regard to get an official response. I thought previous district responses said the amount of material from channel dredging would have rather negligible effects anyway- this seems to be a much different response to me. Another question would be how the material would be placed, since I doubt it would be uniformly placed along the shoreline, but more likely at the worst erosion areas close to the channel. Even if the channel were no longer dredged under the most likely future conditions, it would seem prudent for local interests to do something to protect themselves rather than do nothing. Whatever actions might be taken can be claimed as benefits due to local costs foregone.

JANUARY 2004

Conference Call with SAD/HQ: HQ agreed to SAJ's argument on maintenance funding availability and location of placement of material. Funding for recreational shallow draft navigation channels is very low priority, and there are two islands competing for this resource.

---

b. Validity of the Storm Frequency--Storm Recession Relationship. The future without-project economic evaluation for reach 2 assumes a constant 21.2 feet of long-term erosion for each year of the analysis. In addition, the storm frequency-recession curve assumes an additional 38.5 feet of storm-induced erosion from the annual (table D-1, probability =1.0, i.e., certainty) storm. Thus, the without project economic analysis assumes that more than 60 feet of shoreline recession is expected to occur each year in reach 2. Similarly, the future-without-project economic evaluation for reach 3 assumes a constant 6.3 feet of long-term erosion plus an additional 56 feet of storm induced erosion associated with the annual (table D-2, probability=1.0, i.e., certainty) storm. Thus, the without project analysis for reach 3 assumes that more than 62 feet of shoreline recession is expected to occur in each year. The report should document that erosion of these magnitudes has occurred annually in the past.

OCTOBER 2002

CESAJ RESPONSE: PD-PN. Partially concur. Recession and storm-induced erosion are not additive. The report will be revised to better document the erosion rates claimed.

DISCUSSION: The District explained that their current model does not apply the constant erosion rate beyond the point where coastal armor is encountered. HQ noted that sufficient information should be included in the report to make reviewers comfortable that the values cited are reasonable.

REQUIRED ACTION: The draft report will be revised. The District will provide a generic sample of a model run to better document how long-term and storm-induced erosion rates are applied by the model. Any revisions required by use of un-adjusted erosion rates in the analysis will be made.

CESAJ ACTION TAKEN: Concur. It is important to note that the Storm Damage Model (SDM) does not apply the long-term erosion rate for every year of the period of analysis for Lido Key. That rate is applied for each year until the shoreline recedes to the location of coastal armor. Once the shoreline recedes to the coastal armor location, no further long-term erosion is calculated and the pre-storm shoreline position is held constant at the armor location for each year for the remainder of the period of analysis. It is assumed, under the without project condition, that any unarmored segments of the Lido Key shoreline will be armored when the shoreline has eroded to the point where structures are expected to be damaged by a 1-in-5 year probability storm event. This is permitted under Florida state law, and armoring of the coastline as long-term recession progresses has been observed at numerous sites along the Florida coast.

The SDM input data for reach 3 indicate that all damageable properties in that reach are protected by coastal armor sufficient to halt long term recession. For reach 2, the SDM input data indicate that three structures are not protected by coastal armor; however, structures on either side of those structures are protected by coastal armor. The future location of coastal armor for the unarmored structures was identified, based on the location of existing armor for the adjacent structures. The SDM calculates long-term recession for each year until the future armor location is reached. At that time the SDM assumes that the coastal armor will be constructed and long-term recession is halted for all subsequent years.

MARCH 2003

HQUSACE TEAM ASSESSMENT: **The HQ review team believes that this issue is not resolved.** The information on the without-project conditions presented in various sections of the report and the district responses to review comments seem to have inconsistencies, which need to be resolved in order to assure that the long-term erosion and storm damages are modeled accurately and the without–project conditions are clearly described. These damage analyses form the basis for calculation of project benefits and justification of the recommended plan. Specific examples of the inconsistencies are discussed below.

(1) Shoreline Positions Resulting from Long-Term Recession. Tables D-1 and D-2 show the shoreline position input data for the SDM in Reaches 2 and 3. The text on page D-11 indicates that the future shoreline positions were used to estimate the storm-induced recession. The future shoreline positions reflect the assumption of a constant erosion rate throughout the 50-year period of analysis. The resultant long-term recession extend beyond the coastal armor, contrary to the district's response above, with long-term shoreline recession that reaches

distances of 1,033.9 feet by year 2050 for reach 2, and 310 feet by year 2050 for reach 3. In contrast, Table A-13 of the Engineering Appendix shows that the shoreline recession is expected to be highly variable throughout the reach, with the long-term recession stopping at the coastal armor and much lower recession distances resulting overall. Table A-13 shows that the maximum shoreline change by year 2050 within Reach 3 is expected to occur at profile R-42 with a distance of 139.5 feet (269.5 - 130.2) versus the value of 310 feet input to the model. In Reach 2 the maximum change occurs at profile R-38 with a distance of 282.2 feet (317.2 – 35.0) versus the 1,033.0 feet in the model input. It is not clear whether the economic model disregards the higher values after reaching coastal armor or whether the coastal armor was assumed to be ineffective at stopping the long-term erosion. From the limited data provided in the Economic Appendix it is not possible to determine how the long-term recession values influence the analysis of damages and project benefits and whether the SDM is using the appropriate assumptions for the without-project conditions. The district should review the SDM to assure that the analyses of long-term and storm-induced damage analysis are based on shoreline position changes under the without-project conditions that are consistent with the engineering analyses and representative of the erosion anticipated within each reach. The without-project assumptions must also be clearly and consistently described in the text.

SEPTEMBER 2003

CESAJ RESPONSE: Tables D-1 and D-2 do show the shoreline position for both reaches. The text on page D-11 does stress that the future damages are referenced to the existing shoreline position. A clear understanding could be seen if the paragraph was re-written as follows:

b. Shoreline position: future conditions. "Future year damages to all susceptible structures is simulated in the storm damage computer program using the existing shoreline as a reference point. As the shoreline position changes with time, damage probability at some time period in the future is referenced to an established existing shoreline position. The protective value of the beach is lost over time to long-term erosion as greater numbers of structures are threatened by storm-induced recession. Under with project conditions, seaward extension of the shoreline (which extends the shoreline further seaward) reduces future susceptibility."

In reference to Tables D-1 and D-2, "Shoreline Position," in Table D-1 as it appears in the report is missing the shoreline position for the lat column (years 2005, 2010 etc). Thus, where you indicate a shoreline recession distance of 1,0339.9 for the year 2050 in the year 2050, the shoreline position is 1055 (see new Table D-1). This may resolve your concerns in this comment for Economics and in the main report.

DECEMBER 2003

CESAJ RESPONSE: The comment indicates that there is some misunderstanding regarding model input for shoreline position and model output in the form of expected annual storm damages. Because the model is designed to calculate expected damages on a lot-by-lot basis for both armored and unarmored shoreline, the expected shoreline position for unarmored shoreline is input by reach for each year of the period of analysis. Also included as input to the model is information on the type, location, and protective value of coastal armor for each lot. For lots

with no coastal armor, an armor index number of 1 indicates no coastal armor. (See Table D-1 & D-2). 32 of the 39 lots shown in Table D-2 have coastal armor under existing conditions. In calculating expected damages for those lots and associated structures, the SDM uses the input value for shoreline position for every year of the period of analysis until it is equal to or less than the armor position specified in Table D-2. At that point, shoreline position is held constant, for each of those 32 lots, at the position specified for the existing coastal armor. Similarly, for the 7 unarmored lots, the SDM uses the input value for shoreline position specified in table D-2 is reached. The model then determines that the armor Type 1 (no armor) will be destroyed by any storm event (as it has a protective value of zero) and the replacement armor (also shown in Table D-2) will be constructed at the specified armor location. For 6 of the 7 lots with no coastal armor, replacement armor type 3 is specified (20' concrete sheetpile). That type of armor is sufficient to halt all long-term erosion, so the shoreline of the 6 lots is held constant at the armor location specified in table D-2 for the remainder of the period of analysis. For the single vacant lot without existing coastal armor, only loss-of-land damages are calculated. That is the only lot for which the input shoreline position is used without restriction by the SDM in the calculation of expected damages.

Note that the values in Table D-1 for shoreline position for the last column (2005, 2010... 2050) were cut off. Similarly in Table D-2, the tenths values for the last column (31, 62... 310) were cut off.

HQ: I believe when I talked to Bradd about this that I indicated that the major concern was resolved, but the district should put an explanation as a footnote on the tables or change the headings to say that the shoreline positions were theoretical positions assuming that the erosion continued at the historic rate, rather than saying that they were future shoreline positions, since that sounds like they are predicted to actually reach those positions under the without project conditions.

JANUARY 2004

Conference Call with SAD/HQ: (1) Not discussed.

(2) Averaging of Erosion Rates. The shoreline positions under the without-project conditions are depicted in Figure A-16 of the Engineering Appendix. The figure shows that much of the shoreline in Reach 3 is expected to either accrete or experience less rapid erosion than the average value for the reach, which was input to the SDM. The shoreline recession data in Table A-13 for the Reach 3 profiles lines indicate that the future shoreline change rates are 0.8 feet/year at R-41 (accreting), -2.8 ft./yr. at R-42, and –16.6 ft./yr. at R-43 (the average of these values is 6.2). The high rate at R-43 would only apply for one year before a coastal structure stops the erosion. However, this high rate of erosion significantly affects the average value of –6.3 feet per year. That rate was then applied in the SDM along the entire reach and would lead to model results that reflect more significant long-term and storm-induced recession than would actually be expected in comparison to the recession values in the Engineering Appendix. This would then overstate the without–project damages related to development, coastal armor, backfill, and land loss as well as the benefits attributed to the project. Similarly in reach 2, the

shoreline change rates at profiles T-36, R-37, R-38, R-39 and R-40 vary from 6.1 feet of accretion to 40.8 feet of erosion. The average of these rates, 21.1 feet/year, was applied throughout reach 2 in the SDM although the 40.8 ft./yr. rate of erosion is only experienced until coastal armor is reached in year 2004. The district should review the average erosion rates used in the SDM to assure that they are representative of the entire reach and are applied only until such time as the coastal armor is reached.

CESAJ RESPONSE: The statement that "The high rate at R-43 would only apply for one year before a coastal structure stops the erosion" is inaccurate. The proper wording should reflect that the high rate of erosion measured at R-43 and incorporated into the Reach 3 average would only apply for one year **at one particular property** before the structure at that property stops the erosion. Also, "...reflect more significant long-term and storm-induced recession than would actually be expected in comparison to the recession values in the Engineering Appendix." seems to imply a discrepancy between the long term erosion rate used in the storm damage model (SDM) and that found within the Engineering Appendix. This is not the case in that values determined from historical analysis of shoreline change in the appendix were averaged and imported directly into the SDM.

Estimated shoreline changes were obtained at each DEP monument that are approximately 1000 feet apart. To assume that these rates can be assigned unilaterally to individual properties is a gross overestimate of the accuracy of the estimates. The fact of shoreline change variability along any given stretch of beach is the basis for using average values. The rate of shoreline change is dependent upon physical parameters with wave action being the primary forcing factor. To attempt to eliminate measured values within the long-term and long-reach averages as the estimated shoreline reaches coastal armor is not appropriate. Given the distance between monuments being about 1,000 feet at the referenced property, and the property front footage of only 280 feet, the armor halting the erosion amounts to only about 28% of the shoreline between these monuments. Eliminating the erosion rate for these monuments from the overall reach average would ignore the continued losses at the remaining 72% of properties. More importantly, it can be observed that when shoreline erosion reaches an armored obstruction, the rate of shoreline retreat at adjacent properties accelerates. The effect of these existing structures may already be contributing to the higher rates within this sub- reach. Compared to historical averages, the without-project condition recession could be even higher as time progresses and the with-project condition erosion rate, without the armored shoreline impacts, could even be less than the historical average. These combined effects would tend to raise, not reduce, the with-project storm damage benefits.

DECEMBER 2003

CESAJ RESPONSE: The statement that "The high rate at R-43 would only apply for one year before a coastal structure stops the erosion" is inaccurate. The proper wording should reflect that the high rate of erosion measured at R-43 and incorporated into the Reach 3 average would only apply for one year at one particular property before the structure at that property stops the erosion. Also, "...reflect more significant long-term and storm-induced recession than would actually be expected in comparison to the recession values in the Engineering Appendix." seems

to imply a discrepancy between the long term erosion rate used in the storm damage model (SDM) and that found within the Engineering Appendix. This is not the case in that values determined from historical analysis of shoreline change in the appendix were averaged and imported directly into the SDM.

Estimated shoreline changes were obtained at each DEP monument that are approximately 1000 feet apart. To assume that these rates can be assigned unilaterally to individual properties is a gross overestimate of the accuracy of the estimates. The fact of shoreline change variability along any given stretch of beach is the basis for using average values. The rate of shoreline change is dependent upon physical parameters with wave action being the primary forcing factor. To attempt to eliminate measured values within the long-term and long-reach averages as the estimated shoreline reaches coastal armor is not appropriate. Given the distance between monuments being about 1,000 feet at the referenced property, and the property front footage of only 280 feet, the armor halting the erosion amounts to only about 28% of the shoreline between these monuments. Eliminating the erosion rate for these monuments from the overall reach average would ignore the continued losses at the remaining 72% of properties. More importantly, it can be observed that when shoreline erosion reaches an armored obstruction, the rate of shoreline retreat at adjacent properties accelerates. The effect of these existing structures may already be contributing to the higher rates within this sub- reach. Compared to historical averages, the without-project condition recession could be even higher as time progresses and the with-project condition erosion rate, without the armored shoreline impacts, could even be less than the historical average. These combined effects would tend to raise, not reduce, the with-project storm damage benefits.

Furthermore, long-term shoreline change is the resultant of physical forces which act independently of whether man-made structures exist within the area of interest. The averaging of historical shoreline change within a reach is simply a reflection of the effects of the historical wave and current environment affecting that reach. Any structures, which limit the shoreline movement, will not have any effect on the forces that cause that change. Therefore, to properly determine the anticipated future shoreline change energy, all historical shoreline change rates should be included and averaged. That average change is then input into the storm damage model, which takes into account the existence of armoring and halts damages at that property according to the level of protection assigned. Something else that should be pointed out is that even though the shoreline change rates for Reach 3 don't appear to be as dramatic as what is shown for Reach 2, Table A-15 in the Engineering Appendix shows a large unit volume change for the reach. This reflects the fact that profiles near the end of the island are experiencing deflation (loss of material in the offshore portion of the profile) due to the effects of Big Sarasota Pass; knowledge of this effect, that isn't demonstrated as much in the shoreline change rates led to the use of the 6.3 ft/year rate for this reach.

HQ: There is a significant discrepancy between the shoreline position information shown in the Engineering Appendix and that used in the economics analysis. The engineering figure cited in the original comment shows the predicted shoreline positions under the without project conditions - erosion is not shown to continue at a rate of 16 feet per year anywhere in reach 3. Much of reach 3 is accreting, which therefore has decreasing damage potential in the future and has no Federal interest in shore protection. I believe the R-43 data is not reflected appropriately by simply averaging it with the rates at the other profiles throughout the reach. The resultant

damages and benefits used to justify the reach 3 improvements would then appear to be overstated when compared to the shoreline positions predicted in the engineering figure. Accretion rates should not be averaged with high erosion rates to show a long-term erosion rate that does not occur. It is comparable to predicting flood damages to properties that lie outside of the depicted floodplain. The question is- what shoreline position is representative of the future without-project conditions. The report needs to be made consistent. I do not believe the 16 ft/yr historic rate at R-43 should be ignored, but the averaging currently used for economic evaluations seems inadequate. Plotting the predicted shoreline positions used in the economics model vs. the positions shown in the engineering figure would illustrate the concern, and bringing those positions more in line would help to resolve the concern. Perhaps reach 3 should be shown as a shorter reach with an accreting section between erosion reaches 2 and 3.

JANUARY 2004

Conference Call with SAD/HQ : (2) HQ agreed to accept SAJ's response.

(3) Recession Damage Values. It is not clear whether the appropriate damage values were used in the recession-damage analysis. Table D-4 shows a Recession-Damage Relationship as an example. Although the table does not specify which area it represents, the text on D-14 seems to indicate it is an example of data from the analysis of Reach 2. It is noted that for the recession distances between 210 and 380 feet many of the total damage values in the last column do not equal the sum of the other columns for damages to development, backfill, coastal armor, and loss of land. For example, at a distance of 320 feet, the columns total $11,506,709, but the total damages displayed in the last column are $15,803,567. At 360 feet the columns total $20,430,324 but the last column shows a total of $36,349,739, nearly double that value. It is not known whether these significant discrepancies would impact the damage and benefit values used for formulation and justification. The district needs to revise the table and review the damage values used in the SDM to assure that they are correct and provide an accurate basis for the benefit analyses and determination of project justification.

SEPTEMBER 2003

CESAJ RESPONSE: The first part of this comment is true. Recession-damage refers to Table D-4. As far as Table D-3 relates, it shows the total structural inventory for both reaches. The decision was made at that time not to show separate structural inventory tables. In the interest of clarity, the tables will be separated and paragraph 16 on page D-14 will be re-written to reflect these changes. Both recession-damage tables have been reviewed and changed due to some columns not summing in the tables. The new tables are the sum of the input damage categories as listed in the tables.

(4) No Action Assumptions. The analysis assumes under the future without-project conditions that local entities would not place sand on Lido Key beach. This seems inconsistent with the historic local actions to place fill on Lido Beach, in addition to the Federal disposal of dredged material from the New Pass channel. The local interests placed material in 1970 in the absence of Federal cost sharing and fill has been placed periodically as recently as 1998. It would seem reasonable to assume that local actions would continue under the without-project

conditions to protect the valuable assets and coastal armor along the shoreline with beach fill. Figure A-16 shows that the predominant location of shoreline erosion is in Reach 2, where the bulk of historic fills have been placed. A significant amount of the material eroded from Lido Key Beach appears to accrete in Reach 1 at the public beach beyond the project's northern limit. It would seem more reasonable for the city to take some action to back pass accreted material as a means of maintaining the Reach 2 shoreline, or to continue dredging from the channel or an offshore borrow source, than to take no further local action to prevent damages by maintaining the beach. Further rationale is needed if no action is assumed in the future.

SEPTEMBER 2003

CESAJ RESPONSE: See response to 5.a. above.

DECEMBER 2003

CESAJ RESPONSE: Granted, the local sponsor has performed several "band-aide" type repairs to the beach in an effort to stem the erosion; but without Federal assistance they do not have the resources to commit to a properly engineered hurricane and storm damage reduction project. The reaches that they currently place material within are entirely too short and are subject to tremendous amounts of end losses; they do not have the funding source to pay for the required scheduled periodic renourishments needed to implement a proper Shore Protection Project. The current analysis does not account for the recreation benefits that are going to be lost as the beach continues to erode; this will further reduce the scope of projects that the sponsor will be able to put forth.

HQ: I would concur that local actions would be less effective than a Federal project for the resason stated. However, it would seem likely that those actions would continue in the absence of a Federal project and their costs could be claimed as benefits for local costs foregone.

JANUARY 2004

Conference Call with SAD/HQ: Not discussed

(5) October 2002 Nourishment. The district response above indicates that a maintenance dredging operation of New Pass channel was planned for October 2002. This was not discussed in the report and it is not evident that the erosion analyses have accounted for the effects of that recent nourishment under the without-project conditions. The review of without-project conditions erosion analyses should include consideration of the October 2002 nourishment.

SEPTEMBER 2003

CESAJ RESPONSE: See response to 5.a. above.

6. STORM DAMAGES:

a. Damage to Pile-Supported Structures. Page D-4 of the Economics Appendix states the following: "A structure was considered totally condemned when the shoreline receded to the midpoint of the structure. For multi-story structures on deeply embedded pilings, damages were claimed only for the first two floors." The rationale for the assumption regarding the amount of damage to structures on deeply embedded pilings is not apparent. Why would storm erosion damage two floors? Is there empirical data from post-storm damage assessments to support this assumption? The report should include a discussion of the supporting rationale for critical damage assumptions. Also, the report should also discuss the erosion damage assumptions for structures that are elevated on piles.

OCTOBER 2002

CESAJ RESPONSE: PD-PN. Concur. The Jacksonville District's storm damage model assumes that the full value of structures with slab-on-grade foundations will be realized when erosion reaches the mid-point of the structure. For pile structure, full value is reached at the landward limit of the structure. Damage to the first two floors of pile structures is assumed in the model due to the wave and water level induced impacts. Field verification of post-storm damages is being investigated under an IWR work unit that is currently developing a "national" model for prediction Hurricane and Storm Damage Reduction project benefits. Additional discussion of model assumptions will be provided in the revised report.

DISCUSSION: HQ noted that model assumptions should be supported by post-storm assessment data if possible.

REQUIRED ACTION: The draft report will be revised to incorporate additional information model assumptions and any available post-storm survey assessment data.

CESAJ ACTION TAKEN: Concur. The Jacksonville District's storm damage model assumes that the full value of structures with slab-on-grade foundations will be realized when erosion reaches the mid-point of the structure. This damage function is used for one and two story structures with slab-on-grade foundations. For pile structures, full value is reached at the landward limit of the structure. This damage function is used for all structures with deeply embedded pile foundations. Damage to the first two floors of pile structures is assumed in the model due to the wave and water level induced impacts. It is assumed that all structures of more than two stories will have deeply embedded pile foundations. All structures included in the Lido Key damage inventory are constructed at grade, regardless of whether those structures have pile or slab foundations. There are no structures elevated on piles. Field verification of post-storm damages is being investigated under an IWR work unit that is currently developing a "national" model for prediction Hurricane and Storm Damage Reduction project benefits. Additional discussion of model assumptions will be provided in the revised report.

MARCH 2003

HQUSACE TEAM ASSESSMENT: No changes were made to the final report in response to this concern. According to the response to concern 5.b above, the District assumed, for the Lido Key analysis, that under the without project condition, any unarmored segments of the shoreline will be armored when the shoreline has eroded to the point where structures are expected to be damaged by a 1-in-5 year probability storm event. Once the shoreline recedes to the coastal armor location, no further long-term erosion is calculated and the pre-storm shoreline position is held constant at the armor location for each year for the remainder of the period of analysis. This assumption limits the susceptibility of both slab- and pile-founded structures on the Lido Key shorefront to undermining and collapse. **The HQ review team believes that this issue is resolved.**

---

b. Minor Storm Impacts. Paragraph A-48 states the following: "... storm recession is defined as the horizontal distance between the Mean High Water (MWH) station on the pre-storm profile to the most landward station where the vertical difference between the pre-storm and post-storm profile is 0.5 feet." The review team notes that this is the standard definition of storm recession embedded in the S-BEACH model used for the study. However, we question the direct application of the model-produced recession distances to estimate economic damages. For example, recession of only one foot into a structure's footprint would result in claiming damages amounting to two percent of the depreciated replacement value of a 100-foot wide structure. For some of the structures listed in Table D-3 of the economics appendix, even two percent of the value can be large. Reasonably, damage caused by displacing 6 inches of sand from beneath a pile-supported structure or around a pile-supported foundation could be minimal. The district should investigate whether the assumed storm recession-storm damage relationship provides reasonably supportable damage estimates. The results of this investigation should be included in a revised report.

OCTOBER 2002

CESAJ RESPONSE: PD-PN. Concur. Field verification of post-storm damages is being investigated under an IWR work unit that is currently developing a "national" model for prediction Hurricane and Storm Damage Reduction project benefits. Additional discussion of model assumptions will be provided in the revised report.

DISCUSSION: Reference discussion for 5a above.

REQUIRED ACTION: Reference required action for 5a above.

CESAJ ACTION TAKEN: Concur. As noted above, none of the structures in the damage inventory are elevated on piles. An example of damages calculated for 1 foot of erosion follows. For a 10- story condominium valued at $10,000,000, damages are claimed for the first two stories only. Assuming that all 10 stories have equal value, the value of the first two stories is $2,000,000. Assuming that the structure is 80 feet from its seaward face to its landward face, each foot of erosion will result in 1.25% of $2,000,000 or $25,000 in damage. The amount of damage calculated for one foot of undermining in this example is considered minimal as a proportion of the total structure value ($25,000 is 0.25% of $10,000,000).

MARCH 2003

HQUSACE TEAM ASSESSMENT: The coastal armoring assumption adopted for the Lido Key storm damage analysis limits the susceptibility of both slab- and pile-founded structures to undermining and collapse. See HQUSACE review team analysis for concern 6 .a. above. **The HQ review team believes that this concern is resolved.**

---

c. **Accounting For Recurring Damages.** The Economics Appendix (page D-6, para. j.) states that after structural failure, the shore front development, roads, parking lots, etc. would be repaired to a condition similar to and in the same location as the pre-storm condition. Therefore, it appears that in many instances more than 50 percent of a structure's value could be claimed as damage many times during the period of evaluation. For instance, refer to the assumption stated on page D-6 (paragraph 11.e.). A situation where erosion is 30 percent through the footprint of a structure results in 60 percent damage to the value of the structure plus contents. If content value is assumed to be 50 percent of structure value, then the damages claimed are 0.6 x 1.5 = 90 percent of structure value. In these cases, since erosion did not exceed 50 percent of the structure's footprint, they would not be removed from the structure inventory. Thus, the situation could recur repeatedly. An evaluation of whether any structure sustains multiple damages in excess of its depreciated replacement value would be a useful "reality" check of the reasonableness of the without-project damage estimates. The report should address the following issues: Are some properties damaged multiple times during the 50-year period of economic evaluation? In what situations are structures removed from the inventory of damageable property? Will State statutes (or FEMA regulations) prohibit reconstruction of "substantially" damaged structures and are such restrictions reflected in the damage assessment model? The report should document how substantially damaged structures are addressed in the economic evaluation of alternatives.

OCTOBER 2002

CESAJ RESPONSE: PD-PN. Concur. The Jacksonville District's storm damage model is used to identify reoccurring damage to structures within the 5-year limit of recession. These structures are subsequently "condemned" (i.e. removed from the storm damage model data base). Additional discussion of model assumptions will be provided in the revised report.

DISCUSSION: Reference discussion for 5.a above.

REQUIRED ACTION: Reference required action for 5.a above.

CESAJ ACTION TAKEN: The SDM is a hybrid of a probabilistic and a life-cycle model. As such, it does not specifically address the question of how many times each structure in the database is likely to be damaged and repaired. Expected damage to each structure for each year of the period of analysis is calculated based on the amount of shoreline recession associated with ten storms with known probabilities of occurrence weighted by those probabilities. Whether or

not a given structure is expected to sustain damage from a particular amount of storm-induced recession is a function of the structure's location with respect to the reference shoreline, the presence of intervening coastal armor, and the protective value of the armor. For reach two, there are only four structures that are not currently protected by coastal armor. It is expected that armor will be constructed to protect those structures by the year 2005 under without project conditions. Even without coastal armor for the first five years of the period of analysis, none of those structures is expected to sustain any damage from a 1-in-10 year probability storm. It is also expected that the new protective armor for those structures will be concrete sheet pile consistent with the existing armor that protects adjacent structures. SDM calculations for reach 2 assume that all structures in the database will be protected by coastal armor sufficient to protect against the 1-in-10 year probability storm event. With the coastal armor in place, 11 of the 25 structures in the reach 2 database are subject to damage by the 1-in-20 year probability storm. An additional 3 structures are subject to damage by the 1-in-100 year probability storm. The total value of the 15 structures subject to damage without a project in reach 2 is $63,078,930 (including only the value of the first two stories for multistory structures). The total value of structures subject to damage without a project in reach 2 (including the total value of multistory structures) is $88,425,490. Similarly, for reach 3 all structures are protected by coastal armor sufficient to protect against the 1-in-5 year probability storm event. All 11 structures in the reach three database are subject to damage by a 1-in-10 year probability storm. The total value of the 11 structures subject to damage without a project in reach 3 is $40,332,305 (including only the value of the first two stories for multistory structures). The total value of structures subject to damage without a project in reach 3 (including the total value of multistory structures) is $111,843,551. For the total study area, the value of the first two floors of all structures is $103,411,235. The total value of all structures in the study area is $200,269,041. The without project expected annual damages to structures, calculated at $3,592,839, is less than 4 percent of the value of the first two floors and less than 2 percent of the total value of all structures. It is considered reasonable that this amount of damage will be repaired under without project conditions.

MARCH 2003

HQUSACE TEAM ASSESSMENT: **The HQ review team believes that this issue is not resolved.** Page 42, paragraph 104 of the main report, indicates that relocation of structures is implicitly incorporated into the storm damage model, such that heavily damaged development is removed from the storm damage analysis inventory when the damage occurs. Although this statement is consistent with the CESAJ response above, it seems to conflict with the economic assumptions, which are listed on pages D-4 and D-5. Paragraph 10.i. on page D-5 indicates that after structural failure of the coastal armor and the shoreline recession continues through the shoreline development, roads, parking lots etc, these damageable assets will be repaired to a condition similar to and in the same location as the pre-storm conditions. This would seem to result in recurring damages as assets are repeatedly damaged and rebuilt and it may contribute to the significant level of damages from frequent storms and the ability of relatively small scale plans to eliminate the majority of damages with minimal residual damages. Review of the information in the economic appendix to evaluate recurring damages resulted in the following specific examples of concerns with the analyses of damages and benefits, which may have implications for the overall formulation and plan selection.

SEPTEMBER 2003

CESAJ RESPONSE: The storm damage model default is condemnation (and removal of the inventory thereby no recurring damages) if structure destroyed is within a specified condemnation distance. The write-up on pages D-4 and D-5 of the Economic Appendix will be revised to clarify this point. Discussion will be added to address specifically what types of structures were allowed to be condemned and which ones were not.

(1) Table D-3. The distances to the coastal armor, the face of the structure, and to the mid-point of the structure (point of maximum damage), indicate that the model input assumed several features are instantly destroyed as soon as their seaward edge is touched. The pool and parking areas have a point of maximum damage that is 1 foot from their seaward face and 2 feet from the armor. The last condo listed on page D-12 has a maximum damage point listed that is 20 feet closer to the armor than its seaward face. It isn't clear that the distance data for these items in the inventory represent reasonable assumptions for damage and structural failure. There are also six condos where the distance from the armor from point of maximum damage is only 60 to 80 feet, which is in the range of recession values for the 1 to 5-year frequency events in reaches 2 and 3 when long-term erosion reaches the coastal armor. The proximity of these assets to the coastal armor heightens the criticality of the assumptions for shoreline position and storm recession.

SEPTEMBER 2003

CESAJ RESPONSE: Table D-3 has an error in the name of the last column. It should be distance to full value (this is the distance to where full damage of the structure is assumed, for structures with slab on grade it would be ½ the landward distance toward the back of the foundation, for pile supported structures it would be the full distance to the back of the foundation with damages calculated for the first two floors only). Table D-3 will be modified accordingly.

Table D-3 indicates that value of the pool and parking lot are $1 each. Changes in the distance to full damage for these structures will not affect the outcome of the economic analysis.

The last condo on Page D-12 now shows the distance to armor as 40 feet, distance to structure as 60 feet, and distance to full value as 300 feet.

The SAJ storm damage model has been extensively used for a number of years on HQ approved projects, and provides storm damage results that are reasonable.

(2) Tables D-1 and D-2. The shoreline recession–probability values in these economic input tables are nearly all different from the combined tropical and extra-tropical storm values shown in Table A-21 in the Engineering Appendix by distances in the range of 10 to 20 feet. Of particular concern are the recession values for 5-year and 10-year events in reach 3, which are shown as 136 feet and 197 feet, respectively, in the model input rather than 63 feet 68.4 feet in Table A-12. Figure A-24 shows that the recession-frequency relationship in Reach 3 is a step

function, which would seem to have been smoothed in the economic input. The effect of the discrepancies may be significant given the proximity of damageable assets to the coastal armor and the likelihood that the armor protection is assumed to provide protection from a one in 5-year frequency event. In fact, the Summary of Findings on page D-3 acknowledges that the losses appear to be relatively high when considering the small size of the area and the number of structures impacted. And the text further noted that this is due in part to the high structure values and the susceptibility of a small number of structures to the 1 in 10-year storm event because of their proximity to the shoreline. The district should review the storm recession values shown in Tables D-1 and D-2 to assess the discrepancies with the engineering text and assure that they are the appropriate values for use in the economic analysis.

SEPTEMBER 2003

CESAJ RESPONSE: CESAJ-PD is investigating this issue. Response will be forthcoming.

DECEMBER 2003

CESAJ RESPONSE: If changes to the report are warranted for other comments, these changes will be made at that time provided that funding is available.

HQ: This comment appears to be resolved- the changes will need to be made at some point.

---

d. Land Loss Damages. The report (page 52) indicates that land lost to erosion is valued at $24.00 per square foot. This suggests that a one-acre lot away from the beachfront would be valued at over $1 Million. The report should document that such values are supported by actual real estate sales data.

OCTOBER 2002

CESAJ RESPONSE: PD-PN. Concur. CESAJ-RE reviewed recent real estate sales data to determine the reference nearshore land value. The revised report will include a discussion of these investigations.

DISCUSSION: Response was acceptable.

REQUIRED ACTION: The draft report will be revised to document nearshore land values. The economic evaluation will be revised as necessary.

CESAJ ACTION TAKEN: Concur. The Economics Appendix now includes more information concerning the nearshore land values. No economic re-evaluation was required.

MARCH 2003

HQUSACE TEAM ASSESSMENT: **Not resolved. The HQ review team believes that the value of $24.00 per square foot is representative of developable land in the Lido Key area, however, it is not clear whether the land lost to erosion should be valued as developable land rather than for its recreational use.** The main report, page 52, para. 146, states that recent Lido Key land sales, both beach front and away from the beach, were reviewed to derive a baseline for determining applicable near-shore land values and loss of land prevention benefits. The text indicates that the $428,800 in annual benefits for the prevention of land loss is due to the elimination of land losses to undeveloped private property seaward of the coastal armor, which seems to be private beach areas. It is not clear whether the lands lost are developable, part of the developed parcels that exist landward of the coastal armor, or separate undeveloped lots. Clarification is needed to assure that the benefit category is appropriate for its use in the economic evaluation and that it is valued appropriately.

SEPTEMBER 2003

CESAJ RESPONSE: Comparable land was used to develop values.

DECEMBER 2003

CESAJ RESPONSE: This is the price the land would currently market for under existing conditions; it is the land associated with the lot and there is no data to indicate that the land under the footprint of the building has a different unit cost than land on any side of the building. The entire lot is marketed as nearshore with no distinction on whether or not it is to be used for a building or a sunbathing area. The fact that the land could be used for any number of uses associated with the hotel/condo/residence applies to the reasoning behind the pricing. The value is very much in line, with respect to order of magnitude, with other Federal Shore Protection Projects on the Gulf coast of Florida.

HQ: I believe the economic concern was that the land had to be developable in order to use this land loss calculation technique. Otherwise a different technique, such as the cost of fill would be appropriate.

27 January 2004

Conference Call with SAD/HQ: HQ would like to see a sensitivity analysis to determine the order of magnitude difference between using this nearshore land valuation for storm effects vs. the cost of replacing the material with fill on a cubic yard basis (truck haul).

---

e. **Residual Damages.** Table D-5 indicates that expected pre-project average annual damages of over $3.8 Million per year are reduced to only about $35,000 per year after the project is constructed. Compared to the damage reduction performance of other HSD projects in Jacksonville District, this is a relatively low residual damage estimate, especially considering that the berm is only 80 feet wide and does not incorporate a dune as part of its profile design. Is there an explanation for this counter-intuitive conclusion?

OCTOBER 2002

CESAJ RESPONSE: PD-PN. High without project erosion rates would explain the large percentage of damage reduction for the 80-foot shoreline extension. Just holding the shoreline in the pre-project location would result in significant damage reduction due to the predicted location of the without project shoreline following 50-years of additional recession.

DISCUSSION: Note previous future without-project erosion rate comments/discussions.

REQUIRED ACTION: Reference required action for 5.a above.

CESAJ ACTION TAKEN: High without-project erosion rates would explain the large percentage of damage reduction for the 80-foot shoreline extension. Just holding the shoreline in the pre-project location would result in significant damage reduction due to the predicted location of the without-project shoreline following 50-years of additional recession.

MARCH 2003

HQUSACE TEAM ASSESSMENT: **The HQ review team believes that this issue is not resolved.** The district explanation for this comment seems to conflict with the explanation provided under comment 5.b above regarding the basic assumptions for modeling the coastal damages. It was previously indicated that no long-term recession was assumed under the without-project condition once the shoreline position reached the coastal armor. Therefore, there should not be 50 years of additional recession if the coastal armor is assumed to hold the line against erosion. In fact, Table A-13 indicates that the only area where recession continues throughout the 50-year period of analysis is at profile R-42. In all other locations throughout reaches 2 and 3, the erosion is expected to last only until 2012 at the latest, at which time coastal armor is encountered. The 80 foot-berm plan (with no dune) is projected to eliminate over 99% of the total annual damages under the without-project conditions. The 0-foot berm plan (with no dune) is projected to eliminate over 66% of the annual damages. It would seem improbable that such significant levels of damage reduction could be achieved with such a small-scale plans without dunes, unless the damages are predominantly due to erosion. Based on the economic input data in Tables D-1 and D-2 the assumptions for long-term recession may have resulted in future shoreline positions for modeling of the storm-induced recession that could over estimate the damages and therefore the effectiveness of the plans. See the assessment and action required for comment 5.b.

SEPTEMBER 2003

CESAJ RESPONSE: As indicated on page 51 of the main report paragraph 143, damages are calculated due to shoreline position change and damage probabilities from frequency vs recession distance curves. These two factors account for the long-term erosion and episodic erosion respectively, that puts coastal development at risk. The SAJ storm damage model couples these two affects to calculate damages. The model assumes that damages begin as the landward extent of storm recession reaches the seaward extent of the structure. Damages

calculated by the model are reasonable and have been. The model has been used for numerous previous studies that have been reviewed and approved by HQUSACE.

DECEMBER 2003

CESAJ RESPONSE: Our model does not take into account any damages to structure content. Text could be added to the discussion on damages, stating that this is a benefit that would not likely be realized without the addition of a dune system or the expense of raising the berm elevation above naturally occurring elevations.

HQ: Contents as well as structures are subject to storm damages from inundation and waves in addition to erosion. The sponsor needs to be advised as to the level of protection afforded by the Federal project, and as part of the items of local cooperation they must regularly inform the community. Therefore, the report should clearly explain any damages that were not evaluated so it is understood by the community what protection they are getting.

JANUARY 2004

Conference Call with SAD/HQ: **Not discussed.**

---

f. Tillage Costs. The cost estimate (title page 2) estimates tillage costs based on a 3,000-foot-wide beach area. Three hundred feet may be more appropriate. The cost estimated should be reviewed to insure that tillage costs are accurately calculated.

OCTOBER 2002

CESAJ RESPONSE: PD-PN. Concur. Type will be corrected to indicate the requirement to till 3,000 square feet of beach area.

DISCUSSION: The response was acceptable.

REQUIRED ACTION: The draft report will be revised.

CESAJ ACTION TAKEN: Concur, The MCACES write up and estimates have been changed to reflect the correct value of 300 feet.

MARCH 2003

HQUSACE TEAM ASSESSMENT: **Resolved. The typographical error has been corrected.**

---

7. LEGAL REVIEW CONSIDERATIONS. No evidence of legal review is included in the report. The District must provide certification of legal review. Therefore, the following comments should be regarded as preliminary.

a. Cost-sharing

(1). For non-Federal shores, non-Federal interests must pay 100% of OMRR&R costs assigned. The report does not include this cost.

(2). The report does not explicitly break down cost sharing for initial construction, study and design costs. Planning and design costs are shared 50-50 by Federal and non-Federal interests.

b. Financial Analysis. The report should include the Sponsor's statement of intent to support the project and their understanding of the non-Federal Sponsor's responsibilities for project implementation. The report should also include the District's assessment that indicates the non-Federal Sponsor can meet its obligations in the Federal project.

OCTOBER 2002

CESAJ RESPONSE: PD-PN. Concur. Comment 7 will be fully addressed in the revised report and legal certification will be acquired prior to finalization of the report.

DISCUSSION: The certification of legal review should not be sent out with public review of the report.

REQUIRED ACTION: The draft report will be revised and legal certification will be acquired prior to finalization of the report.

CESAJ ACTION TAKEN: The report has been reviewed by OC and the legal certification is in the pertinent correspondence appendix. The sponsor's intent and financial capabilities along with the District's assessment has been added to the report.

MARCH 2003

HQUSACE TEAM ASSESSMENT: The required technical and legal certification documents have been submitted. The report addressed the financial capability of the non-Federal sponsor. **The HQ review team believes that this issue is resolved.**

---

8. PROGRAMMING AND BUDGETING: There is nothing in the President's Budget for FY 02 OR FY 03 for Lido Key. The AFB material indicates completion of the feasibility report scheduled for Feb/Mar FY02 so there may be a bit of a disconnect between report schedule and funding schedule.

OCTOBER 2002

CESAJ RESPONSE: PD-PN. Concur. The non-Federal sponsor is aware of these issues.

DISCUSSION: Based on the schedule (Final Report – July; DE Notice - August), we are working on a WRDA contingency

REQUIRED ACTION: No further required action.

CESAJ ACTION TAKEN: The sponsor is aware of the situation. Based on the current schedule, we are working on a WRDA contingency.

MARCH 2003

HQUSACE TEAM ASSESSMENT: The response is adequate. **This issue is resolved.**

---

9. AFB RESPONSE INFORMATION DOCUMENTATION. The District's responses (dated March 10, 2002) to concerns based on Alternative Formulation Briefing (AFB) materials contains important information that was not incorporated into the feasibility study. This information is replicated below in comment/response format. In some instances, the information is merely included here as an input to the record of decision-making for the proposed project. In other instances, the comment and response is followed by a review team analysis. In all cases, the district should consider revision of the draft feasibility report to insure that all of the most recent and up-to-date information on the study is available within the covers of the report.

OCTOBER 2002

CESAJ RESPONSE: Concur. The district will revise the draft feasibility report in accordance with previous PGM comments and the additional information below to insure that all of the most recent and up-to-date information on the study is provided.

a. Section 902 Cost Limits. The District needs to provide a total project cost estimate (using the required M-CACES format) and a comparison of the expected project costs versus the authorized project costs to determine whether the Section 902 cost limits are likely to be exceeded. From the information submitted in the AFB materials, it would appear that the initial construction cost for the tentatively selected plan is about 120% higher than the cost authorized in Section 364 of WRDA 99. Since that authorization also specified the annual nourishment cost, a second Section 902 cost limit was established for nourishment costs, which should also be analyzed in accordance with Appendix G of ER 1105-2-100.

OCTOBER 2002

CESAJ RESPONSE. Concur. MCACES estimate from the feasibility report indicates a Section 902 cost of $13,638,000 (initial construction) and $198,162,000 (periodic nourishment) equals $211,800,000. The authorized project cost is based on initial construction cost of $5,200,000,

and average annual cost of $602,000/50 years ($30,100,000) indicates a Section 902 limit of $7,513,000 (initial construction) and $111,477,000 (periodic nourishment) equals $118,990,000. The complete Section 902 analysis is available upon request.

	Initial	Nourish	Total
Expected Project Costs (000)	13,638	198,162	211,800
Authorized Project Costs (000)	7,513	111,477	118,990
Difference	6,125	86,685	92,810

REVIEW TEAM ANALYSIS: The expected project costs are not the same as the costs shown in the feasibility report. The cost estimate in the report is dated January 2001, but there appears to be a March 13,2002 revision to the M-CACES. Regardless of which costs are used, it appears that construction and nourishment costs are far in excess of the 20 percent cost growth limitation imposed by Section 902 and that the project will have to be returned to Congress for authorization.

CESAJ ACTION TAKEN: A Section 902 analysis has been added to the report using the October 2002 MCACES.

MARCH 2003

HQUSACE TEAM ASSESSMENT: **Partially Resolved.** The final report contains a detailed presentation of a Section 902 limit analysis and concludes that the 902 limits have been exceeded. However, there is still concern as to whether the appropriate cost has been identified for the limit on periodic nourishment. ER 1165-2-130, paragraph 7.e regarding periodic nourishment states that Federal participation in periodic nourishment may continue throughout the economic life of the project, but a specified period of time up to 50 years after initiation of construction must be recommended in planning reports. Since this project recommends nourishment in the 50th year following completion of construction, the last cycle of nourishment may occur near or beyond the limit on Federal participation and may require adjustment. The district should review its analysis in light of the regulation to determine if adjustment of the recommended nourishment costs is warranted, since they will result in setting the Section 902 cost cap for future nourishment.

SEPTEMBER 2003

CESAJ RESPONSE: Concur. The district will review the 902 analysis. Normally nourishment is not planned for year 50, but additional material is placed in the nourishment cycle prior to year 50 to ensure maintenance of the design berm until year 50. Report will be revised accordingly.

DECEMBER 2003

CESAJ RESPONSE: Concur, the AAEQ costs do account for a renourishment in year 50, which is not correct. The more accurate AAEQ cost should be $1,934,200 as opposed to the $1,954,700 in the report. It also appears as if 10 renourishments were accounted for in the 902 analysis instead of 9. These changes will need to be incorporated into an addendum reflecting the change and the reasons for the change.

HQ: This appears to be resolved.

---

b. Monitoring Cost. One of the AFB briefing displays shows a cost estimate including a $25,750/ month item for monitoring. This is a relatively high cost for this activity and needs further explanation and justification. Also, the division of monitoring responsibilities between the Corps and the sponsor needs to be carefully defined and the division of all-Federal versus all non-Federal OMRR&R monitoring costs need to be appropriately identified in the final cost allocation.

OCTOBER 2002

CESAJ RESPONSE: Concur. The $25,750 per month monitoring cost displayed in an earlier briefing display was for endangered species and turbidity monitoring as applied only during project construction. The current total cost estimate (based upon the 10/06/02 MCACES) for these monitoring efforts during initial construction of the project (over an estimated duration of 4.94 months) is $153,300 or $31,000/month. This cost is considered reasonable based upon recent contract costs.

Physical monitoring available for Federal cost sharing for the proposed shore protection project will be necessary to assess project performance and to ensure that project functionality is maintained throughout its 50-year design life. The monitoring plan is directed primarily toward assessment of project performance through systematic measurement of remaining beach fill volume, shoreline location, sediment characteristics and environmental habitat quality. Profile surveys should provide accurate assessments of beach fill volumes and a basis for assessing post-construction beach fill adjustments, as well as variations in the profile shape due to seasonal changes and storms. Other monitoring efforts related to surveying include bathymetric mapping of the borrow site and aerial photography of the beach fill project. Beach sediment sampling will be required to provide information on native and fill material characteristics, beach profile shape, and fill volume requirements for future nourishments. Provisions for protection of sea turtles include monitoring during construction and nest relocations, if necessary. Measured wind, wave, and water level information will be obtained from the best available existing data sources.

The proposed monitoring schedule and cost estimate are presented in Table 1 below. Cost shared pre-construction monitoring activities in FY03 and those for initial construction in FY04 are estimated at $135,800 per year. Cost shared project performance monitoring will be required through the first nourishment of the project in FY09. For the remainder of project life, annual Operations and Maintenance (O&M) of the project will be conducted in between nourishments at

100% non-Federal cost. All other monitoring, required to determine project performance and prepare for future nourishments, will be allocated according to current project cost sharing percentages.

TABLE 1: Monitoring Schedule and Cost Estimates

	PRE-CONST.	INITIAL CONST.					FIRST NOUR.	REMAINING	
ITEM	FY03	FY04	FY05	FY06	FY07	FY08	FY09	O&M	5-year
Beach Profile Surveys	$74,000	$74,000	$37,000	$37,000	$37,000	$74,000	$74,000	$36,000	$74,000
Wading Depth Surveys	$26,000	$26,000	$13,000	$13,000	$13,000	$26,000	$26,000	$13,000	$26,000
Aerial Photography	$13,800	$13,800	$13,800	$13,800	$13,800	$13,800	$13,800	$13,800	$13,800
Borrow Site Surveys	$10,000	$10,000				$10,000	$10,000		$10,000
Sediment Sampling	$12,000	$12,000	$12,000	$12,000	$12,000	$12,000	$12,000		$12,000
TOTAL	$135,800	$135,800	$75,800	$75,800	$75,800	$135,800	$135,800	$62,800	$135,800

REVIEW TEAM ANALYSIS: The above detailed information on the cost of the monitoring program should be added to the feasibility study. The report should also include justification for cost-sharing OMRR&R activities after initial construction is completed, since EM 1110-2-2902 requires OMRR&R to be performed by the non-Federal sponsor in such a manner and for such periods that are necessary to obtain the anticipated project benefits.

CESAJ ACTION TAKEN: Costs have been added to MCACES and the report. Explanations of the Florida permitting requirements have also been added. OMRR&R costs have been added to the average annual costs for the projects.

MARCH 2003

HQUSACE TEAM ASSESSMENT: **The concern is partially resolved.** The previous table on the cost of the monitoring program has been included in the feasibility report as Table III-20 and costs have been added to the MCACES estimate. Text was added to explain that monitoring is needed in accordance with Florida permitting requirements for shore protection projects to assure that there are no unforeseen impacts due to the project. OMRR&R costs have also been added to the average annual costs for the project. The report supports Federal cost sharing for certain activities that are needed prior to and after initial construction and periodic nourishment to assess the pre- and post beach fill conditions and resultant impacts. However, there are some further concerns relative to the discussion of monitoring costs, the values shown in the table and cost sharing. (1) It is unclear why cost-shared project performance monitoring (beach profiles, wading surveys, sediment sampling, and aerials photography) is proposed in the intervening years between construction and the first nourishment (years 05 through 07). It would appear that these activities should be classified as OMRR&R since they do not appear directly related to the construction and nourishment and are similar in nature to the OMRR&R costs displayed in the next to last column. The text should describe those efforts, which are cost-shared as project E&D activities to determine the effects of initial construction and the need for and effects of periodic

nourishment. These activities should be clearly distinguished from the sponsor-funded efforts to monitor the condition of the project, which relates to beach maintenance under OMRR&R. These different levels of effort would be expected to result in considerably different costs, contrary to the values shown in the table. (2) In addition, there is concern regarding the appropriateness of values shown in the table. The cost values do not appear to include contingencies or E&D, S&A, based on comparison to the MCACES Cost Estimate. The MCACES estimate includes a cost of $770,600 for monitoring in the initial construction cost. That value corresponds to the sum of total costs in the above table from FY03 through FY 09 (the first nourishment). Another $135,800 for monitoring is included in the year 5 MCACES nourishment costs, so there appears to be some double counting of the year 5 costs. (3) Also, the table shows that the annual O&M monitoring is estimated to cost $62,800 for the intervening years between nourishments. It would be expected that some O&M monitoring might be need in all years regardless of nourishment activities to assess the effects of storm events. In addition, the annual sponsor O&M costs shown in Table III-21 are only $16,900, far less than the $62,800 value in the above table. It is therefore not clear that the correct annual costs have been used in the benefit/cost analysis. The district should clarify the report to assure that the monitoring costs are accurate, the cost-shared project performance and OMRR&R activities are clearly described, and the appropriate values are used in the economic analysis and cost–sharing discussions.

SEPTEMBER 2003

CESAJ RESPONSE: Costs have been added to MCACES and the report. Explanations of the Florida permitting requirements have also been added. OMRR&R costs have been added to the average annual costs for the projects

---

DECEMBER 2003

CESAJ RESPONSE: The monitoring that is proposed in the intervening years 05 through 07 is required through the permitting process, they are considered construction costs since they have to be done in order to stay compliant with the permitting process. It does appear as though an extra monitoring cycle was thrown onto the initial construction, the MCACES should read $634,800 as opposed to the 770,600. E&D and S&A should be added to these costs, but contingency was already built into this and should be reflected correctly in the MCACES. The E&D and S&A are totaled out separately. The AAEQ O&M cost of $16,900 in Table III-21 is poorly defined; since the MCACES renourishment costs already have the monitoring included, that cost is included in the AAEQ cost for future renourishment; the O&M cost shown there, actually accounts for periodic surveys of the groins that are not accounted for in the actual maintenance of the groins. The $62,800 is for the first year after the first renourishment only and is included in the $16,900. After that first year preceeding the first renourishment, there should be enough data to better predict performance and the 5 year cycle would pick up the remaining monitoring. The table will need to be changed to reflect this.

HQ: This concern appears to be resolved.

---

c. **Public Access.** The discussions documented in the ITR meeting minutes indicate that perpetual easements are required to assure that the project lands are open to the public and remain so for the life of the Federal project. It is not evident that consideration was being given to the sufficiency of access (at street ends or through privately held lands) and parking to provide the general public with adequate access to use the beach areas. ER 1105-2-100, Section E-24d. (3) requires the provision of reasonable public access as a condition of Corps participation in storm damage reduction projects. Reasonable access is defined in ER 1105-2-100 as access points at intervals of approximately every one-half mile or less. The project as authorized in 1970 had characterized the area south of Coolidge Park and Lido Casino as privately owned shorefront, which did not qualify for Federal participation in beach fill. The report should explicitly delineate any project reaches that fail to meet the one-half mile requirement.

OCTOBER 2002

CESAJ RESPONSE: Concur. Public access as it relates to project cost sharing has been considered in accordance with ER 1105-2-100. Table 2 displays the cost sharing analysis developed for the subject study. As indicated in the table, based upon current shoreline ownership and use, 1,260 feet of the south end of the study area has been excluded from Federal cost sharing due to limited public access points. The table will be added to the subject report to "explicitly delineate any project reaches that fail to meet the one-half mile requirement."

REVIEW TEAM ANALYSIS: Publication of this information in the feasibility report would augment and clarify the current information on the cost sharing for the proposed project.

CESAJ ACTION TAKEN: The following table has been added to the report, the sponsor has assured the District that the 1,260 feet in discussion above will be open to the public and access will be provided prior to execution of a PCA. (See Attachment)

MARCH 2003

HQUSACE TEAM ASSESSMENT: **Not resolved.** The response states that Table 2 (included in the report as Table III-22) indicates that a 1,260-foot section at the southern end of the project currently lacks sufficient public access for Federal participation. The information is not evident in Table III-22, although a similar table attached to a memo on ITR in Appendix F shows that lots 25, 27, 28, 29, 30, and 31, with a width of 1,260 feet, are the specific parcels that lack public access. It is noted that the lot numbers and the total project lengths are different (7,165' vs. 8,280') between the two tables and the corresponding lots are labeled as 27 through 32 in Table III-22 with a total length of 1,400 feet. Presumably this segment currently fails the distance criteria for public access, but there is insufficient information in the report regarding public access. In particular, the 6,700 feet of shoreline between profile lines R37 and R43.5 appears to be continuously developed with condominiums, and it is not readily apparent from the aerial photos in the report that there are any street ends or public access except maybe at each end of that segment. This may represent a distance of several thousand feet where access could currently be an issue relative to Federal participation (about half the project length).

Although the report discusses access and parking requirements, there is no documentation of either the adequacy of existing parking to handle the general public or the accessibility to the beach areas through the condominium properties, which separate the beach from the public roadway running parallel to it. No details are provided on how the sponsor plans to resolve this issue prior to construction, to assure that the recommended project cost sharing is appropriate. The report recommendations and Certification of Public Accessibility contain what appears to be standard language for local cooperation, that do not allude to any public access issue. No mention is made of any further action during the future design phases to assure that the issue is either addressed or the cost sharing is modified accordingly. Paragraph 6.h.(3) on page 13 of ER 1165-2-130 reads as follows: "In the event public access points are not within one-half mile of each other, either an item of local cooperation specifying such a requirement and public use throughout the project life must be included in the project recommendations or the cost sharing must be based on private use."

Further information should be presented on the existing parking and public access conditions, the public use policies at condominiums and hotels, and what actions are necessary to provide public access in keeping with the recommended cost sharing, which has been based on the maximum Federal participation for the given land uses. Specific requirements should be included in the recommendations so it is clear in the district's report and the Report of the Chief of Engineers that some action is necessary by local interests to qualify for the recommended cost sharing. Otherwise, the cost sharing should be revised to reflect the existing private use.

SEPTEMBER 2003

CESAJ RESPONSE: Concur. Further info will be provided in the report to document where the access is. The Sponsor has obtained the required access.

DECEMBER 2003

CESAJ RESPONSE: This will be added to the report.

HQ: **The public access locations should be identified in the report.**

---

10. ADDITIONAL COMMENTS ON THE REPORT.

a. Independent Technical Review. EC 1165-2-203 specifies that all decision documents (draft or final reports with NEPA documentation) will receive an independent technical review with documentation in a certification and findings, which cites the major issues that were raised and documents how they were resolved, and identifies the technical review team leader and team members. With regard to the ITR documentation package submitted, the ITR comments are divided into two groups, one group specifically targeting the Environmental Assessment (EA) and the other group includes all other comments. This division of comments and the nature of the comments in each group imply that the Feasibility Report and the EA were reviewed as

separate documents with little consideration of how the two documents interrelate. There is concern over the degree to which ITR comments were addressed in the documentation provided. No responses were documented for the ITR comments on the EA and only 15 of the other 39 comments related to formulation, design and model calibrations had meaningful responses. The A-E's quality certification document for the draft report dated February 2002 is provided, but there is no certification of district working-level ITR of the final documents. An A-E cannot appropriately draw conclusions or make recommendations for the Corps, so the district should provide documentation of their quality process. It would also be inappropriate for any individual in the district to represent that they have the expertise needed to QA all the technical aspects of a feasibility report.

SEPTEMBER 2003

CESAJ RESPONSE: It is incorrect to assume that separation of ITR comments implies that the document were reviewed separately. They were not. The ITR comments and responses will be reviewed by the District and responses will be revised as appropriate. Certification of District acceptance of ITR will be provided.

b. Environmental Documentation. The district has satisfactorily addressed all environmental policy compliance concerns raised during earlier reviews. This EA is especially well done. However, the Feasibility Report does not adequately present the extraordinary consideration given the potential effects of each alternative on endangered species during formulation of this project. The significant effect of these environmental considerations should be highlighted in the Syllabus, the Introduction, the Plan Formulation Section, the Study Summary, the Conclusions, and Recommendations sections. Further, the Environmental Considerations section of a Feasibility Report should emphasize the Corps commitment to adhere to the environmental commitments and mitigation measures described in the EA and the terms of the Biological Opinions.

SEPTEMBER 2003

CESAJ RESPONSE: Per ER 200-2-2, there is no requirement to integrate the EA and the report.

---

c. Items of Non-Federal Cooperation.

(1). On page 80, the beginning of paragraph 216a(2) should read "Provide, during the first year of construction," to reflect current policy on payment of additional funds to cover the non-Federal share of PED costs.

SEPTEMBER 2003

CESAJ RESPONSE: The wording will be changed at the beginning of paragraph 216a(2).

(2). Item u. regarding public ownership repeats the wording of item q. and should be deleted. Specific wording should be added to reflect the need for additional public access in order for the project area to qualify for the recommended cost sharing.

SEPTEMBER 2003

CESAJ RESPONSE: CESAJ District Council insists including item q and insists it is sufficient to address the Federally mandated public access requirements.

d. Formulation of Project Length. The project has a length of 8,280 feet exclusive of the tapers, and a total length of 10,130 feet. The area projected to have the most significant long-term shoreline recession is in Reach 2 according to Figure A-16, with significantly less changes in Reach 3, which includes areas of historic accretion or minor erosion. It is noted that the historic beach fills have predominantly occurred in Reach 2, the area of greatest erosion. The engineering appendix indicates that the project design accounted for the variation in erosion rates along the shoreline, and provided for the appropriate fill and nourishment quantities. It is not apparent that an incremental analysis was done of the project reaches to demonstrate that the optimum project length has been recommended. There also is no economic evaluation of the recommended tapers to demonstrate that it is more economical to construct them outside of the protected area versus within. Littoral material accretes in reach 1 from profile R-35 north and the project includes fill in that vicinity from profile lines R-35.5 through R-34.5. The southern terminus includes a taper plus a terminal groin, which appear to provide substantial erosion protection to the public South Lido Key Beach (in Reach 4), although the economic analyses and cost sharing appear to have addressed only reaches 2 and 3 combined. ER 1165-2-130, paragraph 9.c. (Policies Regarding Formulation, Evaluation, and Cost Allocation) Item (3) states that when the cost of construction per unit of benefited shoreline is not reasonably uniform for the entire project area, the project should be subdivided into elements (reaches) within which this condition is met. The first cost for the HSDR measures for the project, or each of the subdivided reaches will then be allocated to the various categories of benefited shore properties. The Lido Key study area was divided into four reaches for evaluation of HSDR measures, however there is no incremental information on the formulation of measures by reach despite the variation between them. Further analyses should be provided to demonstrate that the recommended plan is the optimum length and the appropriate basis for cost allocation has been identified.

SEPTEMBER 2003

CESAJ RESPONSE: The report did break the shoreline into reaches (Engineering Appendix Page A-34) . Sufficient benefits were generated for Reaches 2 and 3.

DECEMBER 2003

CESAJ RESPONSE: The tapers are designed based more on engineering data than on economic data, they are built in such a way that the beach fill presents less of a protrubence in the shoreline. The protrubence causes extremely high end losses to a beach fill, the tapers greatly reduce these losses and do present an economic benefit of reducing periodic renourishment volumes, but the design comes from the length/width of the berm, existing bathymetry and shoreline orientation. They are built at the terminus of the Federal project instead of within the project limits, because their reduced width would not provide the same level of HSDR benefits as the design berm. Therefore, benefits are claimed based on the design berm for the project limits, and the tapers go beyond the limits being claimed for benefits since they contribute very little to the HSDR benefits.

The reaches were defined based on the coastal process along the shoreline, not based on their economic value. With the relatively short length of all of Lido Key, a large protrubence over a short length (1 mile for Reach 2), such as that which would be caused by a SPP construction template would be subject to very large erosion rates. These accelerated high erosion rates would require large renourishment volumes at a more frequent interval, this is one of the main reasons that the local "band-aid" approaches have not been successful. The project length was determined based on the engineering reasoning that the short lengths of Reach 2 or Reach 3 alone would result in an unsound design that would be subject to failure. Since the design of a taper to reduce the large erosion rates in Reach 2 would encompass the majority of Reach 3, it is preferable to include Reach 3 in the project limits and provide HSDR benefits for this highly developed piece of shoreline. Otherwise, once the taper and the initial construction berm equilibrated it would leave this reach without an ample shoreline extension or future renourishment and subject to damages once again.

HQ: The purpose of tapers is understood, but the recommendation to provide terminal groins versus tapers located either inside of outside the protected area should be supported by NED evaluations/rationale. This particular project has an area of accretion between reaches 2 and 3. It is not clear why there is need for a long taper into reach 3 in this case. I believe there was also a question on the degree of investment being different between reaches 2 and 3. This warrants an incremental presentation to assure that the NED plan is recommended, since I believe reach 3 involved investment along inlet shoreline with a taper and a terminal structure in addition to the beachfill.

JANUARY 2004

Conference Call with SAD/HQ: Need to demonstrate the incremental analysis with costs and benefits shown in the text and explain the groins and tapers at south end of island.

e. **MCACES Cost Estimate**. Review of the MCACES Cost Estimate found that the cost estimates for periodic nourishment used escalation factors from ER 1110-2-1304 in developing the costs for nourishment costs in future years during the period of analysis. Since there appears to be no presentation in the report on the calculation of annualized costs, it is not clear whether the escalation factors were incorporated in the calculation of annual costs for nourishment or whether they were used for budgetary and financing considerations only. Corps economic

evaluations are based on a constant dollar approach, so if the escalated costs for nourishment were used in the benefit/cost analysis, it would not be appropriate and should be revised.

SEPTEMBER 2003

CESAJ RESPONSE: Concur. The calculations of annual costs will be revisited to assure that the same price level was used throughout those calculations. Estimates of annual costs will be revised, if necessary.

April 2004

CESAJ RESPONSE: The escalation has been removed from the MCACES. The Differences in the MCACES cost estimates for future renourishments is due to differing borrow areas, they have not been escalated. They vary due to the borrow areas being different distances away from the project site. It is assumed that the nearer borrow areas will be used first, with each subsequent nourishment having to haul the material a longer distance. This results in the higher price for each renourishment.

DEPARTMENT OF THE ARMY
SOUTH ATLANTIC DIVISION, CORPS OF ENGINEERS
ROOM 9M15, 60 FORSYTH ST., S.W.
ATLANTA GA 30303-8801

REPLY TO
ATTENTION OF

CESAD-CM-P

MEMORANDUM FOR Commander, HQ USACE (CECW-ZA), 441 G Street NW, Washington DC 20314-1000

SUBJECT: Sarasota County, Florida, Hurricane and Storm Damage Reduction Project, Lido Key (013570) – Final Report Submittal Package

1. Reference memorandum, CESAJ-PD-PN, Sarasota County, Florida, Hurricane and Storm Damage Reduction Project, Lido Key (013570), 5 November 2002.

2. I concur with the conclusions and recommendations of the District Engineer.

Encl

PETER T. MADSEN
Brigadier General, US Army
Commanding

Public Notice

US Army Corps of Engineers
South Atlantic Division
60 Forsyth Street S.W.
Room 9M15
Atlanta, GA 30303-8801

FEASIBILITY REPORT
FOR
Sarasota County, Florida
Lido Key
Hurricane and Storm Damage Reduction Project

3 December, 2002

COMPLETION OF STUDIES:

Notice is hereby given that the Jacksonville District and South Atlantic Division Engineers have completed the Final Feasibility Study of the hurricane and storm damage reduction project on Lido Key, Sarasota County, Florida. The study was prepared in response to Resolution, Docket 2458, adopted September 14, 1995, by the Committee on Transportation and Infrastructure, U.S. House of Representatives. The resolution directed the Corps to develop studies for the purpose of providing hurricane and storm damage reduction solutions for Lido Key. The Feasibility Study was conducted as a cost-shared study, with the City of Sarasota as the non-Federal study sponsor.

FINDINGS AND RECOMMENDATIONS:

The recommended plan of improvement would provide initial restoration and periodic nourishment of an 80 foot beach berm at elevation +5 ft NGVD over 1.56-miles of shoreline, with a groin field at the southern limits of the project. Periodic nourishment, accomplished at five-year intervals, would optimize net primary benefits over the 50-year life of the project. Borrow material would be obtained from a site approximately 9 miles offshore.

Based on October, 2002 prices, estimated first cost of the plan is $12,632,200 of which $7,769,5000 would be Federal while $4,862,700 would be non-Federal. Average annual benefits and costs based on an interest rate of 6 1/8 percent are estimated at $4,319,900 and $1,954,700 respectively with a resulting benefit-cost ratio of 2.2.

The recommendations contained herein reflect the information available at this time and current policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the

recommendations may be modified before they are transmitted to the Congress as proposals for authorization and/or implementation of funding.

COORDINATION:

The report was coordinated with appropriate Federal, State, and local interests. All pertinent coordination, review, and approvals were obtained as part of the National Environmental Protection Act process. The U.S. Fish and Wildlife Service provided a Fish and Wildlife Coordination Act Report dated August 21, 2002. A Finding of No Significant Impact was signed on September 17, 2002.

The City of Sarasota is the project sponsor and by letter dated October 8, 2002 expressed support for the conclusions and recommendations of the report and their intent to secure funding for project implementation.

PUBLIC INVOLVEMENT:

The list of alternatives and findings of the report have been coordinated with the public through a variety of mailings and information meetings held by the sponsor. The NEPA process has kept the public informed of the progress and findings of the report.

REVIEW AND AUTHORIZATION:

Prior to adoption of the proposed project, the study evaluations and report findings will be reviewed by the Chief of Engineers and the Assistant Secretary of the Army for Civil Works. A coordinated review, including affected states and other Federal agencies, will also be accomplished at that time.

The Chief of Engineers will review the report and forward a recommendation to the Secretary of the Army. The Assistant Secretary of the Army, in consultation with the Office of Management and Budget, then establishes the administration position on whether the proposal should be recommended to Congress for authorization.

VIEWS OF INTERESTED PARTIES:

Interested parties may present written views on the report to the Chief of Engineers and the Secretary of the Army. Such communications should be mailed to the U.S. Army Corps of Engineers, Deputy Commanding General for Civil Works, ATTN: CECW-B, 441 G Street NW., Washington, DC 20314-1000, within 30 days from the date of this notice. Copies of information received by mail will be regarded as public information unless the correspondent requests otherwise. Such a request will limit the usefulness of the information because of the need for full public disclosure of all factors relevant to the decision.

FINAL ACTION BY THE CHIEF OF ENGINEERS:

The Chief of Engineers will not submit a recommendation to the Secretary on the report until after the expiration of this notice or any extension thereof that may be granted, and full consideration of all information submitted in response thereto.

REPORT INFORMATION:

Further information may be obtained from the U.S. Army Corps of Engineers, Jacksonville District Office, P.O. Box 4970, Jacksonville, Florida 32232-0019, Daniel R. Haubner (904-232-2798). Interested parties may obtain copies of the feasibility report, including the main report and the EIS, from the District Commander free of charge, as long as copies are available.

Additional copies of the report volumes will also be on file and available for public review at the libraries shown on the enclosed list (Enclosure 2). Please pass along a copy of this public notice to anyone who may be interested in the report and who has not received a copy.

Peter T. Madsen
Brigadier General, U.S. Army
Division Engineer

Enclosures

SARASOTA COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION PROJECT
LIDO KEY
FEASIBILITY REPORT WITH ENVIRONMENTAL ASSESSMENT

SYLLABUS

1. The Lido Key Hurricane and Storm Damage Reduction Study area comprises 2.4 miles of the Lido Key Gulf of Mexico shoreline. The island, approximately 45 miles south of Tampa, is separated from Longboat Key to the north by New Pass and from Siesta Key to the south by Big Sarasota Pass. Sarasota Bay and the Intracoastal Waterway separate Lido Key from the mainland. A hurricane and storm damage reduction project for Lido Key, Florida was authorized by the December 31, 1970 River and Harbor Act for the mid-section of Lido Key's Gulf of Mexico shoreline and for periodic nourishment on an as-needed basis. Federal participation was limited to an initial period of 10 years. The project was never completed and was subsequently deauthorized in House Document 91-320 on January 1, 1990. Resolution, Docket 2458, adopted September 14, 1995, by the Committee on Transportation and Infrastructure, U.S. House of Representatives, requested the Secretary of the Army to determine the advisability of providing a hurricane and storm damage reduction project for Lido Key. A Reconnaissance Phase Assessment was prepared in January 1997 recommending Federal participation which lead to the feasibility phase. The project was then authorized once more under Section 364 of the Water Resources Development Act (WRDA) of 1999; this allowed for initial construction of a shore protection project and for periodic renourishment over 50 years of Federal participation. This authorization was contingent upon the Secretary determining that the project is technically sound, environmentally acceptable, and economically justified, as appropriate. That is the purpose of this report.

2. This report summarizes a cooperative cost-shared feasibility study on hurricane and storm damage reduction problems of the Gulf of Mexico shoreline of Lido Key, Sarasota County, Florida. Presented in this report are the results of planning, engineering, environmental, geotechnical, economic, and real estate studies of the area and its shoreline erosion problems. An Environmental Assessment is included in this report.

3. For purposes of this study, five characteristic reaches (New Pass Reach and Reaches 1 through 4) were delineated based on beach profile and upland development characteristics, forcing mechanisms causing beach change, and the locations of recent fill projects and disposal operations. The selected plan consists of restoration of 8,280 ft of shoreline along Reach 2 and Reach 3 of the study area. Reach 2 extends from the R-35 (400 ft north of John Ringling Boulevard) south to R-40. This approximately 5,000-ft long segment, lined with condominiums, motels, and houses, is very narrow due to ongoing erosion. Reach 3 extends from DNR-40 to DNR-43. This reach is heavily developed with condominiums lining the shoreline. Restoration of these shorelines would require placement of approximately 460,200 cy of design fill and

614,500 cy of advance material (1,074,700 cy total). Three borrow areas have been delineated for use (Borrow areas 5 – 7) and are located between 7.2 and 9.5 nautical miles offshore of Lido Key. Nourishment would be provided at 5-year intervals over the 50-year life of the project. Three groins will be constructed at an elevation of +5-ft NGVD along the southern portion of the study area. Each structure, varying in length from 320 – 650 ft, will consist of 400 lb core stone overlain by two layers of 2-ton armor stone. Initial beach fill construction costs would be approximately $10,575,000 with periodic renourishment varying between $5.8 million and $6.0 million depending on the borrow area identified for each renourishment. Groin field construction costs are estimated as $2,057,200. This allows for a total initial construction cost of $12,632,200. When the Interest During Construction (IDC), periodic renourishment, and Operation and Maintenance values are considered, the average annual cost of this project is estimated to be $1,954,700 when computed at 6 and 1/8% over a 50 year project life. Hurricane and Storm Damage Reduction benefits are estimated to be $4,319,900, which produces a benefit-to-cost ratio (BCR) of 2.2.

4. Since this project was re-authorized in WRDA 1999 with set funding limits, it is subject to Section 902 of WRDA 1986. Section 902 established the requirement that the cost of projects authorized in and subsequent to WRDA 86 would be the maximum cost of that project. The purpose of Section 902 was to insure against cost overruns. The cost of the project could be increased for price level changes, but the scope of the project could not be changed, without Congressional approval, if it increases project costs by more than 20 percent. This study shows that the costs have exceeded the 902 limit.

5. Federal and non-Federal cost sharing for the selected plan would be based upon shoreline ownership and use at the time of construction. Based upon current estimates of project lengths devoted to public and private (developed and undeveloped) use, cost apportionments of the selected plan were determined. Cost sharing, based on shoreline ownership, for the groin field and initial construction of the fill to be placed along Reach 2 and Reach 3 would be 62.4% Federal and 37.6% non-Federal. When lands, easements, relocations and rights of way are considered, this works out to a Federal cost of $7,769,500 and a non-Federal cost of $4,862,700.

SARASOTA COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION PROJECT
LIDO KEY
FEASIBILITY REPORT WITH ENVIRONMENTAL ASSESSMENT
PERTINENT DATA

PHYSICAL DATA (Project Life = 50 Years)			
Project Length (ft)	8,280		
Berm Crest Elevation (ft NGVD)	5		
Berm Width Extension from ECL (ft)	80		
Foreshore Slope (Berm-MLW)	1 V to 12 H		
Nearshore Slope (MLW-existing profile)	1 V to 35 H		
Post-placement Erosion Rate (cy/yr)	122,900		
Volume of Initial Fill (cy)	1,074,700		
Volume of Design Fill (cy)	460,200		
Volume of Advance Nourishments (cy)	614,500		
Nourishment Interval (yr)	5		
FINANCIAL DATA (Interest Rate = 6.125 % October 2002 Price Levels)			
INITIAL CONSTRUCTION COSTS (groin and beach)	$12,632,200		
INITIAL BEACH FILL CONSTRUCTION COSTS	$10,575,000		
EACH FUTURE NOURISHMENT COST	$5.8 – 6.0 million		
GROIN CONSTRUCTION	$2,057,200		
INTEREST DURING CONSTRUCTION (IDC)	$835,700		
ANNUAL PROJECT COSTS			
Interest and Amortization			
Initial Construction (with IDC)	$869,400		
Future Beach Fill Nourishment	$1,044,400		
Groin Maintenance	$24,000		
Sponsor O&M	$16,900		
Total Annual Project Costs:	$1,954,700		
PRIMARY BENEFITS			
Prevention of Damage to	Reach 2 & Reach 3		
Upland Development	$3,563,300		
Coastal Armor	$37,800		
Backfill	$290,000		
Loss of Land	$428,800		
Total Annual Project Benefits:	$4,319,900		
BENEFIT – TO – COST RATIO	2.2[1]		
PROJECT COST SHARING, INITIAL CONSTR.			
Percent (%): Federal	62.4%		
Non-Federal	37.6%		
Dollars($): Federal	$7,769 ,500		
Non-Federal	$4,862,700		
SECTION 902 ANALYSIS	*Initial Const.*	*Nourishment*	*Total*
Authorized Project Costs ($1,000)	7,209	98,576	105,785
Expected Project Costs ($1,000)	13,762	167,654	181,416
Differences	6,553	69,078	75,631

[1] Benefit-To-Cost Ratio includes Interest During Construction

SARASOTA COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION PROJECT
LIDO KEY
FEASIBILITY REPORT WITH ENVIRONMENTAL ASSESSMENT

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SARASOTA COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION PROJECT
LIDO KEY
FEASIBILITY REPORT WITH ENVIRONMENTAL ASSESSMENT

I. INTRODUCTION

1. This report presents the feasibility study for hurricane and storm damage reduction for the Gulf of Mexico shoreline of Lido Key, Sarasota County, Florida. The report, prepared in accordance with U.S. Army Corps of Engineers ER 1105-2-100 *Planning Guidance Notebook* (April 22, 2000), documents the results of planning, engineering, environmental, geotechnical, economic, and real estate analyses of Lido Key and its shoreline erosion problems.

STUDY AUTHORITY

2. A hurricane and storm damage reduction project for Lido Key, Florida was authorized by the December 31, 1970 River and Harbor Act which provided for beach restoration of 1.2 miles of the mid-section of Lido Key's Gulf of Mexico shoreline and for periodic nourishment on an as-needed basis. Federal participation was limited to an initial period of 10 years. The City of Sarasota completed the northern half of the project in 1970 without Federal participation. The project was never completed and was subsequently deauthorized in House Document 91-320 on January 1, 1990 in accordance with the provisions of Section 1001(b)(1) of the 1986 Water Resources Development Act.

3. A general investigative study of the project was undertaken in response to Resolution, Docket 2458, adopted September 14, 1995 by the Committee on Transportation and Infrastructure, U.S. House of Representatives that stated:

> "Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, that, the Secretary of the Army is requested to review the report of the Chief of Engineers on Lido Key, Sarasota, Florida, published as House Document 320, 91st Congress, 2nd Session, with a view to determining the advisability for providing hurricane and storm damage reduction works."

4. Resolution, Docket 2458, adopted September 14, 1995, by the Committee on Transportation and Infrastructure, U.S. House of Representatives, requested the Secretary of the Army to determine the advisability of providing a hurricane and storm damage reduction project for Lido Key. A Reconnaissance Phase Assessment was prepared in January 1997. Recommendations resulting from this assessment included a hurricane and storm damage reduction project along a 9,100-ft segment of Lido Key extending from Florida Department of Environmental Protection (FDEP) monuments R-35 to R-44.

5. Section 364 of Water Resources Development Act (WRDA) 1999 reauthorized the project as follows:

Each of the following projects is authorized to be carried out by the Secretary, if the Secretary determines that the project is technically sound, environmentally acceptable, and economically justified, as appropriate:

(2) LIDO KEY BEACH, SARASOTA, FLORIDA —

(A) IN GENERAL — The project for shore protection, Lido Key Beach, Sarasota, Florida, authorized by section 101 of the River and Harbor Act of 1970 (84 Stat. 1819) and deauthorized under section 1001(b) of the Water Resources Development Act of 1986 (33 U.S.C. 579a(b)), at a total cost of $5,200,000, with an estimated Federal cost of $3,380,000 and an estimated non-Federal cost of $1,820,000.

(B) PERIODIC NOURISHMENT — The Secretary may carry out periodic nourishment for the project for a 50-year period at an estimated average annual cost of $602,000, with an estimated annual Federal cost of $391,000 and an estimated annual non-Federal cost of $211,000

STUDY PURPOSE AND SCOPE

6. The purpose of this report is to present a feasibility assessment of hurricane and storm damage protection for the Gulf of Mexico shoreline of Lido Key. This report will determine if the project is technically sound, environmentally acceptable, and economically justified. Appendix A, Engineering Analysis and Design, includes suitable data to proceed into the preconstruction, engineering, and design (PED) phase of the project. Following the PED phase, construction of the recommended plan will be contingent upon available Federal and non-Federal sponsor funds and will be subject to Department of the Army policy, guidance, and regulations.

Location

7. Lido Key is a 2.4-mile long barrier island located on the Gulf of Mexico coast of Florida in Sarasota County (Figure I-1). This island, approximately 45 miles south of Tampa. Lido Key is separated from Longboat Key to the north by New Pass (which has a Federal navigation project authorized in 1962 under Section 107) and from Siesta Key to the south by Big Sarasota Pass (which does not have a Federal project). Sarasota Bay and the Intracoastal Waterway (a Federal navigation project authorized in 1945) separate Lido Key from the mainland. John Ringling Causeway Bridge provides mainland access to Lido Key.

8. The Lido Key shoreline is characterized by both public and private beaches. North Lido Public Beach, extending south from about 400 ft north of R-32 to R-35, is an

undeveloped natural beach with limited parking. Lido Key Public Beach, extending south from R-35 to 400 ft south of R-38, is extensively used. The next segment, extending about 4,700 ft from 400 ft south of R-38 to 100 ft south of R-43, is privately owned with hotels, motels, and condominiums lining the shoreline. South Lido Public Beach, owned by Sarasota County and extending 1,300 ft to the south, is largely undeveloped and heavily used.

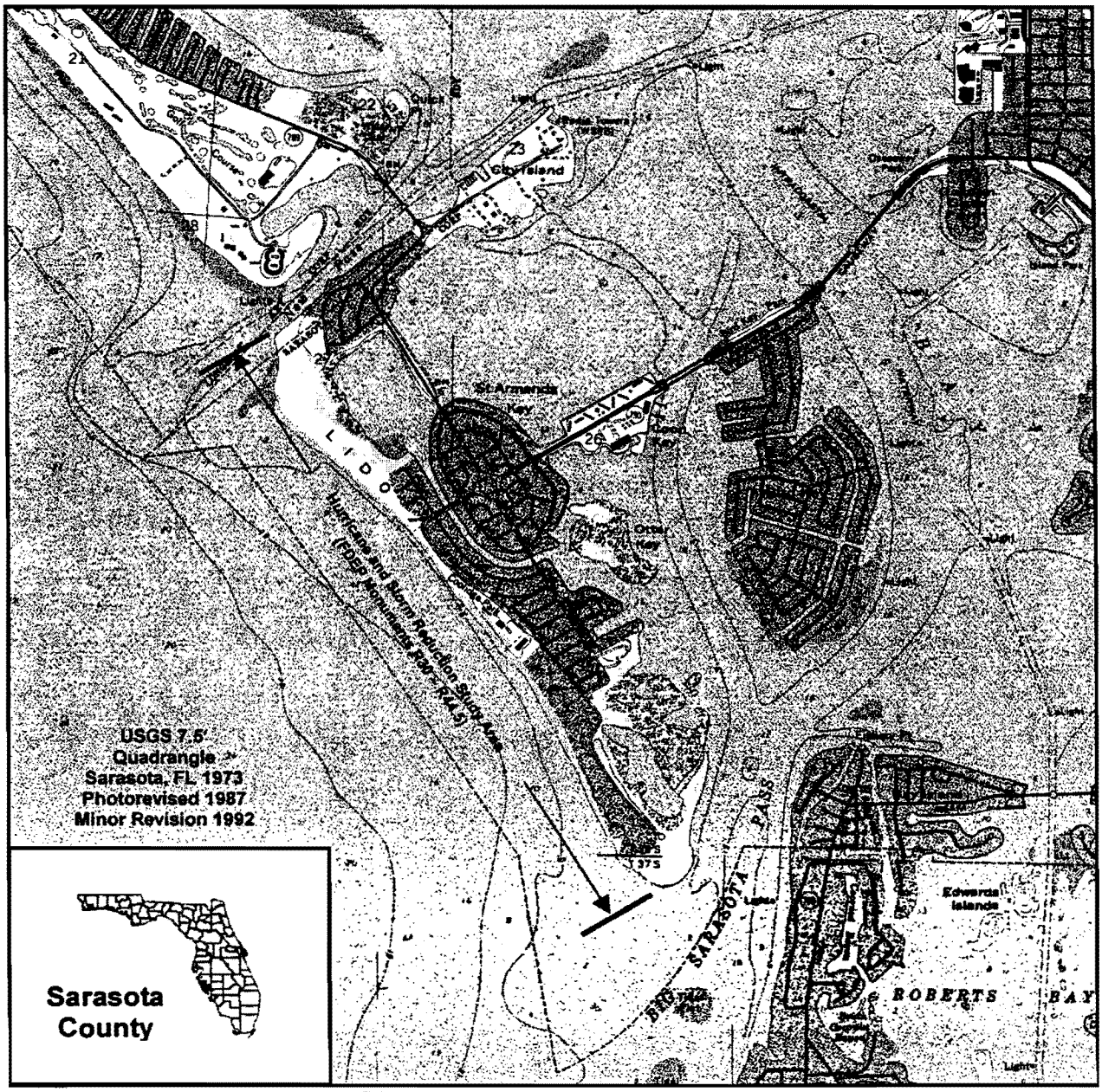


Figure I-1 Lido Key Study Area

Report Participants and Coordination

9. The local sponsor, the City of Sarasota and its consultants, Coastal Planning and Engineering, Inc. provided much of the engineering information to assist with this study. The Jacksonville District coordinated the report with the following Federal, state, and local agencies:

U.S. Fish and Wildlife Service
U.S. Bureau of Public Roads
U.S. Water Pollution Control Administration
U.S. National Park Service
Florida Department of Environmental Protection
Florida Game and Fresh Water Fish Commission
Florida State Historic Preservation Office
Sarasota County
City of Sarasota

II. PRIOR STUDIES AND REPORTS

10. Summaries of prior Federal studies relevant to this project are as follows:

Detailed Project Report on Sarasota Passes, Sarasota, FL, U.S. Army Corps of Engineers, July 1962 — The report recommended that New Pass be improved to provide the following: an entrance channel 10 ft deep and 150 ft wide in the Gulf of Mexico at New Pass; an inner channel 8 ft deep and 100 ft wide through New Pass and extending across Sarasota Bay to the Intracoastal Waterway; side channels to Payne Terminal and the City Pier; and turning basins 8 ft deep, 300 ft wide, and 300 to 700 ft long at Payne Terminal; and 8 ft deep, 300 ft wide, and 300 to 500 ft long at the City Pier. The authorized dimensions were provided in 1964.

Survey-Review Report on Sarasota Passes, Sarasota, Florida, U.S. Army Corps of Engineers, November 1963 — The report was unfavorable because New Pass, as authorized by the July 1962 report, was determined to be sufficient to meet present and future navigation needs of the study area.

Beach Erosion Control Study Sarasota County, Florida: Interim Report on Lido Key, U.S. Army Corps of Engineers, September 1968 — The purpose of the report was to define the beach erosion problem at Lido Key, to determine the most economical method to alleviate the problem, and to determine Federal and non-Federal project cost-shares. The report determined that the most economical method of improvement was beach nourishment, with periodic renourishment as necessary, of 6,200 ft of shoreline along mid-Lido Key. Borrow material was to be obtained by hydraulic dredge from shoals in Big Sarasota Pass and/or from a spoil area, offshore the northwestern tip of Lido Key. This plan was determined to be economically justified.

Beach Erosion Control Project for Lido Key, Sarasota County, Florida, U.S. Army Corps of Engineers, April 1970 — The report was prepared in partial response to resolutions of the Committee on Public Works of the United States Senate and House of Representatives adopted 21 August 1964 and 3 September 1964, respectively. The report recommended initial construction and periodic nourishment, as needed, of a protective and recreational beach along 1.2 miles of Lido Key. The recommended plan called for providing a 125-ft wide berm, at elevation +5 ft mean low water, along the Lido Key shorelines proceeding south a distance of 6,200 ft from a point 400 ft north of the Gulf of Mexico terminus of John Ringling Boulevard. Borrow sands were to be obtained from Big Sarasota Pass and, to a lesser extent, from New Pass. The report also recommended granting the local sponsor credit, contingent upon approval by the Chief of Engineers, for eligible work done on the project before authorization.

Beach Erosion Control Study for Sarasota County, Florida with Environmental Impact Statement, U.S. Army Corps of Engineers, July 1984 — This study did not address Lido Key.

General Design Memorandum, Sarasota County, Florida, U.S. Army Corps of Engineers, July 1991 — This study did not address Lido Key.

Section 905(b) (WRDA) Analysis: Reconnaissance Phase Assessment for Lido Key, Sarasota County, Florida, U.S. Army Corps of Engineers, January 1997 — Project alternatives examined in this assessment, in addition to the no-action condition, included four different beach fill conditions of 1-, 25-, 50-, and 100-ft berm extensions constructed at +5-ft MLW elevation along a 9,100 ft section of Lido Key from Florida Department of Environmental Protection (FDEP) profile R-35 to R-44. Economic analyses of storm damage reduction benefits, recreation benefits, and estimated project costs resulted in benefit to cost ratios of 4.6, 6.8, 7.8, and 8.1 for the respective project conditions. Recommendations stated that (1) the plan developed in the report was technically sound, economically justified, socially and environmentally acceptable, and (2) sufficient justification existed for Federal participation in a feasibility study for storm damage reduction works on Lido Key.

11. Summaries of prior non-Federal studies relevant to the project are as follows:

Brief Report on Coastal Protection at South Lido Beach, University of Florida College of Engineering, Gainesville, July 1961 — Recommendations generated from this report included artificial nourishment and the placement of groins. Design profiles of the groins are included in this report.

Lido Study No.2 – A Preliminary Plan for Public Beach Expansion and Shoreline Stabilization, City of Sarasota, November 1965 — Recommendations generated from this report included the acquisition and development of a public beach

facility and stabilization of the Lido Key shoreline such that future erosion may be minimized.

Long Range Beach Management and Erosion Control Plan and Preliminary Beach Restoration Element Design for Lido Key, Sarasota County, Florida, Coastal Planning and Engineering, Inc, January 1991 — This report presents a comprehensive beach management plan for Lido Key including necessary planning efforts and a recommended plan to offset erosion problems.

Lido Key Beach Restoration Project State Authorization Report, Coastal Planning & Engineering, Inc., August 1991 — This report builds on the January 1991 report and summarizes related geotechnical, environmental, and economic investigations. Based on these investigations and findings, a project was found to be economically and environmentally justified and recommended for State of Florida authorization.

Lido Key Beach Restoration Project Sand Search, Coastal Planning & Engineering, Inc., May 1992 — This report documents expanded hydrographic, geotechnical, and environmental assessments of the beach restoration project.

Big Sarasota Inlet Management Plan, Coastal Planning & Engineering, Inc., September 1993 — A key recommendation of this report is to use the Big Sarasota Pass ebb shoal as a borrow area source of beach quality sand for Lido Key.

New Pass Inlet Management Plan, Coastal Planning & Engineering, Inc., May 1994 — The plan recommends a revised New Pass maintenance dredged material sand sharing ratio of 84.6% to Lido Key and 15.4% to Longboat Key to replace the existing "not equitable" 65/35 ratio agreement.

Cultural Resource Investigation and Remote Sensing Magnetometer Survey Results for Two Proposed Offshore Sand Borrow Sites at Lido Key, Florida, Coastal Planning & Engineering, Inc., August 1995 — This report provides a historical cultural resource perspective for Lido Key and summarizes recent cultural resource investigations conducted at two potential offshore borrow sites. No magnetic anomalies were identified at these two sites.

III. PLAN FORMULATION

THE PLANNING PROCESS

12. The planning process that has evolved at the Federal level to assist in formulating and evaluating water resource projects is based on the National Economic Development objective, or NED. The NED principle is a policy developed to guide Federal water resource planners in their choice of problem solutions. The NED process

ensures that the recommended project is the one that will maximize net benefits. The process also ensures that the recommended project outputs, the benefits to the nation from the use of the resource, will exceed the cost of project implementation.

13. The Federal planning process consists of the following major steps:

a. specification of the water and related land resource problems and opportunities associated with the Federal objective and specific state, county, and municipal concerns,

b. inventory, forecast, and analysis of water and related land resource conditions within the planning area relevant to the identified problems and opportunities,

c. formulation of alternative plans,

d. evaluation of the effects of the alternative plans,

e. comparison of alternative plans, and

f. selection of a recommended plan based on the comparison of alternative plans.

ASSESSMENT OF PROBLEMS AND OPPORTUNITIES

14. Coastal erosion, a persistent problem at Lido Key, threatens commercial and residential structures. Maintenance dredged material from the Federal navigation project at New Pass has periodically been placed on Lido Key at Federal expense. This material is dredged to keep the Federal navigation channel open, but its beach placement has not completely prevented the erosion of Lido Key beaches. The impacts of several major storms from 1982 to the present have accelerated beach erosion and increased the probability for damage to structures at Lido Key.

15. For purposes of this study, the following five characteristic reaches (New Pass Reach, Reaches 1 – 4), as shown in Figure III-1, have been delineated based on the beach profile characteristics and the location of recent fill projects and disposal operations.

16. New Pass Reach extends south along the Pass shoreline from R-30 to about 500 ft south of R-33. This segment is primarily subject to inlet-induced shoreline and beach volume changes.

17. Reach 1 extends south from about 500 ft south of R-33 to R-35 (400 ft north of the seaward terminus of John Ringling Boulevard). The majority of this shorefront section, approximately 2,000 ft long, is a city-owned park known as North Lido Public Beach. No protective coastal structures exist here; however, it is protected by a portion of the

Figure III-1 Reach Delineation, Lido Key, Sarasota, FL

southward growing ebb shoal of New Pass. This section has historically benefited, though generally indirectly, from the gain of sand by diffusion processes from (1) the placement of New Pass maintenance dredged material along its southern portions and in Reach 2 and (2) multiple nourishment projects in Reach 2. A field survey indicated that all structures within this reach are located sufficiently landward so that they would not be susceptible to damages even under extreme storm events.

18. Reach 2 extends from the R-35 (400 ft north of John Ringling Boulevard) south to R-40. This section contains Lido Beach, which is separated from North Lido Public Beach by a large rock revetment at the foot of Ringling Boulevard. This approximately 5,000-ft section is very narrow due to erosion. A low concrete block wall parallels the sidewalk and parking lot along most of this area. This area was severely eroded during Hurricane Josephine (October 7– 8,1996). A beach restoration project was constructed in this segment in 1998. This segment is privately owned and densely developed with single story and multistory buildings consisting primarily of hotels, motels, and condominiums.

19. Reach 3 extends from DNR-40 to DNR-43. This reach is heavily developed with condominiums lining the shoreline.

20. Reach 4 extends south from DNR-43 to Big Sarasota Pass Inlet. This reach, consisting of South Lido Public Beach, is largely undeveloped and heavily used by the public.

SHORELINE CHANGES (1971 TO 2000)

21. Shoreline change data used in the formulation of alternative plans for the study area were obtained through repetitive beach profile surveying along the Florida Department of Environmental Protection (FDEP) coastal monument system. The FDEP monuments for Lido Key, beginning with R-30, are spaced approximately 1,000 ft apart proceeding south to R-44 at Big Sarasota Pass. Predictions of without-project shoreline change used in the storm damage analysis were based upon the surveyed shoreline changes and consideration of beach fill material, which was placed within the study area during the period of analysis. Further discussion of the predicted without-project shoreline change analysis is presented in the section of the report entitled "Development and Analysis of Intermediate Alternative Plans."

22. Beach profile surveys, available at FDEP monuments within the limits of the study area, and aerial photographs provided data for the shoreline change analysis. Absolute distances from FDEP monuments to the mean high water shoreline were compared for the various surveys to define shoreline changes.

23. Tables III-1, III-2, and III-3 summarize mean high water (+1.14 ft NGVD) shoreline position changes and change rates for the study area for the time periods 1971 to 1973 to August 1974, August 1974 to May 1978, May 1978 to May 1987, May 1987 to March 1991, June 1990 to March 1991, March 1991 to March 1998, May 1998 to May 1999,

Table III-1 Recent Shoreline Change (ft), Lido Key (1971 – 2000)

Profile	*1971-1973 TO Aug 1974*	*Aug 1974 TO May 1978*	*May 1978 TO May 1987*	*May 1987 TO Mar 1991*	*June 1990 TO Mar 1991*	*Mar 1991 TO Mar 1998*	*Mar 1998 TO May 1998*	*May 1998 TO May 1999*	*May 1999 TO May 2000*
R-32	-149.0	68.7	136.7	N/A	N/A	N/A	-22.1	-109.9	-49.5
R-33	-209.8	-42.8	256.2	N/A	N/A	N/A	24.2	52.3	-1.2
R-34	N/A	N/A	47.0	135.4	-3.7	248.5	10.9	84.5	-6.8
R-34.5	N/A	N/A	N/A	N/A	N/A	N/A	70.1	N/A	N/A
R-35	1.3	-22.9	-116.0	122.3	166.5	85.8	31.4	135.1	65.1
R-35.5	N/A	N/A	N/A	N/A	N/A	N/A	54.1	N/A	N/A
R-36	166.9	166.6	-396.8	137.7	168.4	-107.2	149.3	-93.7	-13.1
R-36.5	N/A	N/A	N/A	N/A	N/A	N/A	198.4	N/A	N/A
R-37	-34.5	271.0	-337.0	68.0	126.5	-135.0	202.6	-93.5	-41.6
R-37.5	N/A	N/A	N/A	N/A	N/A	N/A	206.9	N/A	N/A
R-38	-8.4	36.2	-40.5	-7.3	51.5	-81.0	177.5	-84.3	-35.2
R-38.4	N/A	N/A	N/A	N/A	-20.0	-39.2	229.0	N/A	N/A
R-39	-37.8	21.8	34.8	-61.7	N/A	-61.2	229.7	-66.8	-51.5
R-39.5	N/A	N/A	N/A	N/A	N/A	N/A	131.3	N/A	N/A
R-40	-99.4	88.0	45.2	-66.8	N/A	-53.3	-10.1	114.8	4.9
R-40.5	N/A	N/A	N/A	N/A	N/A	N/A	-10.6	N/A	N/A
R-41	-110.4	120.9	-37.2	18.0	N/A	-59.9	-5.5	-0.3	73.1
R-42	-96.1	113.4	-36.7	45.7	N/A	-117.2	19.5	-49.3	121.4
R-43	-94.4	11.2	72.8	0.3	N/A	-178.0	76.9	-76.5	24.9
R-44	-171.7	65.2	308.2	-156.2	N/A	N/A	N/A	N/A	-170.1
New Pass	-179.4	13.0	196.5	N/A	N/A	N/A	1.1	-28.8	-25.4
Reach 1	1.3	-22.9	-34.5	128.8	81.4	167.1	37.4	109.8	29.2
Reach 2	-2.6	116.7	-138.9	14.0	81.6	-79.5	156.9	-44.7	-27.3
Reach 3	-100.3	81.8	-0.4	21.3	N/A	-118.4	20.1	-42.0	73.1
Reach 4	-171.7	65.2	308.2	-156.2	N/A	N/A	N/A	N/A	-170.1

NOTES:
1. The shoreline is defined as the location of the MHW (+1.14 ft NGVD) line
2. Shoreline changes are positive (+) seaward and negative (-) landward
3. Sources: FDEP (2000), CP&E (2000)

Table III-2 Recent Shoreline Change Rates (ft/yr), Lido Key (1971 – 2000)

Profile	*1971-1973 TO Aug 1974*	*Aug 1974 TO May 1978*	*May 1978 TO May 1987*	*May 1987 TO Mar 1991*	*June 1990 TO Mar 1991*	*Mar 1991 TO Mar 1998*	*Mar 1998 TO May 1998*	*May 1998 TO May 1999*	*May 1999 TO May 2000*
R-32	-49.7	18.3	15.2	N/A	N/A	N/A	-132.0	-109.9	-49.4
R-33	-69.9	-11.4	28.4	N/A	N/A	N/A	144.8	52.3	-1.2
R-34	N/A	N/A	5.2	35.3	-4.9	35.5	64.9	84.5	-6.8
R-34.5	N/A	N/A	N/A	N/A	N/A	N/A	419.2	N/A	N/A
R-35	0.4	-6.1	-12.9	31.9	222.6	12.2	187.9	135.1	65.0
R-35.5	N/A	N/A	N/A	N/A	N/A	N/A	323.5	N/A	N/A
R-36	55.6	44.4	-44.1	35.9	225.2	-15.3	893.1	-93.7	-13.1
R-36.5	N/A	N/A	N/A	N/A	N/A	N/A	1187.4	N/A	N/A
R-37	-11.5	72.3	-37.4	17.7	169.1	-19.3	1212.2	-93.5	-41.5
R-37.5	N/A	N/A	N/A	N/A	N/A	N/A	1238.1	N/A	N/A
R-38	-2.8	9.7	-4.5	-1.9	68.9	-11.6	1062.0	-84.3	-35.1
R-38.4	N/A	N/A	N/A	N/A	-26.7	-5.6	1369.9	N/A	N/A
R-39	-12.6	5.8	3.9	-16.1	N/A	-8.7	1374.5	-66.8	-51.3
R-39.5	N/A	N/A	N/A	N/A	N/A	N/A	785.8	N/A	N/A
R-40	-33.1	23.5	5.0	-17.4	N/A	-7.6	-60.3	114.8	4.9
R-40.5	N/A	N/A	N/A	N/A	N/A	N/A	-63.4	N/A	N/A
R-41	-36.8	32.2	-4.1	4.7	N/A	-8.6	-32.9	-0.3	72.9
R-42	-32.0	30.2	-4.1	11.9	N/A	-16.7	116.8	-49.3	121.0
R-43	-31.5	3.0	8.1	0.1	N/A	-25.4	460.3	-76.5	24.9
R-44	-57.2	17.4	34.2	-40.7	N/A	N/A	N/A	N/A	-169.6
New Pass	-59.8	3.5	21.8	N/A	N/A	N/A	6.4	-28.8	-25.3
Reach 1	0.4	-6.1	-3.8	33.6	108.8	23.9	224.0	109.8	29.1
Reach 2	-0.9	31.1	-15.4	3.6	109.1	-11.3	938.6	-44.7	-27.2
Reach 3	-33.4	21.8	0.0	5.6	N/A	-16.9	120.2	-42.0	72.9
Reach 4	-57.2	17.4	34.2	-40.7	N/A	N/A	N/A	N/A	-169.6

NOTES:
1. The shoreline is defined as the location of the MHW (+1.14 ft NGVD) line
2. Shoreline changes are positive (+) seaward and negative (-) landward
3. Sources: FDEP (2000), CP&E (2000)

Table III-3 Historic Shoreline Change (ft/yr) Summary (March 1991 — May 2000)

Reach	*MHW Change Rate March 1991 – May 2000 (ft/yr)*	*MHW Change Rate March 1991 – May 2000 (ft/yr), Adjusted for 1996 and 1998 Fills*
New Pass	-9.5	-9.5
Reach 1	35.7	25.6
Reach 2	-1.1	-21.1
Reach 3	-6.2	-6.2
Reach 4	-35.2	-35.2
Project Area: R-35 to Big Sarasota Pass (R-44)	-6.6	-17.7
Lido Key: New Pass (R-32) to Big Sarasota Pass (R-44)	-0.5	-9.8

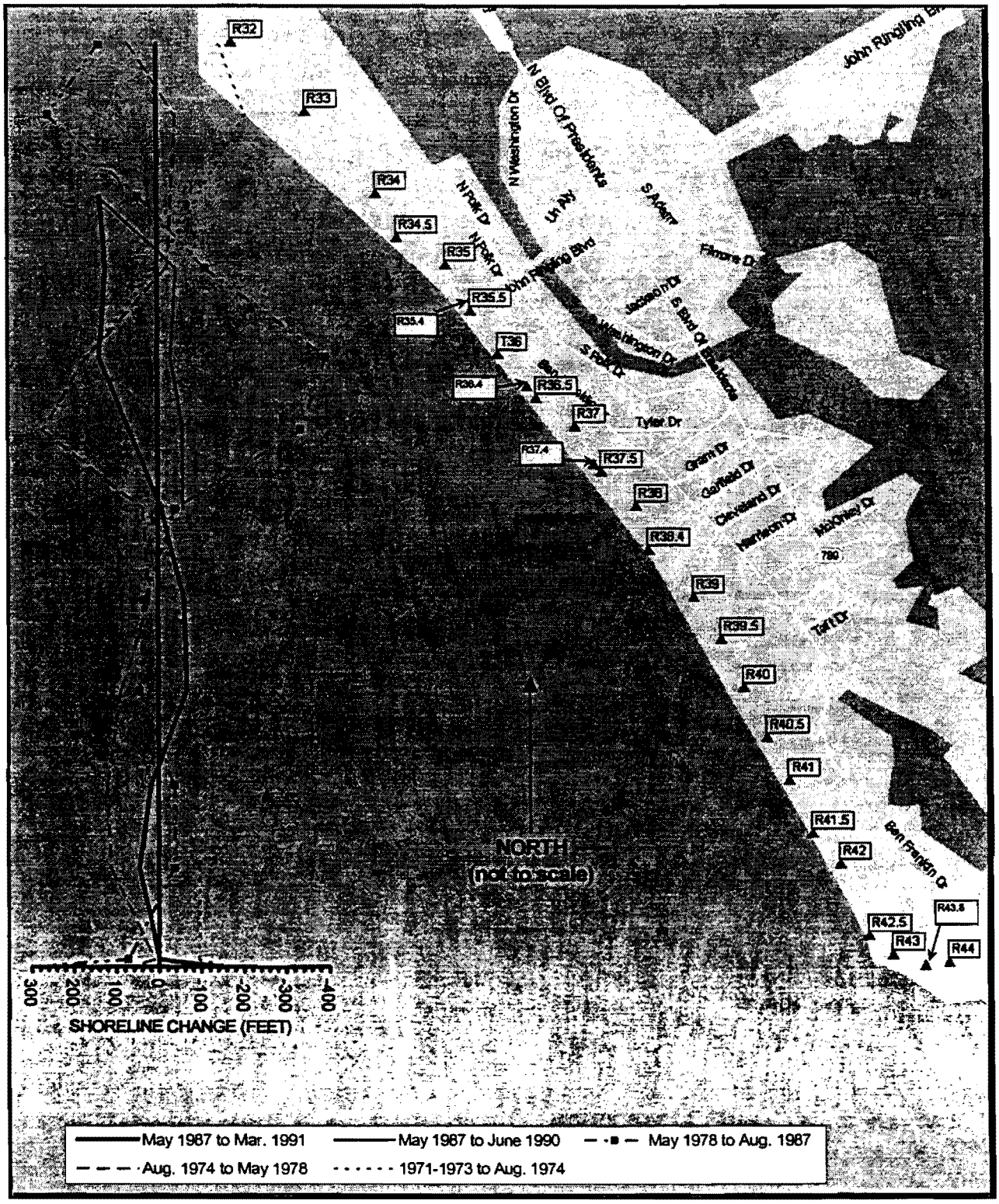


Figure III-2 Shoreline Changes, 1971 – 1991

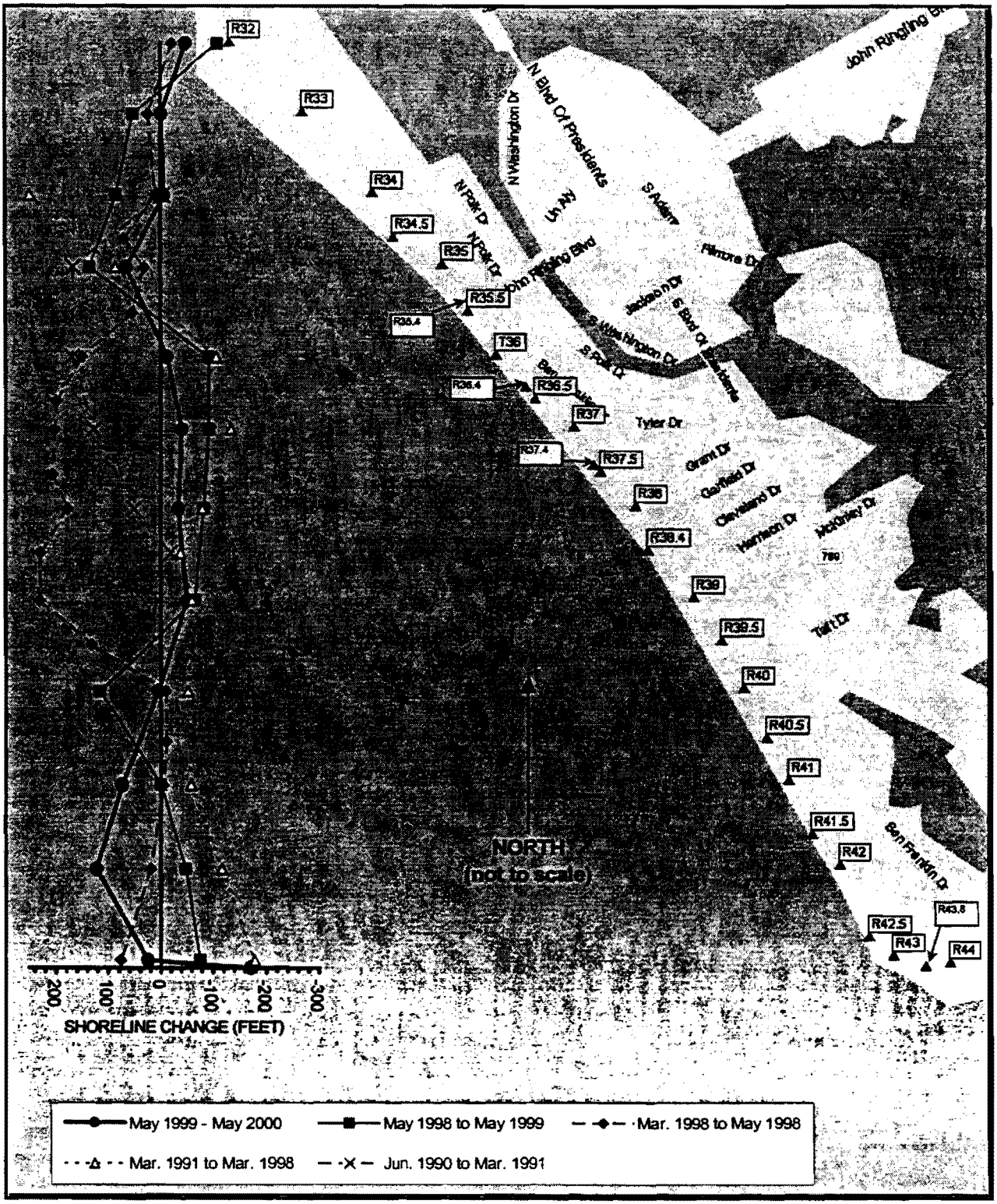


Figure III-3 Shoreline Changes, 1990 – Present

and May 1999 to May 2000. Figures III-2 and III-3 also show the shoreline change data for these periods.

24. New Pass. The New Pass reach of the study area consists of the Lido Key shoreline between FDEP monuments R-30 through R-33. Shoreline changes for the period 1971 – 1973 to August 1974 indicate an average retreat rate of 60 ft/yr. The maximum retreat occurred at R-33 (210 ft) and the minimum retreat occurred at R-32 (149 ft). Shoreline changes for the period August 1974 to May 1978 indicate an average accretion rate of 4 ft/yr. The maximum accretion occurred at R-32 (69 ft) and the maximum retreat occurred at R-33 (43 ft). Shoreline changes for the period May 1978 to March 1991 indicate an average accretion rate of 22 ft/yr. The maximum accretion occurred at R-33 (256 ft) and the minimum accretion occurred at R-32 (137 ft). Shoreline changes for the period May 1998 to May 1999 indicate an average retreat rate of 29 ft/yr. The maximum accretion occurred at R-33 (52 ft) and the maximum retreat occurred at R-32 (110 ft). Shoreline changes for the period May 1999 to May 2000 indicate an average retreat rate of 25 ft/yr. The maximum retreat occurred at R-32 (50 ft) and the minimum retreat occurred at R-33 (1 ft). Overall, the shoreline retreated approximately 10 ft/yr along this portion of the study area from March 1991 to May 2000.

25. Reach 1. Reach 1 of the study area consists of the Lido Key shoreline between FDEP monuments R-34 and R-35. Shoreline changes for the period 1971 – 1973 to August 1974 indicate an average accretion of 0.4 ft/yr. The only shoreline change reported for this period was -1 ft at R-35. Shoreline changes for the period August 1974 to May 1978 indicate an average retreat of 6.1 ft/yr. The only shoreline change reported for this period was -23 ft at R-35. Shoreline changes for the period May 1978 to May 1987 indicate an average retreat of 4 ft/yr. The maximum accretion occurred at R-34 (5 ft) and the maximum retreat occurred at R-35 (13 ft). Shoreline changes for the period May 1987 to March 1991 indicate an average accretion of 34 ft/yr. The maximum accretion occurred at R-34 (135 ft) and the minimum accretion occurred at R-35 (122 ft). Shoreline changes for the period June 1990 to March 1991 indicate an average accretion of 109 ft/yr. The maximum retreat occurred at R-34 (4 ft) and the maximum accretion occurred at R-35 (167 ft). Shoreline changes for the period March 1991 to March 1998 indicate an average accretion of 24 ft/yr. The maximum accretion occurred at R-34 (249 ft) and the minimum accretion occurred at R-35 (135 ft). Shoreline changes for the period May 1998 to May 1999 indicate an average accretion of 110 ft/yr. The maximum accretion occurred at R-35 (135 ft) and the minimum accretion occurred at R-34 (85 ft). Shoreline changes for the period May 1999 to May 2000 indicate an average accretion of 29 ft/yr. The maximum shoreline accretion occurred at R-35 (65 ft) and the maximum retreat occurred at R-34 (7 ft). Overall, the shoreline accreted 36 ft/yr along this portion of the study area from March 1991 to May 2000.

26. Reach 2. Reach 2 of the study area consists of the Lido Key shoreline between FDEP monuments R-35 and R-40. Shoreline changes for the period 1971 – 1973 to August 1974 indicate an average retreat of 1 ft/yr. The maximum accretion occurred at T-36 (167 ft) and the maximum retreat occurred at R-40 (99 ft). Shoreline changes for

the period August 1974 to May 1978 indicate an average accretion of 31 ft/yr. The maximum accretion occurred at R-37 (271 ft) and the minimum accretion occurred at R-39 (22 ft). Shoreline changes for the period May 1978 to May 1987 indicate an average retreat of 15 ft/yr. The maximum accretion occurred at R-40 (45 ft) and the maximum retreat occurred at T-36 (397 ft). Shoreline changes for the period May 1987 to March 1991 indicate an average accretion of 4 ft/yr. The maximum accretion occurred at T-36 (138 ft) and the maximum retreat occurred at R-40 (67 ft). Shoreline changes for the period June 1990 to March 1991 indicate an average accretion of 109 ft/yr. The maximum accretion occurred at T-36 (168 ft) and the maximum retreat occurred at R-38.4 (20 ft). Shoreline changes for the period March 1991 to March 1998 indicate an average retreat of 11 ft/yr. The maximum retreat occurred at R-37 (135 ft) and the minimum retreat occurred at R-38.4 (39 ft). Shoreline changes for the period May 1998 to May 1999 indicate an average retreat of 45 ft/yr. The maximum accretion occurred at R-40 (115 ft) and the maximum retreat occurred at R-37 (94 ft). Shoreline changes for the period May 1999 to May 2000 indicate an average retreat rate of 27 ft/yr. The maximum accretion occurred at R-40 (4.9 ft) and the maximum retreat occurred at R-37 (42 ft). Overall, the shoreline retreated 1 ft/yr along this portion of the study area from March 1991 to May 2000.

27. Reach 3. Reach 3 of the study area consists of the Lido Key shoreline between FDEP monuments R-40.5 and R-43. Shoreline changes for the period 1971 – 1973 to August 1974 indicate an average retreat of 33 ft/yr. The maximum retreat occurred at R-41 (110 ft) and the minimum retreat occurred at R-43 (94 ft). Shoreline changes for the period August 1974 to May 1978 indicate an average accretion of 22 ft/yr. The maximum accretion occurred at R-41 (121 ft) and the minimum accretion occurred at R-43 (11 ft). Shoreline changes for the period May 1978 to May 1987 indicate an average change of 0 ft/yr. The maximum accretion occurred at R-43 (73 ft) and the maximum retreat occurred at R-41 (37 ft). Shoreline changes for the period May 1987 to March 1991 indicate an average accretion of 6 ft/yr. The maximum accretion occurred at R-42 (46 ft) and the minimum accretion occurred at R-43 (0.3 ft). Shoreline changes for the period March 1991 to March 1998 indicate an average retreat of 17 ft/yr. The maximum retreat occurred at R-43 (178 ft) and the minimum retreat occurred at R-41 (60 ft). Shoreline changes for the period May 1998 to May 1999 indicate an average retreat of 42 ft/yr. The maximum retreat occurred at R-43 (77 ft) and the minimum retreat occurred at R-41 (0.3 ft). Shoreline changes for the period May 1999 to May 2000 indicate an average accretion of 73 ft/yr. The maximum accretion occurred at R-42 (121 ft) and the minimum accretion occurred at R-43 (25 ft). Overall, the shoreline retreated 6 ft/yr along this portion of the study area from March 1991 to May 2000.

28. Reach 4. Reach 4 of the study area consists of the Lido Key shoreline between FDEP monuments R-43.8 and R-44.5. Only one profile (R-44) represents Reach 4. Shoreline change for the period 1971 – 1973 to August 1974 indicates a retreat of 57 ft/yr (172 ft). Shoreline change for the period August 1974 to May 1978 indicates an accretion of 17 ft/yr (65 ft). Shoreline change for the period May 1978 to May 1987 indicates an accretion of 34 ft/yr (308 ft). Shoreline change for the period May 1987 to March 1991 indicates a retreat of 41 ft/yr (156 ft). Shoreline change for the period May

1999 to May 2000 indicates a retreat of 170 ft/yr (170 ft). Overall, the shoreline retreated 35 ft/yr along this portion of the study area from March 1991 to May 2000.

29. Table III-4 summarizes the dredged quantities at New Pass and locations of the sand volume placed on Lido Key between 1964 and 1996. New Pass's authorization, thru Section 107 of the 1960 Rivers and Harbors Act, as amended, is nearing the end of the authorization period and will require additional Congressional authorization if it is to be maintained in the future.

Table III-4 Quantities and Placement Locations for Sand Dredged at New Pass

Year	*Total Volume (cy)*	*Volume Placed on Lido Key (cy)*	*Location of Placement on Lido Key*	*Volume Placed on Longboat Key (cy)*
1964	123,700	121,000	R-35 – R-38.5	2,700
1970	350,000	350,000	R-35 – R-38.5	
1974	250,000	246,000	R-35 – R-38	
1977	400,000	400,000	R-35 – R-38	
1982	185,000	92,000	R-35 – R-38	93,000
1985	239,000	239,000	R-35 – R-38	
1991	265,500	177,000	R-34.5 – R-38	88,500
1996	326,000	178,000	R-34.5 – R-36	148,000
TOTAL	2,139,200	1,803,000	-	332,200

Notes:
1. 1964 – 1985 volumes taken from CP&E (1991).
2. 1991 and 1996 Lido Key volumes based on survey data.
3. 1991 Longboat Key volumes assume that 2/3 of the total dredge volume was placed on Lido Key, and 1/3 on Longboat Key.
4. 1996 Longboat Key volumes based on survey data.

30. The recent shoreline changes suggest that the New Pass, Reach 2, Reach 3, and Reach 4 shorelines of the Lido Key study area recede in the absence of man-made changes (Table III-3). South of the 1970 beach nourishment project area (R-35 to R-38), the Lido Key shorelines between R-39 and R-44 experienced recession averaging about 100 ft (33 ft/yr) between 1971 and 1974. Between 1978 and 1991, shoreline recession in the combination of Reaches 2 and 3 averaged 45 ft (3.5 ft/yr) in spite of the renourishment and dredging operations (CP&E, 1991; ATM, 1994). Between 1991 and the most recent beach nourishment in 1998, shoreline recession in Reaches 2 and 3 combined averaged 92 ft (13 ft/yr). Shoreline recession continued following the 1998 renourishment project; between May 1998 and May 1999, shoreline recession in the combination of Reaches 2 and 3 averaged 44 ft. These continuing shoreline recession patterns have prompted the FDEP (2000a) to label Lido Key as a critical erosion area.

Beach Volume Changes (1971 to 2000)

31. Volume change data used in the formulation of alternative plans for the study area were calculated from the same surveys as described in the above "Shoreline Change (1971 to 2000)" section of the report. The onshore and offshore limits of the volumetric analysis were the FDEP monuments and the -12.0 ft NGVD contour, respectively. Due

to limited offshore survey data, changes before 1991 were estimated assuming a volumetric change of 0.60 cy/ft for each foot of shoreline change. This estimate of volume change (cy/ft), given the shoreline change, is based on the relationship developed independently by computing 1991 to 1998 shoreline and volume changes.

32. Tables III-5 through III-7 summarize net volume and annual net volume changes for the study area for the periods 1971 – 1973 to August 1974, August 1974 to May 1978, May 1978 to May 1987, May 1987 to March 1991, June 1990 to March 1991, March 1991 to March 1998, March 1998 to May 1998, May 1998 to May 1999, and May 1999 to May 2000. Figure III-4 displays volume changes at every monument for the period 1971 to 1991. Figure III-5 displays volume changes at every monument for the period 1990 to 1999.

33. New Pass. The New Pass reach of the study area consists of the Lido Key shoreline between FDEP monuments R-30 through R-33. For the period 1971 – 1973 to May 1978, this portion of the study area experienced significant erosion of 172,133 cy; however, for the period May 1978 to May 1987, it experienced significant accretion of 190,424 cy. For the period March 1998 to May 2000, this portion of the study area experienced accretion for the most part (1,560 cy for the period March 1998 to May 1998 and 60,778 cy for the period May 1999 to May 2000); however, for the period May 1998 to May 1999, it experienced 13,295 cy of erosion.

34. Reach 1. Reach 1 of the study area consists of the Lido Key shoreline between FDEP monuments R-34 and R-35. For the period 1971 – 1973 to August 1974, this portion of the study area experienced significant erosion of 258,243 cy; however, for the period August 1974 to May 1978, it experienced significant accretion of 149,874 cy. For the period May 1978 to May 1987, this portion of the study area experienced slight erosion of 6,247 cy. For the period May 1987 to May 2000, this portion of the study area experienced accretion of 387,577 cy.

35. Reach 2. Reach 2 of the study area consists of the Lido Key shoreline between FDEP monuments R-35 and R-40. For the period 1971 – 1973 to May 1978, this portion of the study area experienced significant accretion of 445,756 cy; however, for the period May 1978 to May 1987, it experienced significant erosion of 539,410 cy. For the period May 1987 to March 1991, this portion of the study area experienced accretion of 84,417 cy. For the period March 1991 to March 1998, this portion of the study area experienced significant erosion of 271,224 cy; however, for the period March 1998 to May 1998, it experienced significant accretion of 278,174 cy. For the period May 1998 to May 2000, this portion of the study area experienced significant erosion of 141,740 cy.

36. Reach 3. Reach 3 of the study area consists of the Lido Key shoreline between FDEP monuments R-40.5 and R-43. For the period 1971 – 1973 to August 1974, this portion of the study area experienced significant erosion of 165,794 cy; however, for the period August 1974 to May 1978, it experienced significant accretion of 142,625 cy. For the period May 1978 to May 1987, this portion of the study area experienced slight

erosion of 8,804 cy; however, for the period May 1987 to March 1991, it experienced accretion of 84,417 cy. For the period March 1991 to May 1999, this portion of the study area experienced significant erosion of 192,992 cy. For the period May 1999 to May 2000, this portion of the study area experienced slight accretion of 14,996 cy.

Table III-5 1971 – 2000 Beach Volume Changes (cy)

Monument Name	*1971-1973 To Aug 1974*	*Aug 1974 To May 1978*	*May 1978 To May 1987*	*May 1987 To Mar 1991*	*June 1990 To Mar 1991*	*Mar 1991 To Mar 1998*	*Mar 1998 To May 1998*	*May 1998 To May 1999*	*May 1999 To May 2000*	*Length (ft)*
R-32	-42,593	19,648	39,099	N/A	N/A	N/A	-3,461	-30,862	28,417	477
R-33	-123,907	-25,280	151,325	N/A	N/A	N/A	5,021	17,567	32,362	984
R-34	-258,616	156,695	28,349	81,621	1,065	74,924	10,378	790	-5,434	1,005
R-35	373	-6,821	-34,595	36,474	27,869	44,308	14,302	93,406	7,874	497
R-36	152,710	152,435	-363,047	125,986	99,038	-69,557	54,622	-35,007	-549	1,525
R-37	-20,502	160,861	-200,048	40,368	49,325	-73,911	77,198	-23,700	-18,036	989
R-38	-5,094	21,905	-24,506	-4,440	1,035	-36,150	65,984	-34,990	-18,485	1,008
R-39	-23,123	13,329	21,286	-37,769	N/A	-47,513	74,834	-20,085	-22,575	1,021
R-40	-59,113	52,348	26,906	-39,728	N/A	-44,092	5,536	30,403	1,285	992
R-41	-64,006	70,081	-21,588	10,406	N/A	-61,336	-3,076	8,574	4,625	966
R-42	-57,016	67,237	-21,758	27,108	N/A	-87,060	-7,272	-9,779	19,870	989
R-43	-44,772	5,307	34,543	161	N/A	-11,691	-5,398	-15,954	-9,498	790
R-44	-88,178	33,450	158,236	-80,204	N/A	N/A	N/A	N/A	-10,844	856
New Pass	-166,501	-5,632	190,424	N/A	N/A	N/A	1,560	-13,295	60,778	1,461
Reach 1	-258,243	149,874	-6,247	118,095	28,934	119,232	24,680	94,196	2,440	1,502
Reach 2	44,878	400,878	-539,410	84,417	N/A	-271,224	278,174	-83,379	-58,361	5,535
Reach 3	-165,794	142,625	-8,804	37,675	N/A	-160,087	-15,746	-17,159	14,996	2,745
Reach 4	-88,178	33,450	158,236	-80,204	N/A	N/A	N/A	N/A	-10,844	856

Notes:
1. Depth of closure = -12 ft NGVD
2. Volume changes before 1991 assume 0.60 cy/ft per foot of shoreline change, according to assumptions of CP&E (1991)
3. 1991 – March 1998 volume changes based on beach profile survey
4. March 1998 – May 1999 volume changes from CP&E (2000).

Table III-6 1971 – 2000 Beach Volume Rates (cy/yr)

Monument Name	*1971-1973 To Aug 1974*	*Aug 1974 To May 1978*	*May 1978 To May 1987*	*May 1987 To Mar 1991*	*June 1990 To Mar 1991*	*Mar 1991 To Mar 1998*	*Mar 1998 To May 1998*	*May 1998 To May 1999*	*May 1999 To May 2000*	*Length (ft)*
R-32	-14,198	5,239	4,342	N/A	N/A	N/A	-20,709	-30,862	28,417	477
R-33	-41,302	-6,740	16,804	N/A	N/A	N/A	30,044	17,567	32,362	984
R-34	-86,205	41,778	3,148	21,280	1,424	10,695	62,098	790	-5,434	1,005
R-35	124	-1,819	-3,842	9,509	37,260	6,325	85,578	93,406	7,874	497
R-36	50,903	40,642	-40,314	32,846	132,413	-9,929	326,837	-35,007	-549	1,525
R-37	-6,834	42,888	-22,214	10,525	65,947	-10,550	461,922	-23,700	-18,036	989
R-38	-1,698	5,840	-2,721	-1,158	1,384	-5,160	394,822	-34,990	-18,485	1,008
R-39	-7,708	3,554	2,364	-9,847	N/A	-6,782	447;777	-20,085	-22,575	1,021
R-40	-19,704	13,957	2,988	-10,358	N/A	-6,294	33,125	30,403	1,285	992
R-41	-21,335	18,685	-2,397	2,713	N/A	-8,755	-18,406	8,574	4,625	966
R-42	-19,005	17,927	-2,416	7,068	N/A	-12,427	-43,513	-9,779	19,870	989
R-43	-14,924	1,415	3,836	42	N/A	-1,669	-32,300	-15,954	-9,498	790
R-44	-29,393	8,918	17,571	-20,910	N/A	N/A	N/A	N/A	-10,844	856
New Pass	-55,500	-1,502	21,145	N/A	N/A	N/A	9,334	-13,295	60,778	1,461
Reach 1	-86,081	39,959	-694	30,789	38,684	17,020	147,675	94,196	2,440	1,502
Reach 2	14,959	106,881	-59,898	22,009	N/A	-38,716	1,664,484	-83,379	-58,361	5,535
Reach 3	-55,265	38,026	-978	9,822	N/A	-22,852	-94,218	-17,159	14,996	2,745
Reach 4	-29,393	8,918	17,571	-20,910	N/A	N/A	N/A	N/A	-10,844	856

Notes:
1. Depth of closure = -12 ft NGVD
2. Volume changes before 1991 assume 0.60 cy/ft per foot of shoreline change, according to assumptions of CP&E (1991)
3. 1991 – March 1998 volume changes based on beach profile survey
4. March 1998 – May 1999 volume changes from CP&E (2000).

Table III-7 Historic Beach Volume Change Rate (ft/yr) Summary (March 1991 — May 2000)

Reach	*Length (ft)*	*MHW Change March 1991 – May 2000 (ft/yr)*	*MHW Change March 1991 – May 2000 (ft/yr), Adjusted for 1996 and 1998 Fills*
New Pass	1,461	-9.5	-9.5
Reach 1	1,502	35.7	25.6
Reach 2	5,535	-1.1	-21.1
Reach 3	2,745	-6.2	-6.2
Reach 4	856	-35.2	-35.2
Project Area: R-35 to Big Sarasota Pass (R-44)	9,136	-6.6	-17.7
Lido Key: New Pass (R-32) to Big Sarasota Pass (R-44)	12,099	-0.5	-9.8

Notes: 1. Depth of closure = -12 ft NGVD
2. Volume changes based on FDEP (2000) and CP&E (2000) beach profile data

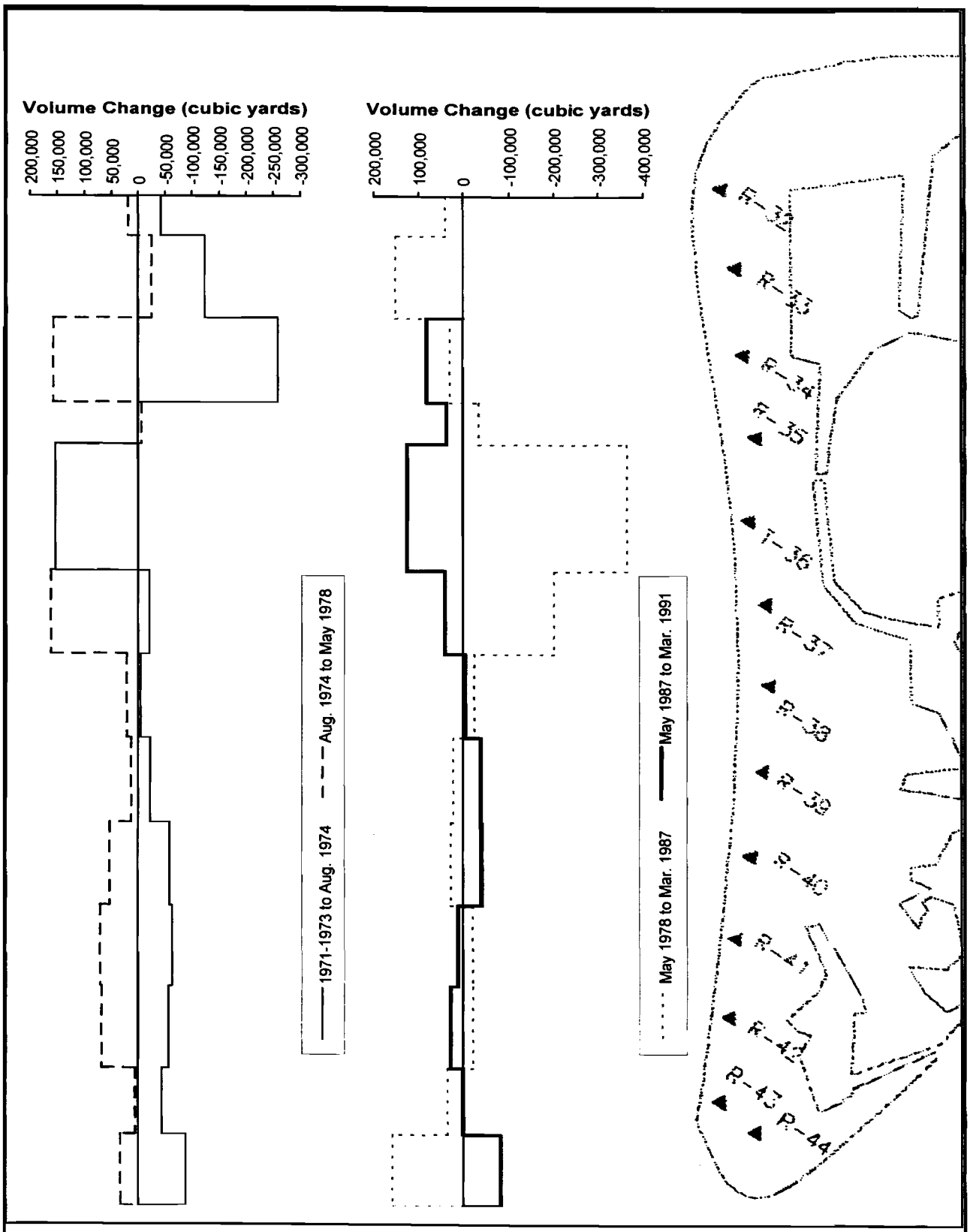


Figure III-4 Beach Volume Changes 1971-1991

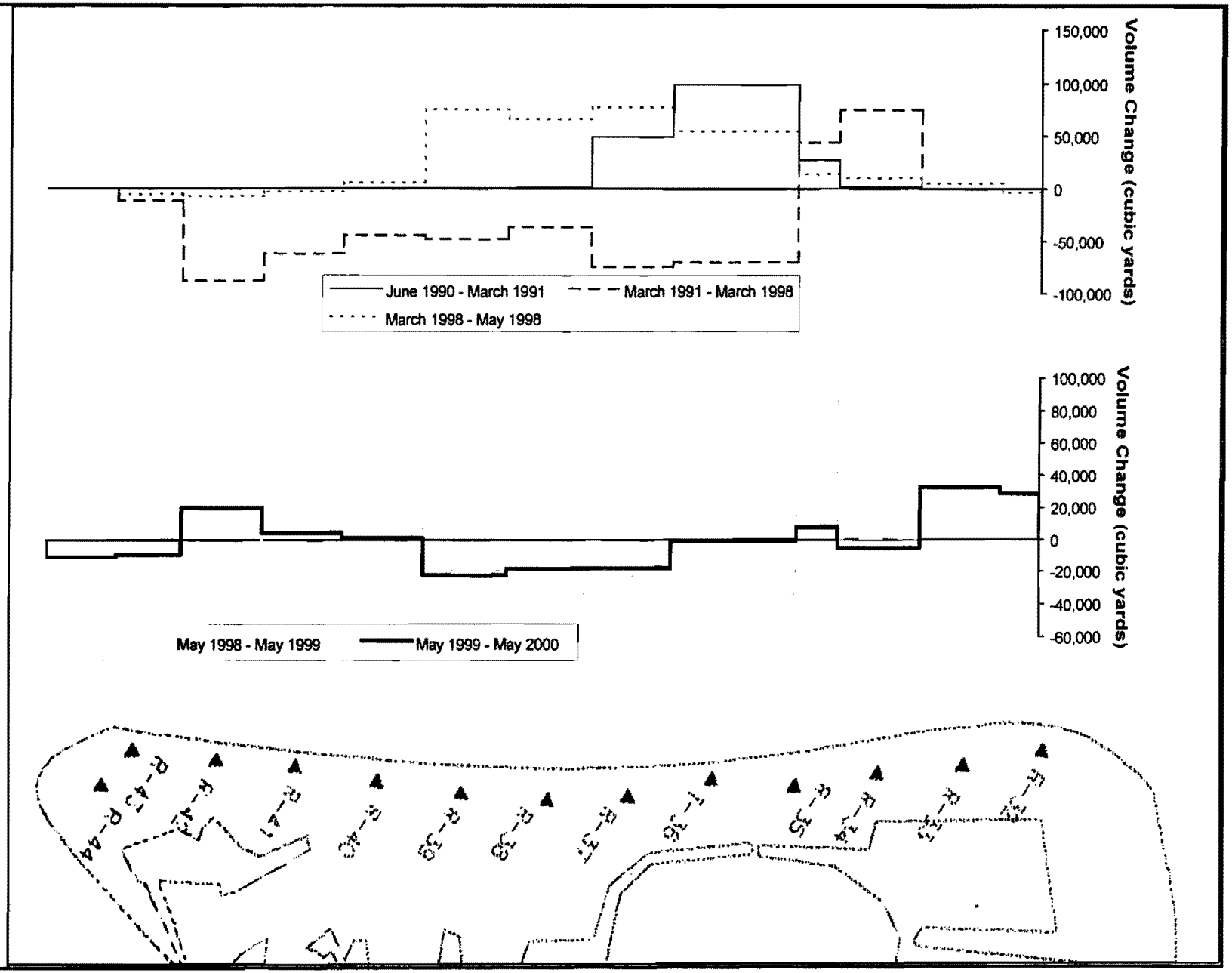


Figure III-5 Volume Changes, 1990-1999

37. Reach 4. Reach 4 of the study area consists of the Lido Key shoreline between FDEP monuments R-43.8 and R-44.5. For the period 1971 – 1973 to August 1974, this portion of the study area experienced erosion of 88,178 cy. For the period August 1974 to May 1987, this portion of the study area experienced significant accretion of 191,686 cy; however, for the period May 1987 to March 1991, it experienced erosion of 80,204 cy. For the period May 1999 to May 2000, this portion of the study area experienced erosion of 10,844 cy.

38. The volumetric changes show that Reaches 2, 3, and 4 of the Lido Key study area erode in the absence of man-made changes (Table III-7). South of the 1970 project area (R-35 to R-38), the beach lost approximately 360,000 cy (20 cy/yr/ft) between 1971 and 1974, partly because of Hurricane Agnes. Between 1978 and 1991, the net erosion in the current project area was 348,000 cy (2.9 cy/yr/ft), in spite of a number of renourishment and dredging operations during this period (CP&E, 1991; ATM, 1994).

39. Between 1991 and the most recent nourishment in 1998, Reaches 2 and 3 combined (R-36 to R-44) lost 431,000 cy (6.7 cy/yr/ft). Erosion following the most recent nourishment project, completed in May 1998, removed 155,000 cy from the current project area (8.5 cy/yr/ft) between May 1998 and May 2000. The majority of the erosion occurred between May 1999 and May 2000. The corresponding shoreline changes demonstrate that adjustment of the beach profile has removed material from the dry beach to the submerged portion of the profile as well as out of the project area. Especially when subject to severe storms or inlet effects areas within the project area can experience erosion rates of 44 cy/yr/ft.

Existing Conditions

40. New Pass. New Pass Reach extends south along the Pass shoreline from R-30 to about 500 ft south of R-33.

41. Reach 1. Reach 1 extends from New Pass Inlet south to the John A. Ringling Boulevard. A field survey indicated that all structures within this reach are located sufficiently landward so that they would not be susceptible to damages even under severe storm events.

42. Reach 2. Reach 2 extends from the John Ringling Causeway at R-35.4 south to R-40. This segment is privately owned and densely developed with single story and multistory buildings consisting primarily of hotels, motels, and condominiums.

43. Reach 3. Reach 3 extends from R-40 to R-43. This reach is heavily developed with condominiums lining the shoreline. Upland development of Reaches 2 and 3 consists of condominiums, single-family homes, and motels valued at approximately $214 million.

44. Reach 4. Reach 4, extending south from DNR-43 to Big Sarasota Pass Inlet, is a state park offering recreational activities. Reach 4 contains no structures susceptible to

damages. Lido Key Beach, already well developed, is unlikely to experience future expansion.

45. Damage susceptibility was limited to two areas, Reaches 2 and 3.

Future Without-Project Conditions

46. As seen in Table III-3 and Table III-7, Reach 2 historically recedes 21 ft/yr and Reach 3 historically recedes 6 ft/yr. These values indicate a continuous loss of land for this section of the study area with man made effects removed. Future dredging operations at New Pass is not considered in the future with-out project conditions. New Pass has reached the end of it's authorization thru Section 107 of the 1960 Rivers and Harbors Act, as amended, and can not be dredged again without additional Congressional approval. Continuous erosion and shoreline recession result in future damages to development becoming more severe from a given storm. Damage assessment is the calculated amount of losses expected to occur when a structure is impacted by the recession of the beach. It is based on the shoreline position relative to existing development at the time the beach profile surveys are taken and projected changes in shoreline position due to long-term erosion and the effects of storm events.

47. The recession-damage relationship, Table III-8, shows the variation in damages the base year for Reach 2. Damages to structures in Reach 2 begin at 230 ft recession of the shoreline. Coastal armor destruction begins when recession exceeds 200 ft. Loss of land begins immediately (10 ft recession); losses to the backfill begin at 170 ft recession. These losses occur because not all properties are protected by coastal armor.

48. Similarly, damages to structures in Reach 3 begin at 180 ft recession of the shoreline. Coastal armor destruction begins when recession exceeds 170 ft. Loss of land begins immediately (10-ft recession); losses to the backfill begin at 170 ft recession. Total average annual equivalent damages for the combination of both reaches are estimated at $3,828,192.

Environmental Considerations

49. Nearshore side-scan sonar and groundtruthing surveys conducted in September 2001 did not detect any hardgrounds adjacent to Lido Key. Upland vegetation is composed of both exotic and native species such as Australian pine, sea grape, and wax myrtle. No seagrass/algal communities were observed in the footprint of the beach fill boundaries or proposed borrow areas. Of the listed animal species found in or near the project area, the loggerhead sea turtle is most likely to be affected by the proposed project. Information provided by the Florida Marine Research Institute indicates that, from 1992 to 2000, loggerhead sea turtles nest numbers varied from 32 to 60 annually along Lido Key. The draft Environmental Assessment contains a full account of this as well as all environmental issues associated with the study area of the Lido Key hurricane and storm reduction project review study. The future without-project condition

Table III-8 Reach 2 Example of Recession Damage Relationships

Recession (ft)	*Damages ($)*				
	Development	*Backfill*	*Coastal Armor*	*Loss of Land*	*Total*
0	0	0	0	0	0
10	0	0	0	8,748	8,748
20	0	0	0	8,748	8,748
30	0	0	0	8,748	8,748
40	0	0	0	8,748	8,748
50	0	0	0	8,748	8,748
60	0	0	0	8,748	8,748
70	0	0	0	8,748	8,748
80	0	0	0	8,748	8,748
90	0	0	0	8,748	8,748
100	0	0	0	8,748	8,748
110	0	0	0	8,748	8,748
120	0	0	0	8,748	8,748
130	0	0	0	8,748	8,748
140	0	0	0	8,748	8,748
150	0	0	0	8,748	8,748
160	0	0	0	8,748	8,748
170	0	4,160	0	8,748	12,908
180	0	24,960	0	8,748	33,708
190	0	45,760	0	8,748	54,508
200	0	66,560	0	8,748	75,308
210	0	1,435,460	52,615	8,748	1,537,058
220	2	1,685,580	52,615	8,748	1,746,945
230	20,091	1,840,280	80,470	8,748	1,949,589
240	195174	1,984,320	80,470	8,748	3,073,329
250	999,791	2,776,020	80,470	8,748	5,993,565
260	3,128,327	2,844,920	108,944	8,748	7,888,494
270	4,925,882	3,008,980	108,944	8,748	8,537,051
280	5,410,379	3,091,270	112,658	8,748	9,204,450
290	5,991,774	3,316,170	161,883	8,748	10,022,510
300	6,535,709	3,492,970	179,783	8,748	10,781,572
310	7,100,071	3,872,570	184,116	8,748	11,585,929
320	7,520,495	3,960,970	196,496	8,748	15,803,567
330	11,637,353	4,279,210	496,496	8,748	17,022,053
340	12,237,599	4,346,810	223,346	8,748	19,389,923
350	14,811,019	4,513,730	223,346	8,748	20,370,044
360	15,624,220	4,556,110	241,246	8,748	36,349,739
370	31,543,635	4,877,210	241,246	8,748	47,406,220
380	42,279,016	5,611,210	281,521	8,748	50,965,798
390	45,064,319	5,729,490	319,706	8,748	51,122,263
400	47,932,257	5,802,290	319,706	8,748	54,063,001
410	50,896,127	5,854,290	319,706	8,748	57,078,871
420	53,859,996	5,906,290	319,706	8,748	60,094,740
430	56,740,017	5,947,890	319,706	8,748	63,016,361
440	59,796,021	5,947,890	319,706	8,748	66,072,365
450	62,579,470	5,947,890	319,706	8,748	68,855,814
460	63,809,925	5,947,890	319,706	8,748	70,086,269
470	65,040,381	5,947,890	319,706	8,748	71,316,725
480	66,270,836	5,947,890	319,706	8,748	72,547,180
490	67,501,291	5,947,890	319,706	8,748	73,777,635
500	68,648,754	5,947,890	319,706	8,748	74,925,098

See Economic Appendix for actual data

would have no effect on marine vegetation. However, continued erosion could eventually result in loss of upland vegetation and sea turtle nesting habitat adjacent to the beach.

Specific Problems and Opportunities

50. Upland development at Lido Key is threatened by both long-term recession and storm-induced damages. Erosion and long-term shoreline recession have rendered upland development at Lido Key increasingly vulnerable to damages from tropical and extra-tropical storms. Sea level rise, various coastal storms, and inlet effects have exacerbated the erosion pressures at Lido Key. Formulation of appropriate shore protection measures could mitigate for these impacting mechanisms as well as result in a net benefit to the national economy. Additional incidental benefits would also be realized by the authorization and construction of a properly formulated hurricane and storm damage reduction project for Lido Key.

PLANNING OBJECTIVES AND CONSTRAINTS

51. Principles and Guidelines. The "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" (The Principles and Guidelines, or P&G) are the principal guidelines for planning by Federal agencies involved in water resource development. Although each project and project setting presents unique problems and opportunities, the U.S. Army Corps of Engineers applies a consistent set of decision criteria to participation in project planning and construction. The Principles and Guidelines contain three basic criteria:

(1) That there be an economically justified and environmentally acceptable project. Widespread use of benefit-cost analysis as a test of a project's economic worth is generally considered to have grown out of the Flood Control Act of 1936. In this Act, Congress required that the U.S. Army Corps of Engineers recommend a project only "if the benefits to whomsoever they may accrue are in excess of the estimated costs and if the lives and social security of people are otherwise adversely affected." Given an economically justified project, decisions on whether and to what extent there should be Federal participation are guided by a concept of the Federal interest that has evolved from legislation, from precedent in project authorization and construction, and from Administration budget priorities.

(2) Federal participation must be otherwise warranted. Federal participation is limited in circumstances where special and local benefits accrue to a limited number of identifiable beneficiaries. The Federal government does not participate in facilities, which produce outputs incidental to basic project purposes.

(3) The project must meet current Administration budget priorities. The Administration does not budget for a project unless a significant proportion of the project outputs have a high budget priority.

Federal Objective

52. The Federal objective, as stated in the P&G, is to contribute to national economic development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. In other words, economic benefits to the Nation must exceed project costs, without unnecessary sacrifice of environmental resources. Federal planning concerns other than economic include environmental protection and enhancement, human safety, social well-being, and cultural and historic resources. Environmental and safety considerations are of prime importance. In developing project modifications or proposed new projects, the U.S. Army Corps of Engineers:

a. provides for full consideration of measures to protect, enhance, and restore ecological, aesthetic, historical, and cultural resources;

b. attempts to obtain the best available information on the environmental effects of plans through an exchange of views and information with resource agencies at all levels of government, affected interests, and the public;

c. provides equal consideration throughout planning for environmental, economic, social, financial and engineering factors in plan scoping, development, evaluation, and modification of the authorized projects or new proposed projects, and;

d. attempts to minimize adverse environmental effects, including irreversible commitments of resources, and to mitigate unavoidable losses to the extent appropriate, concurrent with-project construction.

53. Federal Environmental Objectives. The U.S. Army Corps of Engineers complies with all environmental laws and executive orders. The U.S. Army Corps of Engineers considers carefully and seeks to balance the environmental and development needs of the Nation in full compliance with NEPA and other authorities provided by Congress and the Executive Branch. Alternative means of meeting competing demands generated by human water resources needs are examined and their environmental values examined fully, along with the economic, engineering, and social factors.

54. Public participation is encouraged early in the planning process to define environmental problems and elicit public expression of needs and expectations. Municipal, county, state, and other Federal agencies are contacted early for their views and provided timely information before making recommendations. Significant environmental resources and values that would likely be impacted, favorably as well as adversely, by an alternative under consideration are identified early in the planning process. All plans are formulated to avoid to the fullest extent practicable any adverse impact on significant resources.

55. Those significant adverse impacts that cannot be avoided are mitigated as required by Section 906(d) of the Water Resources Development Act of 1986. Section 906(d) requires the Secretary of the Army to include in reports submitted to Congress for

authorization of construction a specific plan to mitigate fish and wildlife losses or a determination that the project will have a negligible effect on fish and wildlife. The NEPA document in this report describes the environmental impacts of the plan recommended herein and summarizes compliance with the Federal statutes and regulations.

56. Participation in hurricane and storm damage reduction projects is limited to beach restoration and protection, not beach creation or improvement unless such improvement is needed for engineering purposes. The term "restoration" was substituted for "improvement" in the amendment of July 28, 1956 (P.L. 826, 84th Congress, 70 Stat. 702) so that the basis for Federal concern became "restoration and protection" as opposed to creation of new lands (House Report No. 2544 and Senate Report No. 2691, 84th Congress). Accordingly, Federal participation in restoration is limited to the historic shoreline. It does not provide for Federal cost sharing in extending a beach beyond its historic shoreline unless required for protection of upland areas.

57. In addition, the Federal cost share is reduced proportionately to the extent that a project protects private shores from beach erosion and land loss. Section 103(d) of the 1986 Water Resources Development Act specifically prohibits Federal participation in project costs assigned to benefits to privately owned shores, where use of such shores is limited to private interests, or to prevention of losses of private lands.

58. Federal Project Purposes. Hurricane and storm damage reduction projects have been authorized for a variety of purposes: beach erosion control, shore/shoreline protection, hurricane/hurricane wave protection, and storm protection. The WRDA of 1986 now assigns costs of Federal projects to appropriate project purposes. Projects that provide hurricane and storm damage reduction are assigned a 65% Federal share. Project reaches that provide for recreation are assigned a 50% Federal share. Projects that provide for separable recreation are not Federally cost shared. The costs for construction projects or measures for beach erosion control and water quality enhancement are assigned to either hurricane and storm damage reduction, or recreation. The Federal government does not participate in any work relating to recreation facilities at hurricane and storm damage reduction projects. Recreation is not considered to be high priority output or primary project output under current Department of Army policy. This policy precludes Federal funds to support construction of shore or hurricane protection projects which depend on separable recreation benefits for economic justification, or for which incidental recreation benefits are greater than 50% of the total benefits unless the project is economically justified based on primary outputs alone, or based on the combination of primary benefits and an equivalent amount of incidental recreation benefits.

59. Additional Federal Guidelines. The general Federal objectives dealing primarily with broad planning guidelines are described above. Other general study objectives assure that any new project recommended for construction, or proposed modifications to existing hurricane and storm damage reduction projects are formulated to:

a. meet the specific needs and concerns of the general public within the project area;

b. be part of or developed in conjunction with a "systems approach." Alternative plans that consider a broad range of possible impacts including impacts that occur on larger scale, were developed. The combined effectiveness and economic efficiency of the shore protection, navigation maintenance, and dredged material disposal programs can then be optimized;

c. respond to expressed public desires and preferences;

d. be flexible to accommodate changing economic, social, and environmental patterns and changing technologies;

e. integrate with and complement other related programs in the study area, and;

f. be implementable with respect to financial and institutional capabilities and public consensus.

60. Four accounts are established to simplify evaluation and display the effects of alternative plans. These four accounts encompass all significant effects of a plan on the human environment as required by the National Environmental Policy Act of 1969 (NEPA). They also encompass social well-being as required by Section 122 of the 1970 Flood Control Act. The national economic development account is included, because it is the primary Federal objective. Other information that is required by law or that will have a material bearing on the decision-making process is included in the other accounts listed below:

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

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

c. Regional Economic Development (RED). This account registers changes in the distribution of regional economic activity that result from project construction. Evaluations of regional effects are to be carried out using nationally consistent projections of income, employment, output, and population.

d. Other Social Effects (OSE). This account registers project effects from perspectives relevant to the planning process but not reflected in the other three accounts.

61. A plan that reasonably maximizes net national economic development (NED) benefits, consistent with the Federal objective, is the goal of the Federal plan formulation and analysis process. This plan will be identified as the NED plan. The NED plan must also meet the test of four additional criteria:

a. Completeness. The extent to which a given modification of the authorized project provides and accounts for all necessary investments or other actions to ensure the realization of storm damage reduction.

b. Effectiveness. The extent to which a given modification of the authorized project contributes to a solution to shoreline erosion and storm damage problems and achieves protection from storm damages.

c. Efficiency. The extent to which a given modification of the authorized project is the most cost-effective means of providing storm damage protection, consistent with protecting the Nation's environment.

d. Acceptability. The viability of a given modification to the authorized project and its acceptance by the non-Federal project sponsor, state entities and the public, and compatibility with existing laws, regulations, and public policies.

State of Florida's Objective

62. Coastal Management Program. Florida's Coastal Management Program was established under the Coastal Management Act of 1978 (Chapter 380.20, Florida Statutes) and approved by the Federal Coastal Zone Management office in 1981 (Pilkey et al., 1984). Florida does not regulate its coastal zone through one comprehensive law but rather through 28 state statutes. The Florida Department of Community Affairs is the lead state agency for the implementation of the Federal coastal zone management act.

63. Beach and Shore Preservation. The Beach and Shore Preservation Act (Chapter 161, Florida Statutes) is Florida's primary statute for developing and implementing the state's strategic beach management plan, regulating coastal construction seaward of the mean high water, and regulating activities seaward of the coastal construction control lines. The act, administered by the Florida Department of Environmental Protection (FDEP) Office of Beaches and Coastal Systems (OBCS), was first passed in 1965 and has since been significantly amended.

64. Coastal Construction Control Lines. In the Beach and Shore Protection Act, the legislature asserted that Florida's beaches and coastal barrier dunes are among the state's most valuable natural resources and that these resources should be protected from "imprudent construction which can jeopardize the stability of the beach-dune system, accelerate erosion, provide inadequate protection to upland structures, endanger adjacent properties or interfere with public beach access" (Section 161.053, Florida Statutes). To ensure that such "imprudent construction" does not take place, the statute charges the FDEP to define and establish Coastal Construction Control Lines (CCCL). These lines define the landward limit of the active beach-dune system and vary from a few to several hundred ft inland of mean high water. The specific location of the line is a function of the predicted storm surge and erosion resulting from a 100-year storm. The FDEP has established control lines on a county-by-county basis

for Florida's 24 sandy beach counties (Section 161.053, Florida Statutes). Nine of Florida's 33 coastal counties are not considered to be predominantly sandy beach counties and do not, therefore, have CCCL's. The non-sand beach counties, stretching from Wakulla to Pasco County, located on the Big Bend and in Monroe County in southern Florida (Balsillie, 1988), are regulated pursuant to Section 161.052, Florida Statutes.

65. Florida is one of the first states to develop a coastal construction control line program. This program was initiated through legislative action in 1970. The primary goal of this program is the control of coastal construction to curtail impactive and imprudent development. Included in this effort was the establishment of a coastal monument program for survey and documentation purposes. Control monuments have been established approximately every 1,000 ft along the coastal shoreline of all beach front areas, generally located on the shoreward side of existing dune lines away from normal shoreline erosion forces. These monuments serve as the starting reference for beach survey purposes. Massive primary monuments are located further landward and serve as primary monuments for all controlled survey work. All monuments are tied to the State Plane coordinate system and NGVD 1929 vertical datum.

66. Applying numerical modeling storm programs and engineering expertise, including historical shoreline studies and recent survey data, the State has established coastal construction control lines that reflect the determined 100-year storm impact location along each stretch of beachfront property. Acceptance of this line goes through an elaborate review process and finally establishes a regulatory line for construction purposes.

67. The CCCL defines the FDEP's jurisdictional area of construction for regulation of construction activities. Building or excavating seaward of the control line requires a permit from the FDEP. The primary purposes of this permitting program are to 1) ensure that construction seaward of the control line is designed and sited to protect beaches and dunes from adverse impacts, 2) ensure that construction seaward of the line does not result in accelerated erosion on adjacent land, and 3) ensure that habitable structures seaward of the line are designed to withstand the forces associated with a 100-year return interval storm.

68. Before granting a construction permit, the FDEP must consider shoreline stability and the impact of storm tides, design features of the proposed structures or activities and potential impacts of the building or activities, including cumulative effects, on the beach-dune system. The department may grant a coastal construction control line permit in areas where a "reasonably continuous" line of existing construction located seaward of the control line is not "unduly threatened by erosion" (Section 161.053, Florida Statutes).

69. The Beach and Shore Preservation Act also regulates construction of shore protection devices below mean high water (Section 161.041, Florida Statutes). Building such a structure requires a coastal construction permit issued by the FDEP. A coastal construction permit is necessary for any coastal construction or reconstruction or

change to existing structures, or any construction or physical activity undertaken specifically for shore protection.

70. Florida's Administrative Code (Chapter 62B-33) standards and regulations for construction seaward of the control line include provisions which specify that all habitable structures must be pile-supported, elevated above the projected 100-year storm surge, and designed in accordance with Section 6, American National Standards/American Society of Civil Engineers 7-88 (July 1990) "Minimum Design Loads for Buildings and Other Structures" except that for major habitable structures the minimum basic wind speed will be 110 miles per hour (mph) (115 mph in the Florida Keys) unless a higher velocity is required. The code also requires that existing beach topography must be protected, the maximum effort must be made to protect all native stabilizing vegetation, structures must be located as far landward as possible, and all construction must be designed to minimize erosive effects.

71. Before setting control lines, the FDEP must hold a public hearing in the affected county. The results of the hearing must be considered before determining the location of the control line (Section 161.053, Florida Statutes). Once the department has established CCCL's, their location must be recorded in public records (Section 161.053, Florida Statutes).

72. To determine the appropriate location of a control line, the state considers long-and short-term erosion rates, existing upland development, and expected impacts of a 100-year storm. The state contracts with the Florida State University Beaches and Shores Resource Center to assess the impacts of predicted hurricane storm tides. The center uses the storm tide model developed by Dr. Robert Dean to predict water levels, wave heights, and dune and bluff erosion accompanying a 100-year storm event (Balsillie, 1988).

73. For each control line study, stereoscopic aerial photographs are taken. These are then reproduced to provide detailed maps with a 1:100 scale (Balsillie, 1988). These maps are compared to historical maps, beach profile surveys, and photographs to determine long-term erosion rates. For a typical county, five to six surveys, dating from the mid-1800s to the present, are used to compute erosion rates (National Research Council, 1990).

74. To measure shoreline change over relatively short time periods, the state has established over 3,400 concrete monuments at 1,000-foot intervals along the coastline (National Research Council, 1990). These monuments are, in turn, referenced to a system of larger monuments located farther inland. As part of the state's ongoing CCCL delineation and monitoring program, beach profiles are periodically measured from the control line monuments. In addition, the state also conducts post-storm surveys that provide Florida with a comprehensive pre- and post-storm database (Balsillie, 1988).

75. Erosion Setbacks. The 1985 State Comprehensive Growth Management Act (Chapter 85-55, Laws of Florida) amended the Beach and Shore Preservation Act to include a construction setback provision for all sandy beach counties. The amendment

prohibits the FDEP from granting most coastal construction permits on land that will be seaward of the seasonal high water line within 30 years (Section 161.053, Florida Statutes). The 30-year erosion projection cannot, however, extend landward of an established CCCL (Section 161.053, Florida Statutes).

76. The FDEP can grant coastal construction permits for shore protection structures, piers, and minor structures seaward of the 30-year erosion projection. The FDEP will permit construction of a single-family residence seaward of the line only if the parcel was platted before adoption of the amendment, the landowner does not own another parcel adjacent to and landward of the parcel proposed for development, and the structure is located landward of the frontal dune and as far landward as practicable (Section 161.053, Florida Statutes). In addition, repairs or reconstruction of a building cannot "expand the capacity of the original structure seaward of the 30-year erosion projection" (Section 161.053, Florida Statutes). The department can, however, issue a permit for landward relocation of a damaged or existing structure if the relocation will not damage the beach-dune system (Section 161.053, Florida Statutes).

77. The FDEP uses long-term erosion rates to delineate the location of the 30-year erosion projection. FDEP must also consider the presence of shore protection structures and beach renourishment projects in determining the appropriate location of the erosion projection (Section 161.053, Florida Statutes).

78. Coastal Building Zone. The 1985 Growth Management Act further amended the Beach and Shore Preservation Act to establish a coastal building zone extending landward of coastal construction control lines. Within the coastal building zone, strict building codes ensure that all major structures are designed and constructed to withstand the forces of and erosion caused by a 100-year storm event (Florida Atlantic University, 1986).

79. For mainland beaches, barrier spits, and peninsulas lying within Florida's sandy beach counties, the coastal building zone extends from the seasonal high water line to 1,500 ft landward of the coastal construction control line. On barrier islands, the entire island or the area from the seasonal high water line to a maximum of 5,000 ft inland from the control line is included in the building zone (Section 161.54, Florida Statutes). All land areas within the Florida Keys, regardless of island size, also lie within the coastal building zone (Florida Atlantic University, 1986). In counties that lack CCCLs, the coastal building zone is equivalent to the National Flood Insurance Program's V-zone. (FEMA defines the V zone, a coastal high hazard area, as a special flood hazard area that extends from offshore to the inland limit of a primary frontal dune or any area subject to high velocity wave action from storms or seismic sources).

80. Within the coastal building zone, major structures must conform to the state minimum building code, be designed to withstand all anticipated loads resulting from a 100-year storm, and be constructed and located in compliance with NFIP regulations (Section 161.55, Florida Statutes). The statute defines major structures to include houses, mobile homes, commercial and public buildings, and all other construction that has the potential to substantially affect the coastal zone (Section 161.54, Florida

Statutes). Minor structures, such as dune walkways, tennis courts, and gazebos, need not meet these standards but their designs must "produce the minimum adverse impact on the beach and the dune system" (Sections 161.54 and 161.55, Florida Statutes).

81. Erosion Control Program. In 1986, the Florida legislature amended the Beach and Shore Preservation Act to address the statewide problem of beach erosion through a "state-initiated program of beach restoration and beach renourishment" (Section 161.101, Florida Statutes). The legislature declared that "beach erosion is a serious menace to the economy and general welfare of the people of this state and has advanced to emergency proportions" (Section 161.088, Florida Statutes). Correspondingly, the legislature concluded that state management was necessary to ensure that Florida's beaches were properly managed and protected (Section 161.088, Florida Statutes). Although the state had funded and participated in coastal erosion control projects since 1965, most of these projects were locally initiated and were not part of a comprehensive state plan (Florida Atlantic University, 1986).

82. The statute directs the FDEP to develop and maintain a comprehensive long-term management plan for restoration of Florida's critically eroding beaches (Section 161.101, Florida Statutes). The plan must 1) ensure the geographic coordination and sequencing of prioritized projects, 2) reduce equipment mobilization and demobilization costs, 3) maximize the quantity of beach-quality sand into the system, 4) extend the life of beach nourishment projects and reduce the frequency of renourishment, and 5) promote inlet sand bypassing to replicate the natural flow of sand interrupted by inlets and ports (Section 161.091, Florida Statutes). The plan, known as the Strategic Beach Management Plan, is updated annually to address changing conditions in the coastal system.

83. State funds for erosion control projects are available from Florida's Erosion Control Trust Fund (Section 161.091, Florida Statutes). The fund provides money for erosion control; hurricane protection; and beach preservation, restoration, and renourishment projects (Section 161.091, Florida Statutes). The state can pay up to 50% of the actual cost of restoring a critically eroding beach, while the local government in which the project occurs must provide the balance of the funds (Section 161.101, Florida Statutes). The level of state funding is directly related to the amount of public beach access and parking located within the project area.

84. For a project to be eligible to receive state funding, it must be located in an area designated by the FDEP as critically eroded and identified in the Strategic Beach Management Plan. In addition, the proposed project must be 1) designed to protect, preserve, maintain, or enhance the coastal system; 2) cost effective, with tangible benefits, that exceed costs; 3) designed to provide a net positive enhancement to the environment and protect historically established habitat; and 4) consistent with local comprehensive plans and Chapters 161, 253, 258, and Part IV of Chapter 373, Florida Statutes.

85. Erosion Control Line. Property rights of state and private upland owners in beach restoration project areas are set forth in Florida Statute 161.141. The statute proclaims

that the Legislature hereby declares that it is the public policy of the state to cause to be fixed and determined, pursuant to beach restoration, beach renourishment, and erosion control projects, the boundary line between sovereignty lands of the state bordering on the Atlantic Ocean, the Gulf of Mexico, or the Straits of Florida, and the bays, lagoons, and other tidal reaches thereof, and the upland properties adjacent thereto; except that such boundary line shall not be fixed for beach restoration projects that result from inlet or navigation channel maintenance dredging projects unless such projects involve the construction of authorized beach restoration projects. However, prior to construction of such a beach restoration project, the board of trustees shall establish the line of mean high water for the area to be restored; and any additions to the upland property landward of the established line of mean high water which result from the restoration project shall remain the property of the upland owner subject to all governmental regulations and shall not be used to justify increased density or the relocation of the coastal construction control line as may be in effect for such upland property. Such resulting additions to upland property shall also be subject to a public easement for traditional uses of the sandy beach consistent with uses, which would have been allowed prior to the need for such restoration project. It is further declared that there is no intention on the part of the state to extend its claims to lands not already held by it or to deprive any upland or submerged landowner of the legitimate and constitutional use and enjoyment of his property. If an authorized beach restoration, beach renourishment, and erosion control project cannot reasonably be accomplished without the taking of private property, then such taking shall be made by the requesting authority by eminent domain proceedings.

86. Inlet Management. In order to manage the erosion of adjacent beaches as a result of improved navigational inlets, the Florida Legislature passed the Declaration of Public Policy relating to improved navigation inlets (Section 161.142, Florida Statutes). In this statute, the Legislature recognized the need for maintaining navigation inlets to promote commercial and recreational uses of coastal waters and their resources. The Legislature further recognized that inlets alter the natural drift of beach-quality sand resources. The alteration often results in these sand resources being deposited around shallow outer-bar areas instead of providing natural nourishment to the downdrift beaches. Therefore:

a. All construction and maintenance dredging of beach-quality sand should be placed on the downdrift beaches or, if placed elsewhere, an equivalent quality and quantity of sand from an alternate location should be placed on the downdrift beaches.

b. On an average annual basis, a quantity of sand should be placed on the downdrift beaches equal to the natural net annual longshore sediment transport.

c. Construction waterward of the coastal construction control line on downdrift coastal areas, on islands substantially created by the deposit of spoil, located within 1 mile of the centerline of navigation channels or inlets, providing access to ports listed in Section 403.021(9)(b), Florida Statutes, which suffers or has suffered erosion caused by such navigation channel maintenance or construction shall be exempt from the permitting requirements and prohibitions of subsections (2), (5), and (6) of Section

161.053, Florida Statutes. The timing and sequence of any construction in such coastal areas shall comply with 44 C.P.R. part 60 and shall provide protection to nesting sea turtles and hatchlings and their habitats and to native salt-resistant vegetation and endangered plant communities.

d. The provisions of subsections (1) and (2) shall not be a requirement imposed upon ports listed in s.403.021(9)(b).

87. Erosion control of downdrift beaches must also be balanced with the importance of maintaining the water depths needed to conduct deepwater commercial navigation in the channels, ports, and turning basins of Florida. This premise was set forth in Florida Statute 403.021.9(a) and 9(b).

a. 9(a). The Legislature finds and declares that it is essential to preserve and maintain authorized water depth in the existing navigation channels, port harbors, turning basins, and harbor berths of this state in order to provide for the continued safe navigation of deepwater shipping commerce. The department shall recognize that maintenance of authorized channel depths is an ongoing, continuous, beneficial, and necessary activity; and it shall develop a regulatory process which shall enable the ports of this state to conduct such activities in an environmentally sound, expeditious, and efficient manner.

b. 9(b). The provisions of paragraph (a) apply only to the port waters, spoil disposal sites, port harbors, navigation channels, turning basins, and harbor berths used for deepwater commercial navigation in the ports of Jacksonville, Tampa, Port Everglades, Miami, Port Canaveral, Ft. Pierce, Palm Beach, Port Manatee, Port St. Joe, Panama City, St. Petersburg, and Pensacola.

88. All improved inlet projects are evaluated to determine the possible erosion problems associated with their construction. Inlet management is incorporated into the State's beach management plan in Chapter 161.161, Florida Statutes.

a. The division shall develop and maintain a comprehensive long-term management plan for the restoration of the state's critically eroding beaches. The beach management plan shall:

(1) Address long-term solutions to the problem of critically eroding beaches in this state.

(2) Evaluate each improved coastal beach inlet and determine whether the inlet is a significant cause of beach erosion. With respect to each inlet determined to be a significant cause of beach erosion, the plan must include:

(a) The extent to which such inlet causes beach erosion and recommendations to mitigate the erosive impact of the inlet, including, but not limited to, recommendations regarding inlet sediment bypassing; modifications to channel

dredging, jetty design, and disposal of spoil material; establishment of feeder beaches; and beach restoration and beach renourishment; and

(b) Cost estimates necessary to take inlet corrective measures and recommendations regarding cost sharing among the beneficiaries of such inlet.

89. Local Comprehensive Planning. The Local Government Comprehensive Planning Act of 1975 (Chapter 163) requires that all local governments prepare, adopt, and implement comprehensive plans that address community growth and development needs (Pilkey et al., 1984). In the 1985 Growth Management Act, the Florida Legislature strengthened the Planning Act in coastal areas and required that local, regional, and state comprehensive plans be consistent with each other. Under the Planning Act, coastal localities must include a "coastal management element" in their local plans (Godschalk et al., 1989). This section of the plan must be based on an inventory of the beach-dune system and existing coastal land uses and an analysis of the effects of future land uses on coastal resources (Florida Atlantic University, 1986).

90. Within the plan's coastal element, local governments must address disaster mitigation and redevelopment, designation of coastal high-hazard areas, beach protection, and shoreline use. The local plans must fulfill, among others, the following primary objectives:

a. protection of coastal resources;

b. limitation of public expenditures that subsidize development in coastal high-hazard areas;

c. direction of population away from coastal high-hazard areas;

d. management of development and redevelopment in coastal high-hazard areas to minimize risks to life and property; and

e. protection and enhancement of beach-dune systems (Florida Atlantic University, 1986; Godschalk et al., 1989).

91. If a local plan does not meet the requirements of the Growth Management Act, the state may curtail funds (Godschalk et al., 1989). Furthermore, the state cannot issue funds to increase the capacity of local infrastructures unless improvements are consistent with the coastal management element in the local plan. The state can also restrict a locality from receiving post-disaster Federal assistance. The state may exclude local projects on all state applications to the Federal Emergency Management Agency unless the municipality has adopted hazard mitigation and prevention plans (Godschalk et al., 1989).

92. Coastal Barrier Regulations. In the 1981 Coastal Barrier Executive Order (E.O. 81-105), the governor of Florida recognized the value of coastal barriers and set forth

three requirements for state agencies that plan for, manage, and regulate the coastal zone. The governor directed that:

a. acquisition of coastal barriers was a priority;

b. Federal and state money was not to be used to subsidize growth or post-disaster redevelopment on hazardous barriers; and

c. agencies were to manage growth in a manner consistent with the evacuation capabilities of coastal barriers (Florida Atlantic University, 1986).

93. The executive order did not provide state agencies with any specific powers to carry out its directives but rather set the overall policy for state actions on coastal barriers. Subsequently, in the 1985 Growth Management Act, the legislature enacted specific amendments to discourage growth and unwise development on coastal barriers (Sections 380.27 and 163.178, Florida Statutes). In particular, the act directed that state funds could not be used to build bridges or causeways to barrier islands that were not already accessible (Florida Atlantic University, 1986).

94. Coastal Acquisition. Florida has one of the largest state acquisition programs in the country in terms of money spent and land purchased (Florida Atlantic University, 1986). Acquisition of coastal land is among the key components of the state's land protection program. Florida's Save Our Coasts program, authorized under the Land Acquisition Trust Fund (Sections 375.041, Florida Statutes), provides monies specifically for acquisition of coastal properties. Enacted in 1981, the Save Our Coasts program authorized a $200 million bond issue for purchase of sandy beaches, barrier islands, and beach access points. Through July 1986, the program had purchased 2,713 acres of coastal land, representing 13 miles of shoreline (Florida Atlantic University, 1986). The state's coastal acquisition efforts target areas where the local government is willing to make a financial contribution to purchase the land and to manage it after acquisition. Parcels in areas with a need for additional recreational beaches and sites susceptible to repeated erosion are also the focus of the acquisition program (Glassman, 1983).

FORMULATION OF ALTERNATIVE PLANS

95. The alternative plans considered were developed through a three-step process. These three steps were:

a. Identification and preliminary assessment of possible solutions. Costs and benefits have not been computed.

b. Development and assessment of intermediate-level-of-detail alternatives. Unit price cost estimates and benefits have been computed. Includes general discussion of potential environmental impacts.

c. Development and assessment of detailed alternative plans. Cost code of account level cost estimates have been computed, including the costs of lands,

easements, rights-of-way, and mitigation. Detailed benefits have been computed. Federal and non-Federal cost allocation is discussed.

96. Each step was iterative in the process of identifying and selecting the best course of action. Each alternative was considered in light of other projects within each reach or problem area. During the first step of preliminary identification and assessment of alternatives, the alternatives developed included traditional projects, programs that could be carried out by non-Federal interests, and structural as well as nonstructural alternatives. Each plan in the array was screened based on its ability to satisfy the planning objectives. Viable plans were carried forward into the intermediate level of detail and analysis and were developed sufficiently to assess generalized benefits, costs, and impacts. Those plans meriting closer evaluation were carried into the third step entailing the development and analysis of alternative plans at a detailed level.

Economic Benefits and Costs

97. The economic analysis to determine the NED plan for the study area includes an inventory of potential damages, development of plans, and estimation of the costs for project implementation. The cost of mitigation measures is developed along with the cost of each alternative plan. Monetary values are expressed in average annual equivalents by appropriate discounting and annualizing techniques based on the current water resource evaluation interest rate of 6 and 3/8%. The same 50-year period of analysis is used for all alternative plans. The period of analysis does not include the implementation or construction period (the period before the base year). All benefits and costs are expressed as of the beginning of the base year. The following steps are taken in the economic analysis:

a. for the future without-project condition, assess the extent of damageable property through analysis of storm surge and wave damage, assess the loss of recreation, and assess the loss of land,

b. determine damage reduction benefits to the coastal system or reach for various project alternatives, and

c. evaluate all beneficial and adverse impacts for each project altemative in accordance with Engineering Regulation 1105-2-100 (Principles and Guidelines).

98. According to the study guidelines and objectives, the above criteria were used to formulate possible modifications to the authorized hurricane and storm damage reduction projects for Lido Key. These criteria assure that all possible alternative projects are formulated in a systematic and reasonable manner.

INITIAL ASSESSMENT OF ALTERNATIVE PLANS

99. Table III-9 presents an evaluation of possible solutions considered in the first step of project formulation. Many of the alternatives were not retained for intermediate analysis because they did not fully address the planning objectives. Planning objectives

considered in the preparation of this table include the local objectives and the accounts required by the Water Resources Council's "Principles and Guidelines." The alternatives considered in initial plan development are discussed in the following paragraphs.

Table III-9 Initial Assessment of Alternative Plans

		Sponsor Planning Objectives[1]			*Federal Objectives*[2]			
POSSIBLE MEASURES		RB	SDR	TBE	NED	EQ	OSE	RED
Nonstructural Measures (NS)								
NS-1	No-Action	O	O	O	O	O	O	O
NS-2	Construction Control Line	O	P	O	O	O	O	O
NS-3	Moratorium on construction	O	P	O	O	O	O	O
NS-4	Establish a no-growth program	O	P	O	O	P	O	O
NS-5	Relocation of structures	O	F	O	O	P	O	O
NS-6	Flood proofing of structures	O	P	O	O	O	O	O
NS-7	Condemnation of land and structures	O	P	O	O	O	P	O
NS-8	Various nonstructural combinations	-	-	-	-	-	-	-
Structural Measures (S)								
S-1	Seawalls	O	P	O	O	O	P	O
S-2	Revetments	O	P	O	O	O	P	O
S-3	Beach Nourishment	F	P	F	F	P	P	P
S-4	Groins	P	P	P	F	O	P	O
S-5	Breakwaters	P	P	P	P	O	P	O
S-6	Dunes and vegetation	O	P	P	P	P	P	P

Notes:
[1] RB – Provision of recreation beach
SDR – Reduction of hurricane and storm damage
TBE – Protection of tourism-based economy
[2] NED – National Economic Development
EQ – Environmental Quality
OSE – Other Social Effect
RED – Regional Economic Development
[3] F – Fully meeting objective
P – Partially meeting objective
O – Not meeting objective

Nonstructural (NS) Alternative Plans

100. NS-1 – No-Action. The no-action alternative perceives the continuation of existing conditions and provides no solutions to existing problems. However, it also avoids any undesirable effects that may be associated with structural or nonstructural plans of improvement. This option, although not favored by the non-Federal sponsor, is considered in relation to the effects of other alternatives.

101. NS-2 - Construction Control Line. A construction control line would not affect existing development and could only be effective in the unforeseeable future as buildings are razed and destroyed by storms. However, this alternative is acknowledged and included in the nonstructural combination plan and plans are developed around it. A coastal construction control line that does not prohibit construction, but does provide stringent structural restrictions, has been established by the State of Florida for all of the Lido Key study area.

102. NS-3 - Moratorium on Construction. A moratorium on construction is rejected by the non-Federal sponsor and local interests because the desired growth of the area is oriented towards tourism and recreation, attracting retirees, and promoting a stable construction industry. Further, this alternative offers no protection to existing development in the study area. This alternative is therefore excluded from detailed study.

103. NS-4 - Establish a No-Growth Program. The establishment of a no-growth program is rejected by local interests. Growth in the area, particularly that in connection with beach activities, is needed to provide economic depth to the communities. Further, this alternative offers no protection to existing development in the study area. This alternative is therefore excluded from detailed study.

104. NS-5 - Relocation of Structures. The relocation of the structures would allow the area to continue to erode and the land in this area would be lost until the shoreline reached equilibrium. However, structures within the area which cannot be economically or physically moved from the area would be lost due to erosion and have to be abandoned with new structures provided for the existing residents. In addition, implementation of this alternative would result in the loss of valuable recreational beach as shoreline recession continues and would necessitate the condemnation of the land and structures in this area. This alternative is implicitly incorporated into the storm damage benefit analysis in that once condemned by the storm damage model, such upland development is removed from inventory.

105. NS-6 - Flood Proofing of Structures. Flood proofing of existing structures and regulation of flood plain and storefront development are considered part of building code modifications and are not considered as separate alternatives.

106. NS-7 - Condemnation of Land and Structures. This alternative would allow the shoreline to erode in the area with a loss of land until the shoreline reached equilibrium. This alternative is excluded as it fails to meet the planning objectives.

107. NS-8 - Various Nonstructural Combinations. It is recognized that various aspects of many of the preceding nonstructural solutions would be prudent to implement either collectively or in combination with structural alternatives. For the study shoreline, a single nonstructural plan is not applicable for the study area.

Structural (S) Alternative Plans

108. S-1 - Seawalls. The construction of additional concrete seawalls or improvements to and maintenance of the existing bulkheads/seawalls would provide a significant degree of protection; however, this would be accomplished at the expense of a recreational beach and result in substantial economic loss to the area. Reflecting wave energy off the existing seawalls and bulkheads has resulted in steep offshore profiles with resulting hazardous bathing conditions due to increased undertow and runouts. High initial costs of seawall construction in addition to adverse effects on coastal processes eliminate this alternative from further consideration.

109. S-2 - Revetments. Revetments have been placed on similar beaches to protect critically damaged or eroding areas. These measures have provided temporary relief but have not reduced the erosion of the beaches. The hardening of the beach in one area will merely transfer the location of the problems farther down the beach. Emergency construction of revetment type structures, in-line with current State of Florida coastal armoring statutes, is implicit in the storm damage analysis but is not carried forward as an implementable project feature.

110. S-3 - Beach Nourishment. This alternative would provide initial beach fill and future nourishment of a design template of appropriate dimensions to serve as a buffer against wave attack. Renourishment of the beach would be undertaken periodically to maintain the recreational and erosion control features within design dimensions. Dimensions of the beach fill would be based on the degree of protection the project should provide. Beach nourishment is carried forward into the intermediate alternative analysis.

111. S-4 - Groins. Project designed groins or a groin field in the problem area would help hold a beach in front of existing development and prevent further losses of land. The construction of groins would have to be supplemented with nourishment so that adjacent beaches would not be starved of sand. For this reason, groins are considered a method to help hold the fill in place and to reduce periodic renourishment requirements. Groins could also be considered to offer additional stabilization to inlet areas. Groin (terminal and field) construction is carried forward into the intermediate alternative analysis.

112. S-5 - Breakwaters. The construction of breakwaters offshore along the Lido Key problem area is considered as an alternative to reduce periodic nourishment quantities needed to maintain a protective and recreational beach fill in this area. Such structures would reduce the amount of wave energy reaching the shoreline in their lee. The formation of a partial tombolo would occur if the breakwaters are of sufficient size. As a result, the rate of annual erosion would decrease, as would the annual nourishment requirements. However, costs, state regulations, and environmental concerns preclude further consideration of this alternative.

113. S-6 - Dunes and Vegetation. The presence of dunes is essential if a beach is to remain stable and able to accommodate the vagaries wrought by unpredictable storms

and extreme conditions of wind, wave, and elevated sea surface. Dunes maintain a vast sand repository that, during storms, has a sacrificial element attached to it. Storms with low surges are unable to reach the dune — thus, subaerial sand is mostly retained. However, larger storms with attendant high waves and elevated water levels typically erode the dune. Such storms have erosion potentials dependent on their climate and the characteristics of the affected beach. The dune sacrifices a portion of its sand during these storms to satisfy the erosion potential and protects the lands and property on its landward side. In so doing, the dune system provides a measure of public safety and property protection not otherwise provided. Proper dune vegetation on dunes increases sand erosion resistance by binding the sand together via extensive root masses penetrating deep into the sand. Further, such vegetation promotes dune growth through its sand trapping action when significant wind action transports substantial quantities of sand. This alternative may be implemented as a project feature in the future.

INTERMEDIATE ASSESSMENT OF ALTERNATIVE PLANS

114. The previous paragraphs describing the possible solutions eliminated all but one nonstructural and two structural alternatives. The no-action plan (NS-1) is the single nonstructural alternative to be carried throughout intermediate plan formulation for consideration and comparison. The structural alternative plans to be carried into the intermediate assessment include beach nourishment (S-3) and groins (S-4). Volumes calculated for beach fills were based on design requirements at approximately 1,000-ft intervals (every FDEP monument). Volumes were computed with the average end area method.

115. NED Plan Formulation. The Federal Government applies National Economic Development (NED) principles for the economic evaluation of all water resource projects. The NED principles articulate a framework to assist in making project scope and implementation decisions. For the purpose of Lido Key hurricane and storm damage reduction, NED principles are applied to determine the total net benefits of the project. From this information, the NED plan is formulated and net benefits are maximized.

116. The NED plan for the Lido Key hurricane and storm damage reduction project has been developed in accordance with ER 1105-2-100 Section 6-1 by adopting the procedures and policies of the Water Resource Council's (WRC) Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, Chapter II - National Economic Development (NED) Benefit Evaluation Procedures (March 10, 1983).

117. NED Principles. National economic development (NED) is the increase in the net value of the national output of goods and services, expressed in monetary units. "Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the nation. Contributions to NED include increases in the net value of those goods and services that are marketed, and also those that may not be

marketed."(Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, p. 1, March 1983)

118. U.S. Army Corps of Engineers projects produce outputs that benefit the nation, but these projects also expend the nation's resources. The NED principle helps determine which use of the nation's resources will produce the greatest benefits to the nation. As such, the NED principle is a matter of law, policy, and interpretation rather than one of economic fact or theory, although it is a policy firmly rooted in economic theory.

119. The Water Resource Council (WRC) has established evaluation principles, which are intended to ensure proper and consistent planning by Federal agencies. These principles, as defined in the "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies", are as follows:

- That there be an economically justified and environmentally acceptable project. Widespread use of benefit to cost analysis as a test of a project's economic worth is generally considered to have grown out of the Flood Control Act of 1936. In this Act, Congress required that the U.S. Army Corps of Engineers recommend a project only "if the benefits to whomsoever they may accrue are in excess of the estimated costs and if the lives and social security of people are otherwise adversely affected." If there is an economically justified project, decisions on whether and to what extent there should be Federal participation are guided by a concept of the Federal interest that has evolved from legislation, from precedent in project authorization and construction, and from Administration budget priorities.

- Federal participation must be otherwise warranted. Federal participation is limited in circumstances where there are special and local benefits which accrue to a limited number of identifiable beneficiaries. The Federal government does not participate in facilities which produce outputs incidental to basic project purposes.

- The project must meet current Administration budget priorities. The Administration does not budget for a project unless a significant proportion of the project outputs have a high budget priority.

120. Various alternative plans are to be formulated in a systematic manner to ensure that all reasonable alternatives are evaluated.

(a) A plan that reasonably maximizes net national economic development benefits, consistent with the Federal objective, is to be formulated. This plan is to be defined as the NED plan.

(b) Other plans which reduce net NED benefits in order to further address other Federal, state, local, and international concerns not fully addressed by the NED plan should also be formulated.

(c) Plans may be formulated which require changes in existing statutes, administrative regulations, and established common law. Such required changes are to be identified.

(d) Each alternative plan is to be formulated in consideration of four criteria: completeness, effectiveness, efficiency, and acceptability. Appropriate mitigation of adverse effects is to be an integral part of each alternative plan.

(e) Existing water and related resources plans, such as state water resources plans, are to be considered as alternative plans if within the scope of the planning effort.

121. The planning process leads to the identification of alternative plans that could be recommended or selected. The culmination of the planning process is the selection of the recommended plan or the decision to take no-action. The selection should be based on a comparison of the effects of alternative plans (ER 1105-2-100 Section 5-11.a). The basis for selection of the recommended plan should be fully reported (ER 1105-2-100 Section 5-11.b(4)). In presenting the NED plan, all reports must include appropriate information and data (ER 1105-2-100 Section 5-16.b). Concise, understandable displays are also helpful during the planning process and provide documentation in compliance with NEPA (ER 1105-2-100 Section 5-9.a.1).

122. Under the NED principle, the best (or NED) plan maximizes net benefits. The Corps traditionally expresses benefits and costs in monetary terms as equivalent annual values. Thus, maximizing annual net NED benefits is formally equivalent to selecting a plan with the maximum equivalent annual benefits and maximum net present value (NPV). The plan recommending Federal action is to be the alternative plan with the greatest net economic benefit, which is also consistent with protecting the nation's environment (Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, p. 1, March 1983).

Development and Analysis of Intermediate Alternative Plans

123. NS-1 No-Action Plan. The no-action plan is referred to in the economic analysis as the without-project condition. The without-project condition assumes that short-term and long-term erosion will continue into the future at the same rates as they have over the period of record. Structures predicted to be condemned before the base year of the project are removed from the without- as well as the with-project SDM inventories. State of Florida coastal zone management regulations are implemented to determine future without-project coastal armoring activities. The average annual equivalent damage predicted for the no-action plan is used as a benchmark in the comparison of intermediate alternative plans. Predicted with-project damages are subtracted from the damages expected under the no-action plan to determine the benefits of each alternative plan. No costs are associated with the no-action plan.

124. The no-action plan for the study area considers the highly variable shoreline recession rate based on shoreline changes between 1971 and 1999. Due to limited offshore survey data, changes before 1991 were estimated assuming a volumetric

change of 0.60 cy/ft for each foot of shoreline change. South of the 1970 project area (R-35 – R-38), the beach lost approximately 336,000 cy (20 cy/yr/ft) between 1971 and 1974, partly due to Hurricane Agnes. Between 1978 and 1991, the net erosion in the current project area was 348,000 cy (2.9 cy/yr/ft), in spite of a number of renourishment and dredging operations during this period (CP&E, 1991; ATM, 1994). Between 1991 and the most recent nourishment in 1998, the current project area lost 431,000 cy (6.7 cy/yr/ft). Erosion following the most recent nourishment project, completed in May 1998, removed 155,000 cy (8.5 cy/yr/ft) from the project area between May 1998 and May 2000. Especially when subjected to severe storms and/or inlet effects, erosion rates within the current project area can reach 44 cy/yr/ft.

125. Inlet effects along the undeveloped portions of Lido Key (R-32 – R-35, R-44) dominate shoreline changes and therefore are highly uncertain. Along the developed portion of Lido Key, existing seawalls mark the landward limit of shoreline change. Between R-35 and R-39, the MHW line is expected to recede to the location of the seawalls along Ben Franklin Drive over the next 10 – 20 years. Between R-39.5 and R-41.5, the shorelines are expected to advance, as eroded material from the north moves south. South of R-41.5, shoreline retreat is expected, as material from north is swept offshore due to presence of the Big Sarasota Pass ebb shoal. Shoreline recession between R-41.5 and R-43 will be limited by the existing seawalls.

126. The computer model SBEACH (Storm Induced Beach Change Model [Larson and Kraus, 1989]) was used in conjunction with the empirical simulation technique (EST) to develop frequency versus recession curves for Reaches 1 through 4. The Engineering Appendix contains a detailed description of the development of these curves that, in turn, are used later in the Economics Appendix to compute expected storm damages.

127. The Economics Appendix concludes that federal interest, i.e., hurricane and storm damage reduction, is restricted to Reaches 2 and 3. The average annual equivalent storm damage for the no-action plan along Reaches 2 and 3 is approximately $4 million. Additional characteristics of the no-action plan for the study area are described in the section of this report entitled "Future Without-Project Conditions."

128. S-3 – Beach Nourishment. Beach nourishment consists of initial construction of a beach fill design template (with requisite advance nourishment) along a specified length of shoreline and the subsequent nourishment of that shoreline at a predetermined interval.

129. Design Template. Hurricane and storm damage reduction projects, which provide beach fill features, are designed to reduce wave and surge impacts to upland development. The major considerations of beach fill template design include berm width and elevation, foreshore slope, location of the slope break, and nearshore slope. The project baseline is defined in terms of the May 2000 mean high water (MHW: +1.14 ft NGVD) shoreline position. Based on the natural berm elevations and previous project designs, a +5 ft NGVD design berm elevation with a foreshore construction slope of 1 vertical (V) to 12 horizontal (H) has been chosen. This value is similar to the authorized

project height of +4.7 ft NGVD (+5 MLW) and is characteristic of the natural berm elevation within the study area at R-35, R-37, R-40, and R-41.

130. The berm elevation is an important parameter related to hurricane and storm damage reduction. If the berm is constructed too low, inundation or overtopping (and associated damages) during relatively frequent storms could occur. The top of the natural berm crest defines the upper limit of significant sediment movement. EM11110-2-3301 (May 1995), Design of Beach Fills, stipulates that the construction berm elevation should be the same or slightly less than the natural berm crest elevation. Because the construction berm will erode and the beach fill will be redistributed into a more naturally shaped profile, restricting the construction berm crest height to the natural berm crest height will minimize scarping problems as the beach fill undergoes readjustment. Table III-10 summarizes estimated storm surge levels for middle Sarasota County, calculated by combining available historical statistics from hurricanes with a set of numerical models to simulate the storm tides for a given level of storm (Dean, et al., 1988).

131. Still water levels on the order of +1.5 ft NGVD are common along the Gulf of Mexico coast in Sarasota County. The tabulated values for storm surge indicate that a berm crest elevation of +5.0 ft NGVD will be exceeded during times of high water associated with a 10-year return period surge event. The proposed fill to replicate the existing berm height maintains a reasonable level of storm protection, minimizes scarp development, and optimizes beach accessibility. Based on these considerations and typical natural berm elevations along the project length, the design berm elevation for this project was established at an elevation of +5.0 ft NGVD.

Table III-10 Combined Storm Stages for Middle Sarasota County (Dean et al., 1988)

Return Period (Yrs)	*Storm Stage (ft, NGVD)*
10	6.0
20	8.8
50	11.3
100	12.6
200	14.0
500	15.6

NOTE: Stage includes wind stress, barometric pressure, dynamic wave setup, and astronomical tides.

132. Design Berm Widths. Various berm width extensions were considered in the formulation of the National Economic Development (NED) plan for the study area. The berm extension is defined as the distance that the design template moves the MHW shoreline seaward from the pre-project MHW shoreline. The MHW elevation (+1.14 ft above the National Geodetic Vertical Datum at Lido Key) delineates State of Florida owned bottom lands from those of the upland property owner. Before project

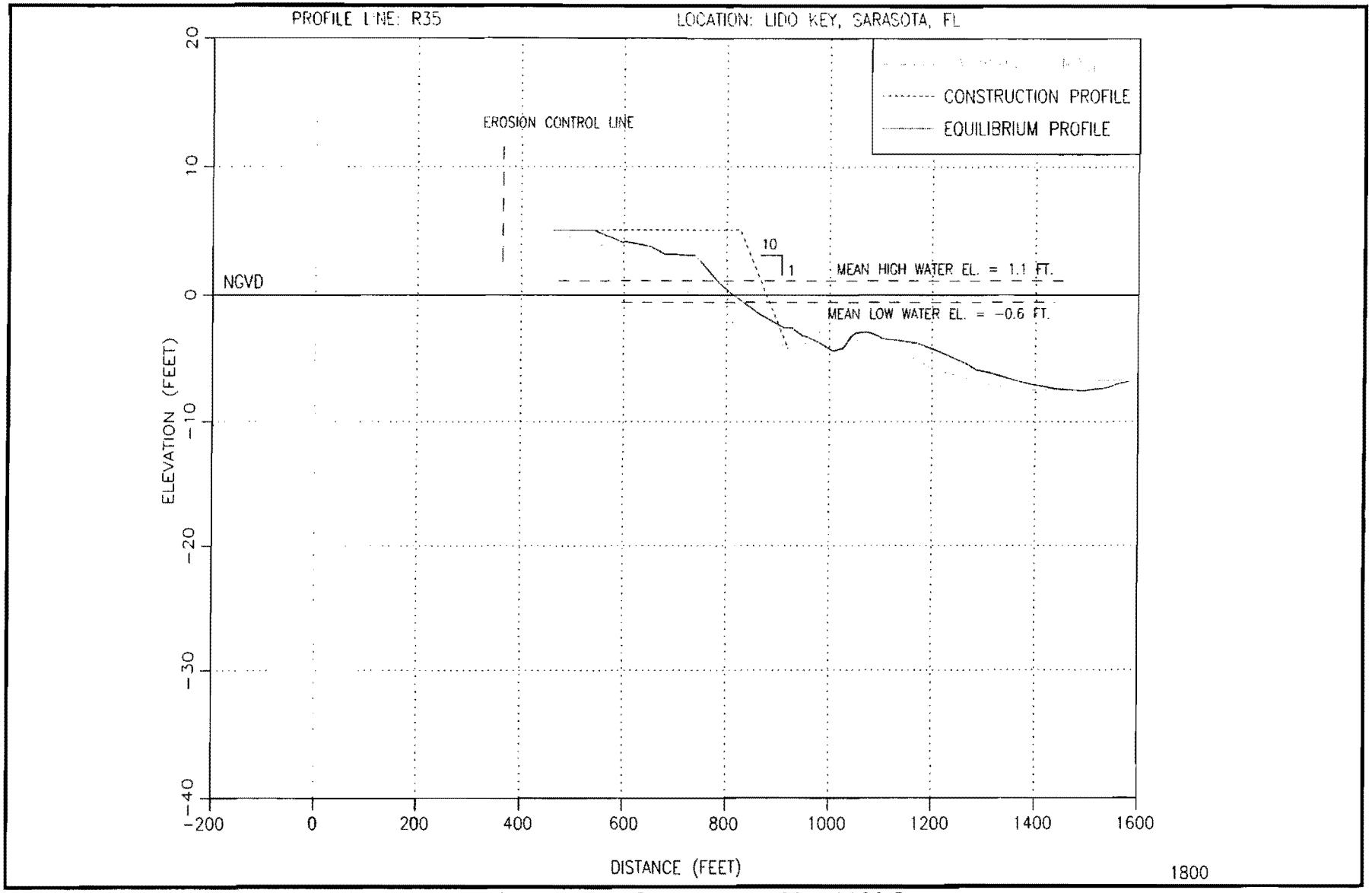


FIGURE III-6 Typical Section From May 2000 Survey

construction, the location of the MHW shoreline would be established as the erosion control line (ECL). Volumes required for berm extensions of 0, 20, 40, 60, 80, and 100 ft were calculated in the process of identifying the NED plan(s) for the study area.

133. Figure III-6 shows a typical section from the May 2000 survey and the 80-ft construction and equilibrium templates for Reaches 2 and 3 of the study area.

134. Benefits. Benefits accrued by beach nourishment originate from reduction in storm damage to upland development, coastal armor, and backfill. Benefits are also realized from the reduction of the amount of land lost between the mean high water shoreline and the coastal armor line along the project reach. The Economics Appendix gives a full account of the Jacksonville District's Storm Damage Model (SDM) used to predict damages with- and without-project conditions.

135. Assumptions pertaining to the engineering, economic, environmental, and political aspects of the alternative plans are crucial to the reliability of the benefit analysis. To determine structural values, the Sarasota County Property Appraiser's Office and the Jacksonville District Real Estate Division created an inventory of each affected structure within Reaches 2 and 3. The structure inventory defined each by type, value, number of floors, and the lot sizes each occupied. A version of the cost approach to value, *Replacement Cost New Less Depreciation*, was used to estimate market values of improvement.

136. Shoreline change values have been assumed for short-term as well as long-term trends. Short-term shoreline change is associated with the recession distance expected for storms of various frequencies of occurrence. The computer model SBEACH was used to determine storm recession and cross-shore sediment transport for representative profiles of Reaches 1 – 4. Storm recession damages were estimated as a function of annual probability and return period (frequency) using the Empirical Simulation Technique (EST). Separate storm recession as function of return period curves were developed for these four segments of shoreline.

137. The computer model GENESIS (Generalized Model for Simulating Shoreline Change [Hanson and Kraus, 1989]) model was used to provide a numerical method for determining long-term shoreline change in response to spatial and temporal differences in longshore sand transport. Two coefficients (K_1 and K_2) in the longshore transport equation are adjusted based on historical shoreline changes to calibrate the model. Coefficient K_1 governs the longshore transport resulting from changes in the orientation of the shoreline. Coefficient K_2 governs the longshore transport resulting from the longshore gradient in breaking wave height (Hanson and Kraus, 1989). The Engineering Appendix A contains a complete discussion of the SBEACH and GENESIS model development.

138. Other assumptions made in determining the benefits of the alternative plans include the shoreline position that would signal condemnation of a structure, protective value of existing and future coastal armor, and the project base year. The SDM allows the condemnation of a structure due to damage of a predetermined percent of the

foundation by a storm of a given return period. Once condemned, the structure is removed from the SDM inventory in the year in which it meets condemnation requirements. Structures two stories or less are considered a total loss when the shoreline recedes halfway through. For structures with more than two stories on deeply embedded pilings, only the structural value of the bottom two floors is considered a loss. Structures condemned before the base year of the project are removed from the SDM inventory. The SDM explicitly accounts for the protective level of coastal armor parcel-by-parcel by protecting upland development within the sheltering limits of the armor from damage due to storm induced as well as long-term recession. The base year of the project was assumed to be 2001, contingent upon allocation of Federal, non-Federal, and state funding.

139. Benefits of beach nourishment are determined for berm width extensions of 0 to 100 ft at 20-ft increments for Reach 2 and Reach 3. Primary benefits from storm damage reduction are claimed in the following analysis while incidental recreation benefits are claimed only for the plan that maximizes NED benefits based solely on storm damage prevention (see Economic Appendix D). Storm damage benefits result from project implementation through reductions in damage to upland development, loss of land, backfill requirements, and coastal armor constructions and maintenance. The 2001 water resource evaluation interest rate of 6 and 3/8% was used in the intermediate assessment of alternative plans.

140. Storm Damage Benefits. Economic justification of beach nourishment in Lido Key is based on the protection of structural improvements located along the front row of development along the project shoreline. Shorefront development is a mix of residential and commercial development in the interior of the project area with recreational parks north and south. The economic evaluation determines the justification of Federal participation based on the benefits generated versus the cost of providing the authorized level of protection along the project shorefront.

141. Benefits resulting from beach nourishment and groin construction are categorized as primary and incidental. Primary benefits are realized through the prevention of storm damages to coastal development and existing protective structures. Guidance for the inclusion of incidental project benefits, such as recreation, are set forth in Engineering Regulation (ER) 1105-2-100 which states that "recreation benefits produces as a benefit of the basic project may exceed 50% of the total project benefits, but economic justification must be demonstrated on the basis of recreation benefits limited to 50% of total project benefits." Recreation benefits of alternative plans will be considered in the section of this report entitled "Detailed Assessment of Alternative Plans."

142. Average annual hurricane and storm damage reduction benefits for the 50-year project life were determined (assuming with- and without-project conditions) for Reach 2 and Reach 3 of the project study area. Damages were simulated from changes due to both shoreline movement and erosion events with storms. Probabilistic frequency vs. storm recession distance curves were developed for Reach 1 – 4 as discussed in detail in the Engineering Appendix A. Recession curves were not developed for New Pass

Reach. Annual shoreline position changes were based on historical shoreline recession rates for the study area.

143. The extent of damages is a result of annual shoreline position change and the damage probabilities from the frequency vs. recession distance curves. Damages are claimed as the result of these two mechanisms in the SDM. The underlying assumption of this model is that a structure will experience damage when the landward extent of storm recession impacts the seaward edge of the structure. Full value of the bottom two floors of the structure is realized when the erosion reaches the middle of the structure. Structures are condemned and taken from the inventory if their full value point (including armor protection level) is located within the recession envelope of a predetermined frequency storm event. Inherent in the routine are the capabilities of coastal structures to halt erosion and the ability to construct new coastal structures upon the failure of the existing structures. Economic Appendix D provides a more detailed discussion of the SDM and the required input data.

144. The SDM was used to compute damages due to both shoreline recession and storm activity for with- and without-project conditions. If an eroding shoreline is assumed to maintain the same profile above the seaward limit of significant sediment transport (limiting depth) while it erodes, the volume of material eroded per foot of beach is equivalent to the vertical distance from the berm crest to the limiting depth, multiplied by the horizontal retreat of the beach profile. The volume of material eroded may be represented by a parallelogram with a vertical height equivalent to the berm elevation plus the limiting depth and a width equivalent to the assumed uniform horizontal elevation provided by the beach fill. The equivalent profile extensions provided by various beach fill design cross sections were input to the SDM for with-project conditions.

145. The shoreline extensions are simulated by SDM, and the reduction in damages is identified for the with-project condition. Storm damage reduction (which includes the effects of long-term recession) is the difference between the expected annual damages under the without-project conditions minus the expected annual damages under the with-project conditions. In the analysis of the average annual benefits, which the project will provide with respect to hurricane and storm damage reduction, the damages projected for the 50-year economic life of the project were determined. The optimum equivalent extensions determined in the economic analysis of storm damage prevention benefits determine the project design cross section that maximizes net benefits.

146. Loss of Land. Loss of land benefits are claimed at privately owned shorefront parcels in the region bounded by the pre-project mean high water shoreline and the location of the coastal armor. Beach nourishment (S-3) results in a design shoreline that is at or seaward of the pre-project mean high water shoreline and thus eliminates the loss of land associated with the no-action plan (NS-1). Determination of the market value of the land losses is based on the value of nearshore upland. Nearshore upland is sufficiently removed from the shore to lose its significant increment of value because of its proximity to the shore when compared to adjacent parcels more distant (inland) from the shore. Real Estate Division, Jacksonville District, investigated recent vacant

nearshore land sale at Lido Key for both residential and commercial properties. The nearshore upland sales data indicated a value for residential as well as commercial land of $24.00 per square foot.

147. Reach 2 and Reach 3 (R35 – R43). Table III-11 shows project benefits, in terms of damages prevented, for the combination of Reach 2 and Reach 3. Total storm damage reduction benefit for the 0-ft berm width extension would be $2,551,122. Maximum benefits of $3,824,274 are obtained with the 100-ft extension resulting in roughly $3,918 of damages to backfill.

148. Costs. Cost estimates (2001 price levels) for providing beach nourishment and groin construction were developed and compared to predicted benefits to determine the plan that would result in maximization of net benefits (the NED plan). Dredge and fill operations were assumed to be accomplished with a generic medium hopper dredge with capability to pump directly to the beach nourishment area. In accordance with ER 1110-2-1302, all dredging costs were computed with the Cost Engineering Dredge Estimating Program (CEDEP). Cost figures in CEDEP were based on an EWT of 90% with a Net Pay yardage loss of 20%. For the 80- and 100-ft berm extensions, mobilization costs are approximately $426,000 while unit costs per cubic yard ($/cy) are $5.38 and $5.29, respectively.

Table III-11 Reach 2 and 3 Benefits (January 2001, 6 and 3/8% interest rate)

Project Condition	*Damages to:*			*Loss of Land*	*Average Annual Equivalent Damages*	*Damages Prevented (Benefits)*
	Develop-ment	*Coastal Armor*	*Backfill*			
Existing	$3,024,470	$46,179	$328,789	$428,754	$3,828,192	N/A
With-project Dam.						
0-ft Ext.	$1,161,247	$5,877	$109,946	$0	$1,277,070	$2,551,122
20-ft Ext.	$968,038	$4,916	$70,425	$0	$1,043,379	$2,784,813
40-ft Ext.	$600,058	$3,066	$40,499	$0	$643,623	$3,184,569
60-ft Ext.	$230,792	$1,187	$21,399	$0	$253,378	$3,574,814
80-ft Ext.	$29,387	$155	$5,023	$0	$34,564	$3,793,628
100-ft Ext.	$0	$0	$3,918	$0	$3,918	$3,824,274

Computed at 6 and 3/8%

149. Optimal renourishment levels for the intermediate assessment of beach fills were determined by comparing cost estimates for renourishment in one-year incremental intervals from a period of one to a period of 12 years. Table III-12 and Table III-13 present the 80- and 100-ft berm extension preliminary January 2001 planning cost estimates along with the total design fill volumes, the required advance nourishment volumes, and estimated construction times. Based on this information, the optimum nourishment interval for both beach fills with an 80-ft and with a 100-ft berm width extension is three years. Each table incorporates weighted averages of mobilization and unit cost based on cost estimates for placement of material for Reach 2 and Reach 3. Contingency costs of 20%, preconstruction and engineering and design (PED) costs

Table III-12 80-ft Berm Extension Cost Estimate (Fill Only)

Lido Key Project Feasibility Study (80-ft Berm Width Extension at 5-ft NGVD) File: - F:\Dan\Region2\Sarasota\LidoKey\Excel\Optiren_Lido_2.xls
Generic Medium Hopper Dredge (Beach Disposal)

Economic Analysis Period	*50 (years)*	*Mob/Demob*	*$426,000*	*Monthly*	215,000 (cy/mo.)
Interest Rate	6.375 (%)	*Unit Price*	$5.38 ($/cy)	*Production*	
Background Erosion Rate	87,000 (cy/yr)	*Monitoring*	$25,750 (/mo.)	*Rate*	
Project Induced Erosion Rate	87,700 (cy/yr)	*Mitigation*	$0 (/mo.)	*Fill Length*	9,100 (ft)
Design Fill	460,200 (cy)	*Contingency*	20 (%)	*Design Fill*	460,200 (cy)
Overfill Factor	0 (%)	*E&D, S&A*	15 (%)		

CAPITAL RECOVERY FACTOR 0.06679 JANUARY 2001 PRICE LEVELS

Total Design Fill + ECL (CY)	Nour. Int. (YRS)	Advance Nourishment (CY) (W/OVERFILL)	Total Initial Fill (CY) (W/OVERFILL)	Estimated Const. Time (MTH) 1 DREDGE	Cost of Initial Const. (1st MOB.)	Cost of Initial Const. (2nd MOB.)	Annual Cost Of Initial Const.	Nourishment Quantity (CY)	Nourishment Cost	Annual Cost of Nourishment	Total Average Annual Equiv. Cost
460,200	1	174,700	634,900	3.0	$5,406,567	$0	$361,099	174,700	$1,913,797	$1,913,797	$2,274,896
460,200	2	349,400	809,600	3.8	$6,732,484	$0	$449,656	349,400	$3,239,714	$1,569,819	$2,019,475
460,200	**3**	**524,100**	**984,300**	**4.6**	**$8,058,401**	**$0**	**$538,212**	**524,100**	**$4,565,631**	**$1,443,797**	**$1,982,010**
460,200	4	698,800	1,159,000	5.4	$9,384,318	$0	$626,769	698,800	$5,891,548	$1,370,400	$1,997,169
460,200	5	873,500	1,333,700	6.2	$5,649,057	$5,649,057	$723,834	873,500	$7,217,465	$1,270,803	$1,994,637
460,200	6	1,048,200	1,508,400	7.0	$6,312,016	$6,312,016	$808,782	1,048,200	$8,543,382	$1,205,678	$2,014,459
460,200	7	1,222,900	1,683,100	7.8	$6,974,974	$6,974,974	$893,729	1,222,900	$9,869,299	$1,158,872	$2,052,601
460,200	8	1,397,600	1,857,800	8.6	$7,637,933	$7,637,933	$978,676	1,397,600	$11,195,215	$1,108,987	$2,087,663
460,200	9	1,572,300	2,032,500	9.5	$8,300,891	$8,300,891	$1,063,623	1,572,300	$12,521,132	$1,054,307	$2,117,930
460,200	10	1,747,000	2,207,200	10.3	$8,963,850	$8,963,850	$1,148,571	1,747,000	$13,847,049	$1,032,188	$2,180,759
460,200	11	1,921,700	2,381,900	11.1	$9,626,808	$9,626,808	$1,233,518	1,921,700	$15,172,966	$972,353	$2,205,871
460,200	12	2,096,400	2,556,600	11.9	$10,289,767	$10,289,767	$1,318,465	2,096,400	$16,498,883	$950,792	$2,269,257

Table III-13 100-ft Berm Extension Cost Estimate (Fill Only)

Lido Key Project Feasibility Study (100-ft Berm Width Extension at 5-ft NGVD) File: - F:\Dan\Region2\Sarasota\LidoKey\Excel\Optiren_Lido_2.xls
Generic Medium Hopper Dredge (Beach Disposal)

Economic Analysis Period	*50 (years)*	*Mob/Demob*	*$426,000*	*Monthly*	215,000 (cy/mo.)
Interest Rate	6.375 (%)	*Unit Price*	$5.29 ($/cy)	*Production*	
Background Erosion Rate	87,000 (cy/yr)	*Monitoring*	$25,750 (/mo.)	*Rate*	
Project Induced Erosion Rate	99,200 (cy/yr)	*Mitigation*	$0 (/mo.)	*Fill Length*	9,100 (ft)
Design Fill	575,200 (cy)	*Contingency*	20 (%)	*Design Fill*	575,200 (cy)
Overfill Factor	0 (%)	*E&D, S&A*	15 (%)		

CAPITAL RECOVERY FACTOR 0.06679 JANUARY 2001 PRICE LEVELS

Total Design Fill + ECL (CY)	Nour. Int. (YRS)	Advance Nourishment (CY) (W/OVERFILL)	Total Initial Fill (CY) (W/OVERFILL)	Estimated Const. Time (MTH) 1 DREDGE	Cost of Initial Const. (1st MOB.)	Cost of Initial Const. (2nd MOB.)	Annual Cost Of Initial Const.	Nourishment Quantity (CY)	Nourishment Cost	Annual Cost of Nourishment	Total Average Annual Equiv. Cost
575,200	1	186,200	761,400	3.5	$6,272,096	$0	$418,907	186,200	$1,977,952	$1,977,952	$2,396,859
575,200	2	372,400	947,600	4.4	$7,662,168	$0	$511,748	372,400	$3,368,024	$1,631,992	$2,143,741
575,200	**3**	**558,600**	**1,133,800**	**5.3**	**$9,052,240**	**$0**	**$604,590**	**558,600**	**$4,758,097**	**$1,504,661**	**$2,109,251**
575,200	4	744,800	1,320,000	6.1	$5,515,096	$5,515,096	$706,669	744,800	$6,148,169	$1,430,092	$2,136,761
575,200	5	931,000	1,506,200	7.0	$6,210,132	$6,210,132	$795,727	931,000	$7,538,241	$1,327,283	$2,123,010
575,200	6	1,117,200	1,692,400	7.9	$6,905,168	$6,905,168	$884,784	1,117,200	$8,928,313	$1,260,001	$2,144,785
575,200	7	1,303,400	1,878,600	8.7	$7,600,204	$7,600,204	$973,842	1,303,400	$10,318,385	$1,211,605	$2,185,447
575,200	8	1,489,600	2,064,800	9.6	$8,295,241	$8,295,241	$1,062,899	1,489,600	$11,708,458	$1,159,828	$2,222,728
575,200	9	1,675,800	2,251,000	10.5	$8,990,277	$8,990,277	$1,151,957	1,675,800	$13,098,530	$1,102,925	$2,254,882
575,200	10	1,862,000	2,437,200	11.3	$9,685,313	$9,685,313	$1,241,014	1,862,000	$14,488,602	$1,080,011	$2,321,025
575,200	11	2,048,200	2,623,400	12.2	$10,380,349	$10,380,349	$1,330,072	2,048,200	$15,878,674	$1,017,578	$2,347,650
575,200	12	2,234,400	2,809,600	13.1	$11,075,385	$11,075,385	$1,419,129	2,234,400	$17,268,746	$995,157	$2,414,287

Table III-14 Costs Associated with Optimum Nourishment Interval (Beach Fill Only)

Project Condition	*Total Design Fill (cy)*	*Nourishment Interval (yrs)*	*Advance Nourishment (w/overfill) (cy)*	*Total Initial Fill (w/overfill) (cy)*	*Estimated Const. Time (months)*	*Cost of Const. 1st MOB.*	*Annual Cost of Nourishment*	*Total Average Annual Equivalent Cost*
0-ft Ext.	0	5	679,500	679,500	3	$6,092,020	$1,072,642	$1,479,522
20-ft Ext.	115,000	5	679,500	794,500	4	$6,979,695	$1,066,038	$1,532,204
40-ft Ext.	230,100	5	744,000	974,100	5	$8,276,723	$1,137,518	$1,690,312
60-ft Ext.	345,100	3	485,400	830,500	4	$7,051,561	$1,380,569	$1,851,536
80-ft Ext.	460,200	3	524,100	984,300	5	$8,058,401	$1,443,797	$1,982,010
100-ft Ext.	575,200	3	558,600	1,133,800	5	$9,052,240	$1,504,661	$2,109,251

of 7%, and supervision and administration (S & A) costs of 8% were applied to the costs of initial construction. Refined cost estimates for PED and S&A are used later in the detailed assessment of alternatives.

150. Table III-14 summarizes preliminary costs associated with optimum nourishment intervals for construction of berm width extensions between 0 to 100 ft for the combination of Reaches 2 and 3. For each berm width extension alternative, the total cost is the sum of the cost of initial construction, future nourishment, and interest during construction. Construction was assumed to be with a generic medium hopper with the capability to pump material directly onto the beach nourishment area. The average annual costs (6 and 3/8%) for the 0-ft, 20-ft, and 40-ft berm width extensions at a nourishment interval of five years would be approximately $1,479,522, $1,532,204, and $1,690,312 respectively. The average annual costs for the 60-, 80-, and 100-ft berm width extension at a nourishment interval of three years would be approximately $1,851,536, $1,982,010, and $2,109,251 respectively.

151. Environmental Concerns. Shoreline protection using beach fill with periodic renourishment is an ongoing effort. No acceptable and permanent one-time fix has been identified. Renourishment efforts have a temporary and shore-term impact on the biological resources off- and onshore. During the placement of material on the beach, temporary impact on marine and shore life in the immediate vicinity of construction would occur. Removal of material from offshore borrow areas has a long-term impact on the nature of the borrow areas. The impacts, however, are not substantial because no protected resources exist within the proposed borrow areas.

152. Average Annual Net Benefits. Optimization through the NED process identified the planning alternative that would maximize net benefits. NED benefits include with-project reduction of damage to upland development, coastal armor, and the cost of requisite backfill. Reduction in the loss of land realized from having a project in place is also taken as a NED benefit. NED costs are made up of average annual equivalent values for initial construction, future nourishment, and interest during construction. In order to satisfy criteria for Federal participation, the NED plan must also have a benefit-cost ratio greater than 1.0.

153. Table III-15 shows the NED intermediate cost and benefit analysis for the study area. Of the berm width extensions examined, the 80-ft berm width with a three-year renourishment interval provides the greatest net benefit of $1,811,618 and an average annual equivalent benefit of $3,793,628. The benefits derived were based on a risk-based analysis with a 95% confidence interval. The annual cost of the project is approximately $1,982,010 providing a benefit-to-cost ratio of 1.9. Therefore, the 80-ft berm extension is the preliminary NED width for Reach 2 and Reach 3 of the Lido Key hurricane and storm reduction project. These numbers were formulated in late Fiscal Year 2001 using January 2001 price levels and an interest rate of 6 and 3/8%.

Table III-15 NED Intermediate Cost and Benefit Analysis (6 and 3/8%)

Project Condition	*Average Annual Equivalent Damages*	*Annual Benefits*	*Annual Costs*	***Net Benefits***	*B/C Ratio*
Existing	$3,828,192	N/A	N/A	N/A	N/A
With-project Damages					
0-ft Ext.	$1,277,070	$2,551,122	$1,479,522	$1,071,600	1.7
20-ft Ext.	$1,043,379	$2,784,813	$1,532,204	$1,252,609	1.8
40-ft Ext.	$643,623	$3,184,569	$1,690,312	$1,494,257	1.8
60-ft Ext.	$253,378	$3,574,814	$1,851,536	$1,723,278	1.9
80-ft Ext.	**$34,564**	**$3,793,628**	**$1,982,010**	**$1,811,618**	**1.9**
100-ft Ext.	$3,918	$3,824,274	$2,109,251	$1,715,023	1.8

154. S-4 – Groins. A groin field in the problem area would help hold a beach in front of existing development and prevent further loss of land on its updrift side through sand impoundment. However, any beaches present on the downdrift side would suffer concomitant sand losses. The construction of groins would have to be supplemented with nourishment so that adjacent beaches would not be starved of sand. For this reason, groins, in combination with beach fills, are considered as a method to help hold the fill in place and to reduce the periodic renourishment requirements. Groins could also be considered to offer additional stabilization to inlet areas. Groin (terminal and field) construction in combination with beach nourishment is carried forward into the detailed alternative analysis. Groin construction (terminal or field) alone would not be a viable option because they do not, on a net basis, provide for additional beach width.

DETAILED ASSESSMENT OF ALTERNATIVE PLANS

155. Intermediate plans, designs, and cost estimates were formulated in the previous section titled "Intermediate Assessment of Alternative Plans." The alternative plans carried into the detailed assessment are the no-action plan (NS-1), the beach nourishment plan (S-3), and the groin field construction plan (S-4).

156. The development and assessment of detailed alternative plans for beach nourishment was undertaken in the final phase of plan formulation. Detailed benefits were computed and MCACES cost estimates (January 2001 price levels), including the cost of lands, easements, and rights-of-way were determined. Area requirements for beach tilling were estimated to be an area of 9,100 ft long x 300 ft wide or roughly 63 acres. In accordance with ER 1110-2-1302, dredging costs to be performed by the prime contractor were computed with the Cost Engineering Dredge Estimating Program (CEDEP). All costs associated with dredging were assumed to be accomplished with a generic medium hopper dredge with the capability to pump material directly onto the beach nourishment area. Endangered species observer duties are to be performed by a subcontractor and were computed in MCACES. A detailed assessment of the beach nourishment, groin construction, and no-action alternatives are presented in the following paragraphs.

157. Cost and Benefits. All NED project costs and benefits are calculated in terms of equivalent annual dollars. ER 1105-2-100 Section 6-168.a.(4) specifies the procedure for economic cost and benefit formulation. The ER directs the analyst to "Inventory potential

damage centers and locations of other project induced benefits or costs. For with- and without-project conditions, estimate the costs of maintaining shore protection and navigation projects. At the project site and other impacted sites, assess the extent of damages to property through analysis of storm surge and wave damage; assess changes in recreation, if any; and evaluate project impacts to jetties, channels, and other navigation features."

158. Relevant cost is somewhat subjectively defined as any cost that will make a difference in a given decision process. The relevant costs for project evaluation have been determined by policy to be NED costs (National Economic Development Procedures Manual: IWR report 91-R-11, p. 38, Oct 1991). New costs are defined as follows:

> "Resources required or displaced to achieve project purposes by project installation and/or operation, maintenance, and replacement activities represent a NED cost and should be evaluated as such. Resources required or displaced to minimize adverse impacts and/or mitigate fish and wildlife habitat losses are also NED costs." (Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, p. 97, March 1983.)

159. NED benefits are the increase in the net value of the national output of goods and services as a direct result of project implementation. A key point is that national output is being determined, not regional output. NED benefit estimation in the U.S. Army Corps of Engineers planning process proceeds by comparing forecasts of economic conditions with the project to forecasts of economic conditions without the project. NED project benefits are found by taking the difference of the two.

Detailed Assessment of Beach Nourishment Only

160. Beach Design. This plan consists of beach fill with periodic renourishment for reducing hurricane and storm damages along the shoreline of the study. Analysis of available data indicates that Reach 2 and Reach 3 of the study area required initial restoration and periodic renourishment. Reach 2 extends from the R-35 (400 ft north of John Ringling Boulevard) south to R-40. Reach 3 extends from DNR-40 to DNR-43. An optimal berm width extension of 80-ft was determined to maximize net primary benefits. Nourishment intervals for the reaches were optimized in the intermediate assessment. Additional increments of berm width result in a reduction in net primary benefits because the costs far outweigh the benefits for additional berm extensions.
Even though Reaches 2 and 3 experience different erosion rates, the berm widths were optimized based on a combined basis due to the short reach length and to avoid any large protuberances in the shoreline.

161. Volume Requirements for Fill Only. Beach nourishment design template volume requirements, for a beach fill only with a berm extension of 80 ft, for Reach 2 and 3 would be approximately 479,000 cy. The advance nourishment volume reflects projected erosion rates and the optimization of the nourishment interval. The optimal nourishment interval and advance nourishment volume, for a beach fill only with a berm extension of 80 ft, for Reaches 2 and 3 would be 3 years and 503,000 cy, respectively. From profile lines R-35

to R-43, the advance nourishment volumes are based on the rates of shoreline recession and erosion observed between 1991 and 1998 and verified with GENESIS simulations of the project. To establish a design rate of erosion, two rates of erosion are calculated for each profile line: one rate based on the shoreline changes and a second rate of erosion based on the beach profile (volumetric) changes. The design rate of erosion is equal to the larger of these two values. To estimate the rate of erosion based on the shoreline change, an equivalent volumetric loss is calculated using the design berm elevation and the depth of closure. Given a +5 ft NGVD design berm elevation and a -12 ft NGVD depth of closure, the corresponding volumetric loss for each foot of shoreline change is 0.64 cy/ft. Except at profile lines R-40 to R-42, the design rate of erosion is equal to the volume change associated with the observed shoreline recession. At each profile line, an additional 3.2 cy/ft is added to the advance fill to compensate for the effects of sea level rise.

162. The Engineering Appendix details the analysis pertaining to the volume of sand needed to provide and maintain the optimal transition section at the northern and southern limits of Reaches 2 and 3. Material in the amount of 26,624 cy and 35,476 cy would be placed in the transition sections at the northern and southern tapers, respectively, to an elevation of +5 ft NGVD with construction slopes of 1 V to 12 H from the berm to MLW and 1 V to 35 H from MLW to intersection with the existing bottom.

Detailed Assessment of Groin Construction with Beach Nourishment

163. Groin Construction with Beach Nourishment. Groin field and terminal groin construction were considered with beach placement to reduce advance nourishment costs and to further optimize the renourishment interval.

164. Groin Field Design Requirements. Project designed groins or a groin field in the problem area would help hold a beach in front of existing development and prevent further losses of land. GENESIS model simulations indicate a significant reduction in the required advance fill with the addition of three groins near Big Sarasota Pass. The lengths and location of the three groins were determined and optimized with the GENESIS model (Alternative 3). Figures III-7 and III-8 illustrate a typical groin cross section and typical groin profile for Lido Key.

165. Groin Field Structure Length and Location. The southernmost structure will be built at the southern end of Lido Key. The total length of the structure will be approximately 650 ft. The landward half of the structure will lie along the north bank of Big Sarasota Pass, on the park lands. The middle structure, to be located 800 ft north of Big Sarasota Pass will extend 440 ft seaward from the existing +5-ft NGVD contour. The northernmost structure to be located 1,400 ft north of Big Sarasota Pass, will extend 320 ft from the existing seawall near R-42.5. Each of the structures is oriented along a bearing of 55°/235° relative to north. The groin field with beach fill alternative, when compared to the beach fill only alternative, increases the renourishment interval from three to five years and reduces the fill requirements by 51,800 cy per year.

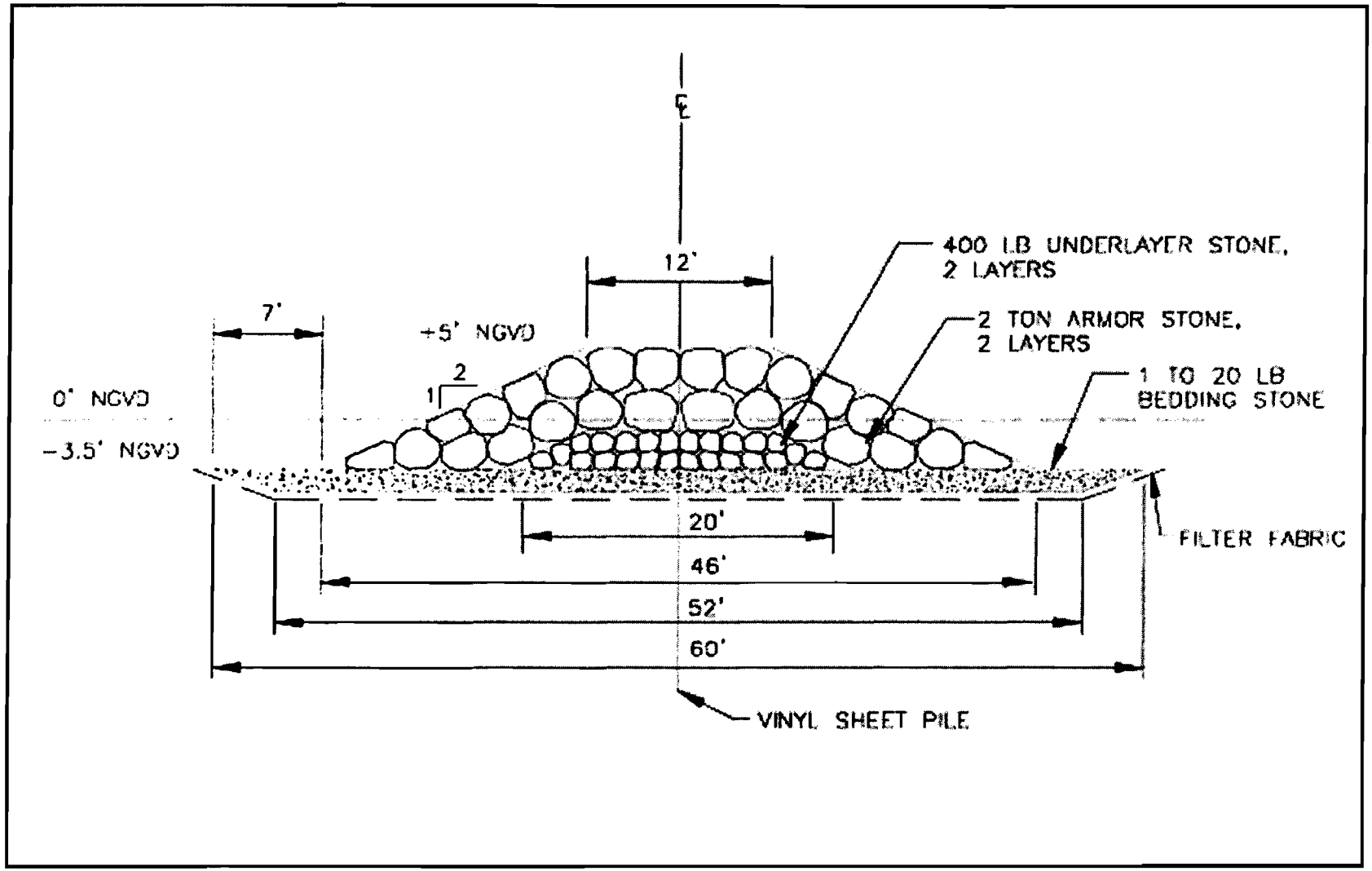


Figure III-7 Typical Groin Cross Section

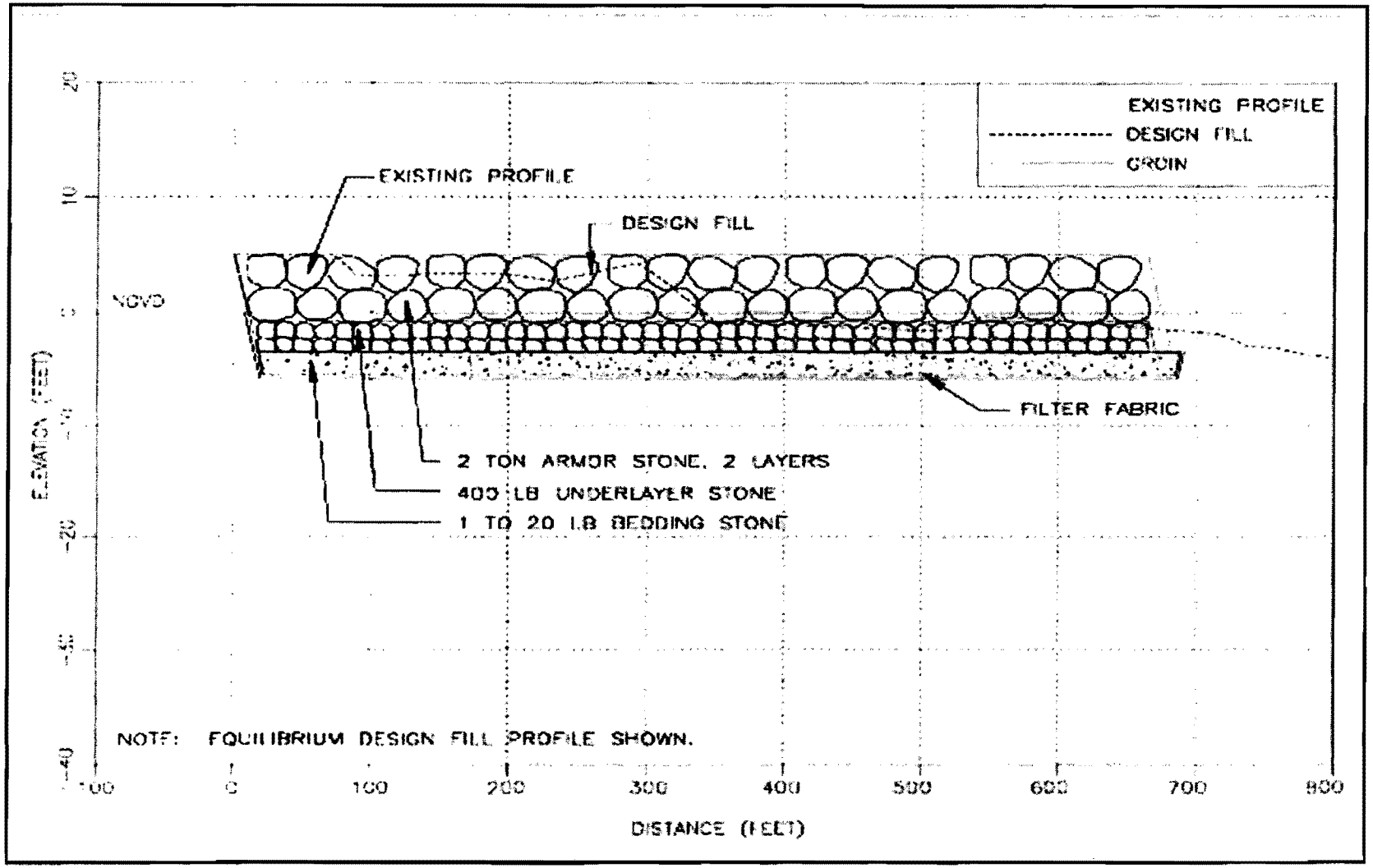


Figure III-8 Typical Groin Profile

166. Terminal Groin Structure Length and Location. The terminal groin option would include only the southernmost groin of the three-groin field just described. The structure would be built at the southern end of Lido Key, and the total structure length would be approximately 650 ft.

167. Groin Structural Cross Section. The groins are designed to withstand a 20-year storm and feature a continuous structure height of +5 ft NGVD. Two layers of two-ton (2.9 ft diameter) armor stone are used in the structure design. Initial calculations are based on the use of a rough granite stone (165 lbs/ft^3). Following *Shore Protection Manual* (United States Army Corps of Engineers (USACE), 1984) guidelines, the armor stone will be laid over 400 lb core stone. A layer of 1 to 20 lb bedding stone will support the core and armor stones. Sand tightening of the structure will be accomplished through the placement of a vinyl sheet pile extending 24 ft below the crest at the center of the structure. Based on the design cross section and combined groin length of 1,420 ft, the approximate stone tonnage is as follows: 15,400 tons of armor stone, 3,000 tons of core stone, and 8,300 tons of bedding stone. In addition, 86,800 ft^2 of filter fabric and 34,200 ft^2 of vinyl sheet pile will be required. The terminal groin with beach fill alternative, when compared to the beach fill only alternative, maintains the renourishment interval at three years but reduces the fill requirements only by 8,600 cy per year

168. Cost Estimates. Engineer Circular (EC) 1110-2-538 dated February 28, 1989 requires the establishment and consistent use of a standard code of accounts when estimating costs for civil works projects. The cost estimates for both Reach 2 and Reach 3 of the study area are presented using the standard code of accounts. Cost estimates for engineering and design were prepared by the Engineering Division, USACE, Jacksonville. The estimates of real estate and related costs were prepared by Real Estate Division, USACE, Jacksonville. A directed interest rate of 6 and 3/8% was used to determine average annual equivalent costs for all plan formulation level NED evaluations; updated price levels and current interest rates were used for the final economic evaluation of the selected plan presented later within this text.

169. Preliminary project cost estimates are based on January 2001 price levels, these were used in the plan formulation stages of this report. All dredging was assumed to be accomplished using a generic medium hopper dredge with the capability to pump material directly onto the beach nourishment area. An estimated 1.8 million cy of beach quality material has been identified through seismic and core boring investigations of three primary borrow areas. Overfill factors of approximately 1.0 were found for various portions of the study area indicating compatibility of this fill material to native sands. Material available for the 50-year plan includes fill previously found in Big Sarasota Pass, New Pass, offshore of Tampa, Longboat Key, and Anna Maria Island. The Geotechnical Appendix B details the location and composition of the material contained in each of the borrow areas. Coastal Planning and Engineering (1999) verifies the quality of the material and suitability for use as fill on this project. Additional escalation was added to each of the renourishment estimates to allow for increases in costs.

170. Cost estimating information used for plan formulation included unit prices for placed material, mobilization, and environmental monitoring costs. Project quantities were based

Table III-16 Berm Extension Cost Estimate Fill & Terminal Groin Construction

Lido Key Project Feasibility Study (80-ft Berm Width Extension at 5-ft NGVD) File: - F:\Dan\Region2\Sarasota\LidoKey\Excel\Optiren_Lido_2.xls
Generic Medium Hopper Dredge (Beach Disposal)

Economic Analysis Period	*50 (years)*	*Mob/Demob*	*$426,000*	*Monthly*	215,000 (cy/mo.)
Interest Rate	6.375 (%)	*Unit Price*	$5.38 ($/cy)	*Production*	
Background Erosion Rate	87,000 (cy/yr)	*Monitoring*	$25,750 (/mo.)	*Rate*	
Project Induced Erosion Rate	79,100 (cy/yr)	*Mitigation*	$0 (/mo.)	*Fill Length*	9,100 (ft)
Design Fill	460,200 (cy)	*Contingency*	20 (%)	*Design Fill*	460,200 (cy)
Overfill Factor	0 (%)	*E&D, S&A*	15 (%)		

CAPITAL RECOVERY FACTOR 0.06679 JANUARY 2001 PRICE LEVELS

Total Design Fill + ECL (CY)	Nour. Int. (YRS)	Advance Nourishment (CY) (W/OVERFILL)	Total Initial Fill (CY) (W/OVERFILL)	Estimated Const. Time (MTH) 1 DREDGE	Cost of Initial Const. (1st MOB.)	Cost of Initial Const. (2nd MOB.)	Annual Cost Of Initial Const.	Nourishment Quantity (CY)	Nourishment Cost	Annual Cost of Nourishment	Total Average Annual Equiv. Cost
460,200	1	166,100	626,300	2.9	$5,341,296	$0	$356,740	166,100	$1,848,526	$1,848,526	$2,205,265
460,200	2	332,200	792,400	3.7	$6,601,942	$0	$440,937	332,200	$3,109,171	$1,506,564	$1,947,501
460,200	**3**	**498,300**	**958,500**	**4.5**	**$7,862,587**	**$0**	**$525,134**	**498,300**	**$4,369,817**	**$1,381,875**	**$1,907,009**
460,200	4	664,400	1,124,600	5.2	$9,123,233	$0	$609,331	664,400	$5,630,463	$1,309,671	$1,919,002
460,200	5	830,500	1,290,700	6.0	$5,485,879	$5,485,879	$702,926	830,500	$6,891,108	$1,213,340	$1,916,266
460,200	6	996,600	1,456,800	6.8	$6,116,202	$6,116,202	$783,691	996,600	$8,151,754	$1,150,410	$1,934,101
460,200	7	1,162,700	1,622,900	7.5	$6,746,525	$6,746,525	$864,457	1,162,700	$9,412,400	$1,105,222	$1,969,679
460,200	8	1,328,800	1,789,000	8.3	$7,376,848	$7,376,848	$945,222	1,328,800	$10,673,046	$1,057,262	$2,002,484
460,200	9	1,494,900	1,955,100	9.1	$8,007,171	$8,007,171	$1,025,988	1,494,900	$11,933,691	$1,004,843	$2,030,831
460,200	10	1,661,000	2,121,200	9.9	$8,637,494	$8,637,494	$1,106,753	1,661,000	$13,194,337	$983,534	$2,090,287
460,200	11	1,827,100	2,287,300	10.6	$9,267,816	$9,267,816	$1,187,519	1,827,100	$14,454,983	$926,342	$2,113,861
460,200	12	1,993,200	2,453,400	11.4	$9,898,139	$9,898,139	$1,268,285	1,993,200	$15,715,628	$905,655	$2,173,939

Table III-17 Berm Extension Cost Estimate Fill & Groin Field Construction

Lido Key Project Feasibility Study (80-ft Berm Width Extension at 5-ft NGVD) File: - F:\Dan\Region2\Sarasota\LidoKey\Excel\Optiren_Lido_2.xls
Generic Medium Hopper Dredge (Beach Disposal)

Economic Analysis Period	*50 (years)*	*Mob/Demob*	*$426,000*	*Monthly*	215,000 (cy/mo.)
Interest Rate	6.375 (%)	*Unit Price*	$5.38 ($/cy)	*Production*	
Background Erosion Rate	87,000 (cy/yr)	*Monitoring*	$25,750 (/mo.)	*Rate*	
Project Induced Erosion Rate	35,900 (cy/yr)	*Mitigation*	$0 (/mo.)	*Fill Length*	9,100 (ft)
Design Fill	460,200 (cy)	*Contingency*	20 (%)	*Design Fill*	460,200 (cy)
Overfill Factor	0 (%)	*E&D, S&A*	15 (%)		

CAPITAL RECOVERY FACTOR 0.06679 JANUARY 2001 PRICE LEVELS

Total Design Fill + ECL (CY)	Nour. Int. (YRS)	Advance Nourishment (CY) (W/OVERFILL)	Total Initial Fill (CY) (W/OVERFILL)	Estimated Const. Time (MTH) 1 DREDGE	Cost of Initial Const. (1st MOB.)	Cost of Initial Const. (2nd MOB.)	Annual Cost Of Initial Const.	Nourishment Quantity (CY)	Nourishment Cost	Annual Cost of Nourishment	Total Average Annual Equiv. Cost
460,200	1	122,900	583,100	2.7	$5,013,422	$0	$334,841	122,900	$1,520,652	$1,520,652	$1,855,493
460,200	2	245,800	706,000	3.3	$5,946,193	$0	$397,140	245,800	$2,453,423	$1,188,818	$1,585,958
460,200	3	368,700	828,900	3.9	$6,878,965	$0	$459,439	368,700	$3,386,195	$1,070,822	$1,530,261
460,200	4	491,600	951,800	4.4	$7,811,737	$0	$521,738	491,600	$4,318,966	$1,004,611	$1,526,349
460,200	**5**	**614,500**	**1,074,700**	**5.0**	**$8,744,508**	**$0**	**$584,037**	**614,500**	**$5,251,738**	**$924,691**	**$1,508,728**
460,200	6	737,400	1,197,600	5.6	$9,677,280	$0	$646,336	737,400	$6,184,509	$872,784	$1,519,119
460,200	7	860,300	1,320,500	6.1	$5,598,966	$5,598,966	$717,416	860,300	$7,117,281	$835,725	$1,553,141
460,200	8	983,200	1,443,400	6.7	$6,065,351	$6,065,351	$777,176	983,200	$8,050,052	$797,430	$1,574,606
460,200	9	1,106,100	1,566,300	7.3	$6,531,737	$6,531,737	$836,935	1,106,100	$8,982,824	$756,373	$1,593,309
460,200	10	1,229,000	1,689,200	7.9	$6,998,123	$6,998,123	$896,695	1,229,000	$9,915,596	$739,129	$1,635,824
460,200	11	1,351,900	1,812,100	8.4	$7,464,509	$7,464,509	$956,455	1,351,900	$10,848,367	$695,213	$1,651,668
460,200	12	1,474,800	1,935,000	9.0	$7,930,895	$7,930,895	$1,016,214	1,474,800	$11,781,139	$678,919	$1,695,134

Table III-18 Groin Structure NED Optimization — First Costs

Structure	*First Cost of Structure*	*Annual First Cost of Structure*	*Reduction in Beach Volume (cy)*	*Annual Fill Savings*
Terminal Groin	$580,309	$48,580	25,800	$52,438
Groin Field	**$2,779,003**	**$206,831**	**259,000**	**$338,409**

Table III-19 Average Annual Benefits and Costs with Groin Field Based on Plan Formulation Costs of January 2001 and an Interest Rate of 6 and 3/8%

Project Condition	*Annual Benefit*	*Annual Fill Cost*	*Annual Groin Cost*	*Annual Total Cost*	***Annual Net Benefit***	*B/C Ratio*
0-ft Ext.	$2,551,122	$1,195,254	$206,831	$1,402,085	$1,149,037	1.8
20-ft Ext.	$2,784,813	$1,249,874	$206,831	$1,456,705	$1,328,108	1.9
40-ft Ext.	$3,184,569	$1,340,463	$206,831	$1,547,294	$1,637,275	2.0
60-ft Ext.	$3,574,814	$1,433,579	$206,831	$1,640,410	$1,934,404	2.1
80-ft Ext.	**$3,793,628**	**$1,508,728**	**$206,831**	**$1,715,559**	**$2,078,069**	**2.2**
100-ft Ext.	$3,824,274	$1,585,416	$206,831	$1,792,247	$2,032,027	2.1

on conditions of shoreline as determined by the May 2000 survey. Note that for the beach fill only alternative, the nourishment interval for Reach 2 and Reach 3 optimized at three years with an 80-ft berm width extension with an annual with-project erosion rate of 87,700 cy/yr.

171. Groin Cost Estimation. A terminal groin and groin field construction were analyzed to optimize the beach nourishment interval and total average annual equivalent cost. Table III-16 and Table III-17 present the cost estimates for the 80-ft berm extension identified as the NED project width in the Intermediate Analysis. Each alternative was estimated with the 80-ft design berm width previously detailed in the Intermediate Assessment; therefore, no benefit changes occur with the groin construction addition. The project-induced losses change from 87,700 cy/yr for the beach fill only condition to 79,100 cy/yr for the beach fill with terminal groin condition and to 35,900 cy/yr for the beach fill with groin field condition. The beach fill with terminal groin alternative optimizes to a nourishment interval of three years with an advance nourishment of 498,300 cy. However, the beach fill with groin field alternative optimizes to a five-year renourishment interval with an advance nourishment of 614,500 cy. The average annual equivalent costs for the beach fill portions of the terminal groin and groin field alternatives are $1,907,009 and $1,508,728, respectively. Table III-18 summarizes the groin structure first costs and the costs of beach fill savings (derived from the reduction of project-induced losses) for each groin configuration. Based on this evaluation, the groin field provides the best NED alternative because the reduction in beach fill costs more than offsets the costs of the groin field construction. Table III-19

summarizes the benefit-to-cost ratio for evaluated berm width extensions. Between the time the plan was formulated and the time it was finalized and coordinated, price levels and interest rates changed. These changes were proportional and deemed not to effect the formulation. From this point forward within the report only the selected plan is discussed; all costs and benefits are at October 2002 price levels and average annual costs were computed at the FY02 interest rate of 6 and 1/8% for the selected plan.

172. Monitoring Schedule and Costs. Endangered species and turbidity monitoring is applied only during project construction. The current total cost estimate (based upon the 10/06/02 MCACES) for these monitoring efforts during initial construction of the project (over an estimated duration of 4.94 months) is $153,300 or $31,000/month. Physical monitoring available for Federal cost sharing for the proposed shore protection project will be necessary to assess project performance and to ensure that project functionality is maintained throughout its 50-year design life. The monitoring plan is directed primarily toward assessment of project performance through systematic measurement of remaining beach fill volume, shoreline location, sediment characteristics and environmental habitat quality. Other monitoring efforts related to surveying include bathymetric mapping of the borrow site and aerial photography of the beach fill project. Beach sediment sampling will be required to provide information on native and fill material characteristics, beach profile shape, and fill volume requirements for future nourishments. The proposed monitoring schedule and cost estimate are presented in Table III-20. Cost shared pre-construction monitoring activities in FY03 and those for initial construction in FY04 are estimated at $135,800 per year. Cost shared project performance monitoring will be required through the first nourishment of the project in FY09. For the remainder of project life, annual Operations and Maintenance (O&M) of the project will be conducted in between nourishments at 100% non-Federal cost (included in Average Annual Costs). All other monitoring, required to determine project performance and prepare for future nourishments, will be allocated according to current project cost sharing percentages. This monitoring is part of the State permitting requirements for shore protection projects to ensure that there are no unforseen negative impacts due to the project.

Table III-20 Monitoring Schedule and Costs

	PRE-CONST.	INITIAL CONST.					FIRST NOUR.	REMAINING	
ITEM	FY03	FY04	FY05	FY06	FY07	FY08	FY09	O&M	5-year
Beach Profile Surveys	$74,000	$74,000	$37,000	$37,000	$37,000	$74,000	$74,000	$36,000	$74,000
Wading Depth Surveys	$26,000	$26,000	$13,000	$13,000	$13,000	$26,000	$26,000	$13,000	$26,000
Aerial Photography	$13,800	$13,800	$13,800	$13,800	$13,800	$13,800	$13,800	$13,800	$13,800
Borrow Site Surveys	$10,000	$10,000				$10,000	$10,000		$10,000
Sediment Sampling	$12,000	$12,000	$12,000	$12,000	$12,000	$12,000	$12,000		$12,000
TOTAL	$135,800	$135,800	$75,800	$75,800	$75,800	$135,800	$135,800	$62,800	$135,800

173. Annual Cost of Initial Construction. Analysis of the 80-ft berm extension resulted in identification of an initial volume requirement of approximately 1,074,700 cy (460,200 cy design and 614,500 cy advance fill) placed over one dredging season and a 5-year nourishment interval. The initial construction cost is approximately $12,632,200

(October 2002 price levels) including the groin field. The average annual equivalent cost for initial construction was determined to be $869,400 (including Interest During Construction) by multiplying the capital recovery factor for the specified interest rate (6 and 1/8%) and the costs of initial construction. The groin field is designed to withstand a 20-yr storm and feature a continuous structure height of +5-ft NGVD. Based on the design cross section and combined groin length of 1,420 ft, the project cost is approximately $2,057,200 with an average annual equivalent cost of $132,800 (October 2002 price levels and 6 1/8% interest rate).

174. Annual Cost of Interest During Construction and Monitoring. The annual cost of interest during construction was determined by multiplying the capital recovery factor for the specified interest rate (6 and 1/8%) by the interest on the costs of the work accomplished during initial construction. Average annual equivalent costs for the $835,700 interest during construction for Reach 2 and Reach 3 would be $53,900.

175. Annual Cost of Future Beach Nourishment and Groin Maintenance. The cost of each future beach nourishment at 6 and 1/8% is equal to the sum of the present worth factor at years 2008, 2013, 2018, 2023, 2028, 2033, 2038, 2043, 2048, and 2053 times the capital recovery factor. Interest and amortization of future beach nourishment for the NED plan would be $1,044,400. The average annual equivalent cost of groin maintenance was estimated at $24,000.

176. Total Annual Cost. The total average annual equivalent cost, including interest during construction, for the NED plan would be approximately $1,954,700.

177. Benefit Summary. The primary purpose of the Lido Key hurricane and shore protection project would be reduction of storm damage to upland development. The NED plan would provide protection to over $214 million in private and commercial upland development, as well as infrastructure such as roads and utilities. Approximately $4.3 million of average annual equivalent damages are predicted to occur under future without-project conditions under October 2002 pricing and computed at an interest rate of 6 and 1/8%. The value includes the cost of damage to upland development, coastal armor, backfill, and the value of land lost. The average annual equivalent benefit of the selected plan would be $4,319,900. The Economic Appendix D presents detailed analyses of project benefits.

178. Economic Justification. Table III-21 summarizes the economic justification of the recommended project. The benefit-to-cost ratio for the NED plan would be 2.2 for the directed interest rate of 6 and 1/8%. Therefore, the addition of groin field construction to the 80-ft berm extension (with a five-year nourishment interval) achieved a total average annual equivalent cost savings of $500,000.

Detailed Assessment of the No-Action Plan

179. This alternative assumes that the erosion in the study will continue with no solutions or remedial measures will be constructed, except for those in response to emergencies. Shoreline recession and erosion will continue. An estimated $214 million

Table III-21 Reach 2 and 3 – Economics of the Selected Plan

PHYSICAL DATA (Project Life = 50 Years)	
Project Length (ft)	8,280 (994 ft taper on north and 856 ft on south totals 10,130 ft)
Berm Crest Elevation (ft, NGVD)	+5
Berm Width Extension from ECL (ft)	80
Foreshore Slope (Berm-MLW)	1 V to 12 H
Nearshore Slope (MLW-existing profile)	1 V to 35 H
Post-placement Erosion Rate (cy/yr)	122,900
Volume of Initial Fill (cy)	1,074,700
Volume of Design Fill (cy)	460,200
Volume of Advance Nourishments (cy)	614,500
Nourishment Interval (yr)	5
FINANCIAL DATA (Interest Rate = 6.125 %, Price Level = October 2002)	
INITIAL CONSTRUCTION COSTS (w/ groin)	$12,632,200
INITIAL BEACH FILL CONSTRUCTION COSTS	$10,575,000
EACH FUTURE NOURISHMENT COST (varies depending upon borrow area)	$5.8-6.0 million
GROIN CONSTRUCTION	$2,057,200
ANNUAL PROJECT COSTS	
Interest and Amortization	
Initial Construction	$869,400
Future Nourishment	$1,044,400
Groin Maintenance	$24,000
Sponsor O&M	$16,900
Total Annual Project Costs(w/ IDC):	$1,954,700
PRIMARY BENEFITS	
Prevention of Damage to	Reach 2 & Reach 3
Upland Development	$3,563,300
Coastal Armor	$37,800
Backfill	$290,000
Loss of Land	$428,800
Total Annual Project Benefits:	$4,319,900
BENEFIT – TO – COST RATIO	2.2[1]

in structural improvements exist between R-35 and R-43 in Lido Key. This does not include infrastructure such as roads and utilities. An estimated $4.3 million in damages will occur annually in Reaches 2 and 3 if no-action is taken. Local efforts to stop the storm and erosion damage have been limited to construction and repair of coastal armor. These efforts have not provided the desired level of storm protection.

180. This option avoids any undesirable effects that may be associated with construction of the selected plan. However, if steps are not taken to counteract the erosion and provide an appropriate level of storm damage protection, continuing erosion and recession of the shoreline will occur with subsequent loss of valuable property and

[1] Benefit-To-Cost Ratio includes Interest During Construction

damage to structural improvements along the shoreline. The Environmental Assessment, which follows the main text of this report, presents a summary of the environmental impacts of the no-action plan.

COST APPORTIONMENT

181. Section 103(a) of the 1986 Water Resources Development Act (WRDA), as amended, specifies that hurricane and storm damage reduction projects are to be cost shared at a 65% Federal and a 35% non-Federal basis. Section 103(c)(4) states that recreation projects are to be cost shared at 50% of separable costs. Section 103(d), as amended, states that the cost of construction projects or measures for beach erosion control and water quality enhancement shall be assigned to the appropriate purposes listed above.

a. Before WRDA 86, Federal projects to protect against hurricanes and abnormal tide flooding were established on a case-by-case basis, based on specific Congressional authorizations. Hurricane protection projects were viewed similar to flood control projects from an authorization perspective before 1986. With the passage of WRDA 86, no Federal distinction exists between shore protection measures for hurricanes, storms, or tidal induced flooding and beach erosion.

b. Wind and tidal generated waves must cause shoreline erosion; therefore, the shore protection program does not cover erosion at upstream locations caused by stream flows except for those actions defined as an emergency measure to protect highways, pubic works, and non-profit public facilities.

182. Department of Army Engineering Regulation 1105-2-100 contains general program guidance for the U.S. Army Corps of Engineers Civil Works programs.

183. Current shore protection law provides for Federal participation on projects for hurricane and storm damage reduction if the restored beaches are open and available for public use. Federal cost sharing is based on Federal law, policy, and conditions of shore ownership and use at the time of construction or subsequent periodic nourishment.

184. Section 103(d) of the Water Resources Development Act of 1986 (Public Law 99-662), as amended, specifies that the cost of construction measures for beach erosion control are assigned to the appropriate purpose(s) specified in Section (c) of the Act. These purposes are normally hurricane and storm damage reduction and/or separable recreation, and shared in the same percentages as to the purposes to which the costs are assigned, except that no costs are assigned to incidental recreation. Hurricane and storm damage reduction projects are cost-shared at 65% Federal and 35% non-Federal, and separable recreation projects are cost-shared at 50% Federal and 50% non-Federal. Cost sharing for beach erosion control measures must also consider shore ownership and use. Additional guidance on cost sharing for shore protection projects is provided in Engineering Regulation (ER) 1165-2-130 dated June 15, 1989,

Table III-22 Federal and non-Federal Cost Sharing Percentages

PARCEL DESCRIPTION	LOT ID	STRUCTURE VALUE	LOT WIDTH	SHORELINE OWNERSHIP	FEDERAL SHARE	FEDERAL LENGTH	NON-FEDERAL SHARE	NON-FEDERAL LENGTH
House	1	221598	200	PRIVATE/DEVELOPED	65%	130	35%	70
Condo	3	14523846.8	440	PRIVATE/DEVELOPED	65%	286	35%	154
Condo	4	1053740	330	PRIVATE/DEVELOPED	65%	215	35%	116
Motel	5	9929387	590	PRIVATE/DEVELOPED	65%	384	35%	207
House	6	217172	60	PRIVATE/DEVELOPED	65%	39	35%	21
House	7	405162	130	PRIVATE/DEVELOPED	65%	85	35%	46
House	8	171350	120	PRIVATE/DEVELOPED	65%	78	35%	42
House	9	250694	80	PRIVATE/DEVELOPED	65%	52	35%	28
House	10	209382	80	PRIVATE/DEVELOPED	65%	52	35%	28
House	11	293260	80	PRIVATE/DEVELOPED	65%	52	35%	28
House	12	293260	110	PRIVATE/DEVELOPED	65%	72	35%	39
House	13	223525	110	PRIVATE/DEVELOPED	65%	72	35%	39
Motel	18	12156190	330	PRIVATE/DEVELOPED	65%	215	35%	116
Condo	19	10103583	220	PRIVATE/DEVELOPED	65%	143	35%	77
Condo	20	132192	220	PRIVATE/DEVELOPED	65%	143	35%	77
Condo	21	1205333	120	PRIVATE/DEVELOPED	65%	78	35%	42
Condo	22	1205333	140	PRIVATE/DEVELOPED	65%	91	35%	49
Condo	23	11984380	140	PRIVATE/DEVELOPED	65%	91	35%	49
Condo	24	5992190	140	PRIVATE/DEVELOPED	65%	91	35%	49
Condo	25	20387210	160	PRIVATE/DEVELOPED	65%	104	35%	56
Parking Lot	26	1	170	PRIVATE/DEVELOPED	65%	111	35%	60
Condo	27	20706578	220	PRIVATE/DEVELOPED	65%	143	35%	77
Condo	28	3064023	90	PRIVATE/DEVELOPED	65%	59	35%	32
Condo	29	2211883	220	PRIVATE/DEVELOPED	65%	143	35%	77
Condo	30	6687204	410	PRIVATE/DEVELOPED	65%	267	35%	144
Condo	31	11606407	230	PRIVATE/DEVELOPED	65%	150	35%	81
Condo	32	16285014	230	PRIVATE/DEVELOPED	65%	150	35%	81
Condo	33	5315730	220	PRIVATE/DEVELOPED	65%	143	35%	77
Condo	34	39531365	220	PRIVATE/DEVELOPED	65%	143	35%	77
Condo	35	7094469	300	PRIVATE/DEVELOPED	65%	195	35%	105
Condo	36	2694397	230	PRIVATE/DEVELOPED	65%	150	35%	81
Condo	37	931179 9	220	PRIVATE/DEVELOPED	65%	143	35%	77
Condo	38	8041260	230	PRIVATE/DEVELOPED	65%	150	35%	81
subtotal			**6790**			**4413.5**		**2376.5**
Vacant	29	1	80	PRIVATE/UNDEVELOPED	0%	0	100%	80
subtotal			**80**			**0**		**80**
Street End	2	1	300	PUBLIC/DEVELOPED	65%	195	35%	105
Parking	14	1	560	PUBLIC/DEVELOPED	50%	280	50%	280
B'house	15	1	160	PUBLIC/DEVELOPED	50%	80	50%	80
Pool	16	1	195	PUBLIC/DEVELOPED	50%	98	50%	98
B'house	17	1	195	PUBLIC/DEVELOPED	50%	98	50%	98
subtotal			**1410**			**750**		**660**
		Total	**8280**			**5163.5**		**3116.5**

Cost Allocation Based On Ownership and Use (1/02)

Total Distance [ft]	8,280
Total Distance [mi]	1.6
Total Distance Federal [ft]	5,164
Total Distance Non-Federal [ft]	3,117

	Total Length	Length Federal	Length Non-Fed
Private			
Developed	6,790	4,414	2,377
Undeveloped	80	0	80
Street Ends	0	0	0
Public/Developed	1,410	750	660
	8,280	5,164	3,117

Cost Sharing

Fed	**62.36%**
Non	**37.64%**
	100.00%

Table III-23 Federal and non-Federal Cost Apportionment

COST SHARING FOR LIDO KEY OCTOBER 2002 PRICE LEVELS Project Feature	Project Cost	Federal Share	Federal Cost	Non-Federal Share	Non-Federal Cost
Mobilization	$461,250	62.4%	$ 287,641	37.6%	$ 173,609
Beach Replenishment	$7,195,166	62.4%	$ 4,486,985	37.6%	$ 2,708,181
Groin Field (mob/demob combined)	$1,701,583	62.4%	$ 1,061,126	37.6%	$ 640,457
Engineering & Design	$862,411	62.4%	$ 537,809	37.6%	$ 324,602
Construction Management	$989,616	62.4%	$ 617,136	37.6%	$ 372,480
Monitoring	$1,078,028	62.4%	$ 672,270	37.6%	$ 405,758
Real Estate					
Administration costs of LERR	$170,820	62.4%	$ 106,525	37.6%	$ 64,295
Acquisitions (LERR)	$173,280	0.0%	$ -	100.0%	$ 173,280
Total Cost	**$12,632,154**		**$ 7,769,492**		**$ 4,862,662**
Less LERR Credit					**$ 173,280**
Total Non-Federal Cash Contribution					**$ 4,689,382**

and Headquarters, U.S. Army Corps of Engineers (HQUSACE) memorandum dated September 23, 1994.

185. The project design section consists of fill placed seaward of the pre-project mean high water shoreline. The pre-project mean high water shoreline will be established as the erosion control line (ECL) before construction of the project. The project design fill cross section, advance nourishment, and overfill (if any) are to be constructed seaward of the ECL. The cost of fill placed landward or seaward of the ECL on privately controlled lands not accessible to the public is 100% non-Federal.

186. The following is a breakdown of cost sharing percentages in the longshore direction. Non-Federal public shores are normally dedicated to park and conservation areas, and the benefits of protecting such shores would be based on the loss of recreation outputs, with cost sharing 50% Federal and 50% non-Federal. Street ends would be cost shared 65% Federal and 35% non-Federal because their protection results in storm damage reduction. The cost sharing would be 65% Federal and 35% non-Federal for protection of privately owned shores resulting in public benefits, i.e. private shore front structures on a beach with public access. Public access to and use of privately owned lands within the footprint of the project, both landward and seaward of the Erosion Control Line (ECL) must be provided and maintained for as long as the Federal project remains authorized. If real estate interests can not be obtained to provide such public access and use, the cost of the entire fill volume, both landward and seaward of the ECL, within the footprint of the project must be apportioned as 100 percent non-Federal. Undeveloped private lands are a 100% non-Federal responsibility. Table III-22 summarizes cost sharing percentages based on shoreline ownership length for each land use category. Based on the breakdown of Federal vs. non-Federal shoreline ownership, the current first cost sharing percentages will be 62.4% and 37.6%, respectively. Lands Easements Rights-of-Way and

Relocations are a non-Federal responsibility, but they do receive credit for this item. This is shown in Table III-23.

IV. DESCRIPTION OF SELECTED PLAN

187. The project area is comprised of an 8,280 ft segment of the Lido Key Gulf of Mexico shoreline located between Florida Department of Environmental Protection (FDEP) monuments R-35 through R-43. The project area comprises Reach 2 of the study area extending from R-35 to R-40 and Reach 3 of the study area extending from R-40 to R-43. The enclosed plates display plan views illustrating the beach fill and groin field of the design template for Reaches 2 and 3 as well as beach fill cross sections of the selected plan. Figure B-2 of Appendix B shows the offshore borrow areas for this project.

188. The National Economic Development (NED) plan identified for Reaches 2 and 3 of the study area consists of beach fill and a groin field with a 1,000 ft taper section at the northern limit of Reach 2 (R-35 to R-34). The south end of Lido Key (R-43) serves as the southern limit of Reach 3 with an 850 foot taper section at the southern limit (R-43 to R-44). The design berm elevation is +5 ft NGVD and extends 80 ft seaward of the baseline. The baseline is defined as the May 2000 MHW shoreline position. The design template slopes at 1 vertical (V) to 12 horizontal (H) from the berm crest to the MLW shoreline and slopes at 1V to 35H from MLW to the point of intersection with the existing profile.

189. Construction of Reaches 2 and 3 would require placement of approximately 460,200 cy of design fill and 614,500 cy of advance fill material. The three borrow areas delineated for use (Borrow Areas 5, 6, and 7) are located between 7.2 and 9.5 nautical miles offshore Lido Key. Each area is located on a small, isolated bathymetric high. Nourishment would be provided at 5-yr intervals over the 50-yr life of the project. Cost estimates developed for various alternatives indicate that a hopper dredge with the capability to pump directly onto the beach would provide the most cost effective plan for construction of Reaches 2 and 3.

190. The structure height of the three groins is +5-ft NGVD. The southernmost structure, to be built at the southern end of Lido Key, has a total length of approximately 650 ft. The landward half of the structure will lie along the north bank of Big Sarasota Pass. The middle structure, to be located 800 ft north of Big Sarasota Pass, will extend 440 ft seaward from the existing +5 ft NGVD contour. The northernmost structure, to be located 1,400 ft north of Big Sarasota Pass, will extend 320 ft from the existing seawall near R-42.5. Two layers of two-ton armor stone are used in the structural design, and the armor stone will be laid over 400 lb core stone. A layer of 1 to 20 lb bedding stone will support the core and armor stones. A vinyl sheet pile extends 24 ft below the crest at the center of the structure.

SECTION 902 LIMITS

191. Since this project was re-authorized in WRDA 1999 with set funding limits, it is subject to Section 902 of WRDA 1986. Section 902 established the requirement that the cost of projects authorized in and subsequent to WRDA 86 would be the maximum cost of that project. The purpose of Section 902 was to insure against cost overruns. The cost of the project could be increased for price level changes, but the scope of the project could not be changed, without Congressional approval, if it increases project costs by more than 20 percent.

192. The MCACES estimate from this study indicates the 902 cost of $13,762,000 (initial construction inflated through construction) and $167,654,000 (periodic renourishment inflated through construction) equals $181,416,000. The Authorized project cost based is based on initial construction cost (WRDA 99) of $5,200,000 and an average annual cost (WRDA 99) of $602,000 over 50 years ($30,100,000). When these numbers are inflated through construction and 20 percent is added, they yield a 902 limit of $7,209,000 for initial construction and $98,576,000 for periodic renourishment for a total of $105,785,000. The selected plan for this report exceeds the 902 limit. The 902 limit is exceeded because the WRDA 99 authorization was based on reconnaissance level data since the feasibility report was just being initiated.

V. PLAN IMPLEMENTATION

PROJECT COOPERATION AGREEMENT

193. As of July 8, 1994, there is no longer a requirement to include an initial draft project cooperation agreement (PCA) when submitting draft feasibility reports. The model PCA and possible deviations based on the recommended plan were fully discussed with the non-Federal sponsor prior to the Feasibility Review Conference (FRC). The non-Federal sponsor has a clear understanding of the type of agreement that they will be expected to sign prior to the start of construction. This report includes the terms of local cooperation in the "Recommendation" section.

194. No Federal commitments relating to a construction schedule or specific provisions of the PCA can be made to the non-Federal sponsor on any aspect of this project or separable element until:

(1) The feasibility report is approved by the U. S. Congress;

(2) The project is budgeted as a new construction start, or construction funds are added by Congress, apportioned by the Office of Management and Budget, and their allocation is approved by the Assistant Secretary of the Army for Civil Works (ASA(CW)); and

(3) The draft PCA has been reviewed and approved by the office of the ASA(CW).

195. Execution. The PCA will not be executed nor will construction be initiated on this project until the National Environmental Policy Act, the Clean Water Act, the Coastal Zone Management Act, the Endangered Species Act, the Fish and Wildlife Coordination Act, and the National Historic Preservation Act planning phase requirements are met. In the case of the Lido Key project, these requirements are met once the Draft Environmental Assessment (DEA) has been coordinated, comments prepared, and a Final Environmental Assessment submitted to the Environmental Protection Agency for filing.

196. Final PCA negotiations with the non-Federal project sponsor may be conducted, and the draft PCA package submitted through the USACE higher authority for review and approval by the ASA(CW), once the feasibility report is approved and the project is budgeted for construction. The PCA for this project will be executed only after the feasibility report is approved, and an Appropriations Bill containing funds for the project is enacted into Law. The Chief of Engineers will not allocate Federal construction funds for a project until the ASA(CW) approves the non-Federal sponsor's financing plan and executes the PCA.

FEDERAL RESPONSIBILITY

197. The U. S. Army Corps of Engineers is responsible for budgeting for the Federal share of construction costs for all future work for Federal projects. Federal funding is subject to budgetary constraints inherent in the formation of the national civil works budget for a given fiscal year. The Corps would perform the necessary preconstruction engineering and design needed to prior construction. The Corps would obtain all necessary permits (including State water quality certification) and would construct the project.

NON-FEDERAL RESPONSIBILITY

198. The non-Federal project sponsors would provide an up-front cash contribution for initial construction costs of the proposed project. The amount of the non-Federal up-front cash contribution would be based on cost sharing principles reflecting shoreline use and ownership in existence at the time of construction. The non-Federal sponsors would also provide the entire cost of all material placed on undeveloped and developed private lands landward/seaward of the ECL. The costs for lands, easements, relocations and rights-of-way (LERR) and a portion of the administrative costs associated with land requirements would also be a non-Federal responsibility. Cost apportionment based on shoreline ownership and LERRs would amount to a non-Federal cost of $4,862,700; credit for the LERR costs would make the total non-Federal cash contribution $4,689,400. The sponsor has expressed their support for this project in a letter of intent dated October 8, 2002.

OTHER NON-FEDERAL REQUIREMENTS

199. Other general non-Federal responsibilities, such as continuing public use of the project beach for which benefits are claimed in the economic justification of the project,

and controlling water pollution to safeguard the health of bathers, must also be assumed by the non-Federal sponsor before the project can be constructed. The items of local cooperation are listed in the section of this report entitled "Recommendations". The delineation of Federal and non-Federal responsibility will be legally defined in the project cooperation agreement.

200. The non-Federal project sponsor will be responsible for all costs of operation, maintenance, and rehabilitation and replacement of project features. Assignment of such responsibility has been included as a part of the items of local cooperation for the project.

201. Section 402 of the 1986 Water Resources Development Act (33 USC 701b-12) as amended by Section 14 of the 1988 Water Resources Development Act states that "Before construction of any project for local flood protection or any project for hurricane or storm damage reduction, the non-Federal interests shall agree to participate in and comply with applicable Federal flood plain management and flood insurance programs." The non-Federal sponsor and communities must be enrolled in and in compliance with the National Flood Insurance Program (NFIP) to receive Federal funding for a recommended hurricane and storm damage reduction project. Compliance with Section 402 has been added as an item of local cooperation.

FINANCIAL ANALYSIS

202. Financial analysis is required for any plan being considered for U.S. Army Corps of Engineers implementation that involves non-Federal cost sharing. The ultimate purpose of the financial analysis is to ensure that non-Federal sponsors understand the financial commitment involved and have reasonable plans for meeting that commitment. The financial analysis shall include the non-Federal sponsor's statement of financial capability, the non-Federal sponsor's financing plan, and an assessment of the sponsor's financial capability. In a letter dated October 8, 2002, the sponsor noted that they were completing the details of their financial plan and would forward them upon completion.

STUDY SUMMARY

203. This report summarizes the feasibility studies conducted for Lido Key in the interest of hurricane and storm damage reduction. Based on these studies, the following conclusions were reached:

a. Storm damage threatens an 8,280-ft segment of the Lido Key study area. The amount of shorefront development in Lido Key threatened by storms is approximately $214 million.

b. The most practical and economical means to prevent or reduce structural damages is to construct the hurricane and storm damage reduction project developed herein. The non-Federal sponsors support construction of the project.

ENVIRONMENTAL CONSIDERATIONS

204. Major environmental considerations taken into account during the formulation of the selected plan were marine resources (i.e. seagrass, hardgrounds), preservation of significant historical cultural resources, and the turtle-nesting season. Nearshore side-scan sonar and groundtruthing surveys conducted in September 2001 did not detect any hardgrounds adjacent to Lido Key. Upland vegetation is composed of both exotic and native species such as Australian pine, sea grape, and wax myrtle. No seagrass/algal communities were observed in the footprint of the beach fill boundaries or proposed borrow areas. Of the listed animal species found in or near the project area, the loggerhead sea turtle is most likely to be affected by the proposed project. Information provided by the Florida Marine Research Institute indicates that, from 1992 to 2000, loggerhead sea turtles nest numbers varied from 32 to 60 annually along Lido Key. Cost estimates for dredging were based upon construction of the project outside of the turtle-nesting season. All available and practicable means and measures have been incorporated into the plan formulation process to ensure that the selected plan is environmentally sound.

FLOOD PLAIN DEVELOPMENT

205. The authorized project is in the base flood plain (100-year flood), and has been evaluated in accordance with Executive Order 11988. Relocation of the project outside the flood plain would not be responsive to the problems and needs of the study area and was not considered further. A non-flood plain alternative for the potential development with the project would be to restrict all future development to those areas outside the flood plain or elevated above the flood plain. Potential flood plain development as a result of project implementation would be minimal. The continued project nourishment would have minimum impact on the natural and beneficial values of the flood plain. In the without-project flood plain (that area immediately adjacent to the project), there will be minimal loss of natural resources due to potential development. Implementation of any nonstructural plans that would minimize potential damage to or within the flood plain beyond those laws and regulations already adopted by local and State interests are not viable solutions under the planning constraints of this study.

FLOOD PLAIN MANAGEMENT AND FLOOD INSURANCE PROGRAMS COMPLIANCE

206. Section 402 of the Water Resources Development Act of 1986 (PL 99-662) as amended by Section 14 of the Water Resources Development Act of 1988 (PL 100-676) states "Before construction of any project for local flood protection or any project for hurricane or storm damage reduction, the non-Federal interests shall agree to participate in and comply with applicable Federal flood plain management and flood insurance programs. Sarasota County is enrolled in and complies with the National Flood Insurance Program.

USE OF OUTER CONTINENTAL SHELF LANDS

207. The Outer Continental Shelf Lands Act (OCSLA) enacted August 7, 1953, as amended (enclosed) grants the Secretary of the Interior authority to grant to qualified persons offering the highest competitive bid leases of any mineral other than oil, gas, and sulfur in any area of the Outer Continental Shelf. The OCSLA was amended by Section 1 of Public Law 103-426, October 31, 1994. The Secretary of the Interior may negotiate the use of Outer Continental Shelf sand, gravel and shell resources for use in a program of, or project for, shore protection, beach restoration or coastal wetlands restoration undertaken by a Federal, State or local government agency; or for a project that is funded in whole or in part by or authorized by the Federal Government. Section 1(a)(2)(B) of the 1994 amendment prohibits the assessment of any fees against an agency of the Federal government, directly or indirectly.

208. Any Federal agency that proposes to make use of sand, gravel and shell resources subject to the OCSLA shall enter into a Memorandum of Agreement with the Secretary of the Interior. The Secretary of the Interior is also required to notify the Committee on Merchant Marine and Fisheries and the Committee on Natural Resources of the House of Representatives, and the Committee on Energy and Natural Resources of the Senate on any proposed project for the use of those resources before the use of those resources.

209. Three separate borrow areas (i.e., Borrow Areas 5 – 7) selected for Lido Key potentially contain about 1,800,000 cubic yards of sand. Each area, located 7 – 9.5 nautical miles offshore of Lido Key, consist of beach quality material in sufficient amount for the immediate requirement. Material available for the 50 year plan included fill previously found in Big Sarasota Pass, New Pass, offshore of Tampa, Longboat Key, and Anna Maria Island. None of the identified borrow areas are regulated under the authority of the OCSLA.

COASTAL BARRIER RESOURCES ACT

210. The proposed new Federal investment decision for the Lido Key hurricane and storm reduction project does not include any recommendations which would result in any new Federal expenditures or financial assistance prohibited by the Coastal Barrier Resources Act (Public Law 97-348); nor were funds obligated in past years for this project for purposes prohibited by this Act.

COASTAL ZONE MANAGEMENT ACT

211. The Coastal Zone Management (CZM) Act of 1972, as amended (PL 92-583) requires all Federal activities inside or outside a state's coastal zone to be consistent with the state's coastal zone management plan if the activities affect natural resources, land uses, or water uses within the coastal zone. By issuance of State Water Quality Certifications on completed shore protection projects, the State has determined that the authorized projects for which initial construction has been completed were consistent with the State CZM Act. The State will review future project work to determine if it is

consistent with the State's coastal zone management plan prior to any future project construction or future nourishment of previously constructed project features.

PUBLIC ACCESSIBILITY

212. In determination of the Federal interest in cost-sharing, Federal participation is limited to the areas where adequate public parking and access are provided. Federal participation is limited to those shoreline reaches within 1/4 mile from an access point, a reasonable walking distance for a beach visitor. For shoreline reaches farther than 1/4 mile from public parking and/or beach access point, Federal participation will not be provided, unless, public accessibility is improved before project construction.

VI. CONCLUSIONS

213. The Sarasota County Hurricane and Storm Reduction Project, Lido Key Feasibility Study provided an opportunity to evaluate coastal problems and alternatives on a systematic basis and consider the advisability of providing various project alternatives.

214. Consideration has been given to all significant aspects of the authorized project in the overall public interest, including engineering feasibility, economic, social, and environmental effects. Based on these efforts, a combination of beach nourishment and groin construction will provide the optimum solution to hurricane and storm damage reduction for upland development in Lido Key, Florida.

VII. RECOMMENDATIONS

215. I have given consideration to all significant aspects in the overall public interest, including engineering feasibility, economic, social and environmental effects. I concur with the recommended project as described herein. The recommended project described in this report provides the optimum solution for shore protection benefits within the study area that can be developed within the framework of the formulation concepts. The Lido Key, Sarasota County, shore protection project would provide initial restoration and periodic nourishment of an 80 foot berm at elevation +5 ft NGVD over 1.56-miles of shoreline, with a groin field at the southern limits of the project. Periodic nourishment, accomplished at five-year intervals, would optimize net primary benefits over the 50-year life of the project. Initial construction costs are estimated at $12,632,200, not including interest during construction, with the Federal share being $7,769,500. Periodic renourishment costs vary between $5,800,000 and $6,000,000 which represents an average annual cost of $1,044,400 for periodic renourishment. Hurricane and Storm Damage Reduction benefits are estimated to be $4,319,900, total average annual costs are estimated to be $1,954,700, which produces a benefit-to-cost ratio (BCR) of 2.2.

216. Recommendations for provision of Federal participation in the selected plan described in this report would require the project sponsor to enter into a written Project Cooperation Agreement, as required by Section 221 of PL 91-611, as amended, to

provided local cooperation satisfactory to the Secretary of the Army. Such local cooperation shall provide the following non-Federal responsibilities:

Items of Non-Federal Cooperation.

a. Provide 35% of initial project costs assigned to hurricane and storm damage reduction plus 100% of initial project costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits plus 50% of initial project costs assigned to protecting recreational public lands, and 50% of periodic nourishment costs assigned to hurricane and storm damage reduction plus 100% of periodic nourishment costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits and as further specified below:

(1) Enter into an agreement that provides, before construction, 25% of design costs;

(2) Provide, during construction, any additional funds needed to cover the non-Federal share of design costs;

(3) Provide all lands, easements, and rights-of-way, and perform or ensure the performance of any relocations determined by the Federal Government to be necessary for the initial construction, periodic nourishment, operation, monitoring, and maintenance of the project;

b. For so long as the project remains authorized, operate, maintain, and repair the completed project, or functional portion of the project, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

c. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal Sponsor, now or hereafter, owns or controls for access to the project for the purpose of inspecting, operating, maintaining, repairing, replacing, rehabilitating, or completing the project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Federal Government shall relieve the non-Federal Sponsor of responsibility to meet the non-Federal Sponsor's obligations, or to preclude the Federal Government from pursuing any other remedy at law or equity to ensure faithful performance;

d. Hold and save the United States free from all damages arising from the initial construction, periodic nourishment, operation, maintenance, repair, replacement, and rehabilitation of the project and any project-related betterments, except for damages due to the fault or negligence of the United States or its contractors;

e. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements

for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

f. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended, 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the initial construction, periodic nourishment, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal Sponsor with prior specific written direction, in which case the non-Federal Sponsor shall perform such investigations in accordance with such written direction;

g. Assume complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the initial construction, periodic nourishment, operation, or maintenance of the project;

h. Agree that the non-Federal Sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, and repair the project in a manner that will not cause liability to arise under CERCLA;

i. If applicable, comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for the initial construction, periodic nourishment, operation, and maintenance of the project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

j. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army," and Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), requiring the non-Federal preparation and implementation of floodplain management plans;

k. Provide the non-Federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1% of the total amount authorized to be appropriated for the project, in accordance with the cost sharing provisions of the agreement;

l. Participate in and comply with applicable Federal floodplain management and flood insurance programs;

m. Do not use Federal funds to meet the non-Federal sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized;

n. Prescribe and enforce regulations to prevent obstruction of or encroachment on the project that would reduce the level of protection it affords or that would hinder future periodic nourishment and/or the operation and maintenance of the project;

o. Not less than once each year, inform affected interests of the extent of protection afforded by the project;

p. Publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the floodplain, and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with protection levels provided by the project;

q. For so long as the project remains authorized, the non-Federal Sponsor shall ensure continued conditions of public ownership and use of the shore upon which the amount of Federal participation is based;

r. Provide and maintain necessary access roads, parking areas, and other public use facilities, open and available to all on equal terms;

s. Recognize and support the requirements of Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element; and

t. At least twice annually and after storm events, perform surveillance of the beach to determine losses of nourishment material from the project design section and provide the results of such surveillance to the Federal Government.

u. For so long as the project remains authorized, the Non-Federal Sponsor shall ensure continued conditions of Public ownership and use of the shore upon which the amount of Federal participation is based.

DISCLAIMERS

217. The recommendations herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction plan nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to higher authority as proposals for project modifications and/or implementation funding.

218. The recommendations herein for provision of a hurricane and storm damage reduction project for Lido Key, Florida, do not include any provisions for work which would result in any new Federal expenditures or financial assistance prohibited by the Coastal Barrier Resources Act (Public Law 97-348); nor where funds obligated in past years for this project for purposed prohibited by this Act.

VIII. CERTIFICATION OF PUBLIC ACCESSIBILITY

219. As part of the obligations established in the project cooperation agreement for the Lido Key hurricane and storm damage reduction project, the non-Federal sponsor shall assure continued conditions of public ownership and public use of the shore upon which Federal participation is based during the economic life of the project. The non-Federal sponsor shall also provide and maintain necessary access to roads, parking areas, and other public use facilities, open and available to all on equal terms.

220. In the determination of the Federal interest in cost sharing, Federal participation was limited to areas where adequate parking and access are available. For shoreline reaches farther than ¼ mile from public parking and/or beach access points, Federal participation was not provided. The maximum Federal participation allowable for each land use category is applied for cost sharing.

221. It was determined that there is ample parking available to all on an equal basis to meet user demand in the project area. Therefore, I conclude that there is reasonable public availability of the project beaches in all areas where Federal participation is provided.

James G. May
Colonel, U.S. Army
District Engineer

IX. REFERENCES

Applied Technology and Management. 1994. New Pass Inlet Management Plan Meeting Exhibits. January 27, 1994.

City of Sarasota. 1965. *Lido Study No.2 – A Preliminary Plan for Public Beach Expansion and Shoreline Stabilization.* Sarasota, FL.

Coastal Planning & Engineering. 1991. *Long Range Beach Management and Erosion Control Plan and Preliminary Restoration Element Design for Lido Key.* Sarasota, FL.

Coastal Planning & Engineering, Inc. 1991. *Lido Key Beach Restoration Project, State Authorization Report.* Boca Raton, FL.

Coastal Planning and Engineering, Inc. 1992. *Lido Key Beach Restoration Project Sand Search Report* (Prepared for the City of Sarasota). Unpublished.

Coastal Planning & Engineering, Inc. 1992. *Sand Search Report, Lido Key Beach Restoration Project.* Boca Raton, FL.

Coastal Planning & Engineering, Inc. 1993. *Big Sarasota Inlet Management Plan.* Boca Raton, FL.

Coastal Planning & Engineering, Inc. 1994. *New Pass Inlet Management Plan.* Boca Raton, FL.

Coastal Planning & Engineering, Inc. 1995. *Cultural Resource Investigations and Remote Sensing Magnetometer Survey Results for Two Proposed Offshore Sand Borrow Sites at Lido Key, Florida.* Boca Raton, FL.

Coastal Planning & Engineering, Inc., 1999. *Town of Longboat Key, Phase II Offshore Borrow Area Investigation to Locate "White Sand" Sources for Beach Renourishment of Longboat Key,* Boca Raton, Florida.

Dean, R.G., Chiu, T.Y., Wang, S.Y. 1988. *Combined Total Storm Tide Frequency Analysis for Sarasota County, Florida.* Florida State University. Tallahassee, FL.

Florida Department of Environmental Protection. 2000. *Critical Beach Erosion Areas in Florida*, Report *No. BCS-99-02*, Bureau of Beaches and Coastal Systems, Division of Water Facilities, Department of Environmental Protection. Tallahassee, FL. http://www.dep.state.fl.us/beach/pdf/errptall.pdf.

Hanson, H. and Kraus, N.C. 1989. *GENESIS: Generalized Model for Simulating Shoreline Change, 2 Vols., Technical Report CERC-89-19*, U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center. Vicksburg, MS.

Larson M., and Kraus, N.C. 1989. *SBEACH: Numerical Model for Simulating Storm-Induced Beach Change, 2 Vols., Technical Report CERC 89-9,* U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center. Vicksburg, MS.

University of Florida. 1961. *Brief Report on Coastal Protection at South Lido Beach.* University of Florida – College of Engineering. Gainesville, FL.

U.S. Army Corps of Engineers. 1962. *Detailed Project Report on Sarasota Passes.* Sarasota, Florida. U.S. Army Corps of Engineers District, Jacksonville District, FL.

U.S. Army Corps of Engineers. 1963. *Survey-Review Report on Sarasota Passes,* Sarasota, Florida. U.S. Army Corps of Engineers District, Jacksonville, District, FL.

U.S. Army Corps of Engineers. 1968. *Beach Erosion Control Study, Sarasota County, Florida, Interim Report on Lido Key.* U.S. Army Corps of Engineers District, Jacksonville, FL.

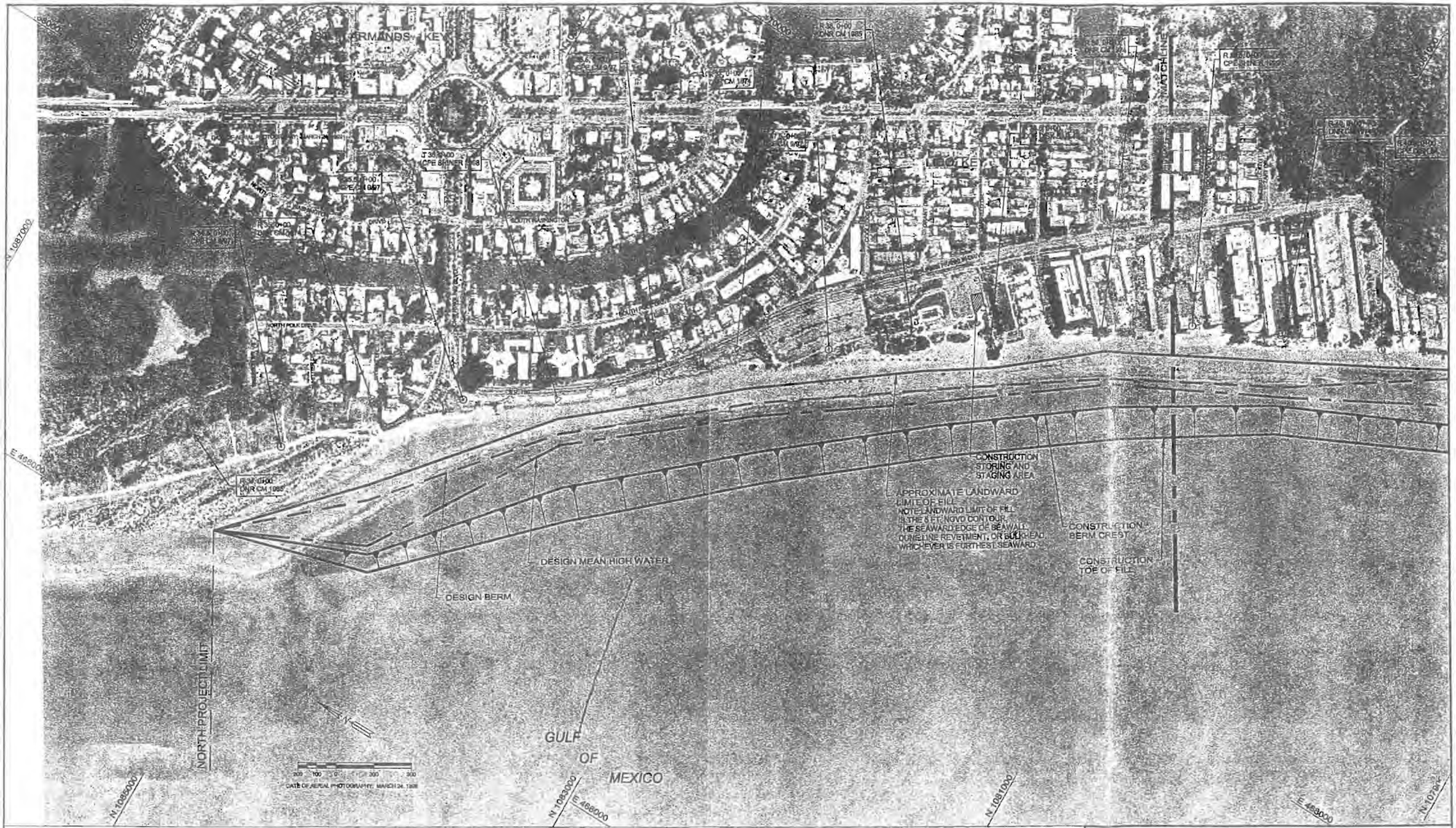
U.S. Army Corps of Engineers. 1970. *Beach Erosion Control Project for Lido Key,* Sarasota County, Florida. U.S. Army Corps of Engineers District, Jacksonville, FL.

U.S. Army Corps of Engineers. 1984. *Beach Erosion Control Study for Sarasota County, Florida, with Environmental Impact Statement*: U.S. Army Corps of Engineers District, Jacksonville, FL.

U.S. Army Corps of Engineers. 1984. *Shore Protection Manual*, 4th Edition, 2 Vols., U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center, U.S. Government Printing Office, Washington D.C.

U.S. Army Corps of Engineers. 1991. *Sarasota County, Florida Shore Protection Project, General Design Memorandum*: U.S. Army Corps of Engineers District, Jacksonville, FL.

U.S. Army Corps of Engineers. 1997. *Section 905(b) (WRDA) Analysis: Reconnaissance Phase Assessment for Lido Key*, Sarasota County, Florida, U.S. Army Corps of Engineers District, Jacksonville, FL.



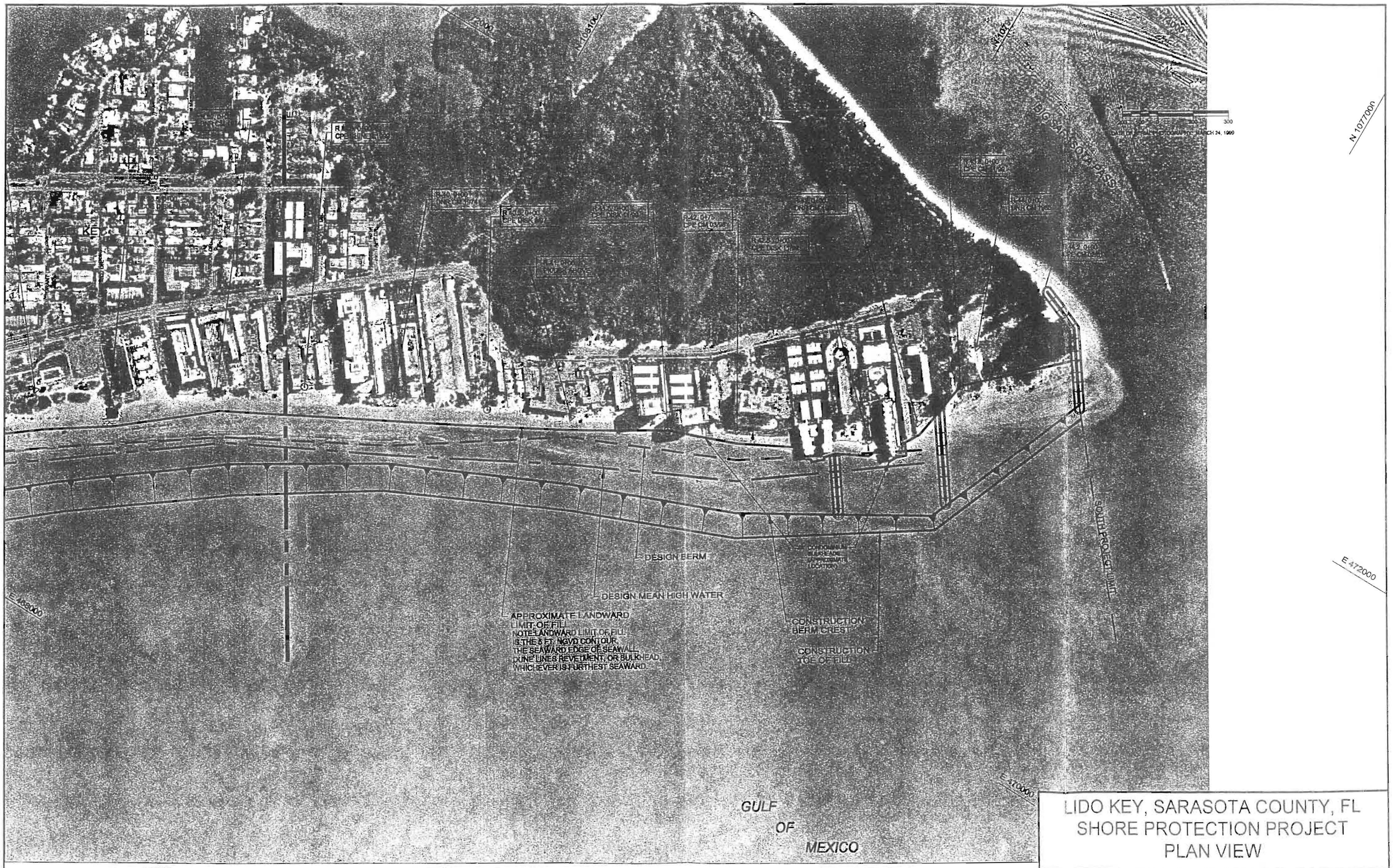
NOTES:

1. COORDINATES SHOWN HEREON ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM 1983.
2. ELEVATIONS SHOWN HEREON ARE IN FEET BASED ON NGVD 1929.

LIDO KEY, SARASOTA COUNTY, FL
SHORE PROTECTION PROJECT
PLAN VIEW

COASTAL PLANNING & ENGINEERING, INC.
2481 NW BOCA RATON BLVD.
BOCA RATON, FL 33431

FIGURE A-29A



NOTES:

1. COORDINATES SHOWN HEREON ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM 1983.
2. ELEVATIONS SHOWN HEREON ARE IN FEET BASED ON NGVD 1929.

LIDO KEY, SARASOTA COUNTY, FL
SHORE PROTECTION PROJECT
PLAN VIEW

COASTAL PLANNING & ENGINEERING, INC.
2481 NW BOCA RATON BLVD.
BOCA RATON, FL 33431

FIGURE A-29B